IEC 62841-2-1

Edition 1.0 2021-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery –
Part 2-1: Particular requirements for hand-held drills and impact drills

Outils électroportatifs à moteur, outils portables et machines pour jardins et pelouses –
Partie 2-1: Exigences particulières pour les perceuses portatives et les perceuses à percussion

IEC 62841-2-1:2017-06/AMD1:2021-11(en-fr)

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ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY –

Part 2-1: Particular requirements for hand-held drills and impact drills

AMENDMENT 1

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Amendment 1 to IEC 62841-2-1:2017 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

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

Draft	Report on voting
116/519/FDIS	116/525/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

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/.

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- replaced by a revised edition, or
- amended.

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1 Scope

Replace the existing text with the following new text:

This clause of Part 1 is applicable except as follows:

Addition:

This part of IEC 62841 applies to hand-held **drills** and **impact drills**, including **diamond core drills**. This document also applies to **drills** that can be used for driving screws by attaching screwdriver bits.

This document does not apply to rotary hammers, screwdrivers, impact wrenches and ratchet drivers even if they can be used as a **drill**.

NOTE 101 Rotary hammers are covered by IEC 62841-2-6.

NOTE 102 Screwdrivers, impact wrenches and ratchet drivers are covered by IEC 62841-2-2.

8 Marking and instructions

Delete existing Subclause 8.3.

18 Abnormal operation

Replace the existing text of 18.8 with the following new text:

18.8 *Replacement of Table 4*:

Table 4 – Required performance levels

Type and purpose of SCF	Minimum performance level (PL)
Power switch – prevent unwanted switch-on for tools with M_R ≤ 25 Nm measured in accordance with 19.102	a
Power switch – prevent unwanted switch-on for tools with M_R > 25 Nm measured in accordance with 19.102	b
Power switch – provide desired switch-off for tools with M_R ≤ 25 Nm measured in accordance with 19.102	b
Power switch – provide desired switch-off for tools with M_R > 25 Nm measured in accordance with 19.102	c
Power switch – provide desired switch-off for tools that require bracing in accordance with 8.14.1.101.	Shall be evaluated using the fault conditions of 18.6.1 without the loss of this **SCF**
Provide desired direction of rotation for tools that do not require bracing in accordance with 8.14.1.101	Not an **SCF**
Provide desired direction of rotation for tools that require bracing in accordance with 8.14.1.101	c
Any electronic control to pass the test of 18.3	a
For tools with a **rated no-load speed** of less than 3 500 min^{-1}, prevent output speed from exceeding 150 % of **rated no-load speed** as measured in 19.6	a
For tools with a **rated no-load speed** of 3 500 min^{-1} or greater, prevent output speed from exceeding 130 % of **rated no-load speed** as measured in 19.6	a
Prevent exceeding thermal limits as in 18.4	a
Prevent self-resetting as required in 23.3 for tools with M_R ≤ 25 Nm measured in accordance with 19.102	a
Prevent self-resetting as required in 23.3 for tools with M_R > 25 Nm measured in accordance with 19.102	b
Limit the torque to comply with 19.102	c
Prevent unwanted lock-on of the **power switch** function for tools with M_R ≤ 25 Nm measured in accordance with 19.102	b
Prevent unwanted lock-on of the **power switch** function for tools with M_R > 25 Nm measured in accordance with 19.102	c

19 Mechanical hazards

Add the following new subclause:

19.6 *Replacement:*

The no-load speed of the spindle at **rated voltage** shall not exceed 120 % of the **rated no-load speed**.

Compliance is checked by measuring the speed of the spindle after the tool has been operating for 5 min at no-load. During the test, separable ***accessories*** *are not mounted.*

19.102.1 General

Replace the existing text of the last paragraph with the following new text:

Compliance is checked by the tests specified in 19.102.2 to 19.102.4 and by the calculations in Figures 104 to 107.

19.102.2 Test equipment

Replace the existing text of the first paragraph, item a) and item b) with the following new text:

The test equipment used for the test of 19.102.4 shall meet the following requirements a) to g):

a) The torque transducer and the rotational angle sensor shall continuously monitor the torque and the rotation produced by the output spindle of the tool during the test of 19.102.4.

b) The output of the torque transducer shall be connected to an oscilloscope or other data acquisition equipment capable of displaying the torque vs. time graph of the tool's output during the test of 19.102.4.

19.102.3 Test procedure

Insert the following new Subclause 19.2.103 before "19.102.3 Test procedure".

19.102.3 Assessment to determine tool configuration

*This assessment is only applicable for tools that employ an **electronic circuit(s)** that affects the output torque in the test of 19.102.4.*

Prior to each measurement, the sample is operated for at least 5 min at no-load. After each 5 min operation period, the measurement shall be conducted within 20 min.

All measurements are made with the tool sample running in the forward position.

The sample is connected to the measurement fixture and is fixed during the test.

For tools with a soft start function, the test of 19.102.4 through steps 1) and 2) is conducted on the sample with the soft start function enabled and then repeated with the soft start function disabled. If analysis shows that the tool will not operate with the soft start function disabled, then the test with the soft start function disabled is not conducted. For tools employing electronically commutated motors, the configuration that results in the greatest output torque shall be used for the test of 19.102.4. For tools other than those employing electronically commutated motors, the configuration that results in the greatest output torque shall be used for the following test.

*For tools other than those employing electronically commutated motors, when all functions affecting the test value of the output torque, except for any soft start function, are not evaluated as **SCF**s according to 18.8 (e.g. current limit and stall detection), the tool configuration for the test of 19.102.4 shall be the configuration that results in the greatest output torque for one trial of the test of 19.102.4 through steps 1) and 2) as specified below:*

– *all functions affecting the output torque enabled; or*

– *each function not evaluated as an **SCF** affecting the output torque disabled one at a time.*

Renumber and replace 19.102.3 as follows.

19.102.4 Test procedure

If applicable, the sample is configured as specified in 19.102.3.

Prior to the test, the sample is operated for at least 5 min at no-load. After the 5 min operation period, the test shall be conducted within 20 min.

All measurements are made with the tool sample running in the forward position.

The sample is connected to the measurement fixture and is fixed during the test. The measurement is conducted by using seven trial measurements of the same sample, each trial conducted as follows:

1) *Energize the tool to the full "on" position as quickly as possible and allow the joint to be tightened until it comes to a complete stop.*
2) *Record the measured output torque.*
   a) *For tools without a mechanical overload clutch, the output torque is determined by either i) or ii):*
      i) *For signals that are stable for a minimum of 2 ms after the initial peak (if present), the output torque value is determined by measuring over the stable region for an interval T not exceeding 100 ms. If there is variation during this interval, the average value shall be used. See Figure 108.*
      ii) *For signals that are not stable for a minimum of 2 ms after the initial peak, the output torque value shall be the RMS value of the signal over the rotation from off until peak torque is achieved. See Figure 109.*

NOTE 101 Torque signals can exhibit a transient peak with a relatively stable signal following the peak. The stable signal can exhibit relatively slow change due to, for example, heating of the windings. The stable signal can also exhibit periodic signal variation due to torque ripple. Averaging over this stable period provides a meaningful torque value. The transient peak and the stable region are not always present.

   b) *For tools with a mechanical overload clutch:*

      The output torque is determined by the peak value of the first peak that occurs after starting the trial. Later peaks, even if they appear to have greater values, are not taken into account. See Figure 110.
3) *Before the next trial, disconnect the spindle from the test fixture and operate the tool under no-load for a minimum of 3 s. Allow the tool to cool for a minimum of 2 min before the next trial.*

M_R is computed as the average of five of the measurements from each of the seven trials, with the highest and lowest measurement eliminated. The standard deviation of the five measurements shall also be computed and shall be less than 5 %. If it is not, then the fixture shall be adjusted to achieve the required repeatability.

NOTE 102 It is recognized that disabling functions that affect the torque can result in a test where the tool is permanently impaired after the test.

21 Construction

Add the following new subclause:

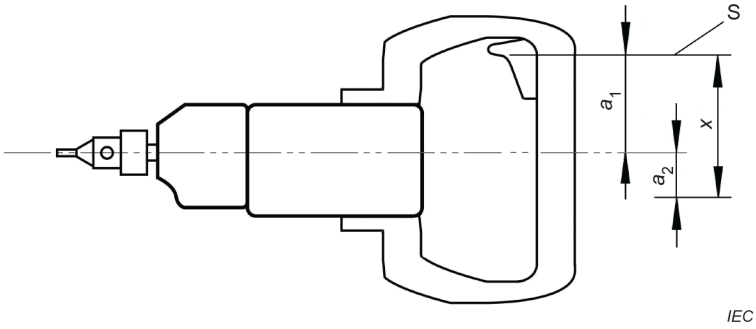
21.18.1.2 This subclause of Part 1 is not applicable.

Figures

Replace the existing Figure 105 with the following new figure:

$M_{R,max}$ = 8 Nm
(For round handle tools)

$M_{R,max}$ = 10 Nm
(For non-round handle tools)

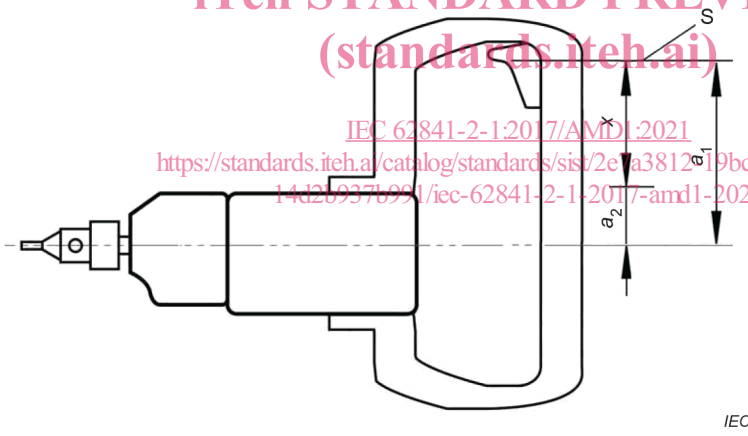


Choose whichever is greater:

$M_{R,max}$ = 400 N × a_1

or

$M_{R,max}$ = 400 N × a_2



Key

S	location of the hand on the **power switch** where the operator naturally grasps and/or the least favourable position on the **power switch** for the reactionary torque measurement
x	measurement point that is 80 mm or the remaining length of the handle, whichever is less, from S in the direction of where the hand grasps the tool
a_1, a_2	lever arm distances
$M_{R,max}$	maximum reaction torque

Figure 105 – Reaction torque measurement of single handle tools (2)

Figure 106 – Reaction torque measurement of multi handle tools (1)

Replace the existing text for key item x with the following new text:

x measurement point that is 80 mm or the remaining length of the handle, whichever is less, from "S" or "F" in the direction of where the hand grasps the tool

Figure 107 – Reaction torque measurement of multi handle tools (2)

Replace the existing text for key item x with the following new text:

x measurement point that is 80 mm or the remaining length of the handle, whichever is less, from "S" or "F" in the direction of where the hand grasps the tool

Annex I – Measurement of noise and vibration emissions

Replace the existing text of Clause I.2 with the following new text:

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:

Drills, except for **impact drills** and **diamond core drills**, are suspended.

Impact drills and **diamond core drills** are held by the operator for drilling vertically down in accordance with I.2.5.

I.2.5 Operating conditions

Addition:

Drills, except for **impact drills** and **diamond core drills**, are tested at no-load without any **accessory** mounted, all speed setting devices adjusted to the highest value.

NOTE 101 Experimental investigations have shown that the noise emission values of **drills**, except for **impact drills** and **diamond core drills**, at no-load and under load are very similar. For reasons of simplification, the noise emission is therefore measured at no-load.

For **impact drills**, the speed setting shall be that recommended by the manufacturer for an 8 mm bit for drilling into concrete.

Impact drills are tested under load as shown in Figure I.101 and in accordance with the conditions shown in Tables I.101 and I.102.

Diamond core drills are tested under load and in accordance with the conditions shown in Table I.103.

Table I.101 – Concrete formulation for impact drills (per cubic metre)

Cement	Water	Aggregate [b]	
		1 450 kg	
		Particle size mm	**Fraction** %
450 kg [a]	220 l [a]	0 to 0,25	12 ± 3
		0 to 0,50	50 ± 5
		0 to 1,00	80 ± 5
		0 to 4,00	100
The minimum compressive strength after at least 28 days shall be 40 N/mm^2.			
[a] The water/cement mass ratio shall be 0,49 ± 0,02 (the mass tolerance of cement and water is + 10 % to enable the concrete manufacturer to ensure compressive strength with local cement).			
[b] Very hard aggregates such as flint or granite and very soft aggregates such as limestone shall not be used.			

NOTE 102 In some parts of the world, concrete with a minimum compressive strength of 40 N/mm^2 after 28 days is readily available. In other parts of the world, it is possible that readily available concrete will take longer than 28 days to achieve a minimum compressive strength of 40 N/mm^2.

Table I.102 – Noise test conditions for impact drills

Orientation	Drilling vertically down into a concrete block having the formulation specified in Table I.101 and having the minimum dimensions 500 mm × 500 mm and 200 mm in height and supported on resilient material. The concrete block, its support and the tool shall be so oriented that – the geometric centre of the tool is 1 m above the reflecting plane; – the centre of the concrete block is located under the top microphone "5"; and – the sides of the concrete block are parallel to the square formed by the microphones "1" to "4".
Tool bit	New 8 mm drill bit for the entire series of tests as specified for drilling in concrete with a usable length of approximately 100 mm
Feed force	(150 ± 30) N in addition to the weight of the **drill**
Test cycle	Measurement starts when the drill bit has reached a depth of approximately 10 mm and stops when the depth has reached approximately 80 mm

Table I.103 – Noise test conditions for diamond core drills

Orientation	If the tool is suitable to drill into concrete with a **liquid system**: Drilling vertically down into a concrete block having the formulation specified in Table I.108 and having the dimensions 500 mm × 500 mm and 200 mm in height, supported on resilient material. If the tool is designed to drill without liquid only: The test is conducted drilling vertically down into a sand-lime-stone or brick with a minimum thickness of 200 mm, supported on resilient material. The workpiece, its support and the tool shall be so oriented that – the geometric centre of the tool is 1 m above the reflecting plane; – the centre of the workpiece is located under the top microphone "5"; and – the sides of the workpiece are parallel to the square formed by the microphones "1" to "4".
Tool bit	New or sharpened diamond core bit for the entire series of tests, with 75 % of the maximum diamond core bit diameter in accordance with 8.14.2 a) 101), but not more than 100 mm.
Feed force	The feed force applied to the tool shall be determined as follows: Drill with the tool increasing the feed force until either the speed is significantly reduced by the load or a torque limiting device operates. Reduce the feed force slightly until a feed force is reached enabling stable operation. Use this feed force for the test or 250 N, whichever is less.
Test cycle	The measurement starts when the diamond core bit has reached a depth between 5 mm and 10 mm and stops after – 1 min, or – when the hole is completed, or – when the maximum drilling depth of the core bit is reached, whichever is achieved first.

I.2.9 Declaration and verification of noise emission values

Addition:

NOTE 102 In order to include the noise emission under load, the values for the uncertainties K_{pA} and K_{WA} for **drills** can be expected to be up to 5 dB.

Replace the existing text of Clause I.3 with the following new text:

I.3 Vibration

This clause of Part 1 is applicable except as follows:

I.3.3.2 Location of measurement

Addition:

Figures I.102 and I.103 show the positions for different types of tools.

I.3.5.1 General

Addition:

For battery operated tools, except for **diamond core drills**, the tests are conducted with the lightest **battery** in accordance with K.8.14.2 e) 2) that has a sufficient capacity to complete fifteen measurements as specified in Table I.104 and Table I.106.

For **diamond core drills**, the tests are conducted with the lightest battery in accordance with K.8.14.2 e) 2). Multiple **batteries** may be used for the test.

I.3.5.3 Operating conditions

Addition:

Impact drills where the impact mechanism can be switched off to have a rotary function only are tested as described under I.3.5.3.101 and I.3.5.3.102.

Diamond core drills are tested as described under I.3.5.3.103.

I.3.5.3.101 Drills

Drills, except **diamond core drills**, are tested under load observing the conditions shown in Table I.104 and Table I.105, all speed setting devices adjusted to the highest value.

Table I.104 – Vibration test conditions for drills

Orientation	Drilling vertically down into a plate of either 20 mm thick grey cast iron as specified in ISO 185:2005, grade 250, or mild steel similar to type S235 in accordance with ISO 630-2:2011. The workpiece shall be clamped or adequately fixed on a wooden board at a height giving the operator a comfortable posture.
Tool bit	Each operator uses a new or newly sharpened drill bit, type HSS-R, for his series of tests. **Drills** shall be equipped with a standard drill bit suitable for the speed of the machine and of a diameter in accordance with Table I.105. The 10 mm drill bit shall be run in predrilled holes with a diameter of 3 mm.
Feed force	In accordance with Table I.105 applied to the handle of the tool.
Test cycle	A test series shall consist of the drilling of five holes. Measurement starts when the drill bit has contact with the plate and stops after 8 s or just before the hole is completed.
NOTE This test is also representative for drilling into other materials without impact.	

Table I.105 – Drill bit diameter and feed force for drills

Rated no-load speed min^{-1}	Drill bit diameter mm	Feed force N
> 5 500	1,5	10 ± 2
3 100 to 5 499	3	50 ± 10
1 000 to 3 099	6	150 ± 30
< 1 000	10	200 ± 30

I.3.5.3.102 Impact drills

For **impact drills**, the speed setting shall be that recommended by the manufacturer for an 8 mm bit for drilling into concrete.