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Road vehicles — Braking threshold pressures for heavy commercial vehicle combinations with fully pneumatic braking systems — Test with roller brake tester

Véhicules routiers — Seuil de pressions de freinage pour les ensembles routiers lourds à systèmes de freinage uniquement pneumatiques — Essais sur banc d'essai à rouleaux

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 20918 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 2, *Braking systems and equipment*.

Introduction

The braking performance compatibility between motor vehicles and trailers is governed by the compatibility bands contained in ECE Council Directive 71/320/EEC, Annex II (including ECE Commission Directive 75/524/EEC) and ECE Regulation No.13, Annex 10, and by brake force development requirements contained in ECE Regulation No.13, Annex 10. The purpose of these compatibility bands is to maintain the stability of a vehicle combination in all braking conditions, while the brake force development requirements are to provide a minimum standard regarding wear balance at low braking pressure.

The compatibility between motor vehicles and trailers relates not only to stability, but also to wear balance, or rather, to wear optimization.

Wear optimization and low adhesion utilization requires good braking balance between axles in the pressure range up to 200 kPa [1)]. This improvement in balance is achieved by minimizing the variation in pressure when all brakes start to develop a braking force.

This International Standard provides a best practice for determining the threshold pressure at which a brake starts to develop a braking force. It is applicable to all vehicles equipped with a conventional braking system and to trailers equipped with an electronic braking system (EBS) when used in conjunction with conventional equipped vehicles, the connector being connected in accordance with ISO 7638.

For EBS equipped motor vehicles, it is intended that the default values for the threshold pressure values of the EBS system comply with this International Standard as a minimum requirement. For EBS equipped vehicles, it is advisable that the vehicle/system manufacturer's manual be followed in order to obtain the appropriate threshold values.

1) 100 kPa = 1 bar.

Road vehicles — Braking threshold pressures for heavy commercial vehicle combinations with fully pneumatic braking systems — Test with roller brake tester

1 Scope

This International Standard describes a method to evaluate the braking threshold of heavy commercial vehicle combinations with pneumatic braking systems, by means of a roller brake tester.

This International Standard describes procedures for workshops and garages and provides

— a recommended pressure range of the system threshold pressure for motor vehicles and trailers, and

— a recommended practice for determining the system threshold pressure.

NOTE Motor vehicles and trailer combinations with conventional braking systems are covered by the procedures given in this International Standard. Motor vehicles with a conventional braking system coupled to an EBS equipped trailer can also be tested using the procedure given in this International Standard, as the pneumatic control line is used.

This International Standard covers neither high-pressure compatibility, including the control of the coefficient of friction between lining/pad and drum/disc, nor dynamic influences. This International Standard is not for use at Type Approval.

2 Normative references

The following referenced documents are indispensable for the application 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 611, *Road vehicles — Braking of automotive vehicles and their trailers — Vocabulary*

ISO 21069-1, *Road vehicles — Test of braking systems on vehicles with a maximum authorized total mass of over 3,5 t using a roller brake tester — Part 1: Pneumatic braking systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 611 and the following apply.

3.1
rolling resistance
A
resistance force generated by rolling causing a braking force or torque

3.2
trailer pressure
p_m
pressure at the coupling head of the control line to the trailer

3.3
brake actuator pressure
p_c
pneumatic pressure in a brake chamber of a braking system

3.4
system threshold pressure
p_t
pressure at which the braking force or torque starts to increase above the rolling resistance measured as trailer pressure

NOTE Pressure is only to be measured with increasing pressure.

4 System threshold pressure recommendation

The recommended system threshold pressure, p_t, in kPa, measured as trailer pressure, p_m, is as follows:

$$p_t = \left(70^{+10}_{-20}\right) \text{ kPa} \quad (1)$$

In the case of unladen vehicles (trailers) equipped with small size actuators (16"), it may not be possible to achieve the above recommended value.

The following value may be accepted for N2 vehicles and O3 trailers:

$$p_t = \left(70^{+20}_{-20}\right) \text{ kPa} \quad (2)$$

For EBS equipped motor vehicles, the default values for the threshold pressure values of the EBS system should comply with this International Standard as a minimum requirement. For EBS equipped vehicles, the vehicle/system manufacturer's manual should be followed in order to obtain the appropriate threshold values.

5 Apparatus

For automatic recording of measurements of any of the following test equipment a minimum sampling rate of 5 Hz is recommended.

5.1 Pressure gauges, in accordance with ISO 21069-1 or equivalent, with an accuracy of ± 10 kPa below 500 kPa, and of ± 2 % of the measured value above 500 kPa.

NOTE It is also possible to use digital diagnostic scan tools capable of measuring the necessary pressure values, providing that accuracy is similar to that obtained with conventional equipment.

5.2 Adapter to measure control line pressure (at the motor vehicle or trailer), capable of fully opening the self-sealing valve in the coupling head.

5.3 Roller brake tester, with a braking force resolution of 100 N or better in the range up to 5 000 N, and of 500 N or better above that limit.

The accuracy of the braking force measurement shall be within ± 100 N below 5 000 N, and within ± 2 % of the measured value above 5 000 N.

5.4 Compressed air source with a continuous pressure regulator, capable of delivering a maximum pressure of 1000 kPa, and of adjusting the pressure within 10 kPa in the range up to 200 kPa.

NOTE The source can be the motor vehicle.

5.5 Device for operating the brakes gradually on the motor vehicle and/or trailer is recommended.

NOTE However, with practice, a well-briefed operator who has a clear view of the control line pressure gauge can achieve comparable results by carefully applying the brake in the normal manner.

6 Procedure

6.1 General

This procedure sets out a method for measuring the brake system pressure threshold relative to the coupling head pressure of a vehicle with the laden condition simulated. Whilst the procedure is based on measuring the system threshold pressures of a laden vehicle or a vehicle in the simulated laden condition, the procedure could also be applied to vehicles in the unladen condition.

It is recommended that when load sensing valves are used, they shall have a characteristic such that pressure reduction starts at a brake pressure above the level needed to overcome the resistance of return springs.

6.2 Vehicle test for truck and semi-trailer tractor

The instructions for the roller brake tester to be used shall be checked before applying the following procedure:

a) charge the air system to the cut-out pressure and fully apply and release the brakes five times;

b) either

   1) install the adapter and gauge in the trailer control line (yellow), or

   2) connect the digital diagnostic scan tool (if available) to the diagnostic interface of the braking system to measure pressure values on different points on the system;

c) charge the air system to cut-out pressure and set any load sensing valve (if applicable) to the laden condition;

d) drive the vehicle so that the foremost axle is on the roller brake tester;

e) gradually increase the pressure by operating the service brake;

f) note the minimum pressure at the coupling head when the braking force on one wheel starts to increase above the force generated by the rolling resistance, A;

g) if the minimum pressure is overshot, do not try to find it by slowly releasing the pedal: instead, fully release the pedal and start again;

h) repeat the procedure three times, fully releasing the pressure after each measurement, and record the average result;

NOTE It is not necessary to record the result if a printout is available. Annex A provides an example of a report form for the roller brake test if printouts are not available.

i) repeat the procedure from 6.2 d) to 6.2 h) for the other wheel on the same axle, and record the average result (if necessary);

j) recharge the air system, if necessary, and repeat for the remaining axles;

k) return the load sensing valve(s) to the appropriate laden condition, if applicable [see 6.2 c) above].