



Geavanceerde brandveiligheids oplossingen voor datacenters

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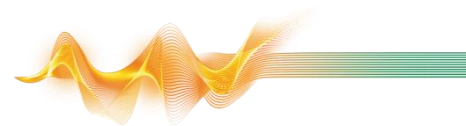
HET KENNISEVENT OVER COMPUTERRUIMTES, DATACENTERS EN CLOUD COMPUTING



2021

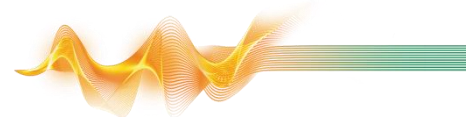
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 - Risk of fire in a datacenter
 - Typical fire development in an IT room
 - Consequences of fire in a datacenter
 - Risk reduction by selecting the right fire protection concept
 - Fire protection technology overview
-
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Introduction



BSc in Mechanical Engineering + MSc in Management Science
17 years working experience in Fire Protection Solutions
(Benelux and USA), after early-career working experience in ICT.

Participant in multiple national and European (CEN) working
committees in the field of fire protection solutions.

Wagner Group was founded in 1976 by Mr Werner Wagner and is still owned&managed
by the family. Since 1980's focus on datacenter fire protection.
Development which resulted in approx. 700 international patents. Manufacturer.

Wagner Nederland BV is since 20 years active in Benelux.
Specialist in fire protection solutions: detection, extinguishing and active prevention.
Project design, installation and services.

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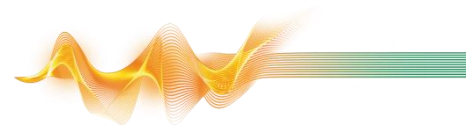
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Risk of fire in a datacenter



- Nearly 800,000 new websites created every day in 2021. Around 5000 data centers are located around the world to host these websites and other company data.
- Growth continues: the data volume is expected to increase from the current 40 to 163 zettabytes by 2025. New datacenter developments in Amsterdam/Netherlands (3rd datacenter hotspot in Europe) must follow sustainability criteria. **Sustainability** is dominant in further development for the data center industry.
- In Netherlands, there are approx. 100.000 fires reported (“brandincidenten”) but statistics related to datacenter fires are not reported separately. Fore sure we had fires in datacenters, ICT telecommunication facilities, connectivity racks, etc.
- All datacenters face the same risk: electrical fires **6% of data center infrastructure failures are fire-related**



Sources: www.bsbrandschutz.de, “Elektrischer Brand im Rechenzentrum”. JLL, Data Center Outlook | Year-End 2020. CBS ‘Branden en hulpverleningen; meldingen brandweermeldkamer’

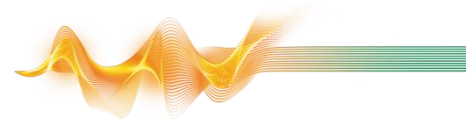
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Consequences of fire in a datacenter



- Personal safety: in the event of a fire, the teams in datacenters are exposed to dangers from the flames or smoke emissions, which can be corrosive and toxic, and which can obstruct the view during evacuation and emergency measures.
- Suitable fire protection is an integrated aspect of sustainability: insufficient or unsuitable fire protection is a threat to sustainability goals. Electronic component materials and rare metals can pollute the environment, extinguishing water (fire brigade, possibly even sprinkler systems) can endanger soil or water bodies. Replacement of damaged equipment, or even the construction of a new data center.
- **The 6% fire-related infrastructure failures in data centers typically result in above-average, potentially very long, downtime**

Server failure can cost up to \$540,000 per hour *

Fire at the OVH Data Center in Strasbourg in March 2021 led to the shutdown of 3.6 Million websites. Two thirds of the French Internet. For several days.

- Potentially huge damage to the brands of the datacenter customers (imagoschade)

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Risk reduction by selecting the right fire protection concept

Work with high-standard (technology and house keeping) to reduce risks. And select the right fire protection concept, based on state-of-art technology, to minimize the fire risks that do still exist. Taking into account the risks and protection goals of a modern data center, criteria for a **state-of-the-art fire protection solution** should be:

1. fire detection as early as possible (pyrolysis/smoke, not heat/multi-sensor)
2. immediate damage limitation without interfering with IT processes (no energy shutdown)
3. based on national and international standards, certified solution
4. completely automatic 24/7
5. 3-dimensional (typically gas, not water)
6. environmentally-friendly and resource-saving, reduced operating costs
7. Ready for the new challenges in datacenter fire protection (see next slide)

Fire protection concepts based on gas extinguishing technology and/or oxygen reduction offer suitable and proven protection solutions for data centers, without using water.

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Risk reduction by selecting the right fire protection concept (cont.)

The state-of-the-art fire protection solution should be adapted to, and ready for, the new challenges in new challenges in datacenter fire protection, such as:

1. increasingly efficient cooling systems, with very high air speeds (i.e. deluting air to below what a smoke detector can detect) and turbulence (i.e. creating more force than the weight of droplets of watermist systems sometimes used)
2. sustainability requirements (as discussed, but also phasing out of chemical agents such as FM200)
3. highly sensitive hard disks (i.e.: Silent damper on each nozzle in a gas extinguishing installation)
4. increased energy per rack (i.e. ,higher hazard' scaling of gas extinguishing installation)
5. fire brigade requirements to dramatically reduce automatic alarms
6. ,in-rack' lithium-ion batteries (a fire of a lithium-ion battery cannot be prevented, but it can be made controllable – a topic that requires further research by fire protection leaders and standardization)
7. What other new challenges do we have?

Important note: update existing fire protection systems ?!



WAGNER MPFS **Lithium-ion batteries**

The fire protection solution from the technology leader

Across all sizes of the **lithium-ion technology** has created new opportunities as a mobile energy storage device. Lithium-ion batteries dominate the market for demanding applications as they offer particularly high energy densities and a long service life. However, lithium-ion batteries also entail specific risks that pose particular challenges for personal safety and, in particular, for **technical fire protection**.

Based on more than 30 years of experience, WAGNER works with its customers to develop individual fire protection solutions for lithium-ion batteries, tailored among other things to the areas of:

- Manufacturing
- Storing
- Storage and
- Operation

Fire risks

Batteries store large amounts of energy. If, due to technical defects or improper handling, the electrically stored energy is released in an uncontrolled and uncontrolled manner, this usually takes the form of **thermal energy**, which amounts to a multiple of the normal electrochemical energy stored. This normally leads to a dissociation and consequently to a **fire**. The release of oxygen by the battery's cathode material enables a self-sustaining process that leads to a **thermal runaway** (cell-combustion) and that is an extremely fast spread of fire. Spontaneous combustion and an associated fire of a lithium-ion battery cannot be prevented, but it can be made controllable.

Specific risks associated with falling lithium-containing batteries include chain reactions of adjacent cells, ignition of adjacent fire loads, communication with conductors and fire material, and bagging being used as a result of explosion.



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Risk reduction by selecting the right fire protection concept (cont.)



Sprinkler/water extinguishing systems are valuable protection solutions, but not well suited for data centers:

- destruction of electrical equipment (infrastructure and server) by extinguishing water in case of fire (or any actuation)
- relatively slow sprinkler activation leads to considerable thermal stress and smoke damage
- 2-dimensional operation, where a typical fire protection hazard in an IT room is 3-dimensional
- potential hazard even without fire in the event of water leakage
- extreme effort for draining flooded areas. Penetration of extinguishing water into unaffected areas
- high expenditure of time and personnel for weekly/monthly/quarterly/annual tests
- not an adequate replacement for a fire alarm system with highly sensitive detection

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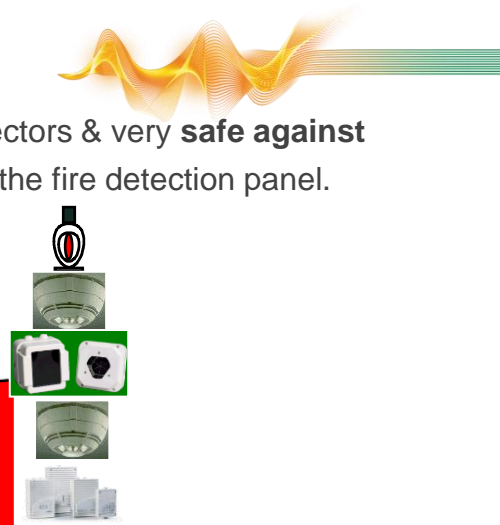
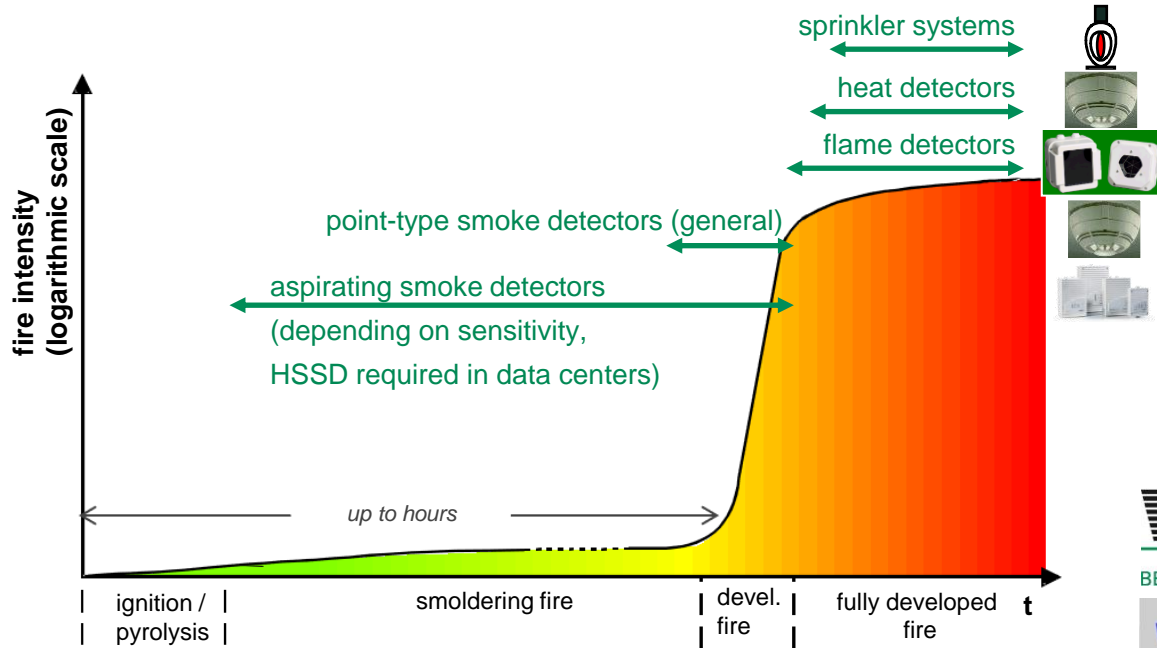
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Technology 1. Fire detection

Aspiration detection (HSSD: up to **2.000 times more sensitive** than point-type smoke detectors & very **safe against false alarms** (algoritms). Possible to integrate in IP-based monitoring systems, parallel to the fire detection panel.



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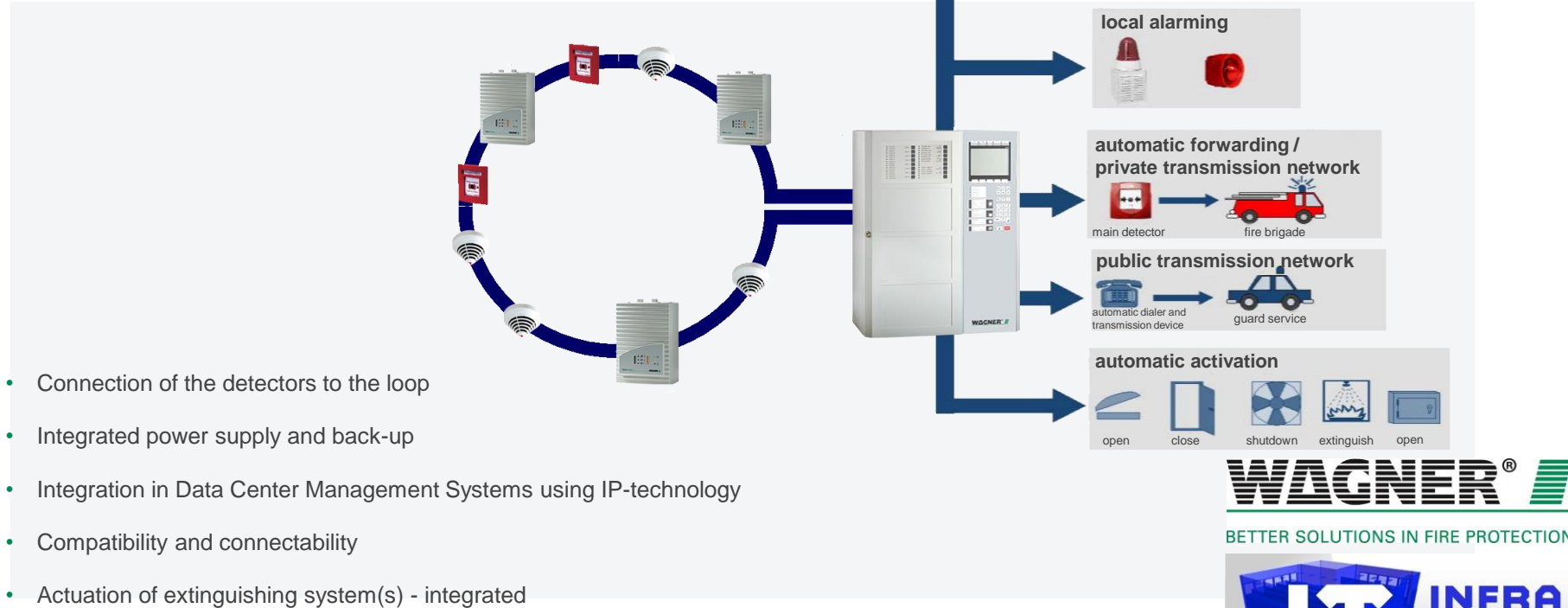
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Technology 1. Fire detection (cont.)



- Connection of the detectors to the loop
- Integrated power supply and back-up
- Integration in Data Center Management Systems using IP-technology
- Compatibility and connectability
- Actuation of extinguishing system(s) - integrated

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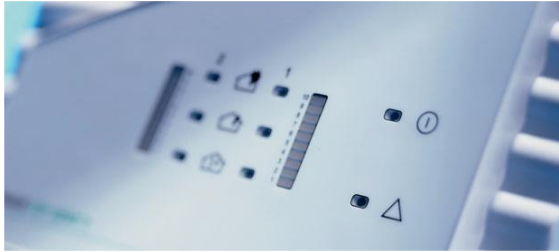
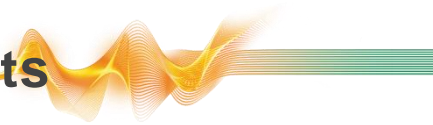
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Technology 2. Fire extinguishing with gaseous agents



aspiration detection HSSD



(residue-free) extinguishing
with (Nitrogen) gaseous mixtures



Silent dampers
for hard disk protection

- + early detection, fully automatic, 3-dimensional, no water, proven technology, scalable
- hold time / protection time limited

note:
older systems often require work to bring to current standards (extinguishing concentration, sound dampers, evacuation, etc)
extinguishing is also possible for (a row of) racks only



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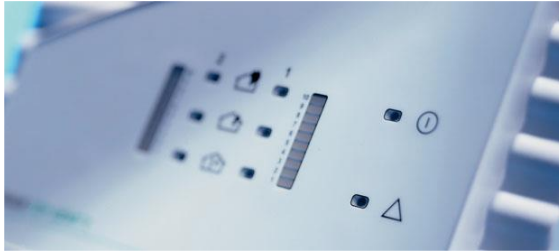
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Technology 3. Integrated two-step fire protection concept



Highly sensitive, false-alarm-free smoke detection at the earliest possible moment

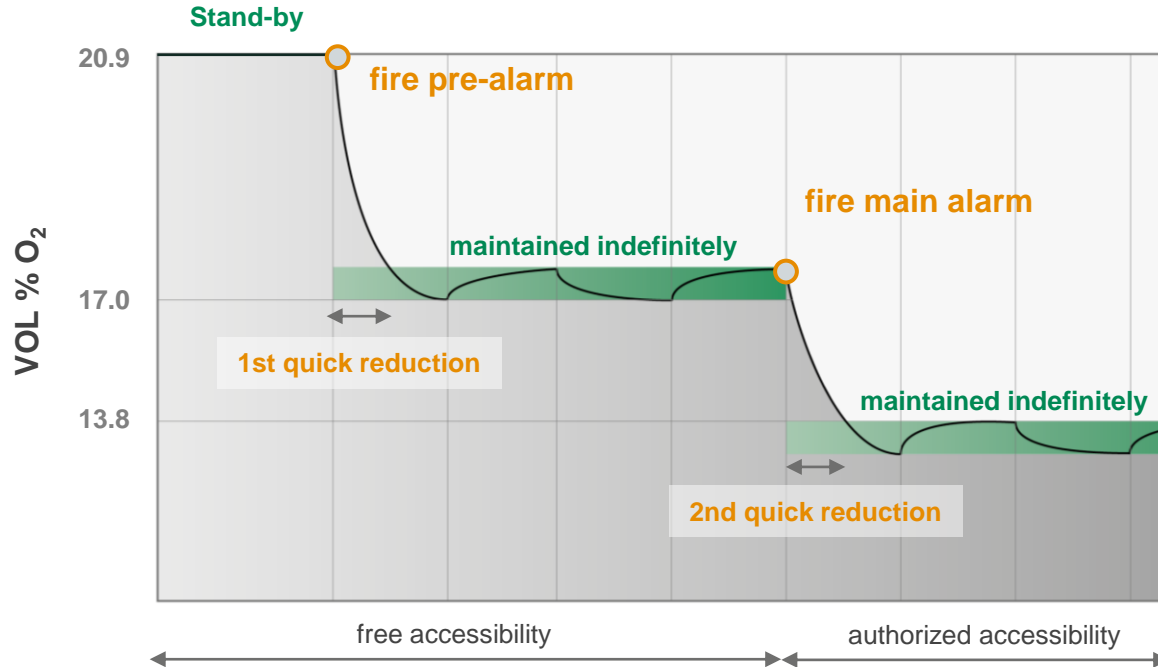


Step-by-step fire fighting with natural nitrogen (residue-free)



Oxygen-reduced protective atmospheres maintained

Technology 3. Integrated two-step fire protection concept (cont.)



reduced fire behavior

fire safe environment

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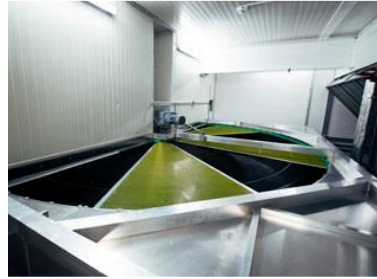
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Technology 3. Integrated two-step fire protection concept (cont.)

very limited power consumption
during normal operation



compatible with
free cooling



accessibility
of protected area



immediate containment
of the spread of fire



no immediate shutdown
of the power

protection
unlimited
in time*



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* to allow for further research in the cause of the fire, preventative measures and refilling (off-site or on-site)

Technology 3. Integrated two-step fire protection concept (cont.)

Telehouse I and II

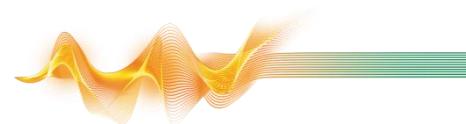
One of the largest data centers in the Frankfurt area



“Overall, a well-rounded solution that exactly meets our requirements”

Asko Hamberger, Safety & Securitymanagement
(Telehouse Deutschland GmbH)

Q&A



Thank you for your time!

Pieter Bikker

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