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Road operation machinery - Safety - Part 4: Road service area maintenance machines - Requirements for grass and brush cutting machines

Maschinen für den Straßenbetriebsdienst - Sicherheit - Teil 4: Maschinen für die Straßenunterhaltung – Anforderungen für Grasmähgeräte

Machines d'exploitation des routes - Sécurité - Partie 4 : Machines d'entretien des dépendances routières - Prescriptions spécifiques pour les faucheuses et les débroussailleuses

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EUROPEAN STANDARD

EN 17106-4

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English Version

Road operation machinery - Safety - Part 4: Road service area maintenance machines - Requirements for grass and brush cutting machines

Machines d'exploitation des routes - Sécurité - Partie 4
: Machines d'entretien des dépendances routières -
Prescriptions spécifiques pour les faucheuses et les
débroussailleuses

Maschinen für den Straßenbetriebsdienst - Sicherheit -
Teil 4: Maschinen für die Straßenunterhaltung -
Anforderungen für Grasmähgeräte

This European Standard was approved by CEN on 16 August 2021.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN 17106-4:2021) has been prepared by Technical Committee CEN/TC 151 “Construction equipment and building material machines - Safety”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.

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 13019:2001+A1:2008, EN 13021:2003+A1:2008 and EN 13524:2003+A2:2014.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA which is an integral part of this document.

EN 17106:2021 consists of the following parts under the general title “Road operation machinery – Safety”:

- Part 1: General requirements
- Part 2: Specific requirements for road surface cleaning machines
- Part 3-1: Winter service machines - Specific requirements for snow clearing machines with rotating tools and snow ploughs
- Part 3-2: Winter service machines - Specific requirements for spreading machines
- Part 4: Road service area maintenance machines - Specific requirements for grass and brush cutting machines

The significant technical changes introduced in this standard, are related to the risks resulting from the combination of a grass/brush-cutting attachment with a vehicle (truck, tractor or self-propelled machinery), in terms of stability, mechanical interfaces, ergonomics of the control system in the cabin and visibility.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 17106-4:2021 (E)

Introduction

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

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:

- distributors;
- machine users/employers;
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers (e.g. for maintenance);
- 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 or hazardous events are covered are indicated in the Scope of this document.

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

1 Scope

This document applies to grass and/or brush cutting machinery which are attached to or mounted on carrier vehicles (e.g. tractor, truck), or which are self-propelled machinery and which are defined in Clause 3.

For mobile machinery, which are a combination of a grass/brush-cutting attachment and a carrier-vehicle, this part of the standard addresses the relevant health and safety requirements of Annex I of the machinery directive which are inherent to the grass or brush cutting attachment itself and those resulting from the other risks which are only related to the combination of the grass/brush-cutting attachment with the carrier vehicle (e.g. interfaces between the attachment and the carrier-vehicle, stability, visibility). For machinery which are a combination of a grass/brush-cutting attachment and a carrier-vehicle, this part does not deal with the carrier vehicle itself which is covered by another European legislation.

For self-propelled machinery, this part only deals with health and safety requirements of the attachment itself and does not deal with the self-propelled machinery itself which are dealt with in EN 17106-1:2021.

The requirements of this part are complementary to the common requirements formulated in EN 17106-1:2021.

This document does not repeat the requirements from EN 17106-1:2021, but contains clauses/subclauses which supplement or modify the corresponding clauses/subclauses of part 1 to provide requirements for grass and/or brush cutting machinery.

When requirements of this document are different from those which are stated in EN 17106-1:2021, the requirements of this document take precedence over the requirements of EN 17106-1:2021 for machines that have been designed and built according to the provisions of this document.

NOTE 1 Road regulations or Directives apply to vehicular trucks and tractors, termed 'carrier vehicles' in this standard.

NOTE 2 The use in public road traffic is governed by the national regulations.

This document deals with all significant hazards identified through a risk assessment pertinent to grass and/or brush cutting machinery, when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (transportation, assembly, dismantling and disabling, see Annex D). This document specifies also the appropriate technical measures to eliminate or reduce risks arising from the significant hazards associated with machine operation, setting and adjustments, load discharge and routine maintenance.

This document does not deal with:

- walker-operated and hand-held machines;
- machines for the maintenance of sports grounds;
- machines for agriculture, horticulture and forestry;
- pit and sewer cleaning vehicles/-machines;
- grass and brush cutting machines with multiple cutting heads (see Figure C.20);
- vertical axis grass and brush cutting machines except inter-post machinery (see Figure C.22);
- horizontal axis grass and brush cutting machines with two rotors (see Figure C.23);
- self-propelled remote-controlled machinery for road service area maintenance, except the mowing head;
- self-propelled remote-controlled machinery used for forestry application (see Figure C.21);
- cleansing and ditch maintenance machines (see Figures C.24 and C.25).

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This document does not deal with the risks associated with the operation of machines in potentially explosive atmospheres and risks associated with electro-magnetic compatibility, vibrations and slewing cab of self-propelled machinery.

This document does not address the safety requirements related to noise declaration.

This document is not applicable to grass and/or brush cutting machinery manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 15436-1:2008, *Road service area maintenance equipment - Part 1: Terminology*

EN 17106-1:2021, *Road operation machinery - Safety - Part 1: General requirements*

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

EN ISO 13850:2015, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)*

ISO 536:2019, *Paper and board - Determination of grammage*

ISO 730:2009, *Agricultural wheeled tractors - Rear-mounted three-point linkage - Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4*

ISO 789-1:2018, *Agricultural tractors - Test procedures - Part 1: Power tests for power take-off*

ISO 1974:2012, *Paper - Determination of tearing resistance - Elmendorf method*

ISO 2758:2014, *Paper - Determination of bursting strength*

ISO 3416:1986, *Textile floor coverings - Determination of thickness loss after prolonged, heavy static loading*

ISO 6750-1:2019, *Earth-moving machinery - Operator's manual - Part 1: Contents and format*

ISO/TR 6750-2:2021, *Earth-moving machinery - Operator's manual - Part 2: List of references*

ISO 11001-1:2016, *Agricultural wheeled tractors - Three-point hitch couplers - Part 1: U-frame coupler*

ISO 11001-2:1993, *Agricultural wheeled tractors and implements - Three-point hitch couplers - Part 2: A-frame coupler*

ISO 11001-3:2009, *Agricultural wheeled tractors and implements - Three-point hitch couplers - Part 3: Link coupler*

ISO 11001-4:1994, *Agricultural wheeled tractors and implements - Three-point hitch couplers - Part 4: Bar coupler*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN 15436-1:2008, EN 17106-1:2021 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

road service area maintenance machine

machine situated at the traffic surface which, from this position, prepares the traffic surface and its neighbouring areas

3.2

grass-cutting machinery

road service area maintenance machine specifically designed and manufactured for grass-cutting operations (for example, see Figures C.1, C.2 and C.18)

Note 1 to entry: Grass-cutting machinery can be self-propelled or mounted at rear, front or laterally of a carrier-vehicle.

3.3

brush-cutting machinery

road service area maintenance machine specifically designed and manufactured for brush-cutting operations (for example, see Figures C.1, C.2 and C.19)

Note 1 to entry: Brush-cutting machinery can be self-propelled or mounted at rear, front or laterally of a carrier-vehicle.

3.4

grass/brush-cutting machinery

road service area maintenance machine specifically designed and manufactured for grass and brush-cutting operations (for example, see Figures C.1, C.2, C.18 and C.19)

Note 1 to entry: Grass/brush-cutting machinery are also named mixed machinery and can be self-propelled or mounted at rear, front or laterally of a carrier-vehicle.

3.5

inter-post machinery

grass-cutting machine specifically designed to remove vegetation around and between posts (see Figures C.3 and C.4)

3.6

releasing device

device ensuring that the cutting head of the grass and/or brush cutting machinery is mechanically or hydraulically released when encountering an obstacle

3.7

primary control

manual control designed to operate the machine and which control main functions for frequent use

EN 17106-4:2021 (E)**3.8****secondary control**

device to control the machine functions which need low frequent use

Note 1 to entry: Devices can be monitor or display.

4 Safety requirements and/or protective/risk reduction measures**4.1 General**

Grass and/or brush cutting machines shall comply with the safety requirements and/or protective/risk reduction measures of this clause. In addition, the machines shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

Grass and/or brush cutting machines shall comply with the requirements of EN 17106-1:2021, as far as not modified or replaced by the requirement of this part.

Where the means of reducing the risk is by a safe system of working the machinery, Clause 6 specifies the minimum required information regarding details of the system and of the elements of training required by the operating personnel to be provided in the Information for use.

4.2 Additional requirements and/or measures for permanently mounted equipment, interchangeable equipment and trailed machines**4.2.1 General**

EN 17106-1:2021, 4.3.1 applies with the following addition:

The design and mounting of the grass and/or brush cutting machinery shall conform to the requirements of the carrier vehicle defined by its manufacturer.

4.2.2 Provisions for transport, storage, mounting, dismounting and stability

EN 17106-1:2021, 4.3.4 applies with the following addition:

The off-side wheel (i.e. opposite to the side where the attachment is used in operation) shall have at least 15 % of the total weight applied on the axle in the most unfavourable configuration, especially for the working position (see Figure 1).

In transport position, the attachment shall not exceed the rear/front axle track (see Figure 2).

For rear-mounted articulated arm-type machinery, the following requirements apply:

- $P1 + P2 + P3 < \text{Maximum operating mass of the carrier-vehicle (Gross vehicle mass)}$;
- $P3 < \text{Maximum Load on rear wheel}$;
- $P1 / (P1 + P2 + P3) > \text{Lateral stability coefficient (coeff "zone preferred" chosen 15 \%)}$;
- $P2 / (P1 + P2 + P3) > \text{Frontal stability coefficient (coeff "zone preferred" chosen 15 \%)}$.

If the coordinates of the centre of gravity on the plane represented in Figure 1 are known, then it has to be verified that the centre of gravity falls inside the stability triangle.

Therefore:

$$\begin{cases} y \geq 0 \\ y \leq \frac{2E}{V}x + E \\ y \leq -\frac{2E}{V}x + E \end{cases}$$

With origin O (0;0) taken in the middle of the basis of the triangle (see Figure 1 or Figure 2) and with following parameters:

- P1, P2 and P3: equivalent load applied to the ground;
- V, rear axle track;
- E, wheelbase;
- x and y, coordinates on the ground plane of the centre of gravity of the total gross weight (combination of the carrier-vehicle and the machinery), in the most extended arm position of the machinery for the purpose of lateral stability.

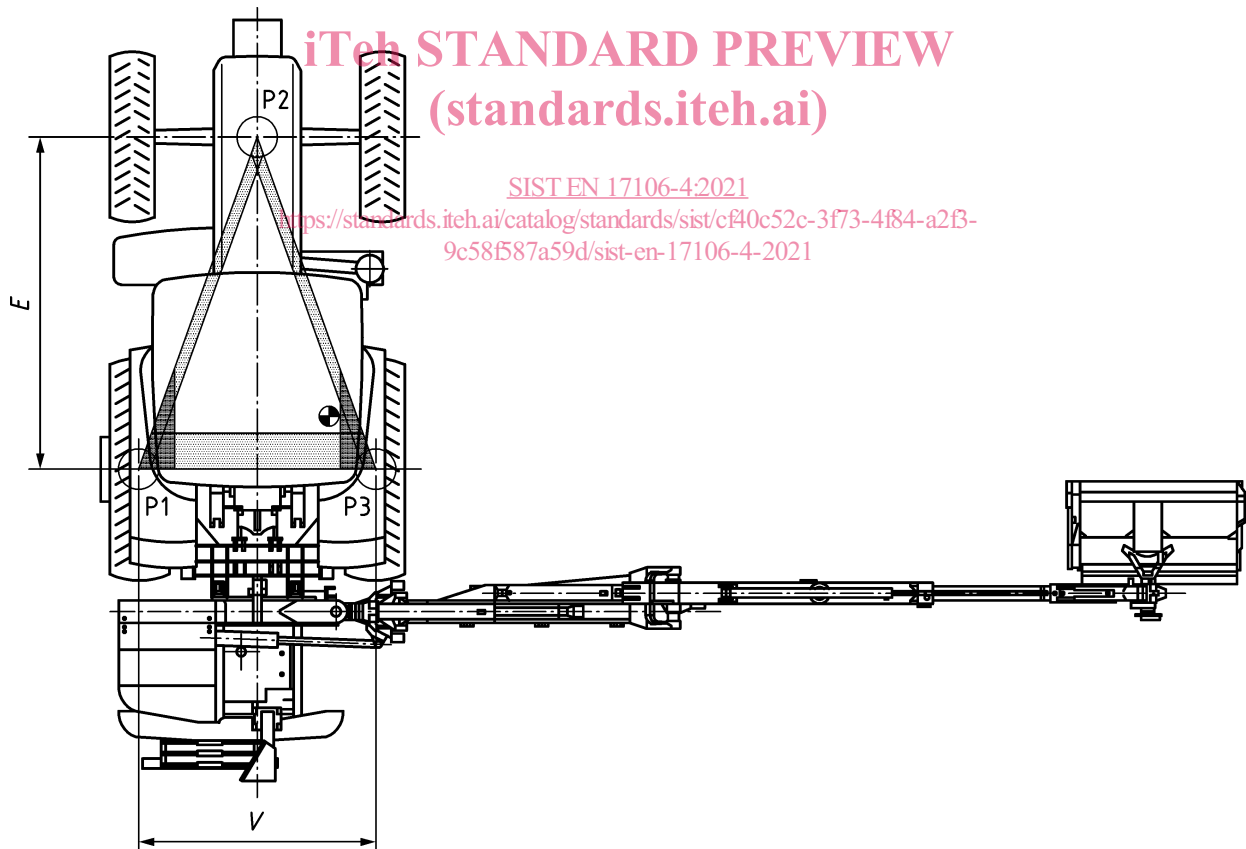
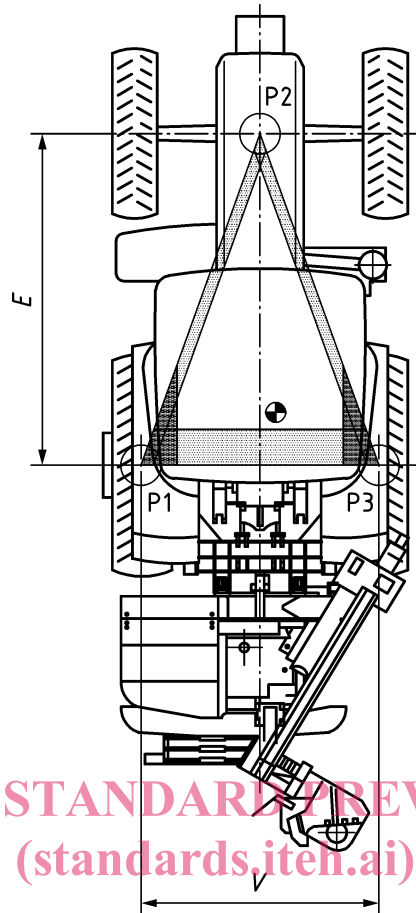


Figure 1 — Working position



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Figure 2 — Transport position

The same calculation method shall be used for other mounting configurations.

4.2.3 Controls

EN 17106-1:2021, 4.3.2 applies.

EN 17106-1:2021, 4.1.4.1 applies with the following additions and/or modifications:

Controls shall be protected against inadvertent contact.

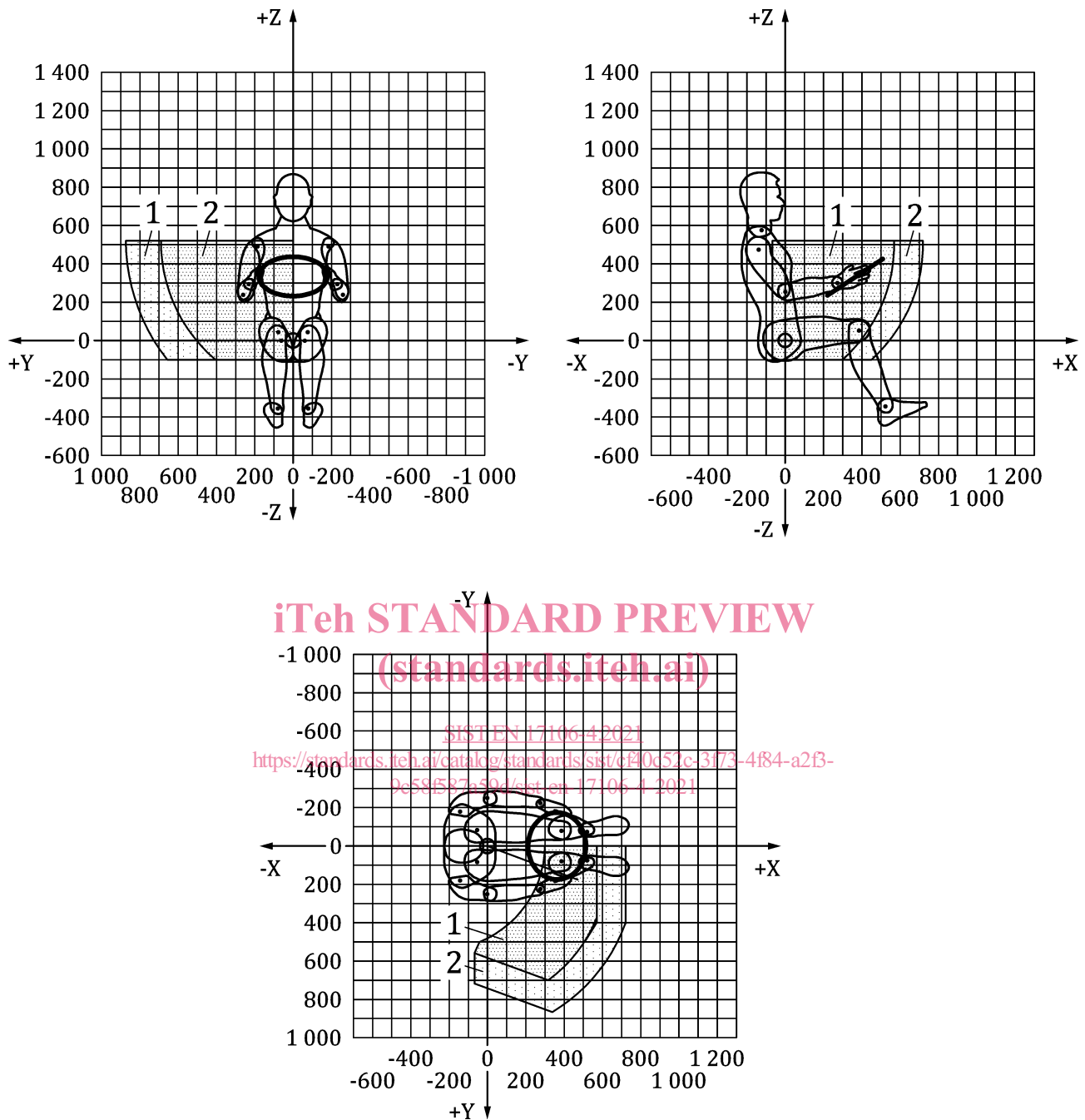
Controls for all the movements of the arm and of the mowing head shall be hold-to-run type, except the control of the activation of the rotating tools, except the floating control of the mowing head and except functions designed to reduce operator fatigue and protect machine structure.

Controls shall be located on the side the operating area; they shall be located in order to minimize the obstruction to visibility caused by their presence.

For application of EN17106-1:2021, 4.1.4.1 control panel shall be considered as secondary hand control.

By exception to EN 17106-1:2021, 4.1.4.1 primary hand controls shall be located in zone 1 (see Figures 3 or 4). If not possible due to technical constraints in relation with the carrier vehicle design (e.g. controls of the carrier vehicle already positioned in zone 1 that leaves no space available for additional controls in this zone), they shall be located in zone 2 (see Figures 3 or 4).

Dimensions in millimetres

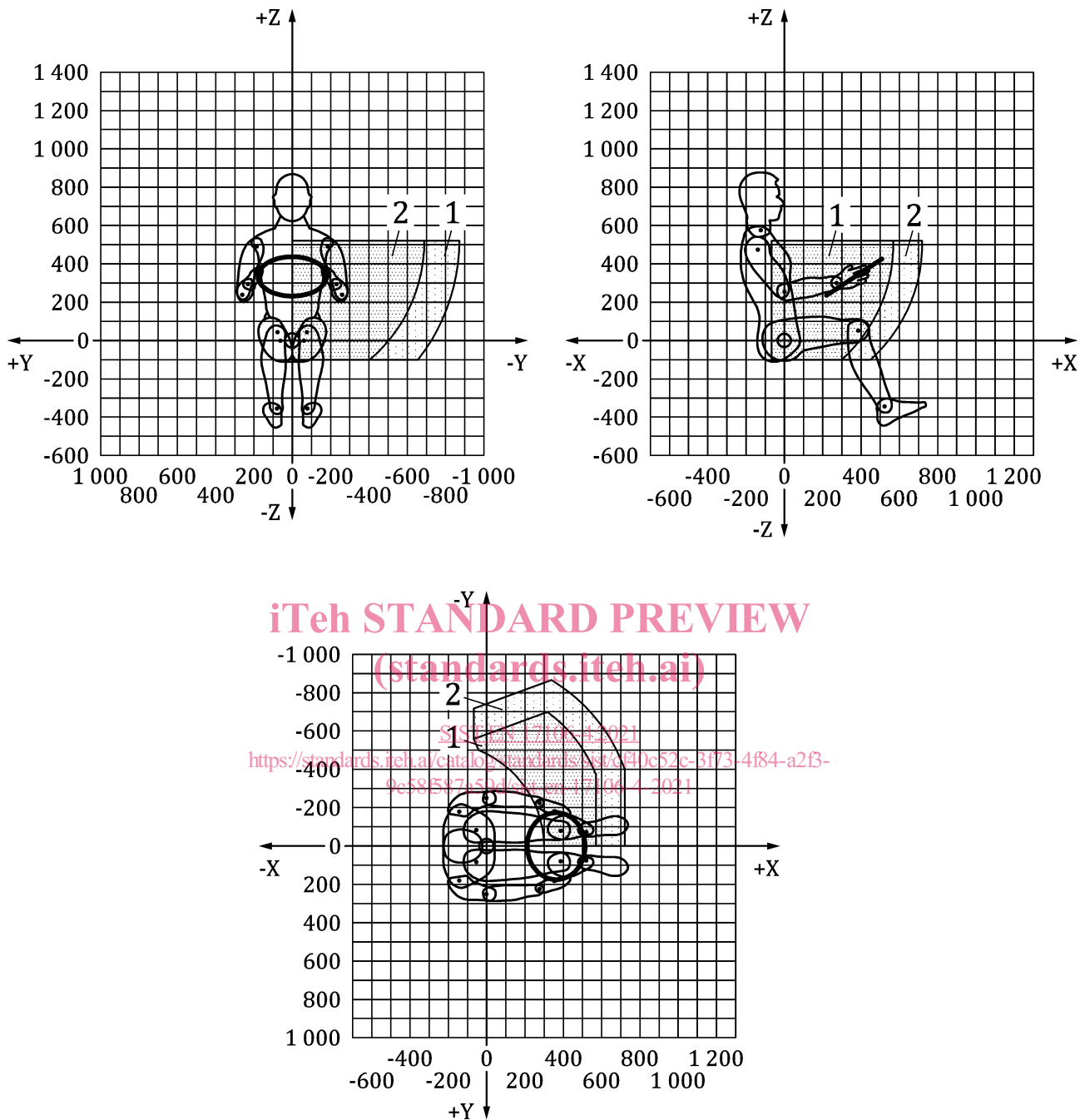
**Key**

- 1 Zone 1 (comfort zone)
- 2 Zone 2 (acceptable zone under specific conditions)

Figure 3 — Definition of comfort and acceptable zones for primary hand controls on the right side

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Dimensions in millimetres

**Key**

- 1 Zone 1 (comfort zone)
- 2 Zone 2 (acceptable zone under specific conditions)

Figure 4 — Definition of comfort and acceptable zones for primary hand controls on the left side

4.2.4 Visibility

EN 17106-1:2021, 4.3.3 does not apply and EN 17106-1:2021, 4.1.3 applies with the following modifications:
EN 17106-1:2021, 4.1.3.1 and EN 17106-1:2021, 4.1.3.2 apply.

EN 17106-1:2021, 4.1.3.3 is replaced by the following requirement:

In case of lack of direct or indirect visibility on the cutting head of the machine from the operator's station, a releasing device (see 3.6) shall be fitted on the equipment.

4.3 Precautions against hazards caused by moving parts excluding cutting head

EN 17106-1:2021, 4.1.5 applies with the following additions:

Rotating or oscillating machine parts on grass and/or brush cutting machinery shall be protected against unintentional contact by means of guards which conform to EN 17106-1:2021, 4.1.5.

4.4 Interfaces

EN 17106-1:2021, 4.3.5 applies.

EN 17106-1:2021, 4.3.5.1, 1st sentence applies with the following addition:

For the mechanical interface complying with ISO 730:2009, ISO 11001-1:2016, ISO 11001-2:1993, ISO 11001-3:2009 or ISO 11001-4:1994 shall also be used in conjunction with ISO 730:2009.

4.5 Unintended lowering of the equipment

- a) The machine when used as intended shall prevent any unintended lowering of the mowing head and/or boom.

NOTE 1 Unintended lowering is when a mowing head or boom runs back or descends because of an interruption or an irregularity in the energy supply.

This requirement shall be achieved by the provision of:

- non-return valves or a corresponding function in the control valves of hydraulic or pneumatic lifting devices, or; <https://standards.iteh.ai/catalog/standards/sist/cf40c52c-3f73-4f84-a2f3-9c58f587a59d/sist-en-17106-4-2021>
- self-locking driving gear or an automatic drop-latch arrangement with a ratchet wheel for mechanical winches, or;
- a control valve as a back-run safety mechanism, only if the adoption of non-return valves is technically not possible.

- b) Where persons have to stand under raised or tilted machines or components for maintenance purposes thereof as part of the working procedure, unintended lowering shall be prevented. This can be achieved, for example, by:

NOTE 2 The term "as part of working procedure" does not cover repair work.

- automatically engaging mechanical locks, or;
- externally unlocking non-return valves mounted directly on the lifting cylinder, or;
- mechanical safety mechanisms which are operated from outside of the danger zone.