

Rail dependent storage and retrieval equipment — Safety

The European Standard EN 528 : 1996 has the status of a
British Standard

ICS 53.080

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee MHE/14, Rail dependent storage and retrieval equipment — Safety, upon which the following bodies were represented:

Automated Material Handling Systems Association
Health and Safety Executive
Storage Equipment Manufacturers Association

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National foreword

This British Standard has been prepared by Technical Committee MHE/14 and is the English language version of EN 528 *Rail dependent storage and retrieval equipment — Safety*, published by the European Committee for Standardization (CEN). EN 528 was produced as a result of international discussion in which the United Kingdom took an active part.

The British Standards corresponding to the European Standards referred to in the text are identical in number and title to those given in clause 2.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 24, an inside back cover and a back cover.

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English version

Rail dependent storage and retrieval equipment — Safety

Transtockteurs — Sécurité

Regalbediengeräte — Sicherheit

This European Standard has been approved by CEN on 1996-07-21. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 149, Rail-dependent storage and retrieval equipment — Safety, the Secretariat of which is held by DIN.

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 February 1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

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 Directives.

For the relationship with EU Directives, see informative Annex Z, which is an integral part of this standard.

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

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0 Introduction

This European Standard has been prepared to be a harmonized 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 shall conform as appropriate to EN 292 for hazards which are not covered by this standard.

1 Scope

This European Standard applies to all types of machines, restricted to the rails on which they travel within and outside of aisles, which embody lifting means and may embody lateral handling facilities, for the storage and retrieval of unit loads and/or long goods such as bar materials and/or for order picking or similar duties. Also included is the transfer equipment used to change between aisles. Control of machines may range from manual to fully automatic.

This standard does not apply to machines derived from cranes (e.g. overhead travelling cranes), industrial trucks with free ranging capability or robots.

Reference in this standard to racking, buildings and systems only applies where it is necessary to assess the hazards and risks at their interfaces with storage and retrieval machines.

This standard covers specific hazards which could occur during erection, commissioning, testing, operation, maintenance and dismantling of machines and equipment.

This standard applies to machines and equipment which are manufactured after the date of issue.

Illustrations of examples of machines and transfer equipment to which this standard applies are shown in annex A.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the 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 292-1	<i>Safety of machinery — Basic concepts, general principles of design — Part 1: Basic terminology, methodology</i>
EN 292-2	<i>Safety of machinery — Basic concepts, general principles of design — Part 2: Technical principles and specifications</i>
EN 294	<i>Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs</i>
EN 349	<i>Safety of machinery — Minimum distances to avoid crushing of parts of the human body</i>
EN 418	<i>Safety of machinery — Emergency stop equipment, functional aspects — Principles of design</i>
prEN 614-1	<i>Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles</i>
prEN 811	<i>Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs</i>
prEN 894-1	<i>Safety of machinery — Ergonomic requirements for the design of displays and control actuators — Part 1: Human interactions with displays and control actuators</i>
prEN 894-2	<i>Safety of machinery — Ergonomic requirements for the design of displays and control actuators — Part 2: Displays</i>
prEN 953	<i>Safety of machinery — General requirements for the design and construction of guards (fixed, movable)</i>
prEN 954-1	<i>Safety of machinery — Safety related parts of control systems — Part 1: General principles for design</i>
prEN 982	<i>Safety requirements for fluid power systems and components — Hydraulics</i>
prEN 50100-1	<i>Safety of machinery — Electro-sensitive protective devices — Part 1: Specification for general requirements</i>
EN 60204-1	<i>Safety of machinery — Electrical equipment of industrial machinery — Part 1: General requirements</i>
EN 60947-5-1	<i>Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices</i>

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 emergency control position

Protected position from which the machine may be controlled during an emergency or a maintenance operation.

3.2 driving position

Position on or off the machine from which the movements of the machine may be controlled.

3.3 load handling device

Part of the machine for carrying the specified loads.

3.4 operator's work area

Area on or off the machine where order picking, stock taking or similar work is carried out.

3.5 operator's position

Position, on or off the machine, comprising the driving position and the operator's work area.

3.6 deterring/impeding device

Any physical obstacle which, without totally preventing access to a danger zone, reduces the probability of access to this zone by offering an obstruction to free access.

3.7 rated load

Maximum load which the machine has been designed to carry, excluding the mass of operator(s) and any part of the machine.

3.8 test load

Rated load and additional load (e.g. person) multiplied by 1,25.

3.9 rated speed

Maximum speed of the machine for which it has been designed and for which normal operation is guaranteed by the vendor.

3.10 safety gear

Mechanical device for stopping and maintaining stationary the lifting carriage in case of overspeeding in the downward direction.

3.11 specified load

Load with specified characteristics (mass, dimensions, pallet or container, packaging, etc.) which the machine has been designed to carry.

3.12 transfer device

Device used for transferring a storage and retrieval machine from one aisle to another. This is not integral with the storage and retrieval machine.

3.13 maintenance position

Position on or off the machine for safe maintenance and repair.

3.14 key

Device which can be mechanical, electrical, magnetic or similar with unique characteristics.

3.15 maximum working pressure

Maximum pressure corresponding to the setting of the pressure relief valve.

3.16 operating pressure

The pressure at which the system is designed to work.

3.17 satellite vehicle

An individual vehicle connected to the lifting carriage of the machine and used for transferring loads into or out of the rack structure.

3.18 load transfer area

An area where loads are transferred into or out of the machine operating area.

3.19 work station

A place where persons carry out their duties.

3.20 traffic area

An area which personnel use for travel from one place to another.

4 List of hazards

The following hazards are applicable in the situations described and could involve significant risks to persons if not reduced or eliminated. The corresponding requirements are designed to limit the risk or reduce the hazard in each situation.

Hazard	Corresponding requirements
4.1 Mechanical hazards	
4.1.1 Crushing from collapse of racking due to contact with the machine	5.3.6.6 Unintentional lowering 5.5.2 End stops 5.5.3 Limitation of forces 5.5.5 Load handling interlocks 5.9.1 Safety clearances 7.4 Load handling devices
4.1.2 Shearing of a person on board between moving machine and racking	6.2.2/7.1 Protection of operator's position 5.8.1 Protection of maintenance position
4.1.3 Cutting due to broken glass	6.1.2.3/6.1.2.10 Safety glass 6.1.4.2 Protected lighting
4.1.4 Entanglement	Not applicable
4.1.5 Drawing-in or trapping of a person in a maintenance position when machine operated by a driver	5.8.4 Communication
4.1.6 Impact from: a) fall of objects from operator's position b) collision between machine and persons	6.1.2.3 Operator's platform floor 5.8.5 Protection from operating machines 5.9.2 Limited access 5.9.3 Load entry/exit protection 5.9.5 Escape 10.3.5 Operator check of aisle 10.3.6 No unauthorized person in aisles 10.3.7 Permit to work system 10.4.1.9 No danger from second machine
4.1.7 Stabbing or puncture	Not applicable
4.1.8 Abrasion	Not applicable
4.1.9 High pressure fluid ejection	Not applicable
4.1.10 Ejection of parts	Not applicable
4.1.11 Loss of stability	5.4.5/5.7.4 Stability 5.5.1 Load stability
4.1.12 Slip, trip or fall on operator's platform	5.9.2.2c Access door interlock 6.1.2.3 Horizontal slip-resistant floor
4.1.13 Rollover	Not applicable
4.1.14 Contact with wheels	Not applicable
4.1.15 Handling of machine	5 Lifting points 8.1 Erection and dismantling
4.1.16 Falling objects	5.3.7.2 No separation of lifting carriage 5.3.8.2 No rack and pinion disengagement 6.1.2.8 Overhead protection
4.1.17 Fall of person from elevated operator position	6.1.1.3 Prevention of falls from access means 6.1.2.3 Floor design 6.1.2.4 Guard rails 6.1.2.7 Operator's position door opening 10.3.14 Driver leave with machine in position 10.3.19 No person on load handling device