BRITISH STANDARD

BS EN 14910:2007 +A1:2009

Garden equipment — Walk-behind combustion engine powered trimmers — Safety

ICS 65.060.70

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National foreword

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

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Gartengeräte - Handgeführte Trimmer mit Verbrennungsmotor - Sicherheit

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Foreword

This document (EN 14910:2007+A1:2009) 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2009-03-14.

This document supersedes EN 14910:2007.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1⟩ ⟨A1▌.

This document 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).

▌A1⟩ For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. ⟨A1▌

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Introduction

This European Standard is a type C standard as stated in EN ISO 12100-1.

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

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.

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1 Scope

This European Standard deals with all significant hazards, hazardous situations and events relevant to walk-behind trimmers, powered by a combustion engine, with cutting means using non-metallic filament line or freely pivoting non-metallic cutter(s), of which the cutting elements rely on centrifugal force to achieve cutting with the kinetic energy of a single cutting element not exceeding 10 J, designed for cutting grass or similar plant material, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This European Standard is not applicable to:

a) walk-behind trimmers with cutting means other than those described above;

b) self propelled walk-behind trimmers or walk-behind edge trimmers;

c) lawnmowers using non-metallic filament line or freely pivoting non-metallic cutting elements with greater than 10 J kinetic energy;

NOTE 1 EN 836 applies for machines using non-metallic filament line or freely pivoting non-metallic cutting elements with greater than 10 J kinetic energy.

d) motor mowers using metal or other solid cutting elements.

NOTE 2 EN 12733 applies for machines using metal or other solid cutting elements.

EMC and environmental hazards other than noise have not been considered in this European Standard.

This European Standard is not applicable to walk-behind trimmers which are manufactured before the date of its publication as EN.

NOTE 3 Lawn trimmers and lawn edge trimmers (electric powered) are dealt with in EN 786, grass trimmers (internal combustion engine powered) are dealt with in EN 11806 and lawn mowers (internal combustion engine powered) are dealt with in EN 836.

2 Normative references

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

EN 294:1992, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs*

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

EN ISO 354:2003, *Acoustics — Measurement of sound absorption in a reverberation room (ISO 354:2003)*

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)*

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)*

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EN ISO 11688-1:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

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)*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
walk-behind
ground supported, possibly by wheels or air cushion and controlled by the operator walking behind (see Figure 1)

3.2
trimmer
grass trimming machine where the cutting means operates in a plane approximately parallel to the ground (see Figure 1 for example of a walk-behind trimmer)

NOTE Throughout the remainder of this European Standard, the term “trimmer” is used to refer to walk-behind trimmers.

3.3
cutting means
mechanism used to provide the cutting action in which one or more cutting elements, cutting by impact, are supported by a cutting head and rotate about an axis normal to the cutting plane (see Figure 2 (a))

3.4
cutting element
single non-metallic filament line or freely pivoting non-metallic cutter (see Figure 5)

3.5
cutting head
support system for the cutting element (see Figures 2 (a) and 2 (b))

3.6
cutting means control
device activated by the operator's hand or finger, for controlling the cutting means movement

3.7
edge trimmer
grass trimming machine where the cutting means operates in a plane approximately perpendicular to the ground

3.8
maximum operating engine speed
highest engine speed obtainable when adjusted in accordance with the manufacturers specification and/or instructions with the cutting means engaged

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3.9
operator presence control
control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

4 List of significant hazards

For the purposes of this European Standard, Table 1 gives, for defined danger zones, all the significant hazards, the significant hazardous situations and events covered by this European Standard, that have been identified by risk assessment as being significant for this type of machine, and which require specific action to eliminate or to reduce the risk.

The attention is drawn to the necessity to verify that the safety requirements specified in this European Standard apply to each significant hazard presented by a given machine and to validate that the risk assessment is complete with particular attention to:

— intended use of the machine including maintenance, setting and cleaning and its reasonably foreseeable misuse;

— identification of all significant hazards associated with the machine.

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Table 1 — List of significant hazards associated with walk-behind trimmers

Ref. No.	Hazard	Location	Reference of this European Standard
1	**Mechanical hazards** due to:		
1.1	Inadequacy of mechanical strength	Guards, cutting head	5.13
1.2	Shearing hazard	Moving parts	5.1, 5.2.2, Annex F
1.3	Cutting or severing hazard	Moving parts and cutting means	5.1, 5.2.2, 5.2.3, 5.9, 5.12, 6.1, 6.2, Annex D, Annex F
1.4	Entanglement hazard	Moving parts	5.1, 5.2.2, 5.2.3, 5.12, 6.1, 6.2, Annex F
1.5	Impact hazard	Thrown objects	5.2.3
2	**Electrical hazards** due to:		
2.1	Contact of persons with live parts under high voltage (direct or indirect contact)	Live parts	5.7.1, 5.7.4, 5.7.5
2.2	Projection of molten particles and chemical effects from short circuits, overloads, etc.	Electric circuits	5.7.3
3	**Thermal hazards** such as burns by a possible contact of persons with engine exhaust parts with a high temperature,	Hot exhaust parts	5.2.4
4	**Hazards generated by noise** such as hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness), and interference with auditory signals and speech communication	Engine, transmission, cutting means	5.11, 6.1, 6.2, Annex B, Annex C, Annex F
5	**Hazards generated by vibration** such as the use of hand-held machines resulting in a variety of neurological and vascular disorders	Handles	5.10, 6.1, Annex A
6	**Hazards generated by materials and substances**		
6.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts	Engine exhaust	5.3, 6.1
		Battery	5.4, 5.7.2
		Fuel	5.4, 5.5, 6.1
6.2	Fire or explosion hazard	Fuel	5.4, 5.5, 5.7.1, 6.1, Annex F
7	**Hazards generated by neglecting ergonomic principles in machinery design**		
7.1	Consideration of hand-arm or foot-leg anatomy	Controls	5.6
		Handles	5.9
7.2	Neglected use of personal protection equipment	Eyes and ears	6.1, Annex F
7.3	Human error, human behaviour	Guards	5.2
7.4	Unauthorised start-up/use	Removable key	5.8
7.5	Inadequate design, location or identification of manual controls	Controls	5.6
8	**Hazards due to unexpected start-up, unexpected over-run**	Cutting means control	5.6, 6.2
		Engine stopping	5.7.4, 5.8
9	**Hazards due to break-up during operation**	Cutting means	5.12
		Cutting head	5.13.3, 6.2.3
10	**Hazards due to insufficient instructions for the driver/operator**	Instructions for use	6.1, 6.2, Annex E, Annex F

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5 Safety requirements and/or measures and means of verification

5.1 General

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

5.2 Guards

5.2.1 General

It shall not be possible to fit or adjust any guard required by this European Standard so that it does not comply with the requirements of this European Standard.

Compliance shall be checked by inspection.

5.2.2 Power driven components (other than the cutting means)

All power driven transmission parts shall be guarded to prevent the operator's contact with these parts. All guards required by this European Standard shall be fixed guards as defined in 3.25.1 of EN 12100-1:2003 or the construction of the trimmer shall be such that it cannot be used without the guard in its guarding position as defined in 3.25.4 of EN 12100-1:2003.

All apertures and safety distances shall conform to 4.5.1, 4.5.3 and Table 4 of EN 294:1992.

Compliance shall be checked by inspection.

5.2.3 Guarding of cutting means

5.2.3.1 The cutting means of trimmers shall be at least guarded either according to 5.2.3.2 or 5.2.3.3. The guarding shall also be subject to the foot probe test of 5.2.3.4.

5.2.3.2 The cutting means of trimmers shall be guarded on the operator's side as a minimum, by a fixed, rigid, imperforate guard to the extent shown in Figure 2 (a). The radius '*X*' of the guard shall not be smaller than the major swept radius of the cutting head, and the guard shall extend beyond the plane of the cutting element by at least 3 mm. The guard shall extend at least 45° from the axis of the handle shaft(s) on the side where the cutting element is moving away from the operator and at least 90° from the axis of the handle shaft(s) on the side where the cutting element is moving towards the operator. The vertex of the angles lies on the axis of the cutting head spindle.

Compliance shall be checked by inspection and measurement.

5.2.3.3 The guarding of cutting means shall be ensured by two fixed, imperforate guards as shown in Figure 2 (b) which meets the following criteria:

Upper guard:

— guard shall be rigid with a width at least equal to the maximum cutting width;

— whole of the upper edge of the guard shall be on or above a line passing through the outermost point of the cutting means path and a point 2 000 mm above the ground at a distance of (330 ± 2,5) mm behind the handle grip(s) (see Figure 2 (b));

— whole of the guard shall be behind a plane which is at right angles to the rearmost point of the cutting means tip circle.

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Lower guard:

— flexible rear flap (see Figure 2 (b)) whose width is (*W* +0/-10) mm where *W* is the distance between the wheels along their axis of rotation. The lower edge of the flap shall be located not more than 10 mm above the ground when the cutting head is touching the ground. The mounting position of the flap shall be on, or not more than 150 mm behind the vertical plane passing through the axis of the ground wheels.

The minimum material specification for the lower guard shall be:

— material textile reinforced rubber;

— thickness 2 mm;

— specific gravity 1,65;

— hardness 70 Shore A;

— tensile strength 3 MPa;

— elongation 300 %;

— temperature range - 20 °C to + 70 °C;

— tear strength 15 N/mm^2.

Compliance shall be checked by inspection and measurement.

5.2.3.4 Foot probe test

5.2.3.4.1 Test equipment

The test probe shall be as illustrated in Figure 3.

5.2.3.4.2 Test method

The guards shall be in the normal operating position and the trimmer support members shall be in contact with the supporting surface. The trimmer shall be placed on a hard flat surface and set to either the highest or lowest cut, whichever is the most unfavourable. For trimmers with only two wheels the test shall be carried out both with the cutting head, set to its lowest height of cut, touching the ground and then with the height of the top of the handle(s) set to 900 mm.

Components such as wheels and frames shall be considered as part of the guarding for the purpose of this test. The test shall be conducted with the trimmer and the cutting means stationary.

Add foot probe test from the rear (for wheeled trimmers this between the rear wheels). The trimmer shall be positioned on a hard level surface.

The tests shall be made with the cutting means in the highest and lowest cutting positions.

The probe shall be applied from the rear of the trimmer at any point between the rear wheels. Whilst applying the probe its movements shall be limited as follows:

a) base of the probe may be inclined forwards or backwards by up to 15° and

b) probe may be on or at any height above the supporting surface and

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c) probe shall be applied with a horizontal force of 20 N.

The probe shall also be applied to the trimmer within an angle of 60° on either side of the direction of any starting position designated by the manufacturer. The 60° angles shall have their vertices at the centre of rotation of the blade nearest to the operator.

5.2.3.4.3 Test acceptance

The test probe shall not enter the path of the cutting means assembly.

5.2.4 Hot surfaces

5.2.4.1 General

Exposed engine exhaust components having a surface temperature greater than 80 °C at (20 ± 3) °C ambient temperature shall be guarded so they are not accessible to unintentional contact during normal operation of the trimmer. These components which shall include the exhaust guard are considered accessible if the area contactable by the appropriate cone is larger than 10 cm^2.

Compliance shall be checked by the test of 5.2.4.2.

5.2.4.2 Test for accessibility of hot surfaces[1)]

5.2.4.2.1 Temperature measuring equipment

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

5.2.4.2.2 Test method

The engine shall be operated at its maximum operating engine 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 4 shall be used. For distances less than 100 mm between the identified hot area and the nearest control, cone B as shown in Figure 4 shall be used.

For cone A, with the axis of the cone anywhere between 0° and 180° to the horizontal and with the nose or point of the cone 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.

5.2.4.2.3 Test acceptance

When tested in accordance with 5.2.4.2, using the test equipment shown in Figure 4, the tip or conical surfaces of cones A or B shall not make contact with the hot surface of the exhaust system as described in 5.2.4.1.

[1)] This subclause will be reviewed when the work on EN 14930:2007 is complete.

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5.3 Protection from exhaust fumes

Engine exhaust shall not be directed towards the operator.

Compliance shall be checked by inspection.

5.4 Liquid spillage

When filled to the maximum according to the manufacturer's instructions liquid containers, batteries, fuel systems, oil reservoirs and coolant systems shall be constructed to prevent spillage for 1 min whilst the trimmer is tilted at 30° in any direction. Weeping at vent systems shall not be considered spillage.

Compliance shall be checked by inspection.

5.5 Tank openings

The fuel tank cap shall have a retainer.

The fuel tank opening shall be at least 20 mm in diameter and the oil tank opening, if any, at least 15 mm in diameter.

The filler openings shall be so located that the filling of the tanks with a suitable funnel is not obstructed by other components.

Compliance shall be checked by inspection.

5.6 Controls

One cutting means control shall be provided and this shall require two separate and dissimilar actions before the cutting elements can be driven. If these actions are to be carried out by using the same hand then the actions shall be totally distinct in order to prevent accidental “switch on”.

There shall be no means of locking this control in the 'on' position and the cutting means shall come to rest when the control is released.

Controls, where the purpose is not obvious to the user, shall have the function, direction and method of operation clearly identified by a durable marking (see 6.2).

Detailed instructions on the operation of all controls shall be provided in the instruction for use (see 6.1).

Compliance shall be checked by inspection.

5.7 Electrical requirements for battery circuits and high tension ignition circuits

5.7.1 Electrical cables

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

Compliance shall be checked by inspection and, if necessary, by cable specification.

5.7.2 Battery installation

The compartment for a vented storage battery shall have openings to provide ventilation and drainage.

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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.

Compliance shall be checked by inspection.

5.7.3 Overload protection

All circuits, except for starter motor and high tension ignition circuits 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.

Compliance shall be checked by inspection.

5.7.4 Terminals and un-insulated electrical parts

Terminals and un-insulated electrical parts, and 2-wire non-grounded systems shall be protected against short circuiting by the fuel can or tool, during normal re-fuelling and lubrication servicing.

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

Compliance shall be checked by inspection.

5.7.5 High voltage parts

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.

Compliance shall be checked by inspection.

5.8 Engine stopping and starting

An engine stopping device shall be provided. The device shall be positioned such that it can be operated without the operator having to release the handle grip and it shall not depend on sustained manual pressure for its continued operation.

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

Compliance shall be checked by inspection.

5.9 Handle construction

Handle shaft(s) shall be fitted with a handle grip for each hand. The handle shaft(s) shall be fastened to the trimmer so as to prevent loss of control by unintentional uncoupling from the trimmer while in operation.

The end of the handle shaft/grip(s) adjacent to the operator shall prevent the operator from approaching nearer than 450 mm horizontally behind the nearest path of the cutting means.

Compliance shall be checked by inspection and measurement.

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