INTERNATIONAL STANDARD

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Caravans and light trailers — Trailers of categories O_1 and O_2 with overrun brakes — Inertia bench test methods for brakes

Caravanes et remorques légères — Remorques des catégories O_1 et O_2 à freins à inertie — Méthodes d'essai des freins sur banc à masse d'inertie

Reference number
ISO 7642:1991(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 7642 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 7642:1983), of which certain values have been altered, the previous clause 8 deleted and references updated.

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Caravans and light trailers — Trailers of categories O_1 and O_2 with overrun brakes — Inertia bench test methods for brakes

1 Scope

This International Standard specifies test methods for type approval testing of the overrun brakes on trailers. It should therefore be used in connection with the pertinent regulation.[1)]

NOTES

1 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.

2 Only SI units are used in this International Standard.

These test methods apply to the type approval of categories O_1 and O_2[1)] trailers with inertia brakes by testing on an inertia dynamometer. They relate to mechanically and hydraulically operated braking systems.

2 Symbols and definitions

2.1 For 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 newtons;

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

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

P_3 is the force applied on the brake, in newtons, for the strength test:

$$P_3 = 1{,}8P_1$$

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 brakes;

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

$$p_3 = 1{,}8p_1$$

T is the time, in seconds.

1) Definitions from UN/ECE Regulation No. 13, incorporating the 05 series of amendments:

Category O_1: Single-axle trailers, other than semi-trailers, with a maximum mass not exceeding 0,75 t.
Category O_2: Trailers with a maximum mass not exceeding 3,5 t other than trailers of category O_1.

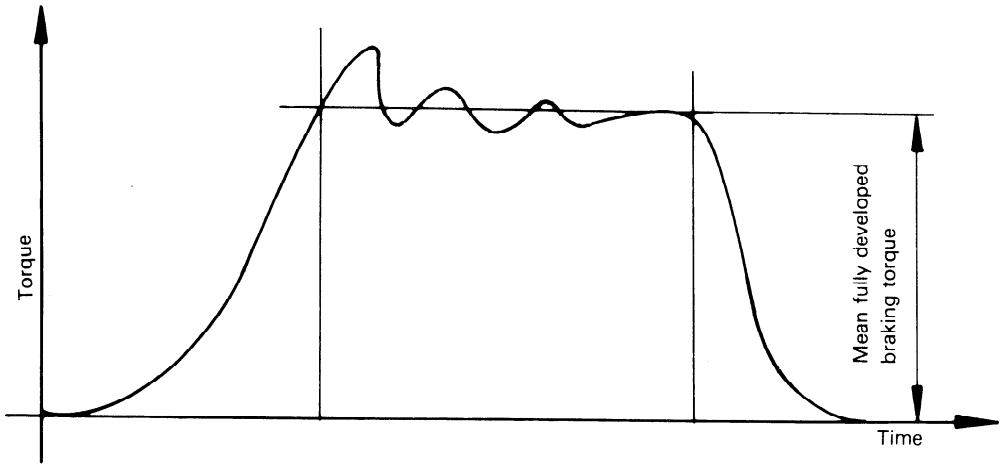

Figure 1 — Example of braking torque curve

2.4 Torque

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

Braking curves shall be recorded.

3 Test conditions

Before carrying out any test, the manufacturer shall indicate:

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

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

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

Mt_{max}: the maximum braking torque admitted by the manufacturer in newton metres.

4 Definitions of test bench parameters

Using the data supplied by the manufacturer, the factors in 4.1 and 4.2 will be determined on the test bench.

4.1 Moments of inertia

The theoretical moment of inertia, J, in kilogram square metres, of the rotating bodies (calculated from R and $g = 9{,}81$ m/s²) is calculated as follows:

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

The real moment of inertia, J', in kilogram square metres, of the inertia dynamometer limits shall be in accordance with the identity:

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

4.2 Rotational frequency

The rotational frequency, N, in reciprocal minutes, (calculated from R' corresponding to a linear speed of 60 km/h) is calculated as follows:

$$N_1 = \frac{60}{R'} \times 2{,}65 \sqrt{\frac{J}{J'}}$$

$$N'_1 = N_1 \pm 5\%$$

5 Braking torques to be obtained[2)]

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

a) a braking force of 49 % G_{Bo} corresponds to a braking torque, in newton metres, of

$$Mt_1 = 0{,}49 \times G_{Bo} \times R$$

b) a braking force of 35 % G_{Bo} corresponds to a braking torque, in newton metres, of

$$Mt_2 = 0{,}35 \times G_{Bo} \times R$$

2) See ECE Regulation No. 13, annex 4 and annex 12.

c) a braking force of 6 % G_{Bo} corresponds to a braking torque, in newton metres, of

$$Mt_3 = 0{,}06 \times G_{Bo} \times R$$

d) a braking force of 59 % G_{Bo} corresponds to a braking torque, in newton metres, of

$$Mt_4 = 0{,}59 \times G_{Bo} \times R$$

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 test[3)]

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 newton metres, shall be measured as a function of increasing input force P, in newtons, 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):

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

$Mt = \rho'(p - p_0)$, 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.

NOTES

3 P_2 should not exceed P_3 (for example $1{,}8P_1$) for mechanical brakes.

4 p_2 should not exceed p_3 (for example $1{,}8p_1$) for hydraulic brakes.

8 Hot brakes effectiveness test[4)]

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. Note the following:

a) the torque Mt_3 as specified in clause 5;

b) the rotational frequency:

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

$$N'_2 = N_2 \pm 5\%$$

c) the torque application duration:

$$T = \frac{1{,}7 \times 3600}{40} \left(\frac{N_2}{N'_2} \right)^2$$

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 shall not be less than Mt_2 and not less than 60 % of the braking torque Mt_4.

9 Cold brake loss of efficiency test

After completion of the type I 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.

10 Strength test

With the brake cold and using the test conditions specified in clause 7, an effort $P_3 = 1{,}8P_1$, in the case of mechanical brakes or $p_3 = 1{,}8p_1$, in the case of hydraulic brakes shall be applied. Record the braking torque.

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

3) See ECE Regulation No. 13, annex 4 and annex 12 (type 0 test – speed = 60 km/h).

4) See ECE Regulation No. 13, annex 4 (type I test).

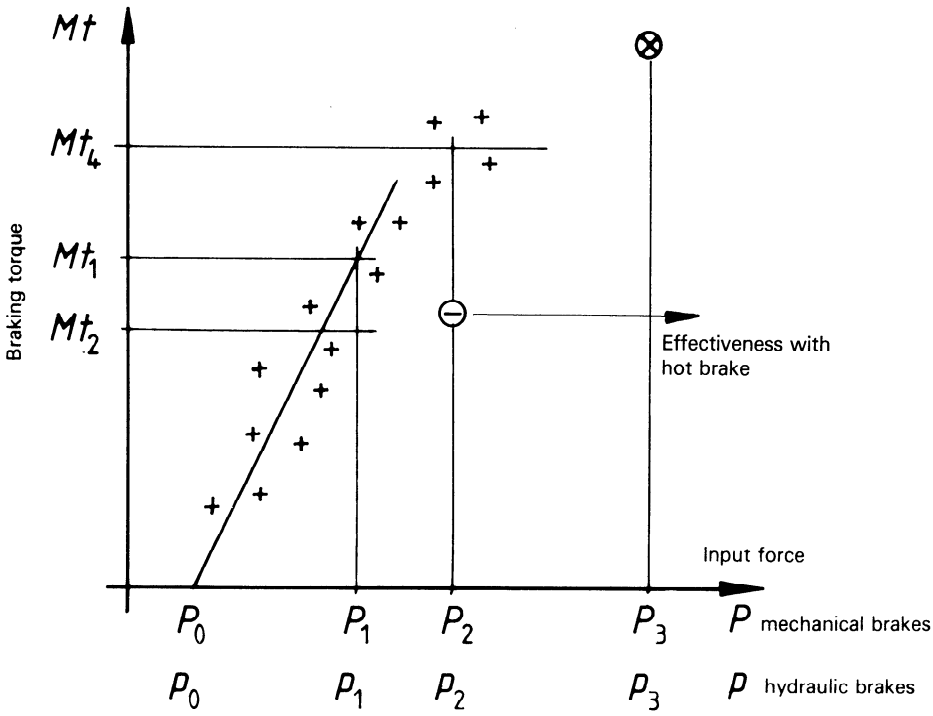

Figure 2 — Braking torques as function of input forces

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