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Fire-fighting with Aerosol

Product information Stat-X

Contents

1. Properties

Stat-X aerosol fire extinguishers and quenching installations work with a solid aerosol-forming compounds that transforms into a quick expanding, highly appropriate and effective dry quenching aerosol based on potassium compounds after activation.

The Stat-X aerosol fire extinguishers and quenching installations are characterised by the following properties:

- they are more appropriate and effective than all other standard quenching fluids
- the quenching fluid is kept in non-pressurised containers made of stainless steel
- the quenching fluid is environmentally friendly and not harmful to the ozone layer
- ODP = 0 (Ozone Depletion Potential)
- GWP = 0 (Global Warning Potential)
- ALT = minimal (Atmospheric Life Time)
- the quenching fluid is not toxic and has no damaging effect on humans, animals and plants in the given concentrations
- they are automatic and can be connected to any standard alarm, notification or activation installation. Some models are autonomous and require no external power supply or compressed air control for their operation
- they can be supplied in varying :
  - Sizes (depending on the intended protection volume)
  - Types (depending on the specific wishes in a project)
- The maintenance requirements are minimal compared to other installations.

2. Description of the function principle

Supply wiring for the electrical activation of the devices are located on the upper side of the electrical design of the Stat-X aerosol fire extinguishers and quenching installations (E-models).

Some models are activated at a temperature of 70°C, 95°C or 123°C, depending on their type, using a so-called thermo-head (temperature-sensitive sensor). These T-models can also be activated mechanically by pulling away a flap.

Outlet openings are located on the underside of the device, generating an even distribution of the quenching aerosol. The Stat-X aerosol fire extinguishers and quenching installations are activated either electrically or thermally/mechanically. The activation occurs through an element which supplies the required energy in order to set off the chemical transformation of the solid quenching material. Once activated, the solid material is transformed into a rapidly expanding quenching aerosol that escapes through the outlet openings after passing through a cooling section and quenches the fire in the space to be protected within seconds.

Versorgungsdrähte = Feed wires

Aussenbehälter = Outer container

Aerosol-bildendes Material = Aerosol-forming material

Isolationsschicht = Insulation layer

Oxidationsschicht = Oxidation layer

Innenbehälter = Inside container

Kühlschicht = Cooling layer

Austrittsöffnungen = Outlet openings

Löschaerosol = Quenching aerosol

3. Quenching principle

The Stat-X aerosol fire extinguishers and quenching installations trigger a chemical reaction after their activation, generating an aerosol composed of nitrogen, water and potassium compounds.

The aerosol generated by the Stat-X aerosol fire extinguishers and quenching installations fights and quenches fire not through asphyxiation (removal of oxygen) or cooling, but through impediment of the chemical combustion reaction on the molecular level, without affecting the oxygen content in the volume to be protected.

The aerosol is made of particles in microscopic size. These particles are suspended in an inert gas, whereby the ratio of exposed surface to reaction mass is extremely high (which is why the required quantity for quenching can be limited to a minimum amount). The particles with so small dimensions stay in suspension relatively long so as to be able to enter natural convection currents upon ignition. This increases the effectiveness of the quenching fluid.

4. Quenching process

Stat-X aerosol fire extinguishers and quenching installations generate a quenching aerosol whose particles dispose of a quenching power that is determined by a chemical chain reaction in the environment without affecting the available oxygen content in the environment.

The quenching effect is achieved through two processes (physical process, chemical process):

- Physical process

  The physical quenching process is based on chemical-physical properties. These elements require the lowest energy for ionisation compared to other materials (smallest ionisation voltage).

  This circumstance, along with the fact that only very little energy is required, allows for the separation of electrons from the atoms. The required quantity of energy is supplied by the energy available in the fire. The ionisation of potassium during quenching can be recognized by the slightly purple colour of the flame. The energy available in the flame is therefore reduced by the ionisation voltage of the available elements

- Chemical process

  During combustion, certain reactions occur in rapid succession between atoms and fragments of unstable molecules (radicals). Such reactions for the so-called chain reactions of radicals. Because of their unstable character, radicals tend to achieve a stable final state via further reactions. The stable end products are among others carbon dioxide (CO2) and water (H2O). The potassium that is released by the decomposition of the potassium compounds reacts with the free radicals of unstable hydroxides during combustion. This creates potassium hydroxide (KOH), a highly stable compound. At this stage, the chain reaction of the free radicals is stopped and the flame dies out.

5. Technical properties

Duration until exit:	from approx. 3 seconds
Required concentration in the volume: class)	from 48 grams per m^3 (depending on the potential fire
Effectiveness duration: wishes)	between 30 and 120 minutes (depending on customer
Electrical activation:	min. 6-24 Volt continuous voltage, 0,5-2 A, 1-2 seconds
Testing current:	max. 5mA
activation time:	immediate
Storage temperature:	from -54 °C to +54 °C
Relative air humidity:	maximum 98%
Fire classes:	A, B, C, E (up to 40.000 Volt)

6. Examples for the activation

- Manually operated system
  The transportable devices can be activated manually and rolled in the direction of the fire.
- Thermal and manual system
  These devices can be activated by a temperature-sensitive sensor or manually (independently from the power supply or compressed air)
- Electrical system – **is used in the present case**
  Triggering occurs through an electrical signal of the fire notification installation in monitored design.
- Special design (Option)
  Automated system
  The devices can be activated by automated installations that process signals from standard alarms.

7. Properties of the released aerosol

Electrical conductivity:	none, tested up to 40.000 Volt
Corrosiveness:	none
Heat shock:	none
Electrostatic load:	none
Condensation:	not applicable
Residue after quenching:	minimal

8. Volumetric protection levels

Protection level

- Complete protection
- Total protection and local protection for identifiable potential hazard sources
- Total protection of particularly important objects (e.g. objects of value, cultural goods)

Stat-X aerosol fire extinguishers and quenching installations were developed both for the universal volumetric protection (total protection) as well as for local protection. This means that the protection per cubic meter is offered and calculated on the basis of which fire extinguisher type and which quantity of quenching fluid are required for the optimal protection of the given volume or object.
For one cubic meter of space (no or little ventilation), Stat-X aerosol fire extinguishers and quenching installations require 48 grams or more of quenching fluid depending on the potential fire class (compared to 250 to 350 grams of Halon or 700 to 1500 grams for CO_2).

Note: In case of external ventilation, a higher concentration is required for the same volume, depending on the ventilation speed.

The dispersion (escape) of the quenching aerosol from the volume following the ventilation and the ventilation speed is a very important parameter to be taken into account when using aerosols for fire-fighting. For this, a ventilation shut-off control in the event of a fire is required (the ventilator stopping time should be taken into account).

9. Installation

The installation is made using a mounting bracket. No further installation components are required beyond that.