BRITISH STANDARD

BS EN
12544-1:1999

Non-destructive testing — Measurement and evaluation of the X-ray tube voltage —

Part 1: Voltage divider method

The European Standard EN 12544-1:1999 has the status of a British Standard

ICS 19.100

National foreword

This British Standard is the English language version of EN 12544-1:1999.

The UK participation in its preparation was entrusted to Technical Committee WEE/46, Non-destructive testing, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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English version

Non destructive testing - Measurement and evaluation of the X-ray tube voltage - Part 1: Voltage divider method

Essais non destructifs - Mesurage et évaluation de la tension des tubes radiogènes – Partie 1: Méthode par deviseur de tension

Zerstörungsfreie Prüfung - Messung und Auswertung der Röntgenröhrenspannung - Teil 1: Spannungsteiler-Verfahren

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EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 138 "Non-destructive testing", the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

In the framework of its scope, Technical Committee CEN/TC 138 entrusted CEN/TC 138/WG 1 "Ionizing Radiation" with preparing the following standard:

EN 12544-1, *Non-destructive testing - Measurement and evaluation of the X-ray tube voltage - Part 1: Voltage divider method*.

EN 12544-1 is a part of series of European Standards; the other parts are the following:

EN 12544-2, *Non-destructive testing - Measurement and evaluation of the X-ray tube voltage - Part 2: Constancy check by the thick filter method*.

EN 12544-3, *Non-destructive testing - Measurement and evaluation of the X-ray tube voltage - Part 3: Spectrometric method*.

Introduction

In order to cover the different requirements for the measurement of the X-ray tube voltage, three different methods are described in EN 12544-1 to EN 12544-3.

The voltage divider method (EN 12544-1) enables a direct and absolute measurement of the average high voltage of constant potential X-ray systems on the secondary side of the high voltage generator.

The thick filter method (EN 12544-2) describes a constancy check. This method is recommended for the regular stability check of an X-ray system.

The spectrometric method (EN 12544-3) is a procedure for non-invasive measurement of the X-ray tube voltage using the energy spectrum of the X-rays. This method can be applied for all X-ray systems and is the recommended method whenever the voltage divider method is not applicable, e. g. in case of tank units where it is not possible to connect the voltage divider device.

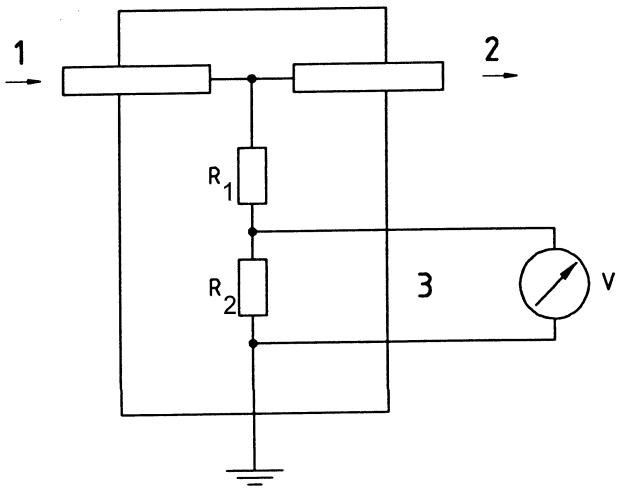
1 Scope

This European Standard specifies a method for the direct and absolute measurement of the average high voltage of constant potential (DC) X-ray systems on the secondary side of the high voltage generator. The intention is to check the correspondence with the indicated high voltage value on the control unit of the X-ray system.

This method is applied to assure a reproducible operation of X-ray systems because the voltage influences particularly the penetration of materials and the contrast of X-ray images and also the requirements concerning the radiation protection.

2 Principle

The principle of the voltage divider method is presented in figure 1:



Key

1 From generator
2 To X-ray tube
3 Analog exit

Figure 1 – Scheme of the voltage divider

The voltage divider system consists of:

– a box with two high voltage connectors;

– a resistor chain R_1, R_2;

– an analog exit for the voltage drop at R_2;

– a measuring device, e.g. a voltmeter or an oscilloscope.

The value of the resistors should be chosen for a current of less than 10 % of the actual tube current.

The resistor chain shall have a temperature coefficient of $\leq 50 \times 10^{-6}/°C$ in relation to the resistor value.

The output voltage across the resistor R_2 represents the value for the high voltage. The input resistance of the voltmeter shall be taken into account.

The required overall precision of the voltage divider method depends on the application, for example

a) 1 % of the maximum voltage of the X-ray unit in case of highly stabilized constant potential systems for sophisticated applications like tomography or dosimetry; or

b) 3 % for general radiographic and radioscopic applications.

3 Measurement

For measuring purposes the measuring device is connected between the high voltage generator and the X-ray tube. The high voltage is devided by means of the resistor chain, presented as R_1 and R_2 in figure 1, and the drop voltage is measured at R_2 using a voltmeter or an oscilloscope.

4 Test report

The test report shall contain at least the following details:

a) the X-ray system with type and serial number;

b) the working conditions of the X-ray system, e.g. tube current, tube voltage, temperature;

c) the accuracy of the measuring device;

d) the date of measurement;

e) a table with the result(s) and a comparison between the actual and the indicated values;

f) name and signature of the operator.

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