IEC 61010-2-061

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REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-061: Particular requirements for laboratory atomic spectrometers with thermal atomization and ionization

IEC 61010-2-061:2018-09 RLV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 2-061: Particular requirements for laboratory atomic spectrometers with thermal atomization and ionization

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International Standard IEC 61010-2-061 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

It has the status of a group safety publication in accordance with IEC Guide 104.

This fourth edition cancels and replaces the third edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) adaptation of changes introduced by Amendment 1 of IEC 61010-1;
b) added tolerance for stability of AC voltage test equipment to Clause 6;
c) added requirement for interlock systems containing electric/electronic or programmable components to Clause 15.

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

CDV	Report on voting
66/643/CDV	66/668/RVC

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.

A list of all parts of the IEC 61010 series, under the general title, *Safety requirements for electrical equipment for measurement, control, and laboratory use*, may be found on the IEC website.

This Part 2-061 is intended to be used in conjunction with IEC 61010-1. It was established on the basis of the third edition (2010) and its Amendment 1 (2016).

This Part 2-061 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for laboratory atomic spectrometers with thermal atomization and ionization.*

Where a particular subclause of Part 1 is not mentioned in this Part 2, that subclause applies as far as is reasonable. Where this part states “addition”, “modification” or “replacement”, or “deletion”, the relevant requirement, test specification or note in Part 1 should be adapted accordingly.

In this standard:

1) the following print types are used:
   – requirements: in roman type;
   – NOTES: in small roman type;
   – *conformity and test: in italic type;*
   – terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS;
2) subclauses, figures, tables and notes which are additional to those in Part 1 are numbered starting from 101. The additional annexes are lettered starting from AA and additional list items are lettered from aa).

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- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 2-061: Particular requirements for laboratory atomic spectrometers with thermal atomization and ionization

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1 Scope

1.1.1 Equipment included in scope

Replacement:

Replace the text ~~by~~, except the first paragraph, with the following new text:

This part of IEC 61010 applies to electrically powered laboratory atomic spectrometers with thermal atomization.

NOTE 1 Examples include atomic absorption spectrometers, emission flame photometers, atomic fluorescence spectrophotometers, inductively coupled plasma spectrometers, microwave coupled plasma spectrometers and mass spectrometers, all with thermal atomization and ionization (including tubing and connectors which are provided by the manufacturer for connection to external supplies).

NOTE 2 If all or part of the equipment falls within the scope of one or more other Part 2 documents of IEC 61010 as well as within the scope of this document, consideration is ~~to be~~ given to those other Part 2 documents.

1.1.2 Equipment excluded from scope

Addition:

Add ~~as~~, before the first paragraph, the following new text:

This document does not apply to thermal atomization detectors (flame ionization detectors) used in gas chromatography.

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

Addition~~s~~:

Add the following ~~definitions~~ new terms:

3.2.101
SPRAY CHAMBER
chamber in which droplets of sample in aerosol are allowed to separate so that the droplets of necessary size can be passed onward to the burner, with the remainder draining to waste

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3.2.102
GAS LOCK
device to allow drainage of waste sample liquid, and to prevent unintentional escape of gas from the SPRAY CHAMBER through its drain outlet

Note 1 to entry: See for example Figure 101.

3.5.101
FLASH-BACK
event during which the flame travels back through the burner with the result that the gas in the mixing chamber is caused to ignite

4 Tests

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclauses:

4.4.2.101 Sampling probe tip

Any system designed to withdraw a sampling probe tip after sampling has been completed shall be overridden, so as to leave the tip in its most exposed position when a sample vessel is removed.

Exceptions:

The withdrawal system need not be overridden if the sampling probe:

a) cannot cause a HAZARD to the OPERATOR when it is exposed;
b) is designed in such a manner that no SINGLE FAULT CONDITION can cause the tip to remain exposed after sampling has been completed.

4.4.2.102 Failure, or partial failure, of the MAINS supply

The voltage of the power supply to the equipment from the MAINS supply shall first be reduced to just less than 90 % of the RATED voltage, and shall then be switched off.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclause:

5.1.5.101 Gas and liquid connections

The following shall be unambiguously marked adjacent to the connector on the equipment (see 5.2):

a) the identity of the gas or liquid;
b) the maximum permitted pressure;
c) flow direction of the gas and liquid, if applicable.

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NOTE Such markings ~~may~~ can be specific (for example acetylene, propane, water) or generic (for example fuel gas, oxidant gas, coolant, waste liquid).

Where no internationally recognized symbol (such as a chemical formula) exists, the equipment shall be marked with symbol 14 of Table 1 together with an unambiguous text in English. The documentation accompanying the equipment shall provide an adequate translation of this text (where it is required) in the language of the country in which it is to be installed, to assure that the installer or OPERATOR is able to connect the equipment correctly.

Conformity is checked by inspection.

5.2 Warning markings

Addition:

Add the following new paragraph before the conformity statement:

Where hot gases or plasma emerge from equipment, the protective structure provided (for example a chimney, see 10.1), shall be clearly marked by symbol 13 of Table 1, to indicate where excessively hot temperatures ~~may~~ can exist.

5.4.3 Equipment installation

Addition:

Add, before the first paragraph, the following new paragraph:

The documentation shall state that the RESPONSIBLE BODY shall ensure that the type of connector used at the outlet side of the gas-pressure regulator conforms to applicable national requirements.

Deletion:

Delete item f).

Addition:

Add, after item g) and before the note, the following new items:

aa) requirements for liquid connection;

bb) requirements for a fume extraction system to remove exhaust gases which may be hazardous. In the case of equipment using only a propane flame in a ventilated room, and when it is known that samples will not leave any hazardous residues, it is not necessary to provide an extraction system, since the exhaust gases from a propane flame will themselves not present any HAZARD;

cc) requirements for appropriate filtering or other systems which may be necessary to trap hazardous sample residues present in the exhaust gas stream;

dd) documentation ~~shall state~~ stating that the RESPONSIBLE BODY shall carry out appropriate leakage tests necessary for safety on those gas and liquid connections which the OPERATOR is directed to assemble during installation, NORMAL USE, or maintenance;

ee) instructions for examining, during installation and maintenance, parts of the external gas supply system including tubing connected to the equipment, in order to confirm that their condition is satisfactory, for example to detect stress cracks. In addition any special national regulations for the safe use of gases and gas cylinders shall be observed;

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ff) instructions for necessary provisions for collection of waste from the SPRAY CHAMBER, including the requirements for any waste container which may be specified by the manufacturer;

gg) requirements for connection of the equipment to supplies of air, fuel gas (for example hydrogen, acetylene, or propane) and oxidant (for example oxygen or nitrous oxide). See also 11.103.

Add, after the existing note, the following new notes:

NOTE 101 Connections on the outlet side of gas regulators (from which tubing connects to the equipment) vary from country to country and are often covered by national regulations. Variations can include thread type, whether left-hand or right-hand, types of tubing and means of attachment.

NOTE 102 Warning markings are specified in 5.1.5.101, 5.1.5.2 c), 6.1.2 b), 7.3.2 b) 3), 7.4, 10.1, and 13.2.2.

5.4.4 Equipment operation

Addition~~s~~:

Add, after item j), the following new items:

aa) a reminder to the RESPONSIBLE BODY of the responsibility for the correct collection and disposal of waste materials, including the necessity for:

1) a suitably sized waste container of appropriately resistant material for the collection of organic solvent waste;

NOTE The proper disposal of waste materials is well documented by national authorities and it is these procedures that supersede the requirements of this document in regard of waste disposal. This Part 2 ~~should~~ only brings to the attention of the OPERATOR that potentially hazardous waste materials are present and national (local) regulations for the proper disposal can apply.

2) provision for the removal into an appropriate exhaust system of any gases or vapours which may be produced in hazardous concentrations;

bb) a list of fluids known by the manufacturer to be potentially unsafe if used with the equipment.

Add, after the list of items, the following new paragraph:

Documentation shall also indicate that this list cannot be taken to be exhaustive and that, in case of uncertainty about a specific fluid, that fluid shall not be used until confirmation by the manufacturer that it will not present a HAZARD.

Add the following new subclause:

5.4.4.101 Cleaning and decontamination

Documentation shall indicate:

a) that the RESPONSIBLE BODY has the responsibility for carrying out appropriate decontamination if hazardous material is spilt on or inside the equipment;

b) the manufacturer's recommendations for cleaning and, where necessary, decontamination, together with the recognized generic names of recommended materials for cleaning and decontamination.

The following wording shall appear in the documentation:

“Before using any cleaning or decontamination methods except those specified by the manufacturer, the RESPONSIBLE BODY should check with the manufacturer that the proposed method will not damage the equipment.”

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If a manufacturer claims that an item can be decontaminated by steam sterilization, it shall be capable of withstanding steam sterilization under at least one of the time-temperature conditions given in Table 101. Cleaning and decontamination shall be necessary as a safeguard when spectrometers and their accessories are maintained, repaired, or transferred. Manufacturers shall provide a format for the RESPONSIBLE BODY to certify that such a treatment has been carried out.

NOTE Information on decontaminants, their use, dilution and potential application is contained in the *Laboratory Biosafety Manual*, published by the World Health Organization and the *Biosafety in Microbiological and Biomedical Laboratories*, published by Centers for Disease Control and Prevention and National Institutes of Health, Washington. There are also national guidelines that cover these areas.

Table 101 – Time-temperature conditions

Absolute pressure kPa	**Corresponding steam temperature**		**Minimum hold time** min
	Nominal °C	**Range** °C	
325	136,0	134 to 138	3
250	127,5	126 to 129	10
215	122,5	121 to 124	15
175	116,5	115 to 118	30
NOTE "Minimum hold time" means the time the contaminant is at the steam temperature.			

5.4.5 Equipment maintenance and service

Addition:

Add, after the first paragraph, the following new paragraph:

Instructions shall include any instructions for examination and tests which are to be carried out on parts and connections containing gases or liquids inside the equipment, in order to check that no leakage is occurring.

6 Protection against electric shock

This clause of Part 1 is applicable except as follows:

6.8.3.1 The AC voltage test

Replacement:

Replace the first sentence with the following new sentence:

The voltage tester shall be capable of maintaining the test voltage throughout the test within ± 5 % of the specified value.

7 Protection against mechanical HAZARDS

This clause of Part 1 is applicable.

8 Resistance to mechanical stresses

This clause of Part 1 is applicable except as follows:

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8.1 General

Replacement:

Replace the text of item 3) ~~by~~ with the following new text:

3) except for FIXED EQUIPMENT, for equipment with a mass over 100 kg, or for equipment whose size and weight make unintentional movement unlikely and which is not moved in NORMAL USE, the appropriate test of 8.3. The equipment is not operated during the tests.

9 Protection against the spread of fire

This clause of Part 1 is applicable.

10 Equipment temperature limits and resistance to heat

This clause of Part 1 is applicable, except as follows:

10.1 Surface temperature limits for protection against burns

Addition:

Add, before Table 19, the following new paragraph:

Protection shall be provided to minimize the possibility of unintentional direct access by the OPERATOR or other persons in the vicinity ~~to~~ of hot gases or plasma emerging from the equipment. ~~This~~ The protection shall comprise a protective structure, for example a chimney of sufficient height to indicate its function (see also 5.2).

11 Protection against HAZARDS from fluids and solid foreign objects

This clause of Part 1 is applicable except as follows:

11.1 General

Replacement:

Replace the first paragraph ~~by~~ with the following new paragraph:

Equipment shall be designed to give protection to the OPERATOR, other persons in the vicinity, and the surrounding area against HAZARDS from direct contact with fluids encountered in NORMAL USE, and from HAZARDS resulting from degradation of parts in contact with these.

Addition:

Add the following new subclauses:

11.101 Sampling probes

Sample fluid remaining on the outside of a sampling probe shall not cause a HAZARD to the OPERATOR or other persons in the vicinity.

Conformity is checked by inspection and, if necessary, by a test using a suitable fluid, for example a solution of fluorescein in water.

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11.102 Gases

Components within the fuel-gas and oxidant paths shall be resistant to the gases specified by the manufacturer, and to any associated solvent vapours. In the case of acetylene, a solvent, for example acetone, will be present in the cylinder which contains the acetylene. Any special national regulations for the safe use of gases and pressurized gas cylinders shall be observed.

Conformity is checked by inspection and by examination of the specification of the materials used.

11.103 Solvents

Parts in contact with solvents, including any which will be contacted by diffusion of vapour in the stand-by condition, shall be resistant to the solvents specified by the manufacturer.

Conformity is checked by inspection and examination of the specification of the materials used.

11.104 Parts in contact with acetylene

The following materials shall not be used for parts intended to be in contact with acetylene:

a) copper and copper alloys with a copper content of more than 70 %;

b) copper alloys (even with a copper content of less than 70 %) in the case of filters and sieves;

c) silver and silver alloys, except for brazing. Silver filler used for brazing shall have a silver content of less than 43 %, and a copper content of less than 21 %. The width of a solder gap, where the silver filler might come into contact with acetylene, shall be less than 0,3 mm;

d) any other material which may form an explosive acetylide.

Conformity is checked by inspection of the materials used and their specification according to the manufacturer.

12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure

This clause of Part 1 is applicable except as follows:

12.5.1 Sound level

Addition:

Add, before Note 1, the following new paragraph:

Equipment which may generate occasional and unavoidable short-duration high sound pressure levels, for example as a result of FLASH-BACK in a burner gas mixing chamber, shall not produce a sound power level in excess of 140 dB(A).

Add, after Note 2, the following new note:

NOTE 101 Exposure to noise has been categorized in many countries by three action levels of “daily personal noise exposure” at 85 dBA, 90 dBA, and 140 dBA. “Daily personal noise exposure” is defined as the total exposure over the whole working day, taking into account the varying noise levels in the working environment and how long a person is exposed to them, without taking account of whether ear protectors are worn.

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The peak action level of 140 dBA relates to cartridge operated tools, shooting guns, and similar loud explosive noises. This action level is most important where workers are subject to a small number of loud impulses during an otherwise quiet day.

Employers in many countries are required to reduce the risk of damage to the hearing of employees from exposure to noise to the lowest level reasonably practicable. For example some countries require manufacturers to provide suitable and efficient ear protectors on request, to employees whose daily personal exposure is between 80 dBA and 90 dBA. For exposures above 90 dBA, exposure is required to be reduced to the lowest level reasonably practicable without taking account of the use of ear protectors. At the same time, suitable ear protectors are to be provided by the employer.

13 Protection against liberated gases and substances, explosion and implosion

This clause of Part 1 is applicable except as follows:

13.1 Poisonous and injurious gases and substances

Addition:

Add, after the ~~first~~ second paragraph, the following new notes:

NOTE 101 Discharge of gases into a fume extraction system is not considered to be liberation (see 5.4.3 bb)).

NOTE 102 Absence of fluid from the type of GAS LOCK shown in Figure 101 is a typical SINGLE FAULT CONDITION.

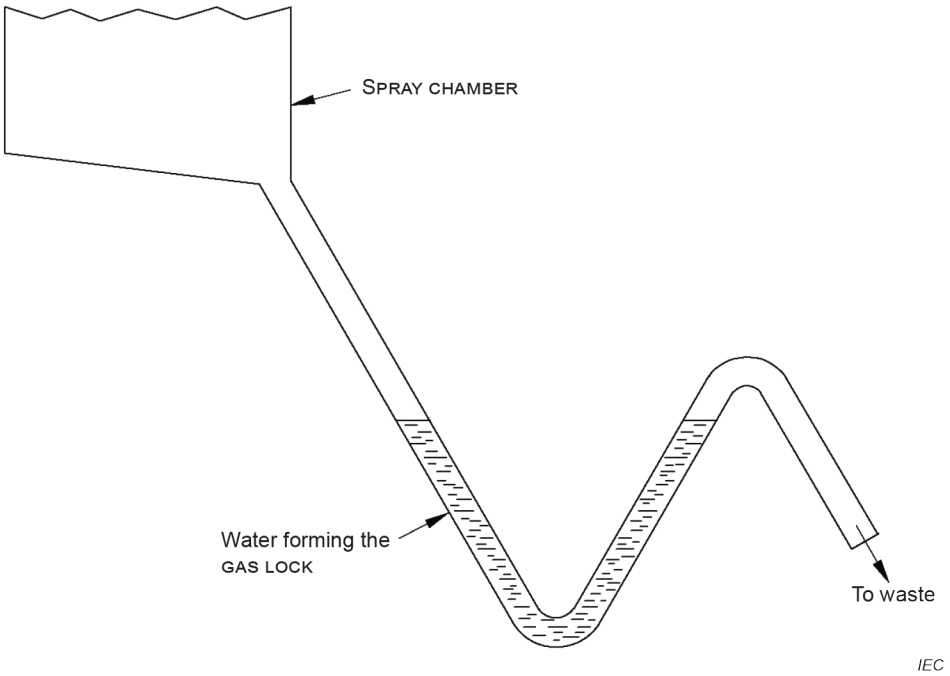

Figure 101 – Example of a GAS LOCK

13.2.1 Components

Replacement:

Replace the first paragraph ~~by~~ with the following new text:

If an explosion ~~could~~ can occur either by FLASH-BACK of gases in a burner and mixing chamber, or if components, if overheated or overcharged, are not provided with a pressure relief device, protection for the OPERATOR and other persons shall be incorporated in the equipment (see also 7.7).

Replace the conformity statement ~~by~~ with the following new text:

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Conformity is checked by inspection and, for burners, by test a) or b) as appropriate:

a) for burners designed to prevent FLASH-BACK, the flame is ignited and the flow of gas mixture, maintained at a constant fuel-oxidant ratio, is gradually reduced to zero. The flame shall extinguish without FLASH-BACK;

b) for other burners, the flame is ignited and the gas mixture adjusted so as to generate the maximum energy flame. Ignition is then initiated inside the burner to simulate FLASH-BACK. No parts shall be expelled outside the equipment.

Addition:

Add the following new subclauses:

13.101 Flame ignition system

For equipment which has an automatically controlled ignition system, the ignition procedure when started shall either cause the flame to ignite in a time less than that required for 0,8 l of fuel-gas to be delivered, or the ignition procedure shall be ended automatically and the equipment returned to stand-by condition. For equipment which does not have an automatically controlled ignition system, it shall not be possible to open the valves which control the flows of fuel-gas and oxidant-gas (except compressed air) for purposes of igniting the flame, unless a manually operated device as described below is provided.

An acceptable manually operated device is one which satisfies the following criteria:

a) it shall override the flame-failure gas shut-off device for not longer than the time for 0,8 l of fuel-gas to be delivered;

NOTE For fuel-gas, the litre (l) will be understood as that which is measured at 0 °C and 0,1 MPa (1 bar).

b) it shall allow the gases to flow to permit the necessary adjustment of the flow rates before the ignition system is operated;

c) if ignition is not achieved, the gas flow valves shall close ~~immediately~~ as soon as the device is released.

Conformity is checked by fitting a gas flow-rate meter in the fuel-gas pipe and measuring both the rate of gas escaping during the ignition procedure in NORMAL USE, and the time from opening the fuel-gas inlet valve to closing it after ignition failures. The gas volume is calculated from these measurements.

13.102 Non-interchangeability of gas connectors

Connectors available to the OPERATOR for fuel-gas shall not be interchangeable with connectors for oxidant-gas.

Conformity is checked by inspection.

13.103 Interchangeable burners

In equipment with interchangeable burners (for example to permit the use of either air or nitrous oxide as the oxidant gas) and where a HAZARD could arise if the incorrect gas is fed to a burner, it shall only be possible to operate with a gas appropriate to the burner fitted.

Conformity is checked by fitting, in turn, each available burner specified by the manufacturer, and confirming that only the gases specified for a burner can flow to the burner.

14 Components and subassemblies

This clause of Part 1 is applicable.

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15 Protection by interlocks

This clause of Part 1 is applicable except as follows:

15.1 General

Addition:

Add, after the first paragraph, the following new text:

As an alternative method, for interlock systems containing electric/electronic or programmable components (E/E/P components) the reliability and design requirements can be determined by applying for example IEC 62061 (SIL) or ISO 13849 (all parts) (PL) or other solutions providing equivalent functional safety.

16 HAZARDS resulting from application

This clause of Part 1 is applicable.

17 RISK assessment

This clause of Part 1 is applicable.

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Annexes

The annexes of Part 1 are applicable except as follows:

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Annex ~~F~~ A
(normative)

Routine tests

Addition:

Add the following new ~~sub~~clause:

F.101 Gas leakage test

A test is carried out to measure leakage of gas from the internal system leading to the burner. The worst-case gas intended to be used in that internal system is applied at 1,2 times the maximum inlet pressure for NORMAL USE. An alternative gas (for example helium) can be used provided that the results, when converted, are equivalent to the results had the worst-case gas been used. Leakage shall not exceed 5 ml/min.

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