



SLOVENSKI STANDARD

SIST EN 60613:1995

01-maj-1995

Electrical, thermal and loading characteristics of rotating anode X ray tubes for medical diagnosis

Electrical, thermal and loading characteristics of rotating anode X-ray tubes for medical diagnosis

Elektrische, thermische und Belastungs-Kennwerte von Drehanoden-Röntgenröhren für die medizinische Diagnostik

Caractéristiques électriques, thermiques et de charge des tubes radiogènes à anode tournante pour diagnostic médical

[SIST EN 60613:1995](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995)

[https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995)

[5439e55b115e/sist-en-60613-1995](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995)

Ta slovenski standard je istoveten z: **EN 60613:1990**

ICS:

11.040.50 Radiografska oprema Radiographic equipment

SIST EN 60613:1995 **en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60613:1995](#)

<https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995>

EUROPEAN STANDARD

EN 60613

NORME EUROPEENNE

EUROPÄISCHE NORM

December 1990

UDC 615.849.114:616-073.75:621.386.2

Descriptors: Medical electrical equipment, X-ray equipment, radiodiagnostic X-ray generator, high voltage generators, X-ray tube assemblies, rotating anode X-ray tubes, definitions, electrical characteristics, thermal characteristics

ENGLISH VERSION

ELECTRICAL, THERMAL AND LOADING CHARACTERISTICS OF
ROTATING ANODE X-RAY TUBES FOR MEDICAL DIAGNOSIS
(IEC 613:1989)

Caractéristiques électriques,
thermiques et de charge des tubes
radiogènes à anode tournante
pour diagnostic médical
(CEI 613:1989)

Elektrische, thermische und
Belastungs-Kennwerte von
Drehanoden-Röntgenröhren für
die medizinische Diagnostik
(IEC 613:1989)

This European Standard 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 giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official 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

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

© 1990 Copyright reserved to CENELEC members

Ref. No. EN 60613:1990 E

FOREWORD

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 613:1989 could be accepted without textual changes, has shown that no CENELEC common modifications were necessary for the acceptance as European Standard. The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60613 on 11 September 1990.

The following dates were fixed:

- latest date of publication of
an identical national standard (dop) 1991-06-15
- latest date of withdrawal of
conflicting national standards (dow) 1991-06-15

Annex designated "normative" is part of the body of the standard. In this standard, annex ZA is normative.

For products which have complied with the relevant national standard before 1991-06-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1996-06-15.

[SIST EN 60613:1995](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-829-5439-55b115/sist-en-60613-1995)

[https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-829-](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-829-5439-55b115/sist-en-60613-1995)

[5439-55b115/sist-en-60613-1995](https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-829-5439-55b115/sist-en-60613-1995)

ENDORSEMENT NOTICE

The text of the International Standard IEC 613:1989 was approved by CENELEC as a European Standard without any modification.

ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

IEC <u>Publication</u>	<u>Date</u>	<u>Title</u>	<u>EN/HD</u>	<u>Date</u>
601-1	1977	Safety of medical electrical equipment Part 1: General requirements	HD 395.1 S1*	1978
601-1	1988	Medical electrical equipment Part 1: General requirements for safety	EN 60601-1 S1	1990
601-2-7	1987	Part 2: Particular requirements for the safety of high-voltage generators of diagnostic X-ray generators	HD 395.2.7 S1	1989
613	1978	Electrical, thermal and loading characteristics of rotating anode X-ray tubes for medical diagnosis	-	-
788	1984	Medical radiology - Terminology	HD 501 S1	1988

SIST EN 60613:1995

<https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-829-5439e55b115e/sist-en-60613-1995>

* superseded by HD 395.1 S2 1988

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60613:1995

<https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995>

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC
613**

Deuxième édition
Second edition
1989-04

Caractéristiques électriques, thermiques et de charge des tubes radiogènes à anode tournante pour diagnostic médical

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Electrical, thermal and loading characteristics of rotating anode X-ray tubes for medical diagnosis

<https://standards.iteh.ai/catalog/standards/sist/d2ac04bc-3cb5-48cc-82b9-5439e55b115e/sist-en-60613-1995>

© CEI 1989 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher

Bureau central de la Commission Electrotechnique Internationale 3, rue de Varembe Genève Suisse



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

N

● Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

	Page
FOREWORD	5
PREFACE	5
Clause	
1. Scope and object	7
1.1 Scope	7
1.2 Object	7
2. Introduction	7
3. Terminology	7
3.1 Degree of requirements	7
3.2 Definitions	7
4. Electrical characteristics of an X-RAY TUBE	7
4.1 X-ray tube voltage	7
4.2 Nominal X-ray tube voltage	9
4.3 Limited X-ray tube voltage	9
4.4 X-ray tube current	9
4.5 Cathode emission characteristic	9
5. LOADING of an X-RAY TUBE	11
5.1 Loading	11
5.2 X-ray tube load	11
5.3 Loading factor	11
5.4 Loading time	11
6. Input power	13
6.1 Anode input power	13
6.2 Nominal anode input power	13
6.3 Equivalent anode input power	13
6.4 X-ray tube assembly input power	15
7. Thermal characteristics of an ANODE	15
7.1 Anode heat content	15
7.2 Maximum anode heat content	15
7.3 Anode heating curve	15
7.4 Anode cooling curve	17
7.5 Verification	17
8. Thermal characteristics of an X-RAY TUBE ASSEMBLY	19
8.1 X-ray tube assembly heat content	19
8.2 Maximum X-ray tube assembly heat content	19
8.3 X-ray tube assembly heating curve	21
8.4 X-ray tube assembly cooling curve	21
8.5 Maximum continuous heat dissipation	21
9. RADIOGRAPHIC RATINGS of an X-RAY TUBE	23
9.1 Single load rating	23
9.2 Serial load rating	23
9.3 Decreasing input power rating	25
Table 1 — List of the characteristic quantities and their units	25
ANNEX A — Terminology	27
ANNEX B — Guidance on type testing	29

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL, THERMAL AND LOADING CHARACTERISTICS OF
ROTATING ANODE X-RAY TUBES FOR MEDICAL DIAGNOSIS**

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.

PREFACE

This Standard has been prepared by Sub-Committee 62B: X-ray equipment operating up to 400 kV and accessories, of IEC Technical Committee No. 62: Electrical equipment in medical practice.

This second edition of IEC Publication 613 replaces the first edition, issued in 1978.

<https://standards.iteh.ai/catalog/standards/sist/d2aeb4bc-3eb3-48ec-82f9-5439e55b115e/sist-en-60613-1995>

The text of this Standard is based on the following documents:

Six Months' Rule	Report on Voting	Two Months' Procedure	Report on Voting
62B(CO)69	62B(CO)74	62B(CO)79	62B(CO)82

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

The following IEC publications are quoted in this Standard:

- Publications Nos. 601-1 (1977): Safety of medical electrical equipment, Part 1: General requirements.
 601-1 (1988): Medical electrical equipment, Part 1: General requirements for safety.
 601-2-7 (1987): Part 2: Particular requirements for the safety of high-voltage generators of diagnostic X-ray generators.
 613 (1978): Electrical thermal and loading characteristics of rotating anode X-ray tubes for medical diagnosis.
 788 (1984): Medical radiology — Terminology.
-

ELECTRICAL, THERMAL AND LOADING CHARACTERISTICS OF ROTATING ANODE X-RAY TUBES FOR MEDICAL DIAGNOSIS

1. Scope and object

1.1 Scope

This International Standard applies to ROTATING ANODE X-RAY TUBES and X-RAY TUBE ASSEMBLIES intended for use in medical diagnosis.

1.2 Object

This International Standard covers definitions of electrical, thermal and loading characteristics of the devices with relation to their behaviour during and after energization and, where appropriate, methods of presentation, determination and verification of these characteristics.

2. Introduction

This International Standard is intended to provide a common basis for the indication of data on ROTATING ANODE X-RAY TUBES and X-RAY TUBE ASSEMBLIES and to facilitate the application of RADIOGRAPHIC RATINGS by the user, basing these on standardized conditions as given in the ACCOMPANYING DOCUMENTS.

3. Terminology

3.1 Degree of requirements

In this International Standard the auxiliary verb

- “shall” implies that compliance with a requirement is mandatory for compliance with the standard;
- “should” implies that compliance with a requirement is strongly recommended but is not mandatory for compliance with the standard;
- “may” implies that compliance with a requirement is permitted to be accomplished in a particular manner, for compliance with the standard.

3.2 Definitions

Definitions of terms printed in small capital letters and not contained in this International Standard are used as given in IEC 788: Medical Radiology — Terminology, first edition 1984. See annex A, Terminology.

The numbering rm-... in the sub-clauses headed “Definition” refers to IEC 788.

Note. — The French terms in Sub-clauses 7.2, 8.1 and 8.2 and the definitions in Sub-clauses 4.4.1 and 6.2.1 deviate from those given in IEC 788, which latter will be revised accordingly.

4. Electrical characteristics of an X-RAY TUBE

4.1 X-ray tube voltage

4.1.1 Definition rm-36-02

Potential difference applied to an X-RAY TUBE between the ANODE and the CATHODE.

4.1.2 Units

X-RAY TUBE VOLTAGE shall be given as the peak value, in KILOVOLTS.

4.2 *Nominal X-ray tube voltage*

4.2.1 *Definition* rm-36-03

Highest permitted X-RAY TUBE VOLTAGE for specific operating conditions.

4.2.2 *Units*

NOMINAL X-RAY TUBE VOLTAGE shall be given as the peak value, in KILOVOLTS.

4.2.3 *Presentation of data*

Values shall be given for the maximum permitted X-RAY TUBE VOLTAGE between

— ANODE and CATHODE.

Values may be given for the highest permitted potential difference between

— ANODE and earth

and between

— CATHODE and earth.

Unless otherwise specified, the above values are valid for all specified operating conditions.

Notes 1. — For different operating conditions of the X-RAY TUBE, for example continuous operation, intermittent operation, short-time operation, there may be different values of the above NOMINAL X-RAY TUBE VOLTAGE.

2. — In some cases the value of the NOMINAL X-RAY TUBE VOLTAGE during on-load conditions (which characterizes essentially the RADIATION ENERGY of the emitted X-RADIATION) and the value during off-load conditions may be different.

4.3 *Limited X-ray tube voltage*

4.3.1 *Definition* rm-36-04

In an X-RAY INSTALLATION, a NOMINAL X-RAY TUBE VOLTAGE limited for a particular combination.

4.4 *X-ray tube current*

4.4.1 *Definition* (rm-36-07; see also 3.2)

Electric current through an X-RAY TUBE.

Unless otherwise specified, values of X-RAY TUBE CURRENT correspond to the electron beam reaching the TARGET of the X-RAY TUBE.

4.4.2 *Units*

X-RAY TUBE CURRENT shall be given as the average value in MILLIAMPERES.

4.5 *Cathode emission characteristic*

4.5.1 *Definition* rm-36-20

Dependence of the X-RAY TUBE CURRENT on variables, for example FILAMENT CURRENT, X-RAY TUBE VOLTAGE.

4.5.2 *Presentation of data*

CATHODE EMISSION CHARACTERISTICS are given as a family of curves in which the X-RAY TUBE CURRENT is shown as a function of the FILAMENT CURRENT and, if appropriate, of further relevant characteristics of the CATHODE, each curve corresponding to an X-RAY TUBE VOLTAGE and a PERCENTAGE MODULATION of stated value and waveform, and other factors as appropriate. In addition, the relationship between FILAMENT CURRENT and filament voltage shall be indicated and, if appropriate, also its dependence on other characteristics of the CATHODE.