IEC 60974-8

Edition 3.0 2021-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Arc welding equipment –
Part 8: Gas consoles for welding and plasma cutting systems

Matériel de soudage à l'arc –
Partie 8: Consoles de gaz pour soudage et systèmes de coupage par plasma

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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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ARC WELDING EQUIPMENT –

Part 8: Gas consoles for welding and plasma cutting systems

FOREWORD

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International Standard IEC 60974-8 has been prepared by IEC technical committee 26: Electric welding.

This third edition cancels and replaces the second edition, published in 2009. This edition constitutes a technical revision.

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

- changes induced by the publication of IEC 60974-1:2017;
- requirements for the rating plate as in IEC 60974-1:2017, Clause 15;
- requirements for the instructions in 13.2.

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
26/719/FDIS	26/723/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- withdrawn,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.

INTRODUCTION

If the console is designed to operate with explosive gases, the manufacturer should perform an assessment for applicability of local legislation for explosive atmospheres (example: ATEX regulation).

ARC WELDING EQUIPMENT –

Part 8: Gas consoles for welding and plasma cutting systems

1 Scope

This part of IEC 60974 specifies safety and performance requirements for GAS CONSOLES intended to be used with combustible gases or oxygen. These GAS CONSOLES are designed to supply gases for use in arc welding, plasma cutting, gouging and allied processes in non-explosive atmospheres.

The GAS CONSOLE can be external or internal to the power source enclosure. In the latter case, the power source shall meet the requirements of both IEC 60974-1 and this document.

NOTE See Annex A for mechanised plasma system diagram.

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 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

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

IEC 60974-10, *Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements*

ISO 10225, *Gas welding equipment — Marking for equipment used for gas welding, cutting and allied processes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151 and 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
gas console
device for gas-flow routing, mixing or both that contains electrical apparatus in a single or multiple enclosure, or open structure

3.2
lower explosion limit
LEL
concentration of flammable gas or vapour in air, below which the gas atmosphere is not explosive

3.3
lower flammability limit
LFL
minimum concentration of combustible gas in a mixture where a combustion can be ignited by an ignition source

3.4
upper explosion limit
UEL
concentration of flammable gas or vapour in air, above which the gas atmosphere is not explosive

3.5
upper flammability limit
UFL
maximum concentration of combustible gas in a mixture where a combustion can be ignited by an ignition source

3.6
external gas console
GAS CONSOLE not incorporated in a power source

3.7
internal gas console
GAS CONSOLE incorporated in a power source

3.8
single-fault condition
condition in which one means for protection against hazard is defective

Note 1 to entry: If a SINGLE-FAULT CONDITION results unavoidably in another SINGLE-FAULT CONDITION, the two failures are considered as one SINGLE-FAULT CONDITION.

3.9
hazardous-live-part
live part which, under certain conditions, can give a harmful electric shock

[SOURCE: IEC 60050-195:1998, 195-06-05]

3.10
hazardous part
part that is hazardous to approach or touch

4 Environmental conditions

As specified in Clause 4 of IEC 60974-1:2017.

5 Tests

5.1 Test conditions

As specified in 5.1 of IEC 60974-1:2017.

5.2 Measuring instruments

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

5.3 Conformity of components

As specified in 5.3 of IEC 60974-1:2017.

5.4 Type tests

As specified in 5.4 of IEC 60974-1:2017.

The other tests included in this document may be carried out in any convenient sequence.

5.5 Routine tests

5.5.1 EXTERNAL GAS CONSOLE

All routine tests shall be carried out on each EXTERNAL GAS CONSOLE in the following sequence:

a) general visual inspection, see 3.1.7 of IEC 60974-1:2017;
b) continuity of protective circuit, see 10.5.3 of IEC 60974-1:2017;
c) dielectric strength, see 6.1.5 of IEC 60974-1:2017;
d) leak test, see 10.3;
e) general visual inspection, see 3.1.7 of IEC 60974-1:2017.

5.5.2 INTERNAL GAS CONSOLE

All routine tests, as specified in 5.5 of IEC 60974-1:2017, shall be carried out on each INTERNAL GAS CONSOLE, with the following addition:

a) leak test, see 10.3.

6 Protection against electric shock

6.1 Insulation

6.1.1 General

As specified in 6.1.1 of IEC 60974-1:2017, with the following exception:

The micro-environment of printed circuit boards shall be improved to pollution degree 2 or better (by means such as filtering, coating, potting, moulding) so that only non-conductive pollution or occasional temporary conductivity caused by condensation occurs in accordance with IEC 60664-1.

6.1.2 Clearances

As specified in 6.1.2 of IEC 60974-1:2017.

6.1.3 Creepage distances

As specified in 6.1.3 of IEC 60974-1:2017.

6.1.4 Insulation resistance

As specified in 6.1.4 of IEC 60974-1:2017.

6.1.5 Dielectric strength

As specified in 6.1.5 of IEC 60974-1:2017.

6.2 Protection against electric shock in normal service (direct contact)

6.2.1 Protection provided by the enclosure

The minimum degree of protection for GAS CONSOLES shall be IP21S in accordance with IEC 60529.

Conformity shall be checked by:

a) applying the articulated finger and ball, as specified in IEC 60529, to any openings and ensuring it does not contact any hazardous live part; and

b) verifying that immediately after the water test, as specified in IEC 60529, the unit satisfies insulation resistance and the dielectric strength tests and is able to operate.

No power is applied to the unit while performing these tests.

6.2.2 Capacitors

As specified in 6.2.2 of IEC 60974-1:2017.

6.2.3 Automatic discharge of supply circuit capacitors

As specified in 6.2.3 of IEC 60974-1:2017.

6.2.4 Isolation of the welding circuit

As specified in 6.2.4 of IEC 60974-1:2017.

6.2.5 Welding circuit touch current

As specified in 6.2.5 of IEC 60974-1:2017.

6.2.6 Touch current in normal condition

As specified in 6.2.6 of IEC 60974-1:2017.

6.3 Protection against electric shock in case of a fault condition (indirect contact)

As specified in 6.3 of IEC 60974-1:2017.

7 Thermal requirements

7.1 Heating test

As specified in 7.1 of IEC 60974-1:2017.

7.2 Temperature measurement

As specified in 7.2 of IEC 60974-1:2017.

7.3 Limits of temperature rise

As specified in 7.3 of IEC 60974-1:2017.

Additionally, the temperature of surfaces exposed to combustible gases shall be at least 20 % cooler than the ignition temperature of any combustible gas intended to be used in the GAS CONSOLE.

Conformity shall be checked by operating the GAS CONSOLE at the maximum specified ambient temperature and system duty cycle, while monitoring the inside of the gas console with an IR camera for temperatures exceeding the 20 % margin of the ignition temperature of any combustible gas intended to be used in the GAS CONSOLE.

a) with the combinations of gas(es) and flow rates which creates the worst-case condition, as specified by the manufacturer;

b) with the cooling liquid as specified by the manufacturer.

8 Connections for plasma cutting torches

As specified in 11.4.6 of IEC 60974-1:2017, where the torch connects to the GAS CONSOLE.

9 Mechanical provisions

9.1 General

As specified in Clause 14 of IEC 60974-1:2017, with the following additions.

9.2 Protection against fire or explosion

The GAS CONSOLE shall be designed to prevent fire or explosion under normal operating conditions and under a SINGLE-FAULT CONDITION (for example, defective valve, hose, etc.).

Where a GAS CONSOLE uses a combustible gas, any circuit, subassembly, or component shall not be capable of creating temperatures or a spark with sufficient energy to cause an ignition.

A GAS CONSOLE using combustible gas in a mixture shall not allow the concentration of mixture to be between the LFL and UFL.

Conformity shall be checked by:

a) design evaluation and calculations of the circuits, subassembly, or component verification;

or

b) applying a fault (for example, open circuit, short circuit, and/or restriction of movement) to the circuits, subassembly, or component until an event occurs (for example, a spark which does not cause ignition, fuse opens, unit shuts down, etc.) or a steady-state temperature is achieved.