UL 62841-2-2

STANDARD FOR SAFETY

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-2: Particular Requirements For Hand-Held Screwdrivers And Impact Wrenches

UL Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-2: Particular Requirements For Hand-Held Screwdrivers And Impact Wrenches, UL 62841-2-2

First Edition, Dated February 26, 2016

SUMMARY OF TOPICS

This revision of ANSI/UL 62841-2-2 dated April 30, 2021 includes the addition of missing text from Clause 17.2DV.2.

Please note that the national difference document incorporates all of the U.S. national differences for UL 60745-2-2. This standard is an adoption of IEC 62841-2-2, Edition 1 published by the IEC, May 2014.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal (s) on this subject dated December 18, 2020.

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Underwriters Laboratories Inc.
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Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches

February 26, 2016

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This national standard is based on publication IEC 62841-2-2, First Edition (2014).

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of the IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the First Edition including revisions through April 30, 2021. The most recent designation of ANSI/UL 62841-2-2 as an American National Standard (ANSI) occurred on April 30, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

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Preface

This is the harmonized CSA Group and UL Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn And Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches. It is the First edition of CAN/CSA-C22.2 No. 62841-2-2 and the First edition of UL 62841-2-2. This harmonized Standard has been jointly revised on April 30, 2021. For this purpose, CSA Group and UL are issuing revision pages dated April 30, 2021.

This harmonized standard is based on IEC Publication 62841-2-2: First edition Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches issued May 2014. IEC publication 62841-2-2 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the International Harmonization Committee (IHC) for the adoption of the IEC series of standards for Hand-Held, Motor-Operated, and Transportable Tools and Lawn and Garden Machinery UL are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Subcommittee on Safety of Hand-Held Motor-Operated Electric Tools, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

This CAN/CSA-C22.2 No. 62841-2-2 Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches is to be used in conjunction with the First edition of CAN/CSA-C22.2 No. 62841-1. The requirements for hand-held screwdrivers and impact wrenches are contained in this Part 2 Standard and CAN/CSA-C22.2 No. 62841-1. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 62841-1. Where a particular subclause of CAN/CSA-C22.2 No. 62841-1 is not mentioned in CAN/CSA-C22.2 No. 62841-2-2, the CAN/CSA-C22.2 No. 62841-1 subclause applies.

This UL 62841-2-2 Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches, is to be used in conjunction with the First edition of UL 62841-1. The requirements for hand-held screwdrivers and impact wrenches are contained in this Part 2 Standard and UL 62841-1. Requirements of this Part 2 Standard, where stated, amend the requirements of UL 62841-1. Where a particular subclause of UL 62841-1 is not mentioned in UL 62841-2-2, the UL 62841-1 subclause applies.

Level of harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for Differences From IEC

Differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

IEC Copyright

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication IEC 62841-2-2 Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety – Part 2-2: Particular Requirements for Hand-Held Screwdrivers and Impact Wrenches, copyright 2014, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword is not a part of the requirements of this standard but is included for information purposes only.

NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication IEC 62841-2-2 (Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-2: Particular Requirements For Hand-Held Screwdrivers And Impact Wrenches) copyright 2014 are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – PART 2-2: PARTICULAR REQUIREMENTS FOR HAND-HELD SCREWDRIVERS AND IMPACT WRENCHES

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 nongovernmental 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.

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6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

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International Standard IEC 62841-2-2 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

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

FDIS	Report on voting
116/162/FDIS	116/177/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.

This Part 2-2 is to be used in conjunction with the first edition of IEC 62841-1:2014.

This Part 2-2 supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for hand-held screwdrivers and impact wrenches.

Where a particular subclause of Part 1 is not mentioned in this Part 2-2, that subclause applies as far as reasonable. Where this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

The following print types are used:

– requirements: in roman type

– *test specifications: in italic type;*

– NOTES: IN SMALLER ROMAN TYPE

The terms defined in Clause 3 are printed in **bold typeface**.

Subclauses, notes and figures which are additional to those in Part 1 are numbered starting from 101.

A list of all parts of the IEC 62841 series, under the general title: *Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety*, can 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 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.

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 36 months from the date of publication.

101DV DE *Modification: Add the following to the IEC Foreword:*

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

102DV DE *Modification: Add the following to the IEC Foreword:*

For this Standard, all references to "Part 1" refer to CAN/CSA C22.2 No. 62841-1 and UL 62841-1.

No Text on This Page

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – PART 2-2: PARTICULAR REQUIREMENTS FOR HAND-HELD SCREWDRIVERS AND IMPACT WRENCHES

1 Scope

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

Addition:

This part of IEC 62841 applies to **screwdrivers** and **impact wrenches**.

This standard does not apply to drills that can be used for driving screws by attaching **screwdriver** bits.

1DV D1 ***Modification: Replace the second paragraph of Clause 1 of the Part 2 with the following:***

This standard applies to screwdrivers, impact wrenches, and ratchet drivers.

2 Normative references

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

Addition:

ISO 28927-2:2009
Hand-held portable power tools – Test methods for evaluation of vibration emission – Part 2: Wrenches, nutrunners and screwdrivers

3 Terms and definitions

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

Additional definitions:

3.101 **screwdriver:** tool equipped with a non-circular tool holder, such as hexagonal or square, intended for tightening and loosening screws, nuts, and the like and not equipped with an impact mechanism but which may have a device for depth setting or setting the torque or means for switching off the rotation

3.102 **impact wrench:** tool equipped with a non-circular tool holder, such as hexagonal or square, intended for tightening and loosening screws, nuts, and the like and equipped with a rotary impact mechanism

Note 1 to entry: Some **impact wrenches** are equipped with a means for depth setting and may have a means for setting the torque or switching off the rotation.

3.103DV D1 ***Addition: Add the following definition to Clause 3 of the Part 2:***

ratchet driver: tool intended for tightening and loosening screws, nuts, and the like and equipped with a ratcheting mechanism. Some ratchet drivers are equipped with a means for switching the direction of rotation

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for the tests

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

5.17 *Addition:*

The mass of the tool includes the auxiliary handle, if any.

6 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

7 Classification

This clause of Part 1 is applicable.

8 Marking and instructions

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

8.14.1.1 *Addition:*

101) **Hold the power tool by insulated gripping surfaces, when performing an operation where the fastener may contact hidden wiring or its own cord.** *Fasteners contacting a "live" wire may make exposed metal parts of the power tool "live" and could give the operator an electric shock.*

NOTE The above safety warning applies only to **screwdrivers** and to **impact wrenches** with a square drive less than 13 mm.

9 Protection against access to live parts

This clause of Part 1 is applicable.

10 Starting

This clause of Part 1 is applicable.

11 Input and current

This clause of Part 1 is applicable.

12 Heating

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

12.2.1 *Replacement:*

The tool is operated intermittently for 30 cycles or until thermal equilibrium is reached, whichever is achieved first, each cycle comprising a period of continuous operation of 30 s and a rest period of 90 s with the tool switched off, the tool loaded during the periods of operation by means of a brake adjusted so as to attain rated input or rated current.

The impact mechanism may be disabled during the test to prevent damage to the brake.

12.2.1DV D1 *Modification: Replace the second paragraph of Clause 12.2.1 of the Part 2 with the following:*

The impact or ratchet mechanism may be disabled during the test to prevent damage to the brake.

12.5DV D1 *Modification: Add the following to Clause 12.5 of the Part 1:*

The temperature-rise limit specified for the external enclosure does not apply to the enclosure of the ratchet head and reversing control of ratchet drivers.

13 Resistance to heat and fire

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of Part 1 is applicable.

15 Resistance to rusting

This clause of Part 1 is applicable.

16 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

17 Endurance

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

17.2 *Modification:*

For **screwdrivers**, the test of Part 1 is applicable.

For **impact wrenches**, replace the test of Part 1 as follows:

*An **impact wrench** is operated with no-load for 12 h at a voltage equal to 1,1 times the highest rated voltage or 1,1 times the upper limit of the rated voltage range and then for 12 h at a supply voltage equal to 0,9 times the lowest rated voltage or 0,9 times the lower limit of the rated voltage range. The 12 h of operation need not be continuous. If applicable, the tool is adjusted to the maximum attainable speed.*

The tool may be switched on and off by means of a switch other than that incorporated in the tool.

Each cycle of operation comprises an "on" period of 100 s and an "off" period of 20 s, the "off" periods being included in the specified operating time.

During the test, the tool is placed in three different positions, the operating time, at each voltage, being approximately 4 h for each position.

NOTE The change of position is made to prevent abnormal accumulation of carbon dust in any particular place. Examples of the three positions are horizontal, vertically up and vertically down.

*After this, the **impact wrenches** are operated intermittently for 12 h at a supply voltage equal to 1,1 times the highest rated voltage or 1,1 times the upper limit of the rated voltage range, then for 12 h at a supply voltage equal to 0,9 times the lowest rated voltage or 0,9 times the lower limit of the rated voltage range.*

Each cycle of operation comprises a tool impacting for a period of 1 s and a resting period of 9 s with the tool switched "off", the "off" periods being included in the specified operating time.

During these tests, replacement of the carbon brushes is allowed, and the tool is oiled and greased as in normal use. If mechanical failure occurs and does not impair compliance with this standard, the part that failed may be replaced.

If the temperature rise of any part of the tool exceeds the temperature rise determined during the test of 12.1, forced cooling or rest periods may be applied, the rest periods being excluded from the specified operating time. If forced cooling is applied, it shall not alter the air flow of the tool or redistribute carbon deposits.

During these tests, overload protection devices incorporated in the tool shall not activate.

17.2DV.1 D1 *Modification: Replace the second paragraph of Clause 17.2 of the Part 2 with the following:*

For impact wrenches and ratchet drivers, replace the test of part 1 as follows:

17.2DV.2 D1 *Modification: Replace the third paragraph of Clause 17.2 of the Part 2 with the following:*

An impact wrench or ratchet driver shall be operated with no-load for 12 h at a voltage equal to 1,1 times the highest rated voltage or 1,1 times the upper limit of the rated voltage range and then for 12 h at a supply voltage equal to 0,9 times the lowest rated voltage or 0,9 times the lower limit of the rated voltage range. The 12 h of operation need not be continuous. If applicable, the tool shall be adjusted to the maximum attainable speed.

17.2DV.3 D1 ***Modification: Replace the seventh paragraph of Clause 17.2 of the Part 2 with the following:***

After this, the impact wrenches and ratchet drivers shall be operated intermittently for 12 h at a supply voltage equal to 1,1 times the highest rated voltage or 1,1 times the upper limit of the rated voltage range, then for 12 h at a supply voltage equal to 0,9 times the lowest rated voltage or 0,9 times the lower limit of the rated voltage range.

18 Abnormal operation

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

18.8 *Replacement of Table 4 by the following:*

Table 4
Required performance levels

Type and purpose of SCF	Minimum Performance Level (PL)
Power switch – prevent unwanted switch-on	a
Power switch – prevent unwanted switch-on for tools where the bit does not rotate without applying axial pressure	Not a SCF
Power switch – provide desired switch-off	a
Power switch – provide desired switch-off for tools where the bit does not rotate without applying axial pressure	Not a SCF
Provide desired direction of rotation	Not a SCF
Any electronic control to pass the test of 18.3	Not a SCF
Any speed limiting device	Not a SCF
Prevent exceeding thermal limits as in Clause 18	a

19 Mechanical hazards

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

19.6 This subclause is not applicable.

20 Mechanical strength

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

20.5 This subclause is not applicable for **impact wrenches** with a square drive greater than or equal to 13 mm.

20.5DV D1 ***Modification: Replace Clause 20.5 of the Part 2 with the following:***

This subclause is not applicable for impact wrenches and ratchet drivers with a square drive greater than or equal to 13 mm.

21 Construction

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

21.30 This subclause is not applicable for **impact wrenches** with a square drive greater than or equal to 13 mm.

21.30DV D1 ***Modification: Replace Clause 21.30 of the Part 2 with the following:***

This subclause is not applicable for impact wrenches and ratchet drivers with a square drive greater than or equal to 13 mm.

22 Internal wiring

This clause of Part 1 is applicable.

23 Components

This clause of Part 1 is applicable.

24 Supply connection and external flexible cords

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

24.4 *Replacement of paragraphs 1 and 2:*

For **impact wrenches**, the lightest cable which can be used is heavy polychloroprene sheathed flexible cable (60245 IEC 66) or equivalent.

24.4DV D1 ***Modification: Replace Clause 24.4 of the Part 2 with the following:***

This subclause of the Part 1 is applicable.

25 Terminals for external conductors

This clause of Part 1 is applicable.

26 Provision for earthing

This clause of Part 1 is applicable.

27 Screws and connections

This clause of Part 1 is applicable.

28 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable.

Annexes

The annexes of Part 1 are applicable except as follows.

Annex I
(informative)

Measurement of noise and vibration emissions

NOTE In Europe (EN 62841-2-2), Annex I is normative.

I.2 Noise test code (grade 2)

This clause of Part 1 is applicable except as follows:

I.2.4 Installation and mounting conditions of the power tools during noise tests

Addition:

Screwdrivers are suspended. The bit holder shall be horizontal.

Impact wrenches are held and used as specified in I.2.5.

I.2.5 Operating conditions

Addition:

Screwdrivers are tested at no-load.

Impact wrenches are tested under load. The load is applied by means of a brake system, so that the socket driving the brake rotates at a test speed of (45 ±5) min^{-1} and the impact mechanism is caused to operate continuously. The brake as shown in Figure I.101is supported on a resilient material and mounted on a bench such that the geometric centre of the tool is 1 m above the reflecting plane. The details of the brake system are given in Annex C of ISO 28927-2:2009.

To prevent chattering noise from items 2, 3 and 5 of the brake shown in Figures C.1 and C.2 of ISO 28927-2:2009, these parts may be insulated between each other by material such as rubber.

The feed force shall be just sufficient to obtain a stable operation.

The measurement time shall be approximately 10 s.

I.3 Vibration

This clause of Part 1 is applicable except as follows:

I.3.3.2 Location of measurement

Addition:

Figure I.102 and Figure I.103 show the positions for different **screwdrivers** and **impact wrenches**.

I.3.5.3 Operating conditions

Addition:

The operating conditions of Part 1 apply except those specified in Table I.101 and Table I.102.

Table I.101
Operating conditions for screwdrivers

Orientation	**Screwdrivers** are tested at no-load. The **screwdriver** is hold horizontally during the test.
Tool bit	Tool bit of medium length and size.
Grip force	Hold the machine with normal gripping force, avoiding excessive gripping force.
Test cycle	One test cycle is given when the tool is switched on for no load at maximum speed for more than 10 s and then switched off again. The measurement is conducted during 10 s within this period.

NOTE As it is difficult to measure load applications of screwdrivers in laboratories and results have shown that the load has no influence on the vibration results, the measurements are conducted with no-load only.

Table I.102
Operating conditions for impact wrenches

Orientation	The tools are tested under load. Either a hexagon head bolt is screwed into a nut or a hexagon nut is screwed onto a bolt using a steel plate as part of a test fixture according to Figure I.104. The test fixture shall be either mounted on the floor or on a concrete block at least the size of the test fixture with a minimum thickness of 200 mm. NOTE Figure I.104 shows an example for mounting the test fixture. The bolts or nuts are of the biggest capacities of the tool under test. The screw case is a hard joint with one steel washer under the head. The initial setting of the bolt or nut shall provide 10 mm of exposed length from the steel plate to provide the run up. The test fixture shall not turn or move during the test. The steel plate shall be long enough to accept 5 fixings with a clearance between each fixing of at least the dimension of the head of the bolt or nut or a dimension distance which does not cause interference with the adjacent fixing.
Tool bit	Hex head sockets of the size and depth needed for the bolts or nuts defined above.
Feed force	Provide sufficient grip and feed force to maintain safe control. Avoid excessive grip and feed force.
Test cycle	The test cycle will be one fixing for the specified bolt or nut for a period of run down and 5 s from first impact (one test series contains five cycles). The measurement starts from switch on of the tool with the socket / bit engaged with the bolts or nuts to the end of 5 s of impact with continuous operation. This includes the time to cover run up of 10 mm.

I.3.6.2 Declaration of the vibration total value

Addition:

The vibration total value a_h of the handle with the highest emission and the uncertainty *K* shall be declared and:

– for **screwdrivers**

the work mode description "screw driving";

– for **impact wrenches**