

# DIN EN 17059:2018-10 (E)

## Plating and anodizing lines - Safety requirements

---

<b>Contents</b>		<b>Page</b>
European foreword .....		6
Introduction .....		7
<b>1</b>	<b>Scope .....</b>	<b>8</b>
<b>2</b>	<b>Normative references .....</b>	<b>9</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>11</b>
<b>4</b>	<b>Requirements .....</b>	<b>17</b>
4.1	General .....	17
4.2	Mechanical safety requirements .....	17
4.2.1	General .....	17
4.2.2	Measures against shearing, crushing, cutting, drawing in and impact hazards .....	17
4.2.3	Safety measures against loss of stability .....	19
4.2.4	Safety measures against entanglement and entrapment .....	20
4.2.5	Safety measures against slipping, tripping and falling .....	21
4.2.6	Safety measures against hazards by pressurized materials .....	21
4.3	Electrical safety requirements .....	21
4.3.1	General .....	21
4.3.2	Safety measures against electric shock .....	21
4.3.3	Protective measures against external effects on electrical equipment .....	22
4.3.4	Protective measures against electric sparks / arcs .....	22
4.4	Safety requirements and protective measures against thermal hazards .....	22
4.4.1	General .....	22
4.4.2	Measures against skin contact with hot surfaces .....	23
4.4.3	Measures against skin contact with hot fluids .....	23
4.4.4	Measures against thermal radiation and/or - convection .....	23
4.4.5	Measures against overheating of process chemistries .....	24
4.5	Safety requirements and protective measures against noise .....	25
4.6	Hazardous substances .....	25
4.6.1	General .....	25
4.6.2	Health .....	28
4.6.3	Explosion .....	29
4.7	Safety measures against fire .....	30
4.7.1	General .....	30
4.7.2	Ignition sources .....	30
4.7.3	Constructive measures .....	31
4.7.4	Procedural measures .....	31
4.7.5	Thermal load .....	31
4.7.6	Fire alarm and extinguishing system .....	32
4.7.7	Additional measures .....	32
4.7.8	Information for use .....	32
4.8	Safety requirements against hazards by failure of energy supply or control .....	32
4.9	Safety requirements for control systems .....	33
4.9.1	Safety functions .....	33
4.9.2	Equipment .....	35
4.9.3	Failure or malfunction of control systems .....	36
<b>5</b>	<b>Determination of compliance with safety requirements and / or protective measures .....</b>	<b>37</b>
5.1	General .....	37

5.2	Mechanical hazards .....	37
5.3	Electrical hazards .....	37
5.4	Thermal hazards .....	37
5.5	Noise .....	37
5.6	Hazardous substances .....	37
5.6.1	General .....	37
5.6.2	Health .....	38
5.6.3	Explosions .....	39
5.7	Fire .....	39
5.8	Failure of energy supply .....	39
5.9	Safety requirements for control systems .....	39
6	Information for use .....	39
6.1	General .....	39
6.2	Instruction handbook .....	40
6.2.1	Minimum information of the instruction handbook .....	40
6.2.2	Information relating to the use of plating lines .....	43
6.2.3	Maintenance .....	43
6.3	Marking .....	45
<b>Annex A (informative) Significant hazards .....</b>		<b>46</b>
A.1	General .....	46
A.2	Mechanical hazards .....	46
A.2.1	General .....	46
A.2.2	Shearing, crushing, cutting, drawing in and impact hazard .....	46
A.2.3	Loss of stability .....	46
A.2.3.1	Loss of stability of plating lines .....	46
A.2.3.2	Loss of stability of transporter system .....	47
A.2.4	Entanglement and entrapment .....	47
A.2.5	Hazards by slipping, tripping or falling .....	47
A.2.6	Hazards by pressurized materials and equipment .....	47
A.3	Electrical hazards .....	48
A.3.1	Electromagnetic fields .....	48
A.3.2	Electric shock .....	48
A.3.3	Electric sparks / arcs .....	48
A.4	Thermal hazards .....	48
A.5	Hazards generated by noise .....	48
A.6	Hazards resulting from dangerous substances .....	49
A.6.1	Health .....	49
A.6.2	Explosion hazard .....	49
A.7	Fire .....	50
A.8	Hazards caused by failure of energy supply or control system .....	50
<b>Annex B (informative) Examples of transporter units .....</b>		<b>51</b>
<b>Annex C (informative) Examples of working areas .....</b>		<b>56</b>
<b>Annex D (normative) Calculation of airflow for tanks with lids and open tanks .....</b>		<b>59</b>
D.1	Introduction .....	59
D.2	Calculations for tanks with lids .....	59
D.3	calculations for open tanks .....	61
D.4	Calculations for enclosing hoods, tunnels .....	62
<b>Annex E (normative) Exhaustive list of the captured air velocities (mean speed) in the main bath used in plating and anodizing industry .....</b>		<b>64</b>
<b>Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered .....</b>		<b>75</b>
<b>Bibliography .....</b>		<b>76</b>

<b>Figures: Figure 1 -- Reinforced plastic process tanks .....</b>	<b>19</b>
<b>Figure B.1 -- One rail overhead transporter with support rail - one belt design .....</b>	<b>51</b>
<b>Figure B.2 -- One rail overhead transporter with support rail - two belt design .....</b>	<b>52</b>
<b>Figure B.3 -- Two rail overhead transporter with guiderails .....</b>	<b>52</b>
<b>Figure B.4 -- Two rail overhead transporter with driptrail .....</b>	<b>53</b>
<b>Figure B.5 -- Transversing overhead transporter - Coordinates unit .....</b>	<b>53</b>
<b>Figure B.6 -- Side-arm transporter .....</b>	<b>54</b>
<b>Figure B.7 -- Portal transporter running on tank rims .....</b>	<b>54</b>
<b>Figure B.8 -- Transfer unit .....</b>	<b>55</b>
<b>Figure B.9 -- Transfer unit between line rows - wet and or dry process step .....</b>	<b>55</b>
<b>Figure C.1 -- manual plating line, working area .....</b>	<b>56</b>
<b>Figure C.2 -- semi-automatic plating line, working area .....</b>	<b>57</b>
<b>Figure C.3 -- automatic two-legs plating line, working area .....</b>	<b>58</b>
<b>Figure D.1 -- Tank with lid - upper openings between lid and tank .....</b>	<b>59</b>
<b>Figure D.2 -- Tank with lid - lateral openings between lid and tank .....</b>	<b>60</b>
<b>Figure D.3 -- Tank with lid - lateral openings at three sides between lid and tank .....</b>	<b>60</b>
<b>Figure D.4 -- Open tank - extraction on one side .....</b>	<b>61</b>
<b>Figure D.5 -- Open tank - extraction on both sides .....</b>	<b>61</b>
<b>Figure D.6 -- Tunnel .....</b>	<b>62</b>
<b>Figure D.7 -- Tank with enclosing hood .....</b>	<b>63</b>
<b>Tables: Table D.1 -- Parameter a, b, n for Formula D.2: Calculation for open tanks with different arrangements to the wall .....</b>	<b>62</b>
<b>Table E.1 -- Exhaustive list of the captured air velocities (mean speed) in the main bath used in plating and anodizing industry .....</b>	<b>64</b>
<b>Table ZA.1 -- Correspondence between this European Standard and Annex I of Directive2006/42/EC .....</b>	<b>75</b>