IEC 61010-2-051

Edition 4.0 2018-10
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

GROUP SAFETY PUBLICATION

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

IEC 61010-2-051:2018-10 RLV(en)

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61010-2-051 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 required RISK assessment for equipment intended to be used with flammable, hazardous, or toxic fluids to Clause 17.

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

CDV	Report on voting
66/642/CDV	66/667/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 2-051 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 2-051 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for laboratory equipment for mixing and stirring*.

Where a particular subclause of Part 1 is not mentioned in this Part 2, that subclause applies as far as is reasonable. Where the part states “addition”, “modification”, “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. Additional annexes are lettered starting from AA and additional list items are lettered from aa).

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

Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the text ~~in 1,1 by the following paragraph~~, except the first paragraph, with the following new text:

This part of IEC 61010 is applicable to electrically operated laboratory equipment and its accessories for mechanical mixing and stirring, where mechanical energy influences the shape or size or homogeneity of materials and their accessories. Such devices ~~may~~ can contain heating elements.

NOTE If all or part of the equipment falls within the scope of one or more other Part 2 standards of the IEC 61010 series as well as within the scope of this document, consideration is ~~to be~~ given to those other Part 2 standards. The standard for equipment which contains heating devices is IEC 61010-2-010.

2 Normative references

This clause of Part 1 is applicable ~~except as follows:~~.

~~*Addition:*~~

~~*Add the following references to the list:*~~

~~IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*~~

~~ISO 13849, *Safety of machinery – Safety-related parts of control systems*~~

3 Terms and definitions

This clause of Part 1 is applicable.

4 Tests

This clause of Part 1 is applicable.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

5.4.1 General

Addition:

Add, after item h), the following new item:

aa) if a HAZARD could be caused by operating a mixer or stirrer intended for use as HAND-HELD EQUIPMENT, there shall be a warning statement to that effect.

5.4.4 Equipment operation

Addition:

Add after item j), the following new item:

aa) instructions for fixing the stirring vessel if specified and sold as part of a mixing system, or if otherwise applicable.

Add a new paragraph after the list of items as follows:

The instructions shall warn against use of the equipment in hazardous atmospheres or with hazardous materials for which the equipment is not designed.

Replacement:

Replace the paragraph before the compliance statement with the following new text:

The user shall be made aware that the protection provided by the equipment ~~may~~ can be impaired if the equipment is used with accessories not provided or recommended by the manufacturer, or used in a manner not specified by the manufacturer.

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 except as follows:

7.3.2 Exceptions

Replacement:

Replace, in item a), the words "for example drilling and mixing equipment" *with the following:*

for example stirrer shafts and impellers extending downwards into material being stirred

Addition:

Add the following new subclauses:

7.3.101 Speed controls

If a SINGLE FAULT of an electronic speed control could cause a HAZARD, the equipment shall incorporate means to interrupt power or otherwise prevent the HAZARD.

Conformity is checked by inspection and test.

7.3.102 Movement during operation

Equipment other than HAND-HELD EQUIPMENT shall not change position during NORMAL USE.

Conformity is checked by inspection and test. Equipment which has not moved by more than 5 mm after operation for 10 min is considered to meet the requirement.

7.3.103 Restarting after interruption

Depending on the operation, a HAZARD ~~may~~ can be caused either by re-starting or by not re-starting after interruption of the mixing action. Instructions shall specify whether equipment will re-start or not re-start, both in the case of MAINS interruption and in the case of a fault or mechanical interruption. If after interruption a HAZARD can occur the equipment shall be equipped with an audible or visible signal to warn that an interruption has occurred.

Conformity is checked by inspection of documentation.

7.3.104 HAZARDS related to application

Additional HAZARDS ~~may~~ can occur with equipment used to mix flammable materials, or where the transfer of mechanical energy to a glass apparatus could lead to breakage.

Instructions for use shall warn against the use of equipment in such applications unless the equipment incorporates appropriate safety devices to prevent a HAZARD in SINGLE FAULT CONDITION. Such safety devices shall be independent from control systems.

Examples of HAZARDS and appropriate safety devices include the following:

a) Where failure of the mixing action could cause a HAZARD, for example in metal-organic reactions, the safety device shall initiate an alarm signal:

   1) if the drive shaft or mixer fails to turn when the mixer is switched on; or

   2) when an overload causes the shaft speed to fall below a preset level.

   NOTE Speed reduction can be caused by a lack of power or by the operation of an automatic device which reduces the shaft speed in the case of an overload.

b) Where a HAZARD could be caused by excessive torque applied to high-viscosity material, for example through glass breakage, the safety device shall initiate an alarm signal if the torque rises above a preset level. It is recommended that safety devices work according to the principle of rest-current.

Conformity is checked by inspection and test.

8 Resistance to mechanical stresses

This clause of Part 1 is applicable except as follows:

8.1 General

Replacement:

Replace the text of item 3) 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.

11 Protection against HAZARDS from fluids and solid foreign objects

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclause:

11.101 Connections for hoses and pipes

Connectors shall be so designed that hoses can be prevented from detaching, for example by means of hose clamps, and that pipes are adequately restrained.

Conformity is checked by inspection.

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

This clause of Part 1 is applicable.

13 Protection against liberated gases and substances, explosion and implosion

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclause:

13.2.101 Protection against explosion and explosives

Equipment designed for protection against explosion or to be used with explosives shall, according to the type, the mode of operation and the location, comply with the appropriate requirements of relevant IEC and ISO standards such as the IEC 60079 series on explosive atmospheres ~~standards~~.

Conformity is checked as specified in the relevant standards.

14 Components and subassemblies

This clause of Part 1 is applicable.

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 paragraph:

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 except as follows:

Addition:

Add the following new text at the end of the first sentence:

RISK assessment is required for mixers or stirrers intended to be used with flammable fluids or with containers or flasks with hazardous or toxic fluids.

Annexes

The annexes of Part 1 are applicable.

Bibliography

The Bibliography of Part 1 is applicable, except as follows:

Addition:

Add the following new references:

IEC 61010-2-010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials*

~~IEC 60079 (all parts), *Explosive atmospheres*~~

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

ISO 13849 (all parts), *Safety of machinery – Safety-related parts of control systems*

IEC 61010-2-051

Edition 4.0 2018-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

Exigences de sécurité pour appareils électriques de mesurage, de régulation, et de laboratoire –
Partie 2-051: Exigences particulières pour appareils de laboratoire utilisés pour mélanger et agiter

IEC 61010-2-051:2018-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

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c) added required RISK assessment for equipment intended to be used with flammable, hazardous, or toxic fluids to Clause 17.

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This Part 2-051 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for laboratory equipment for mixing and stirring*.

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

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1) the following print types are used:
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   - 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. Additional annexes are lettered starting from AA and additional list items are lettered from aa).

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

Part 2-051: Particular requirements for laboratory equipment for mixing and stirring

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

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

This part of IEC 61010 is applicable to electrically operated laboratory equipment and its accessories for mechanical mixing and stirring, where mechanical energy influences the shape or size or homogeneity of materials and their accessories. Such devices can contain heating elements.

NOTE If all or part of the equipment falls within the scope of one or more other Part 2 standards of the IEC 61010 series as well as within the scope of this document, consideration is given to those other Part 2 standards. The standard for equipment which contains heating devices is IEC 61010-2-010.

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

This clause of Part 1 is applicable.

4 Tests

This clause of Part 1 is applicable.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

5.4.1 General

Addition:

Add, after item h), the following new item:

aa) if a HAZARD could be caused by operating a mixer or stirrer intended for use as HAND-HELD EQUIPMENT, there shall be a warning statement to that effect.

5.4.4 Equipment operation

Addition:

Add after item j), the following new item:

aa) instructions for fixing the stirring vessel if specified and sold as part of a mixing system, or if otherwise applicable.

Add a new paragraph after the list of items as follows:

The instructions shall warn against use of the equipment in hazardous atmospheres or with hazardous materials for which the equipment is not designed.

Replacement:

Replace the paragraph before the compliance statement with the following new text:

The user shall be made aware that the protection provided by the equipment can be impaired if the equipment is used with accessories not provided or recommended by the manufacturer, or used in a manner not specified by the manufacturer.

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 except as follows:

7.3.2 Exceptions

Replacement:

Replace, in item a), the words "for example drilling and mixing equipment" *with the following:*

for example stirrer shafts and impellers extending downwards into material being stirred

Addition:

Add the following new subclauses:

7.3.101 Speed controls

If a SINGLE FAULT of an electronic speed control could cause a HAZARD, the equipment shall incorporate means to interrupt power or otherwise prevent the HAZARD.

Conformity is checked by inspection and test.

7.3.102 Movement during operation

Equipment other than HAND-HELD EQUIPMENT shall not change position during NORMAL USE.

Conformity is checked by inspection and test. Equipment which has not moved by more than 5 mm after operation for 10 min is considered to meet the requirement.

7.3.103 Restarting after interruption

Depending on the operation, a HAZARD can be caused either by re-starting or by not re-starting after interruption of the mixing action. Instructions shall specify whether equipment will re-start or not re-start, both in the case of MAINS interruption and in the case of a fault or mechanical interruption. If after interruption a HAZARD can occur the equipment shall be equipped with an audible or visible signal to warn that an interruption has occurred.

Conformity is checked by inspection of documentation.

7.3.104 HAZARDS related to application

Additional HAZARDS can occur with equipment used to mix flammable materials, or where the transfer of mechanical energy to a glass apparatus could lead to breakage.

Instructions for use shall warn against the use of equipment in such applications unless the equipment incorporates appropriate safety devices to prevent a HAZARD in SINGLE FAULT CONDITION. Such safety devices shall be independent from control systems.

Examples of HAZARDS and appropriate safety devices include the following:

a) Where failure of the mixing action could cause a HAZARD, for example in metal-organic reactions, the safety device shall initiate an alarm signal:

   1) if the drive shaft or mixer fails to turn when the mixer is switched on; or

   2) when an overload causes the shaft speed to fall below a preset level.

   NOTE Speed reduction can be caused by a lack of power or by the operation of an automatic device which reduces the shaft speed in the case of an overload.

b) Where a HAZARD could be caused by excessive torque applied to high-viscosity material, for example through glass breakage, the safety device shall initiate an alarm signal if the torque rises above a preset level. It is recommended that safety devices work according to the principle of rest-current.

Conformity is checked by inspection and test.

8 Resistance to mechanical stresses

This clause of Part 1 is applicable except as follows:

8.1 General

Replacement:

Replace the text of item 3) 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.

11 Protection against HAZARDS from fluids and solid foreign objects

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclause:

11.101 Connections for hoses and pipes

Connectors shall be so designed that hoses can be prevented from detaching, for example by means of hose clamps, and that pipes are adequately restrained.

Conformity is checked by inspection.

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

This clause of Part 1 is applicable.

13 Protection against liberated gases and substances, explosion and implosion

This clause of Part 1 is applicable except as follows:

Addition:

Add the following new subclause:

13.2.101 Protection against explosion and explosives

Equipment designed for protection against explosion or to be used with explosives shall, according to the type, the mode of operation and the location, comply with the appropriate requirements of relevant IEC and ISO standards such as the IEC 60079 series on explosive atmospheres.

Conformity is checked as specified in the relevant standards.

14 Components and subassemblies

This clause of Part 1 is applicable.

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 paragraph:

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 except as follows:

Addition:

Add the following new text at the end of the first sentence:

RISK assessment is required for mixers or stirrers intended to be used with flammable fluids or with containers or flasks with hazardous or toxic fluids.

Annexes

The annexes of Part 1 are applicable.

Bibliography

The Bibliography of Part 1 is applicable, except as follows:

Addition:

Add the following new references:

IEC 61010-2-010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials*

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

ISO 13849 (all parts), *Safety of machinery – Safety-related parts of control systems*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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EXIGENCES DE SÉCURITÉ POUR APPAREILS ÉLECTRIQUES DE MESURAGE, DE RÉGULATION, ET DE LABORATOIRE –

Partie 2-051: Exigences particulières pour appareils de laboratoire utilisés pour mélanger et agiter

AVANT-PROPOS

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La Norme internationale IEC 61010-2-051 a été établie par le comité d'études 66 de l'IEC: Sécurité des appareils de mesure, de commande et de laboratoire.

Elle a le statut d'une publication groupée de sécurité conformément au Guide IEC 104.

Cette quatrième édition annule et remplace la troisième édition parue en 2015. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) adaptation des modifications introduites par l'Amendement 1 de l'IEC 61010-1;

b) ajout à l'Article 6 de la tolérance pour la stabilité du matériel d'essai en tension alternative;

c) ajout à l'Article 17 de l'appréciation du RISQUE exigée pour le matériel destiné à être utilisé avec des fluides inflammables, dangereux ou toxiques.

Le texte de cette Norme internationale est issu des documents suivants:

CDV	Rapport de vote
66/642/CDV	66/667/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61010, sous le titre général: *Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire*, peut être consultée sur le site web de l'IEC.

Cette partie 2-051 est destinée à être utilisée conjointement avec l'IEC 61010-1. Elle a été établie sur la base de la troisième édition (2010) et de son Amendement 1 (2016).

La présente Partie 2-051 complète ou modifie les articles correspondants de l'IEC 61010-1 de façon à transformer cette publication en norme IEC: *Exigences particulières pour appareils de laboratoire utilisés pour mélanger et agiter*.

Lorsqu'un paragraphe particulier de la Partie 1 n'est pas mentionné dans la présente Partie 2, ce paragraphe s'applique pour autant que cela soit raisonnable. Lorsque la partie indique «addition», «modification», «remplacement» ou «suppression», il convient d'adapter en conséquence l'exigence, la modalité d'essai ou la note correspondante de la Partie 1.

Dans la présente norme:

1) les caractères d'imprimerie suivants sont utilisés:
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   - termes définis à l'Article 3 et utilisés dans toute cette norme: PETITES CAPITALES EN CARACTÈRES ROMAINS;
2) les paragraphes, figures, tableaux et notes qui viennent en supplément de ceux de la Partie 1 sont numérotés à partir de 101. Les annexes complémentaires sont désignées à partir de AA et les listes de termes additionnels à partir de aa).

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