BS EN 609-1:2017

BSI Standards Publication

Agricultural and forestry machinery — Safety of log splitters

Part 1: Wedge splitters

bsi.

National foreword

This British Standard is the UK implementation of EN 609-1:2017. It supersedes BS EN 609-1:1999+A2:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AGE/29, Forestry machinery.

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

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Land- und Forstmaschinen - Sicherheit von Holzspaltmaschinen - Teil 1: Keilspaltmaschinen

This European Standard was approved by CEN on 2 October 2016.

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European foreword

This document (EN 609-1:2017) has been prepared by Technical Committee CEN/TC 144 "Tractors and machinery for agriculture and forestry", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2017, and conflicting national standards shall be withdrawn at the latest by June 2018.

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

This document supersedes EN 609-1:1999+A2:2009.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2006/42/EC.

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

EN 609, *Agricultural and forestry machinery — Safety of log splitters*, is currently composed with the following parts:

— *Part 1: Wedge splitters*;

— *Part 2: Screw splitters*.

The new edition of this standard proposes a new specific approach, which evaluates the dangers of specifically this type of machine. Machines have been divided into four categories, which are machines for short logs or long logs with splitting direction of horizontal or vertical to reflect the differences concerning safety issues.

The main changes in this new edition are the following:

— four (4) different machine categories, which all have machine specific safety requirements and options (Horizontal and Vertical – Long logs and Short logs);

— more specific interpretation of safety distances for these specific types of machines (EN 13857 and machine specific distances);

— specific requirements for log handling, which includes holding before, during and after the splitting, but also log lifting;

— improved ergonomic requirements, which consider the actual use of the machine;

— requirements for AOPD;

— requirements for hauling winches that can be, and often are, attached to the wedge splitters;

— new tests and verifications, how to interpret the standard.

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

Introduction

The structure of safety standards in the field of machinery is as follows:

a) type-A standards (basic standards) giving basic concepts, principles for design, and general aspects that can be applied to machinery;

b) type-B standards (generic safety standards) dealing with one or more safety aspects or one or more types of safeguards that can be used across a wide range of machinery:

   1) type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   2) type-B2 standards on safeguards (e.g. two-hand control device, interlocking devices, pressure-sensitive devices, guards);

c) type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This document is a type "C" standard as defined in EN ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

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

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

1 Scope

This European Standard specifies the safety requirements, and their verification for the design and construction of horizontal and vertical wedge splitters, designed for splitting logs for firewood, irrespective of the nature of the power source used. This standard deals with wedge splitters that are designed so that the splitting operation is activated by one person only, however it is foreseeable that other operators may be working with the machine e.g. for loading or unloading. In addition, it specifies the type of information on safe working practices to be provided by the manufacturer.

This document deals with all the significant hazards, hazardous situations and hazardous events relevant to these machines when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Table 1).

This document is not applicable to machines that are designed for both cutting into length for splitting and splitting for firewood.

This document is not applicable to wedge splitters which are manufactured before the date of publication of this document by CEN.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 349:1993+A1:2008, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body*

EN 574:1996+A1:2008, *Safety of machinery - Two-hand control devices - Functional aspects - Principles for design*

EN 691-1:2012, *Safety of woodworking machines - Part 1: Common requirements*

EN 894-1:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators*

EN 894-3:2000+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators*

EN 12965:2003+A2:2009, *Tractors and machinery for agriculture and forestry - Power take-off (PTO) drive shafts and their guards - Safety*

EN 14492-1:2006+A1:2009, *Cranes - Power driven winches and hoists - Part 1: Power driven winches*

EN 60204-1:2006, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2006)*

EN 60529:1991[1)], *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61496-1:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests (IEC 61496-1:2012)*

1) EN 60529:1991 is impacted by the stand-alone amendments EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013 and the corrigendum EN 60529:1991/corrigendum May 1993.

EN 61496-2:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

EN ISO 4254-1:2015, *Agricultural machinery - Safety - Part 1: General requirements (ISO 4254-1:2013)*

EN ISO 4413:2010, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)*

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

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850)*

EN ISO 13855:2010, *Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

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

EN ISO 14119:2013, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)*

EN ISO 14120:2015, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

ISO 3767-1:1998 [2)], *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 3767-2:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 2: Symbols for agricultural tractors and machinery*

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

2) ISO 3767-1:1998 is impacted by the stand-alone amendments ISO 3767-1:1998/Amd 1 2008 and ISO 3767-1:1998/Amd 2 2012.

3 Terms and definitions

For the purposes of this document the terms and definitions given in EN ISO 12100:2010 and the following definitions apply.

3.1
wedge splitter
machine in which the log is split as the result of being pressed between a wedge (i.e. the cutting tool of the machine) and a plate

Note 1 to entry: See Figures 1 to 4.

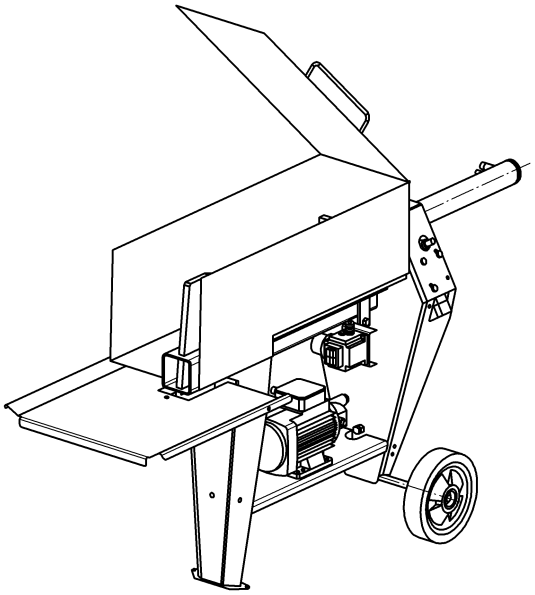


Figure 1 — Example of a horizontal short log wedge splitter

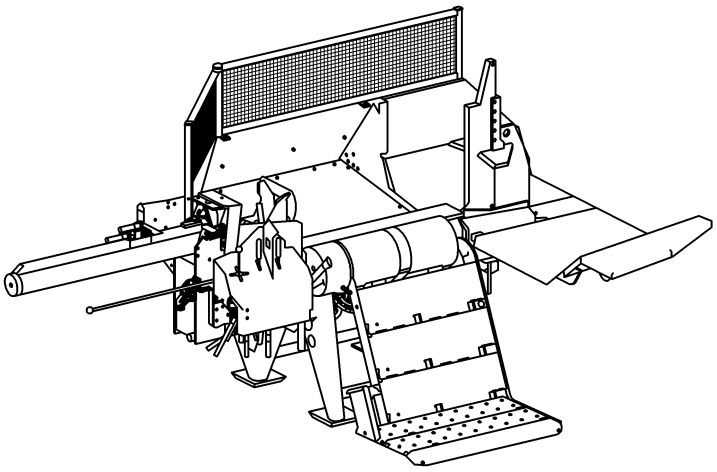


Figure 2 — Example of a horizontal long log wedge splitter

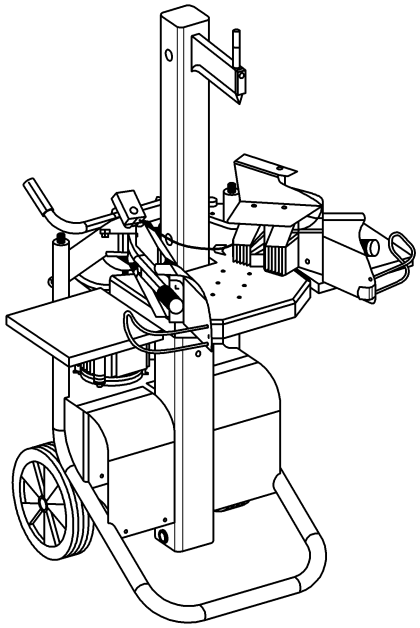


Figure 3 —Example of a vertical short log wedge splitter

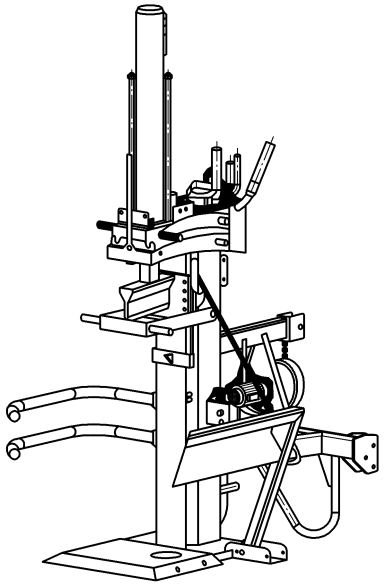


Figure 4 —Example of a vertical long log wedge splitter

3.2
horizontal wedge splitter
wedge splitter with an inclination of the splitting axis of between 0° to 30° to horizontal axis

3.3
vertical wedge splitter
wedge splitter with an inclination of the splitting axis of between 90° to 120° to the horizontal axis

3.4
automatic wedge splitter
wedge splitter in which, after the process is started, continuous feeding of the splitting zone, splitting of the log and the discharge of the splitting zone is carried out without further operator intervention

3.5
semi-automatic wedge splitter
wedge splitter, in which a single splitting process is started by the operator actuating a control and the splitting process is completed without further operator intervention

3.6
manual wedge splitter
wedge splitter in which a log is placed manually for splitting and the splitting movement is carried out using a hold-to-run device

3.7
short log wedge splitter
wedge splitter in which the space between the foremost point of the splitting wedge and the pressure plate or a log support plate is 550 mm or less

3.8
long log wedge splitter
wedge splitter in which the space between the foremost point of the splitting wedge and the pressure plate or a log support plate is greater than 550 mm

3.9
pressure plate
moving part of the machine which pushes the log against a wedge

3.10
wedge
stationary or moving tool which causes the log to split

3.11
log support plate
stationary part of the machine against which the log is pushed by the moving wedge

3.12
splitting zone
area in which the log is being split

3.13
splitting bed
part of a horizontal wedge splitter on which the log is placed for splitting

3.14
log handling device
part of a wedge splitter, which is used for positioning or lifting the log for splitting e.g. hoist or winch

3.15
AOPD
active optoelectronic protective device

4 List of significant hazards

Table 1 gives the significant hazard(s), the significant hazardous situation(s) and hazardous event(s) covered by this document that have been identified by risk assessment as being significant for this type of machine, and which require specific action by the designer or manufacturer to eliminate or reduce the risk.

Attention is drawn to the necessity to verify that the safety requirements specified in this document apply to each significant hazard presented by a given machine and to validate that the risk assessment is complete.

Table 1 — List of significant hazards

No	**Hazards, hazardous situations and hazardous events**	EN ISO 12100	**Relevant subclause of this document**
1	**Mechanical hazards** related to: - machine parts or work pieces:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.18
	b) relative location;		5.9, 5.10, 5.11, 5.12, 5.13, 5.18
	c) mass and stability (potential energy of elements which may move under the effect of gravity)		5.10, 5.12, 5.13, 5.16, 5.18
	d) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.9, 5.10, 5.11, 5.12, 5.13, 5.16, 5.18
	e) mechanical strength.		5.9, 5.10, 5.11, 5.12, 5.13, 5.16
	- accumulation of energy inside the machinery:		
	g) liquids and gases under pressure;	6.2.10, 6.3.5.4	5.7, 5.8
1.1	Crushing hazard		5.9, 5.10, 5.11, 5.12, 5.13, 5.17, 5.18
1.2	Shearing hazard		5.9, 5.10, 5.11, 5.12, 5.13
1.3	Cutting or severing hazard		5.9, 5.10, 5.11, 5.12, 5.13
1.4	Entanglement hazard		5.9, 5.10, 5.11, 5.12, 5.13, 5.16, 5.17.

No	**Hazards, hazardous situations and hazardous events**	EN ISO 12100	**Relevant subclause of this document**
1.5	Drawing-in or trapping hazard		5.9, 5.10, 5.11, 5.13, 5.16, 5.17
1.9	High pressure fluid injection or ejection hazard	6.2.10	5.7, 5.8
2	**Electrical hazards** due to:		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	5.2, 5.3, 5.7.1
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.2, 5.3, 5.7.1
8	**Hazards generated by neglecting ergonomic principles in machinery design** related to:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8.2, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.3, 5.16
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.3, 5.16
8.4	Local lighting	6.2.8.6	7.3
8.6	Human error, human behaviour	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	7.3
8.7	Design, location or identification of manual controls	6.2.8.7, 6.2.11.8	5.3
8.8	Design or location of visual display units	6.2.8.8, 6.4.2	5.3
9	**Combination of hazards**	6.3.2.1	5.7
10	**Unexpected start up, unexpected overrun/over speed** (or any similar malfunction) from:		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.3.2, 5.4, 5.7
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.3.2, 5.4, 5.7, 5.8
10.3	External influences on electrical equipment	6.2.11.11	5.3, 5.7.1
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, See 8.6)	6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4.3	5.3, 7.3
11	**Impossibility of stopping the machine in the best possible conditions**	6.2.11.1, 6.2.11.3, 6.3.5.2	5.3, 5.4, 5.5, 5.7

No	Hazards, hazardous situations and hazardous events	EN ISO 12100	Relevant subclause of this document
13	**Failure of the power supply**	6.2.11.1, 6.2.11.4	5.3.2, 5.7
14	**Failure of the control circuit**	6.2.11, 6.3.5.4	5.3.2
15	**Errors of fitting**	6.2.7, 6.4.5	7.3
16	**Break-up during operation**	6.2.3	5.3.2, 7.3
17	**Falling or ejected objects or fluids**	6.2.3, 6.2.10	5.8, 5.9, 5.10,
18	**Loss of stability / overturning of machinery**	6.3.2.6	5.10, 5.12, 5.13, 5.15, 5.16, Annex D

5 Safety requirements and/or protective measures

5.1 General

Machinery shall comply with the safety requirements and/or protective measures of Clause 5. The machine shall also be marked in accordance with 7.2 and shall be provided or equipped with warnings in accordance with 7.3.

In addition, the machine shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

On a wedge splitter, which can be used both in the horizontal and vertical position, all requirements for both systems shall be fulfilled.

Access to the rotating or moving parts shall be prevented. Guarding, see EN ISO 14120 for fixed and movable guards, shall comply with EN ISO 13857:2008, Tables 1, 3, 4 and 6.

5.2 Electrical equipment

The electrical equipment of electrically driven machines shall comply with EN 60204-1.

The degree of protection of all electrical components shall be a minimum of IP54, and IP 44 for the plug and main switch box in accordance with EN 60529.

See 7.3.2 w) for the use of portable residual current device.

5.3 Control systems

5.3.1 General

Unless otherwise specified in this document controls shall be at least category 1 in accordance with EN ISO 13849-1:2015, 6.2.4.

Log splitters shall be equipped with only one control station.

5.3.2 Reliability of the control systems

The safety-related functions are generally composed of an input portion (e.g. control levers, position sensors, guards or protective devices), a logic part and an outlet part (e.g a motor). These functions shall meet the requirements of EN ISO 13849-1 and performance level as follows:

1) emergency stopping function: PL = c (see 5.5);

2) interlocking movable guard stop function: PL = c;

3) two-hand control device function: PL = c (see 5.6);

4) AOPD stop function: PL = d;

5) log-handling device function: PL = c (see 5.12).

5.3.3 Ergonomic requirements of control actuators

5.3.3.1 General

The controls actuators shall be designed in accordance with the requirements of EN 894-1.

The control systems shall be designed to minimize foreseeable errors that could be made by the operator and to ensure efficient interaction between the operator and the machine.

5.3.3.2 Identification of control actuators

Control functions and movements shall be identified by symbols conforming to ISO 3767-1 or ISO 3767-2, so that the operator can determine the proper control function and movement.

Labels, signs and other informative texts or symbols shall be located on or adjacent to their associated control actuators, in such a position that they are visible when control actuators are operated.

5.3.3.3 Manual controls

Unless otherwise stated in this document, the manual control actuators shall comply with the requirements of EN 894-3 with respect to design and actuating forces:

1) hold-to-run two-hand control device shall be located so that the height of the control actuators shall be between 850 mm to 1 650 mm from ground;

2) it shall be possible to operate control actuators when wearing gloves;

3) the space between individual control actuators shall be optimal in order to ensure efficient operation according to EN ISO 4254-1:2015, 4.5.3;

4) the machines shall be designed to minimize the force exerted by the operator, when using the control actuators. according to EN ISO 4254-1:2015, 4.5.3;

5) minimum control actuating forces shall be sufficient to avoid inadvertent actuation;

6) the force required to activate the manual control actuator hand lever shall not be greater than 55 N in the vertical and 35 N in the horizontal direction.

See Annex B for examples and verification of positioning.

5.4 Starting and stopping of the power source

5.4.1 General

A control device, for starting and stopping the power source, shall be available for the operator.

On machines not powered by electricity, the engine start and stop control or the tractor start and stop control are regarded as the operator's controls for starting and stopping the machine.

5.4.2 Stopping of other than electrically powered machines

Machine shall be equipped with a stopping device. Stopping of the powering unit, e.g. tractor, can be regarded as such a device.

5.4.3 Stopping of the electrically powered machines

Electrically driven machines shall be fitted with a stop control which, when actuated, shall disconnect power from all the machine actuators unless power is required to maintain a safe condition.

The colour of the normal stop control device shall be in accordance with EN 60204-1:2006, 10.2, using only the red colour for better identification.

Stop category 0 functions according to EN 60204-1:2006, 4.1 shall be provided unless power needs to be maintained to provide a safe stop condition.

NOTE The supply disconnecting device (see 5.3) when operated achieves a stop category 0.

Stop functions fulfilling the requirements of EN 60204-1:2006, 9.2.5.2 shall override related start functions. The reset of the stop function shall not initiate any hazardous situation.

5.5 Emergency stop

An emergency stop is not necessary:

a) when operator can see the splitting zone and oversee all access to the splitting zone;

and

b) releasing of a hold-to-run control device stops the splitting and all other hazardous movement;

Where an emergency stop is provided, it shall comply with the requirements of EN ISO 13850 and EN 60204-1:2006, 9.2.5.4 and 10.7. Actuating the emergency stop shall prevent all hazardous movement.

The hazardous movement shall remain stopped until the emergency stop has been manually disengaged (unlatched). Manual disengagement of the emergency stop shall not induce hazardous movement. Actuating the emergency stop shall not cut the power source of the machine, i.e. stop the electric motor, hydraulic pump or PTO.

5.6 Two-hand control device

If the machine has a two-hand control device it shall be the only designated control to operate the splitting process and it shall be ensured that the operator can see the splitting zone and oversee all access to the splitting zone.

A two-hand control device for a wedge splitter shall conform to the following:

a) the two-hand control device shall be of the “hold-to-run“ type, i.e. the splitting process is stopped if either manual control is released;

b) the moving wedge / pressure plate shall not return to the starting position if one manual control is in the “On” position unless the return move does not cause any hazards;

c) it shall be impossible to start the splitting process inadvertently or to operate both manual controls simultaneously with one hand or arm or with other parts of the body or to operate the two-hand control device simultaneously with a hand and an arm, with a hand and other parts of the body, or with an arm and other parts of the body (see Annex B);

d) the selection of dissimilar actuating directions, covers, shapes etc. shall minimize the possibilities of defeat;

e) holding one or both of the two manual control actuators into any single position, by manual operation or by any other means, shall not allow more than one single splitting stroke, before the manual control actuator or actuators are released;

f) the manual control actuating devices for the two-hand control device shall be designed and arranged in such a way that the protective effect of the two-hand control device cannot be easily defeated or by-passed, e.g. tampering with the mechanism using a piece of tape or string or a piece of wood.

NOTE Total protection from defeat is not possible. See note of EN 574:1996+A1:2008, 8.1.

See Annex B for examples and verification.

5.7 Power supply

5.7.1 Electrically powered machines

An automatic restart, in the case of a supply interruption after the restoration of the supply voltage, shall be prevented in accordance with EN 60204-1:2006, 7.5 (Paragraphs 1 and 3).

Under voltage protection shall be provided by, for example, switching off the machine at a predetermined voltage level.

The machine shall have a supply disconnection device meeting the requirements of EN 60204-1:2006, 5.3.

If the machine is connected to a three-phase power supply, with a plug and socket supply disconnecting device, the plug shall include a phase inverter up to CEE 32 A. See the IEC 60309 series.

5.7.2 Machines powered by an external power supply

It shall be possible to disconnect any external power supply.

5.7.3 Machines powered by an internal combustion engine

Exposed components of the power source exhaust system having a surface temperature greater than 80 °C measured at 20 °C ± 3 °C ambient temperature shall be considered hot and shall be guarded so that they are not accessible to unintentional contact during normal use. These parts, which also include the power source exhaust guard, are considered accessible if the area contactable by the appropriate test cone is larger than 10 cm^2.

See Annex C for testing requirements of hot parts.

The exhaust outlet shall be located such that exhaust emissions shall not be direct to the operator, which is in normal working positions.

5.7.4 Machines with two or more power supplies

When a wedge splitter can be driven by more than one power supply, it shall not be possible to connect more than one power supply at a time.

Access to the power-input connection (PIC) of the wedge splitter shall be prevented by a movable guard fixed to the wedge splitter; see EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking, when operating with an alternative power supply.

NOTE For a wedge splitter with two alternative power supplies, this requirement is achieved if a single moveable guard fixed to the wedge splitter is provided which:

— at one position prevents access to the PIC while allowing connection to the other source of power;

— at another position allows connection of a PTO drive shaft to the PIC while preventing the connection of the other source of power; and

— at no position allows both sources of power to be connected at the same time, thereby providing a form of interlock.

5.8 Hydraulic equipment

Hydraulic equipment shall comply with EN ISO 4413. Identification requirements of EN ISO 4413:2010, 7.4.2.1 can also be achieved with identification in the instruction handbook or the spare parts list or catalogue.

Pressurized hoses, lines and components shall be located, shielded or protected so that in the event of rupture, the fluid cannot be discharged directly onto the operators. Hydraulic pipes with an operating pressure under 50 bar and with a temperature below 50 °C are excluded from these requirements.

5.9 Safe guarding of the splitting zone

5.9.1 General

Fixings used for securing fixed guards shall be held captive either on the machine or the guard they secure. See EN ISO 14120:2015, 5.19.

5.9.2 Horizontal short log wedge splitter

5.9.2.1 General

For wedge splitters where the space between the foremost point of the splitting wedge and the pressure plate or a log support plate is 550 mm or less. See L of Figure 8, one of the safeguarding options detailed in the following sub clauses shall be applied.

5.9.2.2 Horizontal short log wedge splitter guarded with a combination of guards

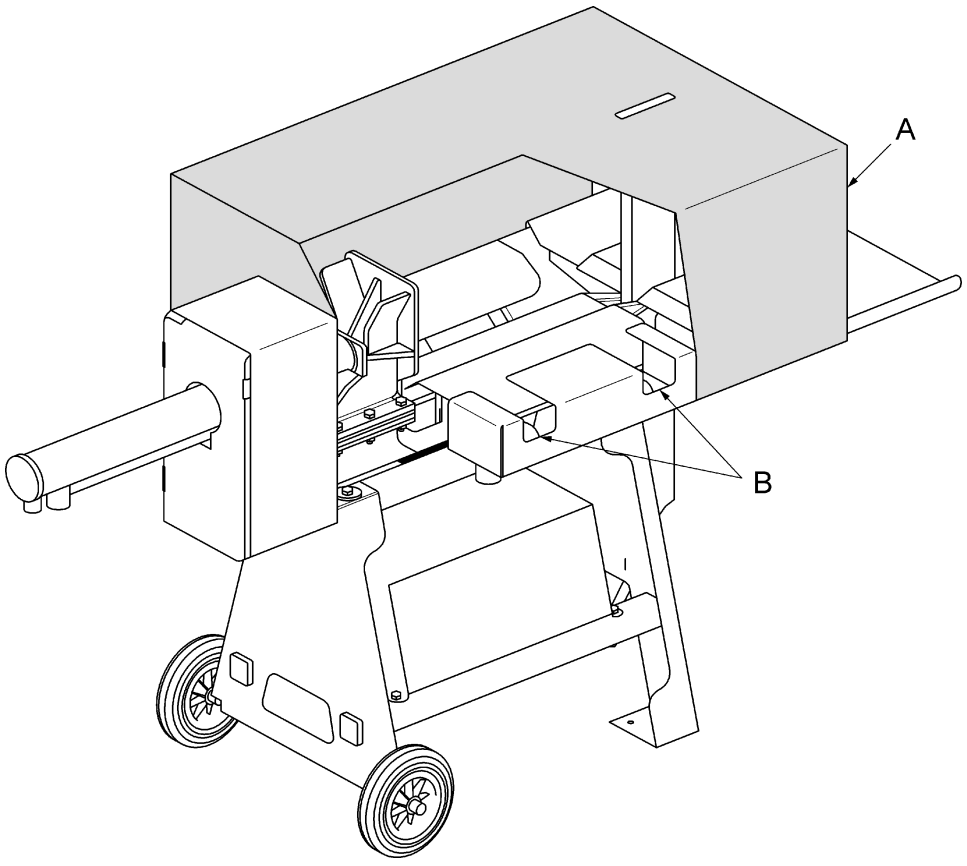
Access to the splitting zone shall be prevented by a combination of fixed guards and interlocking movable guards fulfilling the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 3, 4 and 6.

5.9.2.3 Horizontal short log wedge splitter guarded with a combination of guards with a two-hand-control device

Access to the splitting zone shall be prevented from below, from the sides, from the front and from the top by fixed guards fulfilling the requirements of EN ISO 14120 and in accordance with the safety distances of EN ISO 13857:2008, Tables 3, 4 and 6. It is allowed to have an opening to enable feeding of the machine (see Figure 5). Opening shall start at least from the vertical main cutting edge. See x and x/2 in Figure 7. Distance from the opening to the nearest point of the wedge shall be greater than 230 mm. See Figures 5 to 7.

A two-hand control device shall be provided in the operating position, which fulfils the requirements of 5.6. The two-hand control device shall be placed in front of the access to splitting zone (see Figures 5 to 7) so that the operator cannot be caught between the pressure plate and the wedge, between the log and the wedge, between the log and the pressure plate or between the pressure plate and any other parts of the machine.

At the discharge opening of the splitting zone the guards shall extend horizontally at least 230 mm from the foremost point of the foremost cutting edge in the direction of splitting. The splitting zone is determined as being from the foremost point of the cutting edge, i.e. the vertical cutting edge of the wedge as indicated in Figures 6 and 7.

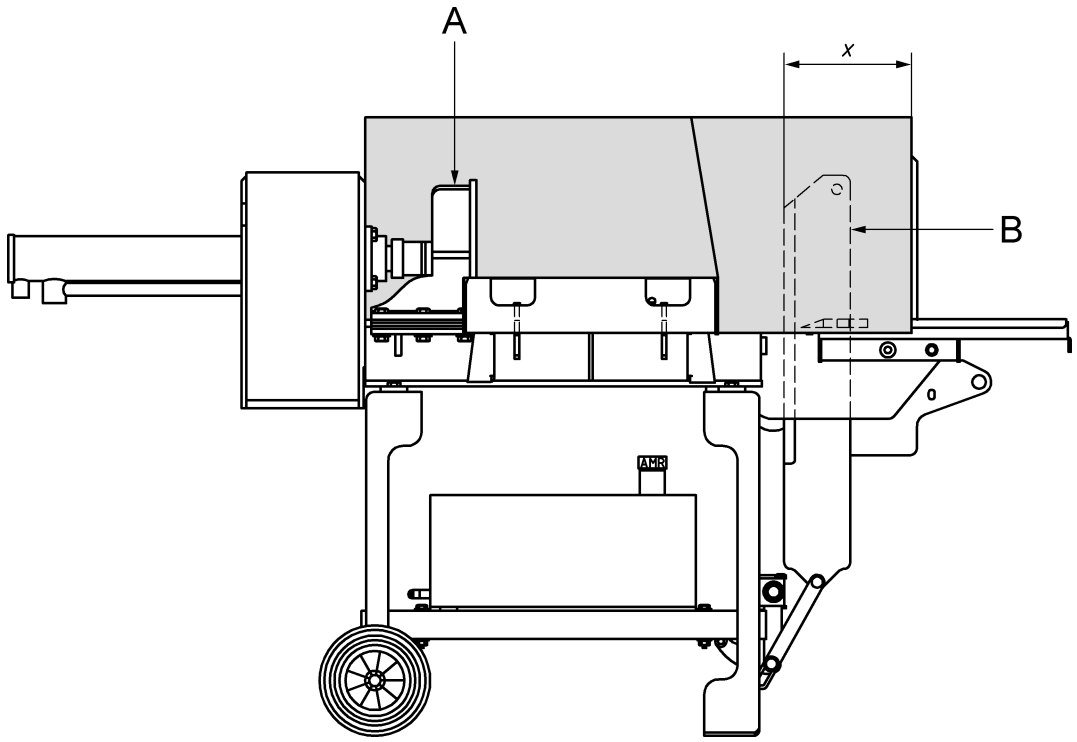


Key

A fixed guard

B two-hand control device

Figure 5 — Horizontal manual short log wedge splitter, example of guarding with a two-hand control device



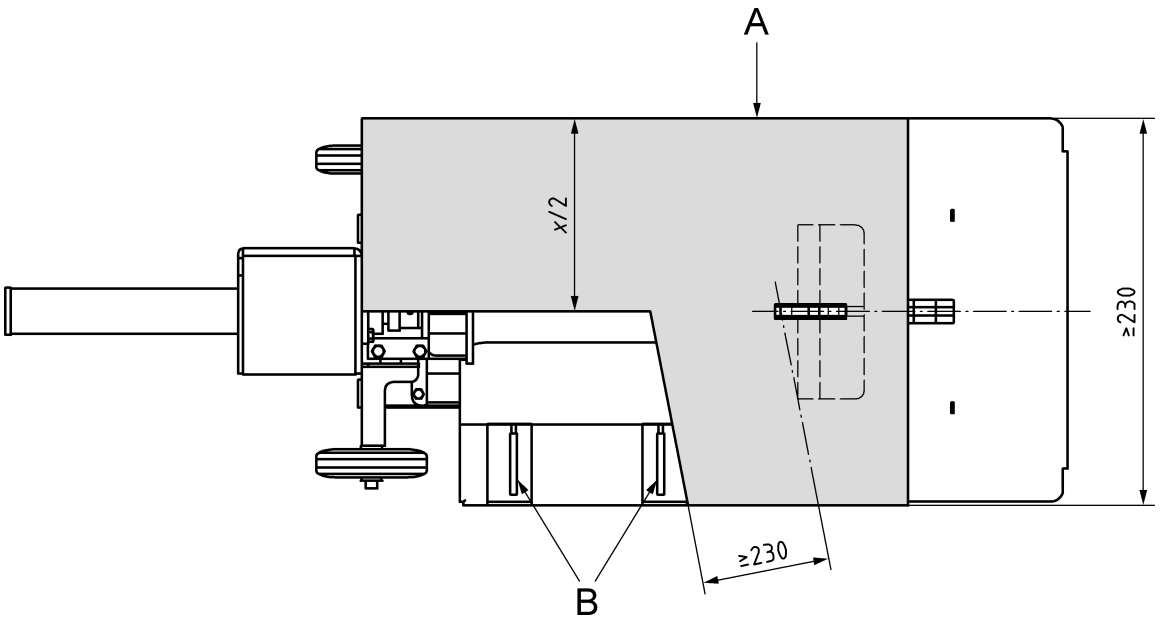
Key

A pressure plate

B Wedge

Figure 6 —Horizontal manual short log wedge splitter, example of guarding with a two-hand control device

Dimensions in millimetres



Key

A fixed guard

B two-hand control device

x width of the guard

Figure 7 — Horizontal manual short log wedge splitter, example of guarding with a two-hand control device

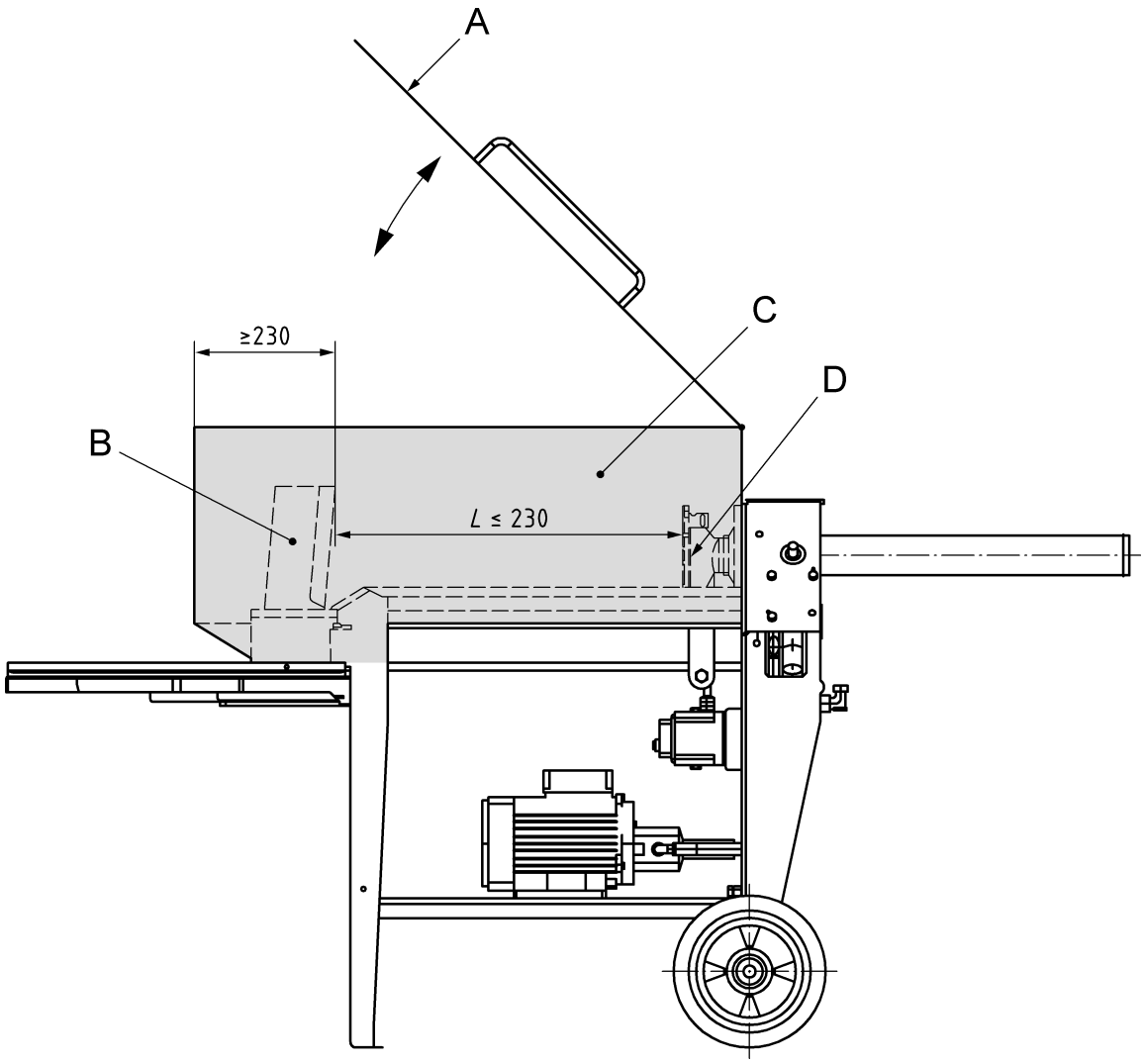
5.9.2.4 Horizontal short log wedge splitter guarded with a combination of guards with a semi-automatic function

Access to the splitting zone shall be prevented from below, from the sides, from the front and from the top by a combination of fixed guards and interlocking movable guards fulfilling the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 3, 4 and 6.

At the discharge opening of the splitting zone the guards shall extend horizontally at least 230 mm from the foremost point of the foremost cutting edge in the direction of splitting. The splitting zone is determined as being from the foremost point of the cutting edge, i.e. the vertical cutting edge of the wedge. See L in Figure 8.

See Figures 1 and 8 as an example of guarding of a horizontal short log semi-automatic wedge splitter.

Dimensions in millimetres



Key

A interlocking movable guard
B wedge
C fixed guard
D movable pressure plate
L splitting zone

Figure 8 — Horizontal semi-automatic short log wedge splitter, example of guarding

5.9.2.5 Horizontal short log wedge splitter guarded with a combination of guards with an active optoelectronic protective device and with a semiautomatic function

Access to the splitting zone shall be prevented from below, from the sides, from the front and from the top by a combination of fixed guards fulfilling the requirements of EN ISO 14120 and EN ISO 14119 and in accordance with the safety distances of EN ISO 13857:2008, Tables 1, 3, 4 and 6. At the discharge opening of the splitting zone the guards shall extend horizontally at least 230 mm from the foremost point of the foremost cutting edge in the direction of splitting.

The splitting zone is determined as being from the foremost point of the cutting edge i.e. the vertical cutting edge of the wedge or foremost point of the pressure plate.

An opening on one side and/or the top of the splitting area to enable feeding of the machine shall be provided and safeguarded by an active optoelectronic protective device (AOPD), which shall fulfil the following requirements:

1) AOPD shall be in accordance with EN 61496-1:2013, type 4 and be designed and constructed according to EN 61496-2;

2) the detection capability of the AOPD shall be ≤ 40 mm;

3) access to the splitting zone from the feeding side shall only be possible through the detection zone of the AOPD;

4) safety distance from the detection zone to the nearest point of the wedge or the pressure plate shall be calculated according to EN ISO 13855:2010, 6.2.3.1 (3);

5) any interruption of the detection zone of the AOPD shall result in an immediate stop of the splitting process. Return movement of the pressure plate or the wedge that complies with 5.11 is allowed;

6) start of the splitting process shall require actuation of a manual control device (e.g. an impulse on a push button);

7) after a stop or a reversing of movement initiated by the AOPD, it shall be necessary to activate the manual control device to restart the splitting process.

5.9.3 Horizontal long log wedge splitter

5.9.3.1 General

For wedge splitters where the space between the foremost point of the splitting wedge and the pressure plate or a log support plate is greater than 550 mm, see B on Figure 12; one of the safeguarding options detailed in the following subclauses shall be applied.

5.9.3.2 Horizontal long log wedge splitter guarded with a combination of guards

Access to the splitting zone shall be prevented by a combination of fixed guards and interlocking movable guards fulfilling the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 1, 3, 4 and 6.

5.9.3.3 Horizontal long log wedge splitter guarded with a combination of guards with a two-hand-control device

A two-hand control device shall be provided in the operating position, which fulfils the requirements of 5.6. The two-hand control device shall be placed in front of the access to splitting zone (see Figures 9 to 13) so that the operator cannot be caught between the pressure plate and the wedge, between the log and the wedge, between the log and the pressure plate or between the pressure plate and any other parts of the machine.

In a horizontal long log wedge splitter the distance between the moving frame of the log-handling device and the fixed part of the machine shall be (180±20) mm. See Figure 10, key E.

A log-handling device according to 5.12 can be used as an interlocking movable distance guard to achieve the required safety distances of the other paragraphs. If the access to the splitting zone from the

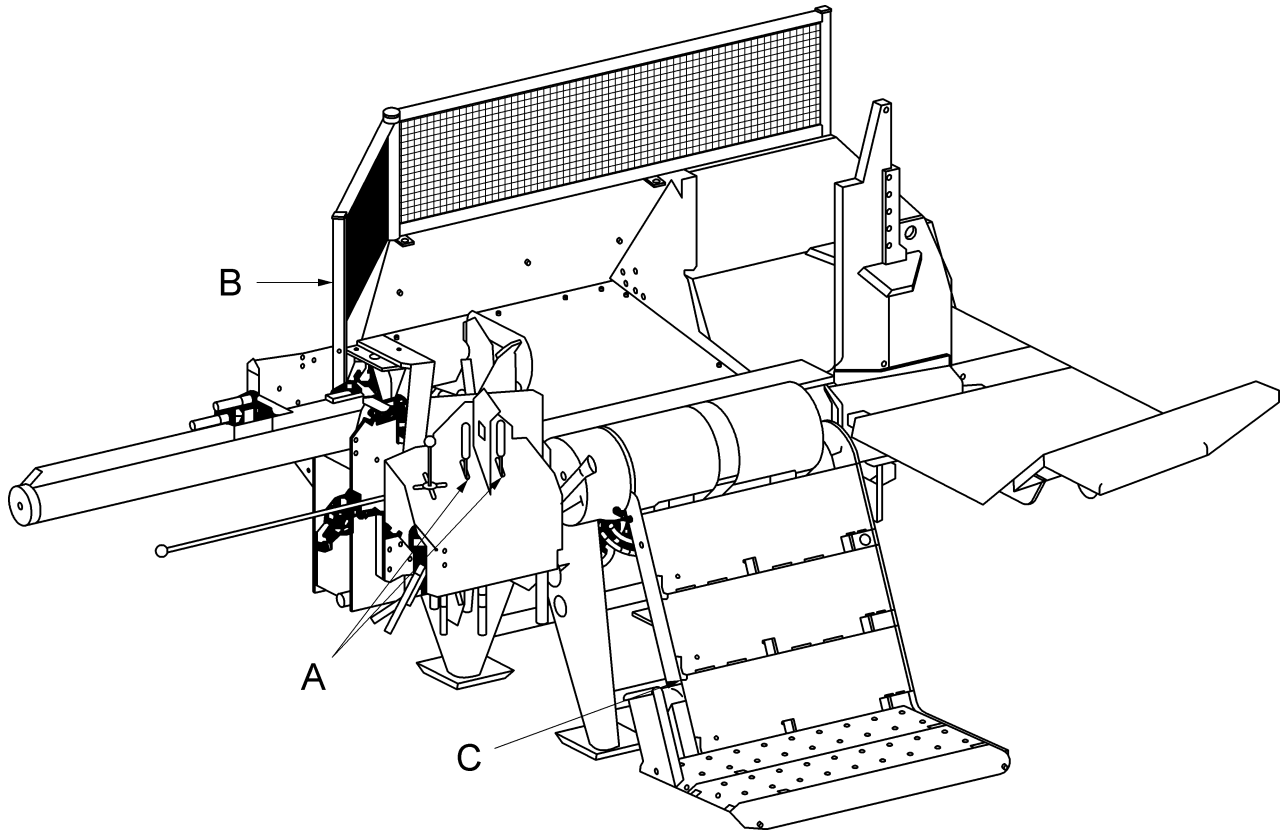
discharge area is not fully prevented by guards fulfilling the requirements of EN ISO 13857:2008, Tables 1, 3, 4 and 6, the following shall be applied:

a) The horizontal distance from the rear section of the discharge table to the nearest point of the first vertical cutting edge of the wedge that encounters the wood that is to be split, shall be at least 1 200 mm. See Figure 10, key F.

b) The lateral distance of the fixed guard to the first vertical edge of the wedge shall be designed in accordance with EN ISO 13857:2008, Tables 1, 3, 4 and 6. The minimum distance to the lateral cutting edges shall be > 850 mm (B in Figure 10 or Figure 13) or shall be according to EN ISO 13857:2008, Tables 1, 3, 4 and 6. Minimum height of the side guards shall be at least 1 000 mm from the ground.

c) If the operator does not have a clear view to the discharge area there shall to be an emergency stop device in the discharge area.

d) The discharge table shall be situated at a height of 700 – 1 000 mm from the ground level. See Figure 13, key D.



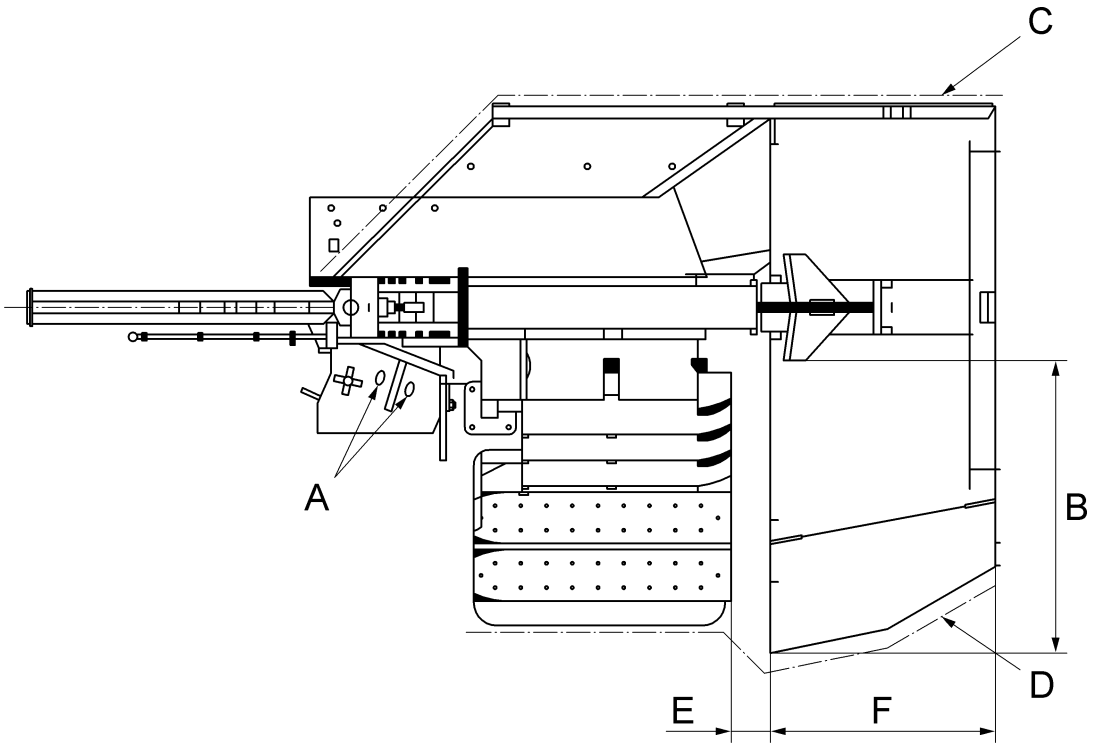
Key

A two-hand control device

B rear guard

C interlocking movable guard log handling device

Figure 9 — Horizontal long log wedge splitter, example of guarding



Key

A two-hand control device

B lateral distance of the fixed guard to the lateral cutting edges

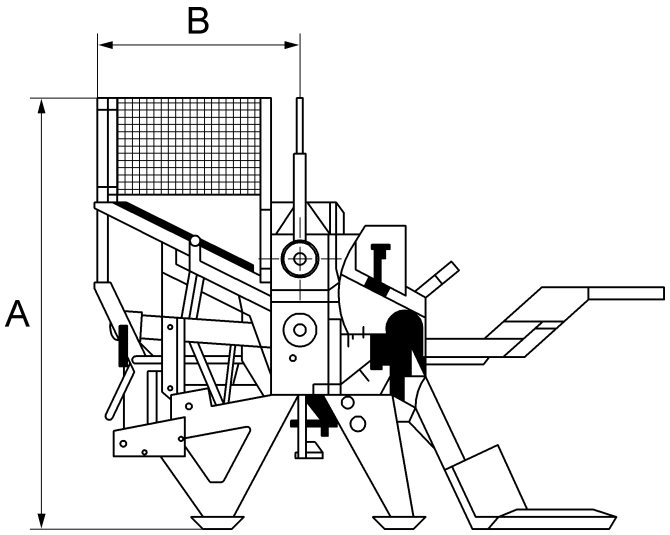
C rear guard

D front guard

E distance between the moving frame of the log handling device and the fixed part of the machine

F the horizontal distance from the rear section of the discharge table to the nearest point of the first vertical cutting edge of the wedge

Figure 10 — Horizontal long log wedge splitter example of guarding

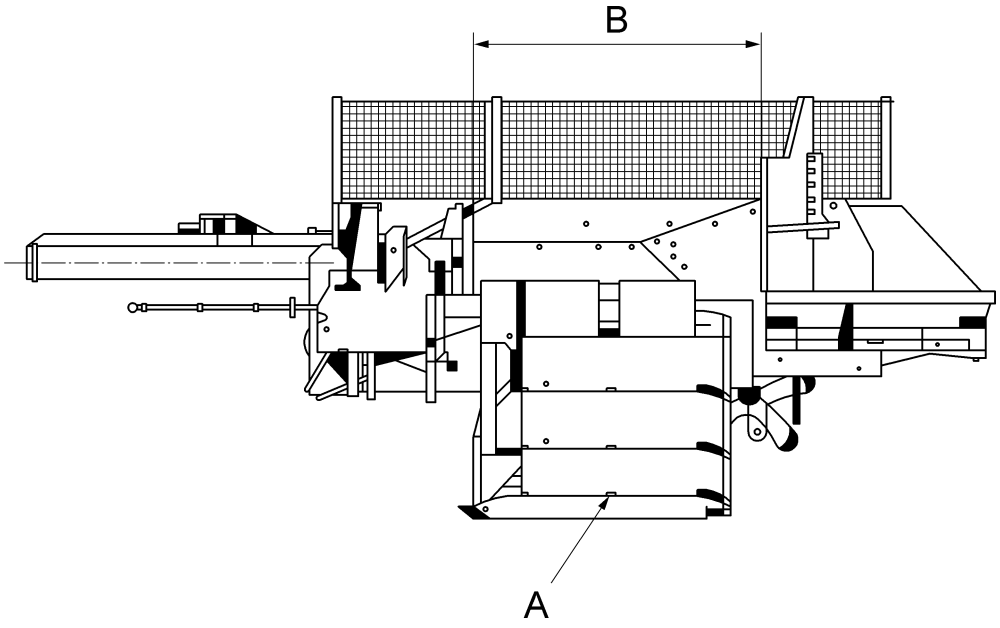


Key

A minimum vertical height of the rear guard from the ground

B minimum horizontal distance of the rear guard to the first vertical edge of the wedge

Figure 11 — Horizontal long log wedge splitter, example of guarding

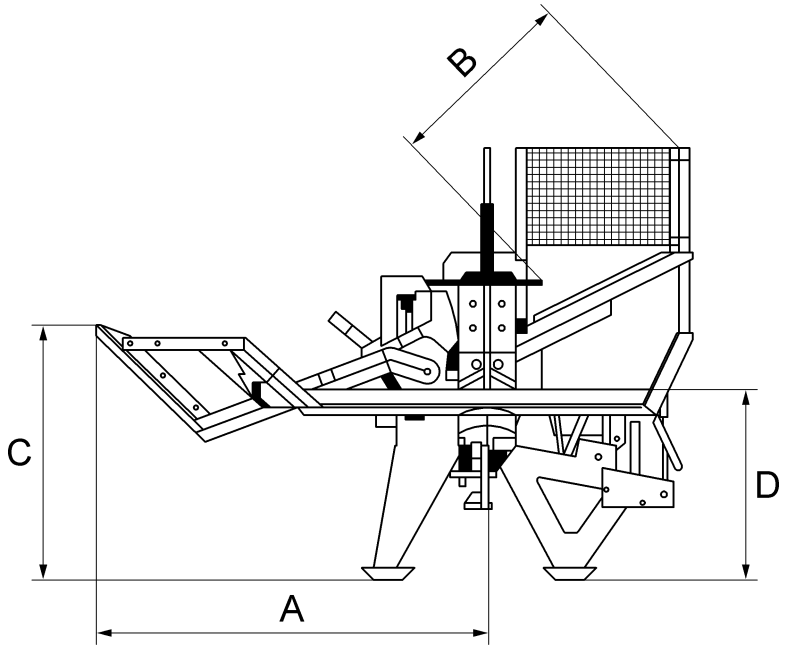


Key

A interlocking movable guard log handling device

B splitting zone

Figure 12 — Example of guarding of a horizontal long log wedge splitter



Key

A minimum horizontal distance of the front guard to the first vertical edge of the wedge

B lateral distance of the fixed guard to the lateral cutting edges

C minimum vertical height of the front guard from the ground

D height of the discharge table from the ground

Figure 13 — Horizontal long log wedge splitter, example of guarding

5.9.3.4 Horizontal long log wedge splitter guarded with a combination of guards with an AOPD

Access to the splitting zone shall be prevented by a combination of guards and an AOPD. Fixed guards and interlocking movable guards shall fulfil the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 1, 3, 4 and 6. AOPD shall fulfil the following requirements:

1) AOPD shall be in accordance with EN 61496-1:2013, type 4 and be designed and constructed according to EN 61496-2;

2) the detection capability of the AOPD shall be ≤ 40 mm;

3) access to the dangerous zones shall only be possible through the detection zone of the AOPD;

4) safety distances shall be calculated according to EN ISO 13855;

5) any interruption of the detection zone of the AOPD shall result in an immediate stop of the dangerous movements;

6) start of hazardous movements shall require actuation of a manual control device (e.g. push button); this control device shall be in a fixed position outside the danger zone with a clear view of the complete danger zone. Starting shall only be possible from outside the danger zone;

7) after a stop or reversing of movement initiated by the AOPD, it shall be necessary to activate the manual control device to restart the splitting process.

5.9.4 Vertical short log wedge splitter

5.9.4.1 General

The following requirements shall be applied with all types of vertical short log wedge splitters:

1) there shall be a log holding device that fulfils the requirements of 5.10;

2) the wedge shall be single-edged and designed with the cutting edge rising away from the operator (angle > 3°); see Figure 25, key A;

3) if a vertical short log wedge splitter may be converted into a vertical long log wedge splitter, all requirements for vertical long log wedge splitters shall also be applied;

4) there shall be separate storage for feed logs and for split pieces available outside the splitting zone, at the height of the log support plate ± 100 mm. Each storage area shall be > 900 cm^2. Height of the log support plate shall be 800 mm to 900 mm; see Figures 15 and 16.

One of the safeguarding options detailed in the following sub clauses shall be applied.

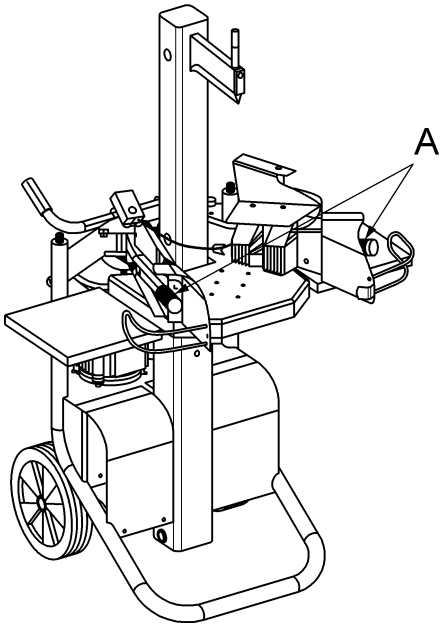
5.9.4.2 Vertical short log wedge splitter guarded with a combination of guards

Access to the splitting zone shall be prevented by a combination of fixed guards and interlocking movable guards fulfilling the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 1, 3, 4 and 6.

5.9.4.3 Vertical short log wedge splitter guarded with a two-hand control device

The operating position shall be designed in such a way that the operator shall stand in front of the splitting zone. A two-hand control device, which fulfils the requirements of 5.6, shall be provided at the operating position. The two-hand control device shall be placed in front of the access to splitting zone so that the operator cannot be caught between the log support plate and the wedge, between the log and the wedge, between the log and the log support plate or between the moving wedge and any other parts of the machine. The operator shall be able to see the entire splitting zone from the normal operating position.

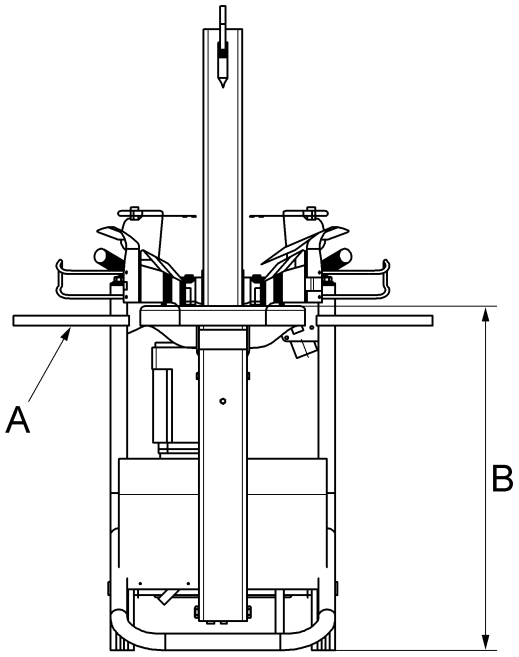
See Figures 14 and 15.



Key

A two-hand control device

Figure 14 — Vertical short wedge splitter, example with a two-hand control device

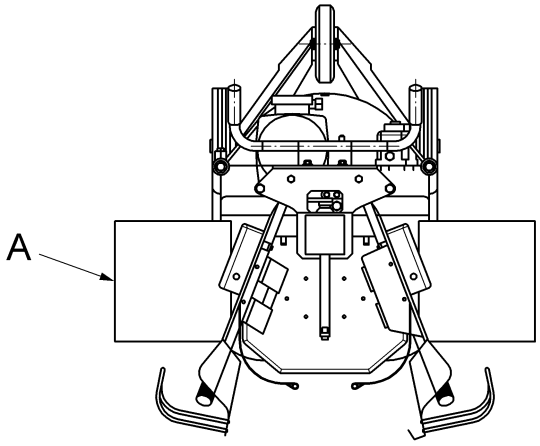


Key

A storage for logs and split pieces

B height of the log support plate

Figure 15 — Vertical short wedge splitter, example with a two-hand control device



Key

A storage for logs and split pieces

Figure 16 — Vertical short wedge splitter example with a two-hand control device

5.9.4.4 Vertical short log wedge splitter guarded with a combination of guards with an AOPD

Access to the splitting zone above the support plate from the sides and rear of the machine shall be prevented with fixed guards. The top edge of guards shall be at a minimum height of 1 600 mm from the ground. Access between the guards and the log support plate shall be prevented.

AOPD configured as shown in Figures 17 to 20, which shall fulfil the following requirements:

1) AOPD shall be in accordance with EN 61496-1:2013, type 4 and be designed and constructed according to EN 61496-2;

2) the detection capability of the AOPD shall be ≤ 40 mm;

3) the AOPD shall be vertically mounted;

4) access to the splitting zone from the front shall only be possible through the detection zone of the AOPD;

5) horizontal safety distance of “S” from the detection zone to the nearest point of the wedge shall be calculated according to EN ISO 13855:2010, 6.2.3.1 (3);

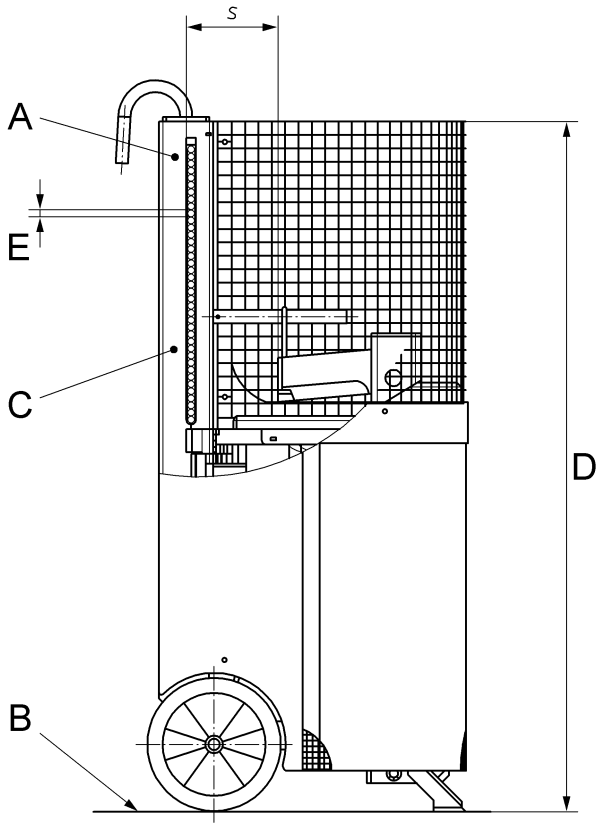
6) bottom edge of the detection zone of the AOPD shall be at the height of the log support plate;

7) top edge of the detection zone of the AOPD shall be at a minimum distance of 1600 mm from the ground;

8) any interruption of the detection zone of the AOPD shall result in an immediate stop of the splitting movement of the wedge. Return movement of the wedge that complies with the requirements of 5.11 is allowed;

9) start of the splitting process shall require actuation of a manual control device (e.g. push button);

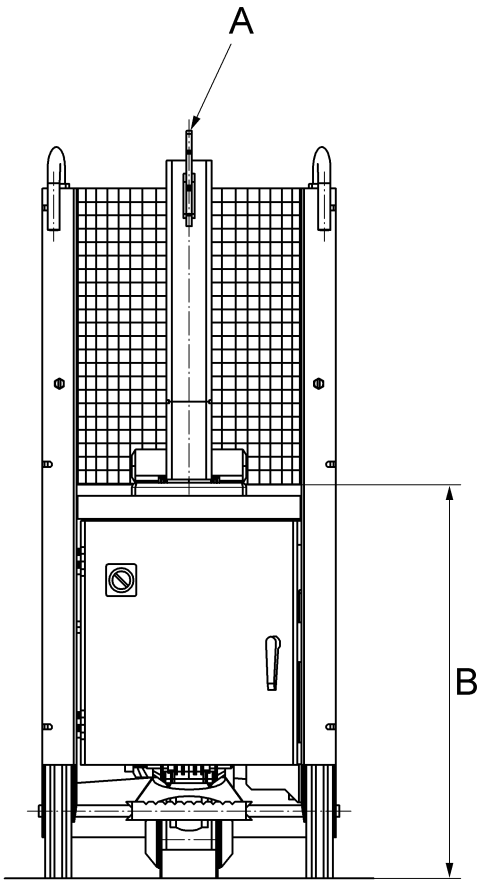
10) after a stop or a revising of movement initiated by the AOPD, it shall be necessary to activate the manual control device to restart the splitting process.



Key

A AOPD
B ground
C detection zone of AOPD
D top edge of guards
E detection capability of AOPD
S safety distance

Figure 17 — A vertical short log wedge splitter, example of guarding with AOPD

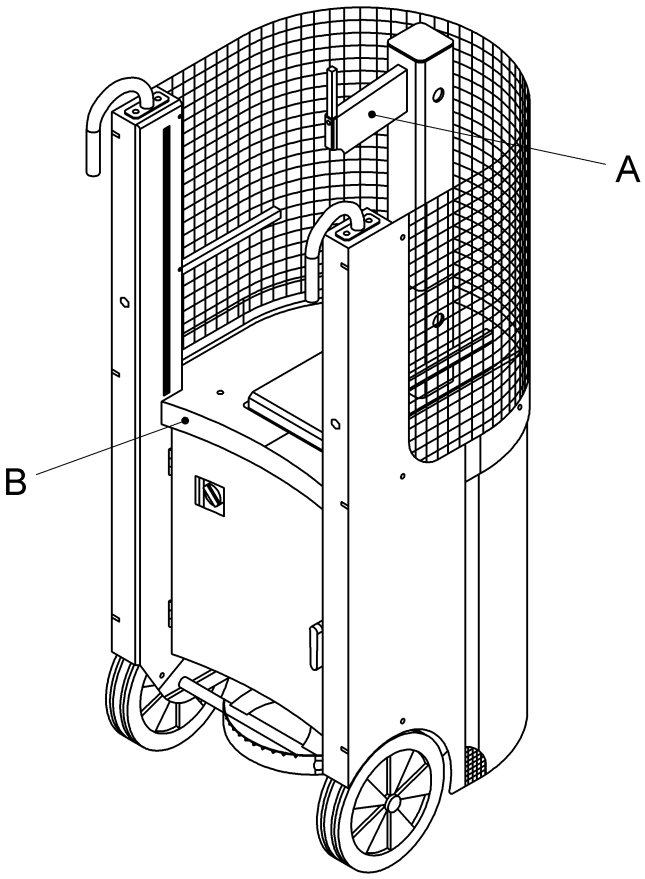


Key

A holding device

B height of the log support plate

Figure 18 — Vertical short log wedge splitter, example of guarding with AOPD

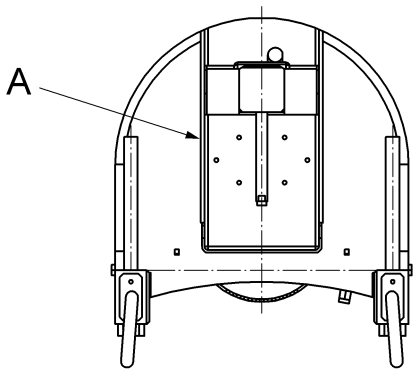


Key

A wedge

B storage for logs and split pieces

Figure 19 — Vertical short log wedge splitter, example of guarding of a with AOPD



Key

A log support plate

Figure 20 — Vertical short log wedge splitter example of guarding with AOPD

5.9.5 Vertical long log wedge splitter

5.9.5.1 General

The following requirements shall be applied with all types of vertical long log wedge splitters:

1) there shall be a log holding device that fulfils the requirements of 5.10;

2) the wedge shall be single-edged and designed with the cutting edge rising away from the operator (angle > 3°); see Figure 25;

3) if a vertical long log wedge splitter may be converted into a vertical short log wedge splitter, all requirements for vertical short log wedge splitters shall also be applied.

One of the safeguarding options detailed in the following sub clauses shall be applied.

5.9.5.2 Vertical long log wedge splitter guarded with a combination of guards

Access to the splitting zone shall be prevented by a combination of fixed guards and interlocking movable guards fulfilling the requirements of EN ISO 14120 for fixed and movable guards and EN ISO 14119 for interlocking and be in accordance with the safety distances of EN ISO 13857:2008, Tables 1, 3, 4 and 6.

5.9.5.3 Vertical long log wedge splitter guarded with a two-hand control device

The operating position shall be designed in such a way that the operator shall stand in front of the splitting zone. A two-hand control device, which fulfils the requirements of 5.6, shall be provided in the operating position. The two-hand control device shall be placed in front of the access to splitting zone so that the operator cannot be caught between the log support plate and the wedge, between the log and the wedge, between the log and the log support plate or between the moving wedge and any other parts of the machine. The operator shall be able to see entire splitting zone from the normal operating position.

When the wedge is in the lowest position, the gap between the wedge and the support plate shall be over 100 mm. The splitting stroke shall be a minimum of 80 % of the maximum log length that can be split.

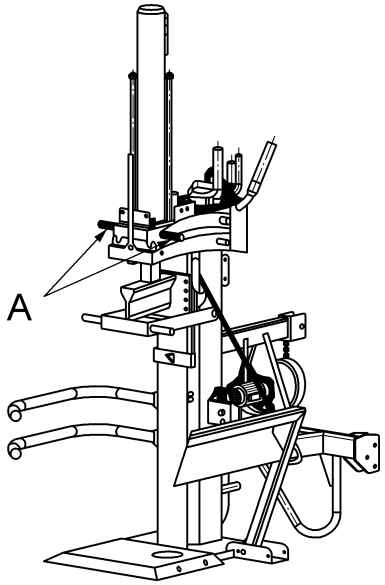
If the log support plate of a wedge splitter stands directly on the ground, the plate shall:

a) extend forward at least 100 mm beyond the edge of the wedge and;

b) be at least 50 mm and at most 75 mm in height and;

c) the support plate shall have in the boundary area an angle between 45° and 90° to the horizontal.

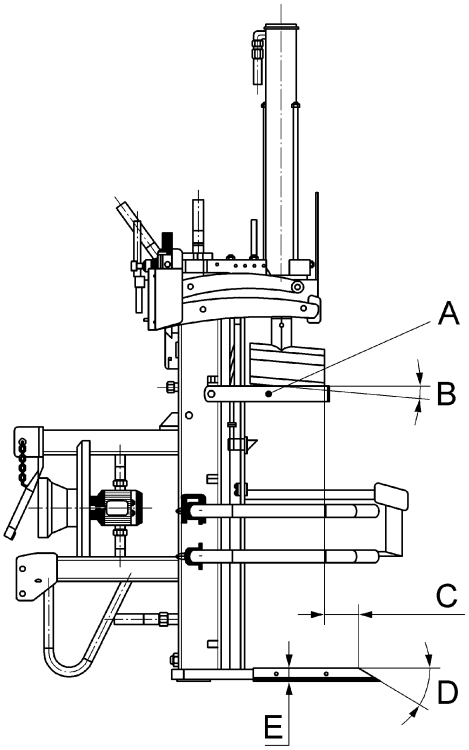
See Figures 21 and 22.



Key

A two-hand control device

Figure 21 — Example a vertical long log wedge splitter with a two-hand control device



Key

A log holding prior splitting

B cutting edge rising away from the operator

C log support plate extension forward beyond the edge of the wedge

D support plate boundary area, an angle between 45° and 90° to the horizontal

E height of log support plate

Figure 22 — Vertical long log wedge splitter example with a two-hand control device

5.9.5.4 Vertical long log wedge splitter guarded with a combination of guards with an AOPD

Access to the splitting zone from the lateral sides and rear of the wedge splitter shall be prevented with fixed guards The guards shall extend from a height above ground between 500 mm (lower edge) to 1 600 mm (upper edge) for log length from 550 mm to – 1 100 mm or according to EN ISO 13857:2008, Table 1 for other log lengths.

AOPD configured as shown in Figures 23 and 24, which shall fulfil the following requirements:

1) AOPD shall be in accordance with EN 61496-1:2013, type 4 and be designed and constructed according to EN 61496-2;

2) the detection capability of the AOPD shall be ≤ 40 mm;

3) the AOPD shall be vertically mounted;

4) access to the splitting zone from the front shall only be possible through the detection zone of the AOPD;

5) horizontal safety distance of "S" from the detection zone to the nearest point of the wedge shall be calculated according to EN ISO 13855:2010, 6.2.3.1 (3);

6) bottom edge of the detection zone of the AOPD shall be at maximum distance of 500 mm from the ground; see B on Figure 2;

7) top edge of the detection zone of the AOPD shall be at a minimum distance of 1 600 mm from the ground;

8) any interruption of the detection zone of the AOPD shall result in an immediate stop of the splitting movement of the wedge. Return movement of the wedge that complies with the requirements of 5.11 is allowed;

9) start of the splitting process shall require actuation of a manual control device (e.g. a push button). This control device shall be in a fixed position outside the danger zone with a clear view of the complete danger zone. Starting shall only be possible from outside the danger zone;

10) after a stop or a revising of movement initiated by the AOPD, it shall be necessary to activate the manual control device to restart the splitting process.

When the wedge is in the lowest position, the gap between the wedge and the support plate shall be over 100 mm. The splitting stroke shall be a minimum of 80 % of the maximum log length that can be split.

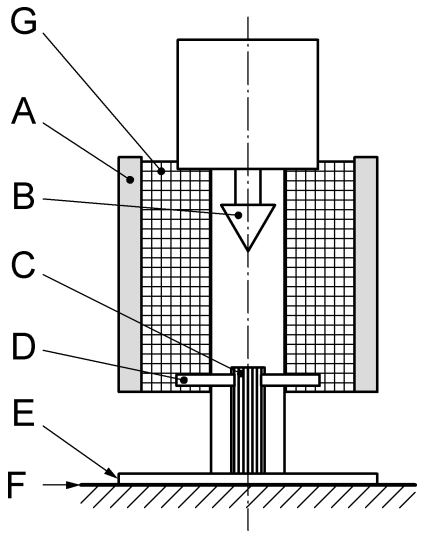
If the log support plate of a wedge splitter stands directly on the ground, the plate shall:

a) extend forward at least 100 mm beyond the edge of the wedge and;

b) be at least 50 mm and at most 75 mm in height and;

c) the support plate shall have in the boundary area an angle between 45° and 90° to the horizontal.

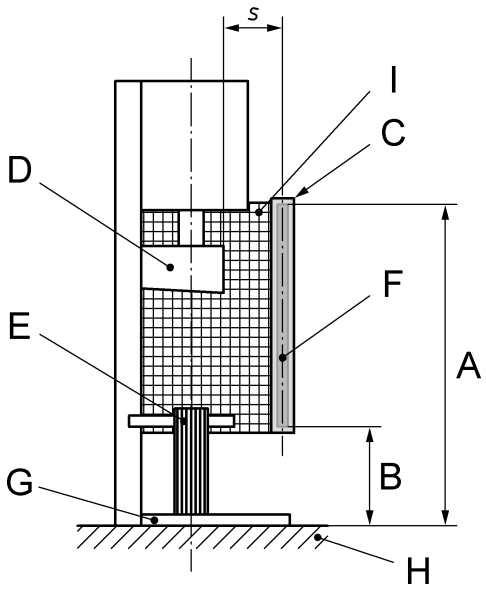
See Figures 23 and 24.



Key

A AOPD
B wedge
C shortest log which can be hold by the holding device
D holding device
E log support plate
F ground
G fixed guard

Figure 23 — Vertical long log wedge splitter, example of guarding with AOPD



Key

s safety distance
A minimum distance between the top edge of the detection zone of the AOPD and the ground
B maximum distance between the bottom edge of the detection zone of the AOPD and the ground
C AOPD
D wedge
E shortest log which can be hold by the holding device
F detection zone of AOPD
G log support plate
H ground
I fixed guard

Figure 24 — Vertical long log wedge splitter, example of guarding with AOPD

5.10 Log holding requirements

5.10.1 General

The machine shall be designed to allow the log to be split without requiring it to be held in position by touching with hands or feet or other parts of the body of the operator. This requirement shall be met by the use of a device designed to hold the log before, during and after the splitting process.

A frame or any other parts of the machine fulfilling the requirements of 5.10 can be considered as a log holding device.

NOTE During the splitting process the wedge normally holds the log in the splitting position.

Log holding requirements shall be fulfilled with logs from a minimum diameter of 80 mm to the maximum diameter of the log specified by the manufacturer in the instruction handbook. A wedge splitter shall be capable of holding:

1) logs having a length between the maximum length and down to 350 mm less than the maximum length that the machine can split;

2) every length between the minimum and maximum allowed length specified by the manufacturer in the instruction handbook.

5.10.2 Prior to and during the splitting

A device for holding the log prior to and during the splitting process shall be provided. It shall be designed in such a way that it does not create any cutting, crushing or shearing hazards.

In a horizontal wedge splitter the splitting bed can be such a device. In this case the splitting bed shall be designed so that splitting does not require a log to be held in position by hand or any other part of the body.

If the two-hand control device, or part of it, is used to hold the log it shall fulfil the following requirements:

1) the log-holding device shall not interfere with the movement of parts of the wedge splitter required to split the log;

2) any other part of the two-hand control device shall not be in contact with the log that is being split;

3) the log holding function shall be independent of the operating function.

See Annex A for testing the correct function of log holding devices for vertical wedge splitters.

5.10.3 After the splitting

5.10.3.1 Horizontal short log wedge splitter

A table is required to prevent split pieces of log from falling on the ground. Minimum length and width of the table shall be at least 400 mm.

For testing the correct function and position of the table, the maximum size of wood for the intended use of the machine as specified in the instruction handbook, shall be split and all parts shall stay on the table.

5.10.3.2 Horizontal long log wedge splitter

A table is required to prevent split pieces of log from falling on the ground. The height of the table shall be between 700 mm and 1 000 mm.

For testing the correct function and position of the table, the maximum size of wood for the intended use of the machine as specified in the instruction handbook, shall be split and all parts shall stay on the table.

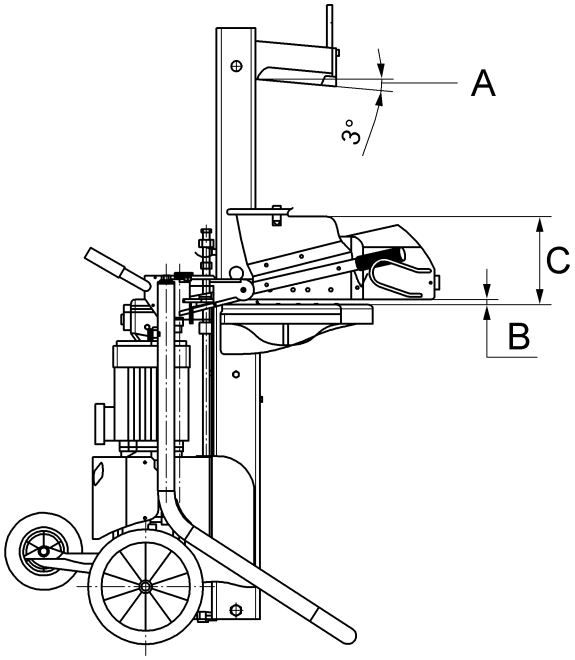
5.10.3.3 Vertical short log wedge splitter

There shall be a support for holding the log after the splitting process, which fulfils the following requirements:

a) the distance between the log support and the log support plate shall not exceed 150 mm (see Figure 25, key B). The overall height of support shall be greater than 250 mm (see Figure 25, key C);

b) the support shall be shaped to prevent wood from falling towards the operator.

See Figure 25.



Key

A cutting edge rising away from the operator

B distance between support and log support plate

C height of support

Figure 25 — Vertical short log wedge splitter, log holding device requirements

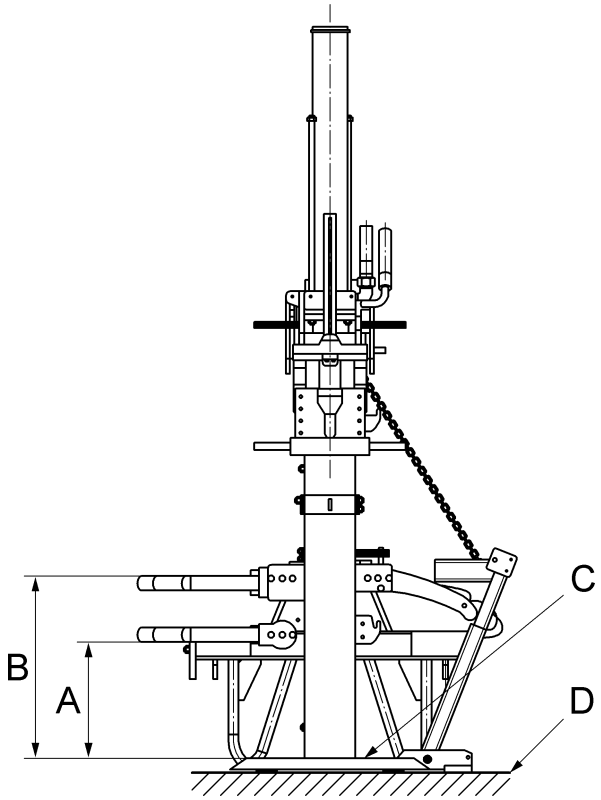
5.10.3.4 Vertical long log wedge splitter

There shall be a support for holding the log after the splitting process, which fulfils the following requirements:

A lower log support at a maximum height A of 500 mm and an upper log support at a minimum height B from the log support plate, on both sides of the wedge, that prevents the split pieces from falling to the ground. B is L/2 + 100 mm, where L is the maximum length in millimetres of the log that can be split. See Figure 26.

NOTE This requirement can be fulfilled with one, two or multiple separate bars supporting the log. In Figure 26 the requirement is fulfilled with two separate bars.

The support shall have a bent or chamfered edge at the end to prevent wood from falling towards the operator.



Key

A maximum height of the lower edge of the log support

B minimum height of the upper edge of the log support

C support plate

D ground

Figure 26 — Vertical long log wedge splitter, log holding device requirements

5.11 Return movement of the moving device of the splitter

If the return movement of the movable pressure plate or moving wedge can create shearing or crushing hazards, access to the hazard zones shall be prevented.

The operator shall be protected against crushing hazards which arise from a log jammed on the wedge or behind the pressure plate. Crushing hazard will appear between the log and machine parts as the wedge or the pressure plate returns to the starting position.

Protection shall be achieved by one of the following measures:

a) automatic stopping of the wedge or pressure plate by a device (e.g. a pressure sensitive bar, see Figure 27) which is actuated by the jammed log. The force needed to actuate the device at any point of the device shall not exceed 150 N; it shall be impossible to use this device to initiate the splitting process;

NOTE For further information about pressure sensitive bars see EN ISO 13856-2.

or

b) maintaining gaps that comply with EN 349:1993+A1:2008, Table 1;

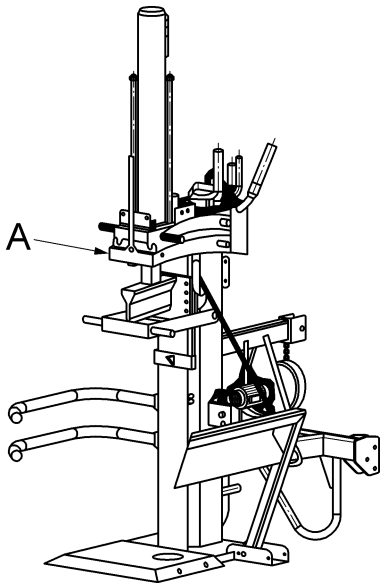
or

c) guarding having safety distances that shall comply with EN ISO 13857:2008, Table 4;

or

d) by an AOPD. Any interruption of the detection zone of the AOPD shall result in an immediate stop of the return movement.

The protection shall be designed in a way that it does not create any other hazards.



Key

A example of an automatic stopping device

Figure 27 — Vertical long log wedge splitter, example of a touch bar

5.12 Log-handling device

A log-handling device is required if the machine has a splitting power over 80 000 N and the log is required to be lifted up or raised for splitting. A winch can be used as a log-handling device. See 5.13.

A log-handling device shall fulfil the following requirements:

1) a log-handling device shall be able to handle logs with the maximum diameter and length given in the instruction handbook and shall have a minimum force of 1 200 N;

2) a manually powered log-handling device is not allowed;

3) crushing and shear hazards caused by the movement of the log-handling device shall be avoided;

4) controls of the log-handling device shall be of the “hold-to–run” type;

   However when the log-handling device is linked with the semi-automatic return movement of the wedge, hold-to-run type of the controls are not required. An automatic return is not allowed, when the return movement of the log-handling device is synchronized with the wedge. A stop function for the movement shall be within the reach of the operator.

5) the log-handling device shall not drop down abruptly;

6) it shall be possible to safely lower the loaded log-handling device;

7) releasing the controls for the splitting movement shall not cause self-actuating movement of the log-handling device;

8) the wood shall not be able to roll or fall down unintentionally from the log-handling device.

5.13 Requirements for hauling winches for a wedge splitter

Wedge splitters with winches shall be stable during the use of the winch. This requirement can be satisfied when the wedge splitter is connected with a tractor through the three-point-linkage and the tractor is the sole power source of the wedge splitter. For testing in this situation see Annex D. Stability shall be verified in practise and with a separate risk assessment with other possible solutions.

Should it be intended that a winch is to be used, when the stability of the wedge splitter with winch is not achieved by connection with a tractor through its three-point-linkage or a source of power other than that provided by the tractor PTO is used, the manufacturer of the wedge splitter should carry out a risk assessment to determine stability requirements and means for verification of stability. Such additional requirements are outside the scope of this standard.

The following requirements shall be applied:

1) simultaneous operation of the splitter and the hauling winch shall not be possible;

2) the line pull of the winch shall be at maximum 7 500 N;

3) there shall be a working coefficient (safety factor) of at least 2 based on the maximum force that can affect the rope or the chain (or equivalent), when using the winch, e.g. with the maximum force of 7 500 N a rope or chain (or equivalent) with a minimum breaking force of 15 000 N is required;

4) an overload-safety-device in accordance with EN 14492-1:2006+A1:2009, 5.2.2.1 shall be provided;

5) the position of the operating device of the winch shall be arranged in a way that operating is possible from a position outside the area, where the log is being moved, so as to avoid contact between the operator and the load;

6) “hold-to-run” controls designed and constructed to avoid inadvertent operation in accordance with EN 14492-1:2006+A1:2009, 5.2.1;

7) there shall be a device to provide controlled pull-out of the rope or chain (or equivalent). Uncontrolled pull-out is not allowed;

8) the winch shall have a brake to prevent uncontrolled movement of the rope or chain (or equivalent). The operation of the brake shall not be affected by a disruption or disconnection of the power source. For hydraulic winches a self-closing valve can be used as a brake;

9) the intake of the rope or chain (or equivalent) shall be controlled, e.g. by in feed rolls (roller fairlead) in accordance with EN 14492-1:2006+A1:2009, 5.7.4;

10) an automatic stop of the winch shall be achieved by a device with positive disconnection of the power supply to the winch at the end position of the rope or chain (or equivalent);

11) maximum length of the rope or chain (or equivalent) shall not exceed 20 m;

12) rope grips and rope grips together with rope thimbles shall not be used as terminations for wire ropes.

5.14 Bluntness of edges

The outer edges of any accessible components, except cutting edges of the wedge and parts necessary for gripping a log, shall not present any sharp edges or acute angles/corners. Radius of angles and bluntness of edges shall be no less than 1,5 mm.

5.15 Stability

The machine shall be of a stable design. Supports or wheels shall have a contact area which restricts the ground pressure to a maximum of 400 kPa.

The machine shall be designed to be stable in any position e.g. during storage and when used according to the instruction handbook. It shall also fulfil the following tests:

a) the machine shall not overturn when placed on a horizontal hard surface, e.g. concrete, and subjected to an inclination of 8,5° in any direction;

b) the machine shall not overturn, when it is placed on a horizontal hard surface, e.g. concrete, and subjected to a horizontal force of 300 N applied in all directions at a point 1 650 mm from the ground or at the highest point of the machine, whichever is the smallest;

c) when the machine is in the working position, no lifting or tipping of the base shall occur, when the log-handling device is subjected to a load of the maximum capacity of the lifting device. The test shall be carried out on a horizontal hard surface, e.g. concrete.

When the machine can be used by PTO it shall be connectable to the power source e.g. by a three-point linkage, unless the stability against the possible torque is achieved by another technical solution.

5.16 Transport and handling of the machine

5.16.1 General

A wedge splitter shall have lifting and tying points that are marked in accordance with the requirements of 7.2.

If the log splitter has a three-point-linkage, it shall fulfil the requirements of EN ISO 4254-1:2015, 6.2.

Safety instructions on stability during transports shall be given in the instruction hand book, See 7.3.2 f).

5.16.2 Ergonomic requirements

If manual transportation of the splitter is an option provided by the manufacturer, there shall be facilities available which enable it, e.g. sufficient handles/holding surfaces for the required number of persons.

The forces that need to be applied in order to move the machine into the transport position and back to the working position shall not exceed 250 N. The force shall be measured at the centre of the grip area provided.

Machines weighing more than 25 kg shall be equipped with a means which enables a safe method of a transport (e.g. three-point-linkage or wheels).

A solution shall be provided to prevent the machine from overturning, if the operator transporting the machine releases his/her handhold. Return into the working position is allowed. See Figure 14.

If the machine has components which need to be changed or moved by the operator during normal use, e.g. a changeable wedge, the required force shall not exceed 250 N.

5.17 The guarding of power transmission from an external power source

The guarding of power transmission from an external power source (e.g. a tractor) to the wedge splitter shall comply with EN ISO 4254-1:2015, 6.4.

5.18 Unprotected gravity moving objects with semi-automatically controlled movement

Protection against trapping, crushing or shearing caused by movement of machine parts under gravity (e.g. self-closing guard, log holding device) shall be in accordance with the following requirements:

1) the force created, should the moving object make contact with the operator or another person, shall not exceed 150 N;

2) the radius of edges, where contact may occur shall be a minimum 1,5 mm;

3) the speed of the moving object(s) shall not exceed 0,4 m/s;

4) the maximum kinetic energy of the moving object(s) shall not exceed 1,0 J;

5) it shall be possible to initiate an opening movement of the related moving part to release a trapped person.

EXAMPLE Examples of the calculation:

[1] $E = m \times \frac{v^2}{2}$ = max. 15 kg x (0,3 m/s)^2 / 2 = 0,7 J

[2] $E = m \times \frac{v^2}{2}$ = max. 10 kg x (0,4 m/s)^2 / 2 = 0,8 J

where:

E is the energy expressed in Joule;

m is the mass of the moving object expressed in kg;

v is the movement speed of the moving object expressed in m/s^2.

6 Verification of safety requirements

Compliance with safety requirements shall be verified according to Table 2.

Table 2 — Safety requirements and testing method

Safety requirements according to subclause		**Testing method**			
		Inspection [a]	Function test[b]	Measurement [c]	Reference
5.2	Electrical equipment	X	X	X	EN 60204–1
5.3.1	Safety and reliability of control systems	X	X	X	EN ISO 13849-1
5.3.2	Starting	X	X		
5.4.2	Normal stopping	X	X		
5.5	Emergency stop	X	X		EN ISO 13850
5.6	Two-hand-control device	X	X	X	Annex B
5.7	Power supply	X	X		
5.7.3	Machines powered by an internal combustion engine	X	X		Annex C
5.7.4	Machines with two or more power supplies	X	X		
5.8	Hydraulic equipment	X	X		
5.9	Guarding of the splitting zone	X	X	X	
5.9.4	Log support plate that stands directly on the ground	X	X	X	
5.10	Log holding device	X	X	X	Annex A
5.10.2	Log holding device prior and during the splitting	X	X	X	Annex A
5.10.3	Log holding device after the splitting	X	X	X	Annex A
5.11	Return movement of the moving device of the splitter	X	X	X	
5.13	Requirements for a hauling winches	X	X	X	Annex D
5.14	Bluntness of edges	X	X	X	
5.15	Stability		X	X	EN 691–1
5.16.2	Ergonomic requirements		X	X	EN 894–3
5.17	The guarding of power transmission from an external power source	X	X	X	EN ISO 4254-1, EN 12965, EN ISO 14119, EN ISO 14120, EN ISO 4413
5.18	Unprotected moving objects with semi-automatically controlled movement	X	X	X	

[a] Inspection: visual check of the machine to see that everything is in place.

[b] Function test = check on the normal operation of the machine/component to see that it performs as specified.

[c] Measurement: determination of a value by using some form of device or instrument.

7 Information for use

7.1 Marking of machine

All wedge splitters shall be legibly and indelibly marked with the following minimum information:

a) business name and full address of the manufacturer or where appropriate, his authorized representative;

b) designation of the machine;

c) year of construction, that is the year in which the manufacturing process is completed;

d) designation of series or type of the machine;

e) serial number of the machine, if any;

f) mass of the machine;

g) maximum permissible operating pressure of the hydraulic system of the machine;

h) the maximum and minimum length and diameter of logs allowed to be split by the machine;

i) lifting points of the machine.

In addition, the following information shall be marked in a position in close proximity to the installed location of the related components on the machine:

j) nominal electrical data for the machine;

k) nominal rotation speed and direction of rotation of the power input connection (marked by an arrow) of the machine;

l) maximum permissible hydraulic oil operating pressure of the machine, when using hydraulics of an external power source.

The markings shall either be in the language of the country in which the machine is to be used or wherever possible by using pictograms.

7.2 Warnings on machine

Marking giving warning information shall be easily legible and located as close as practicable to the relevant hazard. Such marking shall be in one of the official languages of the country in which the machine is to be sold.

Warning b and notices shall comply with ISO 11684.

The following warnings are required for all types of splitting machines:

a) “Danger! Keep clear of moving parts!”;

b) “Wear eye protection!”;

c) “Wear protective gloves!”;

d) “Wear safety footwear!”;

Additional:

e) “Wear hearing protection!” See relevant regulations.

7.3 Instruction handbook

7.3.1 General

An instruction handbook shall be provided with each machine.

Comprehensive instructions and information on all aspects of maintenance and the safe use of the machine, including suitable clothing and personal protective equipment (PPE) requirements and the need for training, if necessary, shall be provided in the instruction handbook.

For the information to be provided to the user the content of this clause together with EN ISO 12100:2010, 6.4, shall apply.

7.3.2 Other information

Each machine shall be provided with information and instructions for normal use including warnings against particular hazards of use and instructions for operating, servicing and maintenance that comply as appropriate with EN ISO 12100:2010, 6.4. The importance of reading the instruction handbook thoroughly before using the machine shall be stressed on the front of the instruction handbook.

The instructions shall include all operations that are meant to be performed by the user. The instructions shall be simple and clear such that they are suitable for unskilled users. They shall include:

a) the need for operator to receive necessary training and instruction;

b) the intended use of the machine and reasonably foreseeable misuse;

c) the maximum and minimum length and diameter of logs allowed to be split;

d) the procedure for safely removing a jammed log;

e) the connection to and disconnection of the machine, from the power source;

f) the precautions for transport and storage (e.g. stability);

g) the splitting operation of the machine is designed to be activated by one person. While there is the possibility that additional operators could be working with the machine (e.g. for loading and unloading), only one operator should activate splitting operations;

h) the machine shall not be used by children;

i) the correct selection of suitable personal protective equipment (PPE), including safety footwear, close fitting clothing and suitable work gloves, eye protection and hearing protection;

j) the tests of the machine's safety devices;

k) that before starting work, hydraulic pipes and hoses shall be inspected and the stopping devices shall be tested;

l) the selection and preparation of a suitable working area free from obstructions;

m) the need to keep the working area free from obstructions, e.g. logs, split wood, etc.;

n) description of functional tests of the machine;

o) the need to stop the machine and disconnect it from the power source before cleaning or making adjustments;

p) the installation and maintenance requirements including a list of those devices e.g. two-hand control device which should be verified, how frequently the verification shall be carried out and by what method;

q) not leaving the machine unattended when running;

r) the operating speed of the machine (power take-off, if applicable);

s) the hazards arising from particular characteristics of wood when being split (e.g. knots, logs of irregular shape, etc. causing projectiles, jamming, crushing, etc.);

t) how the logs are to be inserted to minimize hazards arising during the splitting process;

u) not reaching into the splitting zone;

v) for electrically driven splitters the use of a portable residual current device (PRCD) if a residual current device (RCD) with a maximum residual current of 0,03 A is not provided in the electrical system;

w) the need for a machine used with a PTO to be connected to the three point linkage;

x) the use of the log holding device for vertical splitters;

y) the use, maintenance and limits of the hauling winch. Minimum stability requirements related to the tractor, if relevant;

z) information about the requirements for the terrain on which the machine is intended to be used, when the machine is intended to be used without the three-point-linkage of a tractor and the tractor PTO.

Annex A
(normative)

Log holding test for vertical log wedge splitters

A.1 Long log wedge splitters – Test requirements for the log fixing device

A.1.1 General

The test piece shall be safely held in position before and during the splitting process.

A.1.2 Holding force

This test shall be carried out using four test logs, bevelled 1/3-2/3:

— First with a diameter of (250 ± 20) mm and a length of (1 000 ± 20) mm (or the maximum log length specified in the instructions handbook);

— Second with a diameter of (250 ± 20) mm and a length of (750 ± 20) mm (or the minimum log length specified in the instructions handbook);

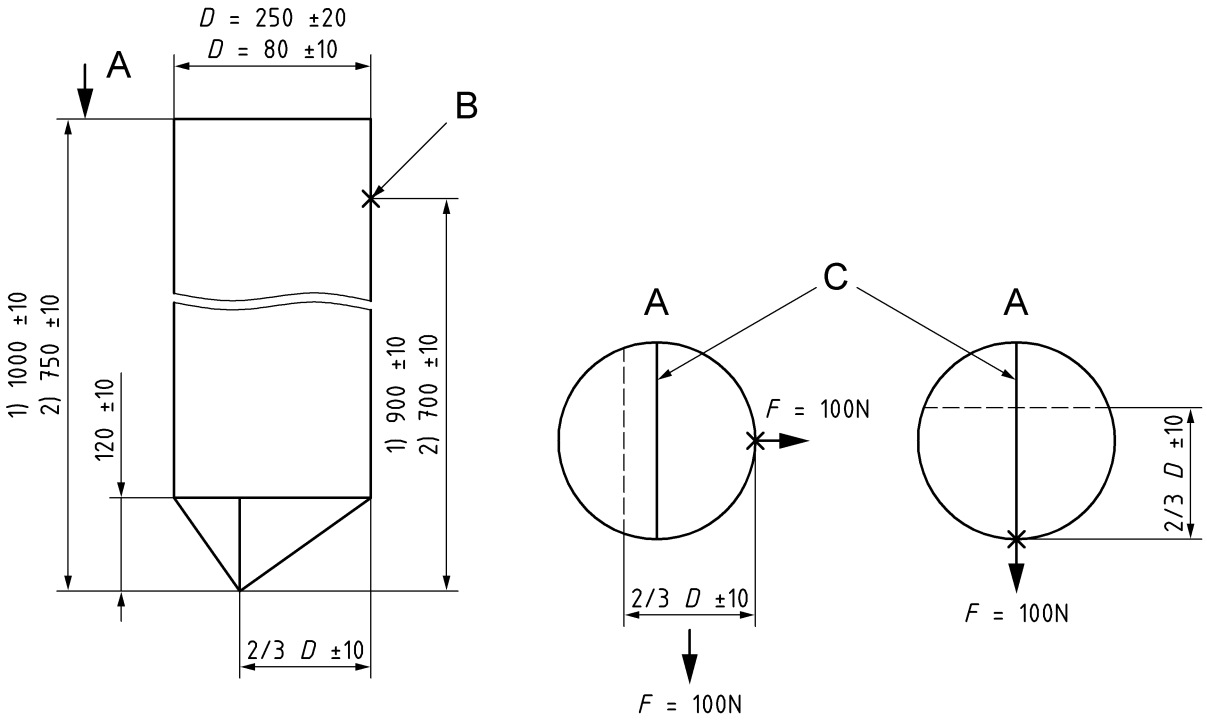
— Third with a diameter of (80 ± 10) mm and a length of (1000 ± 20) mm (or the maximum log length specified in the instructions handbook);

— Fourth with a diameter of (80 ± 10) mm and a length of (750 ± 20) mm (or the minimum log length specified in the instructions handbook);

— The holding device shall resist a force of 100 N applied at the test piece at a height of the length of the test log minus 50 mm, measured by a spring balance, in the direction of and at right angles to the direction of the splitting blade. The measurement shall be carried out without the wedge touching the work piece except where the wedge itself is the holding device;

— For the adjustment of the logs for testing, see Figure A.1.

Dimensions in millimetres



a) **b)** **c)**

Key

a) geometry of the test log (side view)
b) test assembly 1 (top view)
c) test assembly 2 (test log rotated 90°)
A view in direction "A"
B force application point
C contact line of the splitting wedge

Figure A.1 — Application of the test body

A.2 Short log wedge splitters – Test requirements for the log fixing device

A.2.1 General

The test piece shall be safely held in position before and during the splitting process.

A.2.2 Holding force

This test shall be carried out using two test logs, bevelled 1/3-2/3:

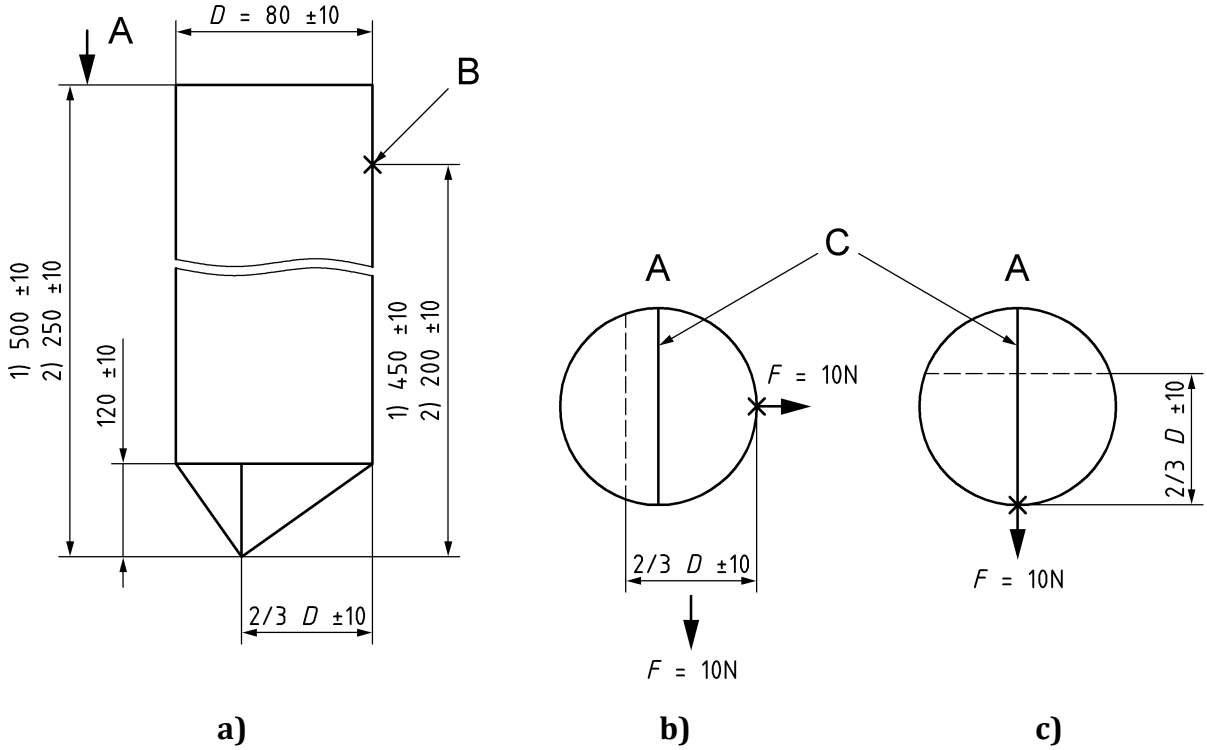
— First with a diameter of 80 ± 10 mm and a length of 500 ± 10 mm;

— Second with a diameter of 80 ± 10 mm and a length of 250 ± 10 mm;

— The test pieces shall resist a force of 10 N at a height of the length of the test log minus 50 mm, measured by a spring balance, in the direction of and at right angles to the direction of the splitting blade. The measurement shall be carried out without the wedge touching the work piece, except where the wedge itself is the holding device;

— For the adjustment of the log for testing, see Figure A.2.

Dimensions in millimetres



a) **b)** **c)**

Key

a) geometry of the test log (side view)
b) test assembly 1 (top view)
c) test assembly 2 (test log rotated 90°)
A view A
B force application point
C contact line of the splitting wedge

Figure A.2 — Application of the test body

Annex B
(normative)

Examples of solutions and verification of the two-hand control device for wedge splitters

B.1 Prevention of accidental actuation and of defeat

The precautionary measures listed may be required singly or in combination to meet this document.

The methods of defeat that shall be considered will depend on the design of two-hand control device, the operating conditions, the method of attachment and positioning of the two-hand control device and the specified safety distance requirements, etc.

B.2 Example for prevention of defeat using one hand

By the provision of one or more shields or an elevated area between the control actuating devices, which is (are) designed in such a way that the control actuating devices are separated by a distance of at least 260 mm around the shields.

Dimensions in millimetres

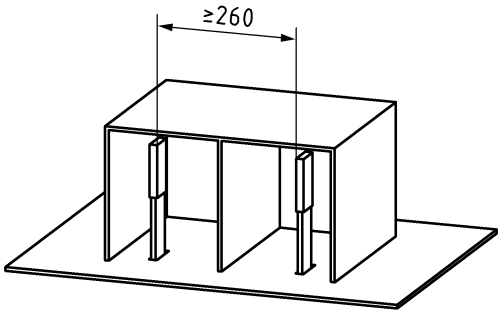


Figure B.1 — Prevention of defeating with using one hand

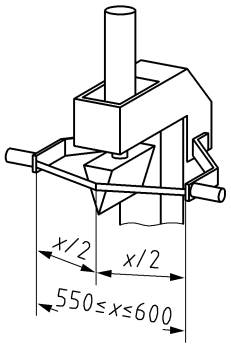
B.3 Example for prevention of defeat using hand and elbow of the same arm

Separation of the control actuating devices by a distance shall be between 550 mm and 600 mm.

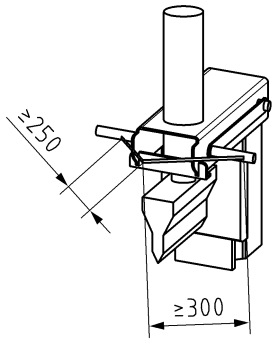
Separation of the control actuating devices by the provision of one or more shields or an elevated area designed in such a way that the control actuating devices cannot be touched at the same time with both ends of measuring equipment consisting of a 300 mm rigid bar not exceeding 5 mm diameter and a 250 mm cord attached to it.

Separation shall fulfil the requirements of EN 574:1996+A1:2008, 8.3.

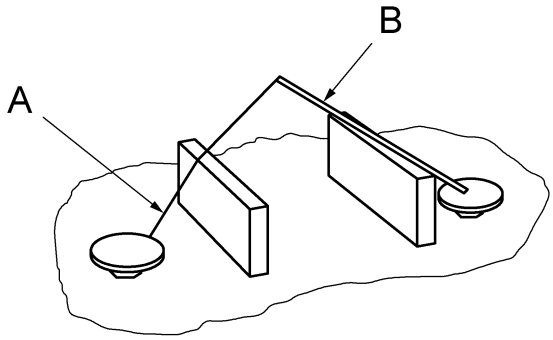
Dimensions in millimetres



a) Separation control devices by a distance



b) Separation control devices by shields at an elevated area



c) Separation of control devices by distance and shields

Key

A string 250 mm

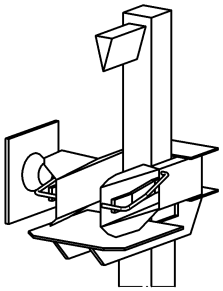
B bar, 300 mm

Figure B.2 — Prevention of defeating with hand and elbow of the same hand

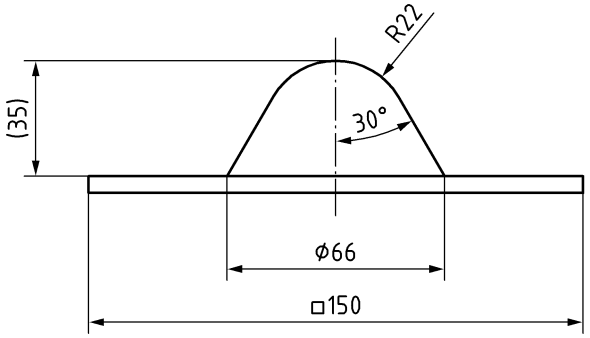
B.4 Example for prevention of defeat using the forearm(s) or elbow(s)

Shields designed in such a way that the control actuating devices cannot be operated by the forearms and/or the elbows. The shields are designed to limit the access from the operating side and also from the rear in such a way that the control actuating device cannot be operated from the operating side with the tip of a test cone representing the elbow. The dimension of the test cone shall be in accordance with Figure B.3.

Dimensions in millimetres



a) Example of arrangement for prevention of defeating with forehands and elbows



b) The dimension of the test cone

Figure B.3 — Prevention of defeating with forehands and elbows

B.5 Example for prevention of defeat using the hand and other parts of the body e.g. knee(s)

Arrangement shall fulfil the requirements of EN 574:1996+A1:2008, 8.5.

Arrangement of the control actuating devices on a horizontal or nearly horizontal surface at least 1 100 mm above floor or level of access.

In the case of attachment to a vertical or near vertical surface, by the provision of a protective collar around the control actuating devices.

Covers and/or shields which are designed in such a way that the control actuating devices cannot be operated by one hand and any other part of the body.

Dimensions in millimetres

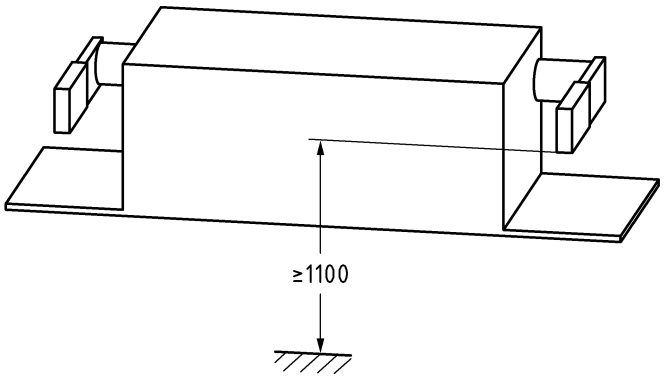


Figure B.4 — Prevention of defeating with one hand and other parts of the body

Annex C
(normative)

Testing requirements for hot exhaust surfaces and hot surfaces

C.1 Temperature measuring equipment

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

C.2 Method of test

The test shall be conducted in the shade. The power source shall be operated at its maximum operating speed until the surface temperatures stabilize.

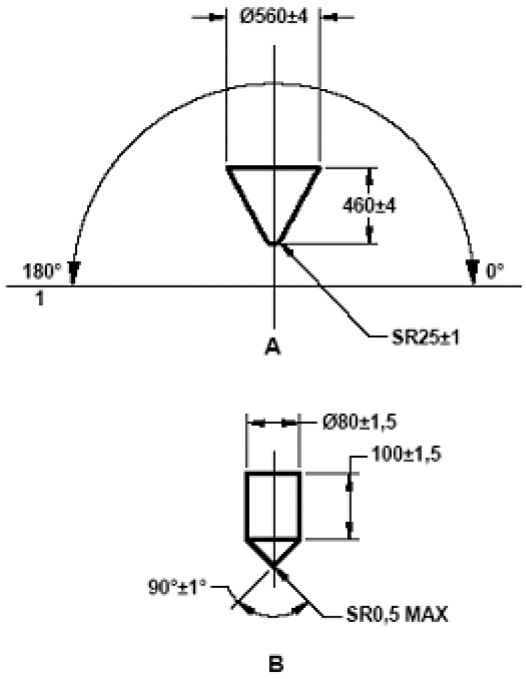
Identify the hot surface area(s) on the power source exhaust system and guard. Temperatures shall be determined by correcting the observed temperature by the difference between the specified ambient and test ambient temperature.

Allow the hot parts to cool. It is not necessary to test the accessibility of hot parts while they are hot. When the distance between the identified hot area and the nearest control is > l00 mm, Cone A in Figure C.1 shall be used. For a distance ≤ l00 mm between the identified hot area and the nearest control, Cone B in Figure C.1 shall be used. For Cone A, with the axis of the cone anywhere between 0° and 180° to the horizontal and with the nose or point of the cone in a downward to horizontal direction, move the cone towards the hot surface. Cone A shall not be moved in an upward direction. Cone B shall be moved in any direction. When moving the cone(s), determine if contact is made with the hot surface area(s) by the cone tip or conical surface of the cone.

C.3 Test acceptance

The tip or conical surface of Cones A or B shall not be able to make contact with a hot surface area greater than 10 cm^2.

Dimensions in millimetres



Key

1 horizontal plane

Figure C.1 — Test cones

Annex D
(normative)

Stability test for log splitters equipped with a hauling winch

D.1 General

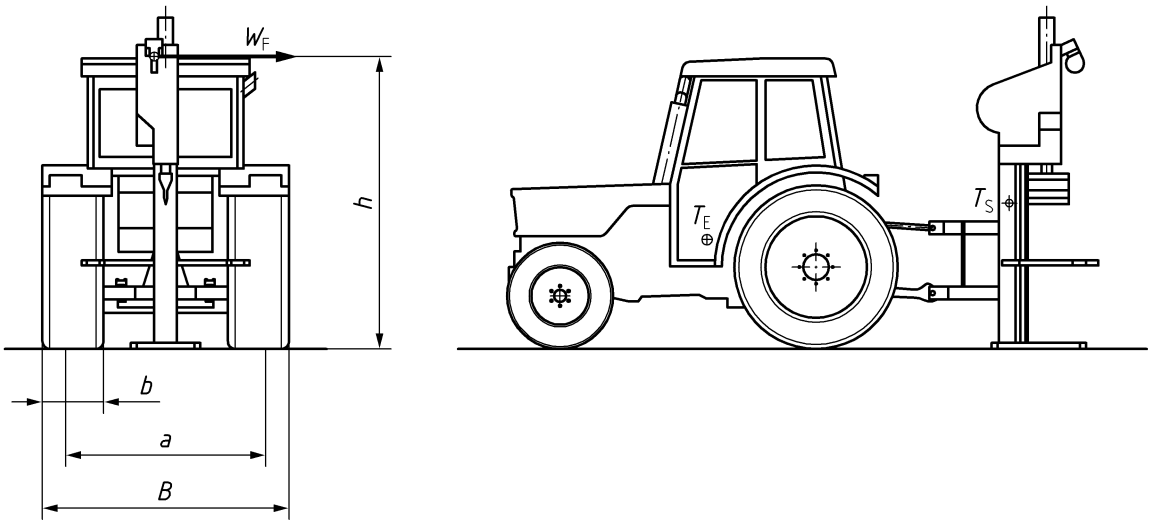
Log splitters with a hauling winch and powered only by the power source of a tractor, e.g. PTO or hydraulic power, shall fulfil the lateral stability test requirements given in D.2.

D.2 Lateral stability test and requirements

According to Figure D.1, the lateral stability requirements (S_R) are fulfilled if:

$$S_R = \frac{(T_E + T_S) \times \frac{a}{2}}{W_F \times h} > 1{,}25 \quad \text{(D.1)}$$

$$a = B - (0{,}5 \times b) \quad \text{(D.2)}$$



Key

T_E	[kg]	mass of an unloaded tractor
T_S	[kg]	total mass of a log splitter with hauling winch
W_F	[kg]	maximum traction force of the hauling winch in horizontal direction
a	[m]	track width of the rear axle
h	[m]	height of the rope or chain (or equivalent) intake from the ground
B	[m]	maximum width of the tractor wheels
b	[m]	width of the tyre

Figure D.1 — Lateral stability

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC on machinery

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Machinery Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN ISO 13856-2, *Safety of machinery - Pressure-sensitive protective devices - Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars (ISO 13856-2)*

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