Impacts of fire hazard in metall cutting production processes

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Sinorix al-deco STD – Intelligent object protection

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European legislation demands fire protection for machine tools and their equipment that pose a fire hazard

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Norms and regulations and their meaning in case of a fire

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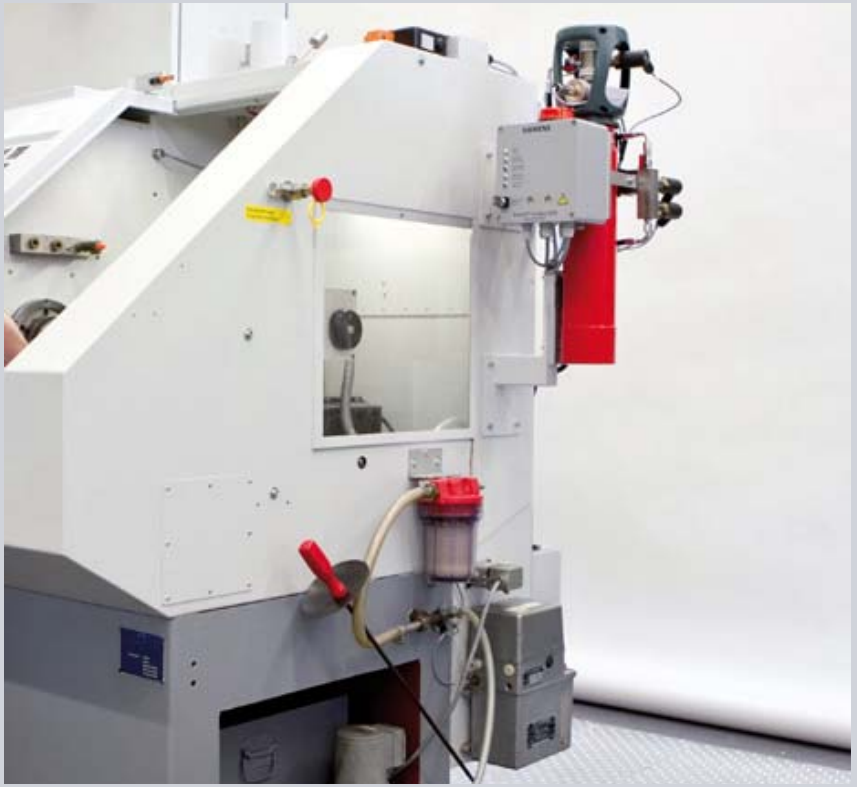
EN 13478

Norm EN 13478, „Security for machines – Fire safety“ prescribes that if there is a fire risk in a machine tool, appropriate design & engineering measures have to be taken.
If there is a conversion from water emulsion to non-hydruous-coolants – which is usually done by the user of the machine tool – in many cases the manufacturer merely calls the attention to the additional fire risk in written form.
Since the norm EN 13478 with the amendment EN 1050 – which the manufacturer has to stick to – indicates the handling of a fire risk it cannot be assumed that the manufacturer will be excluded from the liability chain in any case.



Conclusion: A machine tool manufacturer is responsible for the proper operation of a machine tool. If the user of a machine tool makes a conversion to the machine tool and thus a fire risk arises due to that conversion the danger has to be eliminated

Norms and regulations and their meaning in case of a fire

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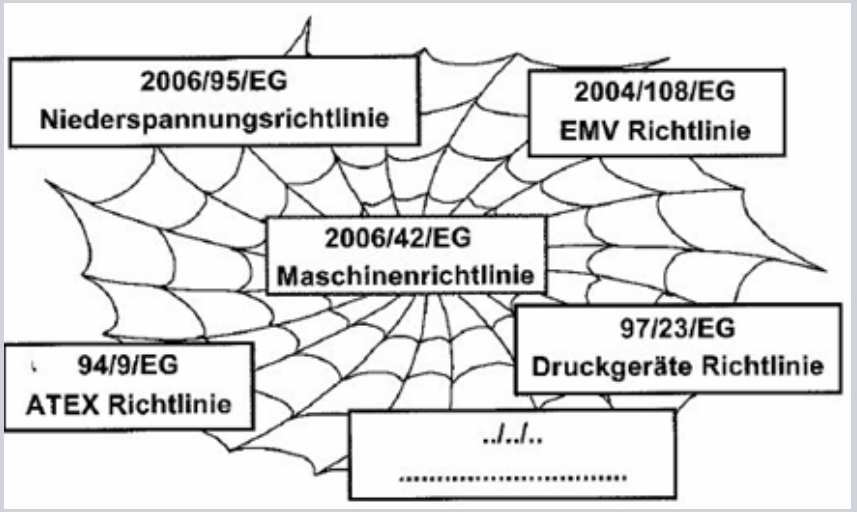
Revised machine directive 98/37/EG = 2006/42/EG

In terms of the installation of an extinguishing system the new machine directive mainly focuses on the protection of the user. It is assured that the user is neither endangered by the fire nor the extinguishing process with CO_2. Special attention is paid to the protection of a person that needs to get into the machine tool unavoidably. In this case the person has to be completely protected against CO_2



Conclusion: Sinorix al-deco STD works pneumatically. Incorrect activation of the system is limited to a minimum because the activation of the extinguishing process can only be done by a mechanical damage of the sensor. The current high standard will be improved in the future. Together with a certification body Siemens is working on a redundant solution which makes the currently highly improbable incorrect activation of the system completely impossible

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Product liability

- In case of damages authorities can ask the manufacturer and/or the user of the machine tool for evidence of guilt/innocence concerning the course of events
- Liability is at the discretion of the authority and can be evaluated as relief
- All security-relevant data is recorded in a long-term memory. Therefore, events can be reconstructed at any time

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Increased fire risk for the metall cutting processes

Factors influencing the fire risk

- High cutting velocities
- Usage of high-strength materials
- High temperatures, stuck chip or tool breakage
- Usage of non-hydruous coolants
- Unsupervised production due to unmanned operation
- Danger of collision at manual operation

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Fire protection in a machine tool

Objectives of protection are requirements about a security level which has to be achieved minimally

- Detect fire in machining chamber within first seconds
- Limit fire to the object
- Avoid spread of the fire to nearby objects
- Avoid major business interruptions
- Definition of small damages which should not be excluded due to cost reasons

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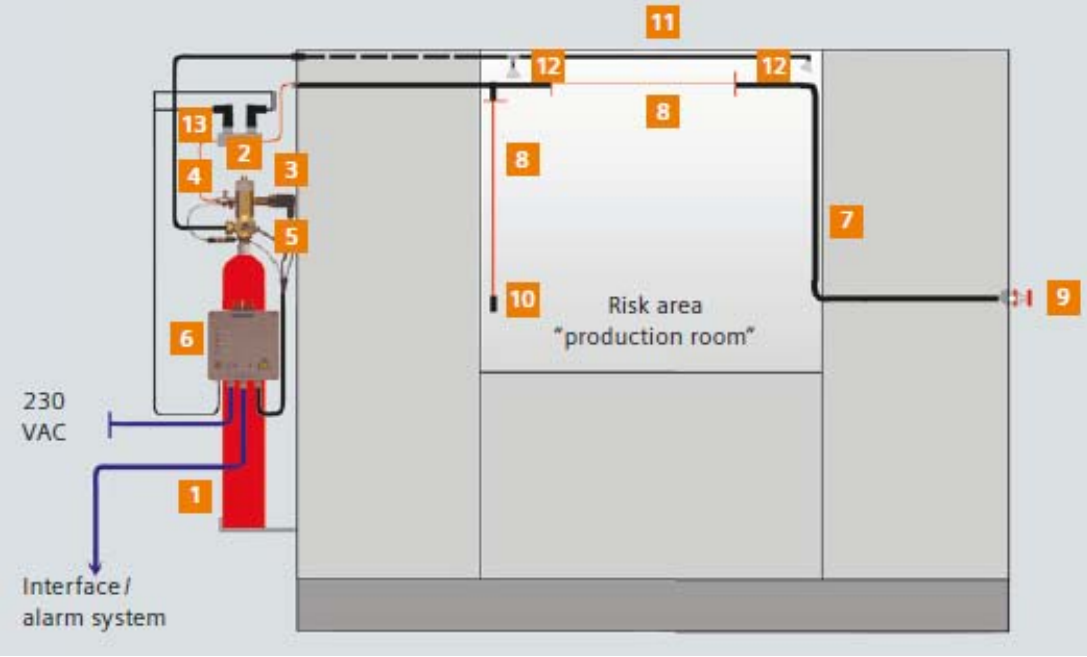
Fire protection in a machine tool

Concept example Sinorix al-deco STD



Legend for the key components

1 CO_2 extinguishing agent cylinder
2 CO_2 valve (IHP)
3 Pressure switch, potential-free
4 Ball valve for the activation/deactivation of the extinguishing system (with status monitoring)
5 Activation and measuring unit (integrated into the valve) for checking the CO_2 quantity
6 Alarm interface
7 Detection line, steel, D–6x4 mm
8 Detection line, fire sensor Lifdes (flexible)
9 Manual release with pressure gauge
10 End stops for detection line
11 Extinguishing line for CO_2
12 Extinguishing nozzles
13 Distribution unit with pressure switch 2 and 3

Fire protection in a machine tool

Linear fire sensor Lifdes™

- Patented, tube-shaped linear, fire sensor Lifdes
- Produced of high-molecular polymer granulate
- Constantly stressed by a pressure of ca. 15 bar
- Bursts if ambient temperature rises above 110° C
- Very small diffusion rate
- Insensitive to dirt, oil, water and vibration

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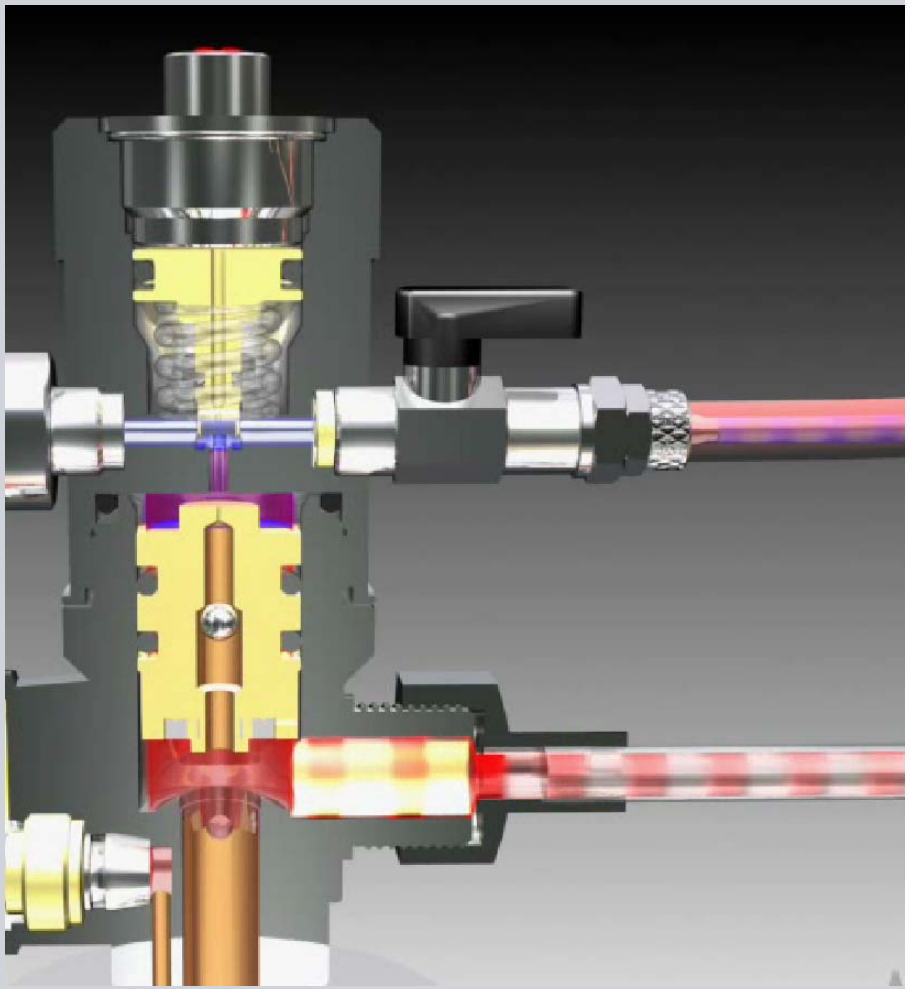
Fire protection in a machine tool

Functional principle of detection and extinguishing

- Pneumatic detection and activation of extinguishing process
- Drop in pressure in the detection line caused by the damage of the Lifdes™ sensor activates the extinguishing process
- The acoustic and optical alarming is activated
- The activation is automatically displayed in the memory



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Fire protection in a machine tool

The most important events are automatically recorded in the memory of the system

- Display visually/acoustically as well as recording in long-term memory
- System ON
  Battery operation
  System released
  System deactivated/activated
  Loss of agent
- Additionally writable on the memory:
  Data of first commissioning
  Data of service
  Data of a recommissioning after a fire incident
- The alarm can be suppressed by means of a key switch but cannot be reset
- The recorded data can be readout via a USB interface

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Approvals for Sinorix al-deco STD

- The system has been tested and certified according to the Type Test AISF-22-05-110 of the TÜV, Technische Überwachung Hessen GmbH (CE 0091)
- The quantity calculation of the extinguishing agent is carried out according to the VdS 2093 directive
- The system has been constructed and installed based on DIN 14497 for small extinguishing systems
- The system fulfills the regulations of the Employers' Liability Insurance Association (Berufsgenossenschaftliche Regeln) BGR 134
- Maintenance takes place in accordance with DIN 14406 Part 4 Maintenance

Insurance companies figures

Currently there are more than 4000 Sinorix al-deco STD object protection systems installed worldwide
More than 400 fires have been successfully extinguished so far

Fire protection to ensure company's continuance

Market situation after a fire incident

- 43% of all companies with a major fire incident file immediately for bankruptcy, further 27% within the first three years
  → 70% of all major fires lead to bankruptcy

Fire incident / frequency

- Recorded ca. 1000 machine tools
- Time frame ca. 5 years
- Fire incident at ca. 10%
  → Ca. 100
  → Ø ca. two fires every month

Source: Helvetia Patria

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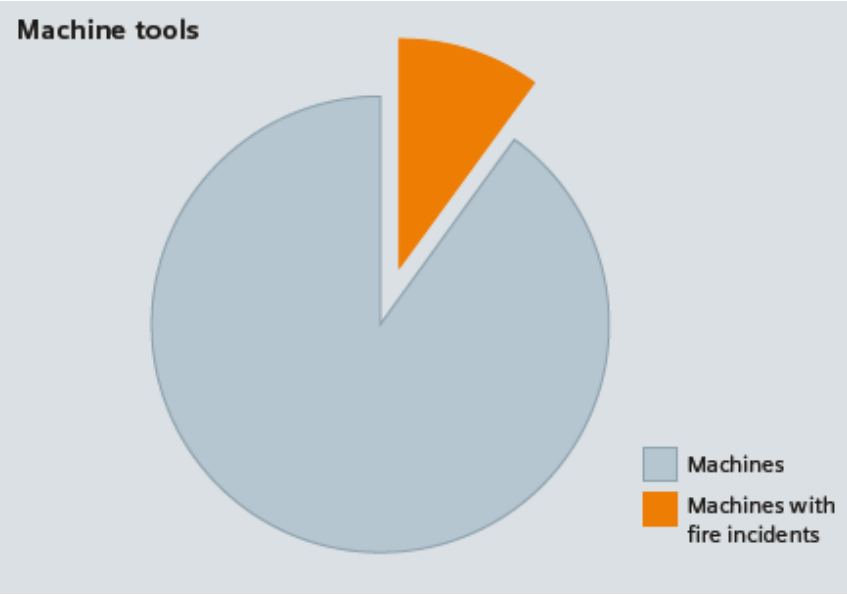
Insurance companies figures

Frequency of a fire incident

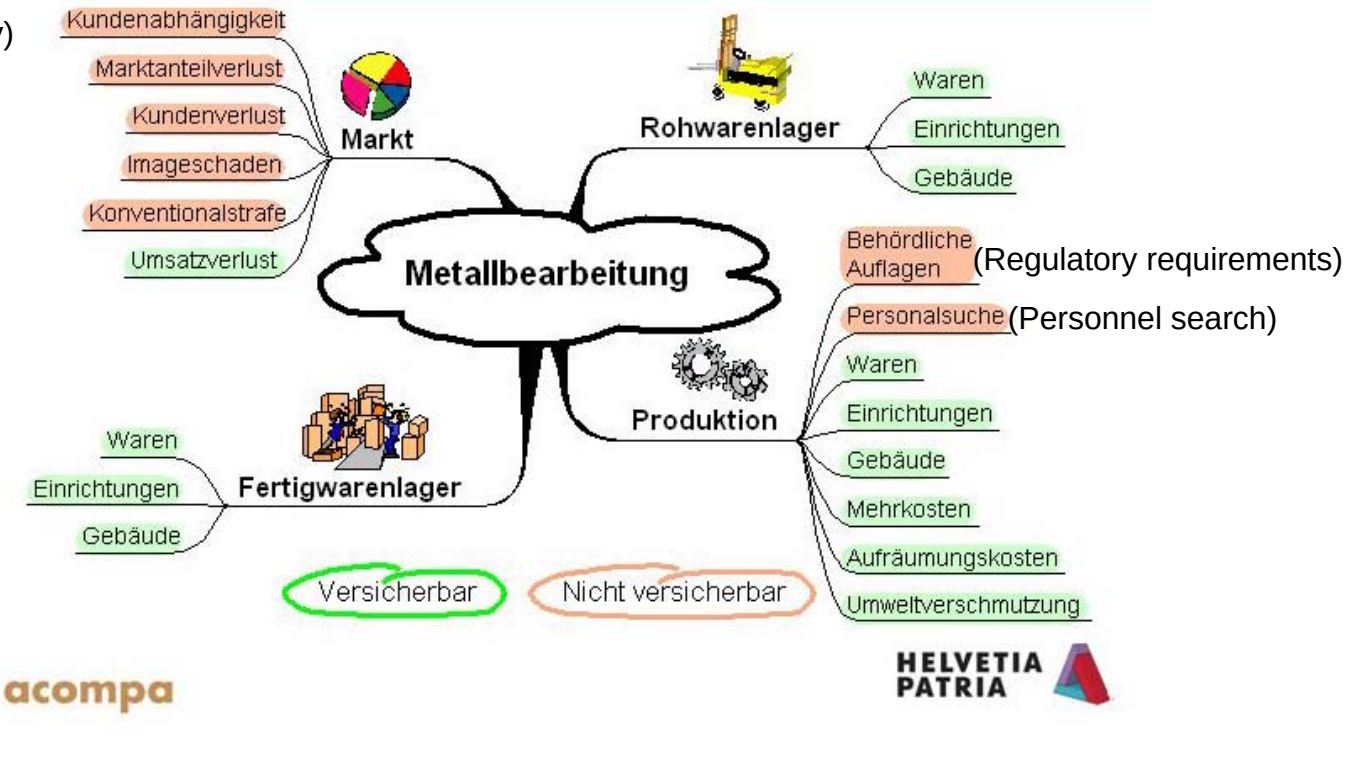
Approximately 10% of all installed machines which are cooled with non-hydruous coolants experience a fire incicent within 2 – 5 years



Insurance companies figures

Insurable or uninsurable risks

(Customer dependency)
(Loss of market share)
(Loss of customer)
(Loss of image)
(Contract penalty)



The most important features of a Sinorix al-deco STD object protection

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No electrical source needed
Virtually no malfunctions

Availability of agent guaranteed
System permanently measures the quantity of the extinguishing agent online

Securing all security-relevant functions
All data is recorded and available as a file after a fire incident and can be read out via USB interface

Operation of the machine tool after an extinguishing
Optimal operation safety at any time

Incorrect activation
Due to the pneumatic functions of Sinorix al-deco STD expensive incorrect activation of the system is virtually impossible. The damaged fire sensor proves that a fire has been extinguishied.

These features make Sinorix al-deco STD one of the safest object protection system for machine tools in the market and also distinguishes itself with an excellent price-performance package

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Summary

- Machine tools with non-hydruous coolants and high cutting velocities held a higher fire risk
- Fire is a danger for the whole production building
- Siemens has the right solution for such machine tools – the intelligent object protection system Sinorix al-deco STD
- Pneumatic detection and activation of the extinguishing process → no external source of energy needed
- All security-relevant functions are monitored online and possible incidents are indicated
- The operating data as well as these functions are automatically recorded in a long-term memory and are available via the USB interface

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Summary

A company‘s existence is endangered if production methods in the cutting process holding a fire risk are not protected accordingly

The automated Sinorix al-deco STD object protection offers all-round protecion for all relevant production processes which can lead to situations with a fire risk