- i) minimum size of workpieces if required that the workpiece covers at least 40 % of the air flow measurement plane;
- j) required minimum exhaust flow rate at 20°C (m³/h);
- k) for spray booths for liquid coating material (see Annex C.2):
 - 1) maximum input of solvents (g/h);
 - 2) LEL of solvent or coating material (if unknown 40 g/m³);
- l) for spray booths for powder coating material (see Annex C.3):
 - 1) maximum input of coating powder (g/h);
 - 2) LEL of coating powder material (if unknown 20 g/m³);
- m) marking according to EN 12198-1:2000+A1:2008 referring to hazards generated by radiation, if applicable.

Annex A (informative)

Hazards

Table A.1 lists all significant hazards related to spray booths.

Table A.1 —	List of significant hazards
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Origin	Potential consequences	Specific requirements of this standard
A.1 Mechanical		
a) Approach of a moving element to a fixed part (conveyor system, manipulator, doors, fans).	 crushing; drawing-in or trapping; impact; shearing; entanglement. 	4.2.1 4.10 4.11
b) Falling objects (workpieces) e.g. from overhead-conveyors.	 crushing; drawing-in or trapping; impact; shearing; entanglement. 	4.2.2 4.11
c) Height from the ground (elevated working areas, elevated maintenance areas, working pits).	impact;falling.	4.2.3
d) Moving elements (doors, conveyor).	 drawing-in or trapping; impact; shearing; entanglement. 	4.2.1 4.10 4.11 4.12
e) Rotating elements (fans, pumps, conveyors).	 cutting; drawing-in or trapping; impact; shearing. 	4.2.1 4.10
f) Slippery surface (working area floor).	 slipping; tripping; falling. 	4.2.4

Origin	Potential consequences	Specific requirements of this standard		
A.2 Electrical				
a) Electrical equipment (lights, distribution fuse-board, drying systems, electro-valves, etc.).	 burn; electrocution; fire; explosion; shock. 	4.3 4.8 4.9		
b) Charging of conducting elements (e.g. gratings, workpiece holding frame).	 consequences of electrostatic discharge (e.g. falling); fire; explosion. 	4.3		
c) Electrostatic phenomena.	 burn; electrocution; fire; explosion; shock. 	4.3 4.10		
d) Not enough distance to live parts (electrostatic application systems).	 burn; electrocution; falling, being thrown; fire; explosion; shock. 	4.3 4.10		
A.3 Thermal				
a) Flame (direct heating system).	 burn; fire; explosion. 	4.4		
b) Radiation from heat sources (drying system, heating system).	 burn; fire; explosion. 	4.4		
c) Hot surfaces (motors, heating systems).	burn;fire;explosion.	4.4		

Or	igin	Potential consequences	Specific requirements of this standard
A. 4	Noise		
a) b) c) d) e) f)	Forced ventilation system; Leakage of pressurized gas; Spraying machinery; Unbalanced rotating parts; Whistling pneumatics; Scrubber system.	 discomfort; stress; tinnitus; tiredness; decrease of hearing capacity; any other (for example, mechanical, electrical) as a consequence of an interference with speech communication or with acoustic signals. 	4.5
A.5	5 Radiation		-
a)	Optical radiation (infrared, visible and ultraviolet).	burn;damage to eyes and skin.	4.6 4.10
A.6	6 Material		
a) b) c) d) e)	Aerosol (atomized paint); Dust (coating powder); Fluid (solvent, liquid paint); Vapour (formed by solvent); Gas (combustion products).	 breathing difficulties; suffocation; carcinogenic, mutagenic or reprotoxic effects; poisoning; respiratory or cutaneous sensitization; asthma. 	4.7 4.10
f)	Flammable (paint, coating powder, combustion media).	 explosion; fire.	4.8 4.9 4.10
g)	Biological and microbiological (viral or bacterial) agent; (air conditioning system, scrubber system).	 asthma; infection; respiratory or cutaneous sensitization. 	4.7
h)	Fibre (filters, insulation).	 breathing difficulties; cancer; irritation. 	4.7

Origin	Potential consequences	Specific		
		requirements of this standard		
A.7 Ergonomics				
 a) Access; b) Design or location of indicators and visual displays units; c) Design, location or identification of control devices; d) Effort; e) Insufficient lighting (flicker, dazzling, shadow); f) Posture; g) Repetitive activity; h) Visibility; i) Air flow. 	 discomfort; fatigue; musculoskeletal disorder; stress; any other (for example, mechanical, electrical) as a consequence of a human error. 	4.12		
A.8 Hazards associated with the environment in which the machinery is used				
a) Dust (from other processes).	• insufficient supply air resulting in exposure to hazardous substances.	6.2.2		
b) Gas (from other processes or recirculated from spray booth exhaust).	 breathing difficulties; suffocation; poisoning; respiratory or cutaneous sensitization; asthma. 	4.7.1		
c) Moisture.	• discomfort.	4.12		
d) Temperature.	• discomfort.	4.12		
e) Wind.	 malfunction of exhaust system resulting in exposure to hazardous substances; recirculation of exhaust air resulting in exposure to hazardous substances. 	4.7.1		
A.9 Combination of hazards	1			
a) Mechanical obstacles and emergency situation (e.g. fire);b) Missing means of escape and emergency situation (e.g. fire).	 trapping; any other (for example, fire) as a consequence of missing possibility to escape. 	4.11 4.13		

Annex B (informative)

Examples of classification of hazardous zones

B.1 Example 1

Figures B.1 and B.2 show the hazardous zones for a manual spray booth for liquid coating material with

- C_{LEL Liquid} < 25 % in the internal volume of spray booth;
- C_{LEL Liquid} < 10 % in the internal volume of exhaust air cleaning system.





Figure B.1 — Manual spray booth for liquid coating material (top view)





zone 2



B.2 Example 2

Figures B.3 and B.4 show the hazardous zones for an automatic spray booth for liquid coating material with

- $C_{LEL Liquid} < 25 \%$ in the internal volume of spray booth;
- sections of the internal volume which cannot be reached by the robot;
- $C_{LEL Liquid} > 10 \%$ and < 25 % in the internal volume of exhaust air cleaning system.







Figure B.3 — Automatic spray booth for liquid coating material operated at $C_{LEL\ Liquid} < 25\ \%$ (top view)

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zone 2



B.3 Example 3

Figures B.5 and B.6 show the hazardous zones for an automatic spray booth for liquid coating material with

- $25 \% < C_{LEL Liquid} < 50 \%$ in the internal volume of spray booth;
- $25 \% < C_{LEL Liquid} < 50 \%$ in the internal volume of the exhaust air cleaning system;
- $25 \% < C_{LEL Liquid} < 50 \%$ in the internal volume of the exhaust air ducting and recirculation air ducting.











Key



Figure B.6 — Automatic spray booth for liquid coating material operated at 25 % < C_{LEL Liquid} < 50 % (side view)

B.4 Example 4

Figures B.7 and B.8 show the hazardous zones for a spray booth for powder coating material with open recovery system with

- C_{LEL Powder} < 50 % in the internal volume of spray booth; •
- C_{LEL Powder} < 50 % in the powder laden air part of the open powder recovery system; •
- powder deposits safely prevented around permanent openings of the spray booth. .