

Garden equipment — Powered lawnmowers — Safety

ICS 65.060.70

National foreword

This British Standard is the UK implementation of EN 836:1997+A4:2011. It supersedes BS EN 836:1997 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

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This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 December 1997

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Matériel de jardinage - Tondeuses à gazon à moteur -
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This European Standard was approved by CEN on 12 March 1997 and includes includes Corrigendum 1 issued by CEN on 13 December 2006, Amendment 1 approved by CEN on 18 September 1997, Amendment 2 approved by CEN on 4 February 2001, Amendment 3 approved by CEN on 17 December 2003 and Amendment 4 approved by CEN on 23 April 2010.

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Foreword

This document (EN 836:1997+A4:2011) has been prepared by Technical Committee CEN/TC 144 “Tractors and machinery for agriculture and forestry”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This European Standard was approved by CEN on 12 March 1997 and includes Corrigendum 1¹ issued by CEN on 13 December 2006, Amendment 1 approved by CEN on 18 September 1997, Amendment 2 approved by CEN on 4 February 2001, Amendment 3 approved by CEN on 17 December 2003 and Amendment 4 approved by CEN on 2010-04-23.

This document supersedes EN 836:1997.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1**, **A2**, **A3**, **A4** and **A5**.

The modifications of the related CEN Corrigendum have been implemented at the appropriate places in the text and are indicated by the tags **AC**.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

¹ Applicable to the French and German versions only.

Introduction

A4 This document is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard. **A4**

1 Scope

This European Standard specifies safety requirements and their verification for the design and construction of powered rotary and cylinder lawnmowers, including pedestrian-controlled and ride-on (riding) types, and lawn and garden tractors, professional lawnmowers, and lawn and garden tractors with mowing attachments.

This European Standard is **A3** not applicable to machines covered by EN 786, lawn edgers, flail mowers, scrub cutters, automatic (robot) mowers, sickle-bar mowers, **A3** or agricultural mowers.

This standard is not applicable to rotary lawnmowers for which the cutting means is a generally circular central drive unit on which is mounted, either one or more non-metallic filaments or one or more non-metallic, pivotally mounted cutting elements. These cutting elements rely on centrifugal force to achieve cutting with the **A3** kinetic energy of a single cutting element not exceeding 10 J **A3**.

It describes methods for the elimination or reduction of hazards arising from their use - in addition, it specifies the type of information to be provided by the manufacturer on safe working practices.

A3 This standard is not applicable to lawnmowers as covered by EN 60335-2-77 and EN 50338. **A3**

The list of significant hazards dealt with in this standard is given in annex A. Annex A also indicates the hazards which have not been dealt with.

A4 The risk of contact with power driven components of ride-on machines (definition 3.28) other than the cutting means and ground contacting parts, has not been dealt with for persons other than the operator when in the driving position. **A4**

A3 Environmental aspects and EMC have not been dealt with in this standard. **A3**

A4 This document is not applicable to powered lawnmowers which are manufactured before the date of its publication as EN. **A4**

NOTE The reduction of risks from noise and vibration will be the subject of amendments to this standard now being developed.

2 Normative references

A4 The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. **A4**

A4 deleted text **A4**

A2 EN 1032:1996, *Mechanical vibration — Testing of mobile machinery in order to determine the whole-body vibration emission value — General*

EN 1033:1995, *Hand-arm vibration — Laboratory measurement of vibration at the grip surface of hand-guided machinery — General* **A2**

A4 deleted text **A4**

A3 EN 50338, *Safety of household and similar electrical appliances — Particular requirements for pedestrian controlled battery powered electrical lawnmowers* **A3**

A3 EN 60335-2-77, *Safety of household and similar electrical appliances — Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers (IEC 60335-2-77:1996, modified)* **A3**

A2 EN ISO 354:1993, *Acoustics — Measurement of sound absorption in a reverberation room (ISO 354:1985)*

EN ISO 3744:1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)* **A2**

A4 EN ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)* **A4**

A3 EN ISO 5353, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point (ISO 5353:1995)* **A3**

A4 EN ISO 5674, *Tractors and machinery for agriculture and forestry — Guards for power take-off (PTO) drive-shafts — Strength and wear tests and acceptance criteria (ISO 5674:2004, corrected version 2005-07-01)* **A4**

EN ISO 6682:1995, *Earth moving machinery — Zones of comfort and reach for controls*

A2 EN ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)* **A2**

A4 deleted text **A4**

A4 EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)* **A4**

ISO 500:1991, *Agricultural tractors — Rear-mounted power take-off — Types 1, 2 and 3*

A4 deleted text **A4**

ISO 3304:1985, *Plain end seamless precision steel tubes — Technical conditions for delivery*

ISO 3305:1985, *Plain end welded precision steel tubes — Technical conditions for delivery*

ISO 3306:1985, *Plain end as-welded and sized precision steel tubes — Technical conditions for delivery*

ISO 3767-1:1998, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator control and other displays — Part 1: Common symbols*

ISO 3767-2:2008, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 2: Symbols for agricultural tractors and machinery*

ISO 3767-3, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 3: Symbols for powered lawn and garden equipment*

ISO 4046:1978, *Paper, board, pulp and related terms — Vocabulary*

ISO 4200:1991, *Plain end steel tubes, welded and seamless — General tables of dimensions and masses per unit length*

ISO 4253:1993, *Agricultural tractors — Operator's seating accommodation — Dimensions*

ISO 5673:1993, *Agricultural tractors and machinery — Power take-off drive shafts and position of power-input connection*

ISO 9190:1990, *Lawn and garden ride-on (riding) tractors — Drawbar*

ISO 9191:1991, *Lawn and garden ride-on (riding) tractors — Three-point hitch*

ISO 9192:1991, *Lawn and garden ride-on (riding) tractors — One-point tubular sleeve hitch*

ISO 9193:1990, *Lawn and garden ride-on (riding) tractors — Power take-off*

3 Definitions

For the purposes of this European Standard, the following definitions apply:

3.1

blade tip circle

the path described by the outermost point of the cutting means cutting edge as it rotates about its shaft axis

3.2

braking distance

the distance travelled between the point of the first application of the brake control and the point at which the machine comes to rest

3.3

braking system

a combination of one or more brakes and related means of operation and control

~~ISO 9193:1990, Lawn and garden ride-on (riding) tractors — Power take-off~~

3.4

cutting means; blade

the mechanism used to provide the cutting action

3.5

cutting means enclosure

the part or assembly which provides the protective means around the cutting means

3.6

cutting positions

any height setting of the cutting means designated by the manufacturer for cutting grass

3.7

cutting width

the total width of cut measured across the cutting means at right angles to the direction of travel

3.8

cylinder lawnmower

a powered lawnmower with one or more cutting means rotating about a horizontal axis to provide a shearing action with a fixed cutter bar or blade

3.9

discharge chute

an extension of the cutting means enclosure from the discharge opening, generally used to control the discharge of material from the cutting means.

3.10

discharge opening

a gap or opening in the cutting means enclosure through which grass can be discharged

3.11

flail mower

a grass cutting machine with a multiplicity of free-swinging cutting elements that rotate about an axis parallel to the cutting plane and cut by impact

3.12

grass catcher

a part or combination of parts which provides a means for collecting grass clippings or debris

3.13

hover lawnmower

a powered lawnmower which uses a cushion of air as its ground support

3.14

jack knifing

movement of an articulated unit which results in:

- prevention of further operation in the reverse direction; or
- entrapment of the operator; or
- displacement of the operator sufficient to cause loss of control

3.15

lawn edger

a powered machine suitable for cutting lawn and soil, usually in a vertical plane

3.16

lawn edge trimmer

a grass trimming machine where the cutting means operates in a plane approximately perpendicular to the ground

3.17

lawn trimmer

a grass trimming machine where the cutting means operates in a plane approximately parallel to the ground

3.18

maximum operating engine/motor speed

the highest engine/motor speed obtainable when adjusted in accordance with the machine manufacturer's specifications and/or instructions with the cutting means engaged

3.19

mowing attachment

a cutting means designed to be easily detached from the machine, generally to allow the machine to be used for other purposes

3.20

mulching lawnmower

a rotary lawnmower without discharge openings in the cutting means enclosure

3.21

normal operation

any use of the machine which is reasonably foreseeable, as seen by the ordinary user, and which is consistent with such activities as cutting grass, starting, stopping, fuelling, connecting to (or disconnecting from) a power source, or the mounting of and dismounting from ride-on machines

3.22

normal use

normal operation, plus routine maintenance, servicing, cleaning, transporting, attaching or removing accessories, and making ordinary adjustments as determined by the manufacturer's instructions

3.23

open discharge chute

a discharge chute without a self closing guard or with a self closing guard which does not completely close the chute

3.24

operator control

any control requiring operator actuation to perform specific functions

3.25

operator presence control

a control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

3.26

pedestrian-controlled powered lawnmower

a grass-cutting machine, either pushed or self-propelled, normally controlled by the operator walking behind the unit

3.27

powered lawnmower

a grass-cutting machine or a machine with grass-cutting attachment(s) where the cutting means operates in a plane approximately parallel to the ground and which uses the ground to determine the height of cut by means of wheels, air cushion or skids, etc., and which utilises an engine or an electric motor for a power source

3.28

ride-on (riding) machine; lawn and garden tractor

a self-propelled machine on which an operator rides and which is designed primarily for cutting grass and auxiliary garden work

NOTE The cutting means can be an integral part of the machine or suspended from or attached to the machine

3.29

rotary lawnmower

a powered lawnmower in which one or more cutting means, cutting by impact, rotate about an axis normal to the cutting plane

3.30

service brake system

the designated primary means for decelerating and stopping a machine from its ground travel speed

3.31

sickle bar mower

a mower which uses a power source to reciprocate a knife or knives to provide a shearing action with a stationary cutter bar or movable knife

3.32

trailing seat

a removable, trailing device designed to carry a seated operator to ride behind while controlling a self-propelled, pedestrian-controlled lawnmower or tractor

NOTE Also known as a 'sully'

3.33

trailing seat unit

a pedestrian-controlled powered lawnmower or tractor with an optional trailing seat attached

NOTE Also known as a 'sully unit'

A3 3.34

automatic (robot) mower

automatic lawnmower that operates without human control. It operates only within a delimited perimeter or within a pre-programmed area

3.35

cutter unit

combination of cutting means and cutting means enclosure A3

4 Safety requirements and/or measures

4.1 General

4.1.1 Power driven components

All power driven components except the cutting means and the ground-contacting parts of A3 pedestrian-controlled self-propelled lawnmowers A3 shall be guarded to prevent contact with these parts during normal operation.

All openings and safety distances shall conform to A4 4.2.4.2 and 4.2.4.3 of EN ISO 13857:2008 A4 unless otherwise specified in this standard.

Rotating covers or discs shall have a continuous unbroken or smooth surface.

Guards shall be provided to prevent accidental contact with hazardous servicing points when the machine is serviced as A3 recommended by the instruction manual. A3

Where a guard is designed to be opened or removed and which exposes a hazard, a safety sign warning of the hazard shall be located on the guard or adjacent to the hazard.

Where a guard is so positioned that it can be used as a step, it shall withstand a force of 1200 N.

Compliance shall be checked by inspection and measurement.

A4 Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards, which are not dealt with by this document. **A4**

4.1.2 Guard attachment

All guards shall be permanently attached to the machine and shall not be detachable without the use of tools. The opening of guards, except for the following, shall require the use of a tool:

- a) the opening of or removable interlocked guards which disable the protected moving parts;
- b) the opening of hinged, automatically closing guards for grass discharge chutes;
- c) engine compartment access of machines where the operator presence control stops the engine.

A4 Fixed guards that are to be removed as a part of maintenance procedures, as described in the operator's manual, shall be fixed by systems that can be opened or removed only with tools. These guard fixing systems shall remain attached to the guards or to the machinery when the guards are removed.

Where possible, fixed guards shall be incapable of remaining in place without their fixings. **A4**

4.1.3 Hot surfaces

4.1.3.1 General

A guard shall be provided to prevent accidental contact with any exposed engine exhaust components larger than 10 cm² which have a surface temperature greater than 80 °C at (20 ± 3) °C ambient temperature during normal starting, mounting and operation of the machine.

NOTE The temperature of 80 °C is to be reviewed at the next revision of this standard taking into account any relevant values given in **A4** EN ISO 13732-1 **A4**.

4.1.3.2 Temperature measuring equipment

The temperature measuring equipment shall have an accuracy of ± 4 °C.

4.1.3.3 Test method

The engine shall be operated at its maximum operating speed until the surface temperatures stabilise. The test shall be conducted in the shade. Temperatures shall be determined by correcting the observed temperature by the difference between the specified ambient and the test ambient temperature.

Identify the hot surface area(s) on the engine exhaust system.

When the distance between the identified hot area and the nearest control is in excess of 100 mm, cone A as shown in Figure 1 shall be used. For distances less than 100 mm between the identified hot area and the nearest control, cone B as shown in Figure 1 shall be used.

For Cone A, with the axis of the cone anywhere between 0° and 180° to the horizontal and with **A3** the cone tip **A3** in a downward to horizontal direction, move the cone towards the hot surface. The cone shall not be

moved in an upwards direction. When moving the cone, determine if contact is made with the hot surface area(s) with the cone tip or conical surface of the cone.

Cone B shall be moved in any direction.

4.1.3.4 Test acceptance

When tested in accordance with 4.1.3.3, using the test equipment given in 4.1.3.2 the tip or conical surface of cone A or B shall not make contact with the hot surface of the exhaust system as described in 4.1.3.1.

4.1.4 Protection from exhaust fumes

Engine exhaust, where provided, shall not be directed towards the operator.

On machines equipped with an enclosure for the operator, the engine exhaust shall not be directed towards the enclosure or the air inlet to the enclosure.

4.1.5 Pressurised components

Pressurised hoses, lines and components shall be located or shielded so that in the event of rupture the fluid can not be discharged directly on to the operator when in the operating position.

4.1.6 Liquid spillage

When filled to the maximum A_3 according to the instruction manual A_3 , liquid containers, batteries, fuel systems, oil reservoirs, and coolant systems shall be constructed to prevent spillage for 1 min whilst the machine is tilted at 20° lateral and 30° longitudinal or at its limit of stability as specified in the stability test for ride-on machines (see 4.2.4.2.3.2) if greater. Weeping at vent systems shall not be considered spillage.

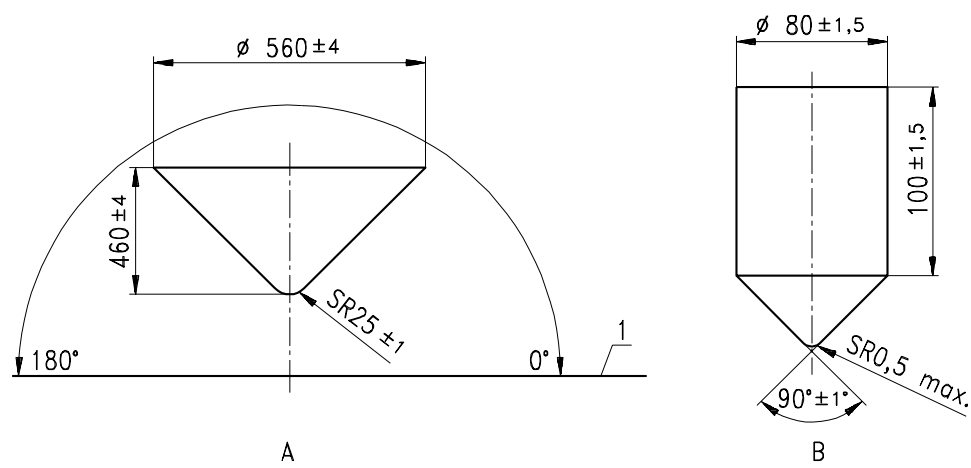
4.1.7 Seats and foot rests

4.1.7.1 Ride-on machines shall be provided with an operator seat and foot rests. Where there is no floor beneath the driver's feet, foot rests shall be provided. These shall be covered with slip resistant material.

Where the operator sits astride the frame of the machine and holds handlebars the requirements of 4.1.7.2 shall not apply.

A_3 For ride-on machines the seat index point (as defined in EN ISO 5353) shall be at least 500 mm from the blade tip circle, measured as a chain dimension around any fixed components (see Figure 2). A_3

Dimensions in millimetres

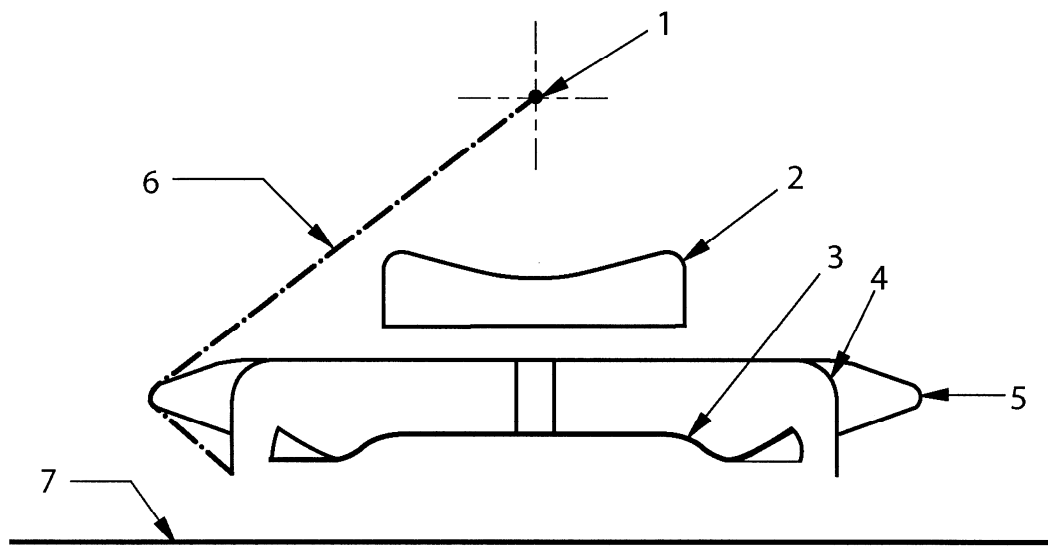


Key

- 1 horizontal plane

Figure 1 — Test cones (see 4.1.3.3)

A3



Key

- | | |
|---------------------------|--|
| 1 seat index point | 5 fixed component |
| 2 seat | 6 chain dimension – seat index point to blade tip circle |
| 3 cutting means | |
| 4 cutting means enclosure | 7 ground surface |

Figure 2 — Example of chain distance measurement from Seat index point to blade tip circle A3

4.1.7.2 For machines with a width of cut less than or equal to 1200 mm:

- a) the operator's seat shall have a buttock support at least 115 mm high at the rear, above the seating surface, to retain the operator;
- b) the seat shall be at least 400 mm wide.

For machines with a width of cut greater than 1200 mm the dimensions and longitudinal adjustment of the driver's seat shall conform to the requirements of ISO 4253:1993.

4.1.8 Controls

4.1.8.1 General

4.1.8.1.1 All machines

Ⓐ Operator controls other than those for:

- height of cut setting;
- fixed blade (on-cut) setting or adjustment on cylinder lawnmowers;
- engine starting;
- grass catcher discharge arrangements

shall meet the requirements of 4.1.8.1.2 or 4.1.8.1.3, whichever is applicable, and the following:

- it shall not be possible to sustain an engine/motor speed greater than the maximum operating speed (see 3.19) by use of any control or by simple adjustments made by using standard tools;
- for machines with traction drive the drive shall automatically stop or disengage when the operator leaves the normal operating position.

NOTE An audible warning device (e.g. horn) is not required. However machines travelling on public roads can be required to be fitted with a horn in order to meet highway regulations. Ⓐ

4.1.8.1.2 Pedestrian-controlled Ⓐ machines Ⓐ

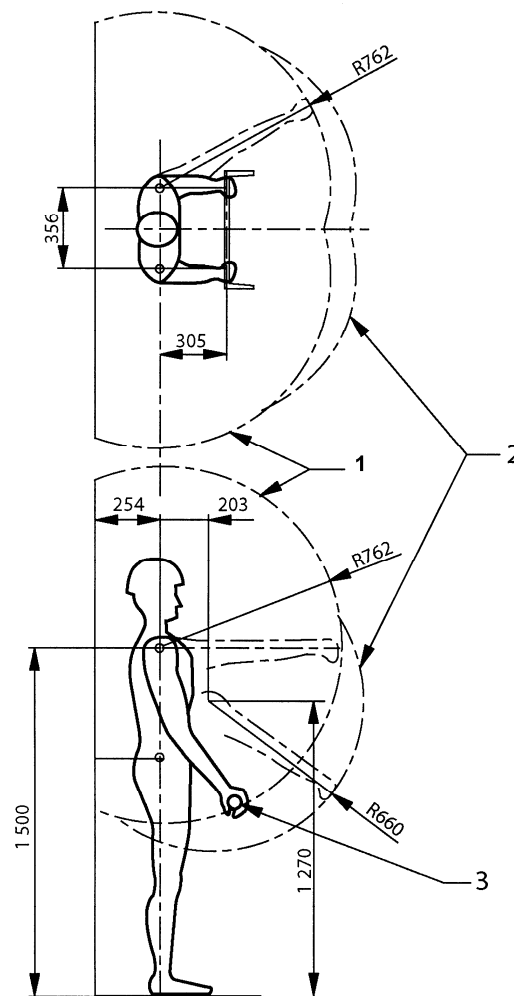
The location and range of movement of operator controls shall remain within anthropometric dimensions given in Ⓐ Figure 3 Ⓐ for pedestrian-controlled units. The operating range of less frequently used operator controls may be extended by allowing the operator's trunk, when standing with both feet on the ground, to articulate within the confines of the operator zone (e.g. lean forward until contacting the handle in any of the operating positions).

Engine starting controls shall only be outside this range if either:

- a) starting can only be accomplished with the Ⓐ cutting means Ⓐ drive disengaged; or
- b) the cutting means enclosure can pass the foot probe test (see 4.2.2.6 and Ⓐ Figure 4 Ⓐ) with the probe applied at the designated starting position of the Ⓐ machine Ⓐ (see 4.2.2.6.2).

The reverse function of the traction drive control(s) shall require continuous activation in the direction of travel to drive.

On self propelled Ⓐ machines Ⓐ it shall be possible to engage or disengage the traction drive when the cutting means is operating.



Key

- 1 operator zone
- 2 lower forward zone
- 3 handle

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

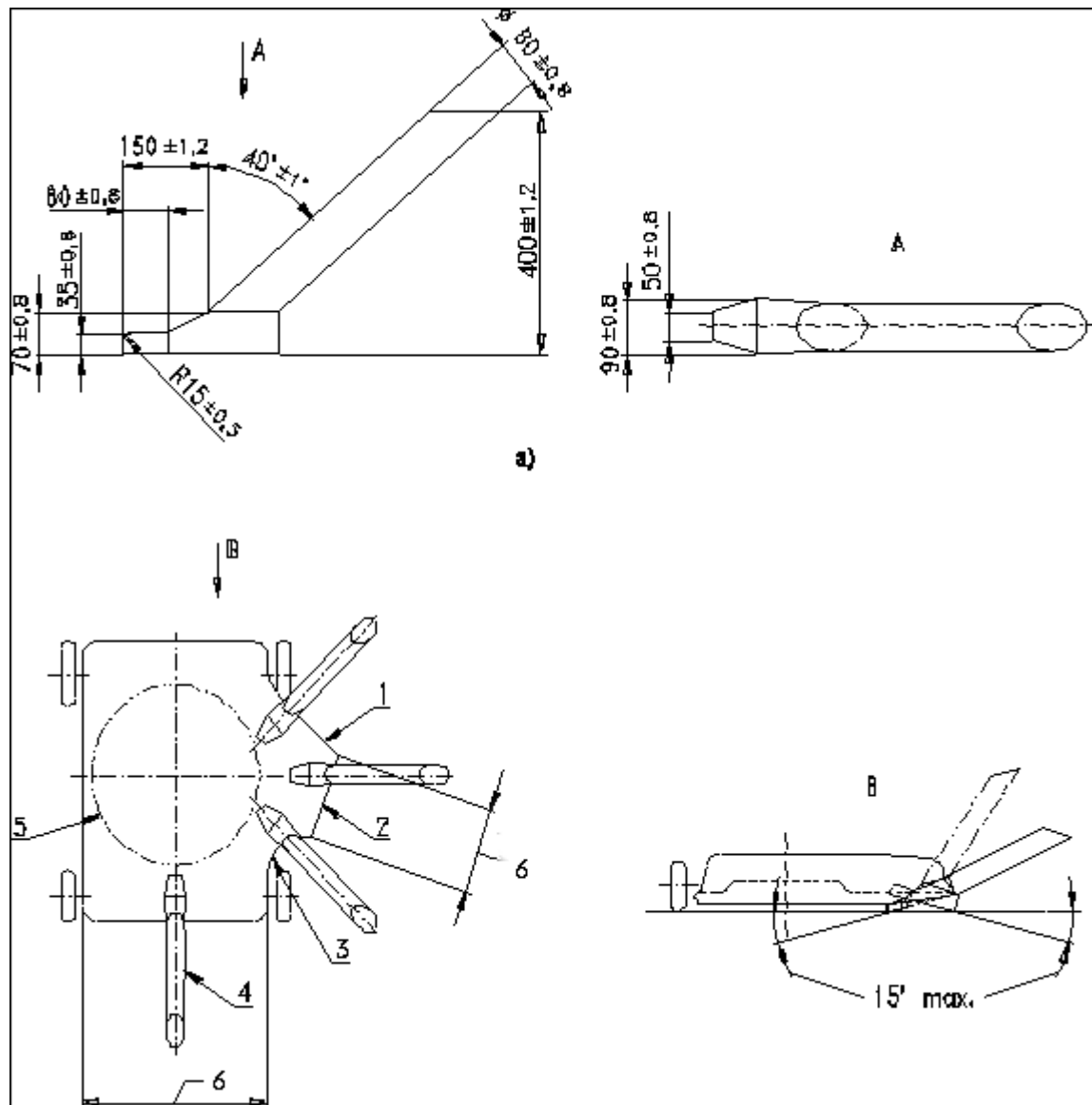
NOTE 2 The lower forward zone is the area into which a 5th percentile male or a 50th percentile female can reach when against the handle. This zone can also be reached by a 95th percentile leaning forward against the handle.

NOTE 3 All barriers (handles) within the operator zone will reduce the zone by the space occupies and protected by the barrier.

NOTE 4 The operator zone includes the maximum range of movement of all frequently used operator controls but is not intended to represent preferred operator control positions.

Figure 3 — Operator zone - Pedestrian-controlled lawnmower (see 4.1.8.1.2)

Linear dimensions in millimetres



Key

a) foot probe

- 1 side of discharge chute probed A_3 if less than 3 mm below plane A_3 of blade tip circle (see 4.2.1.1.1)
- 2 discharge opening
- 3 side of discharge chute probed A_3 if less than 3 mm below plane A_3 of blade tip circle (see 4.2.1.1.1)
- 4 foot probe (also probe deck from any designated starting position: see 4.2.2.6.2)
- 5 blade tip circle
- 6 area to be probed

Figure 4 — Foot probe test (see 4.2.2.6)

4.1.8.1.3 Ride-on (riding) machines

The location and range of movement of operator controls shall remain within the confines of the operator zone of reach as shown in A_4 EN ISO 6682:1995 A_4 . The operating range of less frequently used operator controls

may be extended by allowing the operator's trunk, while sitting on ride-on machines to articulate within the confines of the operator area (e.g. lean forward until contacting the steering control which can be in any of the operating positions).

4.1.8.2 Identification of controls

Controls, whose purpose is not obvious, shall have the function, direction and/or method of operation clearly identified by a durable label or mark.

Detailed instructions on the operation of all controls shall be provided in an instruction handbook.

4.1.8.3 Operator control symbols

Operator control symbols shall comply with ^{A4} ISO 3767-1:1998, ISO 3767-2:2008 and ISO 3767-3 ^{A4}.

4.1.9 Electrical requirements

4.1.9.1 General

These electrical requirements apply only to battery circuits of less than 42 V and high tension ignition circuits. ^{A3} Electrically driven machines shall comply with EN 60335-2-77 or EN 50338 as appropriate. ^{A3}

4.1.9.2 Low voltage battery circuits (not including magneto grounding circuits)

4.1.9.2.1 Electrical cables

Electrical cables shall be protected if located in potentially abrasive contact with metal surfaces and shall be resistant to, or protected against, contact with lubricant and fuel.

The wiring assembly shall, where possible, be grouped together, be supported and be located so that no portion is in contact with the carburettor, metallic fuel lines, the exhaust system, moving parts or sharp edges. Any edges of metal members likely to be in contact with the cables shall be rounded or protected to prevent possible damage to the cables by cutting or abrasion.

4.1.9.2.2 Battery installation

The compartment for a vented storage battery shall have openings to provide ventilation and drainage. When the battery is in the operating position, acid shall not leak onto parts that would be critically affected to the extent that a hazard would be created from corrosion.

4.1.9.2.3 Overload protection

4.1.9.2.3.1 All circuits, except starter motor and high tension ignition circuits, ^{A4} *deleted text* ^{A4} shall be provided with overload protection devices in the ungrounded line near the battery terminal. The overload protection may be located in either wire of a 2 wire system.

^{A3} *deleted text* ^{A3}

4.1.9.3 Terminals and uninsulated electrical parts

4.1.9.3.1 Terminals and uninsulated electrical parts, and two-wire non-grounded systems shall be protected against short circuiting by the fuel can or tools, during normal re-fuelling and lubrication servicing.

4.1.9.3.2 Ignition interruption or short circuiting shall be provided and shall be fitted on the low-voltage side.

4.1.9.3.3 All high-voltage parts of the circuit including spark plug terminals shall be electrically protected in such a manner that the operator cannot make accidental contact with them.

4.1.10 Engine stopping and starting

A stopping device shall be provided. The device shall not depend on sustained manual pressure for its continued operation.

A switch operated by a removable key, or a similar device shall be provided unless a manual starter is the only means of engine starting. Mowers shall not be provided with a starter operated by means of a loose rope.

NOTE An emergency stop device is not required

4.1.11 Transport

4.1.11.1 The transport position of the $\boxed{A_3}$ cutting unit $\langle A_3 \rangle$ of a powered lawnmower shall be that position $\boxed{A_3}$ designated by the instruction manual for use when $\langle A_3 \rangle$ the $\boxed{A_3}$ machine $\langle A_3 \rangle$ is being moved under its own power but the $\boxed{A_3}$ cutting unit $\langle A_3 \rangle$ is required to be well clear of the ground and is not required to cut grass. If movement of the $\boxed{A_3}$ cutting unit $\langle A_3 \rangle$ towards the transport position raises any part of the cutting plane above 400 mm from the ground, then the drive shall be automatically disengaged or require manual disengagement before it can be raised above 400 mm.

4.1.11.2 When $\boxed{A_3}$ moving the cutter unit(s) from the $\langle A_3 \rangle$ transport position to the cutting position the drive to the cutting means shall not be engaged unless:

- a) the operator is at the operator's position; and
- b) all parts of the cutting plane are within 400 mm of the ground; and
- c) there is a deliberate activation of the drive to the cutting means by the operator.

4.1.11.3 When there is a designated transport position, and where the height of any part of the cutting plane of a cutter unit is less than 400 mm there shall be a means of disengaging the cutting means drive while the traction drive is engaged.

4.1.11.4 The cutter unit shall be capable of being secured in the transport position by positive means such as latches.

4.1.11.5 If the cutter units have to be brought to the transport position by hand, they shall be provided with appropriate handles. The maximum force required shall be 350 N.

4.1.11.6 For ride-on units the operation of the cutting means shall be independent of the traction drive and shall include a separate control for engaging and disengaging the traction drive.

$\boxed{A_2}$

4.1.12 Vibration

4.1.12.1 Reduction by design and protective measures

The machine shall be designed to generate a vibration level as low as practicable. The main sources causing vibration are the:

- oscillating forces from the engine;
- cutting means;
- unbalanced moving parts;
- impact in gears, bearings and other mechanisms;
- interaction between operator, machine and material being worked;
- machine design related to mobility;
- travelling surface, speed, tyre pressure.

NOTE 1 CR 1030-1:1995, gives general technical information on widely recognised technical rules and means to be followed in the design of machines for low hand-arm vibration solutions.

NOTE 2 Besides the vibration reduction of the source, technical measures to isolate the vibration source from the handle may be used, when appropriate, such as isolators and resonating masses.

4.1.12.2 Reduction by information

After taking possible technical measures for vibration reduction, it is still recommended that, when appropriate, the instruction handbook recommends:

- the use of low-vibration operating modes, and/or limited time of operation;
- the wearing of personal protection equipment (PPE).

4.1.12.3 Vibration measurement

For the measurement of hand-arm and whole body vibration the methods given in Annex G shall be used.

4.1.13 Noise

4.1.13.1 Reduction as a safety requirement

4.1.13.1.1 Reduction at source by design and by protective measures

The machine shall generate a noise level as low as practicable. The main sources causing noise are:

- air intake system;
- engine cooling system (applicable only for combustion engine);
- engine exhaust system (applicable only for combustion engine);
- cutting system;
- vibrating surfaces.

EN ISO 11688-1 ^{A4} gives general technical information on widely recognised technical rules and means to be followed in the design of low-noise machines. For combustion engine driven machines special care shall be taken in the design of the exhaust system and the selection of the silencer.

NOTE EN ISO 11691:1995 and EN ISO 11820:1996 can be used for the testing of the silencer.

4.1.13.1.2 Reduction by information

If after taking all possible technical measures for reducing noise at the design stage a manufacturer considers that further protection of the operator is necessary, then the instruction handbook shall:

- recommend the use of low-noise operating modes, and/or limited time of operation;
- give a warning of noise level and recommend the use of ear protection.

4.1.13.2 Noise emission measurement

The determination of the sound power level and of the emission sound pressure level at the operator's position shall be carried out using the measurement methods given in Annex H. A_2

4.2 Specific requirements for rotary lawnmowers

4.2.1 General construction of rotary lawnmowers

4.2.1.1 A_3 Cutting means A_3 enclosure

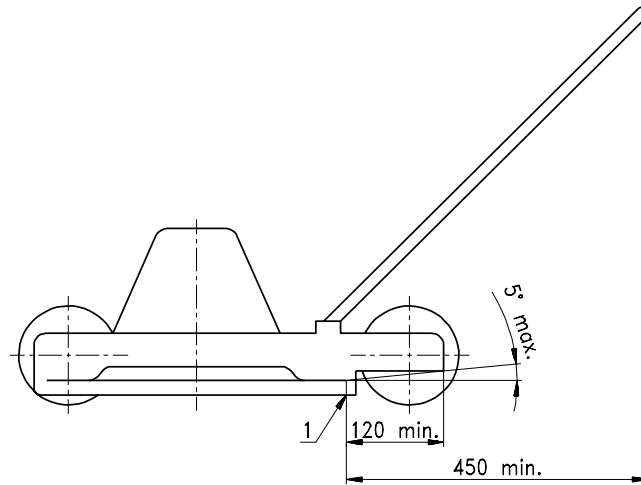
4.2.1.1.1 General

The A_3 cutting means A_3 enclosure shall extend at least 3 mm below the plane of the blade tip circle, except as allowed in 4.2.1.1.2 and at the grass discharge opening. If the bolt heads of blade-securing screws extend below the A_3 cutting means A_3 enclosure these shall be located within the inner 50% blade tip circle diameter.

Any extension of the wall(s) of the blade enclosure adjacent to the discharge opening, including walls of the discharge chute, not meeting this requirement shall be considered as part of the discharge opening. The walls shall satisfy the foot probe test (see 4.2.2.6) and conform to all the other relevant requirements of this standard.

On the operator's side of pedestrian-controlled A_3 machines A_3 , a rear wall of the A_3 cutting means A_3 enclosure or a barrier shall extend at least 120 mm from the nearest point of the blade tip circle and rise by an angle of not more than 5° from the horizontal (see A_3 Figure 5 A_3).

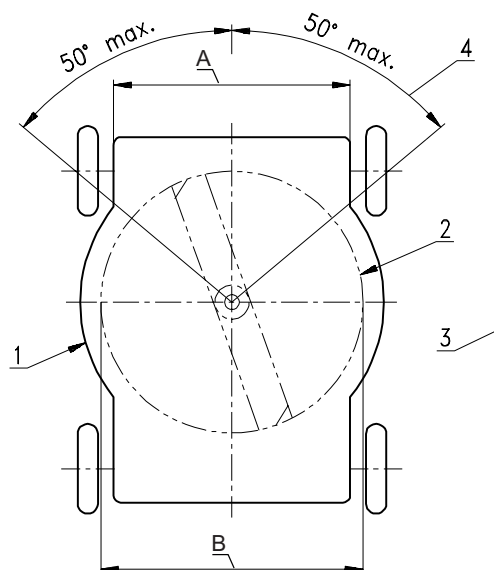
Dimensions in millimetres



Key

- 1 blade tip circle

Figure 5 — Handle distance (see 4.2.3.1.1) and rear cutting means enclosure (see 4.2.1.1.1)

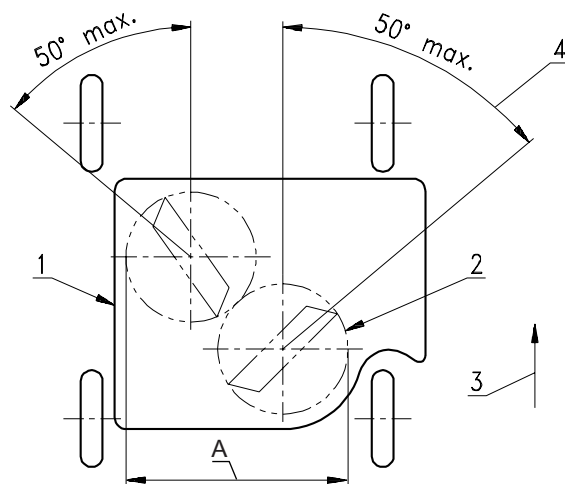


Key

- 1 blade enclosure
2 blade tip circle
3 direction of travel
4 maximum front opening
A-B width of cut

NOTE Limits of blade enclosure front opening are 50° maximum or cutting width, whichever is the narrowest.

Figure 6 — Front opening restrictions for single spindle lawnmowers (see 4.2.1.1.2)



Key

- 1 blade enclosure
- 2 blade tip circle
- 3 direction of travel
- 4 maximum front opening
- A width of cut

NOTE Limits of blade enclosure front opening are 50° maximum or cutting width, whichever is the narrowest.

Figure 7 — Front opening restrictions for multi-spindle lawnmowers (see 4.2.1.1.2)

4.2.1.1.2 Front opening

Machines may be provided with a front opening in the front wall of maximum width as shown in Figures 6 and 7 in which case the following two conditions shall be fulfilled:

- a) they shall satisfy the foot probe test given in 4.2.2.6;
- b) all tangential lines from the blade tip circle, in or above the plane of the blade tip circle and in the direction of rotation of the cutting means shall intersect the cutting means enclosure structure.

NOTE Figure 8 shows an example of a structure meeting this requirement.

4.2.1.1.3 Open discharge chutes

When open discharge chutes are provided, no tangential line which passes through the discharge chute from the blade tip circle in or above the plane of the blade tip circle and in the direction of rotation of the cutting means shall intersect the operator zone (see Figure 3) without first contacting the cutting means enclosure or guard.

Grass catchers are not subject to the tangential line test but if the chute is not completely covered by the catcher the tangential line test is applicable to any opening not covered by the catcher and/or guard.

4.2.1.1.4 Tangential lines

The tangential lines referred to in 4.2.1.1.2 and 4.2.1.1.3 shall be proved by means of a 3 mm diameter rod applied with minimal force from the outside of the machine.

4.2.1.2 Guards and grass catchers

Swinging guards or guards which have to be displaced in order to fit the grass catcher shall automatically return to the closed position when the grass catcher is removed. These guards shall be considered as forming part of the A_3 cutting means A_3 enclosure for the purposes of 4.2.1.1.

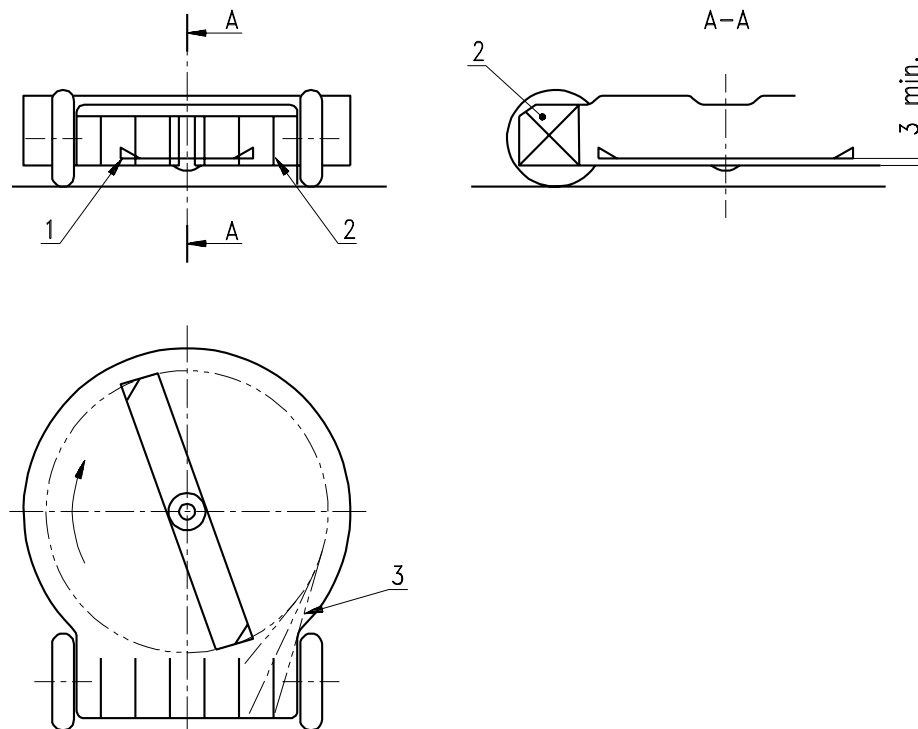
4.2.1.3 A_3 Cutting means A_3

4.2.1.3.1 Operator presence control

4.2.1.3.1.1 Pedestrian-controlled lawnmowers

Pedestrian-controlled A_3 machines A_3 shall be fitted with a device on the control handle which will automatically stop A_3 cutting means A_3 rotation when the operator's hands are removed from the handle.

NOTE This may be accomplished, for example, either by stopping the drive motor or by an intermediate blade brake/clutch mechanism.



Key

- 1 exposed blades can be seen
- 2 vertical baffles
- 3 tangential lines from blade tip circle intercept vertical baffles

A_3 Figure 8 A_3 — Construction for front opening (4.2.1.1.2)

For restarting A_3 cutting means A_3 rotation the control shall require two separate actions. If these actions are to be carried out by using the same hand then the actions shall be totally distinct thus to prevent accidental "switch on".

4.2.1.3.1.2 Ride-on machines

Ride-on machines shall be fitted with a device which will automatically stop rotation of the A_3 cutting means A_3 when the operator leaves the normal operating position.

NOTE If the operator returns to the operator's position before the A_3 cutting means A_3 have stopped, the A_3 cutting means A_3 may automatically resume operation.

Starting of the A_3 cutting means A_3 shall require intentional reactivation by a means other than the operator presence control after stopping.

4.2.1.3.2 A_3 Cutting means A_3 stopping time

4.2.1.3.2.1 Pedestrian-controlled lawnmowers

For pedestrian-controlled A_3 machines A_3 the following A_3 cutting means A_3 stopping times shall apply:

- a) cutting width up to and including 600 mm the A_3 cutting means A_3 shall stop from their maximum rotational speed within 3 s after the operator releases the controls that govern the operation of the cutting means;
- b) cutting width greater than 600 mm the A_3 cutting means A_3 shall stop from their maximum rotational speed within 5 s after the operator releases the controls that govern the operation of the cutting means;

4.2.1.3.2.2 Ride-on machines

For ride-on machines the following A_3 cutting means A_3 stopping times shall apply:

- a) cutting width up to and including 1200 mm the A_3 cutting means A_3 shall stop from their maximum rotational speed within 5 s after the operator leaves the operating position;
- b) cutting width greater than 1200 mm the A_3 cutting means A_3 shall stop from their maximum rotational speed within 7 s after the operator leaves the operating position;

4.2.1.3.2.3 Measurement of A_3 cutting means A_3 stopping time

A_1 Prior to the test the A_3 machine A_3 shall be assembled and adjusted according to the A_3 instruction manual A_3 . Petrol powered lawnmowers shall be "run in" for a period as requested by the manufacturer or for 15 min whichever is the less. During the "run in" period the A_3 cutting means A_3 control shall be operated 10 times. A_3 Prior to the test the machine shall be assembled and adjusted according to the manufacturer's published instructions for use. The machine shall be run-in for a period as requested by the manufacturer or for 15 min, whichever is the lesser. During the run-in period the operator presence control for the cutting means shall be operated 10 times. A_3 Battery powered lawnmowers shall be powered from an external power source to simulate a fully charged battery.

The A_3 machines A_3 shall be mounted and instrumented in such a manner that the results of the test are not affected. If an external starting device is used it shall not influence the results. A device shall be provided to detect the moment of release of the A_3 cutting means A_3 operator presence control and another to detect movement of the cutting A_3 means A_3 .

The time recording measurement system shall have a total accuracy of 25 ms and any tachometers used shall have A_3 an accuracy of 2,5% of the reading A_3 . The ambient test temperature shall be $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

The means of operating the A_3 machines A_3 during the test shall be such that the operator presence control for the A_3 cutting means A_3 is released abruptly from the full "on" position and it returns to the "idle" or "off" position by itself.

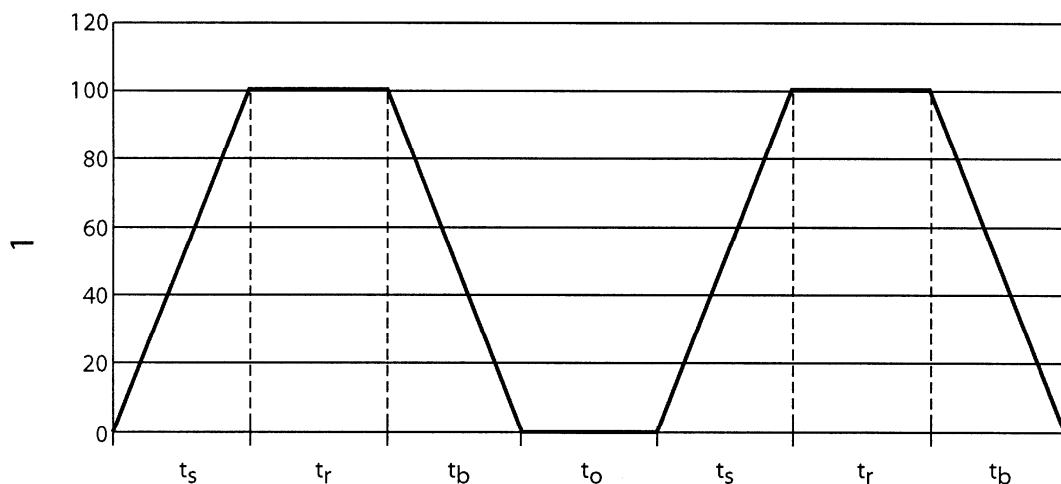
Stopping time is measured from the moment of release of the A_3 cutting means A_3 operator presence control until the last time a cutting A_3 means A_3 passes the sensing device.

The lawnmower shall be subjected to a A_3 series A_3 of 5000 stop/start cycles. The 5000 test cycles are not required to be continuous and the lawnmower shall be maintained and adjusted during the test A_3 in accordance with the instruction manual A_3 . There shall be no maintenance or adjustment after 4500 cycles have been completed.

Figure 9 gives a schematic representation of two cycles. Each cycle shall consist of the following sequence:

- accelerate the A_3 cutting means A_3 from rest to the maximum operating engine/motor speed (m) - (time = t_s);
- hold it at this speed for a short time to ensure that it is stable - (time = t_r);
- release the operator presence control that controls the A_3 cutting means A_3 and allow the A_3 cutting means A_3 to come to rest - (time = t_b);
- allow a short time at rest before commencing the next cycle - (time = t_o).

A_3



Key

1 cutting means speed (% of m) A_3

A_3 Figure 9 A_3 - Example of test cycles

If the total time for one cycle is t_c then $t_c = t_s + t_r + t_b + t_o$. The test cycle times for "on" ($t_s + t_r$) and "off" ($t_b + t_o$) shall be decided by the manufacturer but shall not exceed 100s "on" and 20s "off"

NOTE This test is not representative of normal use and therefore the cycle times should be specified by the manufacturer to avoid unnecessary wear or damage to the machine.

The A_3 cutting means A_3 stopping time shall be measured for the following:-

- each of the first five cycles of the 5000 cycle test sequence (i.e. not including the 10 preparatory operations); and

- each of the last five cycles prior to any brake maintenance or adjustment carried out during the test; and
- each of the last five cycles of the 5000 test cycles.

No other stopping times shall be recorded.

Each of the measured stopping times (t_b) shall comply with the requirement of 4.2.1.3.2.1 or 4.2.1.3.2.2. If the test A_3 machine A_3 fails to complete the full number of cycles but otherwise meets the requirements of this test either the machinery may be repaired if the brake mechanism is not affected and the test continued or if the machine cannot be repaired one further A_3 machine A_3 may be tested which shall then comply fully with the requirements. A_1

4.2.2 Verification of the safety requirements and/or measures for rotary lawnmowers

4.2.2.1 General

This clause specifies the tests for pedestrian controlled and ride on machines. The tests may be carried out in any order.

NOTE All tests of 4.2.2 which are conducted with the engine/motor running are dangerous. Test personnel should be adequately protected.

4.2.2.2 General test conditions

4.2.2.2.1 Engine/motor speed

Where it is specified that the machine shall run during the tests it shall be operated at the maximum operating engine/motor speed (see 3.19). Sealed adjustments shall not be moved when checking the maximum operating speed.

4.2.2.2.2 Pedestrian-controlled lawnmowers - restraint

The method of restraint shall not affect the test results.

NOTE Where necessary, pedestrian controlled A_3 machines A_3 may be elastically restrained at the handle to limit horizontal movement during the tests.

4.2.2.2.3 Machine configuration/attachments

For the thrown object test (see 4.2.2.3) and the structural integrity test (see 4.2.2.7), the machine shall be tested in all operational configurations (e.g. both with and without attachments and accessories such as grass catchers or mulching parts).

4.2.2.2.4 Test enclosure and "target" arrangements for tests 4.2.2.3, 4.2.2.4 and 4.2.2.5 ~~text~~

4.2.2.2.4.1 The test enclosure required for the thrown object, imbalance and impact tests shall be constructed generally as shown in Figure 10. Variations to accommodate different machine types are shown in Figures 11 to 15.

4.2.2.2.4.2 The walls shall consist of eight target panel areas, each 900 mm high, perpendicular to the base of the test enclosure so as to form an octagon. The test enclosure target panel composition shall meet the material specification of annex C. The flutes of the corrugated fibreboard target panels shall be vertical.

NOTE In order to facilitate the counting of hits, the target panel supports should be designed to allow sliding in and out of at least one target panel.

The target panels shall be located perpendicular to a radial line extending (750 ± 50) mm from the blade tip circle of single spindle machines, or to the nearest blade tip circle of multi-spindled machines (Figures 11 to 15). If a target panel interferes with a part of the machine such as grass catcher, handle, or wheel, the target panel shall be moved back to avoid such interference.

The target panels shall be divided into elevation zones by horizontal lines as indicated in Figure 10 and described in annex D. The target panel in the operator target area of a pedestrian-controlled machines above 900 mm shall consist of a single sheet of Kraft paper rising to a height of 2000 mm.