INTERNATIONAL STANDARD

ISO 16526-1

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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 diviseur de tension

Reference number
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Foreword

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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.

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ISO 16526-1 was prepared by CEN (as EN 12544-1:1999) and is submitted for approval under a special “fast-track procedure”, by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiation methods*, in parallel with its approval by the ISO member bodies (see the *ISO/IEC Directives*, Part 1, “Fast-track procedure”).

ISO 16526 consists of the following parts, under the general title *Non-destructive testing — Measurement and evaluation of the X-ray tube voltage*:

— *Part 1: Voltage divider method*

— *Part 2: Constancy check by the thick filter method*

— *Part 3: Spectrometric method*

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Introduction

In order to cover the different requirements for the measurement of the X-ray tube voltage, three different methods are described in ISO 16526-1 to ISO 16526-3.

The voltage divider method (ISO 16526-1) 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 (ISO 16526-2) describes a constancy check. This method is recommended for the regular stability check of an X-ray system.

The spectrometric method (ISO 16526-3) 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.

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

Part 1: Voltage divider method

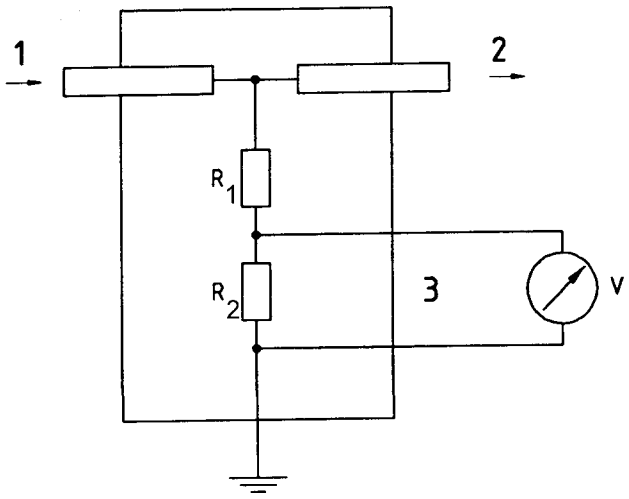
1 Scope

This part of ISO 16526 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

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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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