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**Industrial trucks — Specifications and  
test methods for operator restraint  
systems —**

**Part 1:  
Lap-type seat belts**

*Chariots de manutention — Spécifications et méthodes d'essai pour les  
systèmes de retenue de l'opérateur —  
Partie 1: Ceintures de sécurité ventrales*

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Published in Switzerland

## Foreword

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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 24135 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

ISO 24135 consists of the following parts, under the general title *Industrial trucks — Specifications and test methods for operator restraint systems*:

— *Part 1: Lap-type seat belts*

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# Industrial trucks — Specifications and test methods for operator restraint systems —

## Part 1: Lap-type seat belts

### 1 Scope

This part of ISO 24135 specifies requirements and test methods for operator lap-type seat belt assemblies and their associated mounting structure on industrial trucks.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

SAE J386, *Operator Restraint System for Off-Road Work Machines*

E/ECE/324/TRANS 505 Add.15/Rev.5:2005, *Addendum 15: Regulation Number 16, Revision 5*, Uniform provisions concerning the approval of I. Safety-belts, restraint systems, child restraint systems and ISOFIX child restraint systems for occupants of power-driven vehicles II. Vehicles equipped with safety-belts, restraint systems, child restraint systems and ISOFIX child restraint systems

### 3 Terms and definitions

For the purposes of this document the following terms and definitions apply.

#### 3.1

##### **seat belt assembly**

belt including a fastener (e.g. a buckle), length adjuster, retractor (if fitted) and means for securing to an anchorage, that fastens across the pelvic area of the operator to provide pelvic restraint during operation and tip over conditions

#### 3.2

##### **tip over**

tipping of a truck by approximately a quarter of a turn (90°) either laterally or longitudinally, further rotation being prevented by a mast structure

#### 3.3

##### **mounting structure**

components that transfer the force applied to a seat belt from the seat belt anchorage to the truck structure

#### 3.4

##### **body block**

test device used to apply a test load to a seat belt assembly and mounting structure

#### 3.5

##### **mass of seat**

mass of all applicable seat components, including the seat assembly, adjuster rails and suspension

## 4 Requirements

### 4.1 Seat belt assembly

The seat belt assembly components shall be in accordance with either

- SAE J386, or
- E/ECE/324 Regulation 16, Revision 5:2005, Clause 6, but excluding 6.4.

### 4.2 Belt material

The belt material shall be resistant to mild acids, alkalis, mildew, ageing, moisture and sunlight and equal to or better than untreated polyester yarn.

### 4.3 Belt construction

The strap shall not be less than 46 mm wide, measured with no load applied.

### 4.4 Performance

On completion of the tests, according to Clause 5:

- a) there shall be no failure allowing release of the seat belt or structural failure of any part of the mounting structure, however, permanent deformation of the mounting structure is acceptable;
- b) there shall be no tearing, ripping or other damage to the belt;
- c) it shall be possible to release the operator restraint system, i.e. by unfastening the buckle.

Where a retractable seat belt mechanism is fitted, the locking function of the retractor device shall not depend solely on the speed or acceleration of the belt from the retractor, but shall activate at the lateral tilt angle of the truck designed by the manufacturer. This angle shall be no greater than 30°. During the tests specified in Clause 5, there shall be no unintentional release of the fastener or retractor locking device (if fitted).

## 5 Test methods

### 5.1 General

These are type tests and shall be carried out on an operator restraint system and its mounting structure fitted to a truck of the type for which they have been designed.

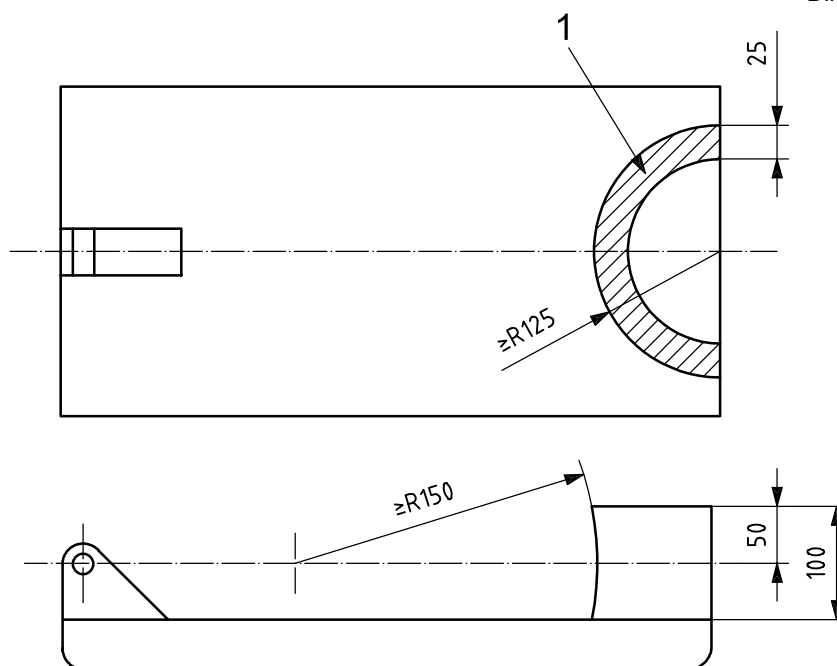
The lap-type seat belt assembly test shall test the belt and anchorages needed to connect it to the structure of the truck. On a suspension-type seat or a seat with integral seatbelt assembly, this shall include the anchorage for the seat.

### 5.2 Seat belt test body blocks

The test force for the lateral pull test specified in 5.3 shall be applied to the seat belt assembly and its mounting structure through a test body block, as shown in Figure 1.

The test forces for the forward pull and retractor locking device tests specified in 5.4 and 5.5 respectively shall be applied to the seat belt assembly and its mounting structure through a test body block, as shown in Figure 2.

Dimensions in millimetres

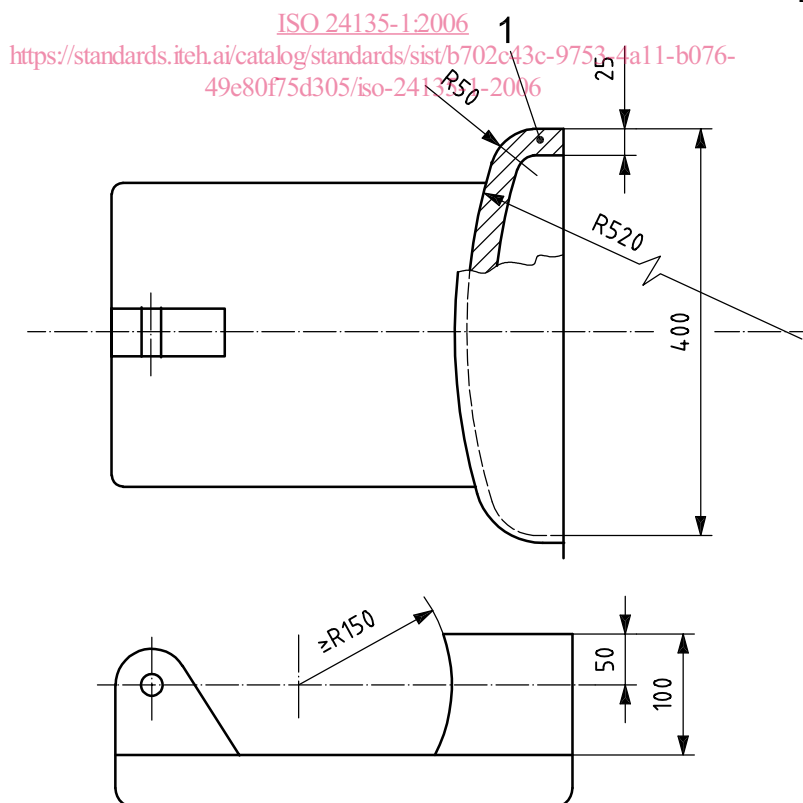


**Key**

- 1 medium-density foam rubber covered with canvas

**Figure 1 — Lateral pull test — Body block**  
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Dimensions in millimetres



**Key**

- 1 medium-density foam rubber covered with canvas

**Figure 2 — Forward pull test — Body block**

5.3 Lateral pull test

A force,  $F_1$ , calculated using Equation (1), shall be applied for a minimum of 60 s through a seat belt test body block to the seat belt assembly and its mounting structure, horizontally and in the lateral direction of least structural resistance, as shown in Figure 3. The test shall be performed on the side where the truck profile is closest to the operator. The seat belt test body block shall be allowed to rotate about its longitudinal axis to align with the belt.

$$F_1 = (W_1 + 4m) g \tag{1}$$

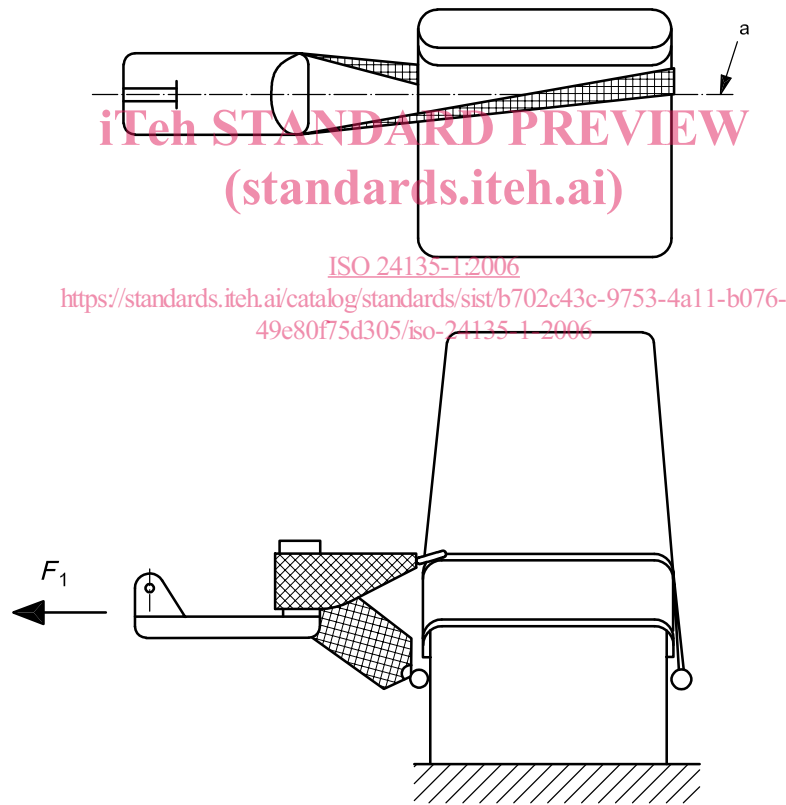
where

$F_1$  is the force applied, in newtons (N);

$W_1$  is equal to 450 kg, approximately four times the weight of a 95 % male operator;

$m$  is the mass of the seat, expressed in kilograms (kg);

$g$  is the acceleration due to gravity, expressed in metres per second squared ( $m/s^2$ ).



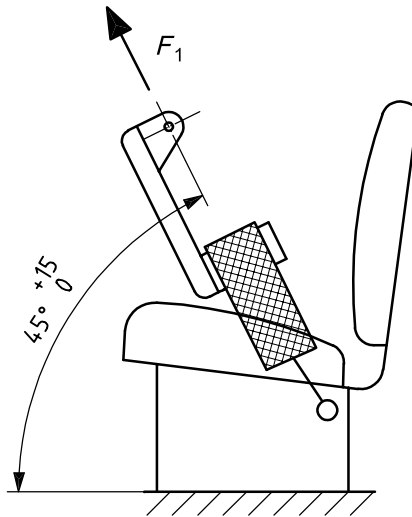
<sup>a</sup> Transverse line of SIP (seat index point).

Figure 3 — Lateral pull test — Application of force



#### 5.4 Forward pull test

The force  $F_1$  calculated according to 5.3 shall be applied for a minimum of 60 s through a seat belt test body block to the seat belt assembly and its mounting structure, in a forward and upward direction, acting at an angle of  $45^\circ \begin{smallmatrix} +15 \\ 0 \end{smallmatrix}$  to the horizontal, as shown in Figure 4.

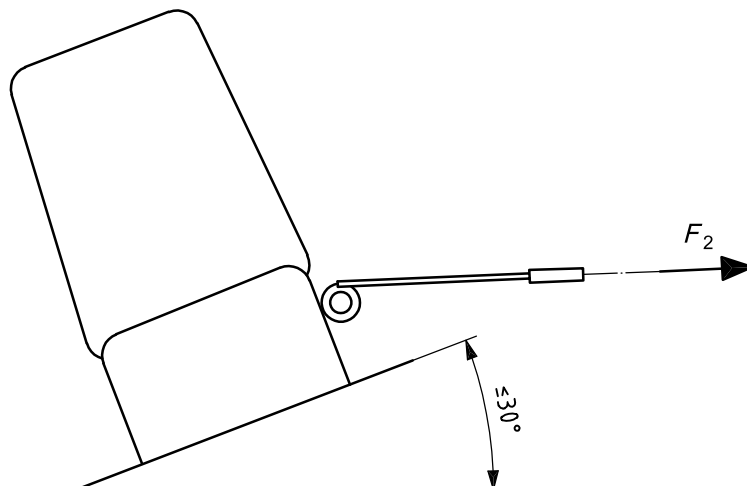


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**Figure 4 — Forward pull test — Application of force**  
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#### 5.5 Retractor locking device test

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With the transversal inclination of the seat belt assembly as intended by the manufacturer and not exceeding  $30^\circ$ , a force,  $F_2$ , of 100 N applied horizontally to the belt shall not release the retractor locking device from the locked position, see Figure 5.



**Figure 5 — Retractor test — Application of force**