



BSI Standards Publication

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety

Part 4-7: Particular requirements for pedestrian controlled walk-behind lawn scarifiers and aerators

National foreword

This British Standard is the UK implementation of EN IEC 62841-4-7:2022. It is identical to IEC 62841-4-7:2022.

The UK participation in its preparation was entrusted to Technical Committee CPL/116, Safety of motor-operated electric tools.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Date	Text affected
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English Version

Electric motor-operated hand-held tools, transportable tools and
lawn and garden machinery - Safety - Part 4-7: Particular
requirements for pedestrian controlled walk-behind lawn
scarifiers and aerators

Outils électroportatifs à moteur, outils portables et machines
pour jardins et pelouses - Sécurité - Partie 4-7: Exigences
particulières pour les scarificateurs à gazon et les aérateurs
de gazon à conducteur à pied

Elektrische motorbetriebene handgeführte Werkzeuge,
transportable Werkzeuge und Rasen- und
Gartenmaschinen - Sicherheit - Teil 4-7: Besondere
Anforderungen für personengeführte Rasenvertikutierer und
Rasenbelüfter

This European Standard was approved by CENELEC on 2022-08-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 116/589/FDIS, future edition 1 of IEC 62841-4-7, prepared by IEC/TC 116 "Safety of motor-operated electric tools" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62841-4-7:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2023-08-08 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-08-08 document have to be withdrawn

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For the relationship with EU Directive(s) / Regulation(s), see informative Annex ZZ, which is an integral part of EN IEC 62841-4-7:2022/A11:2022.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62841-4-7:2022 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 62841-4-3 NOTE Harmonized as EN IEC 62841-4-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS,
TRANSPORTABLE TOOLS AND LAWN AND GARDEN
MACHINERY – SAFETY –****Part 4-7: Particular requirements for pedestrian controlled
walk-behind lawn scarifiers and aerators**

FOREWORD

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IEC 62841-4-7 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
116/589/FDIS	116/621/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 International Standard is English.

This document is to be used in conjunction with the first edition of IEC 62841-1 (2014).

This document supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for pedestrian controlled walk-behind lawn scarifiers and aerators.

Where a particular subclause of IEC 62841-1 is not mentioned in this document, that subclause applies as far as reasonable. Where this document states "addition", "modification" or "replacement", the relevant text in IEC 62841-1 is to be adapted accordingly.

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**.

Subclauses, notes, tables and figures which are additional to those in IEC 62841-1 are numbered starting from 101.

Subclauses, notes, tables and figures in Annex K and Annex L which are additional to those in the main body of this document are numbered starting from 301.

A list of all parts in the IEC 62841 series, published 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.

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

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

Part 4-7: Particular requirements for pedestrian controlled walk-behind lawn scarifiers and aerators

1 Scope

IEC 62841-1:2014, Clause 1 is applicable, except as follows:

Addition:

This document applies to pedestrian controlled walk-behind **lawn scarifiers** and **lawn aerators** which are designed for regenerating lawns by combing out materials such as grass, thatch and moss or cutting vertically into the lawn face using

- metallic **tines**; and/or
- rigid non-metallic **tines**

which rotate about a horizontal axis.

This document does not apply to

- pedestrian controlled walk-behind lawnmowers;
- towed/semi-mounted **lawn scarifiers** and **lawn aerators**;
- ride-on machines;
- non-powered **lawn scarifiers** and **lawn aerators**;
- combustion engine powered **lawn scarifiers** and **lawn aerators**;
- plug aerators (corers);
- hybrid and fuel cell powered machines and associated charging systems; and
- garden tractors or their attachments.

NOTE 101 Pedestrian controlled walk-behind lawnmowers are covered by IEC 62841-4-3.

2 Normative references

IEC 62841-1:2014, Clause 2 is applicable, except as follows:

Addition:

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 61058-2-6:2018, *Switches for appliances – Part 2-6: Particular requirements for switches used in electric motor-operated hand-held tools, transportable tools and lawn and garden machinery*

IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 62841-1:2014, *Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety – Part 1: General requirements*

ISO 354:2003, *Acoustics – Measurement of sound absorption in a reverberation room*

ISO 2758:2014, *Paper – Determination of bursting strength*

ISO 13857:2019, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

Replacement:

IEC 61058-1:2016, *Switches for appliances – Part 1: General requirements*

ISO 3744:2010, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

ISO 11201:2010, *Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

3 Terms and definitions

IEC 62841-1:2014, Clause 3 is applicable, except as follows:

Addition:

3.101 catcher

part or combination of parts, intended to be used with the **lawn scarifier** or **lawn aerator**, which provides a means for collecting material such as grass, thatch, moss or other debris

3.102 cutting width

total width of scarification/aeration measured across the **tines** at 90° to the direction of travel

3.103 discharge chute

extension of the **tines enclosure** from the **discharge opening**, generally used to control the discharge of material from the **tines**

3.104 discharge opening

gap or opening in the **tines enclosure** through which grass, thatch, moss and other debris may be discharged

3.104.1 front discharge

discharge opening for throwing out grass, thatch and moss so that they will be collected in a **catcher** which is located in front of the **tines**

3.104.2

rear discharge

discharge opening for throwing out grass, thatch and moss so that they will be collected in a **catcher** which is located behind the **tines**

3.105

lawn aerator

machine equipped with a **tines assembly** which uses the ground to determine the depth of cut, designed for penetrating the lawn surface

Note 101 to entry: See Figure 101.

Note 102 to entry: **Lawn aerators** that are designed to only make shallow cuts or slices in the soil are also known as verticutters.

3.106

lawn scarifier

machine equipped with a **tines assembly** designed to scratch the surface or earth face

Note 101 to entry: See Figure 101.

Note 102 to entry: **Lawn scarifiers** are also known as lawn rakes and dethatchers.

3.107

maximum speed

highest steady-state **tines** speed attainable under all conditions of **normal use**, including no-load, when adjusted in accordance with the manufacturer's specifications and/or instructions

Note 101 to entry: The steady-state **tines** speed excludes transients such as overshoot that may occur before attaining a steady-state condition.

3.108

operator control

device requiring operator actuation to perform specific functions during **normal operation**

3.109

operator presence control

device that deactivates rotation of the **tines** when the operator's hand(s) is removed from the control

Note 101 to entry: The device typically consists of a combination of a mechanical actuator and other mechanical and electrical components (e.g. tactile switch, relays, load switches or **electronic components**).

3.110

parking brake

device to prevent a stationary machine from moving

3.111

service brake

device for decelerating and stopping a machine from its ground travel speed

3.112

tines

mechanism used to provide the penetrating action or scratching action of the machine

3.113

tines assembly

tines together with any supporting part(s), which together perform the aerating or scarifying action

3.114**tines enclosure**

part or assembly which provides the protective means around the **tines**

3.115**tines tip circle**

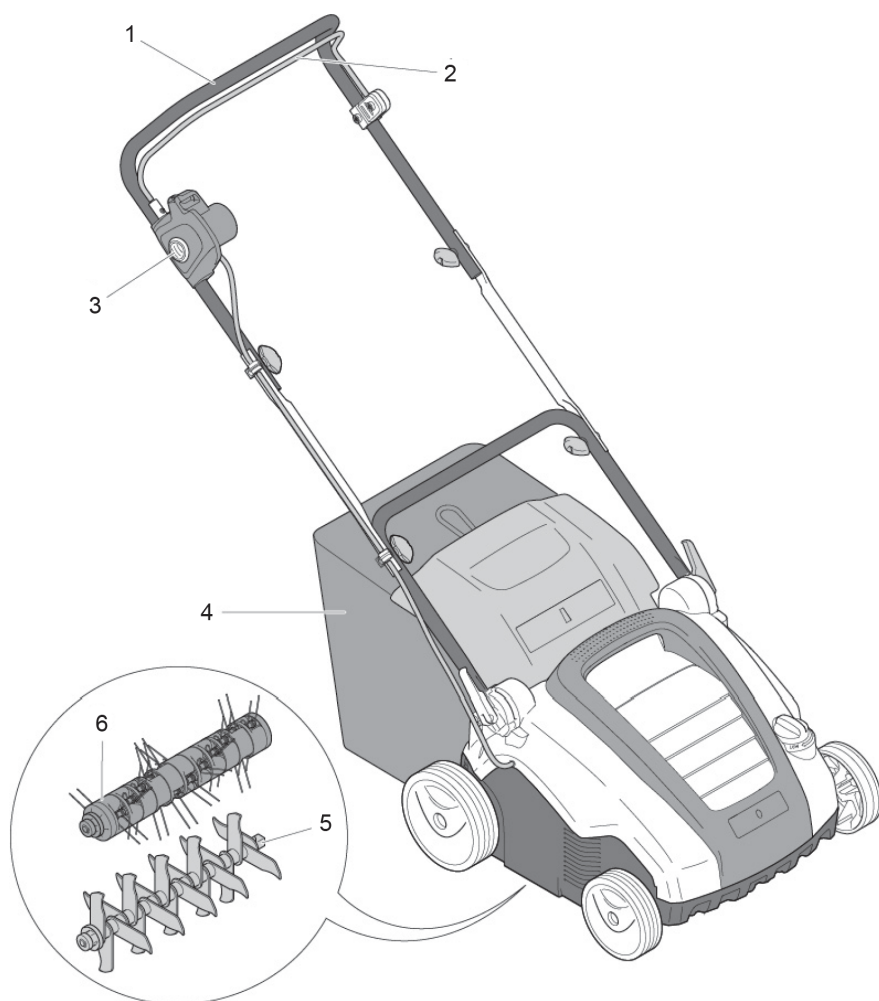
path described by the outermost point of the **tines** as they rotate about their shaft axis

3.116**traction drive**

means (system) used to transmit power from the motor to the ground drive means

3.117**working position**

any depth setting of the **tines** designated by the manufacturer



IEC

Key

- 1 handle
- 2 **operator presence control**
- 3 lock-off device
- 4 **catcher**
- 5 **tines assembly** for a lawn aerator
- 6 **tines assembly** for a lawn scarifier

Figure 101 – Example of a lawn scarifier or a lawn aerator

4 General requirements

IEC 62841-1:2014, Clause 4 is applicable.

5 General conditions for the tests

IEC 62841-1:2014, Clause 5 is applicable, except as follows:

5.4 Addition:

Handle positions that are used for storage purposes are not included in this requirement.

5.7.2 Replacement:

*Machines are tested at **rated voltage**. Machines having more than one **rated voltage** or having a **rated voltage range** are tested at the highest voltage.*

5.17 Addition:

*The mass of the machine includes the **tines assembly**, **catcher** (empty) (if any), **catcher adapter** (if any), **tines enclosure cover** (if any) in the heaviest configuration in accordance with 8.14.2.*

5.101 *During the tests, the **tines** may be adjusted and lubricated as needed to permit operation for extended periods.*

5.102 *For tests that are performed at **maximum speed** and no-load, the manufacturer may need to provide special hardware and/or software in order to achieve **maximum speed** at no-load.*

5.103 *The tests are performed using all **tines** in accordance with 8.14.2 a) 103).*

6 Radiation, toxicity and similar hazards

IEC 62841-1:2014, Clause 6 is applicable.

7 Classification

IEC 62841-1:2014, Clause 7 is applicable, except as follows:

7.1 Replacement:

Machines shall be of one of the following classes with respect to protection against electric shock:

class II tool (machine) or **class III tool** (machine).

Compliance is checked by inspection and by the relevant tests.

7.2 Addition:

Class II tools (machines) shall be at least IPX4. **Class III tools** (machines) shall be at least IPX1.

8 Marking and instructions

IEC 62841-1:2014, Clause 8 is applicable, except as follows:

8.1.101 Machines with more than one motor (i.e. separate motors for the **tines** and **traction drive**) shall be marked with the **rated input** or **rated current** for each motor. These markings may be located on each motor.

Compliance is checked by inspection.

8.2 Addition:

Lawn scarifiers and **lawn aerators** shall be marked with the following safety warnings:

- "⚠️WARNING – Beware of thrown objects – keep bystanders away" or one of the product safety labels specified in Figure AA.1;
- "⚠️WARNING – Keep hands and feet away from the tines" or the product safety label specified in Figure AA.2.

For mains supplied machines:

- "⚠️WARNING – Remove plug from mains before maintenance or if cord is damaged" or one of the product safety labels specified in Figure AA.3;
- "⚠️WARNING – Keep the supply cord away from the tines" or the product safety label specified in Figure AA.4.

8.3 Replacement of the sixth dashed list item:

- "> 25 kg" if the mass of the machine is over 25 kg. For this requirement, the mass of the machine includes the mass of a **supply cord** with a length not less than 10 m, if any, in addition to the items specified in 5.17.

NOTE 101 In Europe (EN IEC 62841-4-7), the following requirement applies:

Replacement of the sixth dashed list item:

- the mass of the machine in kg. For this requirement, the mass of the machine includes the mass of a **supply cord** with a length not less than 10 m, if any, in addition to the items specified in 5.17.

8.9 Replacement:

Unless it is obviously unnecessary, switches and controls (e.g. a **tines** brake/clutch) which may give rise to a hazard when operated shall be marked or so placed as to indicate clearly which part of the machine they control.

Compliance is checked by inspection.

8.11 This subclause of IEC 62841-1:2014 is not applicable for traction drive speed controls.

8.14.1 Addition:

The additional safety instructions as specified in 8.14.1.101 shall be given. These additional safety instructions may be printed separately from the "General Machine Safety Warnings".

NOTE 101 "General Machine Safety Warnings" are referred to as "General Power Tool Safety Warnings" in IEC 62841-1:2014.

8.14.1.1 Replacement for item 2) c) of IEC 62841-1:2014, 8.14.1.1:

- c) **Do not expose the machine to rain or wet conditions.** *Water entering the machine will increase the risk of electric shock.*

For machines classified at least IPX4, the warning in item c) above may be replaced as specified below.

- c) **Do not operate the machine in rain or wet conditions.** *This may increase the risk of electric shock.*

8.14.1.101 Lawn scarifier and lawn aerator safety warnings

For the warnings below, the term "machine" may be replaced by alternate wording (e.g. "scarifier", "lawn rake", "aerator", "verticutter" or "lawn scarifier or aerator").

- a) **Do not use the machine in bad weather conditions, especially when there is a risk of lightning.** *This decreases the risk of being struck by lightning.*
- b) **Thoroughly inspect the area for wildlife where the machine is to be used.** *Wildlife may be injured by the machine during operation.*
- c) **Thoroughly inspect the area where the machine is to be used and remove all stones, sticks, wires, bones, and other foreign objects.** *Thrown objects can cause personal injury.*
- d) **Before using the machine, always visually inspect to see that the tines and the tines assembly are not worn or damaged.** *Worn or damaged parts increase the risk of injury.*
- e) **Before use, check the supply cord and any extension cord for signs of damage or aging. Do not use the machine if the cord is damaged or worn. If the cord is damaged or worn during use, switch off the machine and do not touch the cord before disconnecting it from the supply. A damaged supply cord or extension cord may result in electric shock, fire and/or serious injury.**
- f) **Check the catcher frequently for wear or deterioration.** *A worn or damaged catcher may increase the risk of personal injury.*

NOTE 101 It is possible to replace the term "catcher" by an alternative term such as "collector" or "bag".

NOTE 102 The warning in item f) above is omitted for machines that are not designed to be used with a catcher.

- g) **Keep guards in place. Guards must be in working order and be properly mounted.** *A guard that is loose, damaged, or is not functioning correctly may result in personal injury.*
- h) **Keep all cooling air inlets clear of debris.** *Blocked air inlets and debris may result in overheating or risk of fire.*
- i) **While operating the machine, always wear non-slip and protective footwear. Do not operate the machine when barefoot or wearing open sandals.** *This reduces the chance of injury to the feet from contact with the moving tines.*
- j) **While operating the machine, always wear long trousers.** *Exposed skin increases the likelihood of injury from thrown objects.*
- k) **Do not operate the machine in wet grass. Walk, never run.** *This reduces the risk of slipping and falling which may result in personal injury.*
- l) **Do not operate the machine on excessively steep slopes.** *This reduces the risk of loss of control, slipping and falling which may result in personal injury.*
- m) **When working on slopes, always be sure of your footing, always work across the face of slopes, never up or down and exercise extreme caution when changing direction.** *This reduces the risk of loss of control, slipping and falling which may result in personal injury.*
- n) **Use extreme caution when reversing or pulling the machine towards you. Always be aware of your surroundings.** *This reduces the risk of tripping during operation.*
- o) **Keep the supply cord away from the tines.** *A damaged supply cord may result in electric shock, fire and/or serious injury.*

- p) **Switch off and remove plug from mains if the cord is entangled or damaged.** *Entangled or damaged cords can increase the risk of electric shock.*
- q) **Hold the machine by insulated gripping surfaces only, because the tines may contact hidden wiring or its own cord.** *Tines contacting a "live" wire may make exposed metal parts of the machine "live" and could give the operator an electric shock.*
- r) **Do not touch tines and other hazardous moving parts while they are still in motion.** *This reduces the risk of injury from moving parts.*
- s) **When clearing jammed material or cleaning the machine, make sure all power switches are off and the power cord is disconnected.** *Unexpected operation of the machine may result in serious personal injury.*

8.14.2 a) Addition:

- 101) Explanation of the safety devices that the **lawn scarifier** or **lawn aerator** incorporates as part of the original equipment;
- 102) Information regarding pre-operating procedures;
- 103) Information regarding the **tines** to be used on the **lawn scarifier** or **lawn aerator**;
- 104) Instructions on the permitted operating positions for handles.

8.14.2 b) Addition:

- 101) Hazards which may be encountered while using the **lawn scarifier** or **lawn aerator**, such as blockage of the **tines**, and how to avoid them while performing typical tasks;
- 102) Instructions to stop the **tines** if the machine has to be tilted for transportation when crossing surfaces other than grass and when transporting the machine to and from the area in which it is to be used;
- 103) Instructions not to tilt the machine when switching on the motor, except if the machine has to be tilted for starting. In this case, instruction not to tilt it more than is absolutely necessary and to lift only the part which is away from the operator;
- 104) For single-axe machines, instructions to maintain operating position and stability by properly grasping and supporting the handle;
- 105) Instructions to stop the machine, and remove plug from the socket, and to make sure that all moving parts have come to a complete stop
 - after striking a foreign object, and to inspect the machine for damage and make repairs before restarting and operating the machine;
 - if the machine starts to vibrate abnormally, and then to immediately inspect for damage, replace or repair any damaged parts and to check for and tighten any loose parts;
- 106) Recommendation for the use of a **residual current device** with a tripping current of 30 mA or less;
- 107) Instructions to empty the **catcher** before storage, if applicable.

8.14.2 c) Addition:

- 101) Information regarding regular maintenance routines;
- 102) Recommendations for cleaning and maintenance before storage;
- 103) Information explaining the consequences of improper maintenance, the use of non-conforming replacement components, or the removal or modification of safety components;
- 104) Instruction to replace worn or damaged components in sets to preserve balance, as applicable;
- 105) Instructions to be careful during adjustment of the machine to prevent entrapment of the fingers between moving **tines** and fixed parts of the machine;
- 106) Instructions to always allow the machine to cool down before storing;

- 107) Instructions regarding replacing or servicing **tines**;
- 108) For machines where the **tines** may be serviced by **user maintenance**, advice that when servicing the **tines** to be aware that, even though the power source is switched off, the **tines** can still be moved.

Replacement of NOTE:

NOTE In Europe (EN IEC 62841-4-7), the following additional requirements apply:

Emissions

- 1) The noise emission, measured in accordance with Clause I.2, as follows:
 - A-weighted emission sound pressure level L_{pA} and its uncertainty K_{pA} , where L_{pA} exceeds 70 dB(A). Where L_{pA} does not exceed 70 dB(A), this fact shall be indicated;
 - the A-weighted guaranteed sound power level L_{WA} .
- 2) Recommendation for the operator to wear hearing protection.
- 3) The vibration total value and its uncertainty measured in accordance with Clause I.3.

When the vibration total value does not exceed 2,5 m/s², this shall be stated.

When the vibration total value exceeds 2,5 m/s², its value shall be given in the instructions.
- 4) The following information:
 - that the declared vibration total value(s) and the declared noise emission value(s) have been measured in accordance with a standard test method and may be used for comparing one machine with another;
 - that the declared vibration total value(s) and the declared noise emission value(s) may also be used in a preliminary assessment of exposure.
- 5) A warning:
 - that the vibration and noise emissions during actual use of the machine can differ from the declared total value depending on the ways in which the machine is used; and
 - of the need to identify safety measures to protect the operator that are based on an estimation of exposure in the actual conditions of use (taking account of all parts of the operating cycle such as the times when the machine is switched off and when it is running).

8.14.3 Replacement:

If information about the mass or weight of the machine is provided, it shall be the mass specified in 5.17 together with the mass of a **supply cord** with a length not less than 10 m, if any.

Compliance is checked by inspection.

9 Protection against access to live parts

IEC 62841-1:2014, Clause 9 is applicable.

10 Starting

IEC 62841-1:2014, Clause 10 is applicable, except as follows:

10.1 Addition:

*For the test, the **tines** are raised so that they are not in contact with any surface.*

10.2 Addition:

*For the test, the **tines** are raised so that they are not in contact with any surface.*

11 Input and current

IEC 62841-1:2014, Clause 11 is applicable.

12 Heating

IEC 62841-1:2014, Clause 12 is applicable, except as follows:

12.2.1 Replacement:

The load conditions for the heating test of 12.2 are as follows.

*The test is conducted with the machine mounted on an unperforated flat horizontal surface with the **tines** attached, and with the minimum size of openings for connection to the torque load. The **traction drive** wheels, if any, are lifted the minimum amount required to avoid contact with the unperforated flat horizontal surface. The **working position** is adjusted to the minimum position required to avoid contact with the unperforated flat horizontal surface. The **lawn scarifier** or **lawn aerator** is operated with a torque load applied such that **rated input** or **rated current** is drawn until thermal equilibrium is reached under the most unfavourable conditions. For machines with more than one motor (i.e. separate motors for the **tines** and **traction drive**), the **lawn scarifier** or **lawn aerator** is operated with torque loads such that **rated input** or **rated current** of each motor in accordance with 8.1.101 is drawn until thermal equilibrium is reached under the most unfavourable conditions.*

*The most unfavourable conditions are determined using the configuration of **attachments** and **tines** in accordance with 8.14.2, which yields the highest temperature at a reference location. This determination may be made at one of the required voltages of 12.2 using thermocouples.*

The reference location is chosen on the motor assembly at a location that minimises the cooling effect of air flow.

NOTE A measurement of the rotating speed of the **tines** during the heating test is needed in some cases for the test of 17.2.

13 Resistance to heat and fire

IEC 62841-1:2014, Clause 13 is applicable.

14 Moisture resistance

IEC 62841-1:2014, Clause 14 is applicable, except as follows:

14.2 Replacement:

The enclosure of the machine shall provide the degree of protection against moisture in accordance with the marking of the machine.

Compliance is checked by the appropriate treatment specified in 14.2.2, with the machine conditions as in 14.2.1.

14.2.1 Replacement:

The machine is not connected to the supply.

Detachable parts which can be removed without the aid of a tool are removed and subjected, if necessary, to the relevant treatment with the main part. Machines fitted with an appliance inlet, plug or other connector are tested without the mating connector in place. Air filters are not removed.

14.2.2 Replacement:

Machines other than IPX0 are subjected to tests of IEC 60529, as follows:

- IPX1 machines are subjected to the test described in IEC 60529:1989, 14.2.1;
- IPX2 machines are subjected to the test described in IEC 60529:1989, 14.2.2;
- IPX3 machines are subjected to the test described in IEC 60529:1989, 14.2.3 a);
- IPX5 machines are subjected to the test described in IEC 60529:1989, 14.2.5. For this test, the water stream is applied from all practicable directions, including the underside of the machine;
- IPX6 machines are subjected to the test described in IEC 60529:1989, 14.2.6. For this test, the water stream is applied from all practicable directions, including the underside of the machine;
- IPX7 machines are subjected to the test described in IEC 60529:1989, 14.2.7. For this last test, the machine is immersed in water containing approximately 1,0 % NaCl.

Machines classified as IPX4 are subjected to the test described in 14.2.4 a) of IEC 60529:1989, except as follows:

- the test is conducted with a circular horizontal unperforated support having a diameter of twice the oscillating tube radius minus 15 cm. The support is placed at the level of the pivot axis of the oscillating tube. During the test, the support is rotated about its vertical axis at a rate of $(1 \pm 0,1)$ r/min; and
- the machine is placed on the unperforated support; and
- the **working position** of the **lawn scarifier** or **lawn aerator** is set to the highest position at which the **tines** would still drive when the **operator presence control** is engaged. If this setting still allows the **tines** to make contact with the ground surface, the ground support system of the machine (e.g. wheels) are raised on support blocks to ensure ground clearance. The blocks are to be as small as is practicable; and
- the horizontal centreline of the machine is aligned with the pivot axis of the oscillating tube at the start of test. The movement of the oscillating tube is limited to 90° either side from the vertical, the time for one complete oscillation ($2 \times 90^\circ$) being (6 ± 1) s; and
- the duration of the test is 10 min.

Immediately after the appropriate treatment, the machine shall withstand the electric strength test of IEC 62841-1:2014, Annex D between **live parts** and **accessible parts**, the test voltage being 2 500 V. Afterwards, having carefully wiped the external enclosure to remove any surplus water, inspection shall show that there is no trace of water on insulation which could result in a reduction of **creepage distances** and **clearances** below the values specified in 28.1. Water drops on an appliance inlet, plug or other connector are not considered.

The machine is then evaluated for

- the risk of fire in accordance with item a) of 18.6.1; and
- the loss of any **SCF**, unless the machine is rendered into a safe state.

14.3 to 14.5 These subclauses of IEC 62841-1:2014 are not applicable.

15 Resistance to rusting

IEC 62841-1:2014, Clause 15 is applicable.

16 Overload protection of transformers and associated circuits

IEC 62841-1:2014, Clause 16 is applicable.

17 Endurance

IEC 62841-1:2014, Clause 17 is applicable, except as follows:

17.2 Replacement:

*The machine is operated at no-load. The machine is fitted with the most unfavourable **tines** in accordance with 8.14.2 a) 103).*

*Series motors are supplied at a voltage such that the rotating speed of the **tines** is the same as that obtained in 12.2.1 at **rated voltage** or the lower limit of the **rated voltage range**. Other motor types are operated at **rated voltage** or the lower limit of the **rated voltage range**.*

The machine is operated for 48 h. If the test is conducted on the same sample used for the tests of Clause 12, the 48 h is reduced by the running time necessary for the tests of Clause 12. During the test, the machine is placed in its normal operating position according to 8.14.2.

Machines are operated continuously, or for a corresponding number of periods, each period being not less than 8 h.

The machine may be switched on and off by means of a switch other than that incorporated in the machine unless this disables a functionality of the machine switch.

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

If the temperature rise of any part of the machine exceeds the temperature rise determined during the test of 12.1, forced cooling may be applied. If forced cooling is applied, it shall not alter the air flow of the machine or redistribute carbon deposits.

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

18 Abnormal operation

IEC 62841-1:2014, Clause 18 is applicable, except as follows:

18.5 Replacement:

Protection against electric shock shall not be impaired when a **class II tool** (machine) is subjected to overload conditions according to the type of motor.

For machines with

- motors having electronically commutated stator windings, compliance is checked by the test of 18.5.4;*
- series motors, compliance is checked by the test of 18.5.1;*
- other motors, compliance is checked by the test of 18.5.3.*

18.5.2 This subclause of IEC 62841-1:2014 is not applicable.

18.8 Replacement of Table 4:

Table 4 – Required performance levels

Type and purpose of SCF	Minimum Performance Level (PL)
Power switch (operator presence control) – prevent unwanted switch-on	b
Power switch (operator presence control) – provide desired switch-off	b
Provide desired direction of rotation of the tines	Not an SCF
Provide desired direction of rotation of the traction drive	a
Any electronic control to pass the test of 18.3	a
Service brake as in 19.101.2	b
Parking brake as in 19.101.3	b
Prevent exceeding 150 % of the tines stopping time as required in 19.104 b), if applicable, which is only applicable under any single fault condition (i.e. an abnormal condition) ^a	a
Limit the tines stopping time that does not exceed 150 % of that required in 19.104 b), if applicable, under any single fault condition (i.e. an abnormal condition) ^a	Not an SCF
Prevent increase of rotational speed of tines that would cause non-compliance with 19.105	a
Prevent increase of rotational speed of tines that would cause non-compliance with 20.101	a
Any other speed limiting device	Not an SCF
Lock-off function as required by 21.104.2	b
Visual or audible indicator as referenced in 21.104.2	Not an SCF
Traction drive control system as in 21.104.3.1	b
Prevent self-resetting as required in 23.3	a
^a The tines stopping time shall still meet the requirements of 19.104 b), if applicable, under normal operation .	

19 Mechanical hazards

IEC 62841-1:2014, Clause 19 is applicable, except as follows:

19.1 Replacement:

All power-driven hazardous parts (e.g. drive belts), other than the **tines**, shall be so positioned or enclosed to provide adequate protection. The guarding of the **tines** is covered in 19.103. Ground contacting parts (e.g. wheels) are considered not to be hazardous and are not required to be guarded.

All openings and safety distances shall conform to 4.2.4.1 and 4.2.4.3 of ISO 13857:2019 unless otherwise specified in this document.

Protective enclosures, covers, **guards** and the like shall have adequate mechanical strength for their intended purpose.

Opening automatically closing **guards** for **discharge chutes** does not require the use of a tool.

The use of a **guard** shall not create other dangers, for example by reducing or obstructing the operator's view or by transferring heat.

Compliance is checked by inspection, by measurement, by functional test, by the tests of Clause 20 and by means of the test probe B of IEC 61032:1997 with a force not exceeding 5 N. Prior to the application of the test probe any soft materials (elastomers), such as soft grip coverings, shall be removed. It shall not be possible to touch power-driven hazardous parts with this test probe.

19.3 This subclause of IEC 62841-1:2014 is not applicable.

19.4 This subclause of IEC 62841-1:2014 is not applicable.

NOTE 101 Requirements for handles are given in 19.102.

19.5 This subclause of IEC 62841-1:2014 is not applicable.

19.6 This subclause of IEC 62841-1:2014 is not applicable.

19.7 *Replacement:*

Lawn scarifiers and **lawn aerators** shall have adequate stability.

This requirement is not applicable for single-axle machines.

Compliance is checked by the following test.

*For **lawn scarifiers** or **lawn aerators** provided with an appliance inlet or a **supply cord** with a length between 0,2 m and 0,5 m, a mass of (500 ± 20) g is suspended from either*

- the appliance inlet; or*
- the **supply cord** plug; or*
- any **supply cord** retaining device in accordance with 8.14.2*

whichever is the most unfavourable.

*For **lawn scarifiers** or **lawn aerators** provided with a **supply cord** with a length not less than 10 m, the **supply cord** is placed resting on the inclined plane used for this test in the most unfavourable position.*

The machine is placed with the motor switched off in any normal position of use on a plane inclined at an angle of 10° to the horizontal. If, however, the machine is such that, were it to be tilted through an angle of 10° when standing on a horizontal plane, a part of it not normally in contact with the supporting surface would touch the horizontal plane, the machine is placed on a horizontal support and tilted in the most unfavourable direction through an angle of 10°. For the test, the machine is prevented from sliding.

The machine shall not tip over or, if the machine tips over, the requirements for single-axle machines shall be fulfilled.

19.8 This subclause of IEC 62841-1:2014 is not applicable.

19.101 Brake requirements and test method

19.101.1 General

A **lawn scarifier** or **lawn aerator** exceeding a mass of 78 kg shall be equipped with a **service brake** and a **parking brake**.

Machines requiring a **service brake** and a **parking brake** shall fulfil the requirements of 19.101.2 and 19.101.3.

If steering-assist brakes are also used for the **service brake**, it shall be possible to connect them in a way that they apply both brakes with equal force.

Compliance is checked by inspection and by the requirements of 19.101.2 and 19.101.3.

19.101.2 Service brake

The **service brake** shall meet all of the following requirements:

- the **service brake** performance shall only rely on the effectiveness of the braking system;
- the **service brake** control shall be hand-operated;
- the **service brake control device** shall be located within the **operator control** zone (see Figure 102) and its position shall not interfere with the position of other controls; and
- if the **lawn scarifier** or **lawn aerator** is equipped with combined traction clutch and brake controls, the **service brake** engagement shall simultaneously disengage the traction clutch.

NOTE 101 Examples of **service brakes** include mechanical, electric and hydrostatic means.

Compliance is checked by inspection and by manual test.

The **service brake** shall be capable of stopping the motion of the **lawn scarifier** or **lawn aerator** so that the average measured stopping distance does not exceed 0,19 m for each 1 km/h of the maximum forward speed and maximum reverse speed, if a reverse **traction drive** is provided.

Compliance is checked by the following test.

*The tests are conducted on a **lawn scarifier** or **lawn aerator** in its heaviest configuration in accordance with 8.14.2 and with*

- *pneumatic tyres, if any, inflated to the maximum recommended pressures for the **lawn scarifier** or **lawn aerator** in accordance with 8.14.2; and*
- *brakes adjusted in accordance with 8.14.2; and*
- *any **catcher** filled to its maximum volumetric capacity with material of density $(150 \pm 10) \text{ kg/m}^3$. As an alternative to filling the **catcher** to its maximum volumetric capacity with a material of $(150 \pm 10) \text{ kg/m}^3$ density, an equivalent mass may be positioned and secured inside the **catcher** at its volumetric centre of gravity.*

The tests shall be conducted on a dry, smooth, hard concrete (or equivalent) surface with a maximum slope of 1 %.

*The **service brake** is first conditioned by running the **lawn scarifier** or **lawn aerator** for 10 min during which 10 stops shall be performed from the maximum forward speed.*

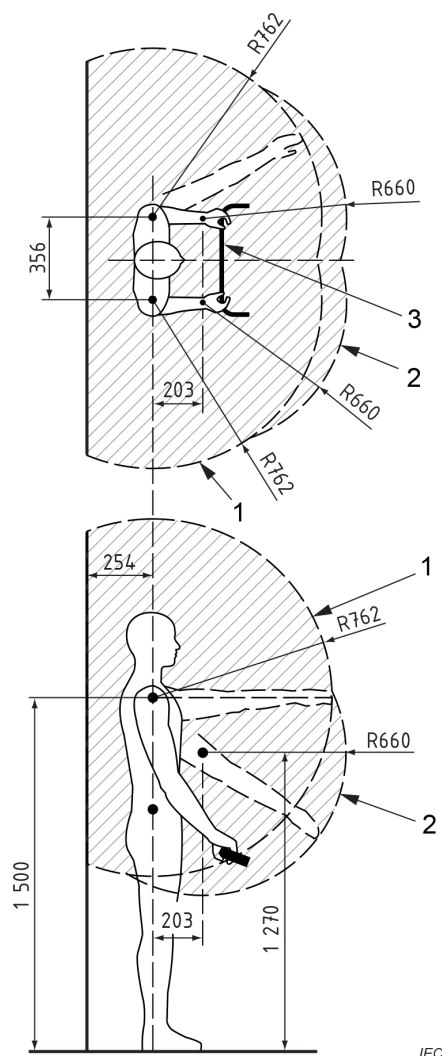
*If a reverse **traction drive** is provided, this break-in period shall be extended to 20 min during which the **service brake** shall be applied to stop the machine 10 times from maximum forward speed, and 10 times from maximum reverse speed.*

*If the **lawn scarifier** or **lawn aerator** is equipped with separate **traction drive** and **service brake** controls, the **traction drive** is simultaneously disengaged with the **service brake** engagement.*

*After the conditioning procedure has been completed, the **service brake** test is conducted three times in the forward direction of travel and, for a **lawn scarifier** or **lawn aerator** with a reverse **traction drive**, repeated three times in the reverse direction of travel.*

With the **lawn scarifier** or **lawn aerator** operating at its maximum ground speed, the **traction drive** control is released and a maximum force of 220 N is applied to the centre of the grip area of the hand control for the **service brake**. The stopping distance is measured for each test and the average value is calculated for each direction tested.

Dimensions in millimetres



Key

- 1 zone 1 – **operator control** zone
- 2 zone 2 – **operator control** zone when leaning against handle
- 3 handle

NOTE 101 Zone 1 is the area into which the extremities of a 95th percentile male can reach from the normal operator position.

NOTE 102 Zone 2 is the area into which a 5th percentile male or a 50th percentile female can reach when leaning against the handle. This zone can also be reached by a 95th percentile female leaning forward against the handle.

NOTE 103 All handles within zone 1 will reduce the zone by the space occupied and protected by the handle.

NOTE 104 Zone 1 includes the maximum range of movement of all frequently used **operator controls** but is not intended to represent preferred **operator control** positions.

Figure 102 – Operator control zones

19.101.3 Parking brake

A **lawn scarifier** or **lawn aerator** required to be equipped with a **service brake** shall also be equipped with a **parking brake**. The **parking brake** shall be capable of holding the **lawn scarifier** or **lawn aerator** facing both uphill and downhill on a slope up to and including 16,7° (30 %).

To allow the removal of initial slack in the system, a distance of 50 mm movement is allowed during the first 30 s after the **parking brake** has been applied. There shall be no further movement after the 30 s.

The **parking brake** may be combined with the **service brake**.

The engagement of the **parking brake** shall not rely on the machine being connected to the supply.

The maximum force to actuate the **parking brake** shall not exceed

- 220 N for a hand-grip **parking brake**, actuated by hand gripping motion only; or
- 330 N for a hand-lever **parking brake**, actuated by arm motion with a hand on a lever; or
- 450 N for a foot-operated **parking brake**.

The unlocking force shall not exceed the maximum specified actuating force.

NOTE The forces 220 N, 330 N and 450 N are considered as maximum forces that can be applied to meet the test requirements of this subclause. The operating forces during **normal use** would in general be less.

If the **lawn scarifier** or **lawn aerator** is equipped with an automatic **parking brake**, it shall be activated when the **operator presence control** is released.

Compliance is checked by inspection, by measurement and by the following test.

The tests are conducted

- *on the same sample and under the same conditions as in 19.101.2, if applicable;*
- *with the transmission in neutral and the motor stopped;*
- *if so equipped, with the hydrostatic bypass valve in the normal position for scarifying or aerating;*
- *on a smooth flat surface with 16,7° (30 %) slope, and a coefficient of friction such that the **lawn scarifier** or **lawn aerator** does not slide down the slope;*
- *with the **parking brake** applied; and*
- *for a period of 5 min, or if the **parking brake** is hydrostatic, for a period of 60 min.*

19.102 Handles

19.102.1 Handle construction

The handle(s) of **lawn scarifiers** and **lawn aerators** shall be fastened to the machine so as to prevent loss of control by unintentional uncoupling from the machine while in operation.

Compliance is checked by inspection.

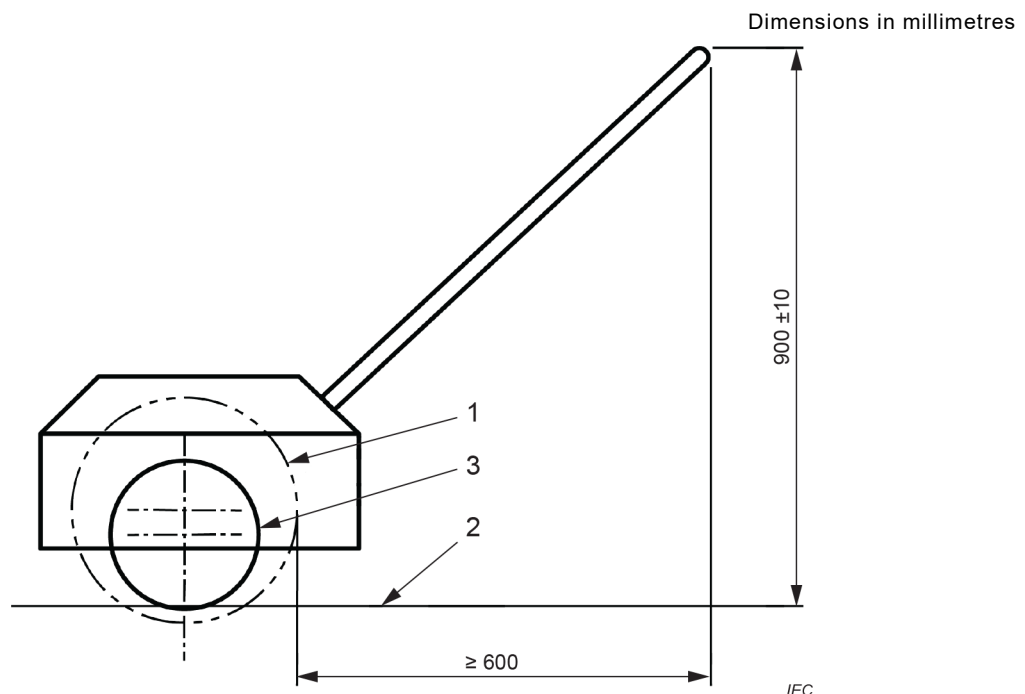
19.102.2 Handle latches and handle length

19.102.2.1 The handle shall either

- have, for a single-axle machine a horizontal distance of at least 600 mm from the rear part of the handle to the vertical tangent of the **tines tip circle**, when the top of the grasping area of the handle is at a height of (900 ± 10) mm above the ground (see Figure 103), or the requirements of the foot protection test of Annex CC shall be fulfilled; or
- have, for machines other than single-axle machines, a horizontal distance of at least 450 mm from the rear part of the handle to the vertical tangent of the **tines tip circle**, which serves as a barrier between the operator and the **tines** (see Figure 104) or the requirements of the foot protection test of Annex CC shall be fulfilled.

Compliance is checked by measurement and, if applicable, by the foot protection test of Annex CC.

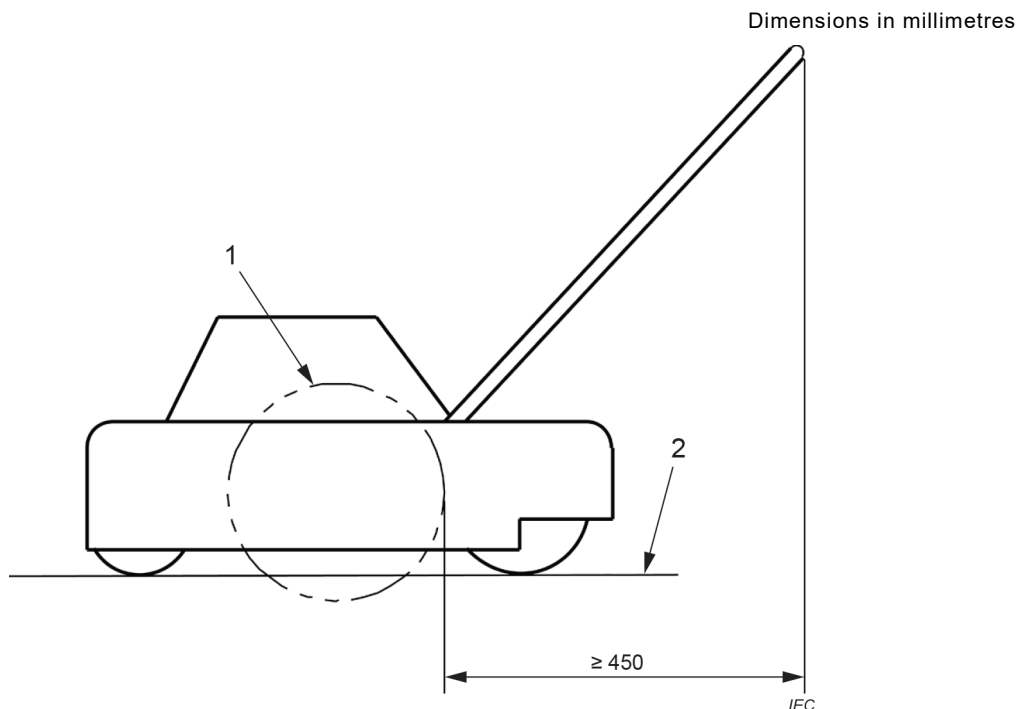
*The foot probe shall not contact the **tines**.*



Key

- 1 **tines tip circle**
- 2 ground level
- 3 wheel

Figure 103 – Safety distances – single-axle machines



Key

- 1 tines tip circle
- 2 ground level

Figure 104 – Handle distance – machines with more than one axle

19.102.2.2 For single-axle machines, there shall be positive means (e.g. latch or upper stop) which cannot be unintentionally disengaged during **normal operation** of the **lawn scarifier** or **lawn aerator**, to prevent the dimension in Figure 103 from becoming less than 600 mm.

Compliance is checked by inspection and by measurement.

19.102.2.3 For machines with more than one axle, there shall be positive means (e.g. latch or upper stop) which cannot be unintentionally disengaged during **normal operation** of the **lawn scarifier** or **lawn aerator**, to prevent the dimension in Figure 104 from becoming less than 450 mm.

Compliance is checked by inspection and by measurement.

19.102.3 Pivoting

A pivoting handle, if any, which has a temporary storage position (park position), usually just forward of the vertical, shall be equipped with a means to either manually or automatically lock the handle back into an operating position.

Compliance is checked by inspection.

19.103 Tines enclosure

19.103.1 Tines shall be guarded.

The **tines enclosure** shall have adequate mechanical strength for its intended purpose. It shall not be removable without the use of tools and withstand a force of 75 N in any direction.

Compliance is checked by inspection and by manual test.