

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Live working – Minimum requirements for the utilization of tools, devices and equipment

(standards.iteh.ai)

Travaux sous tension – Exigences minimales pour l'utilisation des outils, dispositifs et équipements

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LIVE WORKING –  
MINIMUM REQUIREMENTS FOR THE UTILIZATION  
OF TOOLS, DEVICES AND EQUIPMENT**

## FOREWORD

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International Standard IEC 61477 has been prepared by IEC technical committee 78: Live working.

This second edition of IEC 61477 cancels and replaces the first edition published in 2001, its Amendment 1 (2002) and Amendment 2 (2004).

The document 78/772/FDIS, circulated to the National Committees as Amendment 3, led to the publication of the new edition.

The text of this standard is based on the first edition, Amendment 1, Amendment 2 and the following documents:

FDIS	Report on voting
78/772/FDIS	78/786/RVD

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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site 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- withdrawn,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.

The contents of the corrigendum of April 2009 have been included in this copy.

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## INTRODUCTION

This International Standard does not replace national regulations but it can be regarded as a reference for the development of national regulations. Where National regulations are in force to dictate the conditions of utilization of tools, devices and equipment for live working, these can be more stringent than the minimum requirements of this standard.

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# LIVE WORKING – MINIMUM REQUIREMENTS FOR THE UTILIZATION OF TOOLS, DEVICES AND EQUIPMENT

## 1 Scope

This International Standard gives the minimum requirements relative to specification, manufacture, selection, application and maintenance of tools, devices and equipment for live working.

It provides the type of information which is useful to skilled persons in order to make the use of tools, devices and equipment safer.

This type of information includes:

- the characteristics of tools, devices and equipment;
- their conditions for use;
- their conditions for maintenance;
- their conditions for storage and transportation.

Such information may be given in standards, manufacturer's instructions for use and in internal regulations set forth by companies for their own employees.

Such information should be completed by work methods, which are excluded from the scope of this standard. <https://standards.iteh.ai/catalog/standards/sist/431f8eb0-3934-4320-b811-22bd79cfda70/iec-61477-2009>

In this standard, the word tool(s) is used for "tools, devices and equipment for live working" unless otherwise specified.

## 2 Normative references

The following referenced documents are indispensable for the application 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 60050-651:1999, *International Electrotechnical Vocabulary (IEV) – Part 651: Live working*

IEC 60417, *Graphical symbols for use on equipment*

IEC 60743, *Live working – Terminology for tools, equipment and devices*



### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **(electrically) skilled person**

##### **(electrically) qualified person (US)**

person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create

[IEV 651-01-33]

#### 3.2

##### **required insulation level for live working (RILL)**

statistical impulse withstand voltage of the insulation at the work location necessary to reduce the risk of breakdown of this insulation to an acceptable low level

NOTE It is generally considered that an acceptable low level is reached when the value of the statistical impulse withstand voltage is greater than or equal to the overvoltage having a probability of being exceeded by no more than 2 %.

[IEV 651-01-17]

#### 3.3

##### **live working zone**

space around live parts where prevention of electrical hazard is assured by suitable means such as limiting access to skilled persons, maintaining the appropriate air distances to energized parts and using tools for live working

NOTE 1 The distance from the live parts to the outer boundary of a live working zone is greater or equal to the minimum working distance.

NOTE 2 The live working zone and the specific precautions that apply are generally defined by national or company regulations.

NOTE 3 In some countries the term "danger zone" is used instead of "live working zone".

[IEV 651-01-06]

#### 3.4

##### **tools (for live working)**

tools, devices and equipment particularly designed or adapted, tested and maintained for live working

[IEV 651-01-24]

### 4 Characteristics of tools

The selection of tools to carry out the work to be performed requires a combination of both the advice and guidance from the manufacturer of the tools and the knowledge and experience of the user. This information enables the user to select tools that are not only the easiest to use but also ensures that tools are not used beyond their capabilities.

Those persons using the tools should be informed of the correct use of the tools and any particular safety issues that need to be observed or recognized.

#### 4.1 Marking, graphical symbols and information to the users

It is essential for the safety of the user to have a clear meaning of the marking, including graphical symbols.

The items of marking shall be clearly and durably legible. They shall not impair the performance of the tool, particularly its insulating properties, if any.

This subclause applies to the tools considered as final products, and not to the raw material they are made of. According to that, it is considered inappropriate to mark the raw material with the double triangle.

Tools for which compliance with any IEC standard dealing with live working is claimed, shall be indicated by the following marking, as a minimum:

- symbol IEC 60417-5216 (2002-10) – Suitable for live working; double triangle;
- number of the relevant IEC standard immediately adjacent to the symbol (IEC 6XXXX).

NOTE 1 The symbol indicates a suitability for live working (see IEC 651-01-01) and then is not to be associated only with insulating tools. Conductive clothing (IEC 60895) and arc protective clothing (IEC 61482-2) are suitable for live working.

NOTE 2 Portable equipment and separate components for earthing or earthing and short-circuiting (IEC 61230) are not marked with this symbol.

Limit or rated values, such as the working load of any lifting equipment, and special properties or categories shall also be clearly indicated, where these values or indications are needed for a proper selection of the tool.

Identification of the tools can be completed through other means than marking, such as coded information (bar codes, microchips, etc.), or be associated to its packaging. It shall be particularly the case of characteristics or information not needed on the work location.

#### 4.2 Dimensions and weight

The physical characteristics of the tools shall be assessed in order to take account of the implications for safety when in use. These characteristics are as follows:

- the weight of the tools to be handled by the workers, in particular those tools likely to be used at a distance during work, such as universal tool attachments, insulating poles, blankets and protective covers (see IEC 60743);
- the dimension(s) of the parts providing the required insulation level (for example, the distance between the handling zone and the active end of the tool, the boundaries of surface on protective covers which provide the required protection);
- the dimension(s) of the conductive parts which may enter the live working zone.

The last item is particularly useful because it has an influence on the air gap strength.

#### 4.3 Electrical characteristics

The user of tools needs to know and understand the electrical characteristics of the various parts comprising the tools being used. This is especially important for parts which provide insulating, insulated or conductive characteristics.

In this regard, it is necessary to distinguish between:

- the insulating or insulated parts of a tool;
- the conductive parts of a tool.

Some tools may also comprise parts made of non-conductive material which do not comply with the requirements applicable to insulating material for live working. In this case, the corresponding tool shall ensure the required insulation level and consequently shall not affect adversely the electrical insulation at work location.

The tools shall be selected on the basis of its electrical characteristics. The electrical characteristics of a tool are generally related to the maximum system voltage taking into account the required insulation level. These characteristics may be used to allocate the tool to a particular electrical classification, according to the live working product standards.

NOTE Long insulating tools such as insulating poles are generally selected in order to maintain suitable air distances to live parts; therefore, they do not need the kind of classification as explained above.

Limit values for the maximum levels of voltage to which tools should be exposed shall be given in clear terms in the instructions for use accompanying the tools or be clearly marked on the tools.

#### 4.4 Mechanical characteristics

The following mechanical characteristics are particularly important for tools with primarily a mechanical function.

These characteristics represent the maximum mechanical stress and strain values which can be either transmitted by these tools or to which they can be subjected. These stresses and strains can arise from one or more of the following:

- traction;
- compression;
- bending;
- torsion;
- tightening torque;
- shearing.

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For other categories of tools, protective equipment in particular, the characteristics of mechanical strength such as

- puncture resistance;
- cutting resistance;
- tear resistance;
- tensile strength and elongation at break;
- abrasive resistance, etc.

are also important.

#### 4.5 Thermal characteristics

Live working tools are used in an electrical environment where thermal risks may arise, for instance:

- due to proximity of workers where electrical arcing in air can occur; or
- from melting of protective equipment when subjected to abnormal current conditions in the system.

When appropriate, tools shall comply with flame retardancy requirements, they shall guaranty that they do not aggravate the consequence of electrical arcs or comply with other kinds of thermal requirements.

### 5 Conditions of use

The following information is essential for anyone who uses live working tools:

- the operating range, characterized by the type of electrical installations on which it can be used or the limits of use related to the environment or the method of work;
- the verifications before use to ensure the integrity (electrical and mechanical) of the tool;
- the precautions to be observed during use.

## 5.1 Operating range

### 5.1.1 Type of installations and limits of use

The characterization of the electrical installations can be very general:

- overhead lines;
- substations;
- underground networks;
- power generation facilities.

A much more detailed description is needed in many cases. This may include for example:

- type of live parts to be worked on (for instance, use of protective covers);
- type of support (for instance, use of saddles);
- type of insulator (porcelain, toughened glass, composite).

Where tools have been designed to be only used either at a distance, at potential or in contact, it is vital that these limitations and constraints be clearly explained to the users.

Where tools using special techniques are used (e.g. sprayed-water cleaning, work from a helicopter, etc.), the limits and constraints of use shall be clearly explained to the users.

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### 5.1.2 Environment

Where the characteristics of the tools are either limited or adversely influenced by the environmental conditions during use, such limitations and influences shall be explained to the users. The following points shall be taken into consideration (this listing is neither exhaustive nor in order of priority):

- precipitation;
- temperature (some materials suffer adverse mechanical change with very low or very high temperatures);
- altitude;
- fog.

## 5.2 Precautions for use

It is important that the user be familiar with the following points:

- the instructions for assembly and installation;
- the instructions for operation where necessary;
- the particular limits to be observed in use to prevent danger.

When the tool is a diagnostic device, it is important that the user be informed of:

- the functioning principle;
- the possible limitations of use due to this principle;
- ways to confirm the diagnostic, where necessary.