BS EN 17344:2020

BSI Standards Publication

Agricultural machinery — Self-propelled agricultural and forestry vehicles — Requirements for braking

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National foreword

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European foreword

This document (EN 17344:2020) has been prepared by Technical Committee CEN/TC 144 “Tractors and machinery for agriculture and forestry”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by September 2020, and conflicting national standards shall be withdrawn at the latest by month year of September 2020.

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Introduction

This document applies to braking systems for on-road use, installed on self-propelled agricultural and forestry machinery. These vehicles are not primarily designed to pull heavy trailers or implements. For this reason, this standard does not contain provisions for assisted trailer braking control. Information about such systems can be found in EU Regulation 2015/68, last amended by 2018/828, or in UNECE Regulation No. 13, or in any national legislation dealing with braking systems on vehicles.

This document can be used during an EU or national type approval process for self-propelled agricultural or forestry machines.

The sources of this document are, among others:

— EU Regulation 2015/68, as last amended by 2018/828;

— ISO 10998:2008 Agricultural tractors – Requirements for steering.

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1 Scope

This document applies to wheeled and/or track-laying self-propelled agricultural and forestry vehicles when used on public roads. It specifies the definitions, construction and performance requirements and the means for verification of braking systems on vehicles with a maximum design speed not exceeding 60 km/h.

Following items are excluded from the scope of this document:

— coupling force control;

— endurance braking systems;

— Anti-Lock Braking Systems and EBS;

— vacuum braking systems;

— safety related parts of complex electronic control systems;

— trailer braking control systems.

NOTE For assisted trailer braking the EU Regulation 2015/68 can be used but before including these requirements into this document, an additional review of 2015/68 is needed.

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 9128:2006, *Road vehicles — Graphical symbols to designate brake fluid types*

ISO 3767-1:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 3583:1984, *Road vehicles — Pressure test connection for compressed-air pneumatic braking equipment*

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 https://www.iso.org/obp/ui

3.1
braking system
combination of parts whose function is to reduce progressively the speed of a moving vehicle or to bring it to a halt, or to keep it stationary if it has already halted

Note 1 to entry: the system consists of the control device, the transmission and the brake

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3.2
brake
part in which the forces opposing the movement of the vehicle develop

Note 1 to entry: This may be a friction brake, or an electrical brake, or a fluid brake, or an engine/transmission brake

3.2.1
friction brake
brake where the braking forces are generated only by the friction brakes without taking into account of the braking effect of the stepless drive braking system

3.2.2
fluid brake
brake where the braking forces are generated by the action of a fluid situated between two parts of the vehicle moving relatively to one another

3.2.3
electrical brake
brake where the braking forces are generated by electromagnetic action between two parts of the vehicle moving relatively to another but not in contact with one another

3.2.4
engine brake
brake where the forces are generated by a controlled increase of the braking action from the engine which remains connected with the wheels or tracks by the transmission

3.3
service braking system
braking system that enables the driver to control the movement of the vehicle and to halt it safely, speedily and effectively, for all the range of speed and load that the vehicle is approved to operate, on any up or down gradient

3.4
graduated braking
braking which, within the normal range of operation of the equipment, during either the application or the releasing of the brakes, fulfils all the following conditions:

— the driver can, at any time, increase or reduce the braking force through action of the control device; and

— it is easily possible to make a sufficiently fine adjustment to the braking force

3.5
control device
device actuated directly by the driver to supply to the transmission the energy required for braking or controlling it. This energy may be the muscular energy of the driver, or energy from another source controlled by the driver or in appropriate cases the kinetic energy of a towed vehicle, or a combination of these various kinds of energy

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3.6
transmission
combination of components comprised between the control device and the brake, and linking them functionally through mechanical, hydraulic, pneumatic or electric means or through the use of a combination of those means; where the braking power is derived from or assisted by a source of energy

3.7
parking braking system
system that enables the vehicle to be held stationary on an up or down gradient even in the absence of the driver

3.8
secondary braking system
means the braking system that allows the driver to halt the vehicle within a reasonable distance in the event of a failure of the service braking system

3.9
inertia braking
braking by utilizing the forces generated by the towed vehicle's moving up on the towing vehicle

3.10
laden vehicle
vehicle laden at its technically permissible maximum laden mass as declared by the manufacturer for on road operation

3.11
unladen vehicle
vehicle with its mass in running order for road operation

Note 1 to entry: This includes the coupling device(s), coolants, oils, liquids necessary for road circulation, fuel and DEF (Diesel Emission Fluid) tanks, if provided and filled minimum 90 % and a driver of 75 kg

[SOURCE: UNECE R.E.3]

3.12
axle load
sum of the vertical static forces of the road surface in the contact area on the wheels of the axle

3.13
maximum stationary axle load
stationary axle load achieved under the condition of the technically permissible maximum laden mass of the vehicle

3.14
towed vehicle
agricultural trailer or an interchangeable towed equipment

3.15
attachment trailer
any towed vehicle which is designed to be towed by a self-propelled vehicle, and only intended to carry the attachment of its towing vehicle during road operation (for example harvesting attachment)

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3.16
spring compression chamber
chamber where the pressure variation that induces the compression of the spring is actually produced

3.17
energy source
device that provides the energy required to actuate the brakes, either directly or indirectly through an energy storage device

3.18
energy storage device
device that stores the energy provided by the energy source to apply or release the brakes

3.19
energy reserve
pneumatic, hydraulic or electric energy that is stored in an energy storage device

3.20
technically permissible maximum laden mass
maximum laden mass declared by the manufacturer on the basis of its construction features and design performances, irrespective from the load capacity of the tyres or tracks

3.21
technically permissible maximum mass per axle
mass corresponding to the maximum permissible static vertical load transmitted to the ground by the wheels of the axle or the tracks, on the basis of the construction features and of the vehicle and their design performances, irrespective from the load capacity of the tyres

3.22
brake assisted steering function
system allowing to brake a single wheel on one axle, by means of two separate controls, with the aim to shorten the turning radius during off-road use

3.23
measured maximum design speed
measured speed exceeding the nominal value for the maximum design speed by maximum 3 km/h plus an additional 5 % tolerance taking into account variations due to tyre size

Note 1 to entry: This is justified to take account of various unavoidable errors due, in particular to the measuring technique and to the increase in running speed of the engine with a partial load

3.24
unbraked towed vehicle mass
sum of the maximum stationary axle loads of the towed vehicle

3.25
spring braking system
braking system for which the energy required for braking is supplied by one or more springs acting as an energy storage device

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3.26
stepless drive braking system
stepless drive with a substantial braking capability other than by friction and having at least one speed range going from forward to reverse and vice versa

Note 1 to entry: The variable component of the stepless drive can be mechanic, hydraulic, or electric. The connection between engine and output shaft to the wheels or tracks shall remain connected at standstill

3.27
combination stepless drive braking system
braking system utilising both, the stepless drive and friction braking effect, where, however, the braking forces are generated by a predominant proportion generated by the stepless drive

3.28
combination friction braking system
braking system utilising both, the friction and stepless drive braking effect, where, however, the braking forces are generated by a predominant proportion generated by the friction brakes

3.29
graduated stepless drive braking
stepless drive braking through which the driver is able to increase or decrease the vehicle speed at any time by a progressive action on its stepless drive control device

3.30
stepless drive control device
device, such as a lever or pedal, used to vary the vehicle speed

3.31
service brake control device
control device by whose operation the prescribed service braking performance is attained

3.32
inch device
device that affects the speed of the vehicle independently of the stepless drive control. The inch device may be used in confined spaces or where inching of the vehicle is required, e.g. to pick-up or set off attachments

3.33
class I vehicles
self-propelled vehicles with a maximum design speed ≤ 12 km/h

3.34
class II vehicles
self-propelled vehicles with a maximum design speed > 12 km/h and ≤ 30 km/h

3.35
class III vehicles
self-propelled vehicles with a maximum design speed > 30 km/h and ≤ 40 km/h

3.36
class IV vehicles
self-propelled vehicles with a maximum design speed > 40 km/h and ≤ 60 km/h

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4 Construction requirements

4.1 Braking components and braking surfaces

4.1.1 For the purpose of this document, the brake, all mechanical parts of the transmission and the control device, hereafter called 'braking equipment' shall not be regarded as liable to breakage if they are amply dimensioned, readily accessible for maintenance and exhibit safety features at least equal to those prescribed for other essential components (such as the steering system).

4.1.2 The braking equipment shall be designed, constructed and fitted, so that it is capable of withstanding the stresses arising during normal operation for which the vehicle is designated it.

4.1.3 Brake linings shall not contain asbestos.

4.1.4 Unless otherwise specified, it is not permitted to fit any adjustable valves that would allow the performance of the braking system to be changed by the user of the vehicle such that, in service, it falls outside the requirements of this document. An adjustable valve that can only be operated by the manufacturer through the use of special tool or the provision of a tamper proof seal or both shall be permitted provided that the user of the vehicle is not able to adjust this valve, or that any user modification is readily identifiable.

4.1.5 For Class IV vehicles, the wear of the service brakes shall be compensated by means of a system of automatic adjustment. In addition, the control device and the components of the transmission and of the brakes shall possess a reserve of travel and, if necessary, suitable means of compensation such that, when the brakes become heated or when the brake linings have reached a certain degree of wear, effective braking shall be ensured without immediate adjustment being necessary.

4.1.6 It shall be possible for the wear of the service brakes to be compensated by means of a system of manual or automatic adjustment. It shall be possible to easily check this wear on service brake linings from the outside or underside of the vehicle, utilizing only the tools or equipment normally supplied with the vehicle, for instance, by the provision of appropriate inspection holes. Alternatively, acoustical or optical devices warning the driver at his driving position when lining replacement is necessary are acceptable.

4.1.7 The requirements of point 4.1.6 are not applicable to oil immersed brakes which are designed for a long life in the vehicle without servicing.

4.2 Functions of the braking system and the basic requirements

4.2.1 Service braking system: It shall be possible to graduate the service braking system action. The driver shall be able to achieve this braking action from his driving position without removing his hands from the steering control device or with one hand on the steering control device and the other on the stepless drive control device. The service braking system can be one of the following braking systems, as declared by the manufacturer:

— a mere friction braking system;

— a combination friction braking system;

— a combination stepless drive braking system;

— a mere stepless drive braking system.

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4.2.1.1 In the case that the manufacturer declares the stepless drive to act as a braking system, it shall not be possible to disconnect the transmission between the engine and the drive wheels during on-road use, in order to ensure that the stepless drive maintains its braking capabilities. This shall not apply to the presence of an inch device.

4.2.1.2 However, to facilitate vehicle recovery, the operator's manual shall outline how to tow the vehicle without the risk for damage to the stepless drive. If a dedicated tool is needed for this purpose, it shall be carried on the vehicle.

4.2.1.3 The control device of the stepless drive shall be made in a way that inadvertent change of direction is prevented.

4.2.1.4 It is allowed to automatically engage the parking brake system at the end of the brake cycle, in order to bring the vehicle to a stop on a gradient or in the event of residual creep.

4.2.1.5 In case of a combination braking system it is allowed to use simultaneously two controls in order to achieve the required braking performance.

4.2.2 Secondary braking system: The secondary braking system shall make it possible to halt the vehicle within a reasonable distance in the event of a failure of (part of) the service braking system. It shall be possible to graduate this braking action. The driver shall be able to obtain this braking action from his driving seat while keeping at least one hand on the steering control device. For the purpose of this requirement, it is assumed that not more than one failure of the service braking system can occur at one time.

4.2.3 Parking braking system: The parking braking system shall enable the vehicle to be held stationary on an up or down gradient even in the absence of the driver, the working parts of the braking system being then held in the locked position by a purely mechanical device. The driver shall be able to achieve this braking action from his driving seat.

4.2.4 The service, secondary and the parking braking systems shall act on braking surfaces permanently connected to the wheels through components of adequate strength. It shall not be possible to disconnect a braking surface from the wheels; however, such disconnection shall be required in the case of the parking braking system actuated by a spring, in order to allow retrieval of the machine in a recovery situation.

4.3 Axles subject to braking

4.3.1 On Class I, II and III vehicles the service braking system shall act on all the wheels of at least one axle.

4.3.2 On Class IV vehicles the service braking system shall act:

— on all the wheels of at least two axles; or

— in case of vehicles with a braked axle and an automatic engagement of the drive to another axle during braking, these wheels are deemed to be braked.

When more than one axle is subject to braking, one axle may be decoupled provided that activation of the service braking system automatically re-couples this axle and that, in the case of a failure in the energy supply or a failure in the control transmission of the re-coupling control device, then automatic re-coupling shall be ensured.

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