SLOVENSKI STANDARD
SIST EN 1459:1999

01-junij-1999

Varnost vozil za talni transport - Samognana vozila z mehanizmom za dviganje s spremenljivim dosegom

Safety of industrial trucks - Self-propelled variable reach trucks

Sicherheit von Flurförderzeugen - Kraftbetriebene Stapler mit veränderlicher Reichweite

Sécurité des chariots de manutention - Chariots automoteurs à portée variable

Ta slovenski standard je istoveten z: **EN 1459:1998**

ICS:

53.060 Industrijski tovornjaki Industrial trucks

SIST EN 1459:1999 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1459

December 1998

ICS 53.060

Descriptors: Industrial trucks, self-propelled machines, safety of machines, accident prevention, definitions, hazards, safety measures, safety devices, stability, operating stations, verification, tests, information, utilization, marking

English version

Safety of industrial trucks - Self-propelled variable reach trucks

Sécurité des chariots de manutention - Chariots automoteurs à portée variable

Sicherheit von Flurförderzeugen - Kraftbetriebene Stapler mit veränderlicher Reichweite

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 150 "Industrial Trucks - Safety", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1999, and conflicting national standards shall be withdrawn at the latest by June 1999.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard is one of a series of European Standards for the safety of Industrial trucks. The complete series is as follows:

EN 1726	Safety of Industrial trucks Self propelled trucks up to and including 10,000 kg capacity and tractors with a drawbar pull up to and including 20,000 N.
EN 1726-1	Part 1 : General requirements
EN 1726-2	Part 2 : Additional requirements for trucks with elevating operator positions and trucks specifically designed to travel with elevated loads.
EN 1551	Safety of Industrial trucks Self propelled trucks over 10,000 kg capacity
EN 1459	Safety of Industrial trucks Self propelled variable reach trucks
EN 1757	Safety of Industrial trucks Pedestrian propelled trucks
EN 1757-1	Part 1 : Stacker trucks
EN 1757-2	Part 2 : Pallet trucks
EN 1757-3	Part 3 : Platform trucks

EN 1757-4	Part 4 : Scissor lift pallet trucks
EN 1525	Safety of Industrial trucks Driverless trucks and their systems
EN 1175	Safety of Industrial trucks Electrical requirements
EN 1175-1	Part 1 : General requirements for battery powered trucks
EN 1175-2	Part 2 : General requirements for internal combustion engine powered trucks
EN 1175-3	Part 3 : Specific requirements for the electrical power transmission systems of internal combustion engine powered trucks
EN 1526	Safety of Industrial trucks Additional requirements for automated functions on trucks
EN 1755	Safety of Industrial trucks Operation in potentially explosive atmospheres: use in flammable gas, vapour mist and dust
EN 12053	Safety of Industrial trucks Test methods for measuring noise emissions
EN 13564	Safety of Industrial trucks Test methods for measuring visibility from self propelled trucks
EN 13059	Safety of Industrial trucks Test methods for measuring vibration
EN 12895	Safety of Industrial trucks Electromagnetic compatibility

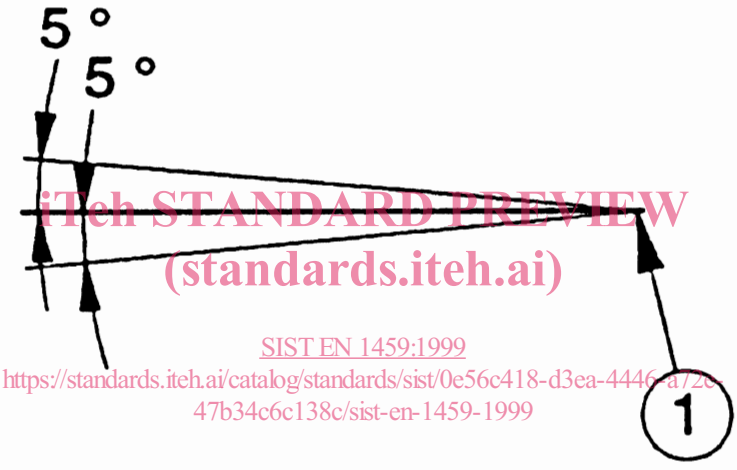
0 Introduction

This standard has been prepared to be a harmonised standard to provide one means of conforming with the essential safety requirements of the machinery directive and associated EFTA regulations. The extent to which hazards are covered is indicated in the Scope of this standard. In addition, machinery should comply as appropriate with Machinery Standards EN 292 for hazards which are not covered by this standard.

1 Scope

1.1 This standard applies to self-propelled seated rider operated variable reach trucks intended to handle loads of all kinds using one of the attachments listed in 3.10 - 3.11 - 3.13 - 3.14 - 3.15 - 3.16 - 3.19 - 3.20. It does not cover the lifting of persons by any attachments, in particular by work platforms. Machines with variable length load suspension elements (chains, ropes etc) from which the load may swing freely in all directions are not covered in this standard. It applies to the handling of series 1 freight containers of length ≥ 6 metres with the dimensional and securing characteristics as specified in ISO 668 and ISO 3874.

1.2 For the purpose of this standard, self-propelled seated rider operated variable reach trucks (hereinafter referred to as "trucks") are counterbalanced lift trucks with one or more articulated arms, telescopic or not, non-slewing, as defined in **4.13.2.2.2** of ISO 5053 :1987 used for stacking loads. The load handling means may be mounted directly on the lifting means or on an auxiliary mast fixed at the end of the lifting means. Lifting means shall be non-slewing or have slewing movement not greater than 5° either side of the longitudinal axis of the truck (see figure 1).



1. Vertical Pivoting axis

Figure 1.

1.3 Two types of variable reach trucks are covered in this standard:

– industrial trucks for operation on substantially firm smooth, level and prepared surfaces;

– rough terrain trucks for operation on unimproved natural terrain and disturbed terrain or areas.

1.4 Trucks may be equipped with fork arms for normal industrial duties, or attachments for specific applications such as handling freight containers. Trucks may be equipped with stabilisers, axle locking or lateral levelling devices.

1.5 This standard covers all specific hazards which could occur during operation and maintenance of trucks. For hazards occurring during construction, transportation, commissioning, decommissioning and disposal, reference should be made to EN 292-2.

1.6 Unless otherwise specified by the manufacturer, the trucks are designed to operate in a temperature range of -20°C to + 50°C. The manufacturer shall specify in his instructions for use the precautions to be taken when using the trucks at extreme temperatures.

2 Normative references

This European standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 281 : 1988	Construction and layout of pedals of self-propelled industrial trucks sit down rider controlled.
EN 292-1 : 1991	Safety of machinery - Basic concepts, general principles for design - Part 1 : Terminology and methodology.
EN 292-2 : 1991	Safety of machinery - Basic concepts, general principles for design - Part 2 : Technical principles and specifications.
prEN 12937 : 1997	Safety of machinery - Basic concepts, general principles for design Part 3 - Additional technical principles and specifications for mobility and for load lifting.
EN 349 : 1993	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body.
EN 414 : 1992	Safety of machinery - Rules for drafting and presentation of safety standards.

EN 1175	Safety of Industrial trucks - Electrical requirements
EN 1175 - 1 : 1998	General requirements for battery powered trucks.
EN 1175 - 2 : 1998	General requirements for internal combustion engine powered trucks.
EN 1175 - 3 : 1998	Specific requirements for the electrical power transmission systems of internal combustion engine powered trucks.
prEN 12053	Safety of Industrial trucks Test methods for measuring noise emissions
prEN 13059	Safety of Industrial trucks Test methods for measuring vibration
prEN ISO 13564	Test method for measuring visibility from self-propelled trucks (ISO/DIS 13564:1996)
ISO 2330 : 1995	Fork lift trucks - Fork arms - Technical characteristics and testing.
ISO 2867 : 1994	Earth moving machinery - Access systems.
ISO 3164 : 1992	Earth-moving machinery, roll over and falling object protective structure - Specification for the deflection limiting volume.
ISO/DIS 3287	Powered industrial trucks - Control systems.
ISO 3449 : 1992	Earth moving machinery - Falling object laboratory tests and performance requirements.
ISO 3471 : 1994	Earth moving machinery - Roll over protective structures - Test and performances requirements.
ISO 3776 : 1989	Tractors for agriculture - seat belt anchorage's.
ISO 3795: 1989	Road vehicles, and tractors and machinery for agriculture and forestry - Determination of burning behaviour of interior materials
ISO 5053 : 1987	Powered industrial trucks - Terminology.
ISO 6055 : 1997	High lift rider trucks - Overhead guards - Specifications and testing.
ISO 6292 : 1996	Powered industrial trucks and tractors - Brake performance and component strength.

ISO/DIS 13284 : 1997	Fork lift trucks - Fork arm extensions and telescopic fork arms - Technical specifications and strength requirements.
ISO 9533 : 1989	Earth moving machinery - Machine mounted forward and reverse audible warning alarm - Sound test method.
ISO 668 : 1995	Series 1 freight containers - Classification, dimensions and ratings.
ISO/DIS 3874	Series 1 freight containers - Handling and securing.

3 Definitions - terminology

Definitions of the main truck components are in accordance with ISO 5053 : 1987. For the purposes of this standard, the following further definitions apply.

3.1 rated capacity of truck : Load “Q” in kg, permitted by the manufacturer, that the truck type is capable of transporting or lifting in normal operation under specific conditions. It shall be equal to the maximum load “Q” with centre of gravity at point “G” (see figure 2) which the truck is designed to carry on fork arms at the standard load centre distance “D” as specified in 3.3 and stack at the standard lift height “H” as specified in 3.2.

“G” is the load centre of gravity positioned in the longitudinal plane that passes through the central point between the front wheels.

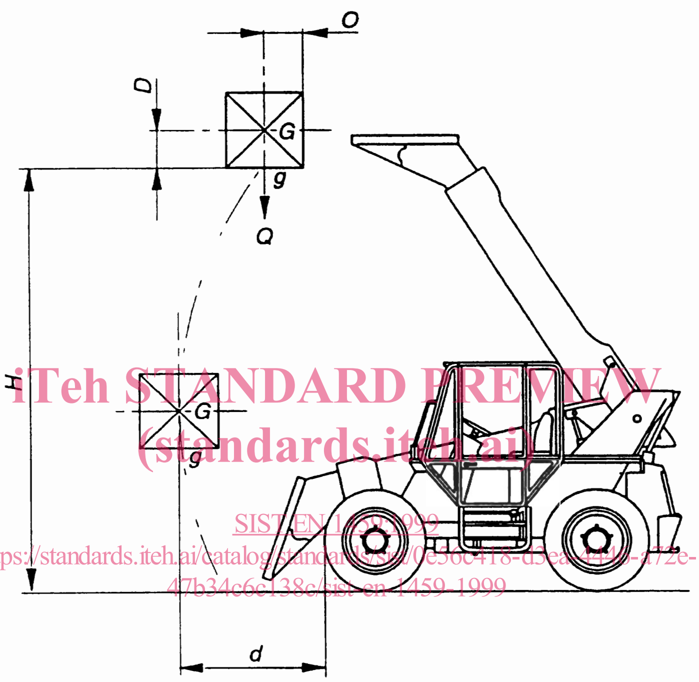


Figure 2. Parameters for the designation of the rated capacity of the truck

3.2 standard lift height : Height “H” from the ground to the upper face of the fork blades or to the underside of the load.

The standard heights are as follows :

H = 3,3 m for trucks with capacities of 10 000 kg or less
H = 5,0 m for trucks with capacities of 10 000 kg.

3.3 standard load centre distance : Distance "D" in mm from the centre of gravity "G" of the load measured horizontally to the front face of the fork shanks and vertically to the upper face of the fork blades as specified in table 1.

Table 1.

Rated load Q (in Kg)		Standard load centre distance D (in mm)					
		400	500	600	900	1200	1500
	< 1 000	X	+	+			
≥ 1 000	< 5 000		X	+			
≥ 5 000	≤ 10 000			X			
> 10 000	< 20 000			X	X	X	
≥ 20 000	< 25 000				X	X	
≥ 25 000						X	X
NOTE : The standard load centre distances D are designated by X. The load centre distances designated by + are optional.							

Trucks may be rated for special applications with load centres related to those applications.

3.4 nominal reach (d) : Between two vertical parallel planes, one plane is tangent to the front of the outside diameter of the front tyres. The other plane is tangent to the curve described by 'g' moving from position 'H' to its lowest position. Point 'g' is the vertical projection of the centre of gravity 'G' onto the plane of the top surface of the fork arm blades.

3.5 actual capacity of truck : Maximum load in kg (depending on lift height "H", attachment, load centre distance and maximum reach,) permitted by the manufacturer, taking into account the stability test results, which the truck is capable of transporting or lifting under specific conditions.

3.6 rated capacity of removable attachments : Maximum load in kg that the attachment is permitted by its manufacturer to handle in normal operation under specified conditions.

3.7 axle locking : Mechanism designed to stop oscillation of the rear axle for improving truck stability during stacking and destacking operations.

3.8 stabiliser : Extendible mechanical supports used to improve stability of a stationary truck.

3.9 lateral levelling : Changing the angular relationship between the chassis and the load axle normally in order to adjust the chassis to horizontal when the truck is standing on a side slope and to ensure the boom operates in a vertical plane.

3.10 forks : A device including two or more solid fork arms (hook-mounted or shaft mounted) which is fitted on the carriage and usually spread manually.

3.11 fork extensions : Devices fitted over the forks to increase their length.

3.12 boom : A device including a fixed length and articulated or telescopic parts.

3.13 spreader : A device fitted to the boom and designed to engage with the lifting points of freight containers, swap bodies and semi-trailers. It may have powered devices to connect the lifting points of the load and an articulated mechanism to facilitate engagement.

3.14 side grabs : A device comprising two plates clamping uniform loads (boxes, cartons, barrels, blocks etc) horizontally.

3.15 wood grab : A device comprising a curved pressing fork arm specially designed for handling logs or round timber.

3.16 bucket : A device intended to carry bulk products such as sand, gravel, coal etc.

3.17 overhead guard : A device protecting the operator's position against falling objects.

3.18 load backrest : A device fitted to the back of the fork arm carriage to prevent any part of the load from falling onto the operator's position.

3.19 load stabiliser : A device clamping the load vertically and stabilizing it to prevent it from falling particularly when the truck is travelling over poor terrain.

3.20 load push pull : A device enabling the load to be slid forward or backwards on the fork arms.

3.21 normal operator's position : A position in which the operator shall be capable of controlling all the operating and load handling functions. Other positions may prove necessary if it is not possible to control all the functions of the truck from a single position.

3.22 forward travel : Forward direction of travel occurs when the load handling means is leading the travel motion of the truck.

3.23 front and rear ends of truck : The front end of a truck is that which leads the forward direction of travel described in 3.22. The rear end of a truck is that which trails.

3.24 quick fastening device: a structure fitted at the end of the lifting boom to grip and lock interchangeable attachments without the use of a tool.

3.25 auxiliary mast: mast at the end of the telescopic boom intended to reach greater lifting heights.

4 Hazards

The following hazards from annex A of EN 414 : 1992 are applicable in the situations described and could involve risks to persons if not reduced or eliminated. The corresponding requirements are designed to limit the risk or reduce these hazards in each situation.

Hazards		Corresponding requirements	
4.1	Mechanical hazards		
4.1.1	Crushing, shearing or entanglement		
4.1.1.1	With truck lifting mechanism	5.6.5	Protection at operator position
4.1.1.2	Within attachment mechanism	5.6.5	Protection on attachment
4.1.1.3	Between truck and obstacles	5.6.1	Operator position : dimensions
4.1.1.4	Between truck and road wheels	5.6.3	Protection from road wheels
4.1.1.5	Within engine compartment	5.4.4	Lockable engine access
4.1.2	Impact by collision		
4.1.2.1	When truck is being driven	5.2	Service brakes
		5.3.1	Travel controls
		5.3.2	Steering controls
		5.4.5	Pressure vessel design
		5.8.3	Audible warnings
		5.5.7.6	Visibility through attachment
		5.9	Visibility through operator position
		5.10.1.5	Visibility through cab windows
4.1.2.2	When truck is unattended	5.1.2.1	Parking brake
4.1.2.3	Due to mechanical failure	5.2	Brake control system
4.1.3	Impact from falling objects		
4.1.3.1	Due to mechanical failure	5.5.1	Lift chains and wire ropes
		6	Structural type test
4.1.3.2	Due to unintended load carrier movement	5.3.3	Load handling control
		5.5.2	Lift system leakage
		5.5.3.3	Non-return device
4.1.3.3	Due to failure or unintended movement of fork arms or extensions	5.5.4	Fork arms
		5.5.5	Fork extensions
4.1.3.4	Due to unintended movement of load handling means	5.5.5	Fork extensions : retention
		5.5.6	Fork carrier stops
		5.5.7.1	Attachment : retention
		5.5.7.3	Attachment : fastening device

Hazards		Corresponding requirements	
4.1.3.5	Due to unstable or insecure loads	5.5.7.2	Load clamping device
		5.5.7.7	Spreader twistlock interlock
		5.5.8	Load stability
		5.8.1	Overhead guard
		5.8.2	Protective structure
		5.10.1.1/2/3	Cab structure
4.1.3.6	When lifting or transporting the truck	5.10.2	Protection during transport
4.1.4	High pressure hazard		
4.1.4.1	Due to hydraulic hose failure	5.5.3.1	Hose burst pressure
4.1.4.2	Due to excessive hydraulic pressure	5.5.3.2	Pressure relief valve
4.1.5	Material ejection from road wheels	5.6.3	Protection from road wheels
4.1.6	Slip, trip, fall		
4.1.6.1	During access to operator position	5.6.2	Operator access
4.2	Electrical hazards from contact	5.4.6	Electrical requirements
4.3	Thermal hazards for the operator	5.6.4	Protection from burning
		5.10.1.1	Protection from cab heater
4.4	Noise hazards		
4.4.1	Hearing loss for the operator	5.10.3.1	Operator noise limitation
4.4.2	Interference with communication	5.10.3.1	Environmental noise limitation
4.5	Vibration hazards	5.6.1	Seat
		5.10.3.2	Vibration
4.6	Hazards generated by radiation		Not applicable
4.7	Hazards due to substances		
4.7.1	Inhalation of engine exhaust emission	5.4.1	Exhaust port arrangement
4.7.2	Fire or explosion		
4.7.2.1	From engine fuel systems	5.4.3	Fuel tanks
		5.4.5	LPG requirements
4.7.2.2	From battery electrolyte	5.4.6	Electro technical requirements
4.7.2.3	In hazardous atmospheres	7.1	Instructions for use
4.8	Hazards due to neglect of ergonomic principles		
4.8.1	Unhealthy postures	3.21	Definition of normal driving position:
		5.6.1	Seat adjustment
		5.8.1	Overhead guard : Headroom
		5.8.2	Protective structure : Headroom
		5.10.1.2	Cab headroom
4.8.2	Inadequate local lighting	5.9.2	Truck lighting
4.8.3	Stress due to operator discomfort	5.4.2	Engine cooling : Air flow
		5.10.1.4	Cab : ventilation
4.8.4	Human error		
4.8.4.1	During truck operation	5.3	Controls
		Annex F	Symbols
4.8.4.2	Prior to initial use	6.2	Functional test
		7.1	Instruction handbook
4.9	Hazard combinations		

Hazards		Corresponding requirements	
4.10	Hazards due to functional disorders		
4.10.1	Hydraulic failure causing load to drop	5.5.3.3	Truck hydraulic system
4.10.2	Control disorder causing uncontrollable movement	5.5.7.4/5	Attachment hydraulic system
4.10.3	Unexpected start-up		
4.10.3.1	When truck is unattended	5.1.2.1	Parking brake
4.10.3.2	Due to unauthorised use	5.1.1	Key switch
4.10.3.3	Due to unintended traction	5.1.2.2	Neutral start switch
		5.1.2.3/4	Direction and accelerator control
		5.1.2.5	Seat or pedal switches
4.10.4	Overturn of truck	5.4.6	Electro technical requirements
4.10.4.1	During truck operation	5.6.6	Safety belt
		5.7	Stability tests
		5.8.2	Protective structure
		5.8.4	Longitudinal stability indicator
		5.10.1.6	Cabs : emergency exit
4.10.4.2	When load handling	5.3.4	Other controls
		5.5.2	Load lowering speed
		7.2.2	Capacity plate
4.10.4.3	When truck is unattended	5.5.2	Hydraulic tilt leakage
4.10.5	Failure of control response	5.5.3.1	Hydraulic burst pressure
4.11	Hazards due to missing or incorrectly positioned safety means		
	Hazards due to mobility	The whole of article 5	
4.12	Inadequate lighting of moving/work area	5.9.2	Auxiliary lights
4.13	Hazards due to sudden movement, instability etc. during handling	5.1	Start up and travel
		5.2	Brakes
		5.7	Stability - annexes A to E
		5.8.1	Overhead guard - ROPS - FOPS
		5.10	Environment condition
		5.2	Functionality
		7.1	Instruction handbook
4.14	Inadequate/in ergonomic design of driving position	5.3	Controls
		5.10	Environmental conditions
4.14.1	Hazards due to dangerous environments (contact with moving parts, exhaust gases etc.)	5.4.5.3	Equipment
		5.6.3	Protection from road wheels
		5.6.4	Protection from burning
		5,6.5	Protection of the operator against crushing, shearing and trapping
4.14.2	Inadequate visibility from drivers/ operators position	5.9	Visibility annex H
4.14.3	Inadequate seat/seating (seat index point)	5.61	Seat