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**Building construction machinery and  
equipment — Machinery for concrete  
surface floating and finishing —**

**Part 2:  
Safety requirements and verification**

**iTeh STANDARD PREVIEW**  
*Machines et matériels pour la construction des bâtiments —  
Talocheuses-lisseuses de mortier —  
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Partie 2: Les exigences de sécurité et de vérification*

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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](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 195, *Building construction machinery and equipment*, Subcommittee SC 1, *Machinery and equipment for concrete work*.

ISO 13105 consists of the following parts, under the general title *Building construction machinery and equipment — Machinery for concrete surface floating and finishing*:

- *Part 1: Terms and commercial specifications*
- *Part 2: Safety requirements and verification*

## Introduction

This part of ISO 13105 is a type-C standard as stated in ISO 12100.

This part of ISO 13105 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 organisations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of this part of ISO 13105 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 the 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 part of ISO 13105.

The machinery concerned and the extent to which hazards, hazardous situations, or hazardous events are covered are indicated in the Scope of this part of ISO 13105.

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.

ISO 13105 deals with machinery designed for smoothing and finishing concrete on construction sites. These machines are commonly referred to as “power trowels.”

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# Building construction machinery and equipment — Machinery for concrete surface floating and finishing —

## Part 2: Safety requirements and verification

### 1 Scope

This part of ISO 13105 specifies safety requirements for machines used for concrete surface floating and finishing. This includes pedestrian-controlled equipment and ride-on equipment.

It is not applicable to

- internal or external vibrators or ancillary equipment used with internal and external vibrators, for example, air compressors, hydraulic power sources, and voltage transformers,
- remote-controlled or hand-held smoothing machines and self-acting (robotic) smoothing machines, and
- strike-off type machines commonly known as screeds.

This part of ISO 13105 deals with significant hazards, hazardous situations, or hazardous events relevant to machinery for concrete surface floating and finishing (power trowels) when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

This part of ISO 13105 is not applicable to machines which are manufactured before the date of its publication.

### 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.

ISO 2631-1, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 5349-1, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

ISO 11201, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

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

## ISO 13105-2:2014(E)

ISO 13105-1:2014, *Building construction machinery and equipment — Machinery for concrete surface floating and finishing — Part 1: Terms and commercial specifications*

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13766, *Earth-moving machinery — Electromagnetic compatibility*

IEC 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60309-1, *Plugs, socket-outlets and couplers for industrial purposes — Part 1: General requirements*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 13105-1, and the following shall apply.

#### 3.1

##### **nylon 6/6 substrate**

polyhexamethylene adipamide material

Note 1 to entry: See ISO 1874-1 for more information.

### 4 Safety requirements and/or protective/risk reduction measures

Machinery shall comply with the safety requirements and/or protective/risk reduction measures of this Clause.

In addition, the machine shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this part of ISO 13105.

#### 4.1 General requirements for all machines

##### 4.1.1 Guarding of the rotating blades

A means shall be provided to protect the operator or bystanders from inadvertently coming in contact with rotating blades. The guarding device shall be designed so that the operator can visually see the interaction of the blades with the concrete surface.

If the guarding device is constructed of tubes (or bars), there shall be a gap not exceeding 90 mm between the concentric tubes (or bars). See ISO 13105-1:2014, Figures A.1 and [A.2](#).

The lowest outer tube (or bar) of the blade guarding device shall be able to withstand an impact force equal to two times the weight of the machine without exposing the blades to the deformation.

##### 4.1.2 Blade guarding device ground clearance

The height of the lowest outer tube (or bar) of the blade guarding device with blades in the unpitched position shall not exceed 60 mm from the concrete surface. See ISO 13105-1:2014, Figures A.1 and [A.2](#).

##### 4.1.3 Blade pitch adjustment

Whenever practicable, the adjustment of the blade pitch shall be carried out from the normal operating position. Where this is neither possible nor practicable, means shall be provided to protect personnel from contact with the blade, e.g. blade lock or equivalent. Instructions for blade pitch adjustment shall be given in the operator's manual. See [6.1.2](#), item t).



#### 4.1.4 Electrical devices

##### 4.1.4.1 Electrical contact of persons with live parts

###### 4.1.4.1.1 Direct contact

Protection from direct contact with live parts shall be in accordance with IEC 60204-1, 6.2.

###### 4.1.4.1.2 Indirect contact

Protection from indirect contact with live parts shall be in accordance with IEC 60204-1, 6.3.

##### 4.1.4.2 External influences on electrical equipment

###### 4.1.4.2.1 Damage to electrical equipment

The position of the electrical equipment in the machinery shall guarantee protection from mechanical damage to electrical equipment.

Flexible leads with insulation meeting specification H 07 RN-F or A 07 RN-F per EN 50525-2-21:2011 or at least equivalent specification shall be used.

Plug devices shall be qualified for more difficult (rough) conditions in accordance with IEC 60309-1.

###### 4.1.4.2.2 Protection from dust

Electrical components shall meet the dust protection requirements to IP-5X of electric protection in accordance with IEC 60529, 13.4.

###### 4.1.4.2.3 Protection from water

Electrical components shall meet the water protection requirements to IP-X5 of electric protection in accordance with IEC 60529, 14.2.5.

##### 4.1.4.3 Protection against residual voltages

Live parts having a residual voltage greater than 60 V after the supply has been disconnected shall be discharged to 60 V or less within a time period of 5 s after disconnection of the supply voltage provided that this rate of discharge does not interfere with the proper functioning of the equipment.

##### 4.1.4.4 Prevention of the occurrence of a touch voltage

For engine powered machines which generate electrical power above 60 V for accessories, the requirements of IEC 60204-1, 6.3.2 shall apply.

##### 4.1.4.5 Failure of electrical energy source

The machine shall be designed to prevent unintentional starting of the machine after re-energizing subsequent to the failure of electrical energy supply.

#### 4.1.5 Hot parts

The machine shall be designed to minimize risk to the operator from inadvertent contact with hot parts in accordance with ISO 13732-1.

#### 4.1.6 Operator exposure to harmful gases

Exhaust gases of the internal combustion engine shall be directed away from the operator.

#### 4.1.7 Securing of machine parts

Machine parts (e.g. guards) shall be secured to prevent unintentional loosening or displacement during operation or machine lifting.

#### 4.1.8 Means for lifting

For machines with a gross weight of 25 kg or greater, means for lifting (e.g. lifting points) the machine shall be provided. These provisions shall be arranged in such a way that the machine can be lifted, held, and lowered in a stable equilibrium state.

Lift points and devices shall be clearly identified on the machine per [6.3.2](#).

#### 4.1.9 Provisions for securing during transport

Provisions shall be in place to secure the machine during transport (i.e. tie-downs, enclosed vehicle).

Securing points on the machine shall be clearly identified per [6.3.3](#).

#### 4.1.10 Noise reduction

Noise reduction shall be an integral part of the design process, thus specifically taking into account measures at source. See [Annex A](#) for details.

#### 4.1.11 Vibration reduction

Vibration reduction shall be an integral part of the design process, thus specifically taking into account measures at source. See [Annex A](#) for details.

#### 4.1.12 Electromagnetic compatibility (EMC)

The relevant EMC requirements shall be in accordance with ISO 13766.

### 4.2 Safety requirements for pedestrian-controlled machines

#### 4.2.1 Handle (pole)

##### 4.2.1.1 Horizontal distance from the handle (pole) to the most external guarding device bar (tube)

The horizontal distance from the controls at the handle (pole) to the most outside part of the protection device shall not be less than 900 mm. See ISO 13105-1: 2014, Figure A.1.

##### 4.2.1.2 Handle (pole) rotation

For engine-powered machines, a means shall be provided to automatically stop handle (pole) rotation in the event the handle is inadvertently released while the blades are in motion. The handle (pole) shall not turn more than 270° from the release position.

For electrically-powered machines, a means shall be provided to reduce power to 25 Joules or less in the event the handle is inadvertently released while the blades are in motion.

Means shall be provided to prevent the handle (pole) from rotating during engine start.

#### 4.2.1.3 Loss of stability

The design of the handle shall take into consideration the maximum static and dynamic loads when used as intended.

#### 4.2.1.4 Controls and adjustment

During normal operation, controlling or adjustment of machine shall only be possible from the operator's position by using the hand controls on the handle (pole).

#### 4.2.2 Unintentional starting of blades

If a disruption of power occurs, a means shall be provided e.g. reset switch, to enable restarting of the blades but only after completing the restart procedure as defined by the manufacturer.

#### 4.2.3 Hand operated starting devices

Engine-powered machines shall be equipped with a pull-type starting device.

The pull rope of pull-type starting device shall be securely attached to the starting device.

During and after engine start with the pull-type starting device, there shall be no automatic movement of the machine or its equipment.

### 4.3 Safety requirements for ride-on machines

#### 4.3.1 Controls

##### 4.3.1.1 General

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During normal operation, operating of controls or adjustment of machine shall only be possible from the operator's position, with the operator in the seated position.

The pedal on the ride-on machine shall be so designed that unintentional motion activation while the operator is not in a position to control the machine is not possible.

##### 4.3.1.2 Blade motion controls

When the blade motion control device is released it shall return to a neutral position and the blades shall automatically come to a stop.

After vacating the operator's seat, the blade rotation shall stop, and the speed of the engine shall be brought to idle, or the engine on the ride-on machine shall be automatically stopped.

##### 4.3.1.3 Steering controls

Steering controls shall have neutral positions and automatically return to that position when the control is released by the operator.

The movement of controls on the ride-on machine shall represent the intended movement of the machine, and prevent the movement of the machine in the wrong direction.

#### 4.3.2 Hydraulic system (if equipped)

The hydraulic system shall be designed in compliance with the requirements of ISO 4413. If leakage occurs either internally or externally, it shall not cause a hazard.