International Standard 7642

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Road vehicles — Caravans and light trailers — Trailers of categories 01 and 02 — Inertia bench test procedures for overrun brakes

Véhicules routiers — Caravanes et remorques légères — Remorques des catégories 01 et 02 freinées par inertie — Procédures d'essai de frein sur banc à masse d'inertie

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Foreword

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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 7642 was developed by Technical Committee ISO/TC 22, *Road vehicles*, and was circulated to the member bodies in January 1982.

It has been approved by the member bodies of the following countries:

Austria	Hungary	Romania
Belgium	Italy	South Africa, Rep. of
Brazil	Japan	Spain
China	Korea, Dem. P. Rep. of	Sweden
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Egypt, Arab Rep. of	Netherlands	USA
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Germany, F.R.	Poland	

The member body of the following country expressed disapproval of the document on technical grounds:

United Kingdom

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Road vehicles — Caravans and light trailers — Trailers of categories 01 and 02 — Inertia bench test procedures for overrun brakes

0 Introduction

The test procedures specified in this International Standard are intended for use in the context of type approval testing of road vehicles with respect to braking.[1] This International Standard should therefore be used in connection with a pertinent regulation.[2]

NOTE — In order to understand fully the requirements of this International Standard and to ensure that the test procedures are correctly applied, it is recommended that the regulation is studied before application of this International Standard.

1 Scope and field of application

This International Standard specifies test procedures for type approval testing of overrun brakes on trailers.

This test procedure applies to the type approval of categories 01 and 02[2] trailers with inertia brakes by testing on an inertia dynamometer. It relates to mechanically and hydraulically operated braking systems.

2 Symbols and definitions

2.1 All brakes

N_1 is the theoretical rotational frequency calculated for tests with cold brakes in reciprocal minutes;

N'_1 is the actual rotational frequency measured during the tests with cold brakes in reciprocal minutes;

N_2 is the theoretical rotational frequency calculated for the heating of the brakes in reciprocal minutes;

N'_2 is the actual rotational frequency measured during the heating of the brakes in reciprocal minutes.

2.2 For mechanical brakes

P_0 is the force of the brake in decanewtons;

P_1 is the force applied on the brake control lever, in decanewtons, to obtain a braking torque Mt_1;

P_2 is the force applied on the brake, in decanewtons, to obtain a braking torque Mt_4 with cold brakes;

P_3 is the force applied on the brake for the strength test : $P_3 = 2P_1$ in decanewtons.

2.3 For hydraulic brakes

p_0 is the input pressure in the brake cylinder in kilopascals;

p_1 is the pressure applied in the brake cylinder, in kilopascals, to obtain a braking torque Mt_1;

p_2 is the pressure applied in the brake cylinder, in kilopascals, to obtain a braking torque Mt_4 with cold brake;

p_3 is the pressure applied in the brake cylinder for the strength test :

$p_3 = 2p_1$ in kilopascals;

T is the time in seconds.

1) Only SI units are used in this International Standard.

2) Definitions from UN/ECE Regulation No. 13 :

Category 01 : Single-axle trailers, other than semi-trailers, with a maximum weight not exceeding 0,75 t.

Category 02 : Trailers with a maximum weight not exceeding 3,5 t other than trailers of category 01.

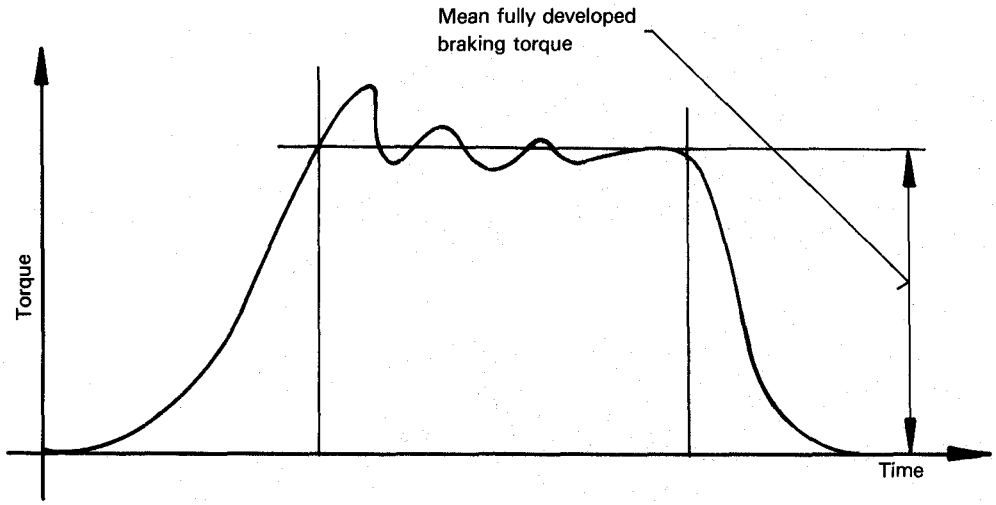

Figure 1 — Example of braking torque curve

2.4 Torque

For the purpose of this International Standard, torque is taken to mean the mean fully-developed braking torque which is established as illustrated in figure 1 above.

NOTE — Braking curves shall be recorded.

3 Test conditions

Before carrying out any test, the manufacturer must indicate :

3.1 G_{Bo} : that fraction of the permissible total weight, in decanewtons, which can be braked by one brake.

3.2 R : the static radius under load of the largest tyre recommended by the manufacturer in metres.

3.3 R' : the static radius under load of the smallest tyre recommended by the manufacturer in metres.

3.4 Mt_{max} : the maximum braking torque admitted by the manufacturer in decanewtons·metres.

4 Definitions of the test bench parameters

Using the data supplied by the manufacturer, the following will be determined for the test bench.

4.1 Moments of inertia

The moment of inertia J (in kilograms·square metres) of the rotating bodies (calculated from R and g = 9,81 m/s²) :

$$\text{Required } J = \frac{10\, G_{Bo} \times R^2}{g}$$

Actual J' : Actual moment of inertia of the inertia dynamometer limits of

$$\sqrt{\frac{J}{J'}} = 1 \pm 0{,}1$$

4.2 Rotational speed

The rotation frequency N in reciprocal minutes (calculated from R' corresponding to a linear speed of 50 km/h).

$$N_1 = \frac{50}{R'} \times 2{,}65 \sqrt{\frac{J}{J'}}$$

$$N_1' = N_1 \pm 5\ \%$$

5 Braking torques to be obtained[1)]

These braking torques shall be calculated with an allowance for rolling resistance of 1 % of G_{Bo} as follows :

a) a braking force of 44 % G_{Bo} corresponds to a braking torque of

$$Mt_1 = 0{,}44 \times G_{Bo} \times R, \text{ in decanewtons·metres;}$$

b) a braking force of 35 % G_{Bo} corresponds to a braking torque of

$$Mt_2 = 0{,}35 \times G_{Bo} \times R, \text{ in decanewtons·metres;}$$

c) a braking force of 6 % G_{Bo} corresponds to a braking torque of

$$Mt_3 = 0{,}06 \times G_{Bo} \times R, \text{ in decanewtons·metres;}$$

d) a braking force of 59 % G_{Bo} corresponds to a braking torque of

$$Mt_4 = 0{,}59 \times G_{Bo} \times R, \text{ in decanewtons·metres.}$$

1) Ref. ECE Regulation No. 13, annex 4 and annex 12.

6 Brake bedding

The manufacturer shall specify the method of bedding brakes and the temperature at which this shall be carried out. Bedding shall be carried out before any torque measurements are taken.

Bedding may be considered to be complete when at least 80 % of the total active surface of the linings are in contact with the brake drum.

7 Cold brake effectiveness[1)]

Each measurement of the cold brake effectiveness shall be carried out with an initial temperature between 50 °C and 100 °C measured on the outside surface of the drum. In order to maintain consistency of results, the starting temperature of each test should be, as near as possible, the same.

The braking torques Mt (in decanewtons per metre) shall be measured as a function of increasing input force P (in decanewtons) in the case of mechanical brakes or increasing pressure p (in kilopascals) in the case of hydraulic brakes.

At least three series of measurements shall be taken, each comprising five points over the operating range, until a minimum torque, Mt_1, as specified in clause 5, is achieved. From the results obtained, draw the interpolation (straight regressive line) (see figure 2) :

$Mt = \varrho\ (P - P_0)$, in the case of mechanical brakes or

$Mt = \varrho'\ (p - p_0)$, in the case of hydraulic brakes.

Three attempts shall be made in order to determine the force P_2 or the pressure p_2 corresponding to a braking torque Mt_4, as specified in clause 5.

NOTE

P_2 should not exceed P_3 (for example $2P_1$) for the mechanical brakes.

p_2 should not exceed p_3 (for example $2p_1$) for the hydraulic brakes.

8 Brakes fitted with stress reducers

A check shall be made that the force corresponding to the start of the functioning of the stress reducer is not less than P_2 in the case of mechanical brakes or p_2 in the case of hydraulic brakes.

A check shall be made that, under the action of a force $P_3 = 2P_1$ for the mechanical brakes or a pressure $p_3 = 2p_1$ for the hydraulic brakes, the maximum travel of the control lever is obtained (see figure 3).

9 Hot brakes effectiveness test (Type 1 test)

During this test, forced cooling is not permitted. The test shall be started at ambient temperature. The brake shall be heated using a brake torque Mt_3 as specified in clause 5, with a speed corresponding to a linear speed of 40 km/h for a distance of 1,7 km on the inertia dynamometer.

a) the torque Mt_3 as specified in clause 5;

b) the rotational speed is

$$N_2 = \frac{40}{R'} \times 2{,}65$$

$$N_2' = N_2 \pm 5\ \%;$$

c) the torque application duration is

$$T = \frac{1{,}7 \times 3\,600}{40} \left(\frac{N_2}{N_2'}\right)^2$$

Within 30 s of completing the heating process (hot brake), a force P_2 for the mechanical brakes or p_2 for the hydraulic brakes (see clause 7) shall be applied to the brake control using a rotational frequency of N_1' (as determined in 4.2).

The measured braking torque must not be less than Mt_2 and not less than 60 % of the braking torque Mt_4.

10 Cold brake loss of efficiency test

After completion of the type 1 test, a new series of measurements shall be taken (see clause 7, type 0) at five points at least.

The force P_1 should result in at least 90 % of value Mt_1.

11 Strength test

With the brake cold and using the test conditions specified in clause 7, an effort $P_3 = 2P_1$, in the case of mechanical brakes or $p_3 = 2p_1$, in the case of hydraulic brakes shall be applied. The braking torque is to be recorded.

After testing, dismantle and inspect the complete brake assembly including the drum. No visible damage or deformation is permissible.

1) See ECE Regulation No. 13, annex 12 (type 0 test — V = 50 km/h).

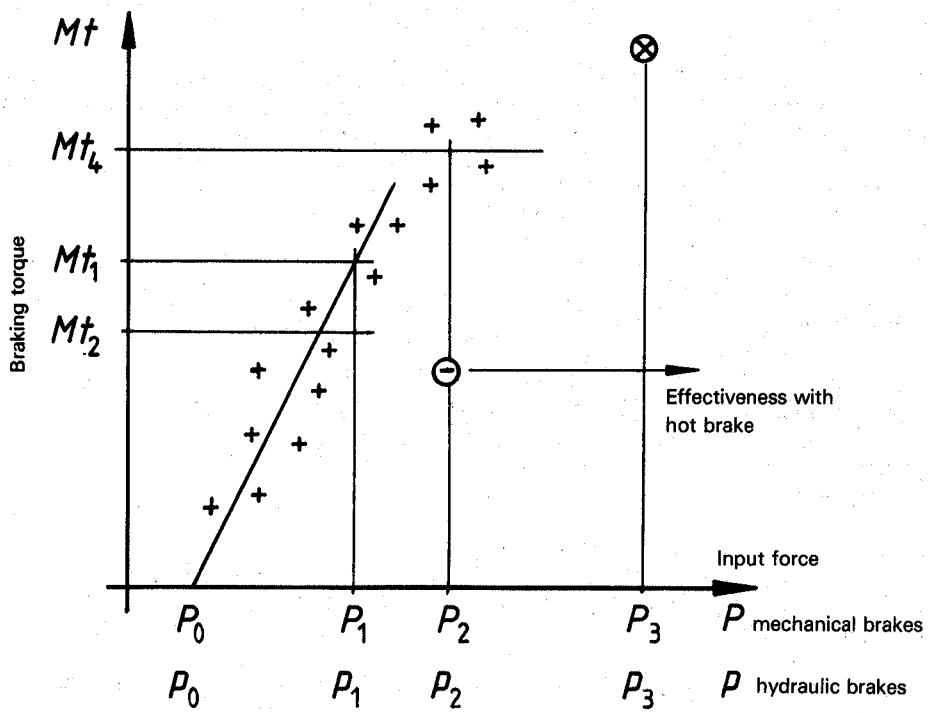

Figure 2 — Braking torques as a function of input forces

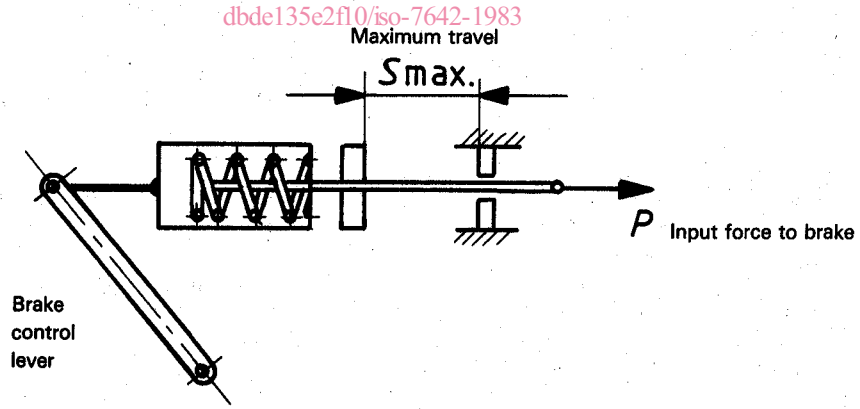

Figure 3 — Stress reducer