BS EN 60974-13:2011

BSI Standards Publication

Arc welding equipment

Part 13: Welding clamp

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National foreword

This British Standard is the UK implementation of EN 60974-13:2011. It is identical to IEC 60974-13:2011. It supersedes clause 2.6 (return current clamps) of BS 638-5:1988.

The UK participation in its preparation was entrusted to Technical Committee WEE/6, Electric arc welding equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Date	Text affected

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English version

Arc welding equipment - Part 13: Welding clamp
(IEC 60974-13:2011)

Matériel de soudage à l'arc - Partie 13: Pince de retour de courant (CEI 60974-13:2011)

Lichtbogenschweißeinrichtungen - Teil 13: Schweißstromrückleitungsklemmen (IEC 60974-13:2011)

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Foreword

The text of document (26/442/FDIS), future edition 1 of IEC 60974-13, prepared by IEC TC 26, Electric welding, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60974-13 on 2011-06-22.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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)	2012-03-22
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-06-22

In this standard, the following print types are used:

- *conformity statements: in italic type.*

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60974-13:2011 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-151	-	International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices	-	-
IEC 60974-1	-	Arc welding equipment - Part 1: Welding power sources	EN 60974-1	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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

The text of this standard is based on the following documents:

FDIS	Report on voting
26/442/FDIS	26/447/RVD

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

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

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

In this standard, the following print types are used:

- *conformity statements: in italic type.*

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

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

ARC WELDING EQUIPMENT –

Part 13: Welding clamp

1 Scope

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

This part of IEC 60974 is not applicable to clamps for underwater welding and plasma cutting.

This part of IEC 60974 specifies safety and performance requirements of welding clamps.

This part of IEC 60974 does not specify requirements for welding cables.

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.

IEC 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

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

3 Terms and definitions

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

3.1
welding clamp
work clamp, US
return current clamp, UK
device connecting welding cable to workpiece

3.2
rated current
current assigned by the manufacturer that the welding clamp can accept at 60 % duty cycle without exceeding the permitted temperature rise

3.3
retaining means
mechanical arrangement that holds the welding clamp in position and prevents an unintentional withdrawal, when properly attached to the workpiece

4 Environmental conditions

The welding 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 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 Type tests

5.1 Test conditions

All type tests shall be carried out on the same new and completely assembled welding clamp.

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

5.2 Measuring instruments

The accuracy of measuring instruments shall be:

a) electrical measuring instruments: class 1 (± 1 % of full-scale reading), except for the measurement of insulation resistance and dielectric strength where the accuracy of the instruments is not specified, but shall be taken into account for the measurement;

b) thermometer: ± 2 K.

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 7.1;

f) general visual inspection;

The other type tests in this part of IEC 60974 not mentioned above may be carried out in any convenient sequence.

6 Designation

The welding 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 clamp shall accept the minimum cross-sectional area as given in Table 1. Minimum cross-sectional area may be reduced to extend the welding clamp fitting range.

Table 1 – Relation between welding clamp test current and welding cables cross-sectional area

Range of cross-sectional area mm^2	Welding clamp test current at 60 % duty cycle A	Welding clamp test current at 100 % duty cycle A
up to 6	80	70
6 to 10	125	87
10 to 16	150	117
16 to 25	200	157
25 to 35	250	196
35 to 50	300	248
50 to 70	400	309
70 to 95	500	374
NOTE 100 % duty cycle test current values are based on cable current capacity given in Table 10 of HD 516 S2.		

Conformity shall be checked by measurement.

7 Protection against electric shock

7.1 Voltage drop

The clamps in the new condition shall be capable of satisfactorily passing the voltage test.

Conformity shall be checked by the following test:

Two 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. 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, 10 mm away from the clamps. The voltage drop shall not exceed 0,08 V per 100 A of the test current.

7.2 Protection of live parts

The welding clamp can be either protected against unintentional contact with the workpiece or not protected.

Conformity shall be checked by visual inspection.

8 Thermal rating

8.1 Temperature rise

The temperature rise caused by the current passing through a welding 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: 30 K;

b) at the connection of the welding cable to the welding clamp: 45 K.

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

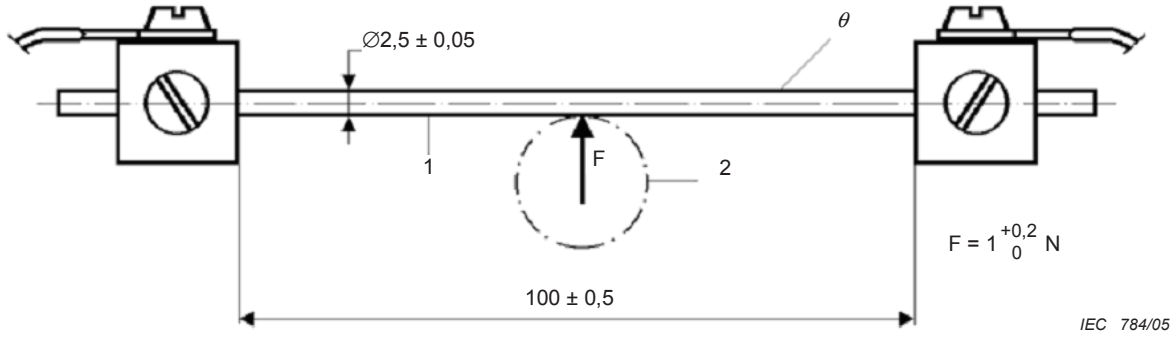
Conformity shall be checked by the following test:

Voltage drop set-up given in 7.1 is used for this test. A d.c. current equal to the 100 % duty cycle test current given in Table 1 is passed through the welding clamp until the rate of the temperature rise does not exceed 2 K/h. During the total test time, the d.c. current shall be kept constant with a tolerance of ± 2 %.

8.2 Resistance to hot objects

In the case of insulated welding 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.



Key

1 18/8 chrome-nickel steel

2 welding clamp

Dimensions in millimetres

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 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.

The heated rod in a horizontal position is then applied for 2 min to the insulation. The heated rod shall not penetrate through the insulation and contact live parts.

An attempt is made to ignite any gases which may be emitted in the region of the contact point by means of an electric spark or small flame. If the gases are flammable, the burning shall stop as soon as the heated rod is removed.

9 Mechanical requirements

9.1 Retaining means

A welding clamp shall be designed to maintain efficient electrical contact in normal service and to prevent the unintentional separation of the welding clamp as a result of a longitudinal pull.

Where springs are incorporated in the clamp they shall not constitute part of the current path unless they are permanently by-passed by a fixed conductor capable of carrying the test current given in Table 1.

Conformity shall be checked by visual inspection and the following test:

A welding clamp is fitted in accordance with the manufacturer's instructions, with a welding cable of maximum cross-sectional area, 5 m length and its coupling device. The welding cable is folded to form a bundle not exceeding 0,4 m in length. The welding clamp is attached to a clean mild steel plate 3 mm thick. The steel plate is hanged in order that cable bundle applies a vertical longitudinal strength on the welding clamp during 1 min.

Test is passed if the welding clamp remains attached to the steel plate.

9.2 Welding cable entry

The cable entries of the welding clamp shall be designed so as to prevent damage to the cable due to flexing.

Conformity shall be checked by visual inspection.

9.3 Welding cable connection

The design of the welding clamp shall be such that welding cables with a cross-sectional area within the range as specified by the manufacturer can be replaced. The connection shall withstand the mechanical stress of the tensile test without separation. A welding clamp may be provided with adaptor to enlarge the fitting range.

Conformity shall be checked by visual inspection and by the following test:

A welding clamp is fitted in accordance with the manufacturer's instructions, with a welding cable of maximum cross-sectional area. The connection is subjected to 10 pulls with a force of 40 N per mm² of the cross-sectional area with a maximum of 2 000 N applied to the welding cable. The force of each pull is gradually increased from zero to the specified value in 1 s and maintained for 1 s.

After the test, the conductor shall not have been noticeably displaced.

This test shall be repeated with a welding cable having the minimum permissible cross-sectional area as specified by the manufacturer.

If more than one method of cable fixing is provided, all methods shall be tested.

9.4 Drop withstand

The welding clamp shall be capable of withstanding a drop test without impairing the mechanical functioning.

Conformity shall be checked by the following test, manual operation and visual inspection.

Lift the clamp without any cable fitted to a height of 5 m above a 10 mm thick steel plate, release without initial velocity and allow to fall on the steel pate. With the clamp in various initial attitudes, carry out this procedure 10 times.

10 Marking

The following information shall be legibly and indelibly marked on a welding clamp:

a) name of the manufacturer, distributor, importer or the registered trademark;

b) rated current;

c) maximum permissible cross-sectional area of the welding cable;

d) minimum permissible cross-sectional area of the welding cable;

e) reference to this part of IEC 60974, confirming that the welding clamp complies with the requirements.

Conformity shall be checked by reading the marking.

11 Instructions for use

Each welding clamp shall be delivered with an instruction sheet which includes the following information:

a) correct coupling and uncoupling of the welding clamp;

b) correct connection of the welding cable;

c) choice of welding cable, type and size;

d) relation of permissible current and duty cycle.

Conformity shall be checked by reading the instructions.

Bibliography

HD 516 S2:1997, *Guide to use low voltage harmonized cables*

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