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**Commercial road vehicles — Mechanical coupling between towing vehicles, with coupling mounted forward and below, and centre-axle trailers — Interchangeability**

*Véhicules routiers utilitaires — Accouplement mécanique entre véhicules tracteurs à dispositif d'attelage avancé et surbaissé et remorques à essieux centraux — Interchangeabilité*

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Published in Switzerland

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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. 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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11407 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 15, *Interchangeability of components of commercial vehicles and buses*.

This second edition cancels and replaces the first edition (ISO 11407:1993), which has been technically revised.

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## Introduction

In many countries, the total length of road trains is limited by law. In view of the increasing demand for large-volume transports, vehicle manufacturers have developed solutions for optimizing the loading space of road trains within the legal specification. Centre-axle trailers are a well-proven means of reducing the necessary free space between towing vehicles and trailer, thereby increasing loading space while keeping within legal limitations.

New demands, wider usage and further development of the concept have led to further changes. To increase the volume even more, lower vehicle chassis have been developed. There is also a growing demand for extra equipment in the overhang, such as retractable tail lift and additional drawbar coupling fitted in the end of the chassis frame.

In order to prevent interference between the drawbar and this extra equipment, specifically on low chassis, it has become necessary to introduce a new, "low" class of drawbar profile.

A new category of road train (25,25 m) has been introduced in Finland and Sweden, the intention being that it will be possible to couple vehicles conforming with this International Standard to combinations of more than one trailer. Consequently, this edition of ISO 11407 is applicable to drawbar and drawbar coupling positions on those road trains, as well.

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# Commercial road vehicles — Mechanical coupling between towing vehicles, with coupling mounted forward and below, and centre-axle trailers — Interchangeability

## 1 Scope

This International Standard specifies the interchangeability requirements of the various elements and dimensions for the mechanical coupling of towing vehicles whose coupling is mounted forward and below to centre-axle trailers. It is applicable to road trains for the commercial transport of low-density, high-volume cargo of the greatest possible variety. It is also applicable to corresponding equipment in cases where the same vehicle makes up part of a road train having more than one trailer. It is not applicable to dedicated or special combinations such as coupling systems with an extensible drawbar; nor does it specify limitations on maximum gross mass and overall dimensions, which are generally laid down by legislative requirements. Vehicle combinations whose couplings form the subject of this International Standard (see Annex B for examples) are not interchangeable with those whose couplings are rear-mounted (see ISO 11406).

## 2 Interchangeability dimensions

### 2.1 Distance between drawbar coupling axis and rear end of towing vehicle

The distance,  $A$ , between the drawbar coupling axis and the rear end of the towing vehicle (see Figures 1 and 2) shall be in accordance with Table 1. Since dimension  $A$  always exceeds 420 mm, a device that enables coupling actuation at a maximum distance of 420 mm from the outer border of the body shall be used.

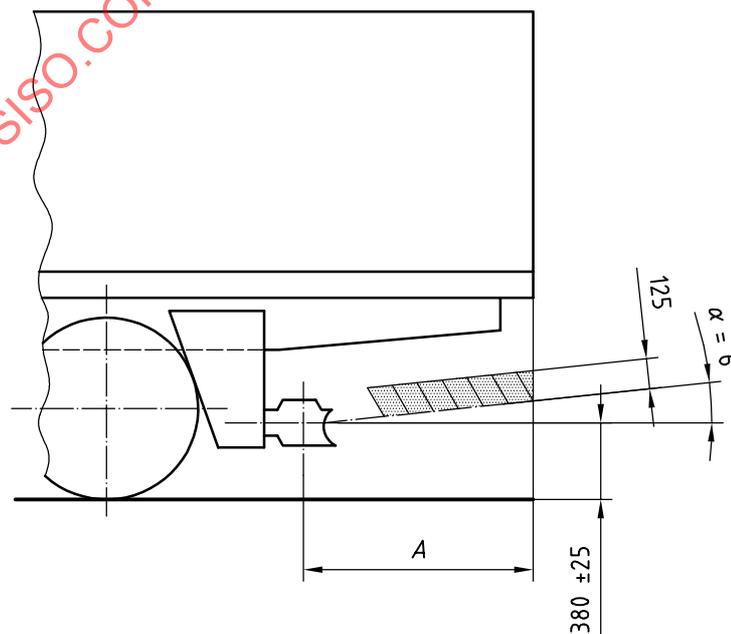


Figure 1 — High class — Rear end of towing vehicle

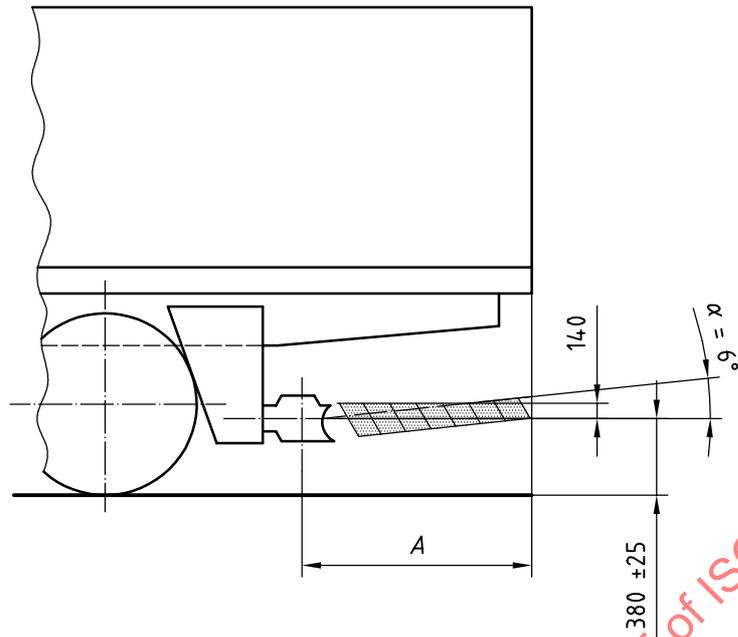


Figure 2 — Low class — Rear end of towing vehicle with tail lift or other extra equipment added

Table 1 — Distance, *A*, between drawbar coupling axis and rear end of towing vehicle

Class designation, low/high	Dimensions in millimetres	
	<i>A</i>	
	0	-100
1 400	1 400	
1 600	1 600	
1 900	1 900	

## 2.2 Turning front of trailer

The turning front of the trailer, *C* (see Figure 3), is the distance between the drawbar coupling axis and the front of the trailer.

The minimum value of *C* in a vehicle combination, expressed in millimetres, is determined by the equation:

$$C_{\min} = \sqrt{\left(\frac{W}{2}\right)^2 + A^2} + S$$

where

*W* is the towing vehicle width, expressed in millimetres;

*A* is the distance, expressed in millimetres, between the drawbar coupling axis and the rear end of the towing vehicle;

*S* is the minimum clearance, expressed in millimetres, between the turning circles of the towing vehicle and the trailer.

Based on practical experience,  $S$  shall not be less than 250 mm (corresponding to an angle of inclination,  $\alpha$ , of  $4^\circ$  at an articulation angle,  $\beta$ , of approx.  $40^\circ$ ). This ensures that no contact is possible between the towing vehicle and the front of the trailer under normal, even ground conditions of operation and turning.

NOTE 1  $S = 365$  mm gives  $\alpha = 6^\circ$  at all available articulation angles  $\beta$ .

Calculation examples for  $C_{\min}$  are given in Annex A.

NOTE 2 A smaller dimension  $C$ , if required by the client, does not exclude the risk of contact and damage to the bodies of towing vehicle and trailer, depending on the angle of articulation and the height of the vehicles. In this case, such a combination is considered a dedicated combination and is not covered by this International Standard.

## 2.3 Height of couplings

The height of the drawbar coupling on the laden towing vehicle shall be as shown in Figures 1 and 2. The height of the towing eye on the laden centre-axle trailer shall be as shown in Figures 4 and 5.

## 2.4 Drawbar contour

Drawbar dimensions shall be in accordance with Figures 4 and 5.

NOTE For drawbar-eye dimensions, see ISO 1102. However, centre-axle trailers could require a reinforced drawbar eye with dimensions larger than those specified in ISO 1102.

## 2.5 Rear end of towing vehicle

The rear end of the towing vehicle shall be in accordance with the high-class configuration (see Figure 1), except when tail lifts or other extra equipment are fitted, when it shall be in accordance with the low-class configuration (see Figure 2).

## 2.6 Angles of inclination and articulation

The towing vehicle shall be so constructed that the towing vehicle and trailer components, except for those concerned with articulation, shall not make contact with each other when the angle of inclination of the centre-axle trailer relative to the towing vehicle is  $\leq 6^\circ$ . See Figures 1 and 2.

Under manoeuvring conditions, an articulation angle  $\beta$  (see Figure 3) of  $90^\circ$  shall be allowed for. The angle of inclination  $\alpha$  shall be able to vary from  $0^\circ$  to  $6^\circ$ .

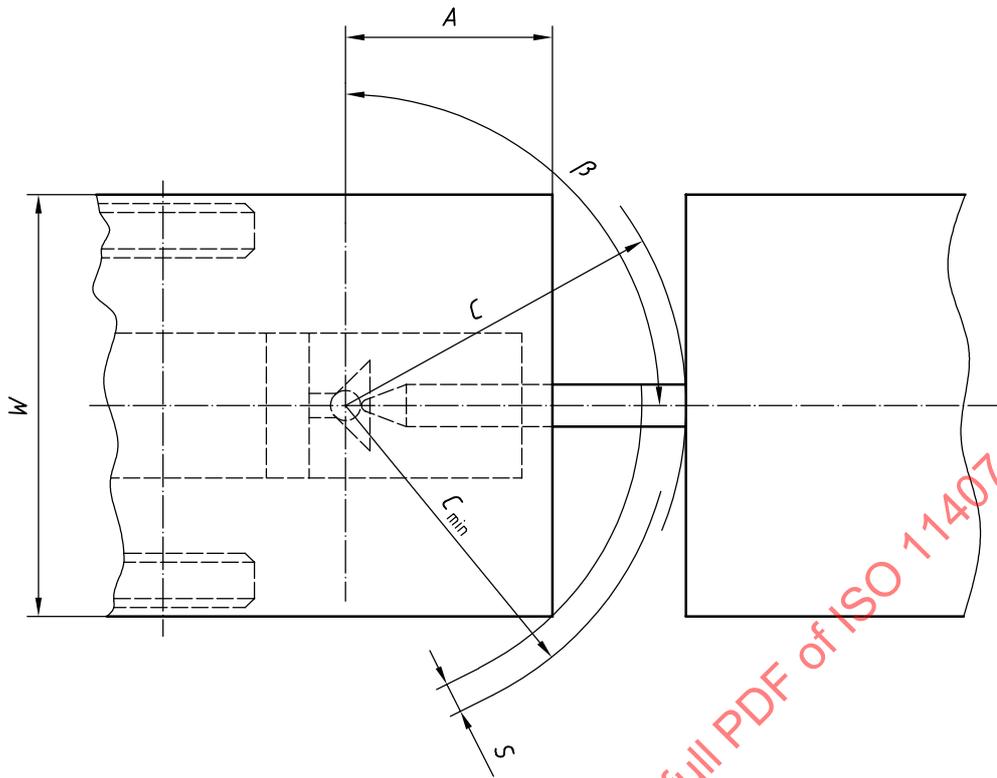


Figure 3 — Turning front of trailer

Dimensions in millimetres

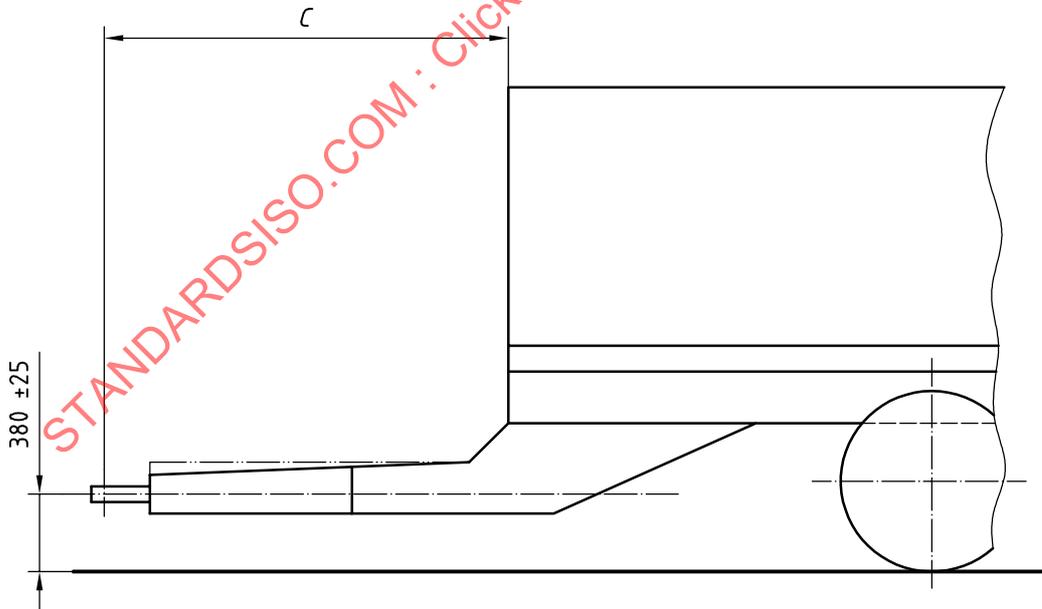
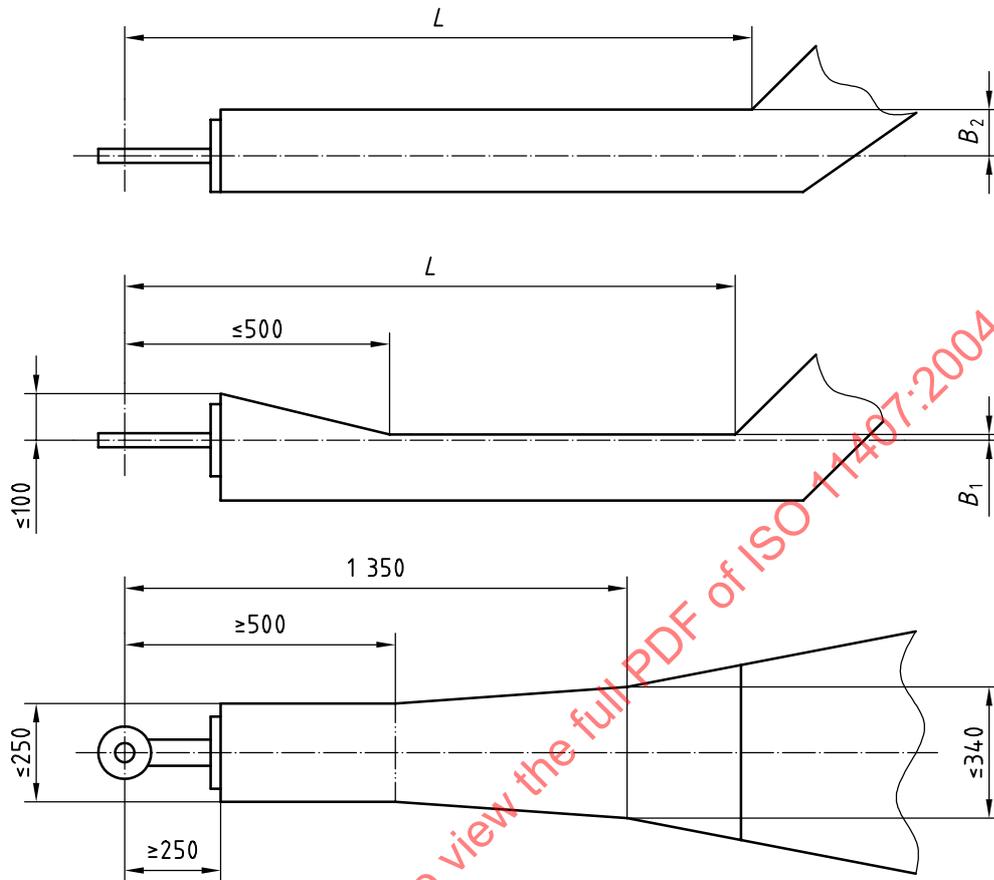


Figure 4 — Front end of centre-axle trailer

Dimensions in millimetres



<i>A</i>	Class		<i>L</i> min.
	High	Low	
1 400	<i>B</i> <sub>2</sub> max.	<i>B</i> <sub>1</sub> max.	1 950
1 600	125	0	2 100
1 900	125	0	2 350

Figure 5 — Drawbar dimensions

### 3 Possible combinations and marking

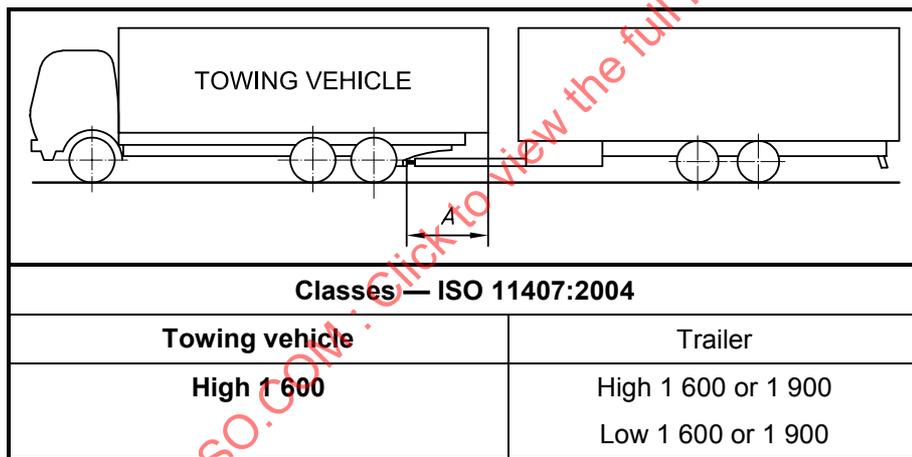
Possible combinations of towing vehicles and trailers are shown in Table 2.

Table 2 — Combinations of towing vehicles and trailers

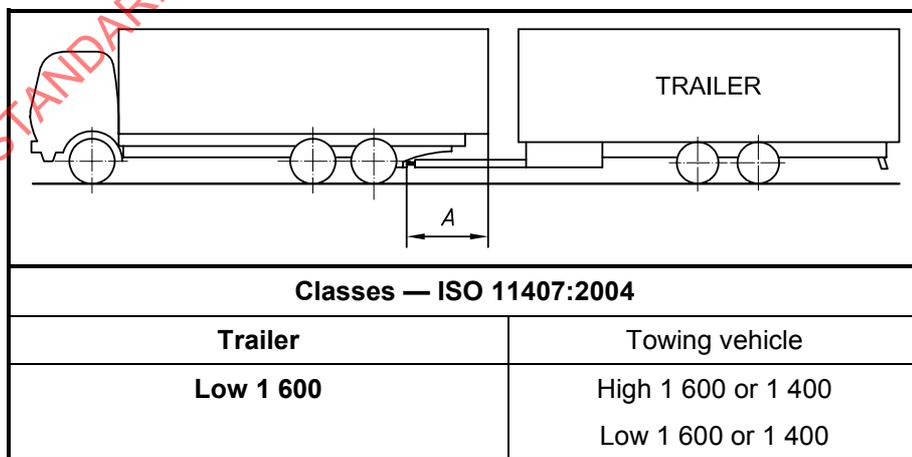
		Towing vehicle						
		Low class			High class			
		1 400	1 600	1 900	1 400	1 600	1 900	
Trailer	High class	1 400	—	—	—	a	—	—
		1 600	—	—	—	b	a	—
		1 900	—	—	—	b	b	a
	Low class	1 400	a	—	—	a	—	—
		1 600	b	a	—	b	a	—
		1 900	b	b	a	b	b	a

<sup>a</sup> Preferred combination.  
<sup>b</sup> May be used if permitted by legal requirements.

So as to ensure easy recognition of the important (but variable) parameter dimension *A*, towing vehicles and trailers should be marked with a plate measuring 150 mm × 150 mm min., affixed permanently at the rear end of the towing vehicle and at the front of the trailer. Examples of such markings are shown in Figure 6.



a) Towing vehicle



b) Trailer

Figure 6 — Marking plate — Examples