INTERNATIONAL STANDARD

ISO 19432

First edition
2006-03-15

Building construction machinery and equipment — Portable, hand-held, internal combustion engine driven cut-off machines — Safety requirements and testing

Machines et matériel pour la construction des bâtiments — Tronçonneuses à disques, portatives, à moteur à combustion interne — Exigences de sécurité et essais

Reference number
ISO 19432:2006(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 19432 was prepared by Technical Committee ISO/TC 195, *Building construction machinery and equipment*.

Introduction

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

a) Type-A standards (basis standards) give basic concepts, principles for design, and general aspects that can be applied to machinery.

b) Type-B standards (generic safety standards) deal with one or more safety aspect(s) or one or more type(s) of safeguards that can be used across a wide range of machinery:

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

   — type-B2 standards on safeguards (e.g. two-hands controls, interlocking devices, pressure-sensitive devices, guards).

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

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

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

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

This International Standard is based on EN 1454:1998 and an ANSI draft.

Building construction machinery and equipment — Portable, hand-held, internal combustion engine driven cut-off machines — Safety requirements and testing

1 Scope

This International Standard specifies safety requirements and their verification by testing for the design and construction of portable, hand-held, internal combustion engine driven, cut-off machines, intended to be used by a single operator in the cutting of construction materials, such as asphalt, concrete, stone and metal. It is applicable to those machines designed purposely for use with a rotating, bonded-abrasive and/or superabrasive (diamond) cut-off wheel having a maximum outside diameter of 406 mm, centre-mounted on, and driven by, a spindle shaft, where the top of the wheel rotates away from the operator (see Figure 1).

This International Standard deals with all significant hazards related to the hand-held use of such machines (see Clause 4). It specifies methods for the elimination or reduction of hazards arising from their use, as well as the type of information on safe working practices to be provided with the machines. Cut-off machines designed in accordance with this International Standard are intended to be used by persons who have read and understood the safety requirements given in the "instruction handbook" and who use the appropriate personal protective equipment (PPE).

Except for noise, environmental aspects are not considered by this International Standard; nor are cut-off wheel specifications given — for such specifications, see, for example, EN 12413 [1] and EN 13236 [2].

This International Standard is not applicable to machines manufactured before the date of its publication.

2 Normative references

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

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

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

ISO 5348:1998, *Mechanical vibration and shock — Mechanical mounting of accelerometers*

ISO 5349-2:2001, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 2: Practical guidance for measurement at the workplace*

ISO 7293:1997, *Forestry machinery — Portable chain-saws — Engine performance and fuel consumption*

ISO 7914:2002, *Forestry machinery — Portable chain-saws — Minimum handle clearance and sizes*

ISO 8041:1990, *Human response to vibration — Measuring instrumentation*

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

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

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

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

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

ISO 16063-1:1998, *Methods for the calibration of vibration and shock transducers — Part 1: Basic concepts*

IEC 60745-1:2003, *Hand-held motor-operated electric tools — Safety — Part 1: General requirements*

IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and the following apply.

3.1
cut-off wheel
wheel composed of abrasive particles bonded together by an appropriate binder and incorporating, if necessary, some appropriate form of reinforcement, or made of metal or other materials of similar properties and having diamond, CBN-particles or other suitable abrasive particles bonded to its rim

3.2
arbor hole
centre hole of the cut-off wheel used for mounting the cut-off wheel on the machine spindle

3.3
blotter
washers made from some compressible material (e.g. paper, card or similar), attached to each side of the cut-off wheel, the function of which is to smooth imperfections in the cut-off wheel and allow a limited degree of slip when the wheel stalls in use

3.4
choke
device for enriching the fuel air mixture in the carburettor, to aid starting

3.5
clutch
device for connecting and disconnecting the driven member to and from a rotating source of power

3.6
cut-off wheel guard
partial enclosure intended to deflect cutting debris, as well as pieces of the cut-off wheel in the event that the wheel is broken in operation

3.7
engine stopping device
device by which the stopping of the power source is initiated

3.8
flange contact surface
area between the inner and the outer circumference on the flange, which forms the contact surface between the flange and the cut-off wheel

3.9
flange assembly
device provided to clamp and drive the cut-off wheel

3.10
handle
device designed to facilitate safe and easy control of the machine

3.10.1
front handle
handle located at or towards the front of the engine housing

3.10.2
rear handle
handle located at or towards the rear of the power source housing

3.11
idle speed
speed at which the engine runs with no load and throttle control released and the cut-off wheel does not rotate

3.12
reactive forces
sudden and unexpected motion of the machine, which can occur when the rotating cut-off wheel contacts a foreign object during cutting or because of pinching

3.13
maximum depth of cut
t
distance to which the cut-off wheel can enter the work-piece as measured from the outside diameter of the wheel to the outside diameter of the flange

3.14
maximum cut-off wheel speed
maximum permitted speed of a new cut-off wheel marked on the cut-off wheel

3.15
maximum spindle speed
maximum speed at which the spindle rotates with full open throttle and no load

3.16
silencer
device for reducing engine exhaust noise and directing the exhaust gases

3.17
rated speed
engine speed at which maximum power occurs

3.18
spindle
shaft of the cut-off machine, which supports, retains and drives the cut-off wheel in connection with the flanges

3.19
throttle control
device for controlling the engine speed

3.20
throttle lock
device for temporarily setting the throttle in a partially open position, to aid starting

3.21
throttle lock-out
device that prevents the unintentional operation of the throttle trigger until manually released

3.22
throttle control linkage
mechanism which transmits motion from the throttle control to the throttle control valve

3.23
transmission cover
device between the engine and the cutting equipment designed to prevent unintentional contact with the transmission

4 List of significant hazards

This clause lists significant hazards, hazardous situations and events as far as they are dealt with in this document, identified by risk assessment as significant for this type of machinery, and which require action to eliminate or reduce the risk. See Table 1.

Table 1 — List of significant hazards

No.	Hazard	Clause(s) in this International Standard dealing with the hazard
1	Mechanical hazards due to cutting, impact and reactive forces (i.e. climbing, pulling and especially reactive forces) related to the cut-off wheel and the transmission to the cut-off wheel	5.2; 5.11; 5.13; 5.14; 5.15; 5.16; 6.1.2
2	Electrical hazards due to contact with parts under high voltage (direct contact) or parts which have become under high voltage under faulty conditions (indirect contact)	5.10
3	Thermal hazards resulting in burns, scalds and other injuries, by a possible contact of persons with objects or materials with high temperature including the radiation of heat sources	5.12
4	Noise, resulting in hearing losses (deafness) and other physiological disorders (e.g. loss of balance; loss of awareness) and interference with auditory signals and speech communication	5.18; 6.1; 6.3
5	Vibration (resulting in peripheral circulatory and nervous functional disturbances in the hand-arm system, such as “white finger” disease)	5.19; 6.1; 6.3
6	Contact with or inhalation of harmful fluids, gases, mists and fumes related to exhaust gases and dust related to debris of cut-off materials	5.7.1; 5.8, 5.13.1; 6.1.2, 6.3
7	Fire or explosion related to fuel spillage	5.9, 6.1.2
8	Neglecting of ergonomic principles in machine design such as hazards from unhealthy postures or excessive efforts and inadequate consideration of human hand-arm anatomy related to handle design, machine balance	5.2; 5.5; 6.1.2; 6.3
9	Unexpected start-up, unexpected overrun/over-speed from failure/disorder of the control system related to failure in the handles and position of the controls	5.2; 5.4; 5.5; 5.6;
10	Impossibility of stopping the machine in the best possible conditions related to the handle strength and position of the engine stopping device	5.2; 5.4
11	Failure of the control system related to handle strength, position of controls and marking	5.5; 6.3
12	Brake up during operation related to cut-off wheel	5.3; 5.14; 6.1; 6.3
13	Ejection of objects related to debris	5.3; 5.8; 5.13, 6.1.2; 6.3

5 Safety requirements and verification

CAUTION — Some of the tests specified in this International Standard involve processes that could lead to a hazardous situation. Any person performing tests in accordance with this International Standard shall be appropriately trained in the type of work to be carried out. All national regulatory conditions and health and safety requirements shall be followed.

5.1 General

The safe running of cut-off machines depends on both the safety requirements according to this clause and the safe working conditions associated with the use of adequate personal protection equipment (PPE), such as gloves, leg protection, boots, and eye, ear and head protection equipment (see Clause 6).

Cut-off machines shall comply with the safety requirements and/or protective measures of this clause. Cut-off machines shall also be marked according to 6.2 and wear warnings according to 6.3. In addition, the machine shall be designed according to the principles of ISO 12100-2 for hazards relevant but not significant, which are not dealt with by this document.

When the machine is placed in its normal position on a flat horizontal surface (see Figure 1), the cut-off wheel or the guard shall not touch the horizontal plane and the machine shall remain stable.

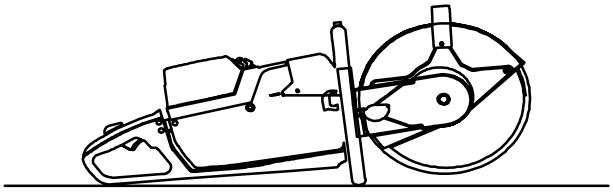

Figure 1 — Example of cut-off machine placed in normal position on flat surface

5.2 Handles

5.2.1 Requirements

Cut-off machines shall have a handle for each hand. These handles shall be designed so that they

— can be fully gripped by an operator when wearing protective gloves,

— provide the necessary sureness of grip by their shaping and surface, and

— conform to the dimensions and clearances, except distances B and C, given in ISO 7914:2002.

Cut-off machines with a system to isolate the machine vibration from the handles shall be designed so that the machine maintains structural integrity allowing the operator to control the machine, even in the event of partial or full failure of the vibration isolators.

5.2.2 Verification

Dimensions shall be verified by measurements. The ability to control the machine if a failure occurs in the vibration isolators shall be verified by inspection of the design.

5.3 Speed

5.3.1 Requirement

Engine speed shall be limited so that it is not possible to accelerate the engine in excess of the maximum spindle speed. The maximum spindle speed shall be specified in the instruction handbook.

5.3.2 Verification

The limitation to adjust engine speed shall be verified by inspection and measurement. The function of the throttle control shall be verified by inspection while operating the machine.

The spindle speed shall be measured at the spindle. Simple calculations using the engine speed and the transmission ratio shall not be permitted due to the potential for slippage in the energy transmission from the engine to the shaft.

5.4 Engine stopping device

5.4.1 Requirements

The machine shall be fitted with an engine stopping device by which the engine can be brought to a final stop and which does not depend on sustained manual effort for its operation. The control for this device shall be so positioned that it can be operated by the operator's right hand while holding the saw and wearing protective gloves. The purpose and method of operation of the device shall be clearly and durably marked, see 6.2.

The colour of the control shall clearly contrast with the background.

5.4.2 Verification

The function of the engine stopping device shall be verified by inspection while the machine is being operated. The control location shall be verified by inspection.

5.5 Throttle control

5.5.1 Dimensions

5.5.1.1 Requirements

The throttle control shall be positioned so that it can be pressed and released with a gloved hand while holding the rear handle by fulfilling the dimensional requirements for clearance around and behind the throttle control as shown in ISO 7914:2002, Figures 4 and 5.

5.5.1.2 Verification

The dimensions shall be verified by measurement.

5.5.2 Unintentional movement

5.5.2.1 Requirements

Unintentional movement of the cut-off wheel shall be minimized by a throttle control that, when released, automatically reverts to the idling position and is retained in that position by the automatic engagement of a throttle control lock-out.

The throttle control linkage shall be so designed that a force applied on the rear handle shall not increase the engine speed to a point where the clutch engages and cut-off wheel movement begins.

5.5.2.2 Verification

The function of the throttle control, throttle control lock-out and the throttle lock shall be verified by inspection while operating the machine. If a relative motion is possible between the carburettor and the throttle control, then the throttle control linkage design shall be verified by applying a force in any direction related to the plane of the cut-off wheel, on the centre of the rear handle grip, equal to three times the weight of the cut-off machine unit without accessories, with the cut-off wheel and with the tanks empty and the machine body secured.

5.5.3 Throttle lock

5.5.3.1 Requirement

If a throttle lock is provided for cold starting, it shall be such that the lock has to be engaged manually and is automatically released when the throttle trigger is operated.