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Translation

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Brakes - Specifications for the construction of the various brake components - Magnetic brakes

*Frein - Prescriptions concernant la construction des différents organes de frein - Frein magnétique
Bremse - Vorschriften für den Bau der verschiedenen Bremssteile - Magnetschienenbremse*



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Adding of magnetic brake type 6+

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Summary

The electromagnetic brake - in abbreviated form the Mg brake - is an additional brake acting directly on the rail and its operation is thus independent of rail/wheel adhesion. Its action is based on the applied magnetic force. The force applied is produced by the electromagnetic effect or by a permanent magnet. Where required, the Mg brake is fitted a coach bogies in order to supplement the air brake. The obligatory requirements of this leaflet apply to this rolling stock only. [Appendix A - page 7](#) shows as an example a diagrammatic arrangement for the Mg brake as fitted to a bogie.

1 - Efficiency

1.1 - The Mg brake comes into operation during emergency brake applications (the R+Mg braking position, marked by R+Mg or by Mg only on the changeover control). The brake shoes shall be applied to the rails within 3 s of the pressure in the main pipe - as measured with the vehicle isolated - falling to a level below 3,0 bars. The circuit is closed at the moment the shoes are lowered. At 20 km/h the brake shall become ineffective. At accelerating speeds, the Mg brake shall become effective again on the speed exceeding 50 km/h. When pressure in the main pipe exceeds 3,0 bars, the Mg brake shall become ineffective independently of the speed.

1.2 - The braking force produced by friction between the magnetically excited shoes and the rail results from the combined effect of the magnetic force applied and the coefficient of friction pole element/rail. **Appendix B - page 8**, Fig. 2 shows, for example, the direction of the lines of force in the magnetic field of an electromagnetic shoe under excitation.

1.3 - Since the braked mass of the magnetic brake cannot be determined independently of the air brake, the braked mass inscribed on the vehicle is the value R+Mg. If, for a coach fitted with the magnetic brake, it is necessary to obtain a braked mass of 208 % - in relation to the total mass (tare + load) of the vehicle - the Mg brake shall be capable of providing a braked mass of 28 t. This is obtained if, at 160 km/h, 4 magnetic shoes are each capable of providing a braking force of at least 4 kN, but without exceeding 10 kN.

1.4 - The Mg brake is applied and released by means of the RIC - R - Mg changeover control.

When the air brake is isolated by the cut-off valve, the Mg brake shall also become inoperative.

1.5 - The Mg brake shall be capable, when in its working position, of negotiating switch and crossing work incorporating fixed crossings where the tangent of the crossing angle is $\tan \alpha > 0,034$ (1:30).

1.6 - The magnetic brake shoes are maintained in the raised position by springs and are lowered pneumatically.

2 - Design characteristics

2.1 - Mechanical characteristics

2.1.1 - The Mg brake is incorporated in the bogie with the brake shoes located between the wheels in line with the centre of the rail.

When the shoes are in the raised position, the suspension system shall prevent any pendular motion in order to ensure compliance with the conditions laid down in *UIC Leaflet 505-1* and *UIC Leaflet 515* (see [Bibliography - page 18](#)).

In the operative position, the magnetic shoes are centrally located over the rail by magnetic force (see [Appendix B - page 8, Fig. 2](#)).

When in the raised position, the magnetic shoes must not cause any damage to track equipment used for shunting movements.

In the operational position, the shoes have a lateral play of $X = 20 \text{ mm} + q \text{ mm}$, in which "q" is the lateral play between axle and bogie underframe as defined in *UIC Leaflet 505-2* (see [Bibliography - page 18](#)). The braking effort is transmitted to the bogie through a control mechanism. The distance between shoes is $A = 1\,510 \text{ mm}$. Appropriate devices (e.g. tie bars) shall be provided to maintain the shoes in a parallel position to each other.

A bogie shall always comprise two shoes of identical construction.

2.1.2 - The shoes shall be of articulated design, formed of movable intermediate elements and fixed end elements (no rigid intermediate elements) (see [Fig. 3](#) of [Appendix B](#)). The end elements shall be designed with the appropriate geometry to accommodate both the characteristics of crossings with a tangent above or equal to 0,034 and the check rails. End elements of the types approved for international traffic, as shown in the diagrams forming [Appendix C - page 10](#), meet these requirements. A list of approved types is given in [Appendix D - page 17](#):

- any new shoe in which the end element fails to comply with this condition must undergo an individual validation process - at railway level - involving tests on a crossing with a tangent of 0,034. If the tests prove satisfactory, the drawing of the corresponding end element will be added to [Appendix C](#) by the UIC Committee responsible for the certification of brakes;
- the width b of the friction plates shall be 65-72 mm and the maximum width B of the shoes 140 mm;
- the total length L over which the Mg brake is applied shall be at least 1,000 mm;
- it shall be possible for all friction plates to be replaced easily while on the vehicle. The limit of wear of the shoe shall be clearly identifiable from the shoe itself.

2.2 - Characteristics of the electromagnetic brake

- **2.2.1** - *UIC Leaflet 550* (see [Bibliography - page 18](#)) must be observed. The Mg brake operates at a voltage of 24 to 120 V DC supplied by the vehicle battery. Both poles of the Mg brake shall be protected. The Mg brake fuses and the other fuses of the vehicle shall be installed in separate locations in order to avoid any confusion.
- **2.2.2** - The induced voltage peaks likely to arise when the power supply to the Mg brake is cut off shall be attenuated by appropriate measures.

2.2.3 - In cases where both bogies are fitted with electromagnetic brakes, it is recommended that current consumption should vary from 160 A for a nominal voltage of 24 V to 35 A for a nominal voltage of 120 V.

This applies to Mg brakes manufactured of cast steel.

- **2.2.4** - The power supply shall be designed so as to ensure that, in the Mg brake position, the Mg brake is ready to come into action at any moment. The connection of the Mg brake to the electrical system of the vehicle shall be such that, even in the absence of any voltage from the battery, the Mg brake is not automatically neutralised.

2.2.5 - Further considerations:

- Additional electrical protection equipment to cut off the power supply in cases of circuit breaker contact burn-out; an electrical circuit preventing supply of current to one shoe only on the bogie in the event of a failure; safeguards to ensure that the Mg brake has sufficient capacity available in relation to other current consuming equipment, etc.,
- Information concerning the electrical circuitry and wiring;
- Manner in which coils are wound;
- Information concerning insulation resistance;
- **2.2.6** - Wiring on bogies shall conform to *UIC Leaflet 505-1*. Cables shall be installed in a manner which ensures their protection against flying stones.

2.3 - Characteristics of the Mg brake using permanent magnets

In abeyance.