DIN EN 16985:2019-04 (E)

Spray booths for organic coating material - Safety requirements

Contents

Page

European foreword 6

1 Scope 8

2 Normative references 9

3 Terms, definitions, variables and abbreviations 11
3.1 Terms and definitions 11
3.2 Variables 15
3.3 Abbreviations 17

4 Safety requirements and/or -measures 18
4.1 General 18
4.2 Mechanical 18
4.2.1 Moving or rotating elements 18
4.2.2 Falling objects 18
4.2.3 Height from the ground 19
4.2.4 Slippery surface 19
4.3 Electrical 19
4.4 Thermal 19
4.5 Noise 19
4.6 Radiation 20
4.7 Contact with and inhalation of hazardous material 21
4.7.1 General 21
4.7.2 Automatic application 22
4.7.3 Manual application 22
4.8 Fire 26
4.8.1 General 26
4.8.2 Spray booth construction 27
4.8.3 Filter media 27
4.8.4 Fire detection 27
4.8.5 Fire extinguishing equipment 28
4.9 Explosion 28
4.9.1 General 28
4.9.2 Spray booth for liquid coating material 29
4.9.3 Spray booth for powder coating material 31
4.10 Safety devices and control systems 34
4.11 Trapping 36
4.11.1 General 36
4.11.2 Manual spray booth 36
4.11.3 Automatic spray booth 37
4.12 Ergonomics 37
4.12.1 General 37
4.12.2 Access 37
4.12.3 Working area 37
4.12.4 Climatic environment 37
4.12.5 Luminous environment 38
4.12.6 Maintenance 38
4.13 Environment in which the machinery is used 38

5 Verification of the safety requirements 38

6 Information for use ... 44
6.1 General ... 44
6.2 Instruction handbook ... 44
6.2.1 General ... 44
6.2.2 Information related to installation ... 45
6.2.3 Information related to operation ... 46
6.2.4 Information related to maintenance ... 46
6.3 Marking ... 47

Annex A (informative) Hazards ... 49

Annex B (informative) Examples of classification of hazardous zones ... 53

B.1 Example 1 ... 53
B.2 Example 2 ... 54
B.3 Example 3 ... 56
B.4 Example 4 ... 58
B.5 Example 5 ... 60
B.6 Example 6 ... 62

Annex C (normative) Calculated average concentration of flammable substances ... 65

C.1 General ... 65
C.2 Spray booths for liquid coating material containing organic solvents ... 65
C.2.1 General ... 65
C.2.2 Example for the calculation of concentration of flammable substances on the basis of a given air flow velocity (manual spray booth) ... 65
C.2.3 Example for the calculation of required minimum fresh air flow (automatic spray booth) . 66
C.3 Spray booths for organic powder coating material ... 67
C.3.1 General ... 67
C.3.2 Example for the calculation of coating powder concentration ... 67
C.3.3 Example for the calculation of maximum coating powder input ... 68
C.4 Filters for powder coating booths ... 69
C.4.1 General ... 69
C.4.2 Example for the calculation of coating powder concentration in the clean air part of the filter ... 69

Annex D (normative) Air flow velocity measurement ... 71

D.1 Measurement equipment ... 71
D.2 Measurement procedure ... 71
D.2.1 Measurement conditions ... 71
D.2.2 Air flow velocity components ... 71
D.3 Measurement points ... 72
D.3.1 Vertically ventilated spray booth (liquid and powder, internal working area) ... 72
D.3.2 Vertically ventilated spray booth with designated workpiece (liquid and powder,internal working area) ... 73
D.3.3 Vertically ventilated segmented spray booth ... 73
D.3.4 Horizontally ventilated spray booth (liquid and powder) ... 75
D.3.5 Openings of a spray booth ... 76
D.3.6 Summary of air flow velocity parameters ... 76

Annex E (informative) Ignitability of water-based paint ... 79

Annex F (normative) Energy-efficiency and reduction of environmental impact ... 80

F.1 General ... 80
F.2 Spray booths for liquid coating material ... 80
F.2.1 Acquisition ... 80
F.2.2 Production ... 80
F.2.3 Use ... 80
F.2.3.1 Input ... 80

F.2.3.1.1 Material 80
F.2.3.1.2 Water 80
F.2.3.1.3 Energy 81
F.2.3.2 Output 81
F.2.3.2.1 Emissions to air 81
F.2.3.2.2 Waste 81
F.2.3.2.3 Noise 81
F.2.4 End of life 82
F.3 Spray booths for powder coating 82
F.3.1 Acquisition 82
F.3.2 Production 82
F.3.3 Use 82
F.3.3.1 Input 82
F.3.3.2 Output 82
F.3.3.2.1 Emissions to air 82
F.3.3.2.2 Waste 82
F.3.3.2.3 Noise 82
F.3.4 End of Life 83

Annex G (informative) Examples for safety related controls 84

G.1 General 84
G.2 Interlocking of forced ventilation system with interface to spray application 84

Annex H (informative) Determination of the spray booth clearance time using smoke 86

H.1 General 86
H.2 Procedure 86

Annex I (informative) Estimation of the spray booth purge time 87

I.1 General 87
I.2 Example 87

Annex J (informative) Examples for ventilation of spray booths with working pits 89

J.1 Ventilation of working pits 89
J.2 Measurement of air flow velocity in working pits 93

Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered 95

Bibliography 98