# Council Directive of 26 July 1971 on the approximation of the laws of the Member States relating to the braking devices of certain categories of motor vehicles and of their trailers (71/320/EEC) (repealed)

# [F1ANNEX VIII

## Conditions governing the testing of vehicles with inertia (overrun) braking systems

**Textual Amendments**

**F1** Substituted by Commission Directive 98/12/EC of 27 January 1998 adapting to technical progress Council Directive 71/320/EEC on the approximation of the laws of the Member States relating to the braking devices of certain categories of motor vehicles and their trailers (Text with EEA relevance).

1. GENERAL PROVISIONS

1.1. The ‘inertia (overrun) braking system’ of a trailer comprises the control device, the transmission and the brake, as defined in point 1.4.

1.2. The ‘control device’ is the combination of components comprising the coupling head.

1.3. The ‘transmission’ is the combination of components comprised between the coupling head and the first part of the brake.

1.4. The ‘brake’ is the part in which the forces opposing the movement of the vehicle develop. The first part of the brake is either the lever actuating the brake cam or similar parts (mechanical-transmission inertia brake) or the brake cylinder (hydraulic-transmission inertia brake).

1.5. Braking systems in which accumulated energy (for instance, electric, pneumatic or hydraulic) is transmitted to the trailer by the towing vehicle and is only controlled by the force at the coupling shall not be deemed to be inertia braking systems within the meaning of this Directive.

1.6. *Tests*

1.6.1. Determination of the main characteristics of the brake.

1.6.2. Determination of the main characteristics of the control device and testing as to whether that device conforms with the provisions of this Directive.

1.6.3. Testing on the vehicle:

— the compatibility of the control device and the brake

— the transmission.

2. SYMBOLS AND DEFINITIONS

2.1. *Units used*

2.1.1. Masses: kg

2.1.2. Forces: N

2.1.3. Torques and moments: Nm

2.1.4. Areas: $cm^2$

2.1.5. Pressures: bar

2.1.6. Lengths: units specified in each case.

2.1.7. Acceleration due to gravity: $g = 10\ m/s^2$.

2.2. *Symbols valid for all types of braking systems* (see diagram 1 in Appendix 1)

| | | | |
|---|---|---|---|
| 2.2.1. | $G_A$ | : | 'maximum mass' of the trailer declared to be technically permissible by the manufacturer |
| 2.2.2. | $G_A$ | : | 'maximum mass' of the trailer which, according to the manufacturer's declaration, can be braked by the control device |
| 2.2.3. | $G_B$ | : | 'maximum mass' of the trailer which can be braked by the joint operation of all the trailer brakes |

$$G_B = n \times G_{Bo}$$

| | | | |
|---|---|---|---|
| 2.2.4. | $G_{Bo}$ | : | fraction of the permissible 'maximum mass' which, according to the manufacturer's declaration, can be braked by one brake |
| 2.2.5. | B* | : | braking force required |
| 2.2.6. | B | : | required braking force taking account of rolling resistance |
| 2.2.7. | D* | : | permitted thrust on coupling |
| 2.2.8. | D | : | load on the coupling |
| 2.2.9. | P′ | : | control device output force |
| 2.2.10. | K | : | supplementary force of control device by convention; this is defined as the force D corresponding to the point of intersection of the x axes of the extrapolated curve expressing P′ in terms of D, measured with the control system in the mid-travel position (see diagrams 2 and 3 in Appendix 1) |
| 2.2.11. | $K_A$ | : | threshold force of control device — this is the maximum force on the coupling head which can be applied for a short period of time without producing any output force on the control device. By convention, $K_A$ is defined as the force measured when force begins to be exerted on the coupling head at a speed of from 10 to 15 mm/s, the control device transmission being uncoupled |
| 2.2.12. | $D_1$ | : | this is the maximum force applied to the coupling head when it is forced rearward at a speed of s mm/s ± 10 %, the transmission being uncoupled |
| 2.2.13. | $D_2$ | : | This is the maximum force applied to the coupling head when this is pulled forward at a speed of s mm/s ± 10 % from its rearmost position, the transmission being uncoupled |

| | | | |
|---|---|---|---|
| 2.2.14. | $\eta H_0$ | : | efficiency of the inertia control device |
| 2.2.15. | $\eta H_1$ | : | efficiency of the transmission system |
| 2.2.16. | $\eta H$ | : | total efficiency of the control device and of the transmission |

$$\eta H = \eta H_0 \times \eta H_1$$

| | | | |
|---|---|---|---|
| 2.2.17. | s | : | travel of control (expressed in millimetres) |
| 2.2.18. | s′ | : | effective travel of control (expressed in millimetres) fixed in accordance with the requirements of point 9.4.1 |
| 2.2.19. | s″ | : | spare travel of the master cylinder actuator, measured in millimetres at the coupling head |
| 2.2.20. | $s_0$ | : | loss of travel, that is to say the travel, measured in millimetres, of the coupling head when it is actuated in such a way as to travel from a point 300 mm above the horizontal plane to a point 300 mm below, the transmission remaining stationary |
| 2.2.21. | $2s_B$ | : | brake-shoe lift measured on the diameter parallel to the operating mechanism and without the brakes being adjusted during the test (expressed in millimetres) |
| 2.2.22. | $2s_{B*}$ | : | minimum brake shoe centre lift (minimum brake shoe application travel), in millimetres, for wheel brakes with drum brakes: |

$$2s_{B*} = 2{,}4 + \frac{4}{1000} \times 2r$$

2r being the diameter of the brake drum expressed in millimetres (see diagram 4 in Appendix 1)

for wheel brakes with disc brakes with hydraulic transmission:

$$2s_{B*} = 1{,}1 \frac{10 \times V_{60}}{F} RZ + \frac{1}{1000} \times 2r_A$$

where:

$V_{60}$ = fluid volume absorption of one wheel brake at a pressure corresponding to a braking force of 1,2 1,2 B* = 0,6 × $G_{Bo}$ and a maximum tyre radius,

$2r_A$ = outer diameter of brake disc

($V_{60}$ in $cm^3$, $F_{RZ}$ in $cm^2$ and $r_A$ in mm)

| | | | |
|---|---|---|---|
| 2.2.23. | M | : | braking moment |

| | | | |
|---|---|---|---|
| 2.2.24. | R | : | dynamic tyre rolling radius in metres, rounded to the nearest centimetre |
| 2.2.25. | n | : | number of brakes |
| 2.2.26. | $D_A$ | : | application force at input side of the control device, at which the overload protector is activated |
| 2.2.27. | $M_A$ | : | braking torque at which the overload protector is activated |

2.3. *Symbols for mechanical transmission braking systems* (see diagram 5 in Appendix 1)

| | | | |
|---|---|---|---|
| 2.3.1. | $i_{H_o}$ | : | reduction ratio between travel of the coupling head and travel of the lever at the output side of the control device |
| 2.3.2. | $i_{H_i}$ | : | reduction ratio between travel of the lever at the output side of the control device and travel of the brake lever (gearing down of transmission) |
| 2.3.3. | $i_H$ | : | reduction ratio between travel of the coupling head and travel of the brake lever |

$$i_H = i_{H_0} \times i_{H_1}$$

| | | | |
|---|---|---|---|
| 2.3.4. | $i_g$ | : | reduction ratio between travel of the brake lever and the brake-shoe centre lift (see diagram 4 in Appendix 1) |
| 2.3.5. | P | : | force applied to the brake control lever |
| 2.3.6. | $P_0$ | : | brake retraction force; that is, in the graph M = *f* (P), the value of the force P at the point of intersection of the extrapolation of this function with the abscissa (see diagram 6 in Appendix 1) |
| 2.3.7. | ρ | : | characteristic of the brake defined by: |

$$M = \rho (P - P_o)$$

2.4. *Symbols for hydraulic-transmission braking systems* (see diagram 8 in Appendix 1)

| | | | |
|---|---|---|---|
| 2.4.1. | $i_h$ | : | reduction ratio between travel of the coupling head and travel of the piston in master cylinder |
| 2.4.2. | $i_g$ | : | reduction ratio between travel of the actuation point of the cylinders and the brake-shoe centre lift |
| 2.4.3. | $F_{R_z}$ | : | surface area of piston of one wheel cylinder for drum brake(s); for disc brake(s), sum of the surface area of the caliper piston(s) on one side of the disc |
| 2.4.4. | $F_{H_z}$ | : | surface area of piston in master cylinder |
| 2.4.5. | p | : | hydraulic pressure in brake cylinder |

2.4.6. $p_O$ : retraction pressure in brake cylinder; that is, in the graph M = *f* (p), the value of the pressure p at the point of intersection of the extrapolation of this function with the abscissa (see diagram 7 in Appendix 1)

2.4.7. $\rho'$ : characteristic of the brake defined by:

$$M = \rho'(p - p_0)$$

3. GENERAL REQUIREMENTS

3.1. The transmission of braking power from the coupling head to the trailer's brakes shall be effected either by a rod linkage or by means of one or more fluids. However, a sheathed cable (Bowden cable) may be used to provide part of the transmission. This part shall be as short as possible.

3.2. All pins at joints shall be adequately protected. In addition, these joints shall be either self-lubricating or easily accessible for lubrication.

3.3. Inertia braking systems shall be arranged in such a way that, in the case where the coupling head travels to its fullest extent, no part of the transmission becomes jammed, or suffers any permanent distortion or fails. This shall be checked after uncoupling the first element of the transmission from the brake control levers.

3.4. The inertia braking system shall allow the trailer to be reversed with the towing vehicle without imposing a sustained drag force exceeding $0{,}08 \times g \times G_A$. Devices used for this purpose shall act automatically and disengage automatically when the trailer moves forward.

3.5. Any special device incorporated for the purpose of point 3.4 shall be such that the parking performance when facing up a gradient shall not be adversely affected.

3.6. Only inertia braking systems with disc brakes may incorporate overload protectors. They may not be activated at a force of less than 1,2 P or a pressure less than 1,2 p corresponding to a braking force of $B^* = 0{,}5 \times g \times G_{B_O}$ (when fitted at the wheel brake) or at a thrust on the coupling less than $1{,}2 \times D^*$ (when fitted at the control device).

4. REQUIREMENTS FOR CONTROL DEVICES

4.1. The sliding members of the control device shall be long enough to enable the brake to be fully applied, even when the trailer is coupled.

4.2. The sliding members shall be protected by a bellows or some equivalent device. They shall either be lubricated or be constructed of self-lubricating materials. The surface in frictional contact shall be made of a material such that there is neither electrochemical torque nor any mechanical incompatibility liable to cause the sliding members to seize.

4.3. The threshold force of the control equipment ($K_A$) shall be not less than $0{,}02 \times g \times G'_A$, and not more than $0{,}04 \times g \times G'_A$.

4.4. The maximum damping force $D_1$ may not exceed $0{,}10 \times g \times G'_A$ in the case of trailers with rigid drawbars and $0{,}067 \times g \times G'_A$ in the case of multi-axled trailers with pivoted drawbars.

4.5. The maximum towing force $D_2$ shall be between $0{,}1 \times g \times G'_A$ and $0{,}5 \times g \times G'_A$.

5. TESTS AND MEASUREMENTS TO BE CARRIED OUT ON THE CONTROL SYSTEM

5.1. Compliance with the requirements of points 3 and 4 shall be verified on the control device submitted to the technical service conducting the tests.

5.2. The following shall be measured in respect of all types of braking systems:

5.2.1. The travel s and the effective travel s′.

5.2.2. The supplementary force K.

5.2.3. The threshold force $K_A$.

5.2.4. The damping force $D_1$.

5.2.5. The towing force $D_2$.

5.3. In the case of mechanical-transmission inertia braking systems, the following shall be determined:

5.3.1. The reduction ratio $i_{Ho}$ measured at the mid-travel position of the control.

5.3.2. The force P′ at the output side of the control device as a function of the thrust D on the drawbar. The supplementary force K and the efficiency shall be derived from the representative curve obtained from these measurements.

$$\eta_{H_0} = \frac{1}{i} H0 \times \frac{P'}{D - K}$$

(see diagram 2 in Appendix 1).

5.4. In the case of hydraulic-transmission inertia braking systems, the following shall be determined:

5.4.1. The reduction ratio $i_h$ measured at the mid-travel position of the control.

5.4.2. The pressure p at the output side of the master cylinder as a function of the thrust D on the drawbar and of the surface area $F_{HZ}$ of the master cylinder piston, as specified by the manufacturer. The supplementary force K and the efficiency shall be derived from the representative curve obtained from these measurements

$$\eta_{H_0} = \frac{1}{i} h \times \frac{p \times F_{HZ}}{D - K}$$

(see diagram 3 in Appendix 1).

5.4.3. The spare travel of the master cylinder actuator s″ mentioned in point 2.2.19.

5.5. In the case of inertia braking systems on multi-axled trailers with pivoted drawbars, the loss of travel $s_O$ mentioned in point 9.4.1 shall be measured.

6. REQUIREMENTS FOR BRAKES

6.1. The manufacturer shall make available to the technical service responsible for the tests, in addition to the brakes to be tested, drawings of the brakes showing the type, dimensions and material of the main parts, and the make and type of the linings. These drawings shall indicate the surface area $F_{RZ}$ of the brake cylinders in the case of hydraulic brakes. The manufacturer shall also indicate the maximum braking torque $M_{max}$ which is allowed, as well as the mass $G_{BO}$ mentioned in point 2.2.4.

6.2. The braking torque $M_{max}$ specified by the manufacturer shall be not less than that braking torque corresponding to 1,2 times the force P or 1,2 times the pressure p, required to give a braking force of $B^* = 0,5 \times g \times G_{BO}$.

6.2.1. In the case when no overload protector is either fitted or intended to be fitted within the inertia (overrun) braking system, the wheel brake shall be tested at 1,8 times the force P or at 1,8 times the pressure p, which is required to give a braking force of $B^* = 0,5 \times g \times G_{BO}$.

6.2.2. In the case when an overload protector is fitted or intended to be fitted within the inertia (overrun) braking system, the wheel brake shall be tested at 1,1 times the force $P_{max}$ or $P'_{max}$ or at 1,1 times the pressure *pmax* or *p'max* of the overload protector including all tolerances (specified by the manufacturer).

7. TESTS AND MEASUREMENTS TO BE CARRIED OUT ON THE BRAKES

7.1. The brakes and items of equipment made available to the technical service responsible for the tests shall be tested to check whether they conform to the requirements of point 6.

7.2. The following shall be determined:

7.2.1. The minimum shoe centre lift $2s_B$*.

7.2.2. The shoe centre lift $2s_B$ (which shall be greater than $2s_B$*).

7.2.3. The braking moment M as a function of the force P applied to the control lever in the case of devices with mechanical transmission, and of the pressure p in the brake cylinder in the case of devices with hydraulic transmission.

The speed at which the braking surfaces rotate shall correspond to an initial vehicle speed of 60 km/h. The following is deduced from the curve obtained from these measurements:

7.2.3.1. The retraction force $P_O$ and the characteristic ρ in the case of mechanically actuated brakes (see diagram 6 in Appendix 1).

7.2.3.2. The retraction pressure $p_o$ and the characteristic ρ′ in the case of hydraulically actuated brakes (see diagram 7 in Appendix 1).

8. TEST REPORTS

Where applications are made for type-approval of trailers fitted with inertia braking systems, such applications are to be accompanied by the test reports relating to the control system and the brakes, as well as the test report on the compatibility between the inertia control device, the transmission and the brakes on the trailer; these reports are to include at least the particulars shown in Appendices 2, 3 and 4 to this Annex.

9. COMPATIBILITY OF THE CONTROL DEVICE AND THE BRAKES OF A VEHICLE

9.1. A check shall be made on the vehicle, taking into account the characteristics of the control device (Appendix 2) and of the brakes (Appendix 3) as well as the trailer characteristics mentioned in point 4 of Appendix 4, as to whether the inertia braking system of the trailer complies with the requirements laid down.

9.2. *General tests for all types of brakes*

9.2.1. Those parts of the transmission which have not been tested at the same time as the brake control device or the brakes shall be tested on the vehicle. The results of the test shall be entered in Appendix 4 (for example $i_{H1}$ and $\eta_{H1}$).

9.2.2. *Mass*

9.2.2.1. The maximum mass of the trailer $G_A$ shall not exceed the maximum mass $G'_A$ for which the control device is authorised.

9.2.2.2. The maximum mass of the trailer $G_A$ shall not exceed the maximum mass $G_B$ which can be braked by the joint operation of all the trailer brakes.

9.2.3. *Forces*

9.2.3.1. The threshold force $K_A$ shall not be less than $0{,}02 \times g \times G_A$ nor greater than $0{,}04 \times g \times G_A$.

9.2.3.2. The maximum damping force $D_1$ shall not exceed $0{,}10 \times g \times G_A$ in the case of trailers with rigid drawbars, nor $0{,}067 \times g \times G_A$ in the case of multi-axled trailers with pivoted drawbars.

9.2.3.3. The maximum towing force $D_2$ shall be between $0{,}1 \times g \times G_A$ and $0{,}5 \times g \times G_A$.

9.3. *Test of braking efficiency*

9.3.1. The sum of the braking forces exerted on the circumference of the trailer wheels shall be at least $B^* = 0{,}5 \times g \times G_A$ including a rolling resistance of $0{,}01 \times g \times G_A$. This represents a braking force of $B = 0{,}49 \times g \times G_A$. In this case, the maximum permitted thrust on the coupling is:

$D^* = 0{,}067 \times g \times G_A$ in the case of multi-axled trailers with pivoting drawbars, and

$D^* = 0{,}10 \times g \times G_A$ in the case of trailers with rigid drawbars.

In order to check whether these conditions are observed, the following inequalities shall be applied:

9.3.1.1. In the case of inertia braking systems with mechanical transmission

$$\left[\frac{B \times R}{\rho} + nP_o\right] \frac{1}{(D^* - K) \times \eta_H} \leq i_H$$

9.3.1.2. In the case of inertia braking systems with hydraulic transmission

$$\left[\frac{B \times R}{n \times \rho'} + p_o\right] \frac{1}{(D^* - K) \times \eta_H} \leq i_h F_{HZ}$$

9.4. *Control travel test*

9.4.1. In the case of control devices for multi-axle trailers with pivoted drawbars, of which the brake rod system is dependent upon the position of the towing device, the travel of the control s shall be greater than the effective travel of the control s′; the difference in length shall be at least equivalent to the loss of travel $s_o$. The travel $s_o$ shall not exceed 10 % of the effective travel s′.

9.4.2. The effective travel of the control s′ shall be determined in the following way:

9.4.2.1. If the brake rod system is affected by the relative position of the towing device, then

$s' = s - s_0$

9.4.2.2. If there is no loss of travel, then

$s' = s$

9.4.2.3. In the case of hydraulic braking systems

$s' = s - s''$

9.4.3. The following inequalities shall be applied in order to check whether the travel of the control is adequate:

9.4.3.1. In the case of inertia braking systems with mechanical transmission:

$i_H \leq \frac{s'}{S_{Bo} \times i_g}$

9.4.3.2. In the case of inertia braking systems with hydraulic transmission:

$i_h F_{HZ} \leq \frac{s'}{2s_{Bo} \times nF_{HZ} \times i_{g'}}$

9.5. *Additional tests*

9.5.1. In the case of inertia braking systems with mechanical transmission, a check shall be made as to whether the rod system by which the forces are transmitted from the control device is correctly fitted.

9.5.2. In the case of inertia braking systems with hydraulic transmission, a check shall be made as to whether the travel of the master cylinder actuator reaches a minimum level of $s/i_h$.

A lower level shall not be permitted.

9.5.3. The general behaviour of the vehicle when braking shall be the subject of a road test carried out at different speeds, with different levels of brake effort and rates of application; self-excited undamped oscillations shall not be permitted.

10. GENERAL COMMENTS

The above provisions apply to the latest models of inertia braking systems with mechanical or hydraulic transmission; in the case of these models, in particular, all the wheels of the trailer are fitted with the same type of brake and the same type of tyre.

When testing special models, the above requirements shall be adapted.

## Appendix 1

### Explanatory diagrams

Diagram 1Symbols valid for all types of braking systems(see point 2.2)

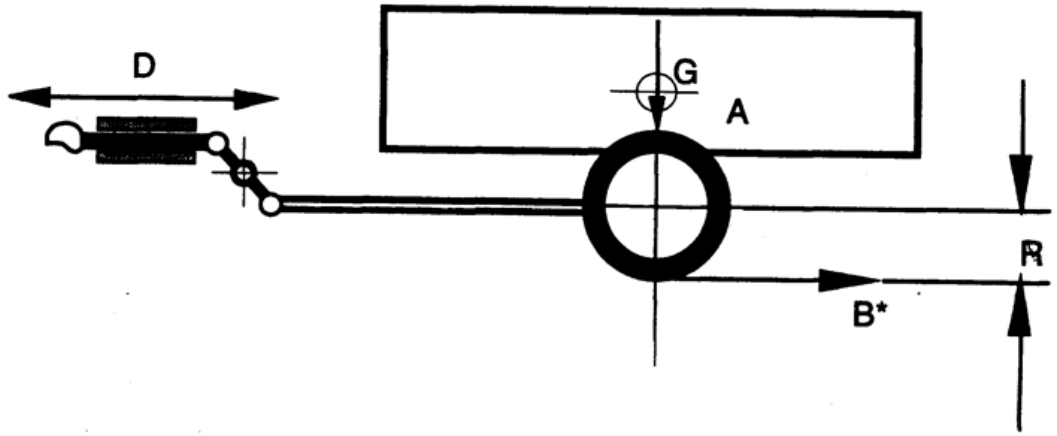
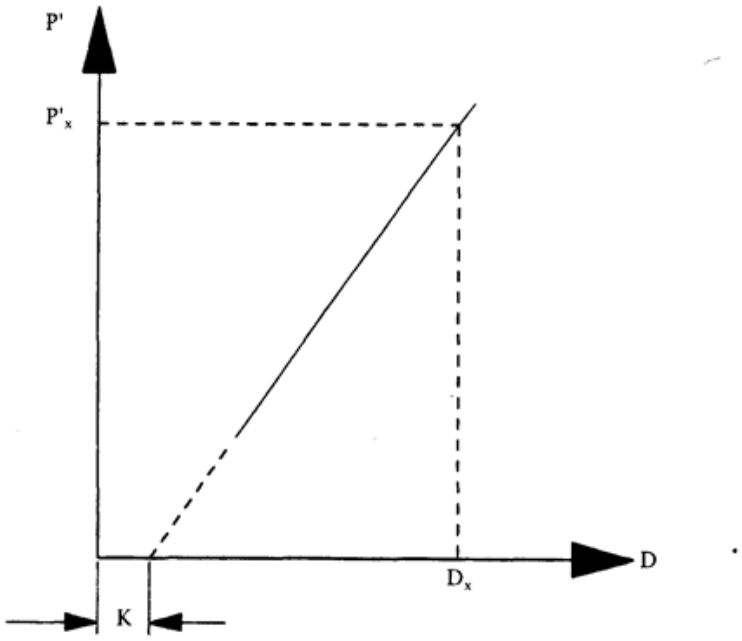
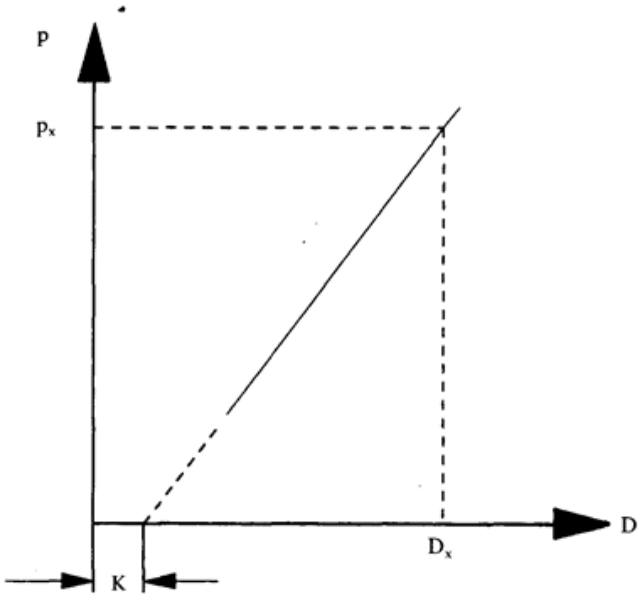



Diagram 2Mechanical transmission(see points 2.2.10 and 5.3.2)




$$\eta_{H0} = \frac{P'_x}{D_x - K} \times \frac{1}{i_{H0}}$$

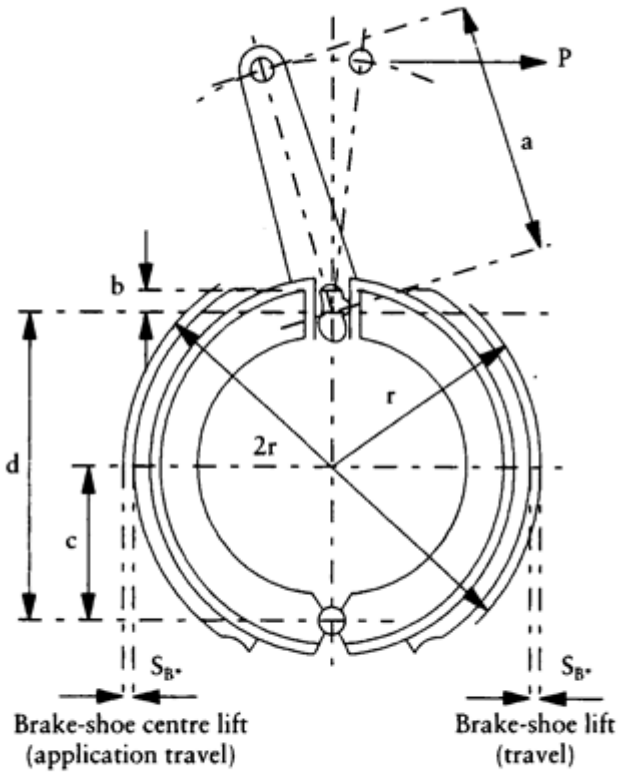
Diagram 3Hydraulic transmission(see points 2.2.10 and 5.4.2)




$$\eta_{H0} = \frac{P_x}{D_x - K} \times \frac{F_{HZ}}{i_h}$$

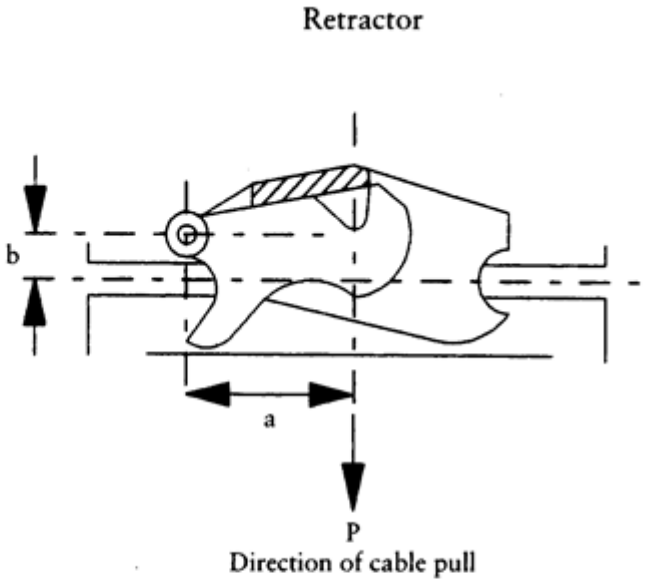
Diagram 4Brake checks(see points 2.2.22 and 2.3.4)

Connecting rod and cam




$$i_a = \frac{a}{2b} \qquad i_g = \frac{a \times d}{b \times c}$$

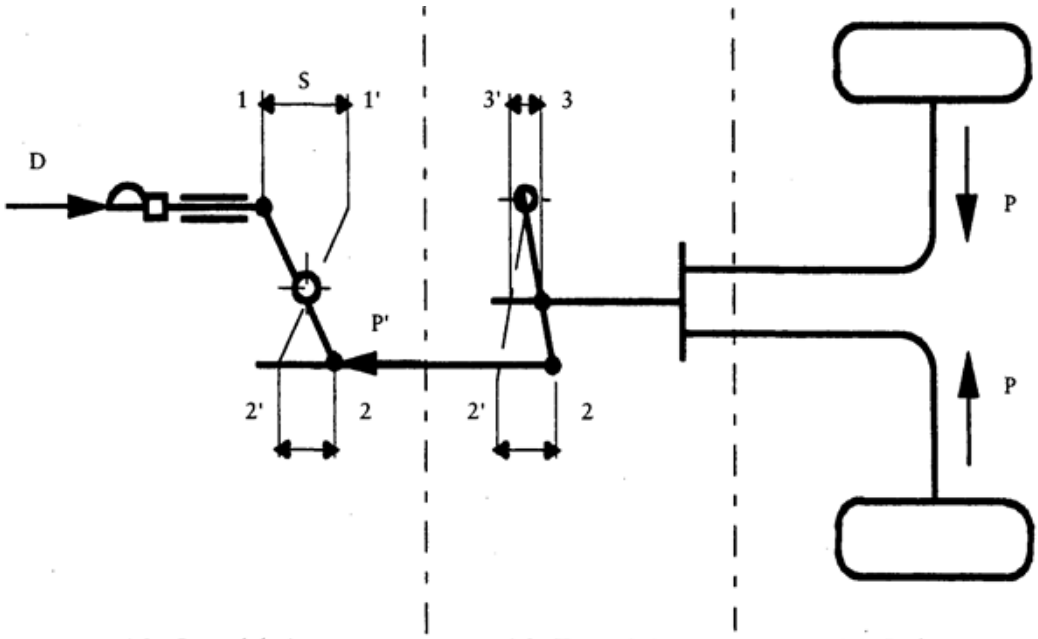
Brake-shoe centre lift: $S_B^* = 1{,}2\ \text{mm} + 0{,}2\ \% \times 2r$




Retractor:

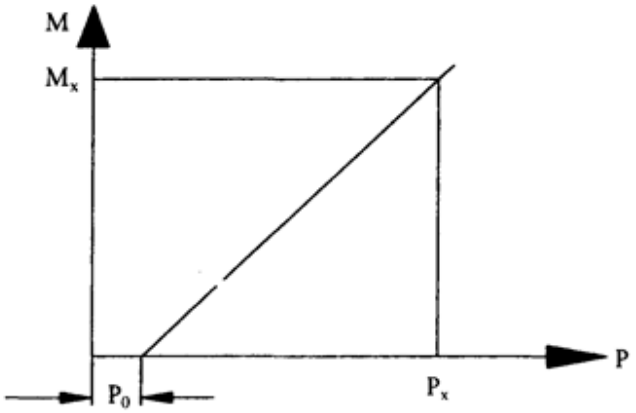
$$i_a = \frac{a}{b} \qquad i_g = \frac{a \times d}{b \times c}$$

Diagram 5Brakes with mechanical transmission(see point 2.3)



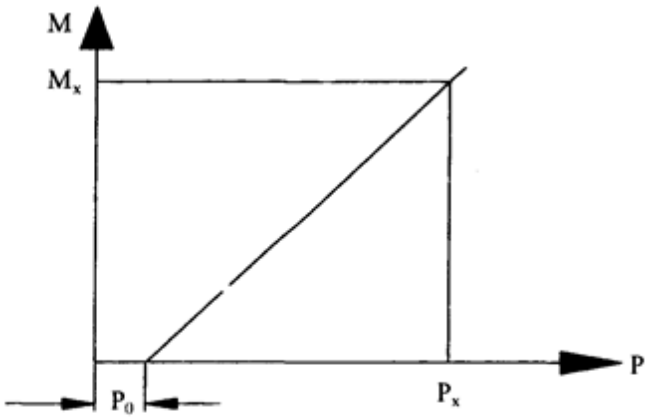

$$i_{H0} = \frac{1 - 1'}{2 - 2'} \qquad i_{H1} = \frac{2 - 2'}{3 - 3'}$$

Diagram 6Mechanical brake(see points 2.3.6 and 7.2.3.1)




$$\varrho = \frac{M_x}{P_x - P_o}$$

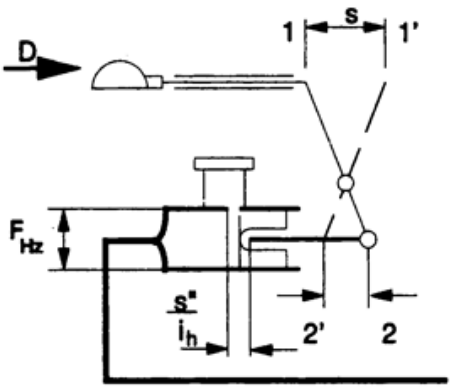
Diagram 7Hydraulic brake(see points 2.4.6 and 7.2.3.2)




$$\varrho' = \frac{M_x}{P_x - P_o}$$

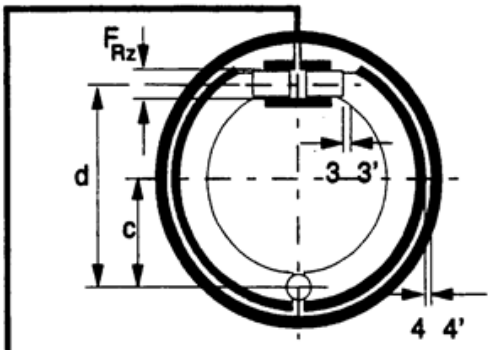
Diagram 8Hydraulic transmission braking system(see point 2.4)

1.2. Control device



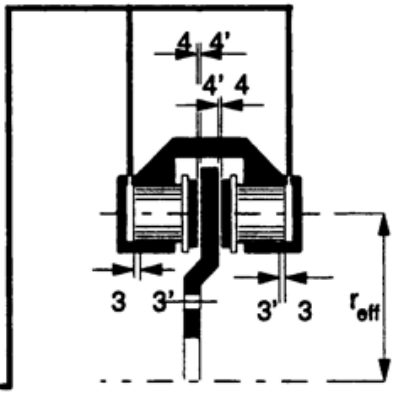

$$i_h = \frac{1 - 1'}{2 - 2'}$$

1.4. Brakes



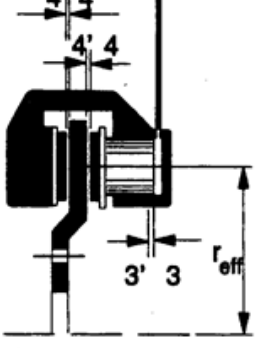

drum brake

$$i'_g = \frac{d}{c} = \frac{3 - 3'}{4 - 4'}$$




disc brake

$$i_g = \frac{r_{eff}}{r_{eff}} = \frac{3 - 3'}{4 - 4'} = 1$$




disc brake

$$i_g = \frac{r_{eff}}{r_{eff}} = \frac{3 - 3'}{2 \cdot (4 - 4')} = 1$$

# Appendix 2

## Test report on the control device

1. Manufacturer .....

2. Make .....

3. Type .....

4. Characteristics of the trailers for which the control device is intended by the manufacturer:

4.1. mass $G'_A$ = ..... kg

4.2. permissible vertical static force at the head of the towing device ..... N

4.3. trailer with rigid drawbar (1) or multi-axled trailer with pivoted drawbar (1)

5. Brief description
(List of attached plans and dimensional drawings)

6. Main diagram of the control device

7. Travel s = ..... mm

8. Reduction ratio of the control device:

8.1. in the case of a device with mechanical transmission (1)
$i_{Ho}$ = from ..... to ..... (2)

8.2. in the case of a device with hydraulic transmission (1)
$i_h$ = from ..... to ..... (2)
$F_{HZ}$ = ..... $cm^2$
travel of the master cylinder actuator ..... mm

9. Test results:

9.1. Efficiency

in the case of a device with mechanical transmission $\eta_H$ = .....

in the case of a device with hydraulic transmission $\eta_H$ = .....

9.2. complementary force K = ..... N

9.3. Maximum damping force $D_1$ = ..... N

9.4. Maximum towing force $D_2$ = ..... N

9.5. Threshold force $K_A$ = ..... N

9.6. Loss of travel and spare travel:
where the position of the towing device has an effect $s_0$ (1) = .....
in the case of a device with hydraulic transmission $s''$ (1) = .....

9.7. Effective travel of the control $s'$ = .....

9.8. An overload protector according to point 3.6 of this Annex is provided/not provided (1)

9.8.1. If the overload protector is fitted before the transmission lever of the control device

9.8.1.1. Threshold force of the overload protector
$D_A$ = ..... N

9.8.1.2. where the overload protector is mechanical (1)
maximum force $P'_{max}$ which the inertia control device can develop
$P'_{max}/i_{Ho}$ = ..... N

---

(1) Delete as appropriate.
(2) Indicate the lengths whose ratio was used to determine $i_{Ho}$ or $i_h$.

9.8.1.3. where the overload protector is hydraulic (1)
maximum hydraulic pressure which the inertia control device can develop
$p'_{max}/i_H$ = ..... N/cm²

9.8.2. If the overload protector is fitted after the transmission lever of the control device

9.8.2.1. Threshold force of the overload protector
where the overload protector is mechanical (1) $D_A\ i_{Ho}$ = ..... N,
where the overload protector is hydraulic (1) $D_A\ i_h$ = .....

9.8.2.2. Where the overload protector is mechanical (1)
maximum force $P'_{max}$ which the inertia control device can develop
$P'_{max}$ = ..... N

9.8.2.3. Where the overload protector is hydraulic (1)
maximum hydraulic pressure which the inertia control device can develop
$P'_{max}$ = ..... N/cm²

10. Technical service which carried out the tests

11. The control device described above does/does not (1) comply with the requirements of points 3, 4 and 5 of the testing conditions for vehicles fitted with inertia braking systems.

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(1) Delete as appropriate

# Appendix 3

## Test report on the brake

1. Manufacturer .....

2. Make .....

3. Type .....

4. Technically permissible maximum mass per wheel $G_{Bo}$ = ..... kg

5. Maximum braking torque $M_{max}$ = ..... Nm
(as specified by the manufacturer according to point 6.2 of this Annex)

5.1. Tested braking torque = ..... Nm
(according to points 6.2.1 and 6.2.2 repectively of this Annex)

6. Dynamic tyre rolling radius
$R_{min}$ = ..... m; $R_{max}$ = ..... m

7. Brief description
(List of plans and dimensional drawings)

8. Main diagram of the brake:

9. Test result:

| | Mechanical brake (1) | | Hydraulic brake (1) |
|---|---|---|---|
| 9.1. | Reduction ration<br>$i_g$ = ..... (2) | 9.1a. | Reduction ration<br>$i'_g$ = ..... (2) |
| 9.2. | Half shoe centre lift<br>$s_B$ = ..... mm | 9.2a. | Half shoe centre lift<br>$s_B$ = ..... mm |
| 9.3. | Half minimum shoe centre lift<br>$s^*_B$ = ..... mm | 9.3a. | Half minimum shoe centre lift<br>$s^*_B$ = ..... mm |
| 9.4. | Withdrawal force<br>$P_0$ = ..... N | 9.4a. | Withdrawal pressure<br>$p_0$ = ..... bar |
| 9.5. | Coefficient<br>$\varrho$ = ..... m | 9.4a. | Coefficient<br>$\varrho'$ = ..... m cm² |
| 9.6. | An overload protector according to point 3.6 of this Annex is/is not provided (1) | 9.6a. | An overload protector according to point 3.6 of this Annex is/is not provided (1) |
| 9.6.1. | Braking torque activating the overload protector<br>$M_A$ = ..... Nm | 9.6.1a. | Braking torque activating the overload protector<br>$M_A$ = ..... Nm |
| 9.7. | Maximum permissible force for $M_{max}$<br>$P_{max}$ = ..... N | 9.7a. | Maximum permissible pressure for $M_{max}$<br>$p_{max}$ = ..... N/cm² |
| | | 9.8a. | Surface area of wheel cylinder<br>$F_{RZ}$ = ..... cm² |
| | | 9.9a. | (for disc brakes)<br>Fluid volume absorption<br>$V_{60}$ = ..... cm² |

10. Technical Service which carried out the test

11. The above brake does/does not (1) conform to the requirements of points 3 and 6 of the testing conditions for vehicles fitted with inertia braking systems described in this Annex.
The brake may/may not (1) be used for an inertia braking system without an overload

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Signature

(1) Delete as appropriate.
(2) Indicate the lengths which have been used to determine $i_g$ or $i'_g$

## Appendix 4

## Test report on the compatibility of the control device, the transmission and the brakes**]**

1. *Control device*
described in the attached test report (see Appendix 2)

Reduction ratio selected:
$i_{Ho}$ (1) = ..... (2) or $i_h$ (1) = ..... (2)
(shall be between the limits specified in Appendix 2, point 8.1 or 8.2)

2. *Brakes*
described in the attached test report (see Appendix 3)

3. *Transmission devices on the trailer*

3.1. Brief description with main diagram

3.2. Reduction ratio and efficiency of the mechanical transmission device on the trailer

$i_{HI}$ (2) = .....

$\eta_{HI}$ = .....

4. *Trailer*

4.1. Manufacturer:

4.2. Make:

4.3. Type:

4.4. Type of drawbar connection:
single-axled trailer with rigid drawbar/multi-axled trailer with pivoted drawbar (1)

4.5. Number of brakes n = .....

4.6. Technically permissible maximum mass $G_A$ = ..... kg

4.7. Dynamic tyre rolling radius R = ..... m

4.8. Permissible force on the coupling $D^* = 0{,}10 \times g \times G_A$ = ..... N
or
$D^* = 0{,}067 \times g \times G_A$ = ..... N
Required braking force $B^* = 0{,}5 \times g \times G_A$ = ..... N
Braking force $B = 0{,}49 \times g \times G_A$ = ..... N

5. *Compatibility Test results*

5.1. Stress threshold 100 $K_A/g \times G_A$ .....
(shall be between 2 and 4)

5.2. Maximum compressive force 100 $D_1/(g \times G_A)$ .....
(shall not exceed 10 for trailers with rigid drawbar, or, 6,7 for multi-axled trailers with pivoted drawbar)

5.3. Maximum tractive force 100 $D_2/(g \times G_A)$ .....
(shall be between 10 and 50)

5.4. Technically permissible maximum mass for the inertia control device $G_A'$ ..... kg
(shall not be less than $G_A$)

---

(1) Delete as applicable.
(2) Indicate the lengths which have been used to determine $i_{ho}$, $i_h$ or $i_{HI}$.

5.5. Technically permissible maximum mass for all trailer brakes
$G_B = n \times G_{Bo}$ = ..... kg
(shall not be less than $G_A$)

5.6. Maximum braking torque of the brakes
$n \times M_{max}/(B \times R)$ = .....
(shall be equal to or greater than 1,2)

5.6.1. An overload protector within the meaning of point 3.6 of this Annex is/is not (1) fitted on the inertia control device/on the brakes (1)

5.6.1.1. Where the overload protector is mechanical on the inertia control device (1)
$n \times P_{max}/(i_{HI} \times \eta_{HI} \times P'_{max})$ = .....
(shall be equal or greater than 1,0)

5.6.1.2. where the overload protector is hydraulic on the inertia control device (1)
$P_{max}/P'_{max}$ = .....
(shall be equal or greater than 1,0)

5.6.1.3. if the overload protector is on the inertia control device:
threshold force $D_A/D^*$ = .....
(shall be equal or greater than 1,2)

5.6.1.4. if the overload protector is fitted on the brake:
threshold torque $n\ M_A/(B \times R)$ = .....
(shall be equal or greater than 1,2)

5.7. Inertia braking system with mechanical transmission (1)

5.7.1. $i_H = i_{Ho} \times i_{HI}$ = .....

5.7.2. $\eta_H = \eta_{Ho} \times \eta_{HI}$ = .....

5.7.3. $\left[\frac{B \times R}{\varrho} + n \times P_o\right] \frac{1}{(D^* - K) \times \eta_H}$ = .....

(shall not be greater than $i_H$).

5.7.4 $\frac{s'}{S_{B^*} \times i_g}$ = .....

5.8. Inertia braking system with hydraulic transmission (1)

5.8.1. $i_h/F_{HZ}$ = .....

5.8.2. $\left[\frac{B \times R}{n \times \varrho'} + P_o\right] \frac{1}{(D^* - K) \times \eta_H}$ = .....

(shall be not greater than $i_h/F_{HZ}$)

5.8.3. $\frac{s'}{2s_{B^*} \times n \times F_{RZ} \times i_g'}$ = .....

(shall be not less than $i_h/F_{HZ}$)

5.8.4. $s/i_h$ = .....

(shall be not greater than the travel of the master cylinder actuator as specified in point of Appendix 2)

6. *Technical Service which carried out the tests*

7. The inertia braking system described above does/does not(1) comply with the requirements of points 3 to 9 of the testing conditions for vehicles fitted with inertia braking systems.

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Signature

(1) Delete as appropriate.