INTERNATIONAL STANDARD

ISO 12357

First edition
1999-12-15

Commercial road vehicles — Drawbar couplings and eyes for rigid drawbars — Strength tests

Véhicules routiers utilitaires — Barres d'attelage et anneaux pour barres d'attelage rigides — Essais de résistance

Reference number
ISO 12357:1999(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 12357 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 15, *Interchangeability of components of commercial vehicles and buses*.

Commercial road vehicles — Drawbar couplings and eyes for rigid drawbars — Strength tests

1 Scope

This International Standard specifies the test conditions and strength requirements to be met by drawbar couplings (see ISO 3584) and the corresponding drawbar eyes (see ISO 1102 and ISO 8755) for rigid drawbars, which are provided for use with centre-axle trailers with a technical maximum mass C exceeding 3,5 t (tonnes).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1102, *Commercial road vehicles — Mechanical connections between towing vehicles and trailers — 50 mm drawbar couplings*.

ISO 1176, *Road vehicles — Masses — Vocabulary and codes*.

ISO 3584, *Road vehicles — Mounting of mechanical coupling devices on rear cross members of trucks*.

ISO 8755, *Commercial road vehicles — Mechanical connections between towing vehicles and trailers — 40 mm drawbar coupling*.

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
S-value
mass imposed vertically on the coupling under static conditions by the centre-axle trailer loaded to its maximum design total mass

3.2
centre-axle trailer
towed vehicle equipped with a towing device which cannot move vertically (in relation to the trailer), and in which the axle(s) is(are) positioned close to the centre of gravity of the vehicle (when uniformly loaded) such that only a small static vertical load, not exceeding 10 % of the load corresponding to the maximum design total mass of the trailer or load of 10 kN (whichever is the smaller), is transmitted to the drawing vehicle

4 General test requirements

4.1 The test shall be carried out with drawbar couplings and drawbar eyes having corresponding functional dimensions.

4.2 The strength tests described in this International Standard are static and dynamic tests to be performed on a test bed.

4.3 The fixing arrangements for the drawbar coupling and the drawbar eye on the test bed shall be the same as for its attachment to the vehicle, and shall be in accordance with the manufacturer's fitting instructions.

4.4 Drawbar couplings and drawbar eyes can be tested separately or together.

4.5 Preferably, couplings should be tested in the original condition as designed for road use. At the discretion of the manufacturer and in agreement with the test laboratory, flexible components may be neutralized if this is necessary for the test procedure and if there is no concern about unrealistic influence on the test result.

4.6 Flexible components which appear to be overstressed due to this accelerated test procedure may be replaced during the dynamic test.

4.7 The test loads may be applied by means of special slack-free devices.

5 Determination of D_c- and V-values

5.1 The D_c-value is a comparative value determined by calculation of the longitudinal forces occurring between the towing vehicle and the trailer. It is expressed in kilonewtons, and calculated from the following equation:

$$D_c = g \cdot \frac{T \cdot C}{T + C}$$

where

T is the maximum design total mass, in tonnes, of the towing vehicle, including S (see 3.1), to which the drawbar coupling is to be attached;

C is the mass, in tonnes, transmitted to the ground by the axle or axles of the centre-axle trailer loaded to its maximum design total mass;

g is the acceleration due to gravity:

g = 9,81 m/s^2

Terminology for the different masses shall be in accordance with the definitions in ISO 1176.

5.2 The V-value is a comparative value determined by calculation of the vertical forces occurring between the towing vehicle and the trailer. It is expressed in kilonewtons, and calculated from the following equation:

$$V = a \cdot \frac{x^2}{L^2} \cdot C$$

where

a is an equivalent vertical acceleration in the coupling point, depending on the type of suspension on the rear axle(s) of the towing vehicle, including a constant factor:

a = 1,8 m/s^2 for vehicles with air suspension (or systems with equivalent damping characteristics),

a = 2,4 m/s^2 for vehicles with other types of suspension systems;

C is the mass, in tonnes, transmitted to the ground by the axle or axles of the centre-axle trailer loaded to its maximum design total mass;

x is the length, in metres, of the loading area of the trailer, see Figure 3;

L is the theoretical drawbar length, in metres, i.e. the distance between the centre of the drawbar eye and the centre of the axle assembly, see Figure 3:

$$\frac{x^2}{L^2} \geqslant 1$$

if this is less than 1, the value 1 shall be used.

Terminology for the different masses shall be in accordance with the definitions in ISO 1176.

6 Dynamic test

6.1 The dynamic test loads given in Table 1, simulating practical loads under driving conditions, shall be applied to the coupling point.

Table 1 — Dynamic test loads

Test load	Mean value kN	Amplitude kN
Horizontal load, $F_{h,t}$	0	$\pm 0{,}6D_c$
Vertical load, $F_{v,t}$	$gS/1000$	$\pm 0{,}6V$
where D_c is determined according to 5.1; V is determined according to 5.2; S is defined in 3.1.		

6.2 The dynamic test force is the geometrical sum of the vertical and horizontal component as specified in Table 1. This can be achieved by the test bed configuration shown in Figure 1. The vertical and the horizontal components shall have a sinusoidal shape (see Figure 2) and shall be applied asynchronously, where the difference between their frequencies shall be between 1 % and 3 %, so that resulting test forces in all directions are created.

6.3 For steel materials, the dynamic test shall be carried out for 2×10^6 cycles. For other materials, the number of cycles should be agreed between the manufacturer and the test laboratory.

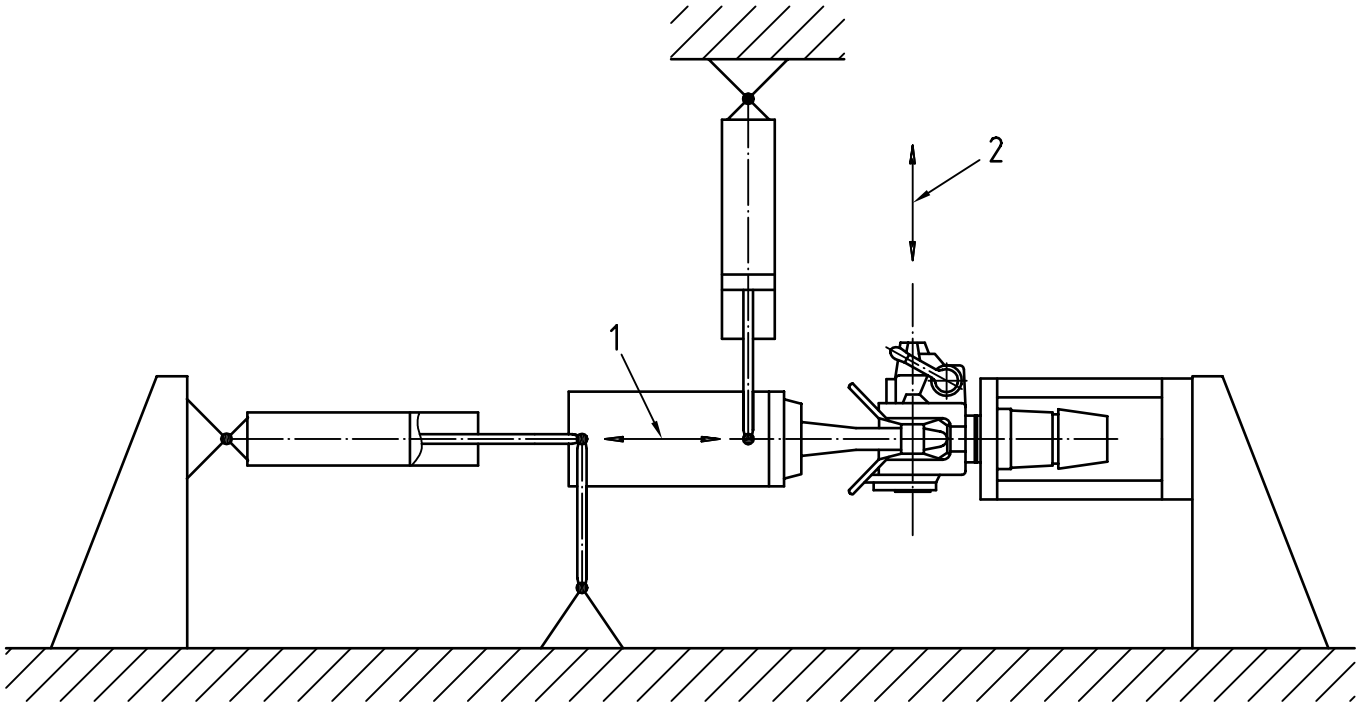
6.4 The selected frequency shall not exceed 25 Hz, and shall not coincide with the natural frequency of the system.

7 Static test

With drawbar couplings it is also necessary to test the closure and any locking devices by means of a static force $0{,}25D_c$ acting in the direction of opening.

8 Strength criteria

The dynamic tests shall not cause permament deformation, fractures or cracks. The static test shall not cause the closure to open and it shall not cause any damage.

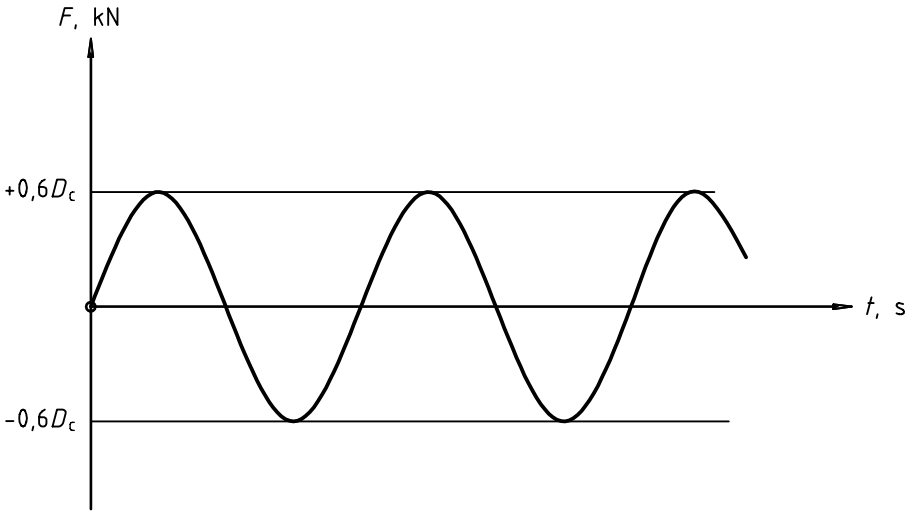


Key

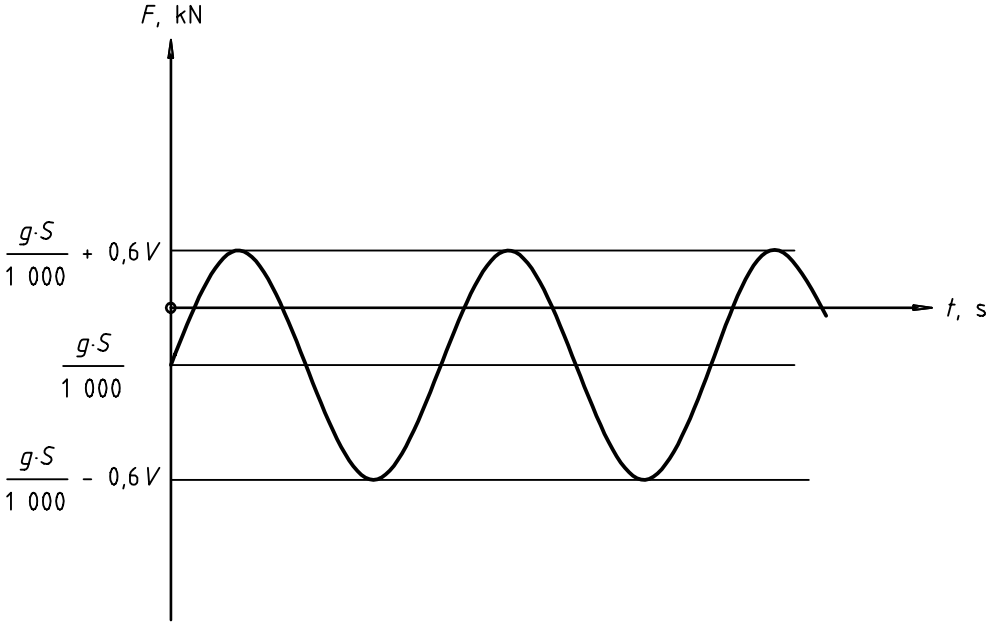
1 Horizontal test load

2 Vertical test load

Figure 1 — Example of test bed configuration



a) Horizontal load



b) Vertical load

Figure 2 — Dynamic test loads

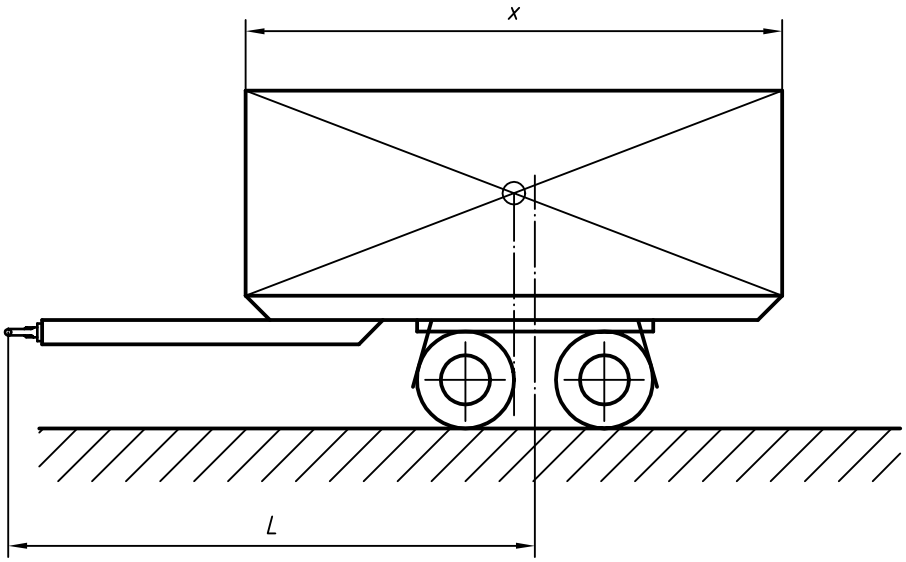


Figure 3 — Dimensions of centre-axle trailer

ICS 43.040.70

Price based on 6 pages