SLOVENSKI STANDARD
SIST EN 60974-1:1999

01-julij-1999

Safety requirements for electric arc welding equipment - Part 1: Welding power sources (IEC 60974-1:1989, modified)

Safety requirements for arc welding equipment -- Part 1: Welding power sources

Sicherheitsanforderungen für Einrichtungen zum Lichtbogenschweißen -- Teil 1: Schweißstromquellen

Règles de sécurité pour le matériel de soudage électrique -- Partie 1: Sources de courant de soudage

Ta slovenski standard je istoveten z: **EN 60974-1:1990**

ICS:

25.160.30 Varilna oprema Welding equipment

SIST EN 60974-1:1999 **sl,de**

CLC/SC 26A

EUROPEAN STANDARD

NORME EUROPEENNE

EUROPÄISCHE NORM

EN 60 974-1

May 1990

UDC 621.791.75.03:614.8

Supersedes HD 24:1976
Supersedes HD 362:1977 (partly)

Descriptors: Arc welding, power sources, safety requirements, test methods

ENGLISH VERSION

SAFETY REQUIREMENTS FOR ARC WELDING EQUIPMENT PART 1: WELDING POWER SOURCES (IEC 974-1:1989, modified)

Règles de sécurité pour le matériel de soudage électrique Partie 1: Sources de courant de soudage (CEI 974-1:1989, modifiée)

Sicherheitsanforderungen für Einrichtungen zum Lichtbogenhandschweißen Teil 1: Schweißstromquellen (IEC 974-1:1989, modifiziert)

This European Standard was approved by CENELEC on 1989-12-05. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 60 974-1:1990 E

FOREWORD

The text of the international standard IEC 974-1 (1st edition, 1989-04) was submitted to the CENELEC members for unique acceptance and was approved and ratified by CENELEC on 11 September 1989 as a European standard with one common modification. This common modification (sub-clause 7.1) is indicated by a vertical line in the margin.

Editorial errors and misprints found in IEC 974-1 have been corrected in each consolidated version of this European standard and are also indicated by a vertical line in the margin.

The following dates of implementation of this standard were fixed:

- date of latest announcement (doa) : 1990-03-01
- date of latest publication (dop) : 1990-09-01
- date of withdrawal of conflicting national standards (dow) : 1990-09-01

This EN replaces HD 24 "No-load voltage of arc welding equipment" and HD 362 "Safety rules for the construction of equipment for arc welding and allied processes" with the exception of clause 3.4 of this HD which treats another subject than EN 60 974-1 and hence is not conflicting with the clauses of EN 60 974-1.

For products which have complied with the European standards HD 24:1976 and HD 362:1977 before 1990-09-01, as shown by the manufacturer or by a certification body, these previous standards may continue to apply for production until 1995-09-01.

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SAFETY REQUIREMENTS FOR ARC WELDING EQUIPMENT

PART 1: WELDING POWER SOURCES

SECTION ONE - GENERAL

1. Scope

This standard is applicable to power sources for arc welding and allied processes designed for industrial and professional use and supplied by a voltage within the low voltage range (as specified in IEC Publication 38) or driven by mechanical means.

This standard is not applicable to welding power sources for manual metal arc welding with limited duty operation that are designed mainly for use by laymen.

Note.- Typical allied processes are for example electric arc cutting and arc spraying.

2. Object

This standard specifies safety requirements for the construction and relevant performance requirements and describes test methods to verify compliance.

3. Environmental conditions

Welding power sources shall be capable of carrying out their welding operation when the following conditions prevail:

a) Range of the temperature of the ambient air:

during welding: -10 °C to + 40 °C
during transport and storage: -25 °C to + 55 °C.

b) Relative humidity of the air:

up to 50 % at 40°C
up to 90 % at 20°C

c) Ambient air, free from abnormal amounts of dust, acids, corrosive gases or substances etc. other than those generated by the welding process.

Note.- Examples of unusual service conditions:

Unusually corrosive fumes, steam, excessive oil vapour, abnormal vibration or shock, excessive dust, severe weather conditions, unusual coastal or shipboard conditions.

d) Altitude above sea level: up to 1000 m.

Note.- Different conditions may be agreed upon between the manufacturer and the purchaser.

4. Definitions

4.1 Arc welding power source

Equipment for supplying current and voltage and having the required characteristics suitable for arc welding and allied processes.

Notes 1.- An arc welding power source may also supply services to other equipment and auxiliaries e.g. auxiliary power, cooling liquid, consumable arc welding electrode and gas to shield the arc and the welding area.

2.- In the following text the term "welding power source" is used.

4.2 Industrial and professional use

Use intended only by skilled and instructed persons.

4.3 Skilled person

A person with technical knowledge or sufficient experience to enable him to avoid dangers which welding and electricity may create.

4.4 Instructed person

A person informed about the tasks assigned to him and about the possible dangers involved in neglectful behaviour and who, if necessary, has undergone some training.

4.5 Type test

A test of one or more devices made to a given design to check if the design complies with the requirements of the standard concerned.

4.6 Routine test

A test made on each individual device during or after manufacture to check if it complies with the requirements of the standard concerned.

4.7 General visual inspection

A visual inspection to verify that there are no apparent faults.

4.8 Drooping characteristic

An external static characteristic of a welding power source which, in its normal welding range, is such that, as the current increases, the voltage decreases by more than 7 V / 100 A.

4.9 Flat characteristic

An external static characteristic of a welding power source which, in its normal welding range, is such that, as the current increases, the voltage either decreases by less than 7 V / 100 A or increases by less than 10 V / 100 A.

4.10 Welding circuit

A circuit that includes all conductive material through which the welding current is intended to flow.

Notes 1.- In arc welding the arc is a part of the welding circuit.

2.- In certain arc welding processes, the welding arc may be established between two electrodes. In such a case, the workpiece is not necessarily a part of the welding circuit.

4.11 Welding current

The current delivered by a welding power source during welding.

4.12 Load voltage

The voltage between the output terminals when the welding power source is delivering current.

4.13 No-load voltage

The voltage, exclusive of any arc striking or arc stabilizing voltage, between the output terminals of a welding power source when the external welding circuit is open.

Note.- If a welding power source is fitted with a hazard reducing device, this is the voltage measured after the hazard reducing device has performed its function.

4.14 Conventional value

A standardized value that is used as a measure of a parameter for the purposes of comparison, calibration, testing etc.

Note.- Conventional values do not necessarily apply during the actual welding process.

4.15 Conventional welding condition

A condition of the welding power source in the hot state defined by a conventional welding current driven by the corresponding conventional load voltage through a conventional load at rated supply voltage and frequency or speed of rotation.

4.16 Conventional load

A practically non-inductive constant resistive load having a power factor not less than 0.99.

4.17 Conventional welding current (I_2)

The current delivered by a welding power source to a conventional load at the corresponding conventional load voltage.

4.18 Conventional load voltage (U_2)

The load voltage of a welding power source having a specified linear relationship to the conventional welding current.

Note.- The specified linear relationship varies in accordance with the process, see Sub-clause 10.2.

4.19 Rated value

A quantity value assigned, generally by the manufacturer, for a specified operating condition of a component, device or equipment.

4.20 Rating

The set of rated values and operating conditions.

4.21 Rated maximum welding current (I_{2max})

The maximum value of the conventional welding current that can be obtained at the conventional welding condition from a welding power source at its maximum setting.

4.22 Rated minimum welding current (I_{2min})

The minimum value of the conventional welding current that can be obtained at the conventional welding condition from a welding power source at its minimum setting.

4.23 Rated no-load voltage (U_0)

The no-load voltage, at rated supply voltage and frequency or speed of rotation.

4.24 Unreduced rated no-load voltage

The unreduced rated no-load voltage of a welding power source, fitted with a voltage reducing device, measured immediately before the device acts to effect a reduction in the voltage when the external welding circuit is open.

4.25 Rated supply voltage (U_1)

The supply voltage for which the welding power source is constructed.

4.26 Rated supply current (I_1)

The supply current to the welding power source at a rated conventional welding condition.

4.27 Rated maximum supply current (I_{1max})

The maximum value of the rated supply current.

4.28 Rated load speed

The speed of rotation of a rotating welding power source when operating at maximum rated output.

4.29 Rated maximum no-load speed

The maximum speed of rotation of a rotating welding power source when the external welding circuit is open.

4.30 Duty cycle; duty factor (X)

The ratio for a given time interval of the on-load duration to the total time.

Notes 1.- This ratio, lying between 0 and 1, may be expressed as a percentage.

2.- For the purpose of this standard, the time period of one complete cycle is 10 minutes. For example, in the case of a 60 % duty cycle (duty factor), load is applied continuously for 6 minutes followed by a no-load period of 4 minutes.

4.31 Clearance

The shortest distance in air between two conductive parts.

Note.- For the purpose of determining a clearance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it were covered by a metal foil wherever it can be touched by the standard test finger according to IEC Publication 529.

4.32 Creepage distance

The shortest distance along the surface of an insulating material between two conductive parts.

Note.- For the purpose of determining a creepage distance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it were covered by a metal foil wherever it can be touched by the standard test finger according to IEC Publication 529.

Note to Clauses 4.31 and 4.32.- Clearances and creepage distances are measured through the joint between two parts of an insulating barrier except when:

- either the two parts forming the joint are bonded together by heat sealing or other similar means at the place where this is of importance;

- or the joint is completely filled with adhesive at the necessary places and the adhesive bonds to the surfaces of the insulating barrier so that moisture cannot be absorbed into the joint;

- or the joint is sealed in such a way that it may be considered tight for the expected life of the welding power source.

4.33 Pollution

Any addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity.

Note.- The following four pollution degrees in the micro-environment are established:

4.34 Pollution degree 1

No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

4.35 Pollution degree 2

Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

4.36 Pollution degree 3

Conductive pollution occurs, or dry, non conductive pollution occrus which becomes conductive due to condensation which is expected.

4.37 Pollution degree 4

The pollution generates persistent conductivity caused, for instance, by conductive dust or by rain or snow.

4.38 Micro-environment

The ambient conditions which surround the clearance or creepage distance under consideration.

Note.- The micro-environment of the clearance or creepage distance and not the environment of the equipment determines the effect on the insulation. The micro-environment might be better or worse than the environment of the equipment. It includes all factors influencing the insulation, such as climatic and electromagnetic conditions, generation of pollution, etc.

4.39 Material group

For the purpose of IEC 664 materials are separated into four groups by their Comparative Tracking Index values, as follows:

Material Group I	$600 \leq CTI$
Material Group II	$400 \leq CTI < 600$
Material Group IIIa	$175 \leq CTI < 400$
Material Group IIIb	$100 \leq CTI < 175$

The CTI values above refer to values according to IEC Publication 112.

Note.- For inorganic insulating materials, for example glass or ceramics, which do not track, creepage distances need not be greater than their associated clearance for the purpose of insulation co-ordination.

4.40 Temperature rise

The difference between the temperature of a part of a welding power source and that of the ambient air.

4.41 Thermal equilibrium

The state reached when the observed temperature rise of any part of the welding power source does not exceed 2 K per hour.

4.42 Thermal protection

A system intended to ensure the protection of a part, and hence the whole, of a welding power source against excessive temperatures resulting from certain conditions of thermal overload. Protection is achieved by means of a thermal detector (or thermal detectors) together with a control system or by means of a thermal protector (or thermal protectors) incorporated in the welding power source.

4.43 Thermal detector

A device, sensitive to temperature only, that will initiate a switching function in the control system when its temperature reaches a predetermined value.

The device is capable of being reset (either manually or automatically) when its temperature falls to the reset value.