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Fire protection
systems
for the protection of

■ — powder coating systems



Fire suppressing system

The process of electrostatic powder coating means working with flammable and explosive powder air mixtures. The risks must be recognised and should be included in the planning stage.

The essential risks are the danger of fire within the booth, the danger of fire in the open filters, as well as the danger of explosion in the enclosed cyclone and filter by burning powder particles that are sucked through the ducts from the booth.

Example: During the cleaning of the filter pads the disturbed powder can be ignited by the burning powder particles. This could lead to the bursting of the filter unit and represent a considerable danger for persons and plant.

The following requirements exist, amongst others, from the standards EN 50177:2009 and EN 12981:2005+A1:2009

1 Fire detection system in booths with powder guns

(EN 12981:2005+A1:2009-5.2.4.1 & 5.2.4.2)

Fire detection and locking must be built up into safety category 3, i.e. redundant.

(EN 12981:2005+A1:2009-2010-5.6.1.3)

The detection in the booth is executed by extremely sensitive flame detectors suitable for Ex Zone 22. These react within milliseconds and are not tripped by daylight.

2 Fast reacting fire suppressing system (flame block) at enclosed recovery system such as a filter

(EN 12981:2005+A1:2009-5.6.2.5)

At fire detection an extinguishing agent flame block is set up in front of the powder recovering system, by the nozzles, to prevent a possible fire breakout into the powder recovering system.

3 Switching off the ventilation, the filter cleaning, the high voltage and the spraying system

(EN 12981:2005+A1:2009-5.6.1.3 & EN 50177:2009-5.2.2)

The fire detection and control device process the incoming signals and immediately starts the alarm and switches off the coating plant.

4 Earth control unit for workpiece, to ensure they are earthen (Leak resistance < 1 MΩ)

For the supervision of the earthing an earthing control unit can be installed in front of the booth. For personal security reasons it works with 24V.

(EN 50177:2009-5.7.3)

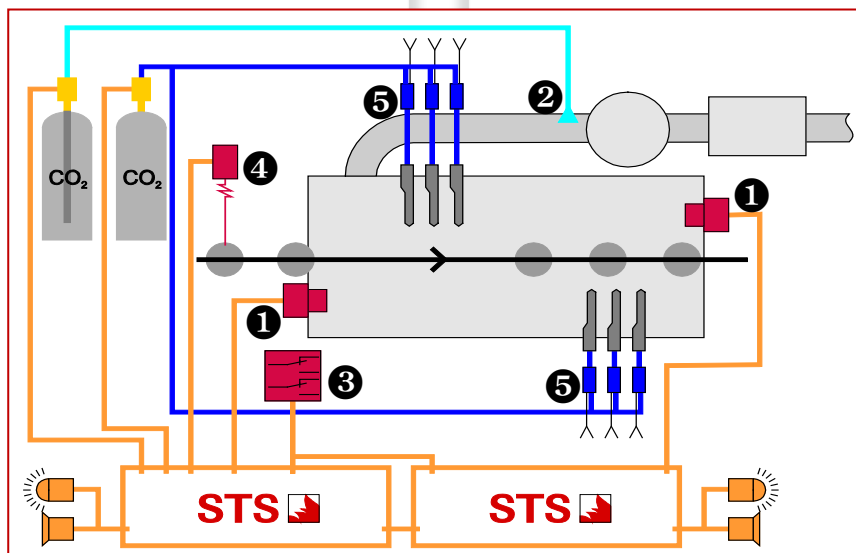
The resistance to earth from the suspending point of each workpiece shall not exceed 1 MΩ. The voltage during measurement shall be 500V or 1000 V. The construction of hangers shall ensure that the workpieces remain earthed during the coating process.

5 Locally acting automatic fire extinguishing system for spraying systems

(EN 50177:2009-5.2 Table 2 & 5.2.5)

A locally acting automatic fire extinguishing system is required for spraying systems of the category 3D of the types B-P and C-P.

The result: A fast reacting fire suppression system represents the optimum technical and price solution for explosion protection.



Standard requirements

Extract from EN 50177:2009 “Stationary electrostatic application equipment for ignitable coating powders”

5.2 Requirements for spraying systems of the category 3D
Table 2

5.2.5 Locally acting automatic fire extinguishing system ^{a)} for type B-P and C-P

^{a)} A locally acting automatic fire extinguishing system is not required if exclusively spraying systems of the category 2D of the types B-P and C-P are used in explosive areas of the zone 22.

5.2.5 Locally acting automatic fire extinguishing system

Electrostatic spraying systems shall be equipped with locally acting automatic fire extinguishing systems which are actuated immediately in case of fire. When the fire extinguishing system has been activated, the high voltage supply, the supply of coating materials and the pressurised air shall be cut off automatically. Regarding powder recovering systems, the requirements of EN 12981 shall be satisfied.

EN 13478 shall be observed.

...

NOTE: In addition to the room-protection system, locally acting fire extinguishing systems (fire extinguishing systems which are installed and allocated to the object) shall protect the area between the powder outlet and the workpiece effectively.

5.7.3 The resistance to earth from the suspending point of each workpiece shall not exceed 1 MΩ. The voltage during measurement shall be 500 V or 1000 V. The construction of hangers shall ensure that the workpieces remain earthed during the coating process.

NOTE Since workpieces are often earthed by metallic hooks, it is important to clean these hooks regularly or to design them in such way, that the built-up of insulating layers of coating materials is prevented.

6.2 Tests of the stationary equipment

6.2.10 Effectivity of locally acting fire extinguishing system

7.2.3 Test intervals

For a safe operation of the stationary equipment for electrostatic spraying of ignitable coating powders the intervals for repeated tests shall be determined by the manufacturer. The intervals depend on the operational and local conditions. The following maximum test intervals are recommended:

Table 4 - Test intervals

6.2.10 Fire extinguishing plant: 6 months

Extract from EN 12981:2005+A1:2009 “Spray booths for application of organic powder coating material”

5.2.4.1 The following control systems are considered safety-related: ...detection of fire and fire alarm; interlocking circuits as dealt with in 5.6.1.3;...

5.2.4.2 Control, monitoring and measurement circuits which are used in safety-related functions shall fulfil the requirements of EN 954-1 category 3 and EN 1088. For safety-related functions see EN 954-1 and CR 954-100.

5.6.1.3 Fire detection system and interlocking

Powder spray booths as defined in 3.1 shall be equipped with a fire detection system, independent of the type of powder recovery system. The fire detection system shall:

- fulfil the requirements in 5.2.4;
- have a response time less than 0,5 s;
- cut off in following order: the power supply, coating powder supply, filter cleaning and the forced ventilation system;
- initiate a visible and audible alarm according to EN981

5.6.2.5 Protective measures against explosion

To protect against possible explosions enclosed powder recovery systems shall be fitted with:

- either explosion suppression
- or explosion relief venting into a safe area combined with explosion decoupling
- or explosion decoupling combined with explosion pressure proof design of the enclosed recovery system
- or rapid acting fire suppression to prevent flame propagation from the powder spraying booth to the enclosed recovery system, but only if the existence of ignition sources inside the enclosed recovery system can be precluded.

Contact

STS Brandschutzsysteme GmbH
Feldstraße 10
D-71292 Frieolzheim

Postfach 1140
D-71288 Frieolzheim
Germany

Tel +49 (0)7044 94 17 20
Fax +49 (0)7044 94 17 29
Web www.sts-brandschutz.de

info@sts-brandschutz.de
verkauf@sts-brandschutz.de
service@sts-brandschutz.de