

DIN 56950-1:2012-05 (E)

Entertainment technology - Machinery installations - Part 1: Safety requirements and inspection

| Contents | | Page |
|--------------------|--|-------------|
| Foreword | | 4 |
| Introduction | | 6 |
| 1 | Scope | 7 |
| 2 | Normative references | 8 |
| 3 | Terms and definitions | 10 |
| 3.1 | General terms | 10 |
| 3.2 | Loads and forces | 12 |
| 3.3 | Electrical equipment | 13 |
| 3.4 | Tolerances relating to movement | 17 |
| 3.5 | Machine group travel | 18 |
| 3.6 | Examples of machinery installations | 19 |
| 4 | Hazards | 21 |
| 5 | Design requirements | 23 |
| 5.1 | Load assumptions | 23 |
| 5.2 | Load bearing equipment and structural elements | 24 |
| 5.3 | Load carrying devices | 29 |
| 6 | Safeguarding hazardous areas | 30 |
| 6.1 | Protective spaces | 30 |
| 6.2 | Safeguarding at crushing, shearing and trapping points, and fall protection | 30 |
| 6.3 | Accessibility of maintenance areas | 30 |
| 6.4 | Elevator shaft walls, openings and landing doors | 31 |
| 6.5 | Counterweights | 31 |
| 7 | Electrical equipment and control systems | 31 |
| 7.1 | General requirements | 31 |
| 7.2 | Incoming supply conductor terminations and devices for disconnecting and switching off | 33 |
| 7.3 | Protection against electric shock | 33 |
| 7.4 | Protection of equipment | 34 |
| 7.5 | Control circuits and control functions | 34 |
| 7.6 | Safety functions and control functions in the event of failure | 38 |
| 7.7 | Emergency stop and emergency switching-off functions | 42 |
| 7.8 | Electronic and programmable electronic systems (E/PES) | 43 |
| 7.9 | Use of programmable electronic systems (E/PES) without safety functions | 43 |
| 7.10 | Operator interfaces, control devices and contactors | 44 |
| 7.11 | Conductors and cables | 44 |
| 7.12 | Wiring practices | 45 |
| 7.13 | Electric motors and associated equipment | 45 |
| 7.14 | Accessories and lighting | 45 |
| 7.15 | Marking, warning signs and reference designations | 45 |
| 7.16 | Technical documentation | 45 |
| 7.17 | Testing and verification of characteristics | 45 |
| 8 | Information for use | 46 |

| | | |
|---|--|----|
| 8.1 | General | 46 |
| 8.2 | Data to be agreed | 46 |
| 8.3 | Documentation | 47 |
| 8.4 | Maintenance instructions | 47 |
| 8.5 | Marking | 48 |
| 8.6 | Instruction handbook | 49 |
| 9 | Testing prior to commissioning | 50 |
| Annex A (normative) Checklist for visual and functional checks | | 51 |
| Annex B (normative) Examples of hazards, hazardous situations and hazardous events associated with machinery installations as in this standard | | 59 |
| Annex C (normative) Designing safeguards on the basis of risk assessment | | 65 |
| C.1 | General | 65 |
| C.2 | Risk assessment as in DIN EN 61508 (VDE 0803) (all parts) | 65 |
| C.2.1 | General | 65 |
| C.2.2 | Consequence risk parameter (C) | 66 |
| C.2.3 | Frequency and exposure time risk parameter (F) | 66 |
| C.2.4 | Possibility of avoiding the hazard risk parameter (P) | 67 |
| C.2.5 | Probability of the unwanted occurrence risk parameter (W) | 67 |
| C.3 | Risk assessment as in DIN EN ISO 13849-1 | 68 |
| C.3.1 | General | 68 |
| C.3.2 | Guidance for selecting parameters S, F and P for the risk estimation | 69 |
| Annex D (informative) Examples of using the risk graphs | | 71 |
| D.1 | General | 71 |
| D.2 | Use of an unregulated three-phase asynchronous motor, with double brake, for moving loads at a speed of 0,15 m/s | 72 |
| D.2.1 | Illustration | 72 |
| D.2.2 | Requirements | 72 |
| D.2.3 | Risk assessment | 72 |
| D.2.4 | Consequence (C or S) | 72 |
| D.2.5 | Frequency of, and exposure time in, the hazardous zone (F) | 73 |
| D.2.6 | Possibility of avoiding the hazardous event (P) | 73 |
| D.2.7 | Probability of the unwanted occurrence (W) | 73 |
| D.3 | Use of computer control to provide protection when the synchronization tolerance is exceeded during the automated synchronized travel of a group of hoists at a speed of 1,2 m/s | 74 |
| D.3.1 | Illustration | 74 |
| D.3.2 | Requirements | 74 |
| D.3.3 | Risk assessment | 74 |
| D.3.4 | Consequence (C) | 75 |
| D.3.5 | Frequency of, and exposure time in, the hazardous zone (F) | 75 |
| D.3.6 | Possibility of avoiding the hazardous event (P) | 75 |
| D.3.7 | Probability of the unwanted occurrence (W) | 75 |
| Bibliography | | 76 |