IEC 63241-1

Edition 1.0 2023-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electric motor-operated tools – Dust measurement procedure – Part 1: General requirements

Outils électroportatifs à moteur – Procédure de mesure de la poussière – Partie 1: Exigences générales

IEC 63241-1:2023-07(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 25.140.30

ISBN 978-2-8322-7090-5

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRIC MOTOR-OPERATED TOOLS – DUST MEASUREMENT PROCEDURE –

Part 1: General requirements

FOREWORD

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IEC 63241-1 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools. It is an International Standard.

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

Draft	Report on voting
116/655/FDIS	116/666/RVD

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.

The language used for the development of this International Standard is English.

This document is to be used in conjunction with the appropriate parts of IEC 63241-2 or IEC 63241-3, which contain clauses that supplement or modify the corresponding clauses in this document to provide the relevant requirements for each type of product.

The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

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

A list of all parts of the IEC 63241 series, under the general title: *Electric motor-operated tools – Dust measurement procedure*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document 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.

INTRODUCTION

Inhalable dust emitted by electric motor-operated tools can present a hazard to the operator and other exposed persons.

Therefore, this document specifies a procedure to measure the **dust** concentration produced by an electric power tool under standardized conditions representing typical applications. However, the **dust** concentration during actual use of the power tool can differ from the **dust** concentration measured in accordance with this document depending on the ways in which the tool is used.

The results of **dust** measurements can be used

– for a declaration of the **dust** emission;

– for comparing the **dust** emission from tools of the same type; or

– in a preliminary assessment of **dust** exposure at a workplace.

For all purposes, it is important to specify measurement procedures with known accuracy so that the results of measurements taken by different laboratories can be compared.

The measurements of **dust** concentration are made in accordance with EN 1093-9:1998 and EN 1093-9:1998/A1:2008 for the test room.

ELECTRIC MOTOR-OPERATED TOOLS – DUST MEASUREMENT PROCEDURE –

Part 1: General requirements

1 Scope

This document specifies general requirements for the **dust** measurement of electric motor-operated tools supplied from mains or from batteries. This document applies to those tools with and without a **dust extraction unit** where **dust** such as mineral **dust** containing silica or wood **dust** is expected.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 1093-9:1998, *Safety of machinery – Evaluation of the emission of airborne hazardous substances – Part 9: Pollutant concentration parameter, room method*
EN 1093-9:1998/A1:2008

EN 13205 (all parts), *Workplace exposure – Assessment of sampler performance for measurement of airborne particle concentrations*

ISO 7708:1995, *Air quality – Particle size fraction definitions for health-related sampling*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
accessory
device that is attached only to the output mechanism of the tool

3.2
detachable battery pack
battery which is contained in a separate enclosure from the battery tool and is intended to be removed from the tool for charging purposes

3.3
dust
distribution of solid materials in gases, generated by mechanical processes

Note 1 to entry: According to ISO 7708:1995, two size categories are to be differentiated: the **inhalable dust** and the **respirable dust** fraction.

3.4
dust extraction unit
suction device, connected to the **dust**/chip outlet of the tool or a **dust** capturing attachment, for collecting **dust** emitted from the tool during working

Note 1 to entry: A **dust extraction unit** can be either an external one (such as a **dust** extractor or a centralized exhaust system) or an integral one.

3.5
dust sampler
device for collecting the **respirable dust** portion and **inhalable dust** portion by aspirating a measured amount of **dust**-laden air and deposition of the **dust** on an integrated filter

3.6
fully charged battery
battery charged to the maximum state of charge permitted by the battery charging system intended for use with the tool

3.7
inhalable dust
dust fraction which can be taken up by the respiratory system in accordance with ISO 7708:1995

3.8
maximum air flow rate
highest air flow rate created by an external **dust extraction unit**, including the specified hose, with no tool attached

3.9
maximum vacuum
highest vacuum level created by an external **dust extraction unit**, including the specified hose with the end of the hose blocked and with no bypass

3.10
quartz
mineral derived from crystalline silica

3.11
rated frequency
frequency assigned to the tool by the manufacturer

3.12
rated frequency range
frequency range assigned to the tool by the manufacturer

Note 1 to entry: It is expressed by its lower and upper limits.

3.13
rated voltage
voltage assigned to the tool by the manufacturer

Note 1 to entry: For three-phase supply, it is the voltage between phases.

3.14
rated voltage range
voltage range assigned to the tools by the manufacturer

Note 1 to entry: It is expressed by its lower and upper limits.

3.15
respirable dust
dust fraction which can reach the alveoli and bronchia in accordance with ISO 7708:1995

3.16
separable battery pack
battery which is contained in a separate enclosure from the battery tool and is connected to the battery tool by a cord

4 Test procedure

4.1 General

*Tests shall be performed under working conditions, including appropriate rest periods, in a test room similar to the one used in EN 1093-9:1998 and EN 1093-9:1998/A1:2008, and measurements of **dust** emission shall be made in accordance with EN 1093-9:1998 and EN 1093-9:1998/A1:2008.*

*The **inhalable dust** shall be measured and analysed. For tools intended to be used with materials likely to contain **quartz**, also the **respirable dust** shall be measured and analysed.*

The operator shall be skilled and able to operate the machine properly, i.e. the operator shall be experienced in the use of the tool.

NOTE Practical tests have shown that the variation of the results can be reduced

– when the distance between the work surface and the operator is kept constant,
– when the posture changes of the operator are minimized, and
– when the posture of the operator is close to real working conditions during the test.

4.2 Test room and equipment

The tests are carried out in a test room that fulfils the following criteria:

– *no other sources of fixed air-polluting material in the room;*
– *no room ventilation during the **dust** measurement;*
– *size of the room (200 ± 20) m^3 with a height between 3,0 m and 4,5 m;*
– *large enough to ensure a distance between the tool and the walls of at least 2,0 m;*

NOTE 1 A smaller distance can lead to higher values of the measured **dust** concentration.

NOTE 2 The dimensions of the test room to measure **dust** concentration are in accordance with EN 1093-9:1998 and EN 1093-9:1998/A1:2008. This test room size has been shown to provide consistent **dust** concentration measurement results and also results in measured **dust** concentrations that are in the upper quartile of typical workplace applications.

– *apart from the equipment required for the test, the test room is as empty as possible, so that the 200 m^3 requirement is not compromised and no unnecessary surfaces are created.*

*During the test, **dust samplers** are carried by the operator on the upper chest zone. If the **inhalable dust** or the **respirable dust** is measured, one **dust sampler** shall be used on each side of the upper chest zone, see Figure 1. In case that during the measurement of the **respirable dust** also the **inhalable dust** fraction shall be evaluated, an additional **dust sampler** for the **inhalable dust** shall be used and placed as close as possible below one of the other two **dust samplers** for **respirable dust**, see Figure 2. If the tests are done by robotic means, the **dust sampler**(s) shall be placed at a place to replicate the upper chest zone of an operator. The **dust sampler**(s) shall remain working throughout the entire time of each test as defined in 4.3.*

*For those tools where the workpiece is placed on a bench, as specified in the relevant part of IEC 63241-2 or IEC 63241-3, the vertical distance between the upper surface of the workpiece and the intake openings of the **dust samplers** carried by the standing operator on the upper chest zone shall be h = (600 ± 50) mm, see Figure 1 and Figure 2. The distance is to be established and measured before the tests are started.*

NOTE 3 The required vertical distance is influenced by the height of the operator (e.g. use of a support for the operator), height of the table, thickness of the workpiece and the position of the **dust samplers** on the operator.

*The **dust samplers** shall comply with EN 13205 (all parts) and shall be suitable for the determination of the concentration of **inhalable dust** and, if required, of **respirable dust**, as specified in ISO 7708:1995. The material of the filters used in the **dust samplers** shall be of cellulose nitrate with a mesh size of 8 µm. Alternatively, the material for filters for **inhalable dust** may be glass fibre grade 85/90.*

NOTE 4 Glass fibre filters can help to ensure the necessary volume flow since their flow resistance is lower than that of cellulose nitrate filters."

The test room, the air inside the test room and the equipment shall be cleaned before each test, so that previous tests have no influence on the test result.

NOTE 5 Whether the air in the test room is clean, typically can be monitored by using an appropriate optical dust monitor (e.g. a laser particle counter).

4.3 Operating conditions

During the tests, the ambient temperature shall be 15 °C to 30 °C and the relative ambient humidity shall be a maximum of 75 %.

*For tools to be used in combination with an external **dust extraction unit**, the tool is connected to the **dust extraction unit** as specified by the manufacturer. If possible, the position of the tool, the operator, or both shall be arranged so that the cooling air outlet is not directed towards the **dust samplers**.*

NOTE 1 The cooling air outlet of the tool can have an influence on the result if directed towards the **dust samplers**.

*Every test consists of five test cycles of 10 min working time and 2 min rest time each, for a total test time of 1 h. For battery-operated tools that are not able to operate for 10 min working time, the test may be split into 10 test cycles of 5 min working time and 1 min rest time. Every 1 h test shall start with an empty **dust extraction unit** equipped with a new filter. During each test, a given task shall be achieved as specified in the relevant part of IEC 63241-2 or IEC 63241-3. Depending on the detection limit of the used **dust sampler**(s) and of the **dust** concentration to be determined, a total test time longer than 1 h may be necessary. This shall be achieved by adding a sufficient number of additional test cycles, so that the relative detection limit of the **dust sampler**(s) is lower than the **dust** concentration to be determined. The task specified in the relevant part of IEC 63241-2 or IEC 63241-3 shall be adapted to the altered test time.*

*The **dust extraction unit** shall be maintained (e.g. filter cleaning) and operated as specified by the manufacturer's instruction manual, and it shall be placed in the test room.*

*Emptying of an external **dust extraction unit** shall be done in accordance with the instruction manual of the external **dust extraction unit**, but at the earliest after three test cycles. Any emptying shall be done during a rest period of a test cycle and outside the test room.*

NOTE 2 Examples of instructions in a manual are requests to obey the warning signal of a class M **dust extraction unit** or to keep the air flow in a certain range.

NOTE 3 Emptying after three test cycles is understood as the earliest opportunity for emptying, but not as a regular action at that point of time.

*Integral **dust extraction units** are changed or emptied in accordance with the instruction manual. This may be done at shorter intervals. If necessary, the test may be split into 10 test cycles of 5 min working time and 1 min rest time. Changing or emptying of the dust container shall be done inside of the test room.*

It shall be ensured that

– *the exhaust air of an external **dust extraction unit** is not directed towards the **dust samplers**; and*
– *the **dust extraction unit** is not moved more than the work process requires during the test.*

*If the instruction manual of the power tool requires a certain air flow rate or an air flow rate range, then this air flow rate or the minimum value of an air flow rate range shall be adjusted for the **dust** measurement within a tolerance of 0 % to 10 %.*

The tool shall be operated under working conditions. The material used for the test shall be appropriate for the intended use of the tool. The tool bit, cutter, abrasive, etc. to be used shall be as specified by the manufacturer for the material to be worked.

*Tools for a.c. only are tested with a.c. at **rated frequency**, if marked, and those for a.c. or d.c. are tested with the supply that results in the highest tool output speed that does not exceed the recommended speed of the **accessory** in accordance with the manufacturer's instructions.*

*Tools for a.c. which are not marked with **rated frequency**, or marked with a **rated frequency range** of 50 Hz to 60 Hz or with 50/60 Hz, are tested with either 50 Hz or 60 Hz, whichever results in the highest tool output speed that does not exceed the recommended speed of the **accessory** in accordance with the manufacturer's instructions.*

*Tools are tested at **rated voltage**. Tools having more than one **rated voltage** or having a **rated voltage range** are tested at the voltage that results in the highest tool output speed that does not exceed the recommended speed of the **accessory** in accordance with the manufacturer's instructions.*

All test parameter settings shall be made with a tolerance of ±2 %.

NOTE 4 Examples of test parameter settings include voltage, current and time period.

The tool and the workpiece shall be placed inside the test room so that the distance between the tool and the walls and between the tool and the ceiling is at least 2,0 m.

*Three tests shall be carried out by one operator. The result shall be one concentration value for each test and **dust** type. The mean value of the two **dust samplers** for the same fraction at the operator shall be taken. The **dust sampler(s)** shall operate during the entire time needed for each of the three tests. The operating conditions are kept stable throughout the test.*

For battery-operated tools:

Prior to the test, all batteries shall be fully conditioned as follows: batteries shall be fully discharged and then charged in accordance with the manufacturer's instructions. The sequence shall be repeated one more time with an interval of at least 2 h after each discharge.

The end-of-discharge voltages for common cell chemistries are as follows:

– *0,9 V/cell for nickel cadmium or nickel metal-hydride batteries;*
– *1,75 V/cell for lead-acid batteries;*
– *2,5 V/cell for lithium-ion batteries, unless the manufacturer specifies a different voltage.*