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INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-020: Particular requirements for laboratory centrifuges

Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-020: Exigences particulières pour centrifugeuses de laboratoire

IEC 61010-2-020:2016-05(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-020: Particular requirements for LABORATORY CENTRIFUGES

FOREWORD

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International Standard IEC 61010-2-020 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

This third edition cancels and replaces the second edition published in 2006. It constitutes a technical revision and includes the following significant changes from the second edition:

a) This Part 2 is established on the basis of the third edition (2010) of IEC 61010-1.The changes listed in its foreword affect this Part 2, too.
b) The language has been updated to reflect current terminology for LABORATORY CENTRIFUGES used in the industry today.

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

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

CDV	Report on voting
66/542/CDV	66/565A/RVC

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.

This Part 2-020 is intended to be used in conjunction with IEC 61010-1. It was established on the basis of the third edition (2010).

This Part 2-020 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Safety requirements for* LABORATORY CENTRIFUGES.

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", 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 tests: in italic type;*
   - terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS.

2) subclauses, tables or figures which are additional to those in Part 1 are numbered starting from 101; additional annexes are lettered AA, BB, etc.

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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

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

Part 2-020: Particular requirements for laboratory centrifuges

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Scope

Replacement:

This Part 2 is applicable to electrically powered LABORATORY CENTRIFUGES.

This group safety publication is primarily intended to be used as a product safety standard for the products mentioned in the scope, but shall also be used by technical committees in the preparation of its publications for products similar to those mentioned in the scope of this standard, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

NOTE If all or part of the equipment falls within the scope of one or more other Part 2 standards of IEC 61010 as well as within the scope of this standard, it will also need to meet the requirements of those other Part 2 standards.

1.1.2 Equipment excluded from scope

Addition:

Add the following new item:

aa) IEC 60034 (Rotating electrical machinery);

1.2 Object

1.2.1 Aspects included in scope

Addition:

Add the following new items:

aa) contact with moving parts (see 7.3);

bb) LABORATORY CENTRIFUGE movement during any DISRUPTION (see 7.3.101);

cc) high energy chemical reaction after ROTOR DISRUPTION (see 7.7.2.2 l));

dd) ineffectiveness of BIOSEALS (see 13.101)

1.2.2 Aspects excluded from scope

Addition:

Add the following new items:

aa) additional precautions which may need to be observed when centrifuging materials which are flammable or explosive (see 5.4.101);

bb) additional precautions which may need to be observed when centrifuging materials that could react chemically with sufficient vigour to cause a HAZARD (see 5.4.101).

1.4 Environmental conditions

1.4.1 Normal environmental conditions

Replacement:

Replace item c) by the following:

c) temperature 2 °C to 40 °C;

1.4.2 Extended environmental conditions

Replacement:

Replace item c) by the following:

c) ambient temperatures below 2 °C or above 40 °C;

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

ISO 3864 (all parts), *Graphical symbols – Safety colours and safety signs*

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.1 Equipment and states of equipment

Addition:

Add the following new terms and definitions:

3.1.101
LABORATORY CENTRIFUGE
apparatus intended for laboratory use that applies a centrifuging effect to sample materials

3.1.102
CENTRIFUGE-ROTOR COMBINATION
LABORATORY CENTRIFUGE and ROTOR ASSEMBLY that are intended to operate together and which have to be evaluated together

3.1.103
DISRUPTION
event in which the ROTOR ASSEMBLY, or part of it, fails or becomes detached during rotation

3.2 Parts and accessories

Addition:

Add the following new terms and definitions:

3.2.101
CHAMBER
enclosed space within a LABORATORY CENTRIFUGE in which the ROTOR ASSEMBLY rotates

3.2.102
ROTOR
primary component of a LABORATORY CENTRIFUGE which holds the material to be subjected to centrifugal force and which is rotated by the DRIVE SYSTEM

3.2.103
BUCKET
sub-assembly of a ROTOR designed to support one or more containers

3.2.104
PROTECTIVE CASING
casing which completely surrounds the ROTOR ASSEMBLY and which includes the LID and its securing devices

3.2.105
LID
access cover of the CHAMBER

3.2.106
ROTOR ASSEMBLY
ROTOR carrying a combination of ROTOR accessories specified by the manufacturer

Note 1 to entry: In the context of a ROTOR ASSEMBLY, ROTOR accessories include all components used with or in the CENTRIFUGE ROTOR for the purpose of holding samples, including adaptors, tubes and bottles.

3.2.107
DRIVE SYSTEM
all components of the CENTRIFUGE associated with the provision of torque to, or the rotational support of, the ROTOR ASSEMBLY

3.2.108
BIOSEAL
device or mechanism additional to, or integral with, a ROTOR or BUCKET and a closure assembly, and which is designed to prevent the escape of contents, for example micro-biological material, during centrifuging

3.5 Safety terms

Addition:

Add the following new terms and definitions:

3.5.101
CLEARANCE ENVELOPE
space around a LABORATORY CENTRIFUGE which is needed for safety

3.5.102
MCA
MAXIMUM CREDIBLE ACCIDENT
planned event chosen to represent worst-case conditions for a test that will evaluate the inherent mechanical safety of a CENTRIFUGE-ROTOR COMBINATION (see 7.7 and Annex BB)

4 Tests

This clause of Part 1 is applicable.

5 Marking and documentation

This clause of Part 1 is applicable except as follows.

5.1.2 Identification

Replacement:

Replace item b) by the following:

b) serial number or other means to identify the production batch of the equipment.

Addition:

Add the following new subclause:

5.1.101 ROTORS and accessories

All OPERATOR-replaceable ROTORS and ROTOR ASSEMBLIES, including ROTOR ACCESSORIES, shall be marked with the manufacturer's or supplier's name or registered trade mark, and identification code.(such as id code, serial number or batch number)

If components are too small, or are not suitable for such marking, the required information shall be marked on the original packaging, as well as being stated in the documentation.

NOTE Packaging can be the outer box, an insert, etc.

If the manufacturer specifies that an individual part, for example a BUCKET, is to be fitted only to a specific ROTOR or in specific ROTOR positions for balance or some other reason, each BUCKET and ROTOR position should be identified by marking with corresponding numbers or letters.

Conformity is checked by inspection.

5.4.2 Equipment ratings

Addition:

Add the following new items:

aa) a list of all ROTORS and ROTOR accessories specified for use with a LABORATORY CENTRIFUGE, together with their RATED rotational frequencies;

bb) any restrictions by the manufacturer warning against the use of particular materials to be centrifuged;

cc) density and volume limits for ROTOR ASSEMBLY loading and, if applicable, derating instructions.

5.4.3 Equipment installation

Addition:

Add, after item a), the following sub-items:

i) floor or bench area required for the CLEARANCE ENVELOPE for the intended use (see 7.4.101);

ii) total weight of the CENTRIFUGE;

iii) instructions for site preparation;

iv) methods for levelling of the CENTRIFUGE;

v) means for securing to the mounting surface.

5.4.4 Equipment operation

Addition:

Add the following new items:

aa) loading and balancing procedures;

bb) ROTOR changing procedure;

cc) any specific requirement for an OPERATOR to be present at stated phases of the centrifuging procedure;

dd) necessary safeguards for personnel. Instructions shall include at least the following:

- not to lean on a LABORATORY CENTRIFUGE;
- not to stay within the CLEARANCE ENVELOPE longer than necessary for operational reasons;
- not to deposit any potentially hazardous materials within the CLEARANCE ENVELOPE;
- methods for safe operation during open LID procedures (see 7.3.102.2);

ee) instructions for use of BIOSEALS and other biocontainment components, including the proper closure techniques. These instructions shall indicate that BIOSEALS and related components are intended to be part of biocontainment systems, as specified in international and national biosafety guidelines. They are not to be relied on as the only means of safeguarding workers and the environment when handling pathogenic micro-organisms.

5.4.5 Equipment maintenance

Addition:

Add the following new paragraph:

Where applicable, the instructions shall specify:

aa) inspection of any means of fixing the equipment to the mounting surface and the condition of the mounting surface itself;

bb) safeguards for the OPERATOR during cleaning;

cc) inspection of the PROTECTIVE CASING;

dd) inspection of the ROTOR ASSEMBLY, and safety considerations;

ee) checking the continuity of the PROTECTIVE BONDING;

ff) frequency of inspection, routine maintenance and the method of replacement of BIOSEALS and other biocontainment components.

Addition:

Add the following new subclauses:

5.4.101 Hazardous substances

The instructions for use shall state the precautions to be observed when the materials to be used with a LABORATORY CENTRIFUGE are known to be toxic, radioactive, or contaminated with pathogenic micro-organisms.

NOTE This information is relevant to the safety of both OPERATORS and service personnel.

The use within the LABORATORY CENTRIFUGE of the following materials shall be prohibited in the instructions for use:

a) flammable or explosive materials;

b) materials which could react chemically with sufficient vigour to cause a HAZARD.

Conformity is checked by inspection.

5.4.102 Cleaning and decontamination

Documentation shall include:

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

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

c) the following statement:

"Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment”

d) the following statement:

Cleaning and decontamination may be necessary as a safeguard before LABORATORY CENTRIFUGES, ROTORS, and any accessories are maintained, repaired, or transferred. Manufacturers may provide a format for users to document that such treatment has been carried out

NOTE Be advised, there are national guidelines and the internationally recognized "Laboratory Biosafety Manual", published in 1993 by the Wor5ld Health Organization in Geneva, which gives information on decontaminants, their use, dilutions, properties, and potential applications.

Conformity is checked by inspection.

5.4.103 Effects of chemicals and environmental influences

To ensure continued safe use of a LABORATORY CENTRIFUGE the documentation shall identify damage which could result from, for example:

a) the effect of chemicals;

b) environmental influences, including natural ultra-violet radiation likely to be encountered;

c) corrosion, and other weakening of construction materials that are part of the PROTECTIVE CASING or other protective components.

Conformity is checked by inspection of the documentation and the relevant data and/or additional testing (if needed).

6 Protection against electric shock

This clause of Part 1 is applicable.

7 Protection against mechanical HAZARDS

This clause of Part 1 is applicable except as follows.

7.1 General

Addition:

Add the following new note:

NOTE 101 A DISRUPTION, resulting in damage to a part of the PROTECTIVE CASING, for example a LID-locking mechanism, is considered to be a SINGLE FAULT CONDITION.

7.3 Moving parts

Addition:

Add the following new subclauses.

7.3.101 LID

7.3.101.1 Requirements

The LID shall be locked closed when the ROTOR drive is energized, and shall remain locked until the circumferential velocity of the ROTOR ASSEMBLY is not more than 2 m/s (see Annex BB).

In the event of a power failure, the LID-locking mechanism shall not release, and subsequent release shall require the use of a TOOL.

The LID shall be held closed with sufficient strength to withstand the results of testing according to 7.7.3. Fragments produced by any DISRUPTION shall be contained as specified in item a) of 7.7.

To evaluate which of the following points are appropriate for the CENTRIFUGE-ROTOR COMBINATION under consideration, information shall be recorded showing the tests conducted by the manufacturer or by a test facility:

a) mechanical abuse;
b) mislatching;
c) misalignment;
d) corrosion;
e) material degradation;
f) material defects;
g) vibration;
h) cleaning and decontamination;
i) environmental influences;
j) other considerations appropriate for the design.

Conformity is checked by visual inspection; by the review of recorded information, by the tests carried out under 7.7.3, and by any further tests considered appropriate for safety.

7.3.101.2 Exception

For LABORATORY CENTRIFUGES that satisfy all the following limitations, a device which merely interrupts motor power may be used instead of an interlock mechanism (see Annex BB):

a) the LABORATORY CENTRIFUGE incorporates a device which holds the LID closed;

b) the device which interrupts motor power does not permit the drive motor to be energized unless the LID is closed;

c) the rotational frequency of the ROTOR ASSEMBLY does not exceed 3 600 rpm;

d) the energy at maximum rotational frequency for the highest energy ROTOR ASSEMBLY when fully loaded does not exceed 1 kJ;

e) the maximum centrifugal force does not exceed 2 000 *g*;

f) the largest ROTOR ASSEMBLY diameter does not exceed 250 mm;

g) a switch is provided for disconnecting motor power, independent of the LID position;

h) the ROTOR ASSEMBLY is visible when the LID is closed, to permit observation of any rotation;

i) all ROTOR ASSEMBLIES used conform to 7.3 of Part 1;

j) if access is possible at a circumferential velocity of the ROTOR ASSEMBLY of more than 2 m/s, a warning label in accordance with ISO 3864 is provided on or near the access point, indicating that the LID should not be opened until rotation has stopped. Where there is insufficient space for such a label, symbol 14 of Table 1 is considered to be an acceptable marking.

Conformity is checked by visual inspection and by the review of data to confirm that all the above limitations are met.

7.3.102 ROTOR ASSEMBLIES

7.3.102.1 General

If a HAZARD could result from contact with moving parts of the ROTOR ASSEMBLY or DRIVE SYSTEM in NORMAL CONDITION or SINGLE FAULT CONDITION, suitable protective means shall be provided to prevent OPERATOR access, except as permitted by 7.3.101.2 and 7.3.102.2.

There shall be no holes or other openings in the top of the CHAMBER which permit the penetration of a 4 mm diameter pin.

Conformity is checked by inspection and by using the test fingers shown in Figures B.1 and B.2, and by checking openings in the top with a 4 mm diameter pin, in NORMAL CONDITION and SINGLE FAULT CONDITION.

The jointed test finger shown in Figure B.2 is applied in every possible position without applying any force. If it is possible to touch a part by applying a force, the rigid test finger shown in Figure B.1 is applied with a force of 10 N. The force is exerted against all outer surfaces, including the bottom, by the tip of the test finger so as to avoid wedge or lever action. The finger shall not touch any moving part that could cause a HAZARD.

7.3.102.2 ROTOR ASSEMBLIES requiring access during rotation

If the manufacturer supplies ROTOR ASSEMBLIES requiring OPERATOR interaction (e.g. zonal or continuous-flow ROTOR ASSEMBLIES), LABORATORY CENTRIFUGES are permitted to have an override control which allows the motor to be energized while the access LID is open, provided that:

a) the override control allows the motor to be energized only by use of a device (which can be a code or code-card) that makes it possible to override a protective system and functions by means that cannot be performed using other tools, or when a special guard plate allows only limited access to the rotor assembly;
b) means are provided to cancel the override function automatically when use of the rotor assembly requiring OPERATOR interaction is ended;
c) maximum speed while the LID is open is limited to 5 000 rpm.

Conformity is checked by inspection

7.4 Stability

Addition:

Add a new third paragraph as follows:

No displacement of the LABORATORY CENTRIFUGE from its installed position shall be visible during NORMAL USE.

Addition:

Add the following new subclause:

7.4.101 LABORATORY CENTRIFUGE movement during malfunction

After installation according to the manufacturer's instructions, movement of a LABORATORY CENTRIFUGE as a result of ROTOR ASSEMBLY imbalance, ROTOR ASSEMBLY DISRUPTION, or drive failure (seizure), shall not present a HAZARD.

Movement shall be limited either by design, or by fastening to the mounting surface, or a combination of both, so that no part of the LABORATORY CENTRIFUGE moves outside a CLEARANCE ENVELOPE extending 300 mm, or less if stated by the manufacturer, in any direction from the outermost parts of the LABORATORY CENTRIFUGE in its original position (for rationale see Clause BB.6).

Conformity is checked by testing to confirm that the 300 mm limit, or any lower limit stated by the manufacturer, is not exceeded in NORMAL USE and after inducing the worst-case situation according to 7.7.2.2 for:

a) imbalance;

USe of an imbalance sensor is acceptable as a means for limiting movement. , but its possible failure should be considered when determining the worst-case condition unless examination of the equipment and design demonstrates conclusively that the sensor will not fail.

b) disruption of the ROTOR ASSEMBLY;

c) DRIVE SYSTEM failure;

d) seizure of the DRIVE SYSTEM.

NOTE The failure mode which will produce the greatest movement can be different from the failure mode of the MCA determined for testing the PROTECTIVE CASING according to 7.7.3. See Annex CC for additional guidance in determining the worst case rotor.

For these tests, the LABORATORY CENTRIFUGE is mounted on, or fixed to, a horizontal smooth concrete test surface of dimensions appropriate for the size of LABORATORY CENTRIFUGE being tested, and as specified in the manufacturer's instructions.