

DRAFT INTERNATIONAL STANDARD

ISO/DIS 20500-2

ISO/TC 195

Secretariat: SAC

Voting begins on:
2020-07-10

Voting terminates on:
2020-10-02

Mobile road construction machinery — Safety —

Part 2: Specific requirements for road-milling machines

Machines mobiles pour la construction de routes — Sécurité —

Partie 2: Prescriptions spécifiques pour fraiseuses routières

ICS: 93.080.10

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Reference number
ISO/DIS 20500-2:2020(E)

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Published in Switzerland

Contents

Page

Foreword.....	v
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	2
4 Safety requirements and/or protective/risk reduction measures	2
4.1 General	2
4.2 Visibility	2
4.2.1 General	2
4.2.2 Visibility performance criteria	3
4.2.3 Visibility performance criteria for the RB	4
4.3 Operation and handling	5
4.3.1 General	5
4.3.2 Road milling machines with emission reducing device by evacuation (EVAC-ERD).....	5
4.4 Operator's station.....	5
4.5 Stopping	5
4.6 Access system to operator's station and to maintenance points.....	5
4.7 Protection.....	6
4.7.1 General	6
4.7.2 Milling equipment	6
4.7.3 Lowering the milling equipment.....	7
4.8 Signal devices and warning signs.....	7
4.9 Electro-magnetic compatibility (EMC)	7
4.10 Noise and vibration.....	7
5 Verification of the safety requirements and/or protective/risk reduction measures	7
6 Information for use.....	9
6.1 Instruction handbook	9
Annex A (normative) Noise test code for road-milling machines	10
A.1 Scope	10
A.2 Determination of A-weighted sound power level	10
A.2.1 General	10
A.2.2 Measurement surface.....	10
A.2.3 Size of the measurement surface	10
A.2.4 Microphone positions on the hemispherical measurement surface	12
A.2.5 Positioning of the machine.....	12
A.2.6 Repetition of the test	12
A.3 Determination of A-weighted emission sound pressure level at the operator's position.....	12
A.3.1 General	12
A.3.2 Enclosed operator's positions.....	13
A.3.3 Quantities to be determined.....	13
A.3.4 Repetition of the test	13
A.3.5 Microphone position(s).....	13

A.4	Operating conditions	13
A.4.1	Fan speed	13
A.4.2	Operating conditions for working units	14
A.5	Uncertainty	14
A.6	Information to be recorded	14
A.7	Information to be reported	14
A.8	Declaration and verification of noise emission values	15
Annex B (informative)	Examples of road-milling machines	16
Annex C (informative)	Emission reducing device by evacuation (EVAC-ERD) – Test procedures	18
C.1	Scope	18
C.1.1	Purpose	18
C.2	Terms and definitions	19
C.2.1	Definitions for EVAC-ERD description	19
C.3	Measurement equipment and devices	20
C.4	General requirements	21
C.4.1	Quality measures	21
C.4.2	Safety precautions	21
C.4.3	Required test-site and environmental specification	22
C.5	Installation, qualification and operating conditions of Equipment under test (EUT)	24
C.5.1	General	24
C.5.2	EUT settings	24
C.5.3	Separation Set-up	24
C.5.4	Smoke-Test	25
C.6	Performance-Test	25
C.6.1	General	25
C.6.2	Methodology and steps of measurement	26
C.6.3	EUT-Separation-Test-Setup	29
C.6.4	EUT-in-situ-test-Setup (NIOSH-Test, modified)	32
C.7	Determination of capture-efficiency	36
C.7.1	General	36
C.7.2	Determination of EUT-Separation-test-Setup capture-efficiency	37
C.7.3	Determination of EUT-In-situ-test-Setup capture-efficiency	37
C.7.4	Variance and statistical significance	37
C.8	Information to be recorded	38
C.9	Information to be reported	40
C.10	Declaration and verification of capture-efficiency values	41
Annex D (informative)	List of significant hazards	43
	For European version only	47
Annex ZA (informative)	Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered	48
Bibliography	53

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).

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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 www.iso.org/iso/foreword.html.

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

ISO 20500 consists of the following parts, under the general title *Mobile road construction machinery — Safety*:

- *Part 1: Common requirements*
- *Part 2: Specific requirements for road-milling machines*
- *Part 3: Specific requirements for soil-stabilising machines and recycling machines*
- *Part 4: Specific requirements for compaction machines*
- *Part 5: Specific requirements for paver-finishers*
- *Part 6: Specific requirements for mobile feeders*
- *Part 7: Specific requirements for slip form pavers and texture curing machines*

A list of all parts in the ISO 20500 series can be found on the ISO website.

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.

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Introduction

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

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

When provisions of this type C standard are different from those stated in type A or 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.

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Mobile road construction machinery — Safety —

Part 2: Specific requirements for road-milling machines

1 Scope

This part of ISO 20500, together with part 1, deals with all significant hazards for road-milling machines when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer associated with the whole life time of the machine (see Annex D).

The requirements of this part are complementary to the common requirements formulated in ISO 20500-1.

This document does not repeat the requirements from ISO 20500-1, but adds or replaces the requirements for application for road-milling machines.

The following significant and relevant hazards are not covered in this document:

— Lightning.

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2 Normative references (standards.iteh.ai)

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

ISO 3744:2010, *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 9244:2008+Amd 1:2016, *Earth-moving machinery — Machine safety labels — General principles; Amendment 1*

ISO 11201:2010, *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 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 15645:2018, *Road construction and maintenance equipment — Road milling machinery — Terminology and commercial specifications*

ISO 20500-1, *Mobile road construction machinery — Safety — Part 1: Common requirements*

ISO 20500-5, *Mobile road construction machinery — Safety — Part 5: Specific requirements for paver-finishers*

ISO 29042-4:2009, *Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 4: Tracer method for the capture efficiency of an exhaust system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1

road-milling machines

mobile road construction machines used to mill material from paved surfaces

3.2

milling equipment/milling drum

power-driven cylindrical bodies on which the milling tools are fitted. The cylindrical bodies rotate during the milling operation

3.3

emission reducing device (ERD)

system to extract or reduce emissions of airborne particles generated by the milling process from the area of the operator's stations of a road-milling machine

3.4

emission reducing device by evacuation (EVAC-ERD)

ERD-system based on fluid-dynamic evacuation of airborne particles by technical means establishing an accelerated air-flow or negative pressure in the rotor chamber

Note to entry: Rotor chamber as defined in ISO 15645.

4 Safety requirements and/or protective/risk reduction measures

4.1 General

Road-milling 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.

Road-milling machines shall comply with the requirements of ISO/DIS 20500-1, as far as not modified or replaced by the requirements of this part.

4.2 Visibility

4.2.1 General

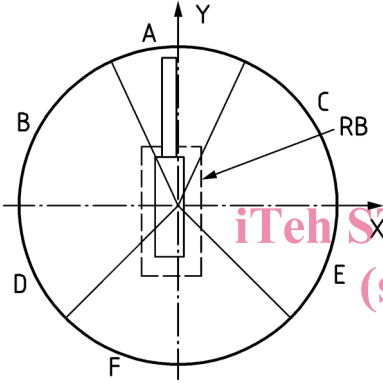
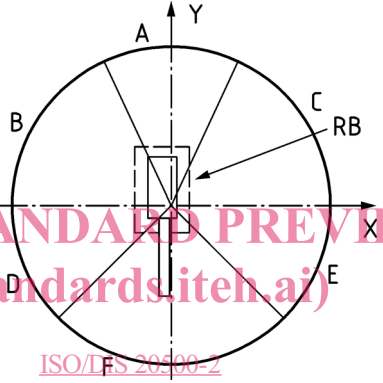
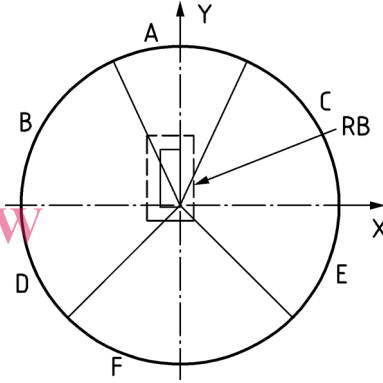
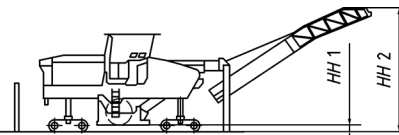
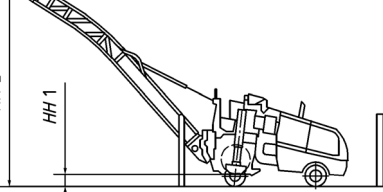
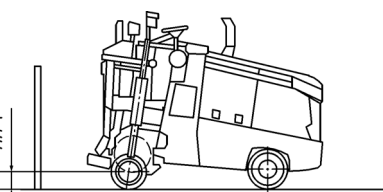
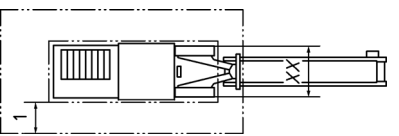
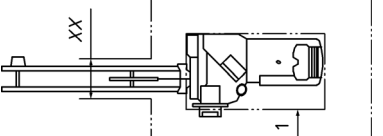
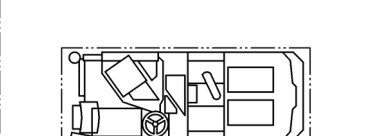
4.2 of ISO 20500-1 applies with the following additions:

4.2.2 Visibility performance criteria

The machine meets the requirements of this International Standard if the measurement results show no maskings or maskings smaller than or equal to the performance criteria with direct or indirect view as specified in Table 1.

When there are two operator positions on the operator's station the resulting maskings may be a combination (overlapping) of the individual maskings.

Table 1 — Setup of machines

Large road milling machine (front mounted conveyor/operator's station on the center of the machine)	Small road milling machine with conveyor (rear or front mounted conveyor/operator's station on the rear of the machine)	Small milling machine w/o conveyor (no or very small conveyor/operator's station on the rear of the machine)
		
 <p>HH1: Height of milling drum above ground HH2: Height of conveyor above ground</p>	 <p>HH1: Height of milling drum above ground HH2: Height of conveyor above ground</p>	 <p>HH1: Height of milling drum above ground</p>
 <p>XX: No requirements under conveyor (gap in the RB)</p>	 <p>XX: No requirements under conveyor (gap in the RB)</p>	
<p>HH1 = In transport position (minimum 200 mm) HH2 = in a loading position (min. 3.000 mm) XX = width of the conveyor + max. 150 mm on each side</p>	<p>HH1 = In transport position (minimum 200 mm) HH2 = in a loading position (min. 3.000 mm) XX = width of the conveyor + max. 150 mm on each side</p>	<p>HH1 = In transport position (minimum 200 mm)</p>

The distances for *HH* and *XX* shall be reported in the test report.

Table 2 — Visibility performance criteria

	A	B	C	D	E	F	RB
Large road milling machine							
	205	405	405	405	405	205	405
	2 – 700 and 1 – 1300	No specific criteria	No specific criteria	No specific criteria	No specific criteria	2 – 700 and 1 – 1300	300
Small road milling machine with front conveyor							
	205	405	405	405	405	205	405
	2 – 700 and 1 – 1300	1 – 1300	1 – 1300	1 – 1300	1 – 1300	2 – 700	300
Small road milling machine with rear conveyor							
	205	405	405	405	405	205	405
	2 – 700	1 – 1300	1 – 1300	1 – 1300	1 – 1300	2 – 700 and 1 – 1300	300
Small road milling machine w/o conveyor							
	205	405	405	405	405	205	405
	2 – 700	1 – 1300	1 – 1300	1 – 1300	1 – 1300	2 – 700	300

4.2.3 Visibility performance criteria for the RB

The machine meets the requirements of the standard if the measurement results show no maskings or maskings smaller or equal to the acceptable maskings (300 mm) when evaluated using the eye spacing specified in Table 2 for the RB and using the test object height for each region as specified in Table 3.

Table 3 — Vertical test object height by machine type and region of rectangular boundary

Machine Type	Region of the RB			
	Front side	Left hand side	Right hand side	Rear side
Large road milling machine	1.5 m (with gap XX under the conveyor)	1.5 m	1.5 m	1.5 m
Small road milling machine with conveyor	1.5 m	1.5 m	1.5 m	1.5 m (with gap XX under the conveyor)
Small road milling machine w/o conveyor	1.5 m	1.5 m	1.5 m	1.5 m

4.3 Operation and handling

4.3.1 General

4.3 of ISO 20500-1 applies with the following addition:

- to minimize the risk of dust and to minimize the risk of inhalable particles (for example silica, mineral fibers), provisions for an ERD (e.g. a water sprinkling system, adjustable flaps, etc.) shall be made.

4.3.2 Road milling machines with emission reducing device by evacuation (EVAC-ERD)

Road milling-machines with an operating width > 1300 mm shall be so designed that in addition an emission reducing device by evacuation (EVAC-ERD) can be fitted, if not already included in the base design of the machine.

Annex C describes the test procedure for evaluating the capture efficiency of such an EVAC-ERD.

NOTE1 National regulations or regional requirements can apply.

NOTE 2 A width of 1300 mm is currently considered to be the threshold between rear-loader and front-loader road-milling-machines.

4.4 Operator's station

4.4 of ISO 20500-1 applies with the following exception:

- 4.4.2 of ISO 20500-1, first paragraph, does not apply for road-milling machines.
- 4.4.3 of ISO 20500-1, does not apply for road milling machinery with an operating mass $\leq 4\,500$ kg.

4.5 Stopping

4.7 of ISO 20500-1 applies with the following addition:

- it shall be possible to stop the milling equipment, even while the power unit (engine) is running.

4.6 Access system to operator's station and to maintenance points

4.9 of ISO 20500-1 applies with the following addition:

- provisions shall be made to minimize hazards if wheels and tracks are in the vicinity of the operator's station and/or in the access areas. If there are guards, they shall comply with ISO 20500-1, clause 5.10.2.

4.4 of ISO 20500-1 applies with the following exemption and addition:

- an alternative exit path according to ISO 2867:2011, clause 4.3 is not required for road-milling machines with a milling width less or equal than 1,3 m.

4.7 Protection

4.7.1 General

4.10 of ISO 20500-1 applies with the following additions:

4.7.2 Milling equipment

4.7.2.1 General

For preventing access to the milling equipment and to retain debris and ejected parts, 4.10.2 of ISO 20500-1 applies with the additions and exceptions in clauses 4.6.2.2 and 4.6.2.3.

4.7.2.2 Rear guards

The rear guards shall be design as movable interlocked guard to stop the milling drum when opened and shall be designed so that:

- it shall be fitted with a holding device in order to be secured while open;
- safety distances between the ground level and the lower part of the guard may be fixed by the operator exceeding the required safety distance according ISO 13857, Annex B in order to complete material discharge or the lowering of the milling drum adjacent to an obstacle;
- a distance guard shall be fitted on small road milling machine.

NOTE Structural parts of the machines and/or conveyors may be considered as part of the distance guards.

4.7.2.3 Side guards

Power-operated side guards of the milling drum guards, intended to be controlled during operation of the machine, shall comply with the following design criteria:

- the controls shall not lock in any position except in neutral (hold-to-run control), see also ISO 20500-1, clause 4.6.2.1;
- the controls shall be fitted out of danger areas and allowing the operator view to the side guards;
- a yellow flashing light shall be fitted within the danger areas and shall be activated whenever the controls are operated;
- the power-operated side guards shall automatically return to their normal (pre-set) position when the controls are released except when the milling drum is stopped.

- The side guards shall be designed so that they can only be locked in the raised position (e.g. for maintenance) when the milling drum is off.

4.7.2.4 Maintenance

For maintenance either a manual milling drum turning system or a maintenance mode according to clause 4.10.2.4 of ISO 20500-1 shall be provided in order to replace the milling tools.

4.7.3 Lowering the milling equipment

The machine shall be designed to minimize the risk of unintentional movement (e.g. jumping backwards) when lowering the milling equipment to the cutting mode.

4.8 Signal devices and warning signs

4.15 of ISO 20500-1 applies with the following addition:

- a legible and indelible warning sign (see e.g. Figure C.22 from ISO 9244:2008+Amd 1:2016) shall be applied on both sides of the movable guards or on the protective devices, located around the milling drum.

4.9 Electro-magnetic compatibility (EMC)

4.18 of ISO 20500-1 applies with the following addition:

- the antenna shall be located successively on the left- and right-hand sides of the road-milling machine, with the antenna parallel to the plane of the longitudinal symmetry of the road-milling machine and in line with the SIP.

4.10 Noise and vibration

4.19 of ISO 20500-1 applies with the following addition:

- for the determination of the noise emission values, Annex A of this standard applies.

5 Verification of the safety requirements and/or protective/risk reduction measures

Safety requirements and/or protective/risk reduction measures of Clauses 4 and 6 of this document shall be verified according to Table 4.

Table 4 sets out verification methods which shall be applied for each safety requirement in this document.

Where X(s) is indicated in the table, the corresponding verification method(s) shall be applied.

Table 4 shall be read in conjunction with the corresponding clauses.

Table 4 includes the following verification methods:

- calculation: to establish that the requirements of this document have been met;
- visual verification: to establish that something is present (e.g. a guard, a marking, a document);