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