BS EN 50434:2014

BSI Standards Publication

Safety of household and similar appliances — Particular requirements for mains operated shredders and chippers

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National foreword

This British Standard is the UK implementation of EN 50434:2014.

BSI, as a member of CENELEC, is obliged to publish BS EN 50434 as a British Standard. However, attention is drawn to the fact that the UK committee voted against its approval as a European standard.

The principal reason is that parts of EN 50434 differ from EN 13683 (the equivalent standard for integrally powered shedders/chippers created by CEN/TC144/WG7). In particular, EN 50434 does not include requirements where protection is provided by means of a tortuous path. These requirements are included in EN 13683, clauses 5.2.1.1 and 5.2.1.4.

In addition, users should be aware in some instances the terminology used in EN 50434 differs from that used in EN 13683.

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 secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2014.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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English Version

Safety of household and similar appliances - Particular requirements for mains operated shredders and chippers

Sécurité des appareils électrodomestiques et analogues - Règles particulières pour les broyeurs et déchiqueteurs fonctionnant sur le réseau

Sicherheit elektrischer Geräte für den Hausgebrauch und ähnliche Zwecke - Besondere Anforderungen für netzbetriebene Schredder, Häcksler und Zerkleinerer

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

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Foreword

This document (EN 50434:2014) has been prepared by WG 5, "Gardening appliances", of the Technical Committee CENELEC TC 116, "Safety of motor-operated electric tools".

The following dates are fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-03-31
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2017-03-31

EN 50434:2014 includes the following significant technical changes:

– alignment to the European Machinery Directive 2006/42/EC;

– alignment to EN 60335-1:2012.

This European Standard is to be used in conjunction with EN 60335-1:2012 "*Household and similar electrical appliances – Safety – Part 1: General requirements*".

When Part 1 is mentioned in this standard, it refers to EN 60335-1:2012.

This European Standard supplements or modifies the corresponding clauses in Part 1, so as to convert that publication into the European Standard "*Safety requirements for **shredders/chippers***".

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

Compliance with the relevant clauses of Part 1 together with this European Standard provides one means of conforming to the specified essential health and safety requirements of the Directive.

This European Standard follows the overall requirements of EN ISO 12100:2010.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For the relationship with EU Directive 2006/42/EC, see informative Annex ZZ, which is an integral part of this document.

Warning: Other requirements arising from other EU Directives can be applicable to the products falling within the scope of this European Standard.

The following numbering system is used:

– subclauses that are numbered starting from 101 are additional to those in Part 1;

– additional annexes are lettered AA, BB, etc..

NOTE In this European Standard the following print types are used:
- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered is as 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 other standards, for machines which have been built and designed to the provisions of this type C standard.

1 Scope

Replacement:

This European Standard specifies safety requirements and their verification for the design and construction of hand fed, **shredders/chippers** with integral electric motor, not exceeding 250 V single phase, with or without vacuum assisted collection which are designed to reduce organic material to smaller pieces and are used in a stationary position by an operator standing on the ground. This standard applies to **shredders/chippers** with **feed intake openings** or segments, in this standard referred to as **feed safety openings** that in total will fit into a square of 250 mm x 250 mm.

NOTE For the requirements for the measurement of the square of 250 mm x 250 mm are given in clause 20.101.1 of this standard.

In this European Standard **shredders** and **chippers** are referred to collectively as machine(s).

This European Standard does not cover requirements for

– machines powered by combustion engines;

NOTE 1 Combustion engine driven machines are covered by EN 13683.

– machines driven by an external power source or by battery power;

– machines with powered discharge intended to broadcast material or load vehicles;

– machines with mechanically powered feed intake or attachments;

– wood chippers for agricultural, lawn and park and forestry use;

NOTE 2 Wood chippers are covered by EN 13525.

– machines powered from a 3 phase supply.

This European Standard deals with all significant hazards presented by **shredders/chippers** when they are used as intended and under conditions of misuse which are reasonably foreseeable.

EMC and environmental aspects, except noise, have not been considered in this European Standard.

This European Standard is not applicable to machines which are manufactured before the date of publication of this document by CENELEC.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

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

EN 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 3744:2010)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN 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 (ISO 11201:2010)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

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

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.1.9 *Replacement:*

3.1.9
normal operation
any use of the machine which is specified by the manufacturer, and which is consistent with such activities as reducing organic material, starting, and stopping

Addition:

3.101
discharge chute
extension of the opening through which the shredded or chipped material is discharged

3.102
discharge zone
any space wherein material is intended to be ejected from the machine

3.103
feed safety opening
opening through which material is passed located at the relevant safety distance from the **shredding means**. This may be the same as the **feed intake opening** in Clause 3.104 or at some point between the **feed intake opening** and the **shredding means**

3.104
feed intake opening
opening through which material is inserted to be fed to the cutting mechanism. A **feed intake opening** can become **feed safety opening**(s) if the relevant safety distance from the **shredding means** is met

3.105
normal use
normal operation, plus routine maintenance, servicing, cleaning, transporting, attaching or removing accessories, and making adjustments as determined by the manufacturer's instructions

3.106
material discharge deflector
fixed or movable component designed to direct the flow of processed material discharging from the machine

3.107
maximum operating speed
highest **power source** speed obtainable with the **shredding means** engaged

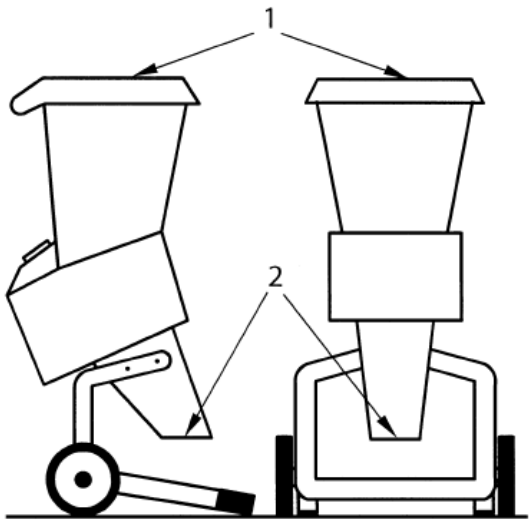
3.108
operator presence control
control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

3.109
power source
motor which provides linear or rotational movement

3.110
screen (grid)
perforated piece or bar(s) located between the **shredding means** and **discharge chute** or opening of the machine to assist in reducing organic materials to smaller pieces

3.111
shredder/chipper
machine designed for use in a stationary position having a **shredding means** for the purpose of reducing organic materials to smaller pieces. See Figures 1a) and 1b)

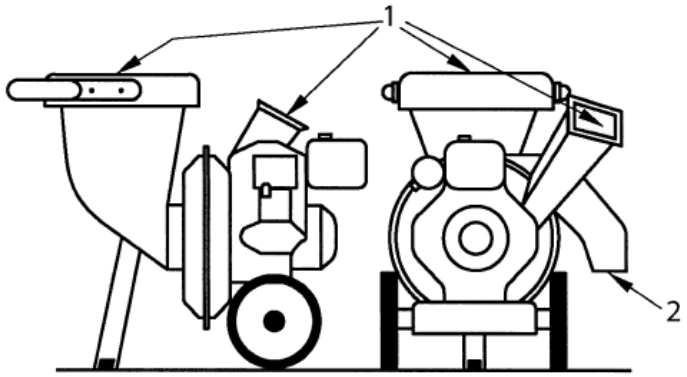
3.112
shredding means
mechanism consisting of one or more cutting means with or without a **screen (grid)**, designed to reduce the size of organic material to smaller pieces



a)

Key

1 feed intake opening
2 **discharge chute**



b)

Key

1 feed intake opening
2 **discharge chute**

Figure 1 - Examples of typical shredders/chippers

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows:

5.2 *Addition:*

A new machine shall be used for each of the tests of Clause 21.

6 Classification

This clause of Part 1 is applicable except as follows:

6.1 *Replacement:*

The machines shall be one of the following classes with respect to protection against electric shock: class I or class II.

Compliance is checked by inspection and by the relevant tests.

6.2 *Addition:*

Machines shall be at least IPX4.

7 Marking and instructions

This clause of Part 1 is applicable except as follows:

7.1 *Addition:*

Add the following new indents:

- business name and full address of the manufacturer and, where applicable his authorized representative;
- year of construction;
- designation of the machine,
  designation of machine may be achieved by a combination of letters and/or numbers provided this code is explained by giving the explicit designation such as “shredders” or “chipper” etc. in the instructions supplied with the machine;

  NOTE 1 An example of such code is “A123B”.
- designation of series or type,
  allowing the technical identification of the product. This may be achieved by a combination of letters and/or numbers and may be combined with the designation of machine;

  NOTE 2 The term “designation of series or type” is also known as model number.
- serial number, if any;
- mandatory markings;

  NOTE 3 For machines and their related products intended to be put on the market in the EEA, CE-marking as defined in the applicable European Directive(s), e.g. the Machinery Directive.
- machines operated continuously shall be marked with rated power in Watts or rated current in Amperes;
- machines rated intermittently according to 11.5 shall be marked with rated power in Watts or rated current in Amperes and the duty cycle in parenthesis (P40). This shall be explained in the instruction manual;

  NOTE 4 As an example 1 800 W (P40).
- guards designed to be opened or removed shall have a sign warning of the relevant hazard visible on the machine both when the guard is closed and when it is opened or removed;
- controls which may give rise to a hazard (e.g. operator presence control and/or on/off switch) when operated shall be marked or so placed as to indicate clearly which part of the machine they control;
- where replaceable during normal use, the shredding means shall be marked to identify the part number(s) and the manufacturer, importer or supplier;
- when a guard or container is so positioned or shaped that it could be misused as a step, there shall be a warning marking “Do not us as a step” or an equivalent safety sign, an example is given in Figure AA.9.

Marking giving warning information shall be easily legible and located as close as practicable to the relevant hazard.

The substance of the following warnings shall be placed in a prominent position on the machine. If a pictogram is used it shall be that shown in Annex AA. It shall be in contrasting colours to the base material. If it is embossed, stamped or cast colours are not required. Markings or symbols giving cautionary information shall be located close to the hazard:

- DANGER - Rotating blades. Keep hands and feet out of openings while machine is running;
- Read the user instructions;

– Keep bystanders away;

– WARNING Switch off and remove plug from mains before adjusting, cleaning or if the cord is damaged.

As appropriate to the machine design:

– Wear eye and/or ear protection;

– Wait until all machine components have completely stopped before touching them.

Compliance shall be checked by inspection.

7.9 This clause of Part 1 is not applicable.

7.12 *Replacement:*

An instruction manual shall be supplied with the machine, giving operating, servicing, maintenance and safety instructions that comply as appropriate with EN ISO 12100:2010, Clause 4. The words 'Original instructions' shall appear on the language version(s) verified by the manufacturer or his authorised representative. Where no 'Original instructions' exist in the official language(s) of the country where the machine is to be used, a translation into that/those language(s) shall be provided by the manufacturer or his authorised representative or by the person bringing the machine into the language area in question. The translations shall bear the words 'Translation of the original instructions', and they shall be accompanied by a copy of the 'Original instructions'.

This instruction manual shall include:

a) a repeat of those warnings required to be marked on the machine together with further explanation, where appropriate. Where safety signs are used in the marking on the machine, their function shall be explained;

b) a warning to never allow children, persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge or people unfamiliar with these instructions to use the machine, local regulations may restrict the age of the operator;

c) a warning to never operate the machine while people, especially children, or pets are nearby;

d) a general description of the machine, the intended use, instructions for the proper use of the machine including advice on what the machine should be used for, how to use it for the intended purpose(s) and any reasonably foreseeable misuse thereof;

e) warnings concerning ways - that experience has shown might occur - in which the machinery shall not be used;

f) instructions for the proper assembly and disassembly of the machine for use, if the machine is not supplied in a completely assembled form;

g) instructions for proper adjustment and any necessary user maintenance of the machine, including timescales and a warning of the danger of moving hazardous parts;

h) instructions for the recommended replacement or repair of, or service attention to critical components. Where parts are consumable, the spare part shall be clearly identified, e.g. by the use of a part number or other means;

i) instructions on the operation of all controls;

j) information how to start the machine safely;

k) instructions for the operating position and the correct and safe operation of the machine such as moving, safe positioning, handling, clearing blockages and keeping the **discharge chute** clear of processed material for use, preparation, maintenance and storage of the machine;

l) an advice to not overreach and to keep the balance at all times, to always be sure of the footing on slopes and to walk, never run;

m) a warning not to touch moving hazardous parts before the machine is disconnected from the mains and the moving hazardous parts have come to a complete stop;

n) an advice on the use, length and type of extension cords to be used (not lighter than required by Clause 25.7);

o) if a collecting facility is provided with the machine, instructions for when and how to attach and detach the collection device to and from the machine;

p) information about the residual risks that remain despite the inherent safe design measures, safeguarding and complementary protective measures adopted;

q) instructions to always wear substantial footwear and long trousers while operating the machine;

r) instructions to disconnect the supply (e.g. remove the plug from the mains or remove the disabling device)

- whenever the machine is left by the user;
- before clearing a blockage;
- before checking, cleaning or working on the machine;
- after striking a foreign object to inspect the machine for damage;
- if the machine starts to vibrate abnormally, for immediately check;

s) instructions when, where and how to inspect the machine, the supply and extension cord for signs of damage or ageing and, if permitted, how to make repairs;

t) a warning never to operate the machine with defective guards or shields, or without safety devices, or if the cord is damaged or worn;

u) an advice not to connect a damaged cord to the supply or touch a damaged cord before it is disconnected from the supply for the reason that damaged cords can lead to contact with live parts;

v) an advice to keep extension cords away from moving hazardous parts to avoid damages to the cords which can lead to contact with live parts;

w) the operating method to be followed in the event of accident or breakdown;

x) instructions how to disconnect the machine from the mains, if the cord becomes damaged or entangled during use;

y) recommendations

- to connect the machine only to a supply circuit protected by a residual current device (RCD) with a tripping current of not more than 30 mA,
- to avoid using the machine in bad weather conditions especially when there is a risk of lightning;

z) an explanation of the term (P40) if applicable;

aa) information about airborne noise emissions of the machine according to Annex FF, this includes:

- the A- weighted emission sound pressure level emitted by the machinery, where this exceeds 70 dB(A), where this level does not exceed 70 dB(A), this fact shall be indicated.
- the peak C-weighted instantaneous sound pressure value at machinery, where this exceeds 63 Pa (130 dB in relation to 20 µPa);
- the A-weighted sound power level emitted by the machinery, if the A-weighted emission sound pressure level exceeds 80 dB(A)
- the uncertainties surrounding the determined noise emission values according to Annex FF.

bb) instructions how to proceed in case of abnormal vibrations;

cc) mass in kilograms.

NOTE Examples of safety instructions are given Annex EE.

Compliance shall be checked by inspection.

7.12.1 This clause of Part 1 is applicable.

7.12.5 to **7.12.6** These clauses of Part 1 are applicable.

8 Protection against access to live parts

This clause of Part 1 is applicable.

9 Starting of motor-operated appliances

Motors shall start under all normal voltage conditions that may occur in use.

Centrifugal and other automatic starting switches shall operate reliably and without contact chattering.

Compliance is checked by starting the machine three times, at no load, at a voltage equal to 0,85 times rated voltage or the lower limit of the rated voltage range, with any control device set at maximum speed.

For the test the shredding means shall be adjusted according to the instruction manual.

The machine shall operate in such a way that safety is not affected.

10 Power input and current

This clause of Part 1 is not applicable.

11 Heating

This clause of Part 1 is applicable.

11.5 *Replacement:*

Machines shall be tested according to their marking. If the machine is marked with rated power input or rated current followed by the term (P40) it shall be operated intermittently. All other machines shall be tested continuously.

Machines marked (P40) are operated intermittently until stabilization or for 30 cycles, whichever is achieved first, each cycle comprising a period of operation of 40 s at rated power **input** and a period of 60 s with the machine at no load. The temperature is measured at the end of a load period.

All other machines are operated continuously. The temperature is measured when the machine has reached stabilization.

The machine is loaded by means of a brake adjuster so as to attain rated input or rated current.

The machine shall be operated at rated voltage and rated current or rated power **input** until stabilization. The torque being applied shall be measured. When tested by 0,94 and 1,06 times rated voltage the previously determined torque shall be maintained.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows:

15.1.2 *Addition:*

Machines with an appliance inlet or cable coupler shall be tested with the appropriate mating connector in place. Air filters shall not be removed.

15.1.2 *Modification:*

The machine shall be rotated during the test along its vertical axis. The rate of rotation shall be 12 ± 2 revolutions per minute.

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operations

This clause of Part 1 is applicable except as follows:

19.9 *Replacement:*

This clause of Part 1 is not applicable.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows:

20.2 *Replacement:*

To prevent unexpected operation which may result in a hazard, only non-self-resetting thermal cut-outs or voltage-maintained non-self-resetting thermal cut-outs are allowed.

Compliance shall be checked by inspection.

Addition:

20.101 Access to power driven components

20.101.1 Feed intake openings

The **feed intake openings** or **feed safety openings** shall in total fit into a square of 250 mm x 250 mm measured at the plane of the opening(s).

Compliance is checked by inspection and measurement.

20.101.1.1 Combinations of feed intake openings

Combinations of slots, squares, and/or rounds with opening sizes up to and including 45 mm shall create a pinch point of less or equal 30 mm and with a length of at least 20 mm (see Annex BB, Figures BB.1 to BB.3).

Combinations with opening sizes greater than 45 mm and up to and including 50 mm shall create a pinch point of less or equal 26 mm and with a length of at least 20 mm (see Annex BB, Figures BB.4 to BB.8).

Where the length of at least 20 mm has to be decreased, the length shall have sufficient dimension to prevent breakage increasing the width of the pinch point during use. The created pinch point shall be less or equal 20 mm for all combinations with opening sizes up to and including 50 mm.

Each shape shall be considered separately for its opening size and the safety distance of at least 200 mm shall be fulfilled (see Table 1 and Annex BB, Figures BB.1 to BB.8).

NOTE Safety distances for combinations with opening sizes greater than 50 mm are covered by Table 1.

Compliance is checked by inspection and measurement.

Table 1 - Safety distances of shredding means from feed safety openings

Feed safety opening *W* mm	**Distance - Feed safety opening to shredding means** *D* mm		
	Slot	Square	Round
$W \leq 30$	$D \geq 200$	$D \geq 200$	$D \geq 200$ [d]
$30 < W \leq 50$	$D \geq 850$ [a or b]	$D \geq 200$	$D \geq 200$ [d]
$50 < W \leq 250$	$D \geq 850$ [b or c]	$D \geq 850$ [b or c]	$D \geq 850$ [b or c]

[a] *D* is reduced to ≥ 200 mm if the longest side of the slot is ≤ 50 mm.

[b] (i) Where the height (h) is < 1 200 mm and $(\alpha) \leq 40°$, *D* shall be 850 mm measured as the shortest distance to the shredding means (see Figures 2a and 2b).

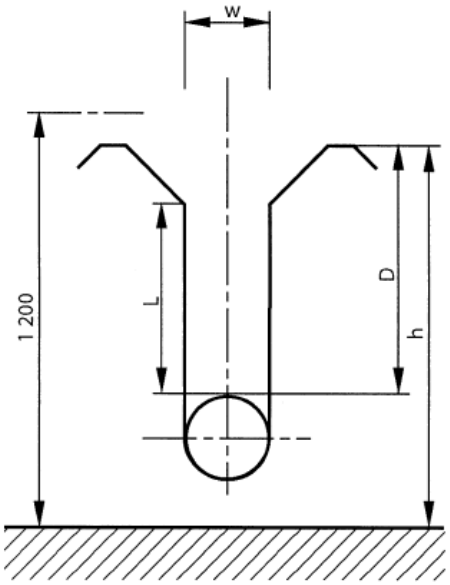
(ii) Where the height (h) is < 1 200 mm and $90° \geq (\alpha) > 40°$, *D* shall be measured as the shortest distance from the outer edge of the **feed intake opening** to the shredding means subject to the following conditions (see Figure 2c):
— $L + 150 (2 + \sin \alpha) \geq 850$ mm; and
— $L \geq 550$ mm.

[c] (i) Where the height (h) is ≥ 1 200 mm, and $(\alpha) \leq 40°$, *D* shall be measured as a chain measurement, subject to the following two conditions (see Figures 2d, 2e and 2f):
— $d_1 + d_2 \ldots + d_n \geq [850 - ½ (h - 1 200)]$ mm; and
— $L \geq 550$ mm.

(ii) Where the height (h) is ≥ 1 200 mm and $90° \geq (\alpha) > 40°$, *D* shall be measured as a chain measurement, subject to the following two conditions (see Figures 2g and 2h):
— $d_1 + d_2 \ldots + d_n \geq [L + 150 (2 + \sin \alpha)] - ½ (h - 1 200)$ mm; and
— $L \geq 550$ mm.

[d] Where a round opening of ≤ 40 mm is used without combination or overlap with any other shape, *D* shall be ≥ 120 mm.

Dimensions in mm



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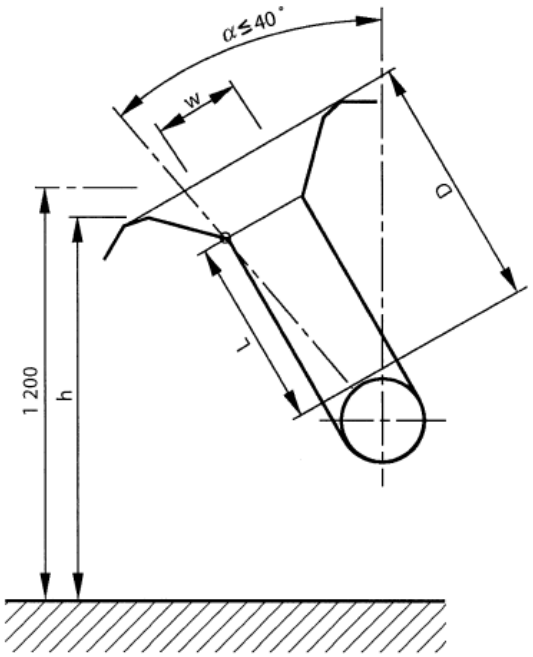

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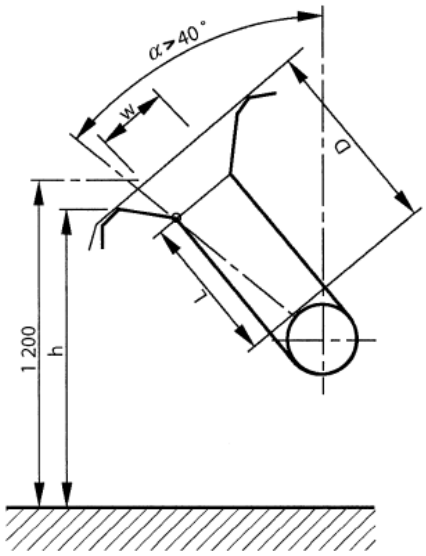

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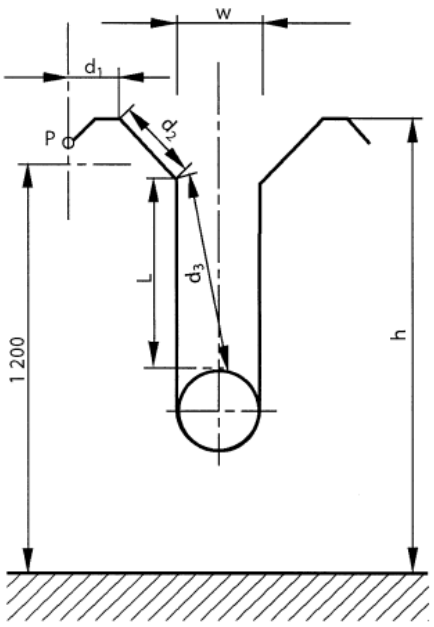

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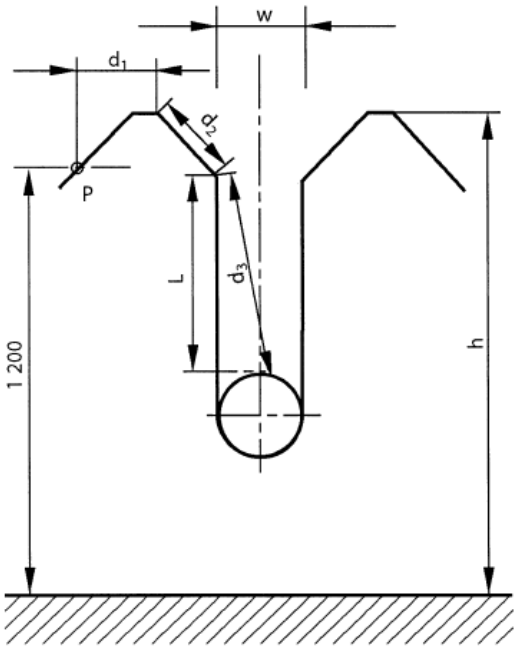

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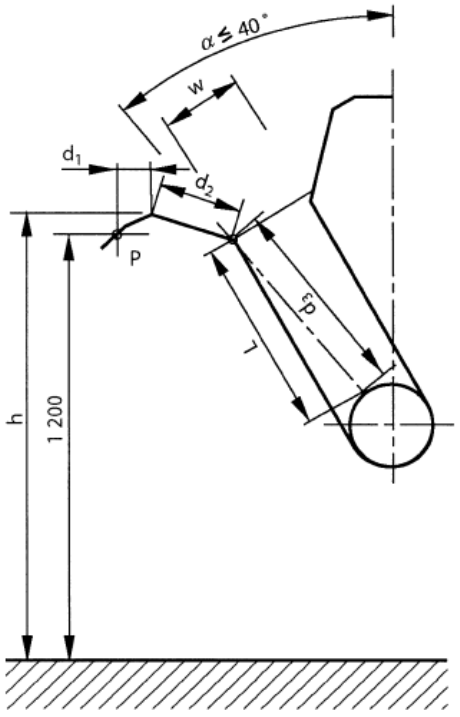
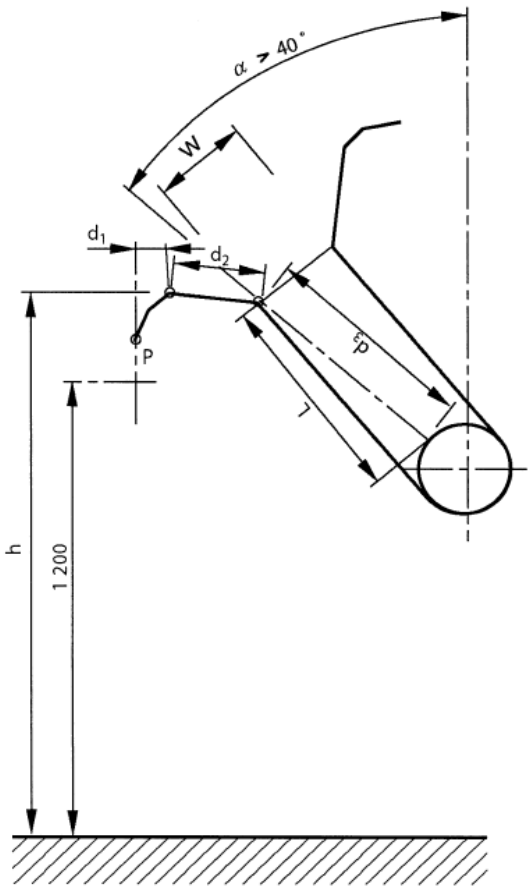


f)



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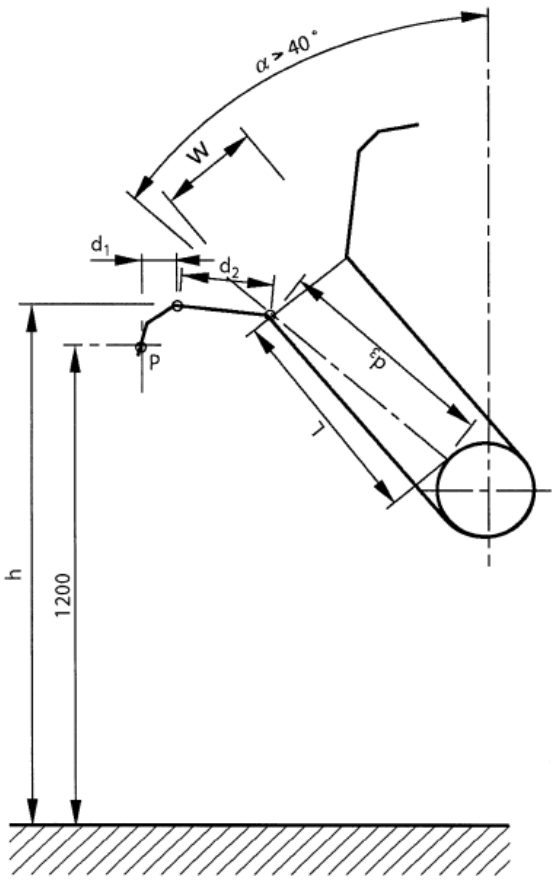


h)

Key

h height of lowest point of feed intake opening from ground
L minimum distance from the highest point of the shredding means to (W)
P point on the feed intake with distance ≥ 1200 mm from the ground. P is starting point for the chain measurement from the feed intake opening to the highest point of the shredding means
W **feed safety opening**
α angle between a vertical line through the centre of the shredding means and a straight line from the point of the shredding means nearest to the opening to the highest point on the lower side of the inside of the feed inlet

Figure 2 - Distance from feed safety opening to shredding means

20.102 Discharge chutes

Except as stated in Clause 20.103, the **discharge chute** shall be designed so as to prevent direct access to and accidental contact with the shredding means. Compliance shall be achieved according to one of the following:

1) where the highest edge of the discharge opening is less or equal than 350 mm from the ground, the highest edge of the discharge chute opening shall extend at least 3 mm below the lowest part of the cutting means and the requirements of a) and/or b) shall be fulfilled:

   a) where the distance of the lowest edge of the discharge chute is less than or equal to 30 mm from the ground (see Figures 3a) and 3b) dimension [1]), any point of the outer edge of the guard to the cutting means shall be at least 230 mm, measured as the shortest distance;

   b) where the distance of the lowest edge of the discharge chute is greater than 30 mm from the ground (see Figures 3a) and 3b) dimension [2]), any point of the outer edge of the guard to the cutting means shall be at least 550 mm, measured as the shortest distance;

   NOTE 1 These shortest distances can be achieved by chain measurement.

2) an operator presence control shall be provided and no point of the discharge chute is more than 350 mm from the ground. The highest edge of the discharge chute opening shall extend at least 3 mm below the lowest part of the cutting means, and the minimum distance from any point on the outer edge of the discharge chute to the cutting means shall be 230 mm (see Figures 3a) and 3b));

   NOTE 2 These shortest distances can be achieved by chain measurement.

3) a tilt switch which stops the shredding means when the machine passes its point of stability shall be provided and no point of the discharge chute is more than 350 mm from the ground. The highest edge of the discharge chute opening shall extend at least 3 mm below the lowest part of the cutting means, and the minimum distance from any point on the outer edge of the discharge chute to the cutting means shall be 230 mm (see Figures 3a) and 3b));

   NOTE 3 These shortest distances can be achieved by chain measurement.

4) where the highest edge of the discharge opening is greater than 350 mm from the ground, and the opening size is not more than 120 mm x 120 mm, the highest edge of the discharge chute opening shall extend at least 3 mm below the lowest part of the cutting means and the safety distance shall conform to the principles set out in EN ISO 13857:2008, Clause 4.2.4.1, or Clause 4.2.4.3 together with Table 4 as appropriate;

5) where the highest edge of the discharge opening is greater than 350 mm from the ground, and the opening size is larger than 120 mm x 120 mm, the highest edge of the discharge chute shall extend at least 3 mm below the lowest part of the cutting means and the safety distance shall be at least 850 mm. The maximum discharge opening size shall be 250 mm x 250 mm;

6) the highest edge of the discharge chute opening shall extend at least 3 mm below the lowest part of the cutting means and it shall not be possible to come into contact with the shredding means by using the test probe B of EN 61032:1998. The tip of the probe shall be inserted a maximum of 850 mm inside the discharge opening towards the shredding means, measured from the most unfavourable point on the discharge opening, with a force of not more than 20 N;

7) the **discharge chute** terminates in a collector, which is interlocked so that the access to the shredding means is prevented while the machine is running and it shall not be possible to come into contact with the shredding means using the test probe B of EN 61032:1998. If the collector contains openings, the tip of the probe shall be inserted a maximum of 850 mm inside these openings towards the shredding means, measured from the most unfavourable point on the discharge opening, with a force of not more than 20 N.

Compliance shall be checked by inspection and measurement with the machine on a smooth horizontal surface.

Dimensions in mm

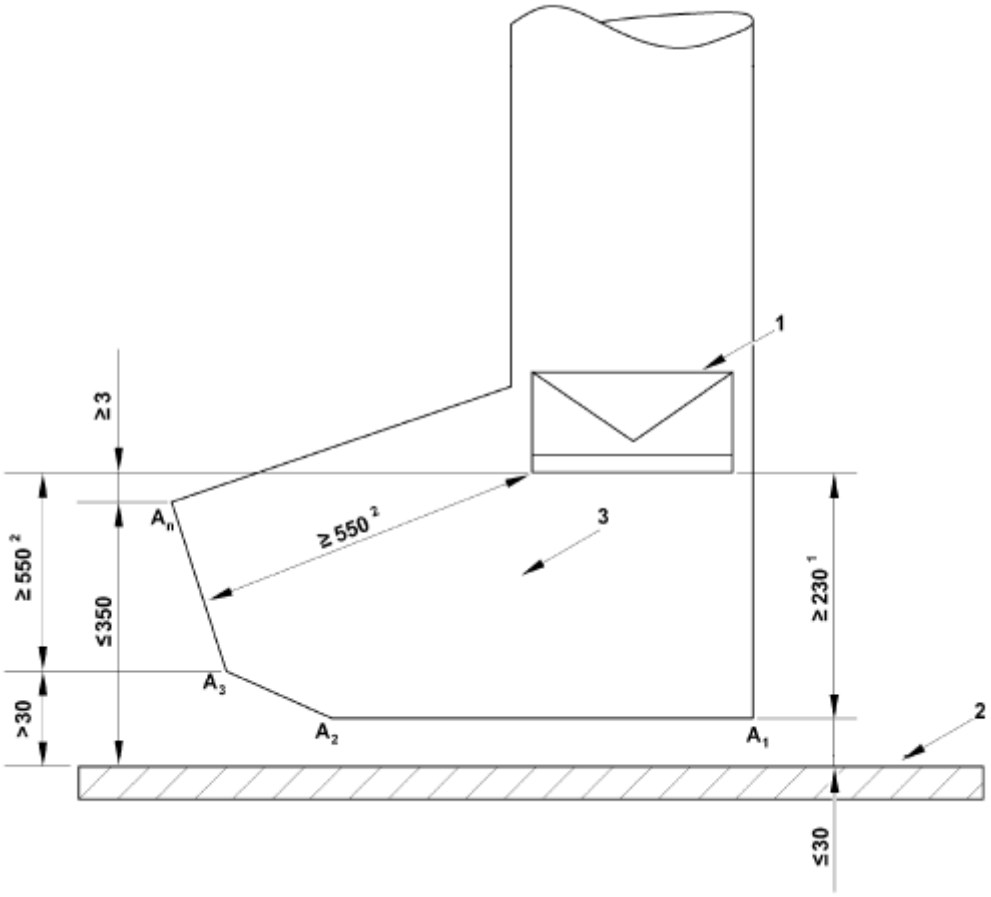


Figure 3a)

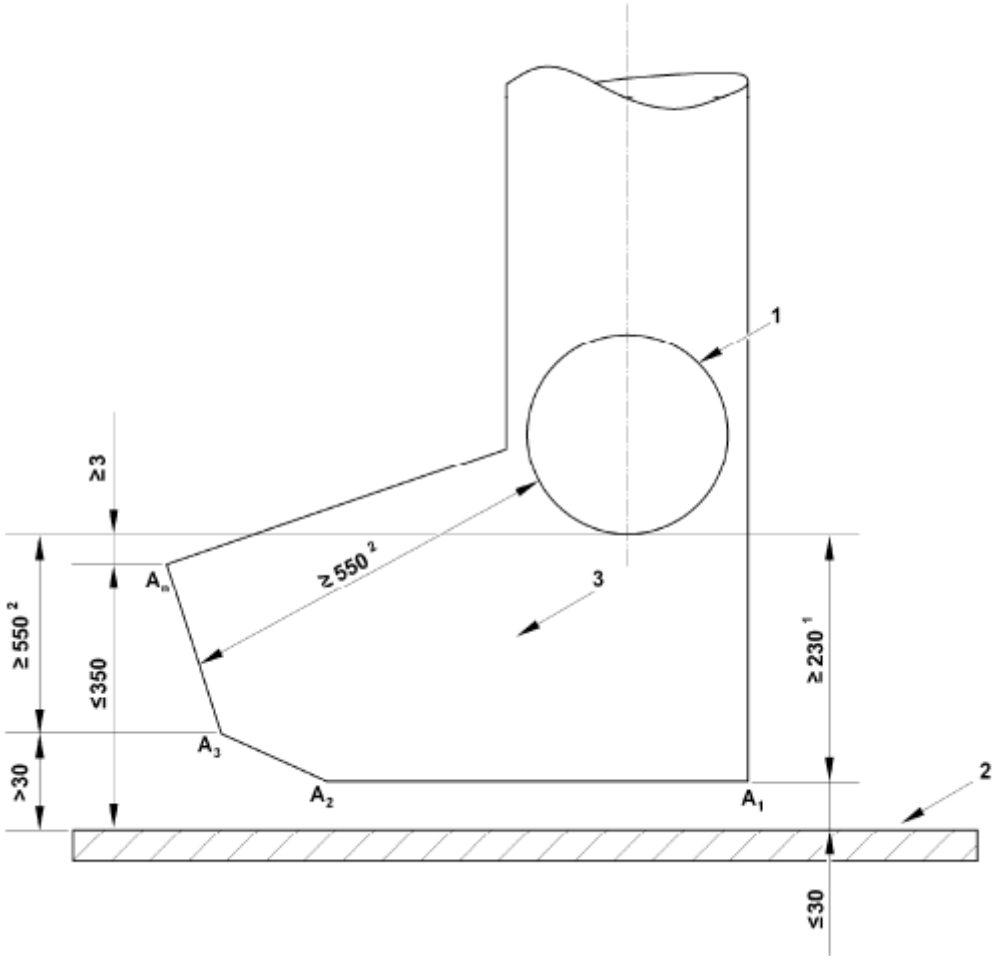


Figure 3b)

Key

1	shredding means
2	ground surface
3	discharge direction
A_1, A_2, A_3, …, A_n	points on discharge
[1]	If A_1, A_2 is ≤ 30 mm above the ground surface there shall be a safety distance of ≥ 230 mm to the cutting means, see 20.102 1) a)
[2]	If A3, …, An is > 30 mm above the ground there shall be a safety distance of ≥ 550 mm to cutting means, see 20.102 1) b)

Figure 3 - Examples of discharge chute distance requirements

20.103 Guards

20.103.1 Attachment

Guards allowing access to the shredding means shall be interlocked at least according to required Performance Level b of EN ISO 13849-1:2008, to cause the moving parts to come to a complete rest before access by the test finger of test probe B of EN 61032:1998 can be gained. The interlock function may be achieved by means of a switch with a contact separation of less than 3 mm. As a protection against the easy defeating of a switch used for the interlock, it shall not be possible to actuate the switch with the test finger of test probe B of EN 61032:1998 when the guard is open.

Compliance is checked by the methods given in EN ISO 13849-2:2012 and by manual tests using the test finger of test probe B of EN 61032:1998 with a force not exceeding

5 N for testing the actuation of the switch,

20 N for testing the accessibility to the moving parts.

While the shredding means are exposed it shall not be possible to drive the shredding means. Other guards shall be fixed guards and shall not be detachable without the use of tools, or the construction of the machine shall be such that it cannot be used without the guard in its guarding position. The fixings of removable guards shall be retained with the guard when it is removed.

Guarding shall be designed to prevent hazardous thrown objects. This shall be tested according to Clause 20.106.2.

Unless otherwise stated all guards shall conform to EN 953:1997+A1:2009, Safety of machinery - Guards - General requirements for the design and construction of fixed and moveable guards.

Fixed guards that the user is instructed to remove for regular maintenance shall have their fixing means retained on either the guard or the body of the machine.

Compliance is checked by inspection and shall be tested by functional test.

20.104 Controls

20.104.1 Location

Controls shall be accessible but not near to the discharge opening.

Compliance is checked by inspection.

20.104.2 Stopping and starting the power source

A control shall be provided to stop the shredding means. Reactivation of the power supply following a failure or disconnection shall not result in the shredding means moving or starting automatically. When a shredding means is stopped, for whatever reason, it shall not be possible for it to restart without manual and intentional operation of a control.

Compliance is checked by inspection.

20.105 Transport

For machines of mass greater than 25 kg two ground contacting wheels and a handle shall be provided to facilitate movement of the machine.

Compliance shall be checked by inspection.

20.106 Verification of safety requirements

20.106.1 Test conditions

Test personnel shall either be kept out of the test area or otherwise protected from the hazards resulting from the following tests.

The tests shall be carried out in the order presented in this standard. A new machine shall be used for each test if necessary.

The machine shall be completely assembled and shall rest on a horizontal surface and shall be operated at the **maximum operating speed**. Any component that can be removed without the use of tools shall be removed when conducting these tests. Machines shall be tested in the most unfavourable condition allowed by the instruction manual.

Where it is specified that the shredding means shall run during the tests, the **power source** shall be operated at the **maximum operating speed**.

20.106.2 Thrown object test (see Clause 20.103).

This test shall not be applied to machines where the shredding means rotates at speeds $\leq$ 300 min^{-1} when measured with the **power source** rotating at **maximum operating speed**.

20.106.2.1 Test enclosure

The thrown object test enclosure shall be constructed generally as shown in Figures 5 and 6. If, during testing the results show that there are test pieces or bits of test pieces ricocheting over the 2 000 mm high panels then the top of the enclosure shall be covered with an additional horizontal layer of Kraft paper over the whole assembly to provide a fully enclosed test environment and the testing restarted.

The base of the test enclosure shall be horizontal and the walls shall consist of eight target panels mounted perpendicular to the base so as to form an octagon as in Figure 4. Each target panel shall consist of a lower section of corrugated fibreboard and an upper section of Kraft paper. The lower sections of corrugated fibreboard shall extend from the base up to a height of and 900 mm and the Kraft paper shall extend from these lower sections up to a total height of 2 000 mm.

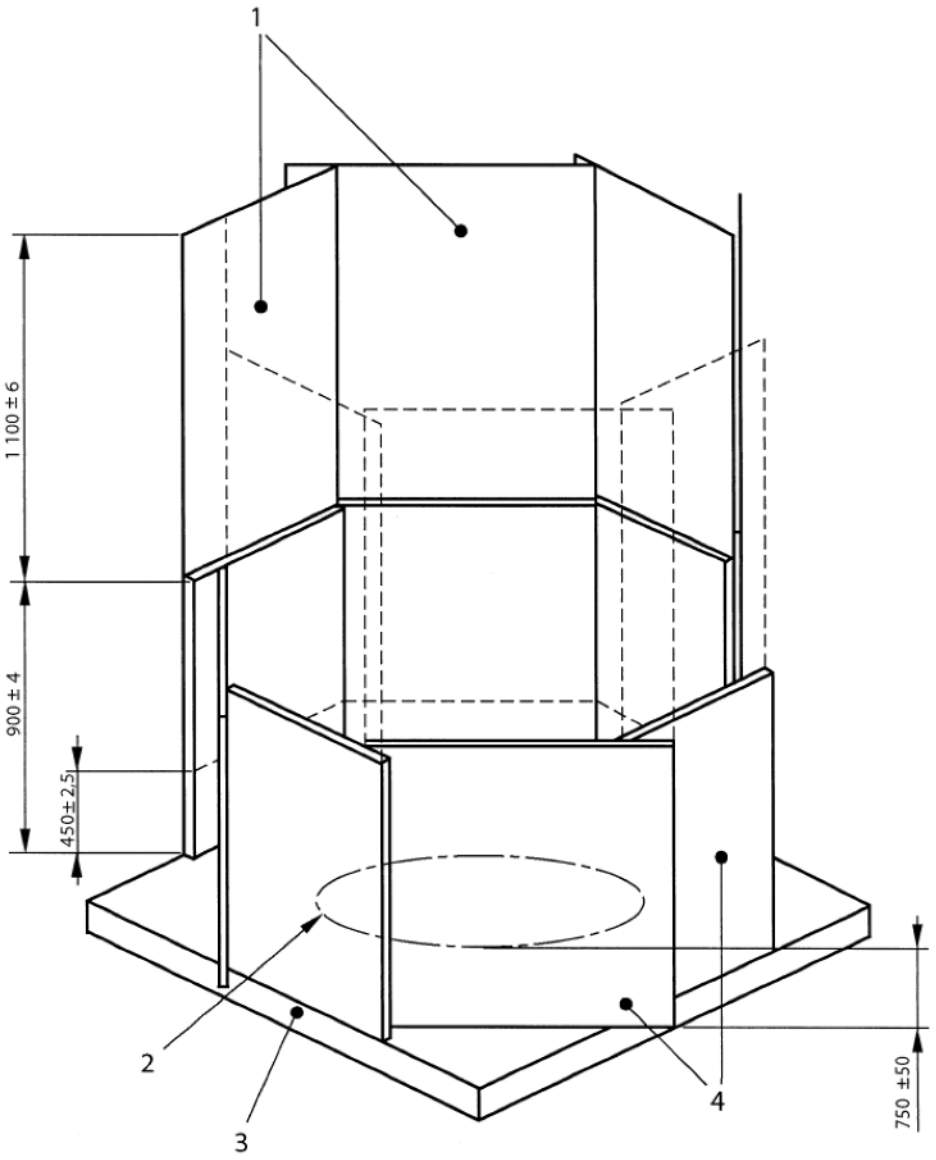
The composition of the base and the lower sections of the target panels shall meet the specifications given in Annex CC and Annex DD. The upper sections of the target panels and the top horizontal layer shall be of 80 g/m² Kraft paper stretched lightly over appropriately sized frames made of narrow section rigid material. The vertical target panels shall generally be located at right-angles to a radial line extending (750 ± 50) mm from the discharge opening(s) of the machine (see Figure 4). If any other part of the machine interferes with any part a target panel, the target panel shall be moved outwards just sufficiently to avoid the interference.

Inside the total enclosure additional target panels of 80 g/m² Kraft paper, fitted to a frame, shall be mounted (200 $\pm$ 10) mm above, and project at least 200 mm beyond, all sides of the **feed intake opening**(s). If the design of the machine and/or the enclosure prevents these distances from being maintained, these panels shall be arranged so as to achieve the closest possible dimensional compliance. See Figure 5.

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 of the vertical target panels.

A line parallel to the base and 450 mm high shall be marked on each target panel.

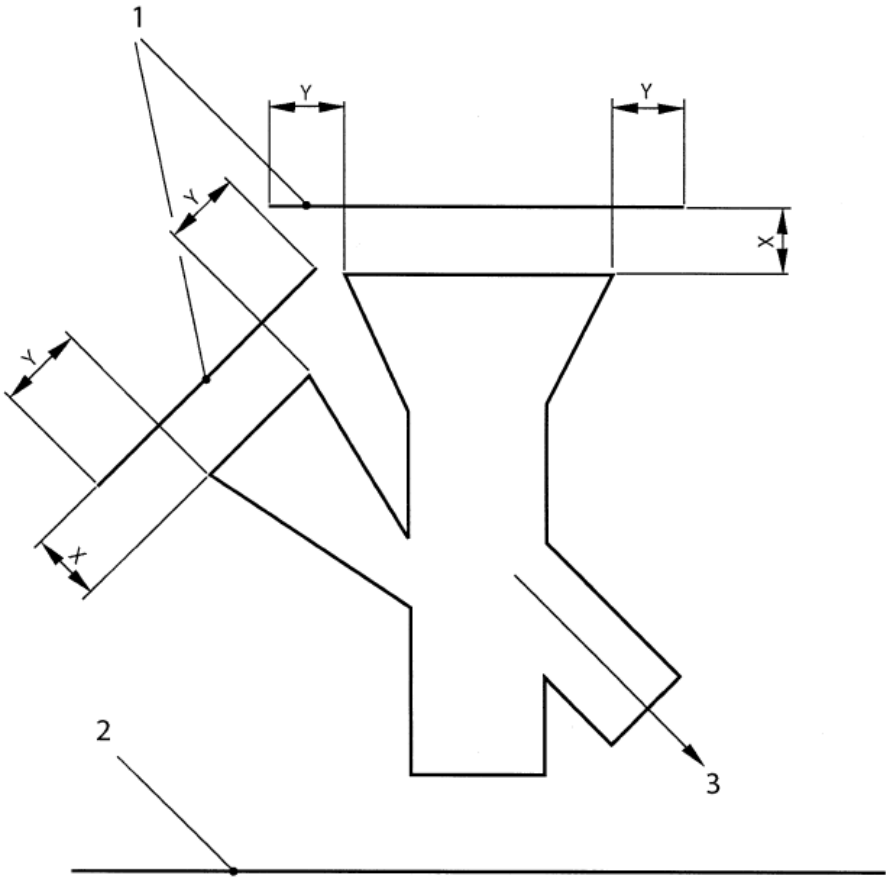
Dimensions in mm



Key

1 kraft paper (80 g/m^2) target panels extending full 360°
2 circle of radius = distance of discharge opening from the vertical centre-line of the machine
3 base (see Annex B and Figures B.1 and B.2)
4 corrugated fibreboard target panels (see Figure B.1 and Annex B)

Figure 4 - Thrown object test fixture - General layout



Key
1 kraft paper (80 g/m^2) target panels
2 base (see Annex B)
3 discharge direction

X = (200 ± 10) mm
Y ≥ 200 mm

Figure 5 - Kraft paper target panel placement

20.106.2.2 Test method

All moveable guards shall be adjusted to the position of greatest opening or discharge (worst condition). The machine shall be placed centrally on the test enclosure base.

For each **feed intake opening** 50 test pieces (beech wood dowels (or equivalent) ($20 \pm 0{,}5$) mm diameter and 50 mm long) shall be fed in, one at a time, at a rate which is slow enough to ensure that the machine does not jam.

The machine shall be stopped 10 min after all test pieces have been fed into the **feed intake opening**(s) or when all projectiles have been fully processed and discharged by the machine.

20.106.2.3 Test results

Determine if any hits occurred on the Kraft paper target panel above the **feed intake opening**(s) or on the vertical target panels. A hit shall be recorded if the test piece or any part of it has passed completely through a target panel. In cases of doubt the penetrator that is used to evaluate the corrugated fibreboard panels in Annex DD (see Figure DD.1) shall be used to determine if a hit has been made. Any test pieces or bits of test pieces shall be removed from the machine side of the panel and then, with the panel held horizontally, the ball end of the penetrator shall be applied vertically to each impact area under its own weight. A hit shall be counted if the whole of the ball end of the penetrator passes through the panel.

Replace the target panels if hits from previous tests leave holes that cannot be covered by a 40 mm square gummed label. Not more than one thickness of gummed labels, used as patches, shall be placed over any one area.

20.106.2.4 Test acceptance

A machine shall have passed the test if all of the following criteria are satisfied:

- there are no hits for the Kraft paper target panels above the **feed intake openings**;
- there are no hits for the horizontal Kraft paper target panel covering the whole test enclosure;
- there are not more than five hits between the base and the 450 mm line for the vertical target panels;
- there are no hits above the 450 mm line for the vertical target panels.

In the event of a test failure, two additional identical machines shall be tested. If either of the additional machines fails a test, the model shall have failed the test.

20.106.3 Stability

Shredders/chippers shall be stable for all use conditions.

20.106.3.1 Test method

The machine shall be placed, free standing, on a tilt table. Attachments, adjustable features, debris collectors etc. shall be placed in their most unfavourable position. Wheels shall be set in their most unfavourable position and chocked as necessary. The tilt table axis shall be set to 10° to the vertical and rotated slowly through 360°.

20.106.3.2 Test acceptance

The machine shall not tip over.

20.106.4 Dynamic stability test

20.106.4.1 Test method

A welded or seamless mild steel tube nominally 30 mm in diameter and 400 mm long with a nominal wall thickness of 3 mm shall be inserted quickly into the **feed intake opening** of the machine in an unsupported manner. Machines having more than one **feed intake opening** shall have the test conducted with a new tube at each opening. The tube shall be bent as required to engage with the **shredding means**.

If a **feed intake opening** of less than 30 mm exists a tube of adequate diameter and length shall be used.

If the machine does not stop in 15 s, the test shall be concluded. A new machine shall be tested for each **feed intake opening**.

20.106.4.2 Test acceptance

The machine shall remain standing in its operating position and shall not tip over in any direction.

Additionally no parts of the machine shall be ejected except through the **discharge chute** and no part of the machine necessary for compliance with this standard shall become detached or deformed so that it no longer complies with the standard. It is not required that the machine be suitable for use after the test. Ejection of small chips of machine parts not exceeding 2 g shall be ignored.

20.107 Noise

20.107.1 Noise reduction as a safety requirement

20.107.1.1 Noise reduction at source by design and by protective measures

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

– air intake system;

– cutting system;

– vibrating surfaces.

EN ISO 11688-1:2009 gives general technical information on widely recognised technical rules and means to be followed in the design of machines with low-noise emission.

The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values (see Annex FF) in relation to other machines of the same family.

20.107.1.2 Noise 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 hazardous noise levels and recommend the use of hearing protection.

20.107.2 Verification of requirements on noise – Noise measurement

For the determination of the sound power level and of the emission sound pressure level at the operator's position the noise test code given in Annex FF shall be used.

21 Mechanical strength

This clause of Part 1 is applicable except as follows:

3rd paragraph *Modification:*

The impact energy shall be (1,0 ± 0,05) J.

21.101 Strength

Guards shall have adequate strength and be constructed to withstand such rough handling that may be expected in **normal use**. Guards shall be checked by the following test.

Each of three samples of the complete machine shall be subjected to an impact of (6,5 ± 0,2) J on a part of the relevant guard likely to be the weakest, with the machine standing on a level surface.

The tests shall be so conducted that in each test the sample receives an impact in a location different from the other two tests.

The impact shall be produced with a smooth solid steel sphere (as used for ball bearings) having a diameter of 50 mm. If the part being tested is at an angle of up to 45° to the horizontal, the sphere shall be allowed to fall vertically from rest to strike the part. Otherwise, the sphere shall be suspended by a cord and shall be allowed to fall from rest as a pendulum to strike the part. In either case, the vertical travel of the sphere shall be 1,3 m.

After the test there shall be no visible signs of cracking and the requirements of Clause 20.102 and 20.103 shall be maintained.

22 Construction

This clause of Part 1 is applicable except as follows:

22.6 *Addition:*

Any drain holes provided to prevent accumulation of water in an enclosure shall be at least 5 mm in diameter or 20 mm^2 area with a width of at least 3 mm.

Compliance is checked by inspection and measurement.

22.101 *If air filters are required to prevent the ingress of airborne particles likely to give rise to a fire hazard and if they* can be removed for cleaning purposes they shall be so designed that they are unlikely to come off in **normal operation**. This requirement is met if, for example, the air filters

– can only be removed with the aid of a tool, or

– is provided with a spring that prevents it from falling away in **normal operation** due to vibration, or

– needs a deliberate action of the user for its removal.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows:

24.1.3 *Modification:*

Switches shall be tested for at least 10 000 operations.

25 Supply connection and external flexible cables and cords

This clause of Part 1 is applicable except as follows:

25.1 *Replacement:*

Machines shall be provided with a power supply cable or an appliance inlet.

Appliance inlets shall not allow the introduction of a connector complying with publication EN 60320 except EN 60320-2-3.

25.5 *Addition:*

Machines shall be provided with one of the following:

– a supply cord with type X attachment; or

– a supply cord of length not exceeding 0,5 m with type X or Y attachment and terminating in a cable coupler;

– an appliance inlet.

25.6 *Replacement:*

Power **supply cords** and extension cords for machines shall be not less than:

– if rubber insulated, ordinary polychloroprene sheathed flexible cord (code designation HO5 RN-F);

– if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation HO5 VV-F).

Compliance is checked by inspection.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part -1 is applicable.

29 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable except as follows:

29.2 *Addition:*

Pollution degree 3 applies to this machine.

30 Resistance to heat, fire and tracking

This clause of Part -1 is applicable.

31 Resistance to rusting

This clause of Part -1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is not applicable.

Annexes

The annexes of Part 1 are applicable except as follows:

Annex B

This annex of Part 1 is not applicable.

Annex AA
(normative)

Safety signs

AA.1 General

The safety signs, which may be used, on hand fed electrically powered **shredder/chippers** as defined in this European Standard are presented in this annex.

The symbols should follow the conventions laid down in EN ISO 3767-1, EN ISO 3767-3, EN ISO 3767-5 and EN ISO 7010 while the pictograms should follow the conventions presented in ISO 11684.

The symbol or pictogram size may be modified to fit a specific machine design. The pictograms or symbols presented are not all-inclusive.

AA.2 Illustrations of safety signs

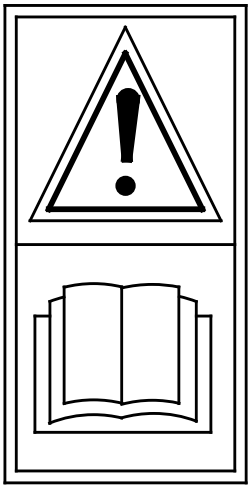


Figure AA.1 - "Read operator's manual"

NOTE As alternatives symbols 1641 of ISO 7000 or symbol M002 of EN ISO 7010 may be used in the lower panel.

Figure AA.2 - "Danger - Rotating blades. Keep hands and feet out of openings while machine is running"

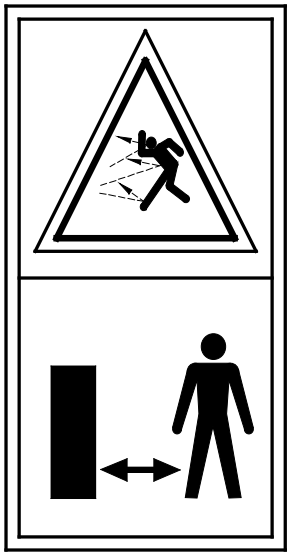


Figure AA.3 - "Keep bystanders away"

Figure AA.4 - "Wear hearing protection"

Figure AA.5 - "Wear eye protection"

Figure AA.6 - "Wear eye and hearing protection"

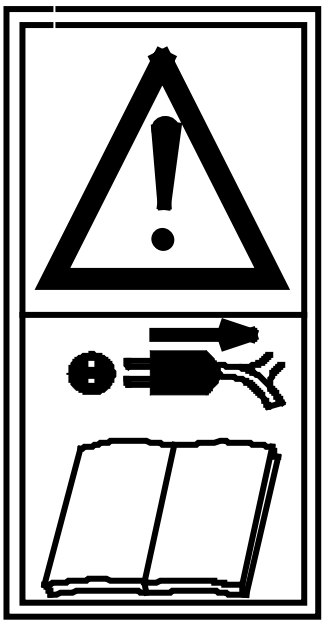


Figure AA.7 - "Switch off and remove plug from mains before adjusting, cleaning or if the cord is entangled or damaged"

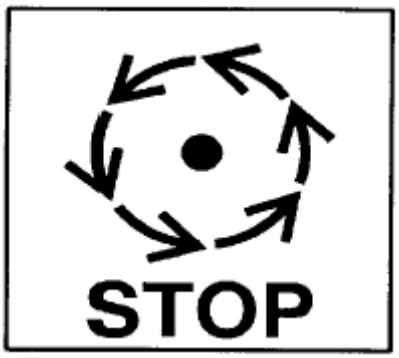


Figure AA.8 - "Wait until all machine components have completely stopped before touching them"

Figure AA.9 - "Do not use as a step"

Annex BB
(informative)

Methods of combining round, square and slot shapes ≤ 50 mm complying with safety distance ≥ 200 mm

Dimensions in mm

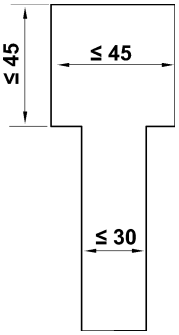


Figure BB.1

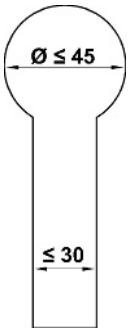


Figure BB.2

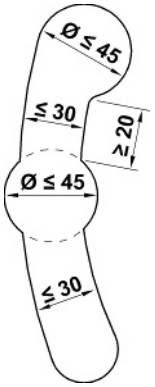


Figure BB.3

Figures BB.1 - BB.3 - Opening sizes ≤ 45 mm

Dimensions in mm

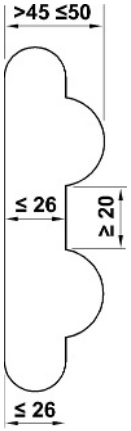


Figure BB.4

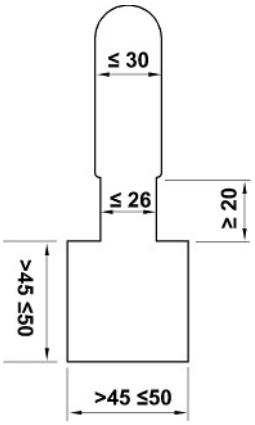


Figure BB.5

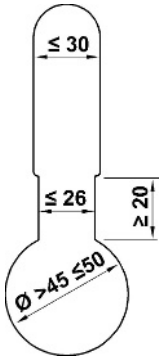


Figure BB.6

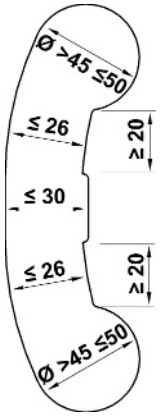


Figure BB.7

Figures BB.4 - BB.7 - Opening sizes > 45 ≤ 50 mm

Dimensions in mm

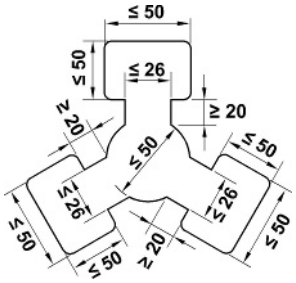


Figure BB.8 - Opening sizes ≤ 50 mm, pinch point ≤ 26 mm

Annex CC
(normative)

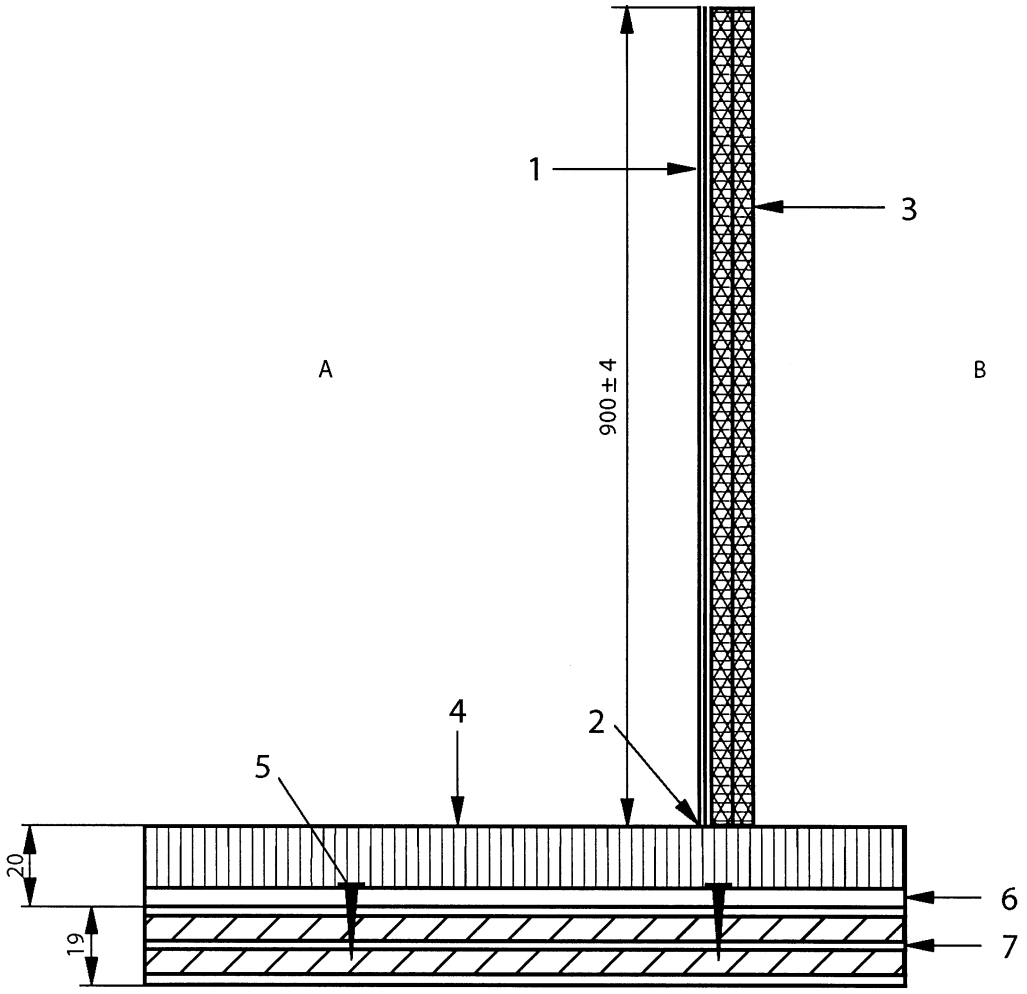
Test enclosure

The test enclosure base specified in 4.6.2.1 shall consist of 19 mm plywood covered with coconut matting. The minimum base size shall be sufficient to support the whole of the enclosure area as shown in Figure 4. The coconut matting shall have approximately 20 mm high fibres embedded in a PVC base weighing approximately 7 000 g/m². The general construction of the test enclosure shall be as shown in Figure CC.1.

500 mm squares of coconut matting may be used so that, should wear develop the worn area can be replaced without replacing the entire test surface. In that case the squares should be nailed to the plywood, with nails spaced as shown in Figure CC.2.

NOTE The coconut matting surface may be covered with a light flexible plastic sheet to assist in clean up of discharged wood chips on the condition that it does not affect the test results.

Dimensions in mm
(all dimensions are nominal unless otherwise stated)



Key

A Inside of test enclosure

B Outside of test enclosure

1 Kraft paper, used if necessary and spot glued to the inside surface of the target panels to ensure close proximity over the whole area

2 Target panels inside edges fit snugly to base surface to prevent balls from escaping from test enclosure

3 Target panels made of double flute corrugated fibreboard of 9 mm maximum thickness with flutes running vertically

4 Coconut matting

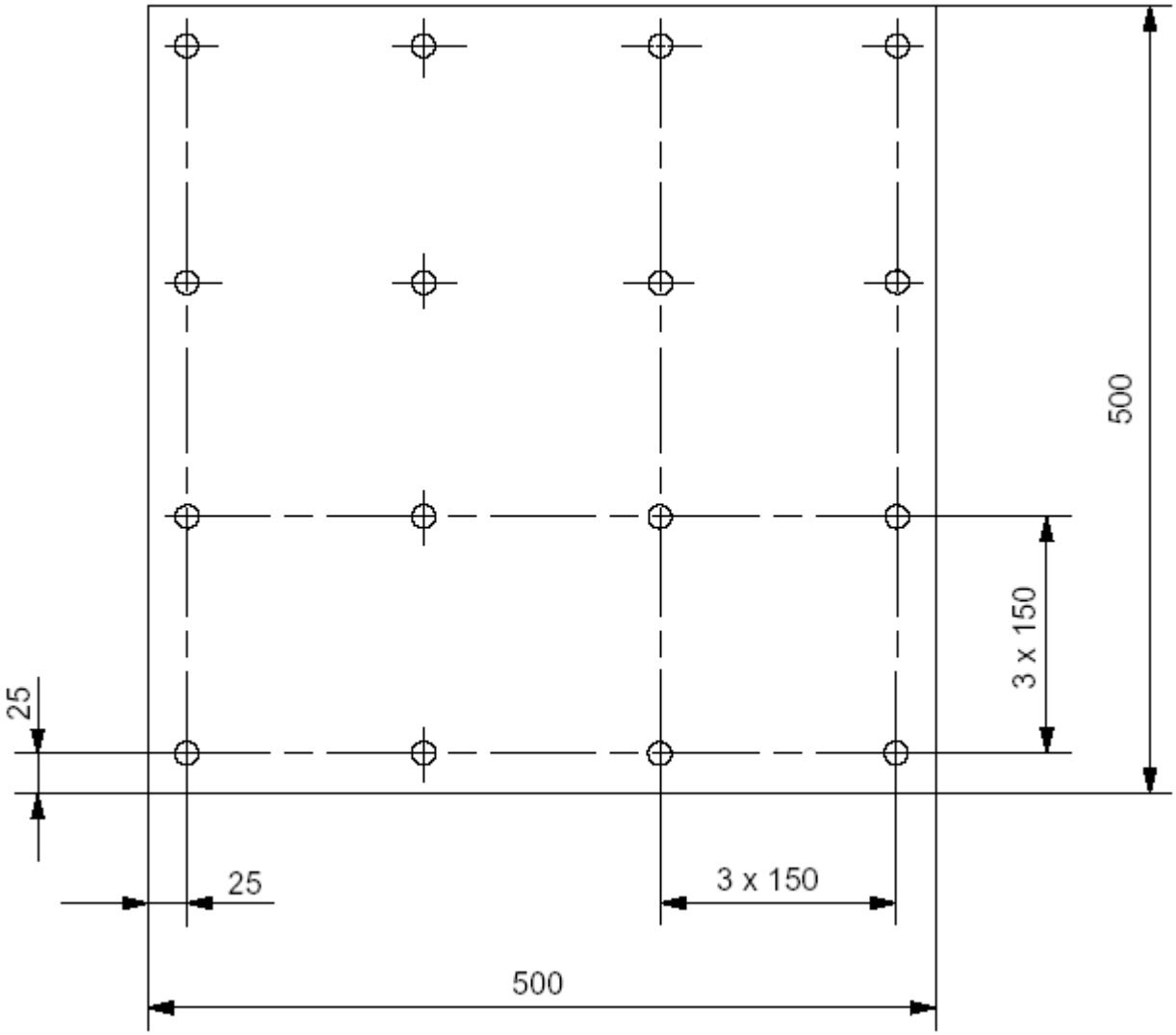
5 Nail

6 PVC base for coconut matting

7 Plywood base

Figure CC.1 - Test enclosure walls and base (not to scale)

Dimensions in mm



NOTE 1 Dimensions shown are approximate.

NOTE 2 The coconut matting surface may be covered with a light flexible plastic sheet to assist in clean up of discharged wood chips on the condition that it does not affect the test results.

500 squares of coconut matting may be used so that, should wear develop the worn area can be replaced without replacing the entire test surface. In that case the squares should be nailed to plywood with nails spaced as shown in Figure BB.2.

Figure CC.2 - Nail plan of test fixture base if 500 mm squares are used

Annex DD
(normative)

Target panels - Specification for corrugated fibreboard

DD.1 Corrugated fibreboard target panel composition

Each corrugated fibreboard target panel shall consist of one of the following:

- a single sheet of corrugated fibreboard;
- a single sheet of corrugated fibreboard with extra sheets of Kraft paper added in front of the target face;
- two sheets of corrugated fibreboard stacked together. The corrugated fibreboard construction may have two or three liners and have one or two flutes.

DD.2 Corrugated fibreboard penetration test

DD.2.1 General

The purpose of the penetration test is to provide a means of selecting a uniform target material for thrown object tests.

DD.2.2 Test fixture

The penetration test fixture shall be in accordance with Figure DD.1.

DD.2.3 Corrugated fibreboard samples

The corrugated fibreboard shall be cut into squares of 150 mm per side.

DD.2.4 Procedure

Immediately before and after the thrown object test is carried out, ten samples of the corrugated fibreboard shall be tested and the requirements of DD.2.5 shall be met.

Place a corrugated fibreboard square centrally on the bottom plate of the test fixture. The square may be secured at the edges by tape or adhesive. Cover with the top plate and make sure that the centre holes of the top and bottom plates are aligned and that the corrugated fibreboard is flattened by the steel top plate.

Raise the penetrator and allow it to fall onto the corrugated fibreboard samples.

DD.2.5 Acceptance criteria

The corrugated fibreboard shall be considered suitable for use as target panel material in the thrown object test of 4.6.2 if

- when dropped 300 mm, the spherical end of the penetrator does not penetrate completely through the test sample on more than two out of five drops, and
- when dropped 400 mm. the spherical end of the penetrator does penetrate completely through the test sample in at least four out of five drops.

If the penetrator penetrates the corrugated fibreboard more than the permitted number of times when dropped 300 mm, sufficient sheets of Kraft paper shall be added to the target face of the corrugated fibreboard in order to meet penetration requirements.

Dimensions in mm

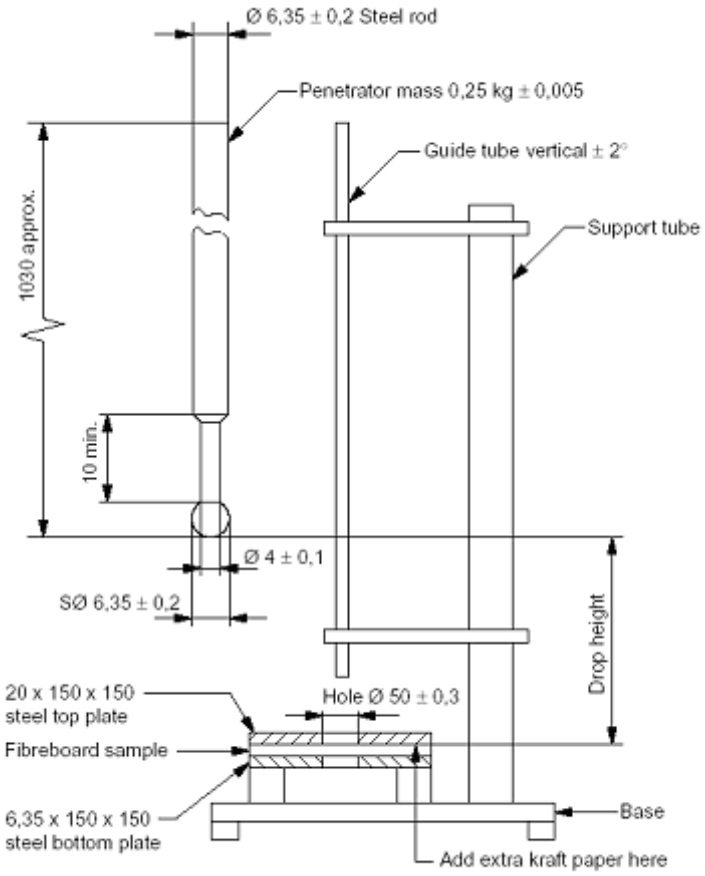


Figure DD.1 - Test fixture for corrugated fibreboard penetration test

Annex EE
(informative)

Safety instructions for shredders/chippers

EE.1 General

This annex presents safe operating practices for hand fed, powered shredders and/or chippers.

These practices are not all inclusive. The substance of these requirements should be provided with each machine as appropriate and tailored to the specific type of machine.

It should also include information concerning noise and vibration levels and any necessary warnings, together with the following:

IMPORTANT
READ CAREFULLY BEFORE USE.
KEEP FOR FUTURE REFERENCE.

EE.2 Safe operating practices for powered shredder/chipper

EE.2.1 Training

a) Read the instructions carefully. Be familiar with the controls and the correct use of the machine.

b) Never allow children or people unfamiliar with these instructions to use the machine. Local regulations can restrict the age of the operator.

c) Keep in mind, that the operator or user is responsible for accidents or hazards occurring to other people or their property.

EE.2.2 Preparation

a) Obtain ear protection and safety glasses. Wear them at all times while operating the machine.

b) While operating the machine always wear substantial footwear and long trousers. Do not operate the machine when barefoot or wearing open sandals. Avoid wearing clothing that is loose fitting or that has hanging cords or ties.

c) Operate the machine in a recommended position and only on a firm, level surface.

d) Do not operate the machine on a paved or gravel surface where ejected material could cause injury.

e) Before using, always visually inspect to see, that the **shredding means**, **shredding means** bolts and other fasteners are secure, the housing is undamaged and that guards and **screens** are in place. Replace worn or damaged components in sets to preserve balance. Replace damaged or unreadable labels.

f) Before use check the supply and extension cord for signs of damage or aging. If the cord becomes damaged during use, disconnect the cord from the supply immediately. DO NOT TOUCH THE CORD BEFORE DISCONNECTING THE SUPPLY. Do not use the machine if the cord is damaged or worn.

g) Never operate the machine while people, especially children, or pets are nearby.

EE.2.3 Operation

a) Before starting the machine, make certain that the feeding chamber is empty.

b) Keep your face and body away from the **feed intake opening**.

c) Do not allow hands or any other part of the body or clothing inside the feeding chamber, **discharge chute**, or near any moving part.

d) Keep proper balance and footing at all times. Do not overreach. Never stand at a higher level than the base of the machine when feeding material into it.

e) Always stand clear of the **discharge zone** when operating this machine.

f) When feeding material into the machine be extremely careful that pieces of metal, rocks, bottles, cans or other foreign objects are not included.

g) If the cutting mechanism strikes any foreign objects or if the machine should start making any unusual noise or vibration, immediately shut off the **power source** and allow the machine to stop. Disconnect the machine from the supply and take the following steps before restarting and operating the machine:

   i) inspect for damage;

   ii) replace or repair any damaged parts;

   iii) check for and tighten any loose parts.

h) Do not allow processed material to build up in the **discharge zone**; this may prevent proper discharge and can result in kickback of material through the **feed intake opening**.

i) If the machine becomes clogged, shut-off the **power source** and disconnect the machine from supply before cleaning debris.

j) Never operate the machine with defective guards or shields, or without safety devices, for example debris collector in place.

   NOTE If a debris collector is not used the text of the example may be deleted.

k) Keep the **power source** clean of debris and other accumulations to prevent damage to the **power source** or possible fire.

l) Do not transport this machine while the **power source** is running.

m) Stop the machine, and remove plug from the socket. Make sure that all moving parts have come to a complete stop

   - whenever you leave the machine,

   - before clearing blockages or unclogging chute,

   - before checking, cleaning or working on the machine.

n) Do not tilt the machine while the **power source** is running.

EE.2.4 Maintenance and storage

a) When the machine is stopped for servicing, inspection, or storage, or to change an accessory, shut off the **power source**, disconnect the machine from the supply and make sure that all moving parts are come to a complete stop. Allow the machine to cool before making any inspections, adjustments, etc. Maintain the machine with care and keep it clean.

b) Store the machine in a dry place out of the reach of children.

c) Always allow the machine to cool before storing.

d) When servicing the **shredding means** be aware that, even though the **power source** is switched off due to the interlock feature of the guard, the **shredding means** can still be moved.

e) Replace worn or damaged parts for safety. Use only genuine replacement parts and accessorises.

f) Never attempt to override the interlocked feature of the guard.

EE.2.5 Additional safety instructions for units with bagging attachments

Switch-off the machine before attaching or removing the bag.

EE.2.6 Recommendation

The machine should be supplied via a residual current device (RCD) with a tripping current of not more than 30 mA.

Annex FF
(normative)

Noise test code – Engineering method (Grade 2)

FF.1 Scope

This noise test code specifies the information necessary to carry out efficiently and under standardized conditions the determination of the noise emission values of electrically powered **shredders/chippers**.

Noise emission characteristics include the emission sound pressure level at the operator position and the sound power level.

The determination of these quantities is necessary for:

– manufacturers to declare the noise emitted;

– comparing the noise emitted by machines in the family concerned;

– purposes of noise control at the source at the design stage.

The use of this noise test code ensures reproducibility of the determination of the noise emission characteristics within specified limits determined by the grade of accuracy of the basic noise measurement method used. Noise measurement methods allowed by this standard give results with Grade 2 of accuracy.

FF.2 A-weighted sound power level determination

For the determination of A-weighted sound power level, EN ISO 3744:2010 shall be used subject to the following modifications or additional requirements:

– the reflecting surface shall be replaced by an artificial surface which complies with Clause FF.4.1 or by natural grass which complies with Clause FF.4.2. Reproducibility of results using natural grass is likely to be lower than that required for Grade 2 of accuracy. In the case of dispute, measurements shall be carried out in the open air and on the artificial surface;

– the measurement surface shall be a hemisphere with a radius, *r*, of 4 m;

– the microphone array shall be six microphone positions as defined in Figure FF.1 and Table FF.1;

– the environmental conditions shall be within the limits specified by the manufacturers of the measuring equipment. The ambient air temperature shall be in the range from 5 °C to 30 °C and the wind speed shall be less than 8 m/s and preferably less than 5 m/s;

– for measurements in the open air K_{2A} shall be taken as 0;

– for measurements indoors the value of K_{2A}, determined without artificial surface and in accordance with EN ISO 3744:2010, Annex A, shall be $\leq$ 2 dB, in which case K_{2A} shall be taken as 0.

FF.3 A-weighted emission sound pressure level measurement

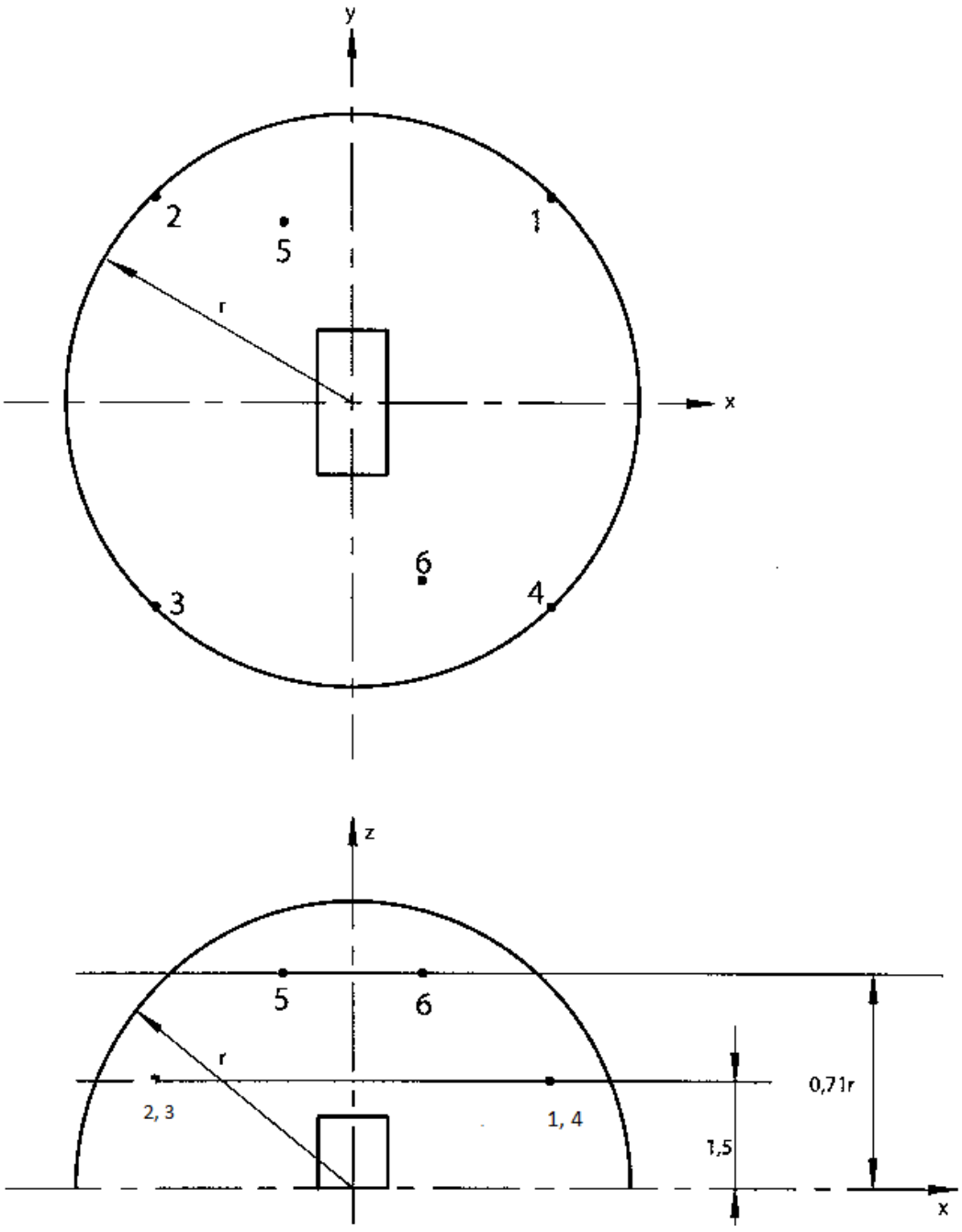
For the measurement of the A-weighted emission sound pressure level EN ISO 11201:2010 shall be used subject to the following modifications or additional requirements:

– the reflecting surface shall be replaced by an artificial surface which complies with FF.4.1 or by natural grass which complies with FF.4.2. Reproducibility of results using natural grass is likely to be lower than that required for Grade 2 of accuracy. In the case of dispute, measurements shall be carried out in the open air and on the artificial surface;

– the environmental conditions shall be within the limits specified by the manufacturers of the measuring equipment. The ambient air temperature shall be in the range from 5 °C to 30 °C, and the wind speed shall be less than 8 m/s and preferably less than 5 m/s;

– the microphone shall be mounted at a height of (1 550 ± 75) mm above the ground and positioned (700 ± 20) mm from the vertical centre line of the main feed intake opening as specified in Figure FF.2. If the discharge is centrally downwards the microphone shall be located in line with any auxiliary feed intake opening. If the discharge is not centrally downwards the microphone shall be positioned at 180° to the direction of the discharge.

Dimensions in mm



Key
r radius of hemisphere

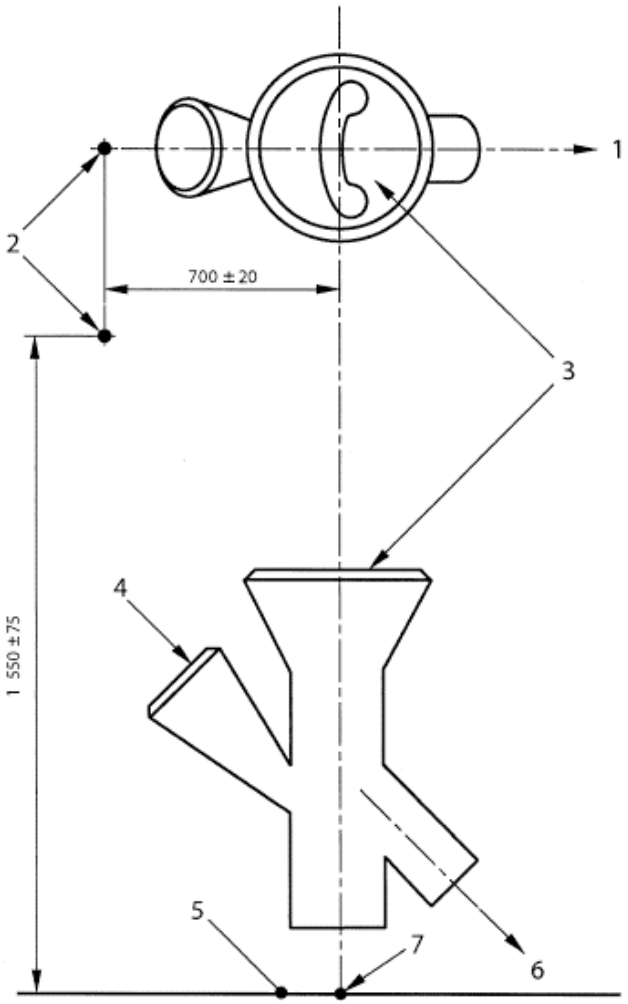
Figure FF.1 - Microphone positions on the hemisphere (see Table FF.1)

Table FF.1 - Co-ordinates of microphone positions

Position No.	*X/r*	*Y/r*	*Z*
1	+ 0,7	+ 0,7	1,5 m
2	- 0,7	+ 0,7	1,5 m
3	- 0,7	- 0,7	1,5 m
4	+ 0,7	- 0,7	1,5 m
5	- 0,27	+ 0,65	0,71 *r*
6	+ 0,27	- 0,65	0,71 *r*

Note Microphones numbered 1 to 4 are not exactly on the hemisphere but a little bit outside.

Dimensions in mm



Key

1 direction of discharge to be in line with the X-axis of the microphone co-ordinate system
2 microphone
3 main **feed intake opening**
4 auxiliary **feed intake opening**
5 ground surface
6 discharge direction
7 centre of microphone co-ordinate system

NOTE For purposes of clarity the machine is not drawn to scale and is shown without ground supports, etc.

Figure FF.2 - Microphone position for measurement of emission sound pressure level and location of machine with respect to the microphone co-ordinate system

FF.4 Requirements for test floor

FF.4.1 Artificial surface

The artificial surface shall have absorption coefficients as given in Table FF.2, measured in accordance with EN ISO 354:2003.

Table FF.2 - Absorption coefficients

Frequency Hz	Absorption coefficients	Tolerance
125	0,1	± 0,1
250	0,3	± 0,1
500	0,5	± 0,1
1 000	0,7	± 0,1
2 000	0,8	± 0,1
4 000	0,9	± 0,1

The artificial surface shall be placed on a hard, reflecting surface and have a size of at least 3,6 m x 3,6 m placed at the centre of the test environment. The construction of the supporting structure shall be such that the requirements for the acoustic properties are also met with the absorptive material in place. The structure shall support the operator to avoid compression of the absorbing material.

NOTE See Annex GG for example of a material and construction which can be expected to fulfil these requirements.

FF.4.2 Natural grass

The test environment shall be covered, at least for the horizontal projection of the measurement surface used, with high quality natural grass. Before the measurements are taken, the grass shall be cut with a mower to a height of cut as near as possible to 30 mm. The surface shall be clean of grass clippings and debris and shall be visibly free of moisture, frost and snow.

FF.5 Installation, mounting and operating conditions

Measurements shall be carried out on a new, normal production machine featuring standard equipment as provided by the manufacturer. If a collector is provided or available for the machine from the manufacturer, it shall not be fitted.

The machine shall be run until stable conditions are reached before the test is commenced; the rated voltage of the upper limit of the rated voltage range and/or frequency shall be maintained during the test at 0,98 to 1,02 times the stated values. The supply voltage is measured at the plug of the cable or cord supplied, not at the plug of any extension cable or cord.

The test shall be carried out at the **maximum operating speed** (see Clause 3.9).

A motor speed indicator shall be used to check the speed of the motor. It shall have an accuracy of ± 2,5 % of the reading. The indicator and its engagement with the **shredder/chipper** shall not affect the operation during the test.

The **shredder/chipper** shall be in the normal stationary position on a horizontal surface and shall be tested using two pieces of pine (12 x 24 x 200) mm with a moisture content of 18 % (± 3 %) for each test cycle. In the case that the machine being tested does not chip the test pieces the pieces shall be left inside the machine untouched by any outside means until the measurements have been completed.The operator shall stand in the designated operating position and shall drop the test pieces simultaneously into the **feed intake opening**. The operator shall remain stationary while the measurements are made. Where there is more than one **feed intake opening** each opening shall be tested separately. Measurements shall only be made while there are test pieces in the machine and shall be of not less than 10 s duration. If necessary additional pairs of test pieces may be dropped into the machine in order to achieve a 10 s measurement period. All results except that from the **feed intake opening** giving the highest result shall be disregarded.

For the sound power level determination, the **shredding means** shall be above the centre of the hemisphere. The operator shall not stand between the machine and any microphone.

NOTE These test pieces are different from that specified in the EU Directive 2000/14/EC on Noise of Equipment used Outdoors because it is known that these test pieces do give repeatable results as they do not significantly slow down the machine and are not influenced by the operator.

FF.6 Measurement uncertainty

The total measurement uncertainty of the emission sound pressure level respectively sound power level is depending on the standard deviation σ_{R0} given by the applied noise emission measurement method and the uncertainty associated with the instability of the operating and mounting conditions σ_{omc}. The resulting total uncertainty is then calculated from

$$\sigma_{tot} = \sqrt{\sigma_{R0}^2 + \sigma_{omc}^2}$$

NOTE σ_{tot} was formerly denoted as σ_R !

The upper bound value of σ_{R0} is about 1,5 dB for a grade 2 measurement method, assuming a noise source which emits sound without significant tones.

NOTE For machines with a rather constant noise emission a value of 0,5 dB for σ_{omc} can apply. In other cases, e.g. a large influence of the material flow into and out of the machine or material flow that varies in an unpredictable manner, it is possible that a value of 2 dB may be more appropriate. Methods to determine σ_{omc} are described in the basic measurement standards.

The expanded measurement uncertainty U, in decibels, shall be calculated from

$U = k\,\sigma_{tot}$, with k the coverage factor.

NOTE 1 The expanded measurement uncertainty depends on the degree of confidence that is desired. For the purpose of comparing the result with a limit value, it is appropriate to apply the coverage factor for a one-sided normal distribution. In that case, the coverage factor k = 1,6 corresponds to a 95 % confidence level. Further information is given in EN ISO 4871:2009.

NOTE 2 The expanded measurement uncertainty U is denoted as K in EN ISO 4871:2009.

NOTE 3 The expanded measurement uncertainty as described in this European Standard does not include the standard deviation of production which is used in EN ISO 4871:2009 for the purpose of making a noise declaration for batches of machines.

FF.7 Information to be recorded and reported

The information to be recorded and reported is that required by EN ISO 3744:2010 and EN ISO 11201:2010.

FF.8 Declaration and verification of noise emission values

The declaration of the sound pressure level shall be made as a dual value according to EN ISO 4871:2009. It shall declare the noise emission value L_{pA} and the associated uncertainty KpA.

The declaration of the A-weighted sound power level L_{WA} shall be made as a single number noise emission declaration according to EN ISO 4871:2009.

The noise emission values shall be rounded to the highest decibel.

The noise declaration shall state that the noise emission values have been obtained according to this noise test code and to the basic standards EN ISO 11201:2010 and EN ISO 3744:2010.

If this statement is not true, the noise emission declaration shall indicate clearly what the deviations are from this standard and/or from the basic standards.

If undertaken, verification shall be done according to EN ISO 4871: 2009 by using the same mounting, installation and operating conditions as those used for the initial determination of the noise emission values.

Annex GG
(informative)

Example of a material and construction fulfilling the requirements for an artificial surface

GG.1 Material

The material is a mineral fibre, 20 mm thick, having an airflow resistance of 11 kN s/m^4 and a density of 25 kg/m^3.

GG.2 Construction

As is shown in Figure GG.1, the artificial flooring of the measurement site is sub-divided into nine joint planes, each of approximately 1,20 m x 1,20 m. The backing layer (a) of the construction as shown in Figure GG.1 consists of chipboard, 19 mm thick, coated with a plastics material on both sides. Such boards are used, for example, for the construction of kitchen furniture. The cut edges of the chipboards should be protected against moisture by applying a coat of plastic paint. The outsides of the flooring are bordered by a two-legged aluminium section (d), its leg height being 20 mm. Sections of this profile material are also screwed to the edges of the joint planes where they serve as spacers and attachment points.

On the middle joint plane on which the machine is placed during measurement as well as any other place on which the operator can get to stand on, aluminium T-sections (c) with a leg length of 20 mm are mounted as spacers. These sections also provide exact markings which facilitate the alignment of the machine in the middle of the measurement site. The prepared boards are then covered with the insulating felt material (b) cut to size.

The felt flooring of the joint planes which are neither stood on nor driven over (type A surface in Figure GG.1) are covered with a simple wire mesh fastened to the edge strips and to the attachment points; for this purpose, the sections should be provided with holes. Thus, the material is adequately attached, but it remains possible to replace the felt material should it become soiled. As a wire mesh, a so-called aviary wire (e) with a mesh width of 10 mm and a wire diameter of 0,8 mm has proved to be suitable. This wire appears to protect the surface adequately without affecting the acoustic conditions.

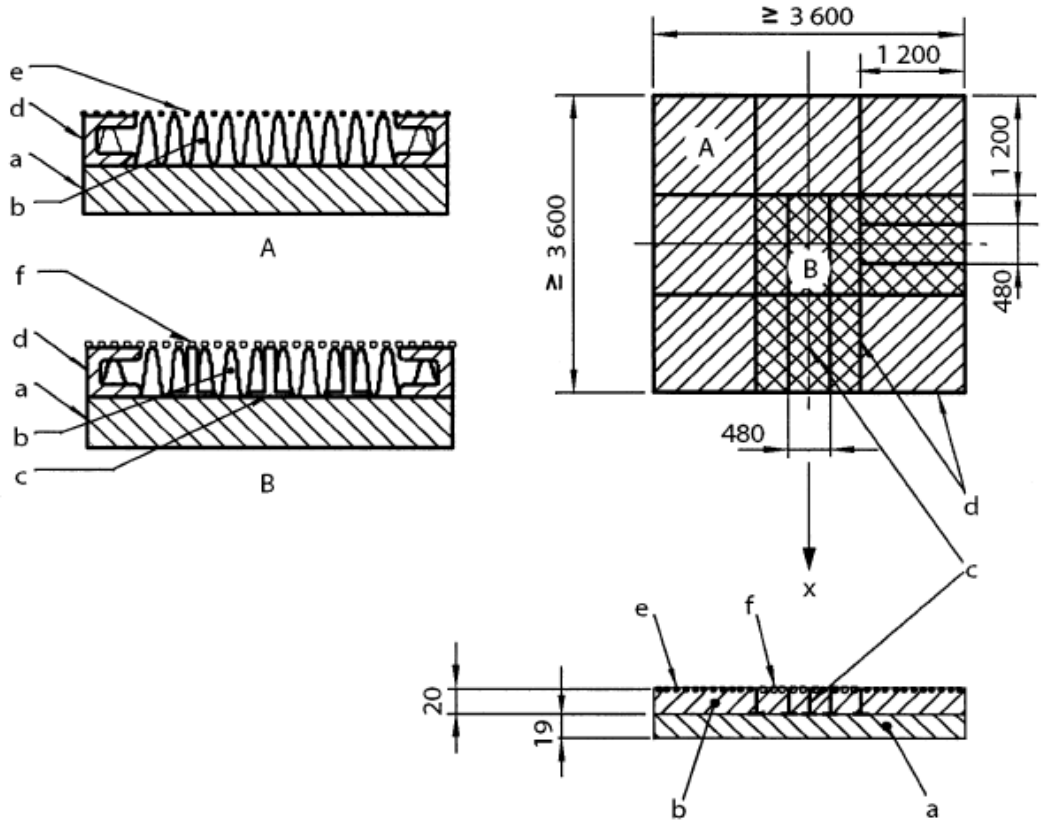
Protection by simple wire mesh is not, however, sufficient in the area subjected to traffic (type B surface in Figure GG.1). For these surfaces, the use of wire grating of corrugated steel wire (f) with a diameter of 3,1 mm and a mesh width of 30 mm has proved to be suitable.

The construction of the measurement site as described above offers two advantages: it can be prepared without much time and effort, and all the materials are easily obtainable.

The fact that the microphone positions are not situated directly above the flooring of the measurement site allows the microphones to be easily mounted on stands, assuming that the ground is even and hard as, for example, an asphalt or concrete site.

When arranging the microphones, account has to be taken of the fact that the height of the microphones has to be determined in relation to the surface of the flooring of the measurement site. It shall, therefore, be 40 mm higher when measuring from the ground under the microphone.

Dimensions in mm
(unless otherwise stated all dimensions are approximate)



Key

A this surface is not suitable to carry weight. Do not stand on or drive over
B this surface is suitable to carry weight. May be stood on or driven over
a backing layer of plastics coated chipboard (nominally 19 thick)
b mineral wool fibre layer (nominally 20 thick)
c aluminum T-sections (nominally 3 thick x 20 high)
d aluminum U-sections (nominally 3 thick x 20 high)
e wire mesh (nominally 10 x 10 mesh made of 0,8 diameter steel wire)
f wire grating (nominally 30 x 30 mesh made of 3,1 diameter steel wire)

Figure GG.1 - Sketch of the measurement surface covered with an artificial surface (not to scale)

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in EU Directive 2006/42/EC (Machinery Directive).

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Bibliography

The Bibliography of Part 1 is applicable except as follows:

Addition:

EN ISO 7010, *Graphical symbols — Safety colours and safety signs - Registered safety signs (ISO 7010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2012)*

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

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 3767-5, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 5: Symbols for manual portable forestry machinery*

ISO 11684, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

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