



IEC 60974-14

Edition 1.0 2018-10

INTERNATIONAL STANDARD

**Arc welding equipment –
Part 14: Calibration, validation and consistency testing**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.160.30

ISBN 978-2-8322-6165-1

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

| | |
|--|----|
| FOREWORD..... | 4 |
| INTRODUCTION..... | 6 |
| 1 Scope..... | 7 |
| 2 Normative references | 7 |
| 3 Terms and definitions | 7 |
| 4 Safety precautions..... | 9 |
| 5 Testing personnel..... | 9 |
| 6 VERIFICATION accuracies – permitted deviations..... | 9 |
| 7 Arc welding power sources..... | 11 |
| 7.1 Selection related to CALIBRATION, VALIDATION or CONSISTENCY TESTING of process-relevant parameters..... | 11 |
| 7.1.1 VERIFICATION method | 11 |
| 7.1.2 Special features for AC determination of welding power source output mode for VERIFICATION | 12 |
| 7.2 Testing equipment and test setup | 14 |
| 7.2.1 Test setup | 14 |
| 7.2.2 Reference instruments..... | 14 |
| 7.2.3 Test load | 15 |
| 7.2.4 Conventional load test values | 15 |
| 7.3 CALIBRATION, VALIDATION and CONSISTENCY TESTING procedure..... | 16 |
| 7.3.1 General | 16 |
| 7.3.2 CALIBRATION of DISPLAYED VALUE reading..... | 16 |
| 7.3.3 VALIDATION of SET VALUES..... | 17 |
| 7.3.4 CONSISTENCY TEST of SET VALUES | 17 |
| 8 Wire feeder..... | 17 |
| 8.1 General..... | 17 |
| 8.2 Requirements for VERIFICATION..... | 18 |
| 8.3 Method | 18 |
| 9 Frequency of VERIFICATION..... | 18 |
| 10 Marking and VERIFICATION report..... | 19 |
| 10.1 Marking..... | 19 |
| 10.2 VERIFICATION report..... | 19 |
| Annex A (informative) Diagrams of VERIFICATION accuracies | 20 |
| A.1 CALIBRATION accuracies of DISPLAYED VALUES | 20 |
| A.2 VALIDATION accuracies of SET VALUES | 20 |
| Annex B (informative) Measured value formation | 22 |
| B.1 General..... | 22 |
| B.2 Averaging of measurement values | 22 |
| B.2.1 Arithmetic mean..... | 22 |
| B.2.2 Arithmetic rectified value | 22 |
| B.2.3 Root mean square (effective value) | 23 |
| Annex C (informative) Slope, pulse and synergic controls..... | 24 |
| C.1 VERIFICATION accuracy | 24 |
| C.2 Requirements for VERIFICATION..... | 24 |
| C.3 Method | 25 |
| C.4 Pulsed MIG and synergic controls..... | 25 |

Annex D (informative) Precautions to be taken with TIG welding equipment..... 26

Annex E (informative) Samples of VERIFICATION reports..... 27

 E.1 Sample of CALIBRATION report..... 27

 E.2 Sample of VALIDATION report..... 28

 E.3 Sample of CONSISTENCY TEST report 29

Bibliography..... 30

Figure 1 – Determination of VERIFICATION method..... 12

Figure 2 – Determination of VERIFICATION based on power source type 13

Figure 3 – Test setup example..... 14

Figure 4 – Example 10 kHz filter with reference voltmeter 15

Figure A.1 – Diagrams of CALIBRATION accuracies 20

Figure A.2 – Diagrams of VALIDATION accuracies 21

Table 1 – CALIBRATION accuracies of DISPLAYED VALUES 10

Table 2 – VALIDATION accuracies of SET VALUES..... 10

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ARC WELDING EQUIPMENT –

Part 14: CALIBRATION, VALIDATION and CONSISTENCY TESTING

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60974-14 has been prepared by IEC technical committee TC 26: Electric welding.

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

| FDIS | Report on voting |
|-------------|------------------|
| 26/661/FDIS | 26/666/RVD |

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this standard, the following print types are used:

- terms used throughout this standard which have been defined in clause 3: SMALL ROMAN CAPITALS.

A list of all parts of the IEC 60974 series can be found, under the general title *Arc welding equipment*, on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum 1 (2022-01) have been included in this copy.

INTRODUCTION

This document is the first international edition for CALIBRATION, VALIDATION and CONSISTENCY TESTING of arc welding equipment. It is based on the European Standard EN 50504:2008 and will replace it. A brief history helps to understand the origin and development of this document.

In Great Britain, BS 7570:1992, *Code of practice for the validation of arc welding equipment*, was published and it became the equivalent European pre-standard ENV 50184:1996 (withdrawn).

The revised second edition of BS 7570 was published in 2000 and was later replaced by the equivalent EN 50504:2008.

For quality management in the field of welding, this document should be used in conjunction with ISO 17662.

The significant changes in respect to EN 50504:2008 are the following:

- terms VERIFICATION and VALIDATION aligned to ISO/IEC Guide 99:2007;
- wire feed equipment moved from the annex to main part of the document;
- new preferred requirement for digital instrument CALIBRATION with fixed tolerance values;
- flow charts for determination of VERIFICATION methods and sample reports added;
- EN 50504:2008 Annex E *Validation of ancillary components in a welding system* and Annex F *Voltage drops in the welding circuit* deleted.

ARC WELDING EQUIPMENT –

Part 14: CALIBRATION, VALIDATION and CONSISTENCY TESTING

1 Scope

This part of IEC 60974 specifies requirements for the VERIFICATION of arc welding and external monitoring equipment. This document also serves for practical implementation of the VERIFICATION procedure for arc welding equipment.

This document can be applied at the time of installation and any other times or intervals the user deems appropriate to ensure the equipment is capable of operating to the manufacturer's specification or other specifications deemed applicable by the user.

This document is not applicable to

- plasma systems used for cutting and gouging;
- arc striking and stabilizing devices;
- arc welding equipment designed in accordance with IEC 60974-6.

NOTE 1 Other components in welding systems such as for example robots, turning devices, gas consoles, etc. also have influence on the welding result and can be verified, if necessary. Additional information can be found in ISO 17662.

NOTE 2 Periodic inspection and testing for arc welding equipment is covered in IEC 60974-4.

This document is applicable for the user, service shop or manufacturer. It can be used

- stand alone;
- in conjunction with manufacturer's instructions; or
- as the basis for an equivalent VERIFICATION procedure written by the manufacturer for specific equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*