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INTERNATIONAL STANDARD

Arc welding equipment –
Part 13: Welding current return clamp

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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FOREWORD

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International Standard IEC 60974-13 has been prepared by IEC technical committee 26: Electric welding.

This second edition cancels and replaces the first edition, published in 2011, and constitutes a technical revision.

The significant technical changes with respect to the previous edition are the following:

- Modified the title from "Welding clamp" to "Welding current return clamp" and updated the term through the document.
- Updated all values of test current in Table 1 corrected to 40 °C.
- Updated the reference to EN 50565-1:2014, *Electric cables – Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U) – Part 1: General guidance*

This part of IEC 60974 is to be used in conjunction with IEC 60974-1.

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

FDIS	Report on voting
26/717/FDIS	26/722/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:

– conformity statements: in *italic type*.
– terms defined in Clause 3: in SMALL ROMAN CAPITALS.

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- withdrawn,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

ARC WELDING EQUIPMENT –

Part 13: Welding current return clamp

1 Scope

This part of IEC 60974 is applicable to WELDING CURRENT RETURN CLAMPS for arc welding processes, designed to make an electrical connection to the workpiece without using tools.

This document is not applicable to WELDING CURRENT RETURN CLAMPS for underwater welding and plasma cutting.

This document specifies safety and performance requirements of WELDING CURRENT RETURN CLAMPS.

This document does not specify requirements for welding cables.

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 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*
IEC 60050-151:2001/AMD1:2013
IEC 60050-151:2001/AMD2:2014
IEC 60050-151:2001/AMD3:2019
IEC 60050-151:2001/AMD4:2020

IEC 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*
IEC 60974-1:2017/AMD1:2019

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151, IEC 60974-1, as well as the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
WELDING CURRENT RETURN CLAMP
WORK CLAMP, US
RETURN CURRENT CLAMP, UK
clamp that is attached to, or in contact with, the workpiece, to connect the welding return cable to the workpiece

[SOURCE: IEC 60050-851:2008, 851-14-36]

3.2
RATED CURRENT
current assigned by the manufacturer that the WELDING CURRENT RETURN CLAMP can accept at 60 % duty cycle without exceeding the permitted temperature rise

3.3
RETAINING MEANS
mechanical arrangement that holds the WELDING CURRENT RETURN CLAMP in position and prevents an unintentional withdrawal, when properly attached to the workpiece

4 Environmental conditions

The WELDING CURRENT RETURN CLAMP shall be capable of operation when the following environmental conditions prevail:

a) range of ambient air temperature:
   during operation: −10 °C to +40 °C;
b) relative humidity of the air: up to 50 % at 40 °C;
   up to 90 % at 20 °C.

The WELDING CURRENT RETURN CLAMP shall withstand storage and transport at an ambient air temperature of

– 20 °C to + 55 °C without any damage to function and performance.

5 Tests

5.1 Test conditions

All type tests shall be carried out on the same new and completely assembled WELDING CURRENT RETURN CLAMP.

All type tests shall be carried out at an ambient air temperature between 10 °C and 40 °C.

5.2 Measuring instruments

As specified in 5.2 of IEC 60974-1:2017.

5.3 Test sequence

The type tests given below shall be carried out in the following sequence:

a) general visual inspection;
b) temperature rise, see 8.1;
c) RETAINING MEANS, see 9.1;
d) drop withstand, see 9.4;
e) voltage drop, see Clause 7;
f) general visual inspection.

The other type tests in this document not mentioned above may be carried out in any convenient sequence.

6 Designation

The WELDING CURRENT RETURN CLAMP shall be designated by the range of cross-section area of the welding cable intended to be connected. The test current is given in Table 1 based on maximum cross-section area. The WELDING CURRENT RETURN CLAMP shall accept the minimum cross-sectional area as given in Table 1. Minimum cross-sectional area may be reduced to extend the WELDING CURRENT RETURN CLAMP fitting range.

Table 1 – Relation between WELDING CURRENT RETURN CLAMP test current and welding cables cross-sectional area

Range of cross-sectional area mm^2	WELDING CURRENT RETURN CLAMP test current at 60 % duty cycle A	WELDING CURRENT RETURN CLAMP test current at 100 % duty cycle A
6 to 10	88	87
10 to 16	121	117
16 to 25	165	157
25 to 35	211	196
35 to 50	275	248
50 to 70	351	309
70 to 95	433	374
95 to 120	511	435
120 to 150	599	505
150 to 185	693	579
185 to 240	824	679
NOTE 60 % and 100 % duty cycle test current values are based on cable current capacity given in Table D.4 of EN 50565-1:2014 corrected for an ambient temperature of 40 °C.		

Conformity shall be checked by measurement.

7 Protection against electric shock – Voltage drop

The WELDING CURRENT RETURN CLAMPS in the new condition shall be capable of satisfactorily passing the voltage test.

Conformity shall be checked by the following test:

Two WELDING CURRENT RETURN CLAMPS are required for this test. Connect each clamp to a cable of maximum cross-sectional area as indicated in Table 1, by using the method of attachment for which the clamps are designed. Attach one clamp to each end of a clean mild steel plate 300 mm × 75 mm × 12 mm. The two clamps shall be positioned so that the centers of the contact points are 260 mm ±20 mm apart. Connect the other end of the cables to a power source to form a circuit. Pass the test current through both clamps and the plate. The voltage is measured on the two cables, at a distance of 10 mm from the cable connections. The voltage drop shall not exceed 0,08 V per 100 A of the test current.

8 Thermal rating

8.1 Temperature rise

The temperature rise caused by the current passing through a WELDING CURRENT RETURN CLAMP normally coupled and fitted with an untinned copper welding cable of maximum cross-sectional area as indicated in Table 1 shall not exceed:

a) at the hottest spot of the external surface normally gripped by the operator: 40 K;

b) at the connection of the welding cable to the WELDING CURRENT RETURN CLAMP: 45 K.

NOTE These values are temperature rises in relation to the ambient air temperature (maximum 40 °C).

Conformity shall be checked by the following test:

Voltage drop set-up given in Clause 7 is used for this test. Before beginning the test, pass the test current through the WELDING CURRENT RETURN CLAMP for a period of 1 h. Allow the WELDING CURRENT RETURN CLAMP to cool to ambient temperature.

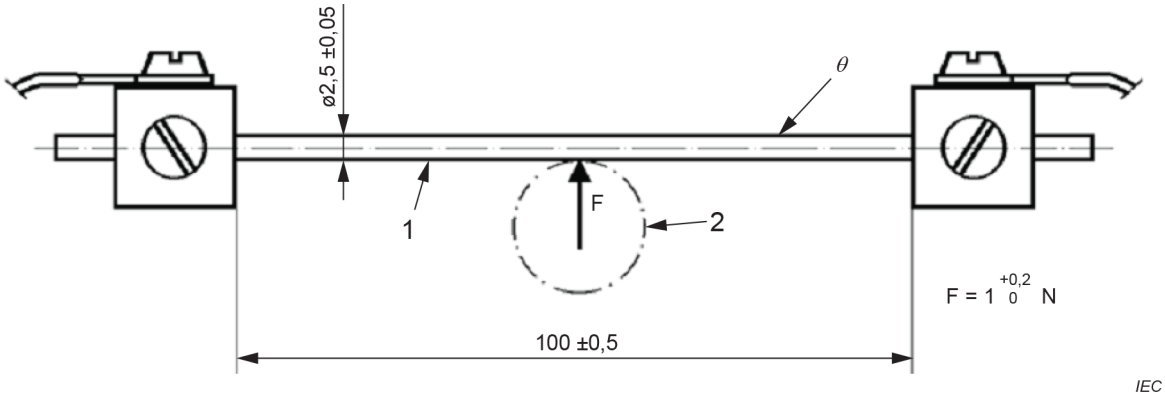
A DC current equal to the 100 % duty cycle test current given in Table 1 is passed through the WELDING CURRENT RETURN CLAMP until the rate of the temperature rise does not exceed 2 K/h. During the total test time, the DC current shall be kept constant with a tolerance of ± 2 %.

8.2 Resistance to hot objects

In the case of insulated WELDING CURRENT RETURN CLAMP, the insulation shall be capable of withstanding hot objects and the effects of a normal amount of weld spatter without being ignited.

Conformity shall be checked with a device in accordance with Figure 1.

Dimensions in millimetres



Key

1 18/8 chrome-nickel steel

2 WELDING CURRENT RETURN CLAMP

θ test temperature

Figure 1 – Device for testing the resistance to hot objects

An electric current (of approximately 25 A) is passed through the rod until a steady-state temperature θ of ú 300 $^{+5}_{0}$ °C is reached. During the test, the temperature of the heated rod shall be maintained. This temperature will be measured by a contact thermometer or thermocouple.