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Braking of motor vehicles and their trailers – Terminology

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 611 (originally Draft International Standard ISO/DIS 2161) was drawn up by Technical Committee ISO/TC 22, *Automobiles*.

It was approved in March 1971 by the Member Bodies of the following countries :

Australia	Israel	Spain
Austria	Korea, Rep. of	Sweden
Belgium	Netherlands	Switzerland
Canada	New Zealand	Thailand
Czechoslovakia	Poland	U.A.R.
France	Portugal	United Kingdom
Hungary	Romania	U.S.S.R.
Ireland	South Africa, Rep. of	Yugoslavia

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Germany
Japan

This International Standard cancels and replaces ISO Recommendation R 611-1967.

Braking of motor vehicles and their trailers – Terminology

SCOPE AND FIELD OF APPLICATION

This International Standard relates to braking terminology and defines the main terms used in connection with braking. These terms may designate either material parts which are actuated when a braking system is operating or quantities which are involved in the whole or a part of this operation.

Except for term 1, the terms thus defined pertain to motor vehicles and their trailers, i.e. single and articulated vehicles or road trains. In the definition of term 1, "braking equipment", the word "vehicle" may be assumed to have its broadest meaning.

TERMS AND DEFINITIONS

1 BRAKING EQUIPMENT

braking equipment : All the braking and retarding devices with which a vehicle is equipped.

2 BRAKING SYSTEMS; BRAKE SYSTEMS /USA/

braking system : A combination of parts, the function of which is to reduce the speed of the vehicle or to bring it to a halt or to maintain it at rest when halted.

2.1 service braking system : Assembly of parts which can be applied progressively by the driver and used during normal use of the vehicle.

2.2 secondary braking system; emergency brake /USA/ : Assembly of parts which can be applied progressively by the driver and can be brought into action to supplement the service braking system in the event of failure of the latter.

2.3 park braking system : Assembly of parts by means of which the vehicle can be maintained at rest even on a slope or in the absence of the driver.

3 COMPONENT PARTS OF BRAKING SYSTEMS; ... OF BRAKE SYSTEMS /USA/

3.1 source of energy : Those parts of a braking system which provide the energy for braking.

The source of energy can be located outside the vehicle.

The type of energy may be, for example :

- muscular;
- mechanical;
- electrical;
- hydraulic;
- pneumatic (air pressure or vacuum);
- kinetic;
- potential.

3.2 control : The element or mechanism of the braking system which governs the action of that braking system as a whole. It ends where the energy for production of the application force is controlled in the transmission.

The control can be operated :

3.2.1 *by the driver*

3.2.1.1 by hand;

3.2.1.2 by foot.

3.2.2 *without direct action by the driver*

(This type of control is generally used on articulated vehicles or road trains only.)

3.2.2.1 *by inertia or weight of the vehicle or of a component part of the vehicle*; by the moving together or separation of the tractor and trailer or lowering of a component;

3.2.2.2 *by pressure variation*; by variation of pressure in a line between towing vehicle and trailer.

3.2.2.3 *by variation of current in an electrical circuit*; by variation of current in an electrical circuit between towing vehicle and trailer.

3.3 transmission /GB/; linkage /USA/ : Assembly of the parts of a braking system by means of which the energy is transmitted to the brakes. It begins where, by means of the control, the energy for production of the application force is distributed.

Energy storage devices are considered as a component part of the transmission.

The transmission ends at the part of the braking system in which the forces opposing the motion of the vehicle are produced.

The different transmissions are the following :

3.3.1 mechanical transmission : Energy is transmitted to the brakes by purely mechanical devices.

3.3.2 hydraulic transmission : Energy is transmitted to the brakes by means of a liquid.

3.3.3 pneumatic transmission : Energy is transmitted to the brakes by means of gas, the pressure of which is higher or lower than atmospheric pressure.

3.3.4 electric transmission : Energy is transmitted to the brakes by means of an electric current.

3.3.5 combined transmission : Energy is transmitted to the brakes by means of a combination of the foregoing means (for example hydro-mechanical or hydro-pneumatic transmission).

3.4 brake : That element of the braking device in which the forces opposed to the motion or tendency to motion of the vehicle are produced.

3.4.1 friction brake : A brake in which components attached to a fixed part of the vehicle apply the application force to components attached or coupled to one or more of the wheels of the vehicle.

Friction brakes in which the application force is boosted by the frictional force are called self-servo-brakes.

3.4.1.1 drum brake : A friction brake in which friction forces are produced between components attached to a fixed part of the vehicle and either the internal or the external face of a drum or both these faces at the same time.

3.4.1.2 disc brake : A friction brake in which friction forces are produced between components attached to a fixed part of the vehicle and the faces of one or more discs.

3.4.2 positive engagement brake : A brake in which non-rotating components of the vehicle prevent, by positive engagement, the movement of components connected in a permanent manner to one wheel or an assembly of wheels. Positive engagement brakes can only be engaged when the vehicle is stationary.

4 COMPLEMENTARY DEFINITIONS RELATED TO THE NATURE OF BRAKING SYSTEMS; ... OF BRAKE SYSTEMS /USA/

4.1 Definitions related to energy source

4.1.1 muscular energy braking system : A braking system in which the energy needed to produce the braking force emanates solely from the physical effort of the driver.

4.1.2 power-assisted braking system : A braking system in which the energy needed to produce the braking force emanates from the physical effort of the driver and one or more other sources.

4.1.3 power braking system : A braking system in which the energy needed to produce the braking force emanates from one or several energy sources, excluding the physical effort of the driver.

4.1.4 over-run braking system : A braking system in which the energy needed to produce the braking force is generated by movement of the trailer towards the towing vehicle.

4.1.5 gravity braking system : A braking system in which the energy needed to produce the braking force emanates from the lowering of a component of the trailer by gravity.

4.2 Definitions related to the structure of the transmission

4.2.1 single-circuit braking system : A braking system with a transmission comprising a single circuit.

4.2.2 multiple-circuit braking system : A braking system with a transmission comprising several circuits.

4.3 Definitions related to vehicle combinations

4.3.1 single-line braking system : Connection of the braking systems of the individual vehicles of a combination, where supply of energy and operation take place alternatively via one single line.

4.3.2 multiple-line braking system : Connection of the braking systems of the individual vehicles of a combination, where supply of energy and operation take place separately via several lines.

4.3.3 continuous braking system : Braking system of an articulated vehicle or a road train with the following properties :

- a) a single control which can be operated from the driver's seat in one single operation;
- b) one single energy source supplies the energy for braking all the individual vehicles;
- c) simultaneous or suitably phased braking of all individual vehicles.

4.3.4 semi-continuous braking system : Braking system of an articulated vehicle or a road train with the following properties :

- a) a single control which can be operated from the driver's seat in one single operation;
- b) different energy sources supply the energy for braking the individual vehicles;
- c) simultaneous or suitably phased braking of all the individual vehicles.

4.3.5 non-continuous braking system : Braking system of a vehicle combination which is neither continuous nor semi-continuous.

5 RETARDERS

retarder : A device the function of which is to reduce or limit the speed of a vehicle, but not to stop it; the different types of retarder are the following :

5.1 reduction of fuel supply to engine : The engine connected to the drive wheels exerts a retarding effect on the vehicle when the fuel supply is reduced.

5.2 exhaust retarder : A device which impedes the flow of exhaust gases from the engine and so increases the retarding effect of the engine defined in 5.1.

5.3 engine retarder : Alteration of the valve timing (by displacement of the cam-shaft, or by other change in valve operation) increasing the retarding effect of the engine defined in 5.1.

5.4 hydrodynamic retarder : A device where a retarding effect is produced by the action of a liquid on parts connected to one or several wheels or to another part of the power transmission of the vehicle connected to the wheels.

5.5 aerodynamic retarder : A device where a retarding effect is produced by increasing the wind resistance of the vehicle (e.g. by opening spoiler flaps).

5.6 electromagnetic retarder : A device where a retarding effect is produced by the effect of a magnetic field on a rotating metal disc (eddy, hysteresis), which is connected to one or several wheels or to another part of the power transmission of the vehicle connected to the wheels.

5.7 electric motor as retarder : A device where a retarding effect is produced by the energy produced by the rotor of an electric traction motor which is connected to one or several wheels or to another part of the transmission of the vehicle connected to the wheels.

6 BRAKING MECHANICS¹⁾

Below are described the processes which occur from the start of operating of the control to the finish of the braking action.

6.1 Forces

6.1.1 operating force : The force exerted at the control.

6.1.2 application force : In a friction brake, the force which when applied at the brake lining surfaces produces, by the resulting friction, the braking force.

6.1.3 braking force, F : The total force produced by the action of the braking system and which is opposed to the movement or tendency to movement of the vehicle.

6.2 Times

6.2.1 operating time (only in the case of application by the driver) : The time which elapses from the beginning of the movement of that part of the control on which the operating force acts up to its reaching its final position.

6.2.2 initial delay time (GB); brake system activation time (USA) : The time which elapses from the beginning of operation of the control up to the onset of the braking force.

6.2.3 build-up time : The time which elapses between onset of the braking force and the time when it reaches its maximum value.

6.2.4 active braking time : The time which elapses between the onset of braking force and its cessation. If the vehicle stops before the braking force ceases, the stop constitutes the end of active braking time.

6.2.5 final release time (GB); brake release time (USA) : The time which elapses between the moment of commencement of operation of the control for release and the moment when the braking force ceases.

6.2.6 total braking time : The time which elapses between the onset of the operating force and the cessation of the braking force. If the vehicle stops before the braking force ceases, the stop constitutes the end of total braking time.

6.3 braking distance, s : The distance covered by the vehicle during the total braking time.

6.4 braking work, W : The integral of the product of the braking force, F , by the unit displacement, ds , over the braking distance, s .

$$W = \int_0^s F \cdot ds$$

6.5 instantaneous braking power, P : The product of the braking force, F , and road speed, v .

$$P = F \cdot v$$

6.6 braking deceleration, a : The reduction in road speed produced by the braking system, in unit time. One can select either instantaneous deceleration,

$$a = \frac{dv}{dt}$$

or mean deceleration between two moments during deceleration separated by time t ,

$$a_m = \frac{v_1 - v_2}{t}$$

6.7 braking ratio, z ; braking efficiency : The ratio between braking deceleration and acceleration due to gravity or between braking force and vehicle weight.

1) All definitions in this section with the exception of 6.1.2 (application force) also apply to the retarder.

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