INTERNATIONAL STANDARD

ISO 13563-1

First edition
2001-03-01

Single side loading fork-lift trucks —

Part 1: Stability tests

Chariots élévateurs à fourche à chargement latéral sur un côté —

Partie 1: Essais de stabilité

Reference number
ISO 13563-1:2001(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
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 part of ISO 13563 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13563-1 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

This part of ISO 13563 has been prepared using EEC 89/240 Method 5 as a basis.

ISO 13563 consists of the following parts, under the general title *Single side loading fork-lift trucks*:

— *Part 1: Stability tests*

— *Part 2: Additional stability tests for trucks handling freight containers of 6 m length and above*

Single side loading fork-lift trucks —

Part 1:
Stability tests

1 Scope

This part of ISO 13563 specifies basic tests to verify the stability of single side loading fork-lift trucks with tiltable or non-tiltable mast or fork arms. It is applicable to trucks fitted with fork arms and/or attachments.

This part of ISO 13563 is not applicable to trucks that handle suspended loads that can swing freely.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 13563. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13563 are encouraged to investigate the possibility of applying the most recent edition of the normative document 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 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point.*

3 Purpose of tests

3.1 Normal operating conditions

The basic tests specified in this part of ISO 13563 ensure that the type of truck specified has satisfactory stability when reasonably and appropriately used under normal operating conditions, as follows:

a) operating (travelling and stacking) on substantially firm, smooth, level and prepared surfaces;

b) travelling with the mast or fork arms tilted backwards and the load retracted and in the lowered (travelling) position, or resting on the load-carrying deck;

c) stacking with the mast substantially vertical and the fork arms substantially horizontal;

d) operating with the load centre of gravity approximately on the centre plane between the mast uprights.

3.2 Operating in conditions other than normal

When the operating conditions differ from those specified in 3.1, it is necessary to use either

a) a truck complying with other parts of ISO 13563 covering different specific conditions, or

b) a truck whose stability is agreed upon between the interested parties; this agreed stability shall not be less than that required by the tests specified for normal operating conditions in 3.1.

4 Stability tests

4.1 Test requirements

The stability of single side loading fork-lift trucks shall be verified by one of the procedures specified in 4.2.

4.2 Verification procedure

4.2.1 Tilting platform

Use a test platform that can be tilted about one side. Place the truck being tested for stability on the initially horizontal test platform, in accordance with 4.3 then, successively, in each of the positions described in Table 3.

In each of the tests, slowly tilt the test platform to the slope specified in Table 3. The truck is considered stable if it passes all tests without overturning.

For the purposes of the tests, overturning is defined as the test platform slope value that, if increased, would cause the truck to overturn.

It is permissible in lateral tests for one load wheel to lose contact with the test platform. It is acceptable for parts of the structure to make contact with the test platform.

4.2.2 Fixed slope

Use fixed slopes with inclinations equivalent to the specified test slope. The slope surface shall be smooth and capable of supporting the truck mass with no deformation that could affect the test results.

Drive the truck under test onto the fixed slopes with the mast lowered and positioned as specified in Table 3. For each of the truck positions with an elevated load or load carrier, the mast shall be elevated smoothly to the position specified in Table 3.

4.2.3 Calculation

Compliance with the specified stability values may be determined by calculation methods verified by empirical data.

The calculated capacities shall take into account any manufacturing variations and deflections of the mast, tyres, etc.

4.3 Test conditions

4.3.1 Condition of the truck

The tests shall be carried out on an operational truck.

The operator on rider-controlled trucks shall be simulated by an object having a mass of 90 kg if the stability during a test is thereby decreased. For a truck designed for operation with a standing operator, an object having a mass of 90 kg shall be secured with its centre of gravity 1 000 mm above the floor of the operator's platform at the centre of the position normally occupied by the operator. For a truck designed for operation by a seated operator, the centre of gravity of the object shall be secured 150 mm above the seat index point (SIP) as determined in accordance with ISO 5353, with the seat at the closest position to the midpoint of the adjustments provided. Where the operator's position can be moved relative to the truck, it shall be located for each test in the position that minimizes the stability of the truck.

Fuel tanks of internal combustion engine trucks shall be full if the stability is thereby decreased. All other tanks shall be filled to their correct operating levels, as applicable.

Tyres shall be inflated to the pressure specified by the truck manufacturer. Where tyre ballast is incorporated in the truck design, the use of ballast shall be in accordance with the truck manufacturer's instructions.

4.3.2 Position of truck on platform

The truck shall be placed on the test platform or slope with the line MN parallel to the tilt axis, XY, of the test platform.

Tests shall be conducted on the side of the truck which is the least stable.

Point N is the centre point of the area of contact between the test platform surface and a non-articulating wheel or stabilizer pad.

Point M is defined as follows.

a) For trucks with an articulating axle: the projection onto the test platform of the point of intersection of the longitudinal centre plane, AB, of the truck with the axis of the steer axle.

b) For trucks without an articulating axle or with axle locks or stabilizers in use: the centre of the point of the area of contact between the test platform surface and another wheel or stabilizer pad.

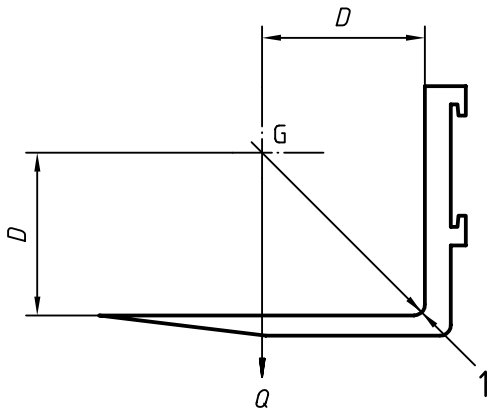
When the truck rating is related to the use of stabilizers, suspension locks, etc., such devices shall be used during tests. If the truck can also be used without their engagement, an additional test shall be carried out in this condition.

4.3.3 Test load

The test load shall have a mass equivalent to the maximum load, Q, that the truck can elevate to its maximum lift height acting through the centre of gravity, G, nominally positioned at the standard load centre distance, D, as indicated on the capacity plate of the truck both horizontally from the front face of the fork arm shank and vertically from the upper face of the fork arm blade (see Figure 1 and Table 1).

When additional lift heights, loads and load centre distances are to be indicated on the capacity plate, the truck shall meet the requirements established by the tests specified in this part of ISO 13563 for these additional ratings.

The centre of gravity, G, of the test load shall be located on the centre plane between the mast uprights.



Key

1 is a point (E) on the inside heel of the fork arm.

D is the load centre distance.

G is the centre of gravity.

Q is the load.

Figure 1

Table 1 — Standard load centre distance

Load, Q kg	**Load centre distance**, D mm
$Q < 1\,000$	400
$1\,000 \leqslant Q \leqslant 4\,999$	500
$5\,000 \leqslant Q \leqslant 10\,000$	600
$Q > 10\,000$	600, 900, 1 200 or 1 500

4.3.4 Location of the truck on the test platform

The location of the truck on the test platform or slope shall be maintained during each test.

This may be achieved by application of parking or service brakes which can be secured in the “on” position, or by wedging the wheels against the truck frame, ensuring however that the articulation is not affected.

Blocks (chocks) with a maximum height not exceeding the value indicated in Table 2 may be used, if necessary, to maintain the initial position of the truck on the test platform or slope. Blocks (chocks), if used, shall not artificially improve stability.

Table 2 — Height of blocks

Tyre outside diameter, d mm	**Height of blocks** max.
$d \leqslant 250$	25 mm
$250 < d \leqslant 500$	0,1d
$d > 500$	50 mm

The coefficient of friction of the platform surface or slope may be increased if required by an appropriate friction-increasing material.

4.3.5 Position of front face of fork arm shank

Test 1 shall be conducted with the horizontal position of a load datum point (e.g. point E) unchanged when elevated from its lowered position (see Figure 20).

By means of a plumb line or other suitable equipment, set the mast vertical. Elevate the fork arms and specified test load to approximately 300 mm above the test platform. With the front face of the fork arm shank vertical, establish a point, E (see Figure 18) on the fork arm or fork carrier having a fixed relationship to the centre of gravity, G, of the test load (see Figure 1). This point E shall be used to provide a reference datum, F, on the test platform (see Figure 18). When the mast is elevated, a new point F_1 on the test platform may occur (see Figure 19). By the following adjustments this new point F_1 can be returned to the original location F (see Figure 20).

For trucks with tiltable masts, changes in the location of F_1 shall be corrected by varying the tilt of the mast within the limits provided by the design of the truck.

For trucks with fixed masts, adjustments in the fork arms or fork carrier tilt (where provided) may be used to correct for changes in location of point F_1 within the limits of tilt provided by the design of the truck.

Adjustments cannot be made on trucks having non-tiltable masts, fork arms or fork carriers.

4.3.6 Lift height for tests simulating travelling

For tests simulating travelling, the upper face of the load platform or fork arms at the heels shall be positioned 300 mm from the ground or at the minimum height for transporting the load, whichever is the greater.

4.3.7 Lift height for tests simulating stacking

For tests simulating stacking, the lift height shall be measured between the surface of the tilting platform and the upper surface of the fork arm blade.

4.3.8 Safety precautions

Precautions shall be taken to prevent the truck overturning or displacement of the load during the tests. If the truck is prevented from overturning by rope lashing or chain, this shall be sufficiently slack to impose no appreciable restriction on the truck until the overturning point is reached.

Displacement of the test load shall be prevented by means such as

a) firmly securing the test load to the load carrier or equivalent structure, or

b) suspending the test load near to the ground from an appropriate support placed on the fork arms so that the suspension point is at the point where the centre of gravity, G, of the test load would be if the test load were placed on the fork arms.

5 Stability tests for trucks with attachments

Trucks fitted with attachments other than fork arms shall be subject to the same stability tests.

The test load shall be the actual load, at the specified load centre distance indicated for the attachment when used on the truck being tested.

The lift height required in the tests shall be measured between the surface of the tilting platform and the underside of the load in its approved handling position, or the underside of the load engaging means, whichever is the smaller.

Table 3 — Summary of tests

	Tests for lateral stability		
	Test 1		**Test 2**
Test of stability when	stacking		stacking
Test load	with		with
Load centre distance	*D* of test load		*D* of test load
Lift height	maximum (see 4.3.7)		maximum (see 4.3.7)
Position of carrying device	extended		retracted
Tilt of mast or fork arms	vertical (see 4.3.5)		maximum backward tilt
Position on test platform	Figures 2 and 5, or Figure 6 and/or 3 and 7		Figures 4 and 8 or Figure 9
Test platform slope	4 % up to and excluding 5 000 kg	3,5 % from 5 000 kg	6 %

	Tests for lateral stability		
	Test 3	**Test 4**	**Test 5**
Test of stability when	travelling	travelling	stacking
Test load	without	without	without
Load centre distance	—	—	—
Lift height	lowered (see 4.3.6)	lowered (see 4.3.6)	maximum
Position of carrying device	retracted	retracted	retracted
Tilt of mast or fork arms	positioned so that the truck is in the condition of minimum stability		vertical (see 4.3.5)
Position on test platform	Figures 10 and 13 or Figure 15	Figures 11 and 14 or Figure 16	Figures 12 and 8 or Figure 9
Test platform slope	see Figure 17	see Figure 17	8 %

XY is the test platform tilt axis.

MN is the truck axis of original tilt.

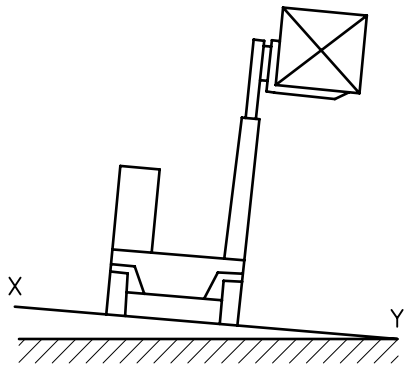


Figure 2

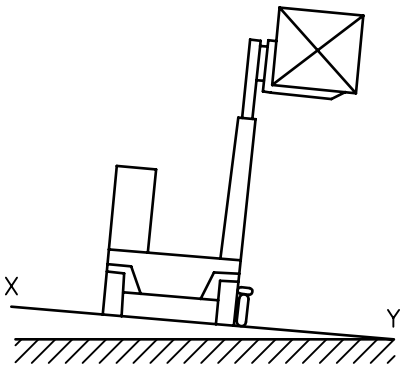


Figure 3

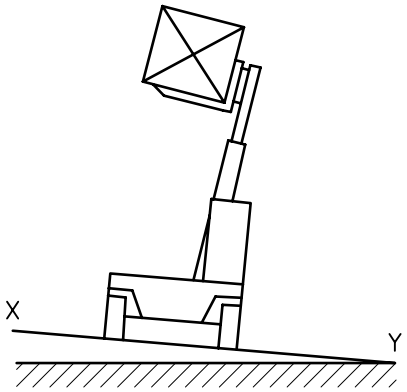
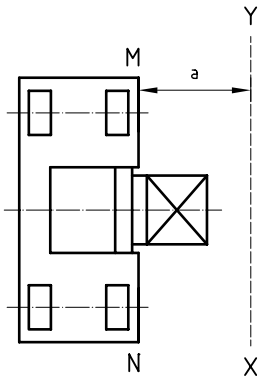
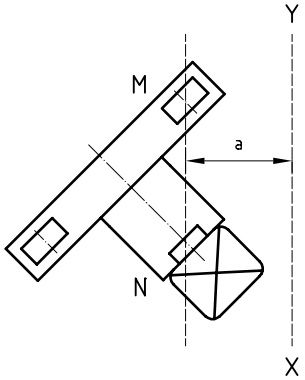


Figure 4



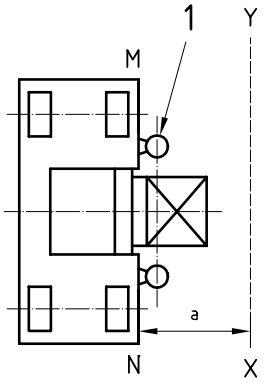
a Parallel

Figure 5



a Parallel

Figure 6

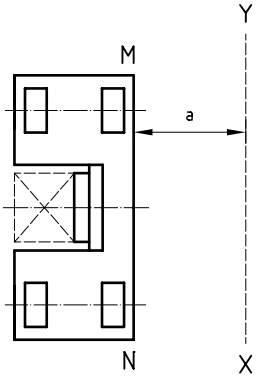


Key

1 Stabilizers

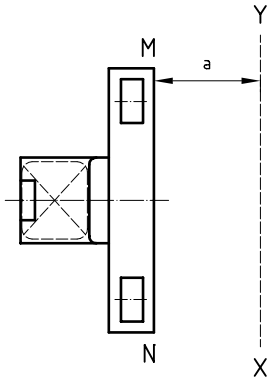
a Parallel

Figure 7



a Parallel

Figure 8



a Parallel

Figure 9

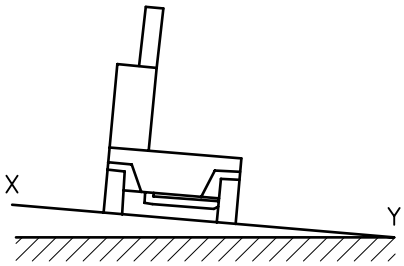


Figure 10

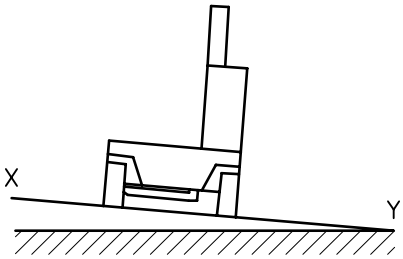


Figure 11

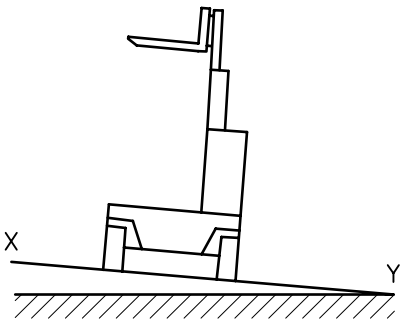
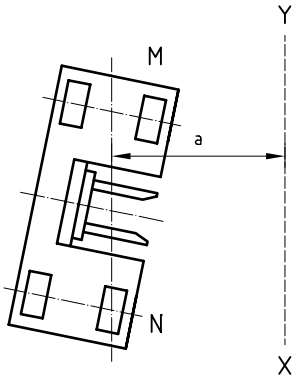
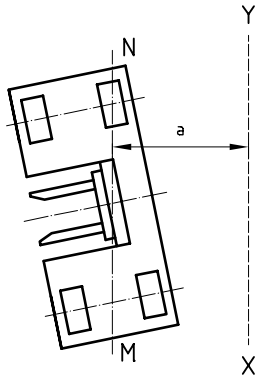


Figure 12



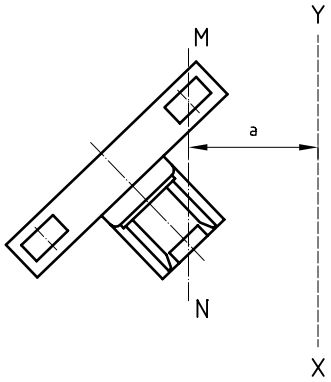
a Parallel

Figure 13



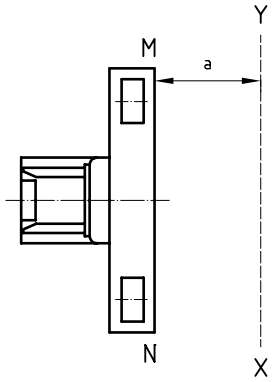
a Parallel

Figure 14



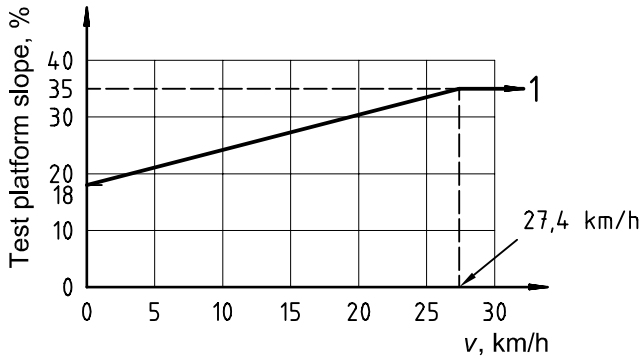
a Parallel

Figure 15



a Parallel

Figure 16

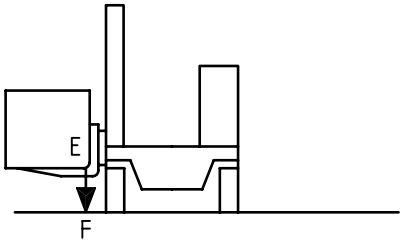


Key

1 $v' = (18 + 0{,}62v)$ % – max. 35 %

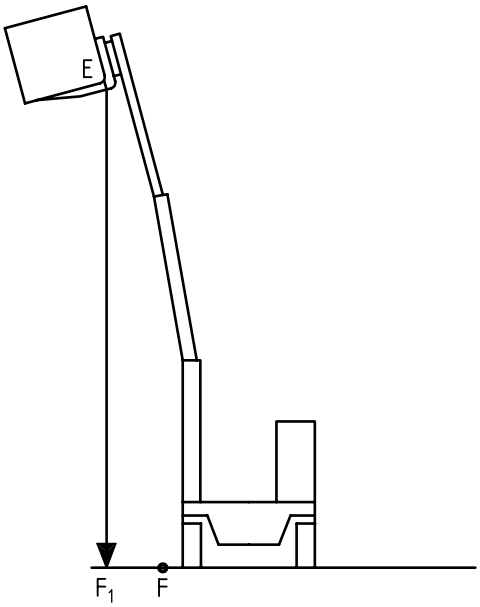
v is maximum speed of the truck, in kilometres per hour, unladen, on smooth and level ground.

Figure 17



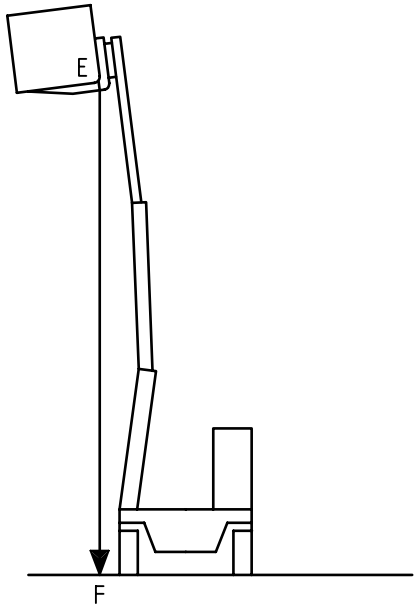
E is a point on the inside heel of the fork arm.
F is the reference datum on test platform.

Figure 18



E is a point on the inside heel of the fork arm.
F is the reference datum on test platform.
F_1 is the new point on test platform.

Figure 19



E is a point on the inside heel of the fork arm.
F is the reference datum on test platform.

Figure 20

ICS 53.060

Price based on 11 pages