

# DIN EN 12581:2006-03 (E)

## Coating plants - Machinery for dip coating and electrodeposition of organic liquid coating material - Safety requirements

---

<b>Contents</b>		<b>Page</b>
Foreword .....		5
Introduction .....		6
<b>1</b>	<b>Scope .....</b>	<b>7</b>
<b>2</b>	<b>Normative references .....</b>	<b>7</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>10</b>
<b>4</b>	<b>List of significant hazards .....</b>	<b>16</b>
4.1	General .....	16
4.2	Mechanical hazards .....	16
4.2.1	Shearing, crushing, cutting, entanglement, drawing-in and impact hazards .....	17
4.2.2	Loss of stability (of the dip or electrophoretic coating machinery) .....	17
4.2.3	Entrapment hazard .....	17
4.2.4	Personnel's slip, trip and fall of personnel .....	17
4.3	Electrical hazards .....	17
4.3.1	Electrical shock .....	17
4.3.2	External influence on electrical equipment hazards .....	18
4.4	Thermal hazards .....	18
4.5	Hazards generated by noise .....	18
4.6	Hazards resulting from dangerous substances .....	18
4.7	Fire and explosion hazards .....	18
4.7.1	Fire hazard .....	18
4.7.2	Explosion hazard .....	19
4.8	Hazards caused by failure of energy supply .....	19
4.9	Hazards related to failure of control systems .....	20
<b>5</b>	<b>Safety requirements and/or measures .....</b>	<b>20</b>
5.1	General .....	20
5.2	Mechanical safety requirements .....	20
5.2.1	Safeguarding of danger points .....	20
5.2.2	Safety measures against loss of stability (of dip or electrophoretic coating machinery and their parts) .....	23
5.2.3	Protective measures against entrapment .....	23
5.2.4	Measures against personnel's slip, trip and fall .....	24
5.3	Electrical safety requirements .....	24
5.3.1	General .....	24
5.3.2	Measures against electrical shock .....	24
5.3.3	Measures against external influence on electrical equipment .....	24
5.4	Safety requirements and measures against thermal hazards .....	25
5.4.1	Heating systems .....	25
5.4.2	Measures against contact of the skin with hot surfaces .....	26
5.4.3	Measures against radiation and/or convection of heat .....	26
5.4.4	Measures against overheating of organic liquid coating material .....	26
5.5	Safety requirements and measures against noise .....	26
5.6	Safety requirements against dangerous substances .....	28
5.6.1	Measures against contact with/or absorption of dangerous fluids (organic liquid coating material, solvents) .....	28
5.6.2	Measures against inhalation of dangerous volatile substances .....	29

5.6.3	Measures against inhalation of toxic gases released by the heating device .....	32
5.6.4	Measures against contact with hazardous foams or inhalation of hazardous gases, vapours emitted by fire extinguishing equipment .....	32
5.7	Safety requirements and measures against fire and explosion .....	32
5.7.1	Fire .....	32
5.7.2	Explosions .....	33
5.8	Safety requirements and measures against failure of energy supply .....	35
5.9	Safety requirements and measures against failure of control systems .....	36
5.9.1	General .....	36
5.9.2	Level of safety .....	37
5.9.3	Emergency stop equipment .....	37
5.9.4	Failure or malfunction of the control system .....	37
6	Verification of the safety requirements and/or measures .....	37
6.1	General .....	37
6.2	Mechanical .....	38
6.3	Electrical .....	38
6.4	Thermal .....	38
6.5	Noise .....	38
6.6	Dangerous substances .....	38
6.6.1	Tank and ancillary equipment .....	38
6.6.2	Measures against contact with/or absorption/or inhalation of hazardous fluids or vapours .....	38
6.7	Verification of the safety requirements and measures against fire and explosion .....	39
6.7.1	Fire .....	39
6.7.2	Explosion .....	39
6.7.3	Limitation of concentration .....	39
6.7.4	Hazardous areas and ignition sources .....	40
6.8	Failure of energy supply .....	40
6.9	Control systems .....	40
7	Information for use .....	40
7.1	General .....	40
7.2	Instruction handbook .....	40
7.3	Marking .....	44
Annex A (normative) Diagrams related to hazardous zones of potentially explosive atmosphere .....		45
Annex B (normative) Determination of concentration of flammable solvents in terms of LEL .....		47
B.1	Dip coating machinery using solvent borne coating material .....	47
B.1.1	General .....	47
B.1.2	Calculation .....	47
B.1.3	Example: Calculation of the required minimum exhaust volume flow .....	48
B.2	Electrophoretic and dip coating machinery using water borne coating material .....	49
B.2.1	General .....	49
B.2.2	Data .....	49
B.2.3	calculation .....	49
Annex C (informative) Diagrams relative to dip and electrophoretic coating machinery classification .....		52
Annex D (informative) Classification of material's reaction to the fire - National standards .....		55
Annex E (informative) Reference to national exposure limit values .....		56
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC .....		57
Annex ZB (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC .....		58

<b>Bibliography .....</b>	<b>59</b>
<b>Figures Figure A.1 -- Dip coating machinery using solvent-borne coating material, with enclosure ..</b>	<b>45</b>
<b>Figure A.2 -- Dip coating machinery using solvent-borne coating material with or without enclosure .....</b>	<b>46</b>
<b>Figure C.1 -- Dip coating machinery without specific enclosure - with or without operator (see 5.6.2.2) .....</b>	<b>52</b>
<b>Figure C.2 -- Dip coating machinery with specific enclosure - with or without operator (see 5.6.2.3) .</b>	<b>53</b>
<b>Figure C.3 -- Electrophoretic coating machinery without specific enclosure - with or without operator (see 5.6.2.4) .....</b>	<b>53</b>
<b>Figure C.4 -- Electrophoretic coating machinery enclosed into a treatment tunnel - without operator (see 5.6.2.5) .....</b>	<b>54</b>