

RÖÖBASTEL LIIKUVAD VIRNASTAJAD. VIRNASTAJATE
OHUTUSNÕUDED

Rail dependent storage and retrieval equipment -
Safety requirements for S/R machines

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 528:2021 sisaldab Euroopa standardi EN 528:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 528:2021 consists of the English text of the European standard EN 528:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 10.03.2021.	Date of Availability of the European standard is 10.03.2021.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

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ICS 53.080

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English Version

Rail dependent storage and retrieval equipment - Safety requirements for S/R machines

Transtockeurs - Prescriptions de sécurité

Regalbediengeräte - Sicherheitsanforderungen

This European Standard was approved by CEN on 4 January 2021.

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Contents

Page

European foreword.....	6
Introduction.....	8
1 Scope	9
2 Normative references	9
3 Terms and definitions.....	11
4 Safety requirements and/or protective/risk reduction measures.....	14
4.1 General	14
4.2 Control position	14
4.2.1 General	14
4.2.2 Access to and egress from the permanent on-board control position	14
4.2.3 Floor of the on-board control position	14
4.2.4 Design and dimensioning of permanent on-board control position	14
4.2.5 Emergency call device on permanent on-board control positions	15
4.2.6 Lighting on permanent on-board control position	15
4.3 Control equipment.....	16
4.3.1 General	16
4.3.2 Safeguard of the operator on a permanent on-board control position	16
4.3.3 Prevention of unauthorised operation (equipment switch)	16
4.3.4 Changing mode of operation (mode switch)	16
4.3.5 Key dependence	17
4.3.6 Control devices for powered movements.....	17
4.3.7 Control device identification.....	17
4.3.8 Stop function	17
4.3.9 Emergency stop function	18
4.3.10 Safety requirements related to EMC.....	18
4.4 Hoist unit.....	18
4.4.1 Hoist unit brake	18
4.4.2 Limitation of the lifting and lowering movement.....	19
4.4.3 Overload and slack condition protection	19
4.4.4 Safety gear and overspeed governor.....	20
4.4.5 Suspension elements.....	21
4.4.6 Hydraulic drives	24
4.4.7 Lead-screw drive	24
4.4.8 Rack and pinion drives.....	25
4.5 Travel unit of the S/R machine.....	25
4.5.1 Travel unit braking system.....	25
4.5.2 Speed reducing system.....	26
4.5.3 Limitation of travel.....	26
4.5.4 Anti-derailment devices.....	27
4.5.5 Stability	27
4.6 Load handling devices	28
4.6.1 Load stability.....	28
4.6.2 Determination of possible impacts on the rack	28
4.6.3 Rotating devices.....	28
4.6.4 Interlocking functions	28
4.6.5 Auxiliary handling equipment.....	28
4.6.6 Load position monitoring.....	29

4.6.7	Satellites	29
4.7	Electrical equipment	29
4.7.1	General	29
4.7.2	Electrical supply conditions	29
4.7.3	Environment	29
4.7.4	Supply disconnecting (isolating) device	29
4.7.5	Protection against electric shock	30
4.7.6	Suspension of safeguarding	30
4.7.7	Overriding of safety functions	30
4.8	Transfer device	30
4.8.1	General	30
4.8.2	Retention of position	31
4.8.3	Movement	31
4.8.4	Interlocking functions	31
4.8.5	Stability	31
4.9	Maintenance repair and fault clearance	31
4.9.1	General	31
4.9.2	Maintenance position	31
4.9.3	Emergency control position	32
4.9.4	Speed limitation	32
4.9.5	Communication	33
4.9.6	Protection from operating machines (S/R machines and its transfer equipment)	33
4.9.7	Access along the mast	33
4.10	Machine environment	35
4.10.1	General	35
4.10.2	Communication of force information	35
4.10.3	Safety clearances	35
4.10.4	Safeguarding of persons (Limiting access)	35
4.10.5	Load entry / exit points	36
4.10.6	Escape from dangerous areas	37
4.10.7	Protection against unintentional load movement	38
4.10.8	Protection against falling	39
5	Verification of safety requirements and/or measures	39
5.1	Examination	39
5.1.1	General	39
5.1.2	Movements to be done	39
5.1.3	Test of the safety gear	39
5.1.4	Verification of the mechanical limits of travel	40
5.1.5	Test of the lowering control valve	40
5.1.6	Written record	40
5.2	EMC	40
5.3	Noise	40
5.3.1	General	40
5.3.2	Noise measurement	40
5.3.3	Declaration	41
5.4	Load tests	42
5.4.1	Test load	42
5.4.2	Static load test	42
5.4.3	Dynamic load test	42
5.4.4	Load test record	42
6	Information for use	42
6.1	General	42
6.2	Erection on site	42
6.3	Commissioning	42
6.3.1	Method statement	42

6.3.2	Instructions	43
6.3.3	Training	43
6.3.4	Safety devices.....	43
6.3.5	Individual elements of the machine	43
6.3.6	Integrated commissioning	43
6.4	Normal operation	43
6.4.1	General	43
6.4.2	Operation and use	43
6.4.3	Maintenance, repair and fault-clearing.....	43
6.4.4	Spare parts.....	43
6.4.5	Certification of suspension elements	43
6.4.6	Noise declaration.....	43
6.4.7	Test report	44
6.4.8	Minimum markings	44
6.4.9	Conditions for the safe operation of equipment	44
6.5	Fault finding/troubleshooting.....	47
6.5.1	General	47
6.5.2	Description of safe access and egress to trouble points on the S/R machine.....	47
6.5.3	Description of safe access and egress to trouble points at the interface between S/R machine and racking.....	47
6.5.4	Description of safe access and egress to trouble points at the interface between the S/R machine and the conveying system.....	47
6.5.5	Training	47
6.6	Rescue of persons.....	47
6.7	Maintenance, inspection, testing and training	47
6.7.1	General	47
6.7.2	Maintenance	47
6.7.3	Periodic maintenance and testing.....	48
6.7.4	Training	49
6.8	Dismantling	49
Annex A (informative) Figures.....		50
Annex B (normative) Performance levels according to EN ISO 13849-1:2015.....		58
Annex C (normative) Preventing access to dangerous movements across the load entry/exit points.....		65
C.1	General	65
C.2	Preventing access besides the conveyor.....	65
C.2.1	Preventing access between conveyor and fixed guards.....	65
C.2.2	Preventing access between conveyor tracks.....	66
C.3	Preventing access under the conveyor	67
C.4	Preventing access over the conveyor	67
C.4.1	General	67
C.4.2	Preventing access by limited opening height and tunnels	67
C.4.3	Preventing access by minimum height of conveying level	69
C.4.4	Preventing access by design of gravity roller conveyor	71
C.4.5	Preventing access by mechanical guards	73
C.5	Stopping the dangerous movement of the S/R-machines.....	75
C.6	Additional organizational measures.....	76
Annex D (normative) Access to restricted areas.....		77

Annex E (normative) Verification of safety requirements and/or measures	80
Annex F (normative) List of significant and relevant hazards.....	87
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EU aimed to be covered.....	92
Bibliography.....	99

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European foreword

This document (EN 528:2021) has been prepared by Technical Committee CEN/TC 149 “Power-operated warehouse equipment”, 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 September 2021, and conflicting national standards shall be withdrawn at the latest by September 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document 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 document.

This document supersedes EN 528:2008.

The main changes compared to the previous edition EN 528:2008 are as follows:

- clearer / more understandable Annex C dealing with preventing access to dangerous movements across the load entry/exit points;
- Annex ZA has been updated by introducing the generic template for Annex ZA amended in accordance with decision of EU commission;
- revision and adaption of Annex B Performance level according to EN ISO 13849-1:2015;
- the scope has been stated more precisely;
- more readable and clearer text in standard due to avoidness of separate chapters for automatic and manual machines;
- amendment or rather change of the following definitions (3):
 - on-board control position (3.4), permanent on-board control position (3.5), load entry / exit points (3.7), working place (3.8), pick and deposit station (3.9), restricted area (3.11), danger area (3.12), satellite vehicle (3.15), powered access cabin (3.20), climb assistance system (3.21), rated speed (3.22), normal operation (3.25), deleted definition 3.22 and renamed following definitions;
- speed limitation (4.9.4) has been updated and been stated more precisely;
- where a powered access cabin is provided, it shall comply with the requirements for control positions (4.9.7.2);
- Detachable ladders may be used up to a maximum height of 3 m (4.9.7);
- safety gear required for lifting carriages, that are designed to carry person(s) (4.4.4.1);
- the ratio of the minimum breaking force to the maximum static force for all types of suspension elements to the lifting of persons has been reduced from 10 to 8 (4.4.5.1);
- requirements for additional person(s) on the lifting carriage has been stated more precisely (4.9.2.2);

- ladder along the mast shall be fitted with a guided type of a fall arresters according with EN 353-1:2014+A1:2017 and anchor points at the transition points (4.9.3);
- prevention against load falling into adjacent automatically operated aisles: Safety level (PLr) is not more depending on the frequency of access to the aisle (4.10.7.3);
- physical safety backstops shall be dimensioned according to the loads that occur (4.10.7);
- information on the planned dismantling of the installation is required in information for use (6.8).

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulars, accident prevention organizations, market surveillance etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the Scope of this standard.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards, for machines that have been designed and built according to the requirements of this type-C standard.

While producing this standard, it was assumed that:

- a) only competent persons operate the machine;
- b) components without specific requirements are:
 - 1) designed in accordance with the usual engineering practice and calculation codes, including all failure modes;
 - 2) of suitable mechanical and electrical construction;
 - 3) made of materials with adequate strength and of suitable quality;
- c) harmful materials, such as asbestos are not used as part of the machine;
- d) components are kept in good repair and working order, so that the required characteristics remain despite wear;
- e) by design of the load bearing elements, safe operation of the machine is ensured for loading ranging from zero to 100 % of the rated possibilities;
- f) discussions have taken place between the user and the supplier concerning particular conditions for the use and places of use of the machinery;
- g) working area is adequately lit;
- h) places of installation allow a safe use of the machine.

1 Scope

This document is applicable to all types of Storage and Retrieval (S/R) machines, restricted to the rails on which they travel within and outside the aisles for the storage and retrieval of unit loads and/or long goods such as bar materials and/or for order picking or similar duties. These machines embody lifting means along a mast and may include lateral handling facilities. Also included is the transfer equipment used to change between aisles. Control of machines may range from manual to fully automatic.

S/R-machine-related satellite vehicles according to definition 3.15 are included as a load-handling-device (LHD).

References in this standard to racking, buildings and systems only apply where it is necessary to assess the hazards and risks at their interfaces with S/R machines.

This document deals with all significant hazards relevant to rail dependent storage and retrieval equipment, when they are used under the conditions intended by the manufacturer including reasonably foreseeable misuse (see Annex F "List of significant hazards").

This document is applicable to machines and equipment that are manufactured after the date of issue of this document. A transition period of 12 months is proposed.

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

Safety requirements and/or measures in this standard apply to equipment used under indoor conditions. However, additional risk assessments and safety measures need to be considered for uses in severe conditions, e.g. extremely high temperatures, loads, the nature of which could lead to a dangerous situation (e.g. especially brittle loads, explosives), earthquake effects and also contact with foodstuff.

This document also deals with the technical requirements for electromagnetic compatibility (EMC).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 81-50:2020, *Safety rules for the construction and installation of lifts — Examinations and tests — Part 50: Design rules, calculations, examinations and tests of lift components*

EN 341:2011, *Personal fall protection equipment — Descender devices for rescue*

EN 353-1:2014+A1:2017, *Personal fall protection equipment — Guided type fall arresters including an anchor line — Part 1: Guided type fall arresters including a rigid anchor line*

EN 358:2018, *Personal protective equipment for work positioning and prevention of falls from a height — Belts and lanyards for work positioning or restraint*

EN 361:2002, *Personal protective equipment against falls from a height — Full body harnesses*

EN 363:2018, *Personal fall protection equipment — Personal fall protection systems*

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 795:2012, *Personal fall protection equipment — Anchor devices*

EN 894-1:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 894-3:2000+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 12385-4:2002+A1:2008, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

EN 13501-1:2018, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

prEN 14449:2017, *Glass in building — Laminated glass and laminated safety glass — Product standard*

EN 60204-32:2008, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*

EN IEC 61000-6-2:2019, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2:2016)*

EN 61496-1:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

EN ISO 13851:2019, *Safety of machinery — Two-hand control devices — Principles for design and selection (ISO 13851:2019)*

EN ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

EN ISO 13856-1:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors (ISO 13856-1:2013)*

EN ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*

EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access (ISO 14122-1:2016)*

EN ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2016)*

EN ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*

EN ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2016)*

ISO 16625:2013, *Cranes and hoists — Selection of wire ropes, drums and sheaves*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

control position

every place, from where the machine can be controlled, including external control position (3.2), emergency control position (3.3) and on-board control position (3.4)

3.2

external control position

control position placed outside of the operational area of the S/R machine, from where the movements of the machine can be controlled

3.3

emergency control position

position on the machine or inside the danger area of the machine, from where the machine can be controlled in case of fault clearing (emergency) or maintenance works

3.4

on-board control position

protected position on the machine, from where the movements of the machine can be controlled (includes permanent on-board-control position as defined in 3.5)

3.5

permanent on-board control position

protected position on the machine, from where the movements of the machine can be controlled, intended to be used by an on-board operator in the normal operation

Note 1 to entry: Permanent on-board control is fitted e.g. for on-board picking.