
International Standard



5696

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Trailed agricultural vehicles — Brakes and braking devices — Laboratory test method

Véhicules agricoles remorqués — Freins et dispositifs de freinage — Méthode d'essai de laboratoire

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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. Every 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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5696 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*.

Trailed agricultural vehicles — Brakes and braking devices — Laboratory test method

1 Scope

This International Standard specifies a method of bench testing of brakes and their control devices in order to determine their suitability for use on trailed agricultural vehicles.

2 Field of application

This International Standard is applicable to assisted mechanical braking devices, using either compressed air or hydraulic fluid under pressure, for mounting on trailed agricultural vehicles.

3 References

ISO 611, *Road vehicles — Braking of automotive vehicles and their trailers — Vocabulary*.

ISO 1728, *Road vehicles — Pneumatic braking connections between motor vehicles and towed vehicles — Interchangeability*.

ISO 5669, *Agricultural trailers and trailed equipment — Braking cylinders — Specifications*.

ISO 5676, *Tractors and machinery for agriculture and forestry — Hydraulic coupling — Braking circuit*.

4 Definitions

4.1 friction brakes: See ISO 611.

4.1.1 drum brakes: See ISO 611.

The characteristic dimensions of these drum brakes are:

the internal diameter of the drum, d ;

the working width of the drum, i .

4.1.2 pivoting shoes: Shoes supported by one or two fixed pivots.

4.1.3 floating shoes: Shoes shouldered one upon the other.

4.1.4 disc brakes: See ISO 611.

The characteristic dimensions of disc brakes are:

the diameter of the disc, d ;

the length, L_1 , and width, e_1 , of the plates;

the distance from the centreline of the disc to the centre of the plates, h_1 .

4.2 automatic braking device: See ISO 611.

4.3 supplementary (braking) device on the towing vehicle for the towed (agricultural) vehicle: See ISO 611.

NOTE — If the pressure transmitted to the coupling head is used directly by the brake, the brake shall only be tested using the parameters of the control device — values of the pressure of compressed air or fluid transmitted by the brake control device

4.4 coupling head: A connecting device between the hydraulic or pneumatic installation of the towing vehicle and the trailed vehicle.

4.5 wheel: For the purpose of this International Standard, "wheel" is taken to mean the rim and tyre assembly.

4.6 braking torque: See ISO 611.

4.7 cam torque; control torque: Torque applied to the drive shaft of a single brake of the axle.

NOTE — The maximum cam torque which the brake can withstand, indicated by the manufacturer, has the symbol $C_{\max}$. If the brake has a control with linear travel, the term is replaced by **control force**, F_c .

$F_{c, \max}$ is the symbol for maximum control force

4.8 moderability curve (see figure 1): Curve representing the braking torque of a wheel as a function of the cam torque or control force.

4.9 mean gradient of braking force as a function of cam torque, G (see figure 1): Braking torque obtained by the brake, relative to the maximum cam torque (or control force) corresponding to zero braking torque. The gradient is expressed without unit or in newton metres per newton.

4.10 mean gradient of cylinder force as a function of pressure, J (see figure 2): Force of the cylinder at maximum pressure relative to maximum pressure minus the corresponding pressure at zero force. This gradient is expressed in newtons per kilopascal.

4.11 maximum deviation related to brake linearity, E (see figure 1): Ratio of the maximum difference between the actual moderability curve and the straight line which it subtends at the maximum braking force.

4.12 maximum deviation related to linearity of the braking device, e (see figure 2): Ratio of the maximum difference between the actual moderability curve and the straight line which it subtends at the maximum force produced by the cylinder

5 Tests

Brakes and braking devices shall be the objects of separate tests.

5.1 Brake tests

5.1.1 Sample

The tests shall be carried out on one of the brakes of the axle presented. The brake shall be tested in the condition in which it is supplied by the manufacturer; moreover, no adjustment shall be made during testing.

The manufacturer shall indicate:

- the radius under load, R_1 , in metres, of the largest wheels which can be fitted to the axle;
- the radius under load, R_2 , in metres, of the smallest wheels which can be fitted to the axle;
- the maximum braking mass, m , in kilograms, of the brake under test.

5.1.2 Test bench

5.1.2.1 Description

On the test bench, the maximum brakable load specified by the manufacturer is represented by a rotating inertia flywheel. There is no ventilation system allowing the brake under testing to be cooled.

The test bench shall enable the measurement of:

- the cam torque, expressed in newton metres, or the control force, in newtons;
- the braking torque, in newton metres;
- speed of rotation, in radians per second, of the brake;
- angle of rotation, in radians, of the drive shaft for brakes with rotating control, or the travel, in metres, of the control for brakes with linear control;
- external temperature, in degrees Celsius, of the drum or disc.

5.1.2.2 Adjustments

The moment of inertia, I , of the flywheel shall be between

$$I_1 = 0,9 m \left(\frac{R_1 + R_2}{2} \right)^2$$

and

$$I_2 = 1,1 m \left(\frac{R_1 + R_2}{2} \right)^2$$

where

m is the maximum braking mass, in kilograms, of the brake under test;

R_1 and R_2 are the radii under load, in metres, of the largest and smallest wheels, respectively, which can be fitted to the axle.

The speed of rotation, ω , in radians per second, at the start of braking is given by the equation

$$\omega = \frac{14}{(R_1 + R_2)}$$

5.1.3 Service cam torque tests (or tests on service control forces)

5.1.3.1 Hydraulic control

If

p_h is the normal service pressure, in kilopascals, measured at the coupling head of the hydraulic control;

P_h is the maximum permissible pressure, in kilopascals;

$C_{\max}$ is the maximum cam torque indicated by the brake manufacturer;

then the service cam torque, C_h , is given by the equation

$$C_h = \frac{p_h}{P_h} \times C_{\max}$$

5.1.3.2 Pneumatic control

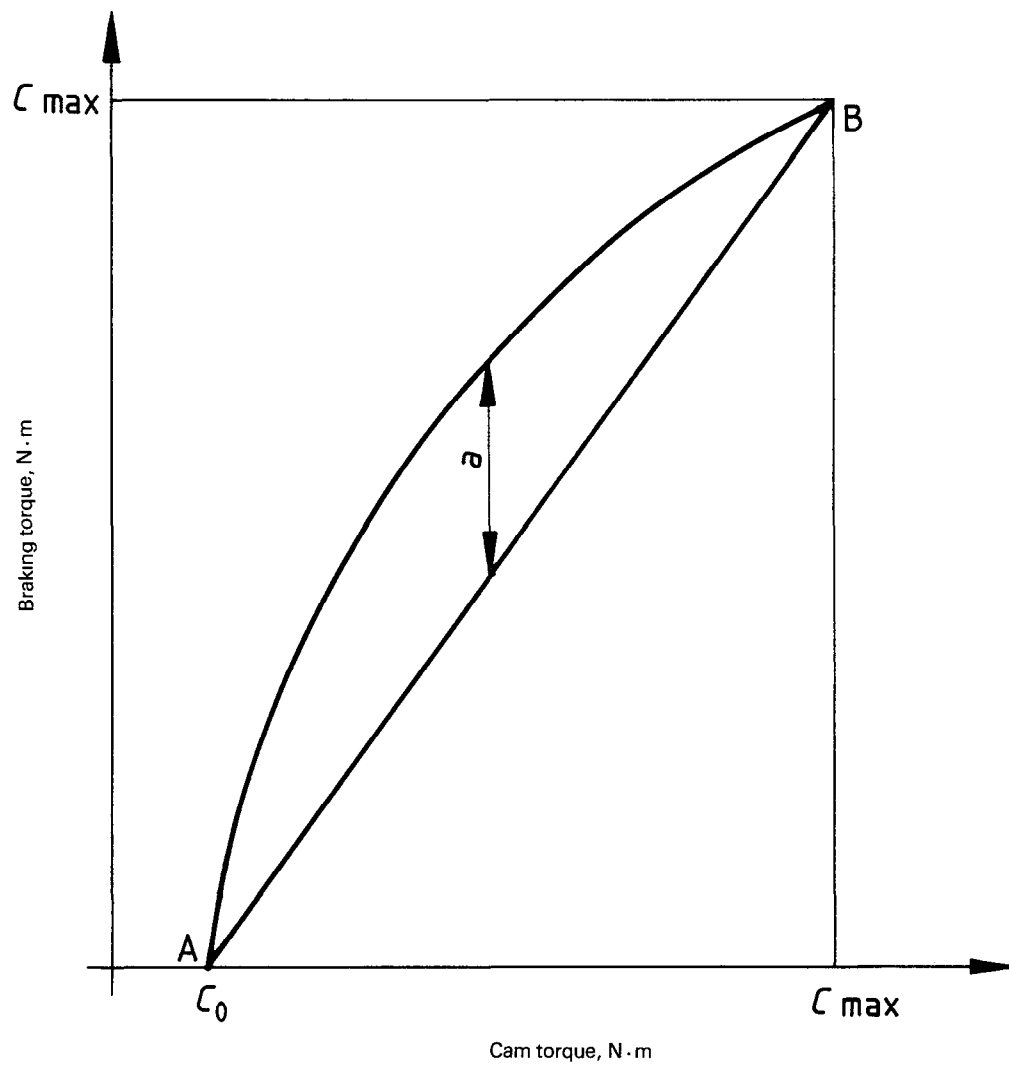
If

p_a is the normal service pressure, in kilopascals, measured at the coupling head of the pneumatic control;

P_a is the maximum permissible pressure, in kilopascals;

then the service cam torque is given by the equation

$$C_a = \frac{p_a}{P_a} \times C_{\max}$$



Maximum deviation from linearity, $E = a/C_{\max}$.

The mean gradient of braking torque as a function of cam torque is the slope of the straight line AB.

Figure 1 — Moderability curve: braking torque as a function of cam torque