

5th edition, November 2006

Translation

O

Brakes - Air brakes for freight trains and passenger trains

Freins - Freins à air comprimé pour trains de marchandises et trains de voyageurs

Bremsen - Druckluftbremsen für Güter- und Personenzüge



UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

Leaflet to be classified in Volume:

V - Rolling stock

Application:

With effect from 1 November 2006

All members of the International Union of Railways

Record of updates

1st edition, August 1954 First issue

3rd edition, January 1982

4th edition, June 2002 Retyped in FrameMaker. Incorporation of previous amendments (letter dated 28.7.2000 sent by Chairman of Sub-Commission 5T). Titles added to points 1.10, 1.12, 1.13, 1.19. Change to title of point 2. Point 3.4 added. Titles changed in Appendix A. Knorr braking system added to the two tables in Appendix A. SAB-Wabco braking system added to the table in Appendix C.

5th edition, November 2006 Publication of Appendix A on the UIC website and transfer of Appendix C to UIC Leaflet 543 (Appendix E, also published on the UIC website)

The person responsible for this leaflet is named in the UIC Code

Contents

Summary	1
1 - Conditions with which air brakes for freight trains and passenger trains must comply to be approved in international traffic	2
2 - Conditions governing air brakes approved in international traffic prior to 1.1.1982.....	6
3 - Procedure to be followed for the approval of air brakes in international traffic... 	7
Appendix A - Air brakes for freight trains and passenger trains approved before 1.1.1982 in international traffic	8
Appendix B - Table of conditions.....	9
Appendix C - Air brakes for freight and passenger trains approved in international traffic after 1.1.1982	11
Appendix D - Conditions for air brakes approved in international traffic before the date of implementation of this leaflet.....	12
Bibliography	23

Summary

General provisions governing the approval of air brakes in international traffic.

Any RU, wishing to have a new continuous braking system for freight trains or for passenger trains approved for use in international traffic, must submit it beforehand for examination to the UIC Study Group 5 "Braking" which will ascertain that it complies with the conditions set out in this leaflet.

Any operating modification contemplated on the brakes previously approved in international traffic must, beforehand, be brought to the notice of the SG5 "Braking", which will lay down the requisite conditions for approval.

1 - Conditions with which air brakes for freight trains and passenger trains must comply to be approved in international traffic

1.1 - The brake must be automatic; the use of compressed air must be sufficient for the working of the brake, and this only with one pipe system (brake pipe) with an inside diameter of 25 mm or 32 mm.

The brake must also comply with all the conditions set out below, even if the auxiliary reservoir is filled permanently from the main air supply pipe.

The use of electricity for the control of the brake is allowed, provided that the latter may also be worked by means of compressed air alone without it being necessary to perform any manipulation on the vehicle, and that it complies with all the conditions below and with those in *UIC Leaflet 541-5* (see [Bibliography - page 23](#)).

1.2 - The new air brakes must be capable of working without difficulty together with those previously approved.

1.3 - The normal working pressure is 5 bar, although a decrease or an increase in this working pressure of less than 1 bar must not disrupt the operation of the brake.

1.4 - The brake must comply with all the conditions when it is operated by means of a driver's brake valve which conforms to the conditions in *UIC Leaflet 541-03* (see [Bibliography - page 23](#)).

The operation of the brake by means of older driver's brake-valve designs not complying with the above-mentioned conditions must be possible.

1.5 - The brake must be ready-for-use and released when the working pressure is applied.

The application must be obtained by a pressure decrease in the brake pipe, and the release by pressure increase thus obtained. It is permitted for the brake to be completely released before pressure in the main brake pipe has attained the normal value.

The brake must not come back to the ready-for-use position as long as the pressure at the brake cylinder is more than or equal to 0,3 bar¹. On the other hand, the brake must have come back to the ready-for-use position, at the latest, when the pressure at the brake pipe has attained a value 0,15 bar lower than the normal value, it being understood that the brake must then be completely released.

1.6 - The brake must permit emergency application by a sudden and considerable exhaust of the air contained in the pipe, as well as ordinary progressive application till full application, and non-progressive full application by slow exhaust of the air from the brake pipe.

At the time of release, it must be possible to obtain graduated release by interrupting the re-filling of the brake pipe (adjustability on release).

1.7 - In order to obtain full application as from the normal working pressure, the pressure in the brake pipe must be reduced by $1,5 \pm 0,1$ bar.

1. In the case of brakes with pneumatically-controlled devices for the variation of the braking power, the pressure of 0,3 bar corresponds to the pressure existing at the pneumatic relay (pilot pressure).

The maximum pressure obtained at the brake cylinder must be $3,8 \pm 0,1$ bar without being related to the stroke of the piston in the cylinder. If the brake equipment includes a relay device allowing fixed or variable pressure ratios, this provision shall apply to the control pressure of this device.

1.8 - The filling time of the brake equipment of a vehicle must be such that the filling of auxiliary reservoirs and the release of the brakes on the rear vehicles, even on long rafts of vehicles, are not impeded and that there do not appear, in the brake pipe, sudden large variations in pressure, likely to bring about an inopportune application of the brakes on the neighbouring vehicles.

1.9 - The operation of the brake on a raft of vehicles must be ensured when, on a maximum of 50% of the vehicles, the complete brake equipment is working, whereas, on the other vehicles, only the brake pipe is in operation.

The vehicles on which the brake has been isolated may form one or several coherent groups within the raft; the length of each of them must not exceed 80 m approximately.

1.10 - Sensitivity/Insensitivity

1.10.1 - The insensitivity of the brake to slow decreases in pressure in the brake pipe must be such that the brake is not activated if the normal working pressure drops by 0,3 bar in one minute.

1.10.2 - The sensitivity of the brake to decrease in brake-pipe pressure must be such that the brake is activated within 1,2 second if the normal working pressure drops by 0,6 bar in 6 seconds.

1.11 - The brake must be designed to allow vehicles to be fitted with a device capable of varying the braking power (load-proportional braking in two or more stages or automatic load-proportional braking, graduated braking).

1.12 - Brake Inexhaustibility

1.12.1 - Brakes must allow the train to run down all gradients on the main railway lines, with perfect safety and variations of the speed prescribed as reduced as possible.

1.12.2 - Brakes must be inexhaustible, that is to say it must always be possible, by emergency application on a given train when stationary, and after any manipulation of the driver's brake valve, to obtain on the brake cylinders of the vehicles a final weighted pressure at least equal to 85% of the pressure obtained, on the same train, by emergency application as from the normal working pressure.

However, these manipulations will not include the prolonged use of the driver's brake valve in a position interrupting the brake-pipe supply and must not give rise, at any time, to a pressure under 0,3 bar in the brake cylinders.

1.13 - Cylinder pressure

1.13.1 - The brake must be such that the pressure at the cylinder is always in keeping with the variations in the brake pipe. A pressure variation of 0,1 bar in the brake pipe must give rise, from the distributor, to a corresponding variation in the cylinder, after the brake starts working.

For one and the same pressure in the brake pipe, the pressure at the brake cylinder must not vary by more than 0,1 bar during applications and releases.

NB : As regards brakings achieved with pneumatically-controlled devices for braking-power variation, the pressure of 0,1 bar corresponds to the pressure existing at the pneumatic relay (pilot pressure).

1.13.2 - As regards the pressure at the cylinder, the brake shall be such as to maintain the pressure in the course of all ordinary applications, full and emergency applications, i.e. the leakages in the cylinder and its pipes shall be automatically compensated as long as the pressure in the auxiliary reservoir so permits.

1.14 - At the time of a normal operation of the brake and, in particular, at the time of an emergency application on a train in which the braking operation is already under way, no harmful longitudinal recoils must occur.

1.15 - The brake must be such as to be capable of being utilised either as "Freight" brake, passenger brake, or "Freight-Passenger" brake; in the latter case, a changeover device must be provided to permit its utilisation in passenger trains as well as in "freight" trains.

1.16 - The transmission speed¹ of brake action must be, for emergency applications effected as from the normal working pressure, at least 250 metres per second, whatever the composition of the train.

This applies to trains with a length equal to or exceeding 500 m, at least 50% of the hauled vehicles being braked.

1.17 - The ordinary applications must be transmitted to the last vehicle of the train, under any braking system, as soon as the pressure in the brake pipe at the front of the train has been reduced by a maximum of 0,3 bar, irrespective of the length and consist of the train, it being understood that the first reduction in pressure achieved in the brake pipe of the rear vehicle by the distributor accelerators must not exceed 0,4 bar.

1.18 - When activating the brake of one separate vehicle, either by emergency application or by ordinary application, effected as from the normal working pressure, the pressure at the brake cylinder:

- in "G" (freight) position, irrespective of the load, must rapidly be obtained and be sufficient to permit the application of the brake-shoes on the wheels. The pressure on the shoes² thus obtained must be approximately 10 % of the maximum pressure which may be obtained at the end of the application.

Following this, the pressure increase to its maximum value must be progressive; the filling time of the brake cylinder, measured between the moment when the air begins to enter the cylinder and that when the pressure in the cylinder reaches 95 % of its maximum, must be between 18 and 30 seconds (subject to Technical Unity's approval), whether or not there is a system for braking the load and whatever its type,

- in the "P" (passenger) position, must increase continuously up to its maximum value, whatever the load braking system considered.

In emergency application, the filling time of the brake cylinder, measured from the moment when the air begins to enter the cylinder and that when the pressure attains 95 % of its maximum value, must be between 3 and 5 seconds, except in the case of the load-braking system for which a period of 3 to 6 seconds is allowed.

1.19 - Release procedures for individual wagons/vehicles

1. The transmission speed is the quotient of the length of the brake pipe, determined without taking the branch pipes into consideration, from the driver's brake valve to the rear stop cock, by the time elapsing between the moment when the driver places his valve in the application position and that when the air begins to enter the brake cylinder of the last vehicle (transmission time).
2. "The pressure on the shoes" is the actual pressure of the shoes on the wheels, measured when stationary.

1.19.1 - At the time of a full continuous release of the brake on one separate vehicle, following a full application, the pressure at the brake cylinders must fall progressively.

The draining time of the brake cylinder, measured by the time between the moment when the air begins to escape from the brake cylinder and that when the pressure attains 0,4 bar, the driver's valve being placed in the application position, must be¹:

- between 45 and 60 seconds, in the "G" position,
- between 15 and 20 seconds in the "P" position (for a wagon with a mass on rails equal to or exceeding 70 t, a time between 15 and 25 seconds is permissible).

1.19.2 - On a separate vehicle, it must be possible, after a full application, to make an uneven release at a pressure of at least 6 bar, maintained in the brake pipe during:

- at least 40 seconds, on "Freight" system,
- at least 10 seconds, on passenger system,

with no overload occurring in the various brake capacities, which would be likely to impede the subsequent operating of the brake.

1.20 - When a brake release is effected on a complete train following a full application, and without any overload occurring that might impede the subsequent operation of the brakes, the time which elapses between the beginning of the release operation on the valve and the moment when the pressure in the brake cylinder of the last vehicle has fallen to 0,4 bar, must not exceed¹:

- in the "G" position, 70 seconds for a train 750 m in length, with a brake-pipe inside diameter of 32 mm, made up at least, of 50 vehicles, all braked,
- in the "P" position, 25 seconds for a train 400 m in length, either made up of 15 bogie-vehicles (coaches) with a brake pipe inside diameter of 25 mm, or of 20 wagons (with 2 axles and/or bogies) with a brake-pipe inside diameter of 32 mm.

These times must be obtained even when the full application is preceded by some partial application and release operations, achieving in the brake cylinders a pressure reaching approximately the third of the pressure obtained by a full application.

1.21 - When releasing the brake, it must be possible to effect a high pressure overcharge for 2 seconds at a pressure of 6 bar without the brakes being activated once the overcharge has been cancelled, bringing the pressure down from 6,0 bar to 5,2 bar in 1 second and followed by a return to normal working pressure.

No activation of the brakes must occur on the train for a period of 30 seconds after the said cancellation.

1.22 - The brake must have a device allowing manual release.

1. On vehicles fitted with a pneumatically-controlled device for the variation of the braking power, the release time is the time which must elapse before obtaining a pressure of 0,4 bar at the relay control chamber (pilot pressure).

2 - Conditions governing air brakes approved in international traffic prior to 1.1.1982

2.1 - In view of the present state of technology, air brakes for freight trains and passenger trains, approved in international traffic before the date of implementation of the present leaflet, may possibly not comply with all the conditions in point **1 - page 2** of this leaflet.

2.2 - Air brakes for freight trains approved in international traffic before the date of implementation of this leaflet are listed in Appendix **A - page 8**.

2.3 - Air brakes for passenger trains approved in international traffic before the date of implementation of this leaflet are listed in Appendix **A - page 8**.

2.4 - Any RU wishing to modify the operating method of an air brake previously approved in international traffic must submit an accurate description of the modification and of the new operating method contemplated, in French and German. After examination of these documents, the UIC SG5 "Braking" will either lay down the procedure to be followed for approval, or refuse approval for this modification of the operating method of the brake in international traffic.

2.5 - The conditions regarding air brakes approved in international traffic before the date of implementation of this leaflet are shown in Appendix **D - page 12**.