

## Validation of arc welding equipment

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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 50504:2008 sisaldab Euroopa standardi EN 50504:2008 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 19.08.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 24.07.2008.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 50504:2008 consists of the English text of the European standard EN 50504:2008.

This standard is ratified with the order of Estonian Centre for Standardisation dated 19.08.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 24.07.2008.

The standard is available from Estonian standardisation organisation.

ICS 25.160.10

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## **Validation of arc welding equipment**

Validation du matériel de soudage à l'arc

Validierung von  
Lichtbogenschweißeinrichtungen

This European Standard was approved by CENELEC on 2008-06-01. 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.

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# **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

This European Standard has been prepared by the Technical Committee CENELEC TC 26A, Electric arc welding equipment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50504 on 2008-06-01.

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) 2009-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2011-06-01

This European Standard has been developed under the authority of CLC/TC 26A, Electric arc welding equipment. Welding is considered to be a special process because the final result may not always be capable of being verified by testing, hence it requires continuous control and/or adherence to documented procedures.

This European Standard has been developed to identify the controls and procedures required. It requires the use of calibrated welding equipment, then the quality/consistency of the weld depends upon accurate and repeatable setting of parameters such as current, voltage, speed, gas flow, etc.

This European Standard concentrates on validating equipment built to the constructional standard EN 60974-1. The accuracy of this equipment is designated as standard grade. A higher level of accuracy (precision grade) is introduced in this document.

As a code of practice, this European Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

A standard does not purport to include all necessary provisions of a contract. Users of standards are responsible for their correct application.

Compliance with a standard does not of itself confer immunity from legal obligations.

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## Introduction

The quality and consistency of a weld depends on the welder, the materials and the welding equipment. Variability in the output of the welding equipment will affect the quality of the weld. In some arc welding processes, e.g. MMA, the welder controls the process through his experience and measurement of run out length is used to monitor the heat input. However, in other arc welding processes the quality of the weld depends upon accurate and repeatable setting of parameters such as current, voltage, speed, gas flow, pulse characteristics, etc.

The relevant construction standard for arc welding equipment is EN 60974-1. This standard sets the reference level for the accuracy and consistency of the welding output. EN 60974-1 derives its specification for performance accuracy from the requirements of manual welding. In manual welding the welder plays a key role in adapting and adjusting the output of the equipment to meet the requirements of the weld. This adaptability allows equipment to be constructed with a relaxed specification for calibration of output.

Mechanised welding methods lack the skilled adaptability of the manual welder and require precise control of all aspects of the welding process. The control of the output of the welding equipment is of particular importance. Manufacturers have responded to this need by producing equipment with an accuracy of output control and calibration, which exceed the requirements of EN 60974-1.

In addition to the demands of mechanized welding, manual welding methods have become more refined and welding procedures often call for the precise control of power source outputs to limit the freedom of the manual welder in order to produce particular results.

The improvement in equipment construction, the adoption of mechanized welding, the introduction of quality assurance programmes and the increased understanding of the factors which control weld quality have led to the demand for more rigorous calibration and validation of welding equipment performance.

The term calibration has been used in the foregoing text to introduce the general subject of checking that the welding equipment output meets the manufacturer's specification and is fit for the purpose of making welds. This is a commonly accepted term for this checking operation but it does not meet the strict definition of the word calibration.

Clause 3 of this document gives the definition of calibration. The operation of calibration can be applied only to determining and adjusting the errors of a measuring instrument. An item of welding equipment is not a measuring instrument though the meters fitted to the welding equipment are and can be calibrated. The difficulty of terminology and the checking task is further compounded as many pieces of welding equipment do not have calibrated outputs but are scaled in arbitrary units. Again this is a function of the manual welding usage in which the skill of the manual welder is used to adjust and set the welding variables. It is necessary to use an alternative term to describe the operation of verifying that the welding equipment is fit for the intended purpose. The term selected is validation.

Validation is the operation which verifies that the welding equipment conforms to the operating specification for that equipment. If the equipment fails to conform to the specification then the correction of the errors within the equipment is outside the scope of this European Standard. That operation is the province of the manufacturers or equipment specialists.

It is implicit in the introduction of a more rigorous standard of accuracy of control of output for welding equipment that the scope of application of that standard should be defined. This European Standard defines two levels of accuracy. One is derived directly from EN 60974-1 and is called standard grade. A higher level of accuracy for more exacting welding applications is defined, called precision grade, and this is given in Annex A for information. The use of precision grade is dependent upon the welding application.

The welding equipment covered by this European Standard will be fitted with controls intended to regulate the output of the welding equipment. The controls may be scaled in absolute units (amperes, volts and metres per minute) or in arbitrary units (numbers, letters, geometrical marks). Controls scaled in absolute units may be validated and the consistency of those controls scaled in arbitrary units may be assessed.

The welding equipment may be fitted with meters that measure the output of the equipment and these meters should normally be validated against the appropriate standard, unless a different method is used to control the welding process.

The use of meters and measuring instrument packages with welding equipment that is required to produce welds of integrity and reliability is strongly recommended.

This code of practice recommends the use of resistive loads to validate the power source and associated meters. Alternatively, independent instrumentation may be used to monitor the welding process, rather than validating the power source itself. The method of control and type of instrumentation should be detailed on the welding procedure sheet.

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## 1 Scope

This European Standard specifies validation methods for arc welding equipment constructed and used to the accuracy specified in EN 60974-1 or other equivalent standards. The accuracy of this equipment is designated as standard grade.

This European Standard is applicable to

- a) arc welding power sources,
- b) wire feeders,
- c) welding instrumentation.

This European Standard is not applicable to arc striking and stabilizing device.

Calibration, verification and validation of equipment for other welding processes and ancillary equipment which may affect the quality of the weld, e.g. flow gauges, thermocouples, robots and manipulators are given in EN ISO 17662.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60051-1:1998, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 1: Definitions and general requirements common to all parts* (IEC 60051-1:1997)

EN 60974-1, *Arc welding equipment – Part 1: Welding power sources* (IEC 60974-1)

EN ISO 17662, *Welding – Calibration, verification and validation of equipment used for welding, including ancillary activities* (ISO 17662)

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 60974-1 and the following apply.

### 3.1 calibration

operations for the purpose of determining the magnitude of the errors of a measuring instrument and if necessary to determine other metrological properties

### 3.2 validation

operations for the purpose of demonstrating that an item of welding equipment or a welding system conforms to the operating specification for that welding equipment or system

### 3.3 accuracy

closeness of an observed quantity to the defined or true value