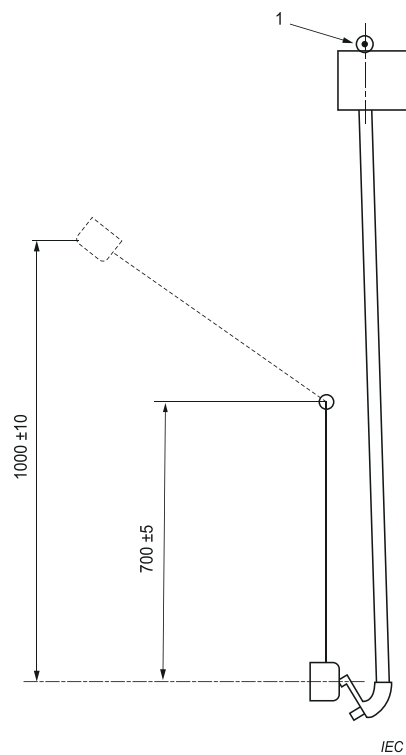


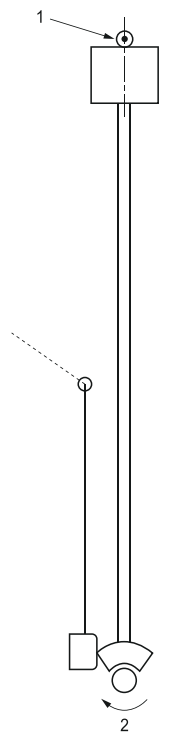
20.102.2.3 The hammer is raised to a height of $(1\,000 \pm 10)$ mm above the point of impact with the **cutting accessory guard** and allowed to fall so that it strikes the **cutting accessory guard** rear edge (see [Figure 118 a](#)). The test is conducted so that the rear edge of the **cutting accessory guard** is subjected to a total of 25 blows conducted in succession as quickly as possible after the temperature conditioning for each temperature specified in [20.102.2.2](#).

20.102.2.4 The hammer is raised to a height of $(1\,000 \pm 10)$ mm above the point of impact with the **cutting accessory guard** and allowed to fall so that it strikes the **cutting accessory guard** from the side where the **cutting accessory** rotates towards the **guard** (see [Figure 118 b](#)). The test is conducted so that the side of the **cutting accessory guard** is subjected to a total of 25 blows conducted in succession as quickly as possible after the temperature conditioning for each temperature specified in [20.102.2.2](#).

Dimensions in millimetres



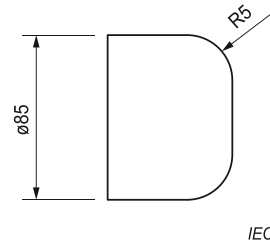
su4170

a) Rear edge impact

su4171

IEC

b) Side impact



su4172

c) Hammer**Key**

1 swivel bracket

2 direction of rotation

Figure 118**Cutting accessory guard test**

20.102.3 Cutting accessory guard rigidity

The rigidity of the **cutting accessory guard** is checked by applying a force, at any point, equivalent to the weight of the machine in the most unfavourable direction for 30 s.

During the test, the **guard** shall not have become detached, nor shall it show any visible cracks. After the test, the **guard** shall not have distorted permanently and the screws and retaining clips shall still be secure.

20.102.4 Strength of cutting accessory

The mechanical strength of the **cutting accessory** shall be adequate for **normal use**.

Compliance is checked by the following test.

NOTE 101 It is important to take proper precautions to ensure operator safety during this test.

The tests are done at an ambient temperature of $(25 \pm 10) ^\circ\text{C}$.

The **cutting accessory** shall not break or crack when impacted once against a steel rod of diameter (25 ± 1) mm according to Annex [CC](#).

The same **cutting accessory** shall then, without any adjustments, not break or crack when operated at **maximum speed** for 5 min.

If the machine is not operable, this may be accomplished by assembling the **cutting accessory** to a new machine sample or to an external driving device.

The final verification for cracks shall be done by visual inspection using normal vision.

These requirements are applicable to all **cutting accessories** specified in accordance with 8.14.2.

21 Construction

This clause of Part 1 is applicable, except as follows:

21.17.1 Addition:

This subclause of Part 1 is also applicable for an **operator presence sensor** that either functions as a lock-off device or is locked off as a switch.

21.17.1.3 Replacement of Table 7:

Table 7
Switch trigger force

Trigger type	Force (N)
Single finger trigger (trigger length < 30 mm)	100

Table 7 Continued on Next Page

Table 7 Continued

Trigger type	Force (N)
Multi finger trigger (trigger length ≥ 30 mm)	150
Operator presence sensor	100

21.18 *Replacement:*

Requirements for **power switches** for all machines are specified in [21.18.1](#).

Additional requirements for **power switches** for **lawn trimmers** and **lawn edge trimmers** are specified in [21.18.1.2](#) or [21.18.101](#).

Additional requirements for **power switches** for **grass trimmers**, **brush cutters** and **brush saws** are specified in [21.18.101](#).

21.18.1 *Replacement:*

The **power switch** required by 21.17 shall be a **momentary power switch** without a lock-on device, which can be switched on and off by the user without the need to release any of the handle(s) identified in accordance with [8.14.2](#) b) 109).

The **cutting means** or **cutting accessory** shall operate within 1 s after actuation of the **power switch**, provided the lock-off device, if applicable, has been first actuated.

NOTE The up to 1 s delay provides an allowance for a self-checking function of electronic controls.

Compliance is checked by inspection, by measurement and by manual test.

21.18.1.1 This subclause of Part 1 is not applicable.

21.18.1.2 *Replacement:*

For **lawn trimmers** and **lawn edge trimmers**, **power switch** triggers shall be so located, designed or guarded that inadvertent operation is unlikely to occur.

It shall not be possible to start the machine when a rigid sphere with a diameter of (100 ± 1) mm is applied to the **power switch** in any direction with a single linear motion. Alternatively, the requirements of [21.18.101](#) shall be fulfilled.

Compliance is checked by inspection and by manual test.

21.18.2 This subclause of Part 1 is not applicable.

21.18.2.1 to 21.18.2.4 These subclauses of Part 1 are not applicable.

21.18.101 Inadvertent starting prevention

Grass trimmers, **brush cutters** and **brush saws** shall be provided with a **power switch** having a lock-off device such that at least two separate and dissimilar actions are required before drive to the **cutting means** or **cutting accessory** is possible. It shall not be possible to achieve these actions with a single

grasping motion or a straight line motion within any grasping surface identified in accordance with [8.14.2 a\)](#).

Drive to the **cutting means** or **cutting accessory** shall only be enabled when the lock-off device is operated prior to the **power switch**.

It shall not be necessary to sustain the actuation of the lock-off device until the **power switch** is activated, provided:

- the **power switch** or an **operator presence sensor** (if any) is activated within 5 s of the release of the lock-off device; and
- there is a visual or audible indication as soon as the lock-off actuator is released and continues at least until the **power switch** or **operator presence sensor** (if any) is activated;

or

- an **operator presence sensor** (if any) is activated prior to the release of the actuator of the lock-off device.

NOTE 101 The visual or audible indication is intended to only indicate the state of the machine.

After the **power switch** is released, the machine shall return to the original locked state (i.e. at least two separate and dissimilar actions are required before drive to the **cutting means** or **cutting accessory** is possible)

- within 5 s; or
- no later than when the **cutting means** or **cutting accessory** has come to a complete stop,

whichever is longer, unless

- an **operator presence sensor** is provided; and
- the hand is not released from the **operator presence sensor**.

Compliance is checked by inspection, by measurement and by manual test.

*Additionally, for lock-off devices that are actuated in a direction generally perpendicular to the longitudinal vertical plane of the machine, (see [Figure 119](#)), and that are located within any gripping surface of handle(s) or grasping surface(s) identified in accordance with [8.14.2 a\)](#), to determine if it is possible to actuate the **power switch** and the lock-off device with a single grasping motion or a straight line motion, compliance is checked by the following test:*

*With the **power switch** in the "off" position, a 25 mm diameter x 75 mm long steel rod with a force not exceeding 20 N is applied to the lock-off device in any direction. The steel rod shall be applied such that its cylindrical surface bridges the surface of the lock-off device and any surface adjacent to the lock-off device. During the test, it shall not be possible to actuate the power switch with a force not exceeding 20 N.*

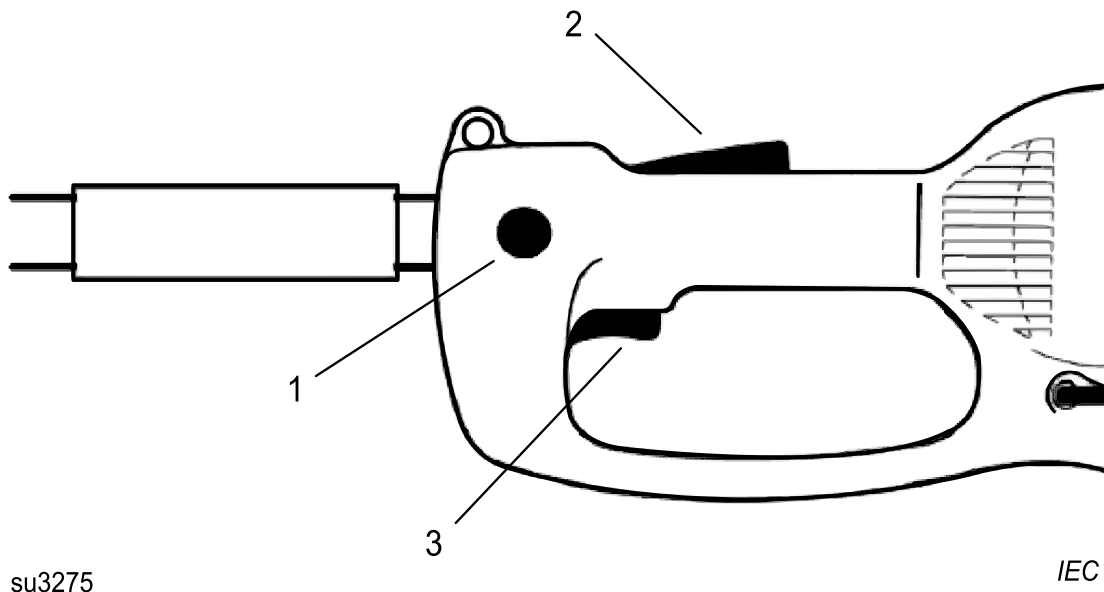
21.18.102 Operator presence sensor

The **operator presence sensor**, if any, shall be incorporated in the handle or grasping surface associated with the **power switch**.

The function of the **operator presence sensor** may be achieved by one or any combination of mechanical, electrical or electronic means.

NOTE 101 An example of an operator presence sensor is shown in [Figure 119](#).

Compliance is checked by inspection.



Key

- 1 lock-off device
- 2 **operator presence sensor**
- 3 **power switch**

Figure 119
Example of an operator presence sensor

21.18.103 Reverse rotation selector

If the machine is provided with a reverse rotation selector, it shall permit reverse rotation of the **cutting means** or **cutting accessory** at a rotational speed

- no greater than 30 % of the **maximum speed** in the primary rotation direction; or
- up to **maximum speed**, provided the machine when operating in the reverse rotation direction, fulfils all of the requirements of this standard.

Compliance is checked by inspection, by measurement and by relevant tests.

21.30 Replacement:

For **grass trimmers** that can be converted to a **brush cutter** or **brush saw** in accordance with [8.14.2](#) a) 104), **brush cutters** and **brush saws**, handles, as specified in the instruction manual in accordance with [8.14.2](#) b) 109), shall be formed of insulating material or, when of metal, shall be either adequately covered by insulating material or their **accessible parts** shall be separated by insulating barrier(s) from metal parts that may become live by the spindle or any surface within 300 mm of the spindle. These insulating barriers are not to be regarded as **basic insulation**, **supplementary insulation** or **reinforced insulation**.

Compliance is checked by inspection and by the tests of [20.5](#).

21.35 This subclause of Part 1 is not applicable.

21.101 Lawn trimmer and lawn edge trimmer cutting elements

For **lawn trimmers** and **lawn edge trimmers**, the **cutting means** shall consist of one or more non-metallic **cutting elements** mounted on or emerging from a **cutting head**.

Compliance is checked by inspection and by functional test.

A **cutting element** shall consist of one of the following:

- a non-metallic filament line; or
- a non-metallic freely pivoting cutter.

Machines having **cutting means** using one or more **cutting elements** of continuous filament line (e.g. wound on a spool contained either in the **cutting head** or other **attachment**) shall incorporate a means to automatically limit the filament line to its correct operating length after the line has been extended and/or the machine is operated.

Compliance is checked by inspection.

A **cutting element** shall have a kinetic energy of not more than 10 J.

For the purposes of this standard, the kinetic energy, in Joules, shall be determined by means of the following formula:

$$\text{kinetic energy} = 1/2 mv^2$$

where

m is the mass of the length L of the conditioned **cutting element**, in kilograms (see [Figure 120](#)), where **cutting elements** of hygroscopic material are stored for at least seven days in a humidity cabinet under the same conditions as those required for the test of 14.1 before carrying out the test and measurement;

v is the maximum attainable velocity of point Z which is half-way along the length L of the **cutting element**, in metres per second.

Therefore:

$$v = 0,104 \sqrt{7 n(r - (L / 2))}$$

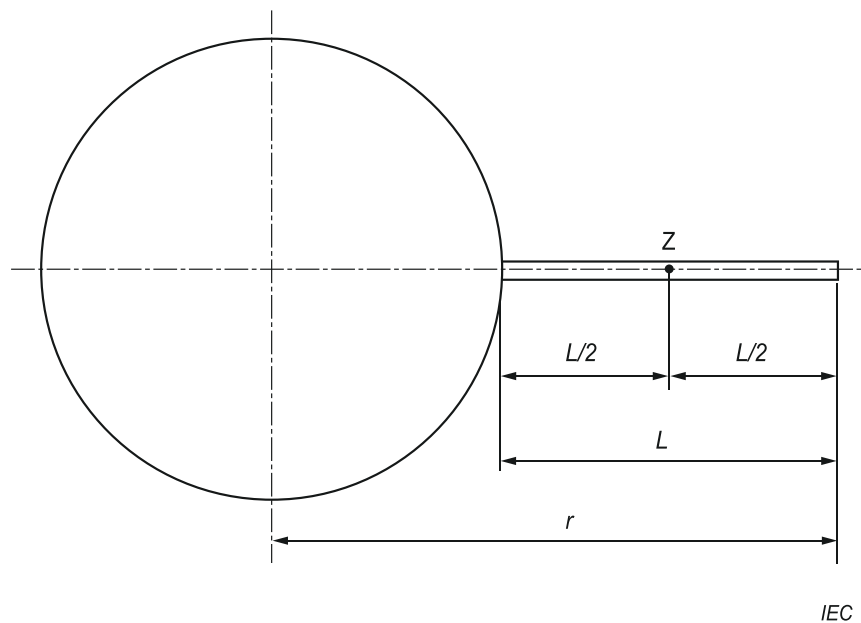
where

n is the **maximum speed** of the machine, in revolutions per minute;

r is the distance from the axis of rotation of the **cutting head** to the outer tip of the **cutting means**, in metres;

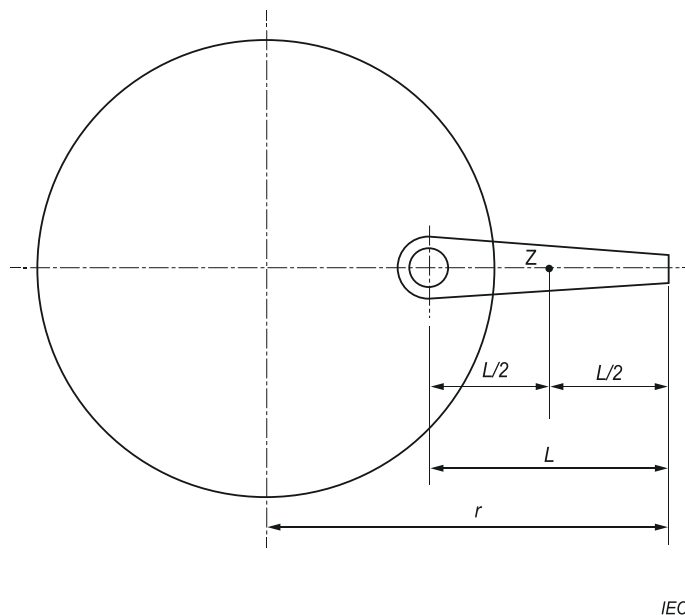
L is the measured length of the **cutting element**, in metres.

Compliance is checked by measurement and by calculation.



su4173

a) Filament line



su4174

b) Pivoting cutter

Key L length of the **cutting element** r distance from the axis of rotation of the **cutting head** to the outer tip of the **cutting means** Z point which is half-way along the length L of the **cutting element****Figure 120****Lawn trimmer and lawn edge trimmer cutting means measurement**

21.102 Lawn trimmer and lawn edge trimmer cutting elements

For **lawn trimmers** and **lawn edge trimmers**, the minimum distance from the **guard** specified in [19.101](#) to the nearest point of the **power switch** shall be at least 600 mm with the handle adjusted to its shortest operating position in accordance with [8.14.2](#) b) 109).

NOTE 101 Minimum distance requirements for lawn trimmers with a guard in accordance with [Figure 107](#) c) are specified in [19.101.1.4](#).

For **grass trimmers**, the minimum distance from the **guard** specified in [19.101](#) to the nearest point of the **power switch** shall be at least 750 mm with the handle adjusted to its shortest operating position in accordance with [8.14.2](#) b) 109).

Compliance is checked by measurement.

21.103 Lawn edge trimmer cutting head ground contact

Lawn edge trimmers shall be designed so as to prevent contact of the **cutting head** with the ground during **normal use**. This may be fulfilled by the design of the **guard** specified in [19.101.2](#).

Compliance is checked by the following test.

*A **lawn edge trimmer** with its **cutting means** removed is placed on a flat level surface such that the plane of the **cutting means** is perpendicular to the surface. With the machine in any operating configuration in accordance with [8.14.2](#) b), there shall be no contact between the **cutting head** and the surface.*

21.104 Cutting head and cutting accessory retention

Machines shall be provided with a means for securing the **cutting head** and **cutting accessory** to prevent loosening during use.

For machines not provided with a reverse rotation selector, the **cutting head** or **cutting accessory** may be retained by a thread that is self-tightened by the driving torque of the spindle.

For machines that are provided with a reverse rotation selector, the retention system shall not allow relative motion exceeding 15° of the **cutting head** or **cutting accessory** and its retainer in either direction upon application of a torque applied to the **cutting head** or **cutting accessory**.

*Compliance is checked by inspection and by the following test for all **cutting heads** and **cutting accessories**, except for those that are only retained by a thread that is self-tightened by the driving torque of the spindle:*

*a) The **cutting head** or **cutting accessory** is installed in accordance with [8.14.2](#).*

b) The spindle of the machine is locked.

*c) A torque of 5 Nm is applied for 5 s to the **cutting head** or a torque of 15 Nm is applied for 5 s to the **cutting accessory**, as applicable.*

The test is conducted five times in each direction of rotation.