



## **Industrial trucks—Verification of stability**

### **Part 2: Counterbalanced trucks with mast**



This Australian Standard® was prepared by Committee ME-026, Industrial Trucks. It was approved on behalf of the Council of Standards Australia on 10 June 2015. This Standard was published on 30 June 2015.

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The following are represented on Committee ME-026:

- Australian Industrial Truck Association
  - Australian Industry Group
  - Construction and Mining Equipment Industry Group
  - Hire and Rental Industry Association of Australia
  - Safety Institute of Australia
  - WorkCover New South Wales
  - WorkSafe Victoria
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This Standard was issued in draft form for comment as DR AS ISO 22915.2:2015.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard<sup>®</sup>

## **Industrial trucks—Verification of stability**

### **Part 2: Counterbalanced trucks with mast**

Originated as part of AS B270—1968.  
Revised and redesignated AS 2359.1—1980.  
Revised and redesignated in part as AS 2359.3—1995.  
Revised and redesignated as AS ISO 22915.2:2015.

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Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 1 76035 106 9



PREFACE

This Standard was prepared by the Standards Australia Committee ME-026, Industrial Trucks, to supersede AS 2359.3, *Powered industrial trucks, Part 3: Counterbalanced fork-lift trucks—Stability tests*.

The objective of this Standard is to provide designers and manufacturers of counterbalance powered industrial trucks with the test criteria when conducting stability tests. It is to be used in conjunction with AS ISO 22915.1, *Industrial trucks—Verification of stability, Part 1: General*.

This Standard is identical with, and has been reproduced from, ISO 22915-2:2008, *Industrial trucks—Verification of stability, Part 2: Counterbalanced trucks with mast*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this part of ISO 22915’ should read ‘Australian Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian Standard</i>	
ISO		AS	
		2359	Powered industrial trucks
5053	Powered industrial trucks—Terminology	2359.7	Part 7: Terminology
		AS ISO	
22915	Industrial trucks—Verification of stability	22915	Industrial trucks—Verification of stability
22915-1	Part 1: General	22915.1	Part 1: General

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## AUSTRALIAN STANDARD

**Industrial trucks—Verification of stability****Part 2:  
Counterbalanced trucks with mast****1 Scope**

This part of ISO 22915 specifies the tests for verifying the stability of counterbalanced trucks with masts, equipped with fork arms or with load handling attachments. It is not applicable to those trucks designed for handling freight containers, dealt with by ISO 22915-9 <sup>1)</sup>.

**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.

ISO 5053, *Powered industrial trucks — Terminology*

ISO 22915-1, *Industrial trucks — Verification of stability — Part 1: General* <sup>2)</sup>

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in ISO 5053 and ISO 22915-1 apply.

**4 Test conditions****4.1 General**

See ISO 22915-1.

**4.2 Position of truck on tilt table****4.2.1 Load and steer axles**

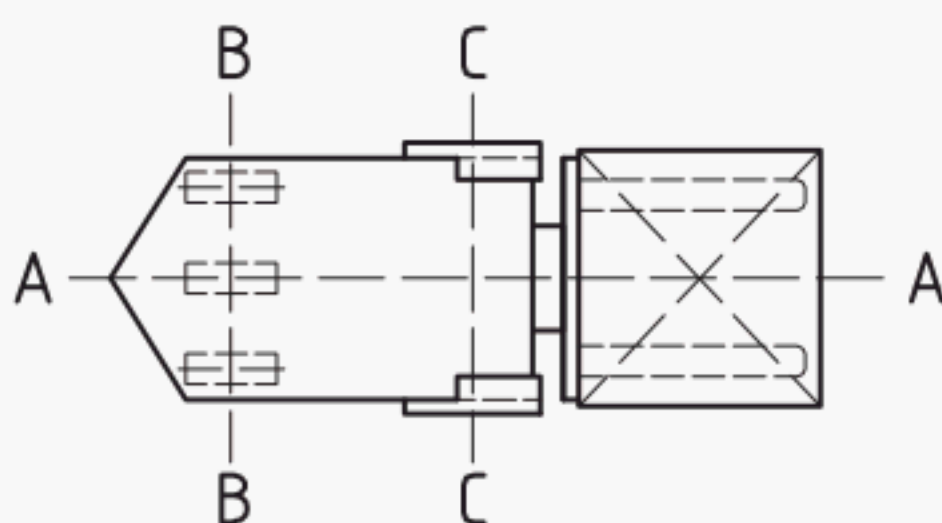
The load and steer axles are defined by Figure 1.

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1) Under preparation.

2) To be published.



**Key**

- A–A longitudinal centre plane of truck  
 B–B steer axle  
 C–C load axle

**Figure 1 — Load and steer axles****4.2.2 Tests 1 and 2**

The truck shall be positioned on the tilt table so that its load axle, C–C, is parallel to the tilt axis, X–Y, of the tilt table. See Table 1.

**4.2.3 Tests 3 and 4**

The truck shall be positioned on the tilt table in a turning position with the line, M–N, parallel to the tilt axis, X–Y, of the tilt table.

As shown in Table 1, the steered wheel nearest to the tilt axis shall be parallel to X–Y. Point M is defined as follows.

- For trucks having an articulating steer axle: point M shall be the projection on the tilt table of the intersection of the longitudinal centre-plane, A–A, of the truck with the axis of this axle.
- For trucks steered by a single wheel: point M shall be the centre point of the tread contact area between the steered wheel and the tilt table surface.
- For trucks steered by twin wheels: point M shall be the centre point of the tread contact area between the steered wheel closest to the tilt axis, X–Y, of the tilt table and the tilt-table surface.
- For trucks having wheels for steering not connected by a common axle, but that are arranged to articulate approximately about the longitudinal centre-plane of the truck: point M shall be the projection on the tilt table of the intersection of the longitudinal centre-plane of the truck, A–A, with the steer axle B–B connecting the vertical turning axis of the steer wheels.

As shown in Table 1, point N is defined as the centre point of the area of contact between the tilt table surface and the load wheel nearest to the tilt axis.

Table 1 — Verification of stability

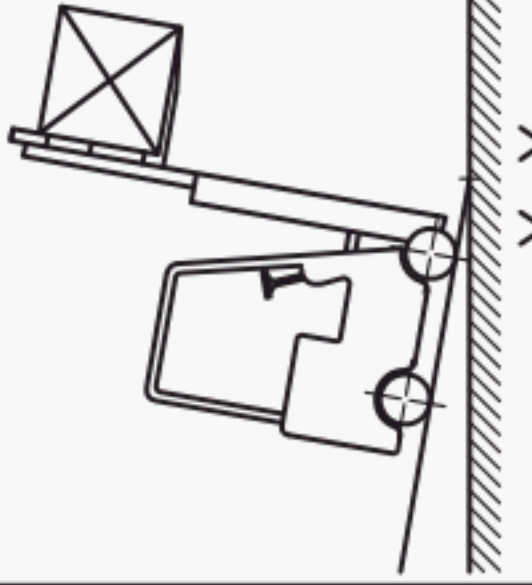
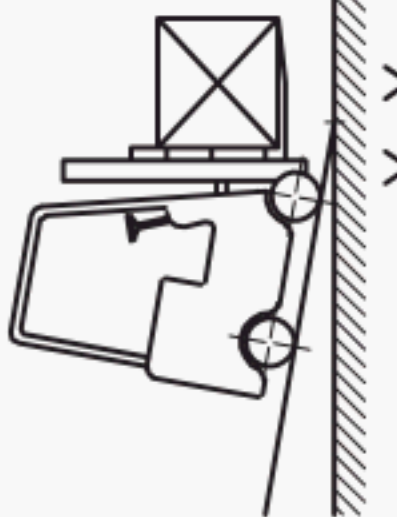
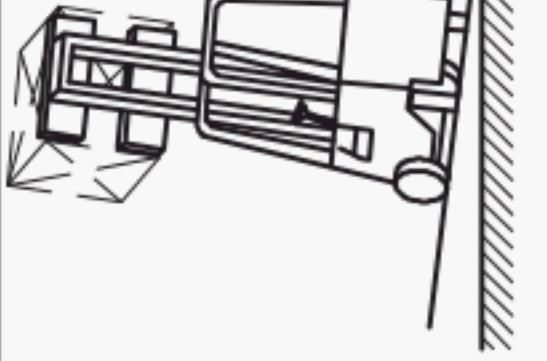
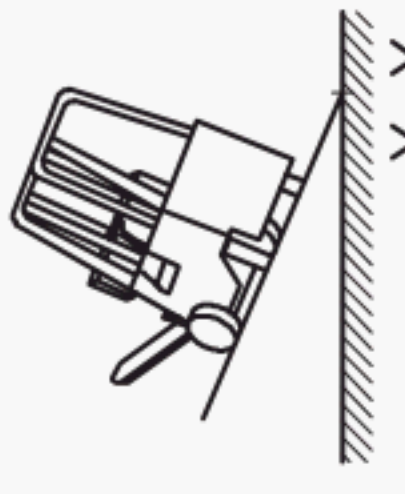
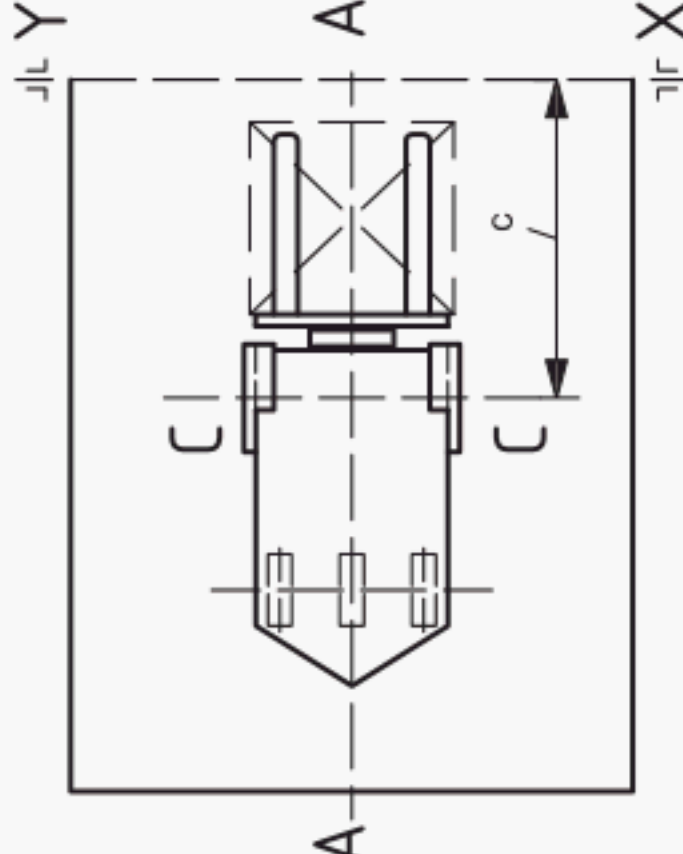
Test criteria	Test 1	Test 2	Test 3	Test 4
<b>Direction of test</b>	Longitudinal	x		
	Lateral		x	x
<b>Direction of load handling device</b>	Load leading	x		
	Load trailing			
<b>Mode of operation</b>	Travelling	x		x
	Stacking/retrieving		x	
<b>Load at load centre</b>	With	x	x	
	Without			x
<b>Lift height</b>	Maximum		x	
	Travel	x		x
<b>Position of mast</b>	Vertical			
	Full rearward	x	x	x
<b>Tilt-table angle for actual capacity</b>	< 5 000 kg	4 %	6 %	$(15 + 1,4 \cdot v) \%^a$
	$\geq 5 000$ kg	3,5 %		$(15 + 1,4 \cdot v) \%^b$
<b>Truck position on tilt table</b>				

Table 1 (continued)

Test criteria	Test 1	Test 2	Test 3	Test 4
Truck position on tilt table		<p>Points M and N</p> <p>As per 4.2.3 a) or d)</p> <p>As per 4.2.3 b)</p> <p>As per 4.2.3 c)</p>		
$v$ is the travel speed of the unladen truck in km/h.	As per 4.2.2			
a 50 % maximum.				
b For North America and Australia: 50 % maximum. For all other regions: 40 % maximum.				
c Parallel.				



### 4.3 Datum point positions

Test 1 shall be conducted with the horizontal position of the load datum point, E, unchanged when elevated from its lowered position as shown in Figure 2.

With the prescribed test load, set the mast vertical and then elevate to approximately 300 mm above the tilt table. With the shank of the front face of the fork arm set vertical, establish point E, as shown in Figure 2 a), on the fork arms or fork carrier having a fixed relationship to the centre of gravity of the test load. E shall be used to provide a reference datum point, F, on the tilt table. When the mast is elevated, a new point,  $F_1$ , on the tilt table may occur, as shown in Figure 2 b). This new point may be returned to the original location of F, as shown in Figure 2 c), by varying the tilt of the mast within the limits provided by the design of the truck.

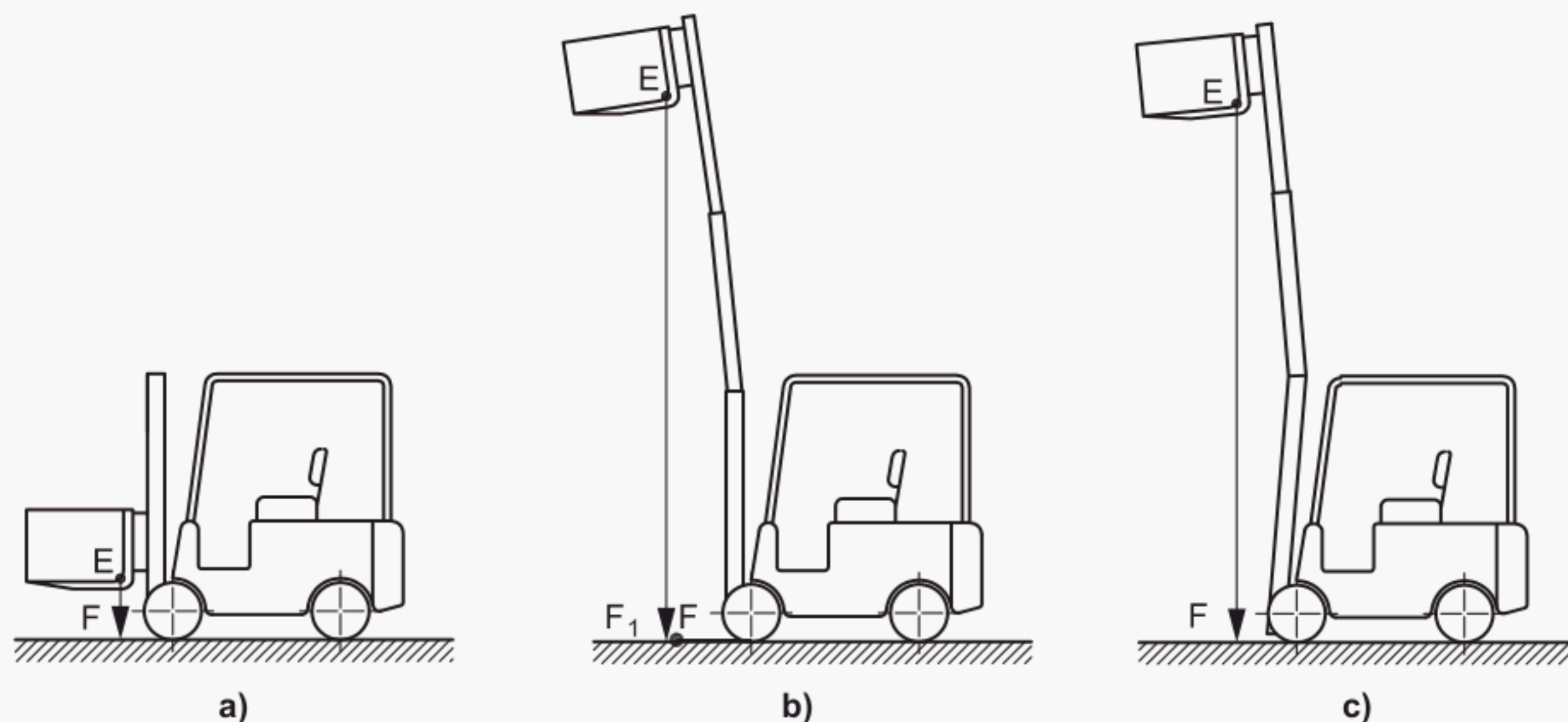


Figure 2 — Datum point positions

### 4.4 Lift height for tests simulating travel

For tests simulating travel (Tests 2 and 4), the upper face of the fork arms, measured at the heel of the fork arm, shall be positioned 300 mm above the tilt table for trucks with a rated capacity less than or equal to 10 t, and 500 mm for trucks with a rated capacity of greater than 10 t.

## 5 Verification of stability

### 5.1 General

The stability of a truck shall be verified in accordance with Table 1. Those trucks having a rated capacity greater than or equal to 5 000 kg are subject to the following regional requirements when their stability is verified using Test 4.

## **5.2 Regional requirements for trucks with rated capacity $\geq$ 5 000 kg**

### **5.2.1 North America and Australia**

Maximum tilt-table angle required: 50 %.

### **5.2.2 All other regions**

Maximum tilt-table angle required: 40 %.

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Standards Australia Limited  
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Sydney NSW 2001  
Phone: 02 9237 6000  
Fax: 02 9237 6010  
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ISBN 978 1 76035 106 9

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