



**SLOVENSKI STANDARD**  
**SIST EN ISO 19296:2019**

**01-maj-2019**

**Nadomešča:**  
**SIST EN 1889-1:2011**

---

**Stroji za rudarska in zemeljska dela - Mobilni stroji za podzemne rudnike - Varnost stroja (ISO 19296:2018)**

Mining and earthmoving machinery - Mobile machines working underground - Machine Safety (ISO 19296:2018)

Bergbau- und Erdbaumaschinen - Mobile Untertagemaschinen - Maschinensicherheit (ISO 19296:2018)

Machines de mines et de terrassement - Machines mobiles souterraines - Sécurité des machines (ISO 19296:2018)

**Ta slovenski standard je istoveten z: EN ISO 19296:2018**

---

**ICS:**

73.100.40 Oprema za vleko in dviganje Haulage and hoisting equipment

**SIST EN ISO 19296:2019**

**en,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 19296:2019

<https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019>

EUROPEAN STANDARD

EN ISO 19296

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2018

ICS 73.100.40

Supersedes EN 1889-1:2011

English Version

## Mining - Mobile machines working underground - Machine safety (ISO 19296:2018)

Exploitation minière - Engins mobiles d'exploitation souterraine - Sécurité des machines (ISO 19296:2018)

Bergbau- und Erdbaumaschinen - Mobile Untertagemaschinen - Maschinensicherheit (ISO 19296:2018)

This European Standard was approved by CEN on 12 December 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>
<b>Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered .....</b>	<b>4</b>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 19296:2019  
<https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019>

## European foreword

This document (EN ISO 19296:2018) has been prepared by Technical Committee ISO/TC 82 "Mining" in collaboration with Technical Committee CEN/TC 196 "Mining machinery and equipment - 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 June 2019, and conflicting national standards shall be withdrawn at the latest by December 2020.

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 1889-1:2011.

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(s).

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

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

<https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019>

## Endorsement notice

The text of ISO 19296:2018 has been approved by CEN as EN ISO 19296:2018 without any modification.

## Annex ZA (informative)

### Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 (Machinery) to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC (MD).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

**Table ZA.1 — Correspondence between this European Standard and Directive 2006/42/EC (MD)**

Essential Requirements of Directive 2006/42/EC (MD)	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
Within the limits of the scope all relevant essential requirements are covered	All normative clauses	For relation of normative clauses of this standard to significant hazards/relevant essential requirements of 2006/42/EC see informative Annex B „List of significant hazards“ of this standard in combination with Annex D “Examples of significant hazards, hazardous situations, hazardous events and their relation to the Essential Requirements of the Machinery Directive 2006/42/EC” of CEN Guide 414

**WARNING 1** — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

**WARNING 2** — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

INTERNATIONAL  
STANDARD

ISO  
19296

First edition  
2018-11

---

---

**Mining — Mobile machines working  
underground — Machine safety**

*Exploitation minière — Engins mobiles d'exploitation souterraine —  
Sécurité des machines*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN ISO 19296:2019](https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019)

[https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-  
22c0bd98d960/sist-en-iso-19296-2019](https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019)



Reference number  
ISO 19296:2018(E)

© ISO 2018

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 19296:2019

<https://standards.iteh.ai/catalog/standards/sist/69765a51-a5ee-4114-a917-22c0bd98d960/sist-en-iso-19296-2019>



### **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland



# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>4</b>
<b>4 Safety requirements and/or protective/risk reduction measures</b> .....	<b>9</b>
4.1 General requirements.....	9
4.1.1 General.....	9
4.1.2 Moving parts.....	9
4.1.3 Equipment carrier restraints.....	10
4.1.4 Starting system.....	10
4.1.5 Unintended movement.....	10
4.2 Lifting and transportation.....	10
4.3 Towing and retrieval.....	10
4.4 Fluid power systems.....	11
4.4.1 Hydraulic systems.....	11
4.4.2 Pneumatic systems.....	12
4.5 Electrical equipment.....	13
4.5.1 General.....	13
4.5.2 Electromagnetic compatibility (EMC).....	13
4.5.3 Batteries.....	13
4.6 Machines powered by diesel engine.....	13
4.6.1 Fuel and exhaust.....	13
4.6.2 Exhaust pipes.....	13
4.6.3 Engine cooling system.....	14
4.7 Fuel systems.....	14
4.7.1 Fuel tanks.....	14
4.7.2 Fuel tank filler inlet.....	14
4.7.3 Fuel tank vent system.....	14
4.7.4 Fuel tank drainage device.....	14
4.7.5 Fuel shut-off system.....	14
4.7.6 Fuel lines.....	15
4.8 Light intensity and quantity.....	15
4.8.1 General.....	15
4.8.2 Head lights.....	15
4.8.3 Tail lights.....	15
4.8.4 Reversing lights.....	15
4.8.5 Stop lamps.....	15
4.8.6 Both direction lights.....	15
4.8.7 Protective systems.....	16
4.9 Warning devices and safety signs.....	16
4.10 Braking.....	16
4.10.1 General requirements.....	16
4.11 Control systems and devices.....	16
4.11.1 General.....	16
4.11.2 Control devices.....	16
4.11.3 Steering systems.....	17
4.11.4 Displays.....	17
4.12 Operator and passenger's position.....	18
4.12.1 Protection.....	18
4.12.2 Access systems.....	18
4.12.3 Visibility.....	18
4.12.4 Interior space, dimensions, and seats.....	19

## ISO 19296:2018(E)

4.13	Fire protection.....	19
4.14	Noise .....	20
4.14.1	Noise reduction at source at the design stage.....	20
4.14.2	Information on noise emission.....	20
4.15	Vibrations.....	21
4.16	Radiation health risks.....	21
4.17	Tyres and rims.....	21
4.18	Stability.....	22
4.19	Load haul dump capacity.....	22
4.20	Maintenance.....	22
4.20.1	General.....	22
4.20.2	Frequent maintenance.....	22
4.20.3	Support devices.....	22
4.20.4	Tiltable cab support device.....	23
4.21	Quick coupler systems.....	23
<b>5</b>	<b>Verification of safety requirements and/or protective/risk reduction measures.....</b>	<b>23</b>
<b>6</b>	<b>Information for use.....</b>	<b>23</b>
6.1	Operator's manual.....	23
6.1.1	General.....	23
6.1.2	Information on noise emission.....	24
6.1.3	Information concerning hand-arm and whole-body vibration emission.....	24
6.2	Marking.....	25
6.2.1	General.....	25
6.2.2	Attachment points.....	25
6.2.3	Section or sub-assemblies.....	25
6.3	Training manuals.....	26
<b>Annex A</b>	<b>(normative) Brake requirements for rubber tyred underground mining machines.....</b>	<b>27</b>
<b>Annex B</b>	<b>(informative) List of significant hazards, hazardous situations and hazardous events.....</b>	<b>33</b>
<b>Annex C</b>	<b>(normative) Verification table.....</b>	<b>37</b>
<b>Annex D</b>	<b>(informative) Examples of performance levels for safety-related functions.....</b>	<b>42</b>
<b>Bibliography</b>	.....	<b>43</b>

## 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 82, *Mining*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## ISO 19296:2018(E)

### Introduction

This document is a type-C standard as stated in 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 organisations, 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 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 -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.

The following assumptions were made in writing this standard:

- a) the operators of the machines are well trained professionals and aware of potential risks of the working environment;
- b) the machines are operated according to the instructions given by the manufacturer in the operating instructions;
- c) administrative controls are in place for preventing unauthorized entry of persons to the area where machines are working;
- d) components are:
  - 1) designed in accordance with the good engineering practice and calculation codes, taking account of shocks and vibration, including all failure modes;
  - 2) made of materials with adequate strength and of suitable quality; and
  - 3) free of defects;
- e) harmful materials, such as asbestos are not used;
- f) components are kept in good repair and working order, so that the required dimensions remain fulfilled despite wear.

# Mining — Mobile machines working underground — Machine safety

## 1 Scope

This document specifies the safety requirements for self-propelled mobile machines used in underground mining, as defined in [3.1](#).

This document deals with hazards, hazardous situations and hazardous events (see [Annex B](#)) relevant to these machines when they are used as intended or under conditions of misuse reasonably foreseeable by the manufacturer.

For utility/service/support machines, this document only includes provisions to address the risks associated with the mobility (movement of the whole machine from one location to another). Risks for the additional functions (e.g. scaling, concrete spraying, bolting, charging, drilling, attachments) are not covered in this document.

This document specifies the appropriate technical measures for eliminating or sufficiently reducing risks arising from hazards, hazardous situations or hazardous events during commissioning, operation and maintenance.

This document does not address:

- the additional risks for machines operating in potentially explosive atmospheres;
- air quality and engine emissions.

This document is not applicable to:

- machines constrained to operate by rails;
- continuous miners, roadheaders, drill rigs, conveyors, long wall production equipment, tunnel boring machines (TBM), and mobile crushers.

## 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.

ISO 2860:1992, *Earth-moving machinery — Minimum access dimensions*

ISO 2867:2011, *Earth-moving machinery — Access systems*

ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

ISO 3449:2005, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*

ISO 3450:2011, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems*

ISO 3457:2003, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*

**ISO 19296:2018(E)**

ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 4250-3:2011, *Earth-mover tyres and rims — Part 3: Rims*

ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

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

ISO 5006:2017, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 5010:—<sup>1)</sup>, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

ISO 5349-1:2001, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

ISO 6011:2003, *Earth-moving machinery — Visual display of machine operation*

ISO 6014:1986, *Earth-moving machinery — Determination of ground speed*

ISO 6016:2008, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

ISO 6395:2008, *Earth-moving machinery — Determination of sound power level — Dynamic test conditions*

ISO 6396:2008, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Dynamic test conditions*

ISO 6405-1:2017, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2:2017, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Symbols for specific machines, equipment and accessories*

ISO 6483:1980, *Earth-moving machinery — Dumper bodies — Volumetric rating*

ISO 6682:1986, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 6683:2005, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

ISO 6750:2005, *Earth-moving machinery — Operator's manual — Content and format*

ISO 6805:1994, *Rubber hoses and hose assemblies for underground mining — Wire-reinforced hydraulic types for coal mining — Specification*

ISO 7130:2013, *Earth-moving machinery — Operator training — Content and methods*

ISO 7546:1983, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings*

ISO 8030:2014, *Rubber and plastics hoses — Method of test for flammability*

1) Under preparation (revision of ISO 5010:2007). Stage at the time of publication: ISO/DIS 5010:2018.

- ISO 8084:2003, *Machinery for forestry — Operator protective structures — Laboratory tests and performance requirements*
- ISO 8152:1984, *Earth-moving machinery — Operation and maintenance — Training of mechanics*
- ISO 9244:2008, *Earth-moving machinery — Machine safety labels — General principles*
- ISO 9533:2010, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*
- ISO 10262:1998, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards*
- ISO 10263-2:2009, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter element test method*
- ISO 10263-3:2009, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*
- ISO 10264:1990, *Earth-moving machinery — Key-locked starting systems*
- ISO 10265:2008, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*
- ISO 10268:1993, *Earth-moving machinery — Retarders for dumpers and tractor-scrappers — Performance tests*
- ISO 10532:1995, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*
- ISO 10533:1993, *Earth-moving machinery — Lift-arm support devices*
- ISO 10570:2004, *Earth-moving machinery — Articulated frame lock — Performance requirements*
- ISO 10968:2004, *Earth-moving machinery — Operator's controls*
- ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*
- ISO 12508:1994, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*
- ISO 13031:2016, *Earth-moving machinery — Quick couplers — Safety*
- ISO 13333:1994, *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*
- ISO 13766-1:2018, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 1: General EMC requirements under typical electromagnetic environmental conditions*
- ISO 13766-2:2018, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 2: Additional EMC requirements for functional safety*
- ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*
- ISO 14397-1:2007, *Earth-moving machinery — Loaders and backhoe loaders — Part 1: Calculation of rated operating capacity and test method for verifying calculated tipping load*
- ISO 14990-1:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 1: General requirements*
- ISO 14990-2:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 2: Particular requirements for externally-powered machines*