Experts in fire protection

MINIMAX

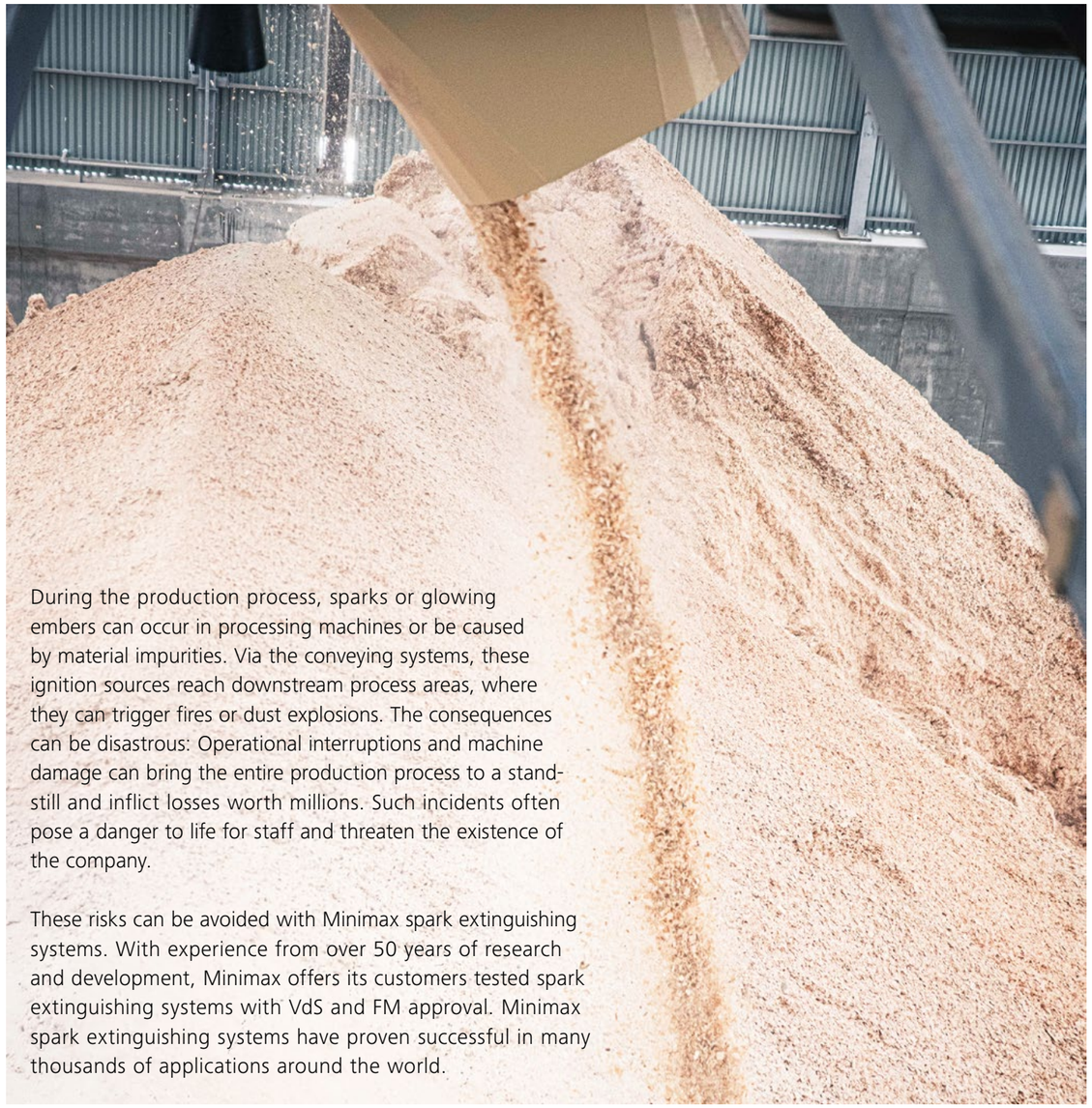
Spark Extinguishing Systems – Fire Protection for Pneumatic Conveying Systems

TECHNOLOGY

SPARK EXTINGUISHING SYSTEMS

Before sparks turn into flames

Wherever combustible materials are pneumatically conveyed, there is also a fire risk. This is particularly true for suction and conveying systems in the wood, textile, and food industries. Operators require a solution that quickly detects potential sources of ignition as they arise and deals with them in a targeted manner.



During the production process, sparks or glowing embers can occur in processing machines or be caused by material impurities. Via the conveying systems, these ignition sources reach downstream process areas, where they can trigger fires or dust explosions. The consequences can be disastrous: Operational interruptions and machine damage can bring the entire production process to a standstill and inflict losses worth millions. Such incidents often pose a danger to life for staff and threaten the existence of the company.

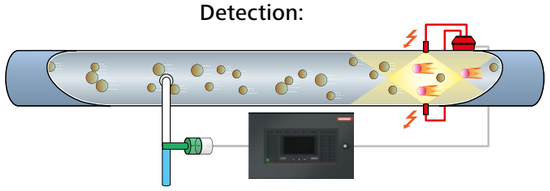
These risks can be avoided with Minimax spark extinguishing systems. With experience from over 50 years of research and development, Minimax offers its customers tested spark extinguishing systems with VdS and FM approval. Minimax spark extinguishing systems have proven successful in many thousands of applications around the world.

Minimax spark extinguishing systems detect ignition sources in suction and conveying systems and, by means of an automatic extinguishing device, swiftly produce a water spray curtain over the entire pipe cross section of the suction air duct to extinguish glowing parts. They are used wherever combustible materials are pneumatically conveyed and there is a high risk of fires or dust explosions caused by sparks or hot spots. The suppression process normally takes place without interrupting ongoing operation.

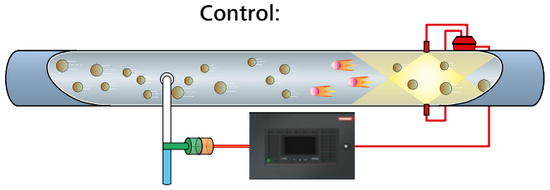
Operating principle

If the spark detectors detect sources of ignition – such as sparks or hot particles – in the conveyed material, they send a signal to the control panel. This then activates the solenoid valve of the automatic extinguishing device within milliseconds. Extinguishing water is released and introduced into the conveyor flow via the self-closing nozzle. The glowing particles fly into the water curtain created by the nozzle and are extinguished. The solenoid valve automatically closes again immediately afterwards. At the same time, alerting is activated. Depending on the number of ignition sources, an automatic machine shut-off may be performed. However, the suppression process normally takes place during production to avoid costly downtime.

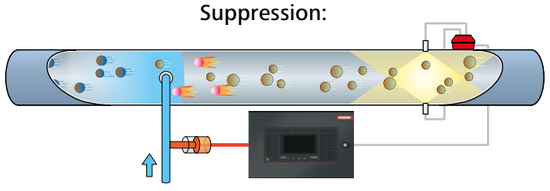
Detection:



Control:

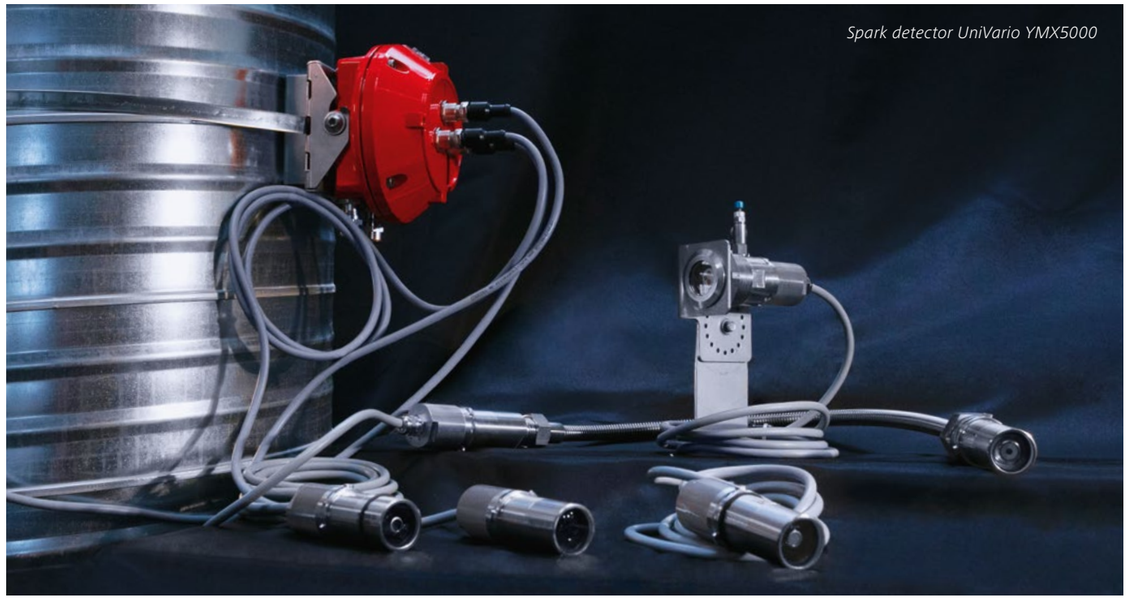


Suppression:

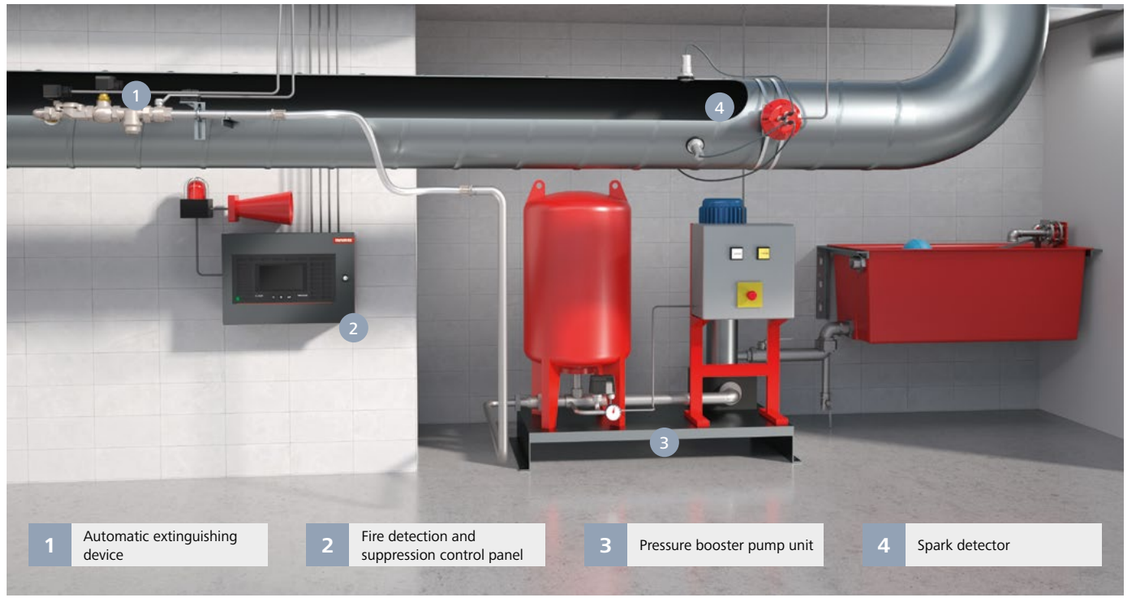


Design and function

As standard, the automatic spark extinguishing system consists of spark detectors, a control panel, and an automatic extinguishing device with the corresponding water supply.



Spark detector UniVario YMX5000



Detection
Spark detection in the closed conveying system is performed using functionally monitored UniVario YMX5000 spark detectors, which react to the infrared radiation emitted by passing ignition sources. The detector continuously monitors the functionality of its electronics and the visibility of its optics. Faults are automatically forwarded to the control panel. If elevated operating temperatures are to be expected in particular zones, functionally monitored spark detectors with fiber optics are used for thermal decoupling.

Control
The FMZ6000 spark detection control panel monitors all spark detectors, including their function monitoring, flow switches, shut-off devices, pressure booster pump units, pipe trace heating, extinguishing valves, and spark test sets. As soon as sparks are detected, the spark detection control panel activates the suppression process to prevent fire damage.

There are three spark counters per spark detector line, one of which indicates an average value over a definable period of time. These counters form the basis for further, graduated measures in case of increased or persistent flying sparks and can be used to statistically evaluate the occurrence of sparks in individual zones. The time of each spark message as well as the start and end of the spark extinguishing processes are recorded in a log accurate to the millisecond. The spark detection control panel can check the functionality of the spark detectors and suppression components at preselected times.

All cable connections are monitored separately for wire breaks and short circuits. The FMZ6000 complies with both EN 54 Part 2 and 4 for fire alarm control panels as well as EN 12094-1 for controlling gas-based extinguishing systems. In addition, the FMZ6000 is approved by VdS and FM for simultaneous operation as a spark detection, fire alarm, monitoring, and control panel for all types of fire suppression systems. All fire protection tasks for an object can therefore be performed using a single control panel. The Minimax reflex module for the FMZ6000 offers a combined fire detection and spark extinguishing function for both pneumatic conveying and suction systems. Spark detection and the suppression process take place "reflex"-ively.

When the control panel receives a spark message, it activates the quick release solenoid valve of the automatic extinguishing device and releases a dosed amount of extinguishing water. Minimax flow switches for function monitoring are not installed in the water supply but are integrated into the automatic extinguishing device. In this way, the flow of water at each extinguishing position can be individually monitored and faults can be indicated. In addition, the corresponding ball valve on the automatic extinguishing device can be electrically monitored to ensure that the water supply is unobstructed.

Suppression – safely and quickly with the Minimax flat spray nozzle F180

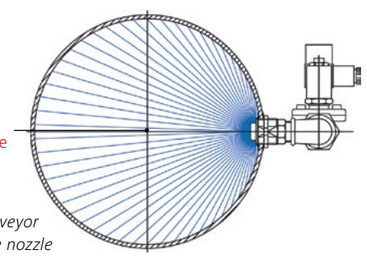
Minimax Flat spray nozzle F180

Suppression

The extinguishing water is introduced into the conveyor channel via the patented flat spray nozzle F180, which was specially developed for the particular requirements of pneumatic suction systems. The F180 nozzle produces a uniform water curtain across the entire pipe cross section with minimal water use. By contrast, conventional disk nozzles can only completely cover the cross section of the conveyor pipe by means of vortices in the conveyor flow. For this purpose, there must be a sufficiently large conveyor pipe section downstream of the nozzle position. In practice, this requires greater distances between the position of the extinguishing nozzles and subsequent equipment (such as filters or silos), which is often not the case. In conveyor pipes without vortices, such as in the area of drop shafts, the spray pattern of conventional disk nozzles only completely covers the conveyor cross section if multiple such nozzles are installed.

If the Minimax flat spray nozzle F180 is used, a single nozzle is often sufficient. The high-quality materials and the flush design of the Minimax flat spray nozzle F180 in the channel wall reduce its sensitivity to contamination and abrasion.

Spray pattern Minimax Flat spray nozzle F180



Protected zone:
180° with just one nozzle

Section through the conveyor pipe at the height of the nozzle

Valve unit G1

Pressure booster pump unit – sufficient water pressure at all times

Water supply

A pressure booster pump unit must always be installed if a sprinkler system with a pressure tank or a service water network does not deliver the minimum flow pressure required to supply the automatic extinguishing device. The main components of a pressure booster pump unit are the diaphragm pressure tank, control devices, and the centrifugal pump. When the automatic extinguishing device is activated, the diaphragm pressure tank supplies water with sufficient pressure without delay.

If the fill pressure falls below a particular value, the centrifugal pump takes over the function of supplying the suppression zone and simultaneously refills the diaphragm pressure tank. The redundant design also ensures high system reliability. If the pump fails, several extinguishing blasts from the diaphragm pressure tank are possible. Optionally, diaphragm break monitoring can also be installed.

There are many good reasons to opt for Minimax spark extinguishing systems

- **Immediately activated protection:**
  The optimized interrupt-driven evaluation of detected ignition sources makes it possible for the necessary suppression measures to be initiated almost simultaneously.

- **Reliable protection of short conveyor sections:**
  Everything is designed for the quickest possible extinguishing of sparks. Thanks to the combination of the exceptionally quick reaction time with the optimized design of the valve unit and the 180° spray angle of the flat spray nozzle, system areas with short conveyor sections can also be reliably protected.

- **Confidence in the spark sensors:**
  The visibility monitoring integrated into the sensor optics enables demand-controlled cleaning of the sensors, thus ensuring a consistently high quality of the response sensitivity of the spark sensors.

- **Simplified maintenance:**
  Spark sensors and extinguishing nozzles are assembled onto conveyor pipes and drop shafts using quick assembly kits. These also enable rapid access to the sensors and nozzles for maintenance and cleaning purposes.

- **Lower premiums:**
  Minimax spark extinguishing systems are VdS- and FM-approved, which means lower insurance premiums.

FM APPROVED

VdS

For more information:

Photos

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