# SLOVENSKI STANDARD
# SIST EN 528:1999/A1:2003

**01-maj-2003**

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**Regalna skladiġ a - Streġne naprave - Varnost - Dopolnilo A1**

Rail dependent storage and retrieval equipment - Safety

Regalbediengeräte - Sicherheit



Transtockeurs - Sécurité

**Ta slovenski standard je istoveten z:** **EN 528:1996/A1:2002**



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**ICS:**

| | | |
|---|---|---|
| 53.080 | Skladiġ na oprema | Storage equipment |

**SIST EN 528:1999/A1:2003** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 528:1996/A1

December 2002

ICS 53.080

English version

## Rail dependent storage and retrieval equipment - Safety

Transtockeurs - Sécurité

Regalbediengeräte - Sicherheit

This amendment A1 modifies the European Standard EN 528:1996; it was approved by CEN on 16 October 2002.

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This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Ref. No. EN 528:1996/A1:2002 E

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## Foreword

This document EN 528:1996/A1:2002 has been prepared by Technical Committee CEN/TC 149 “Power-operated warehouse equipment”, the secretariat of which is held by DIN.

This Amendment to the European Standard EN 528:1996 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

# Annex C
# (normative)

# Safety categories in accordance with EN 954-1

This normative annex has been prepared under the following assumptions:

— The risk assessment has been based on the risk graph in annex B of EN 954-1:1996.

— Only category B has been selected in accordance with EN 954-1:1996 if more than one measure is stipulated in EN 528 to fulfil the safety-related functions.

— Safety categories for motors, brakes and other structural elements, e.g. end stops, have not been taken into account.

— The safety categories reflect the state of the art.

## 1 Normative references

EN 954-1:1996, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*



EN 50110-1:1996, *Operation of electrical installations*



## Table C.1 Safety categories for safety-related parts



The safety categories in this table specify the control function requirements of the designated subclauses of EN 528:1996.

Unless otherwise indicated, the categories apply to safety-related parts and not to safety-related functions as listed in the relevant clauses of this standard

| Subclause | Safety requirement from EN 528 | Category | Supplementary information |
|---|---|---|---|
| 5.2.1 | **Prevention of unauthorized operation** | **1** | |
| 5.2.2 | **Changing mode of operation** | **1** | The requirements of 5.2.3 shall also be noted for safe access to the work area of the machine. See also Table C.2. |
| 5.2.6 | **Emergency stop equipment** | **1**<br>**(2/4)** | If individual devices with electronic parts (e.g. emergency stop equipment) are used for the emergency stop system, they shall be to category 2.<br>If electronic devices are the only means of transmitting emergency stop commands or if the emergency stop system contains programmable controls, the system shall be to category 4. |
| 5.3.1.1 | **Hoist unit brake** | **1** | Category 1 relates to brake protection.<br>See also Table C.2. |
| 5.3.2.a | **Limitation of the lifting and lowering movements –** Preliminary devices | **B** | See also Table C.2. |
| 5.3.2.b | **Limitation of the lifting and lowering movements –** Control devices for correct direction | **B** | See also Table C.2. |
| 5.3.2.c | **Limitation of the lifting and lowering movements –** Time delay for the stop function in controlled drives | **2** | Category 2 relates to the time delay equipment. |

| Subclause | Safety requirement from EN 528 | Category | Supplementary information |
|---|---|---|---|
| 5.3.3 | **Overload protection** | **1 (2)** | If electronic devices are used for the overload protection system, they shall be to category 2. |
| 5.3.4.3 | **Safety gear and overspeed governor –** Operation of the overspeed governor. | **1** | Safety components for lifts (EN 81-1) are assumed to be well-tried components here. |
| 5.3.4.5 | **Safety gear and overspeed governor –** Stopping of the hoist unit | **1 (B)** | Category B, if the safety gear is triggered and slackening or overloading of suspension elements is not possible. |
| 5.3.4.6 | **Safety gear and overspeed governor –-** Monitoring of the overspeed governor drive | **1 (2)** | If electronic devices are used for the overspeed protection system, they shall be to category 2. |
| 5.3.4.7 | **Safety gear and overspeed governor -** Leadscrew drives or direct acting hydraulic drives | **1 (2)** | If electronic devices are used for the overspeed protection system, they shall be to category 2. |
| 5.3.5.6 | **Suspension elements –** Monitoring of the suspension elements | **B** | |
| 5.3.6.6 | **Hydraulic drives –** Unintentional lowering | **1** | See also Table C.2. |
| 5.3.6.7 | **Hydraulic drives –** Valves of the auxiliary hoist unit | **1** | |
| 5.3.7.3 | **Leadscrew drives –** Monitoring of the safety nuts | **1** | |
| 5.4.1.1a | **Travel unit – Braking system -** Braking system for normal operation | **B (1)** | Category 1 applies to the brake protection if a mechanical braking system is used for normal operation. See also Table C.2. |
| 5.4.1.1b | **Travel unit - Braking system -** Mechanical braking system | **1** | Category 1 relates to brake protection. See also Table C.2. |
| 5.4.1.2 | **Travel unit – Braking system -** Additional braking system | **1** | Category 1 relates to brake protection. See also Table C.2. |
| 5.4.2 | **Speed reducing system** | **2 (3)** | Category 2 only for automatic machines (without operator's position on machine), if the design of the mechanical equipment prevents the machine from tipping over or leaving the rail. Category 3 for machines with operator's position and all other cases. See also Table C.2. |
| 5.4.3.a | **Limitation of travel –** Buffers or other equivalent devices | **-(3)** | Category 3 applies if no suitable buffer is available to absorb the energy of the travel movement. See also Table C.2. |
| 5.4.3.b | **Limitation of travel –** Operational devices to interrupt the power supply | **B** | See also Table C.2. |
| 5.4.3.b | **Limitation of travel –** Monitoring of the buffers | **1** | See also Table C.2. |
| 5.4.3.c | **Limitation of travel –** Ultimate limit switch | **1** | See also Table C.2. |
| 5.4.3.d | **Limitation of travel –** Means to prevent collisions | **2 (3)** | Category 2 only for automatic machines (without operator's position on machine), if the design of the mechanical equipment prevents the machine from tipping over or leaving the rail. Category 3 for machines with operator's position and all other cases. See also Table C.2. |

| Subclause | Safety requirement from EN 528 | Category | Supplementary information |
|---|---|---|---|
| 5.4.4.1 | **Anti-derailment device** | **3** | Category 3 applies only if non-mechanical devices are used in addition to or instead of mechanical devices. |
| 5.4.4.2 | **Anti-derailment device –** Interlocking devices | **3** | |
| 5.5.2 | **Load handling devices – End stops** | **B** | Category B applies only for additional limiting devices..<br>See also Table C.2. |
| 5.5.3 | **Load handling devices – Limitation of forces** | **B** | Category B applies to other limiting devices.<br>See also Table C.2. |
| 5.5.4 | **Load handling devices – Rotating devices –** Braking system | **1** | Category 1 applies to brake protection. |
| 5.5.5a,b,c,d | **Load handling devices – Interlocks** | **B** | Category B applies to all monitoring devices. It is state of the art that these monitoring devices are linked by interlocks, sequencing controls and plausibility checks in the control system (e.g. programmable controls).<br>See also Table C.2. |
| 5.5.7 | **Load handling devices – Load position monitoring** | **B** | Category B applies to all monitoring devices. It is state of the art that these monitoring devices are linked by interlocks, sequencing controls and plausibility checks in the control system (e.g. programmable controls).<br>See also Table C.2. |
| 5.5.8.2 | **Load handling devices – Satellite vehicles –** Position monitoring | **B** | Category B applies to all monitoring devices. It is state of the art that these monitoring devices are linked by interlocks, sequencing controls and plausibility checks in the control system (e.g. programmable controls).<br>See also Table C.2. |
| 5.6.3 | **Electrical equipment – Unintended connection** | **1** | Category 1 applies to the electrical components. Work on the electrical installation shall only be carried out taking into account the requirements of 6.2 of EN 50110-1:1996. |
| 5.7.1 | **Transfer device – Retention of position** | **2** | See also Table C.2. |
| 5.7.2 | **Transfer device – Movement** | **2** | See also Table C.2. |
| 5.7.3 | **Transfer device - Interlocking** | **3** | If a mechanical solution is available, the notes on 5.4.1, 5.4.2 and 5.4.3 shall be taken into account. See also Table C.2. |
| 5.8.3 | **Maintenance and repair – Speed limitation** | **B** | |
| 5.8.5 | **Maintenance and repair – Protection from operating machines** | **1** | Category 1 relates only to other suitable measures. |
| 5.9.2.2c | **Machine environment – Limited access –** Stopping and restarting of the machine | **1 (2)** | If electronic devices (e. g. proximity switches) are used for the door protection system, they shall be to category 2.<br>See also Table C.2. |
| 5.9.2.2d | **Machine environment – Limited access –**<br>Locking access doors more than 1 m above ground level | **1** | Category 1 relates to the additional locking device.<br>See also Table C.2. |

| Subclause | Safety requirement from EN 528 | Category | Supplementary information |
|---|---|---|---|
| 5.9.2.2e | **Machine environment – Limited access** – Locking of movable panels | **1 (2)** | If electronic devices (e. g. proximity switches) are used for the door protection system, they shall be to category 2.<br>See also Table C.2. |
| 5.9.2.4 | **Machine environment – Limited access –** Sensing devices | **2** | Category 2 applies only to sensing devices.<br>See also Table C.2. |
| 5.9.2.5 | **Machine environment – Limited access –** Safety devices (e. g. warning means) | **B** | Category B relates only to electrical warning devices. |
| 5.9.3.1 | **Machine environment – Load entry and exit –** Load transfer areas | **2** | Category 2 applies only to sensing devices. |
| 5.9.3.2 | **Machine environment – Load entry and exit –** Gravity roller systems | **2** | Category 2 applies only to sensing devices. |
| 5.9.4 | **Machine environment – Interaction with other equipment** | **2** | Relates to the control of the rail dependent storage and retrieval equipment. |
| 5.9.6 | **Machine environment – Protection against unintentional load movement** | **B** | For sensing devices - see notes on 5.5.5. |
| 6.1.2.6 | **Machines with on-board operator's position – Operator's position – Design and dimensioning of operator's position –** Interlocking of guard rails | **1** | |
| 6.1.2.7 | **Machines with on-board operator's position – Operator's position – Design and dimensioning of operator's position –** Interlocking of doors or gates leading into the operator's position | **1** | |
| 6.2.2 | **Machines with on-board operator's position - Control equipment –** Hold to run controls | **1** | |
| 6.3.1 | **Machines with on-board operator's position - Hoist unit – Overload protection** | **1 (2)** | If electronic devices are used for the overload protection system, they shall be to category 2. |
| 6.3.2 | **Machines with on-board operator's position - Hoist unit – Overload protection – Slack rope or chain protection** | **1 (2)** | If electronic devices are used for the slack rope or chain protection system, they shall be to category 2. |
| 7.2.2 | **Machines with on-board operator's position - Control equipment – Emergency stop equipment** | **1**<br>**(2/4)** | If individual devices with electronic parts (e.g. emergency stop equipment) are used for the emergency stop system, they shall be to category 2.<br>If electronic devices are the only means of transmitting emergency stop commands or if the emergency stop system contains programmable controls, the system shall be to category 4. |