

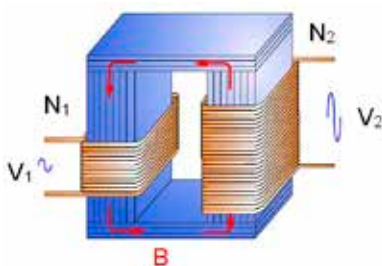
AUTOMATIC FIREFIGHTING
SYSTEMS IN
TRANSFORMERS



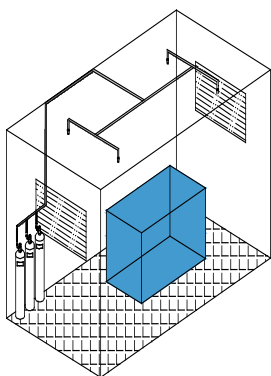


Hazard type

OPERATION OF A TRANSFORMER



PROTECTION OF A ROOM WITH A BATTERY SYSTEM CYLINDER



Transformers are electromagnetic devices which can increase or decrease the electric voltage and current. The most important application is in medium and long range electrical power transmission.

In case of fire, the value of losses depend not only on the material value of the equipment, but also on the indirect consequences:

- Power cuts in large urban areas.
- Power cuts at public facilities such as hospitals, shopping centres, etc.
- Loss of production at companies or entire industrial estates.
- Expenses incurred as the result of time spent on re-launching all the systems affected.

Given the importance of the transformers and their cost, the need arises for the installation of fixed fire protection systems.

There exist a large variety of electrical transformers, with different classifications depending on:

- Structure: dry or oil-filled
- Location: outdoors, indoors, underground, etc.
- Primary voltage: 12,000 to 220,000 volts
- Voltage systems: single phase, 3-phase, 3-phase-6phase, 3-phase-12-phase, 3-phase-single phase.

Among the transformers, oil-filled ones are a particularly high fire hazard, since this oil has a relatively low flash point and therefore a risk of fire with a considerable release of smoke.

Whatever the type of transformer, prevention is always essential. SIEX will advise on how to protect this risk in the most effective way.

The most frequent fire sources in these devices vary according to the type of transformer:

OIL-FILLED TRANSFORMERS.

The main coolants used to avoid heating of the transformer are air and mineral oil. Oil has better thermal conductivity and higher specific heat. Its function is twofold: it acts both as an insulator and as a coolant. However, inflammation of the oil is what usually leads to a fire.

The transformer is a machine requiring very little maintenance. The part that requires most attention is the oil. Mineral oils tend to age and oxidize and these alterations reduce their electrical and technical properties. The oil is affected by temperature, humidity, and contact with oxygen in the air. The main advantages of oil-filled transformers over dry ones are: lower cost, less noise, higher resistance to surges and overloads, and the fact that they can be installed outdoors and work in polluted atmospheres.

According to UNE the minimum flash point of transformer oil is 140 °C. For this reason, a well or reservoir must be provided under each transformer with sufficient capacity for all the transformer oil. This well should have fire grids or flame arresters to prevent flames reaching the transformer housing and damaging it.



OIL-FILLED TRANSFORMERS

DRY TRANSFORMERS.

A dry transformer is one in which the magnetic circuit and windings are not immersed in an insulating liquid. This is the main advantage they have over oil-filled transformers. The materials used in their construction (epoxy resin, quartz and alumina powder) are self-extinguishing, and do not produce toxic or poisonous gases. They decompose from 300 °C upwards and the fumes they produce are very faint and non-corrosive. In the event of and external fire (close-by), when the resin reaches 350 °C it burns with a very weak flame which self-extinguishes approximately 12 seconds after the heat source is removed.



DRY TRANSFORMERS

HAZARD FACTORS

- *Inflammation of cooling oil*
- *Short-circuits caused by overvoltage and overload*
- *Refits in the room*

SPECIAL

ATTENTION

Inside the transformer, apart from the metallic structures, there are components such as laminated paper, varnished fabrics, and ducts lined with fabrics and varnishes. All these parts are potential fire sources, as well as being highly flammable.

SIEX recommendations

GENERAL CONSIDERATIONS

At SIEX we are highly experienced in the protection of transformers, both oil-filled and dry. The main solutions adopted for this type of risk are: CO₂, Dry Chemical and Water Mist.

WHICH AGENT TO CHOOSE?

This is the main question an installer asks when confronted with the protection of transformers. It will depend on various factors such as:

- Location of the transformers (outdoors, in a transformer room or an open space in an industrial bay)
- Likelihood of people normally being present near the transformers
- Type of transformer
- Storage space for the bottles, etc.

For transformers located outdoors, the only possible solution would be local application using dry chemical, since a powder, (rather than a gas) extinguishes

mostly by breaking the chain reaction in flame, and can suffocate a fire in open or windy locations.

In the event that the transformer is located where there is a continuous traffic of people, we should discard the use of CO₂ because of its high asphyxiation capacity.

In the case of a transformer room with few openings or openings which close automatically at the time of discharge, the choice is wider and CO₂ total flooding, water mist (total flooding according to FM), dry chemical or inert agents (total flooding) can be used.

However, if the transformer is located in the middle of a bay with no walls to contain it, it would not be feasible to flood the entire room with CO₂ or water mist. This is where local application would be used for extinguishing. The options are the same: Water mist, Dry Chemical or CO₂.

SOLUTIONS



Water mist is especially suitable for protecting electrical-electronic equipment since it avoids one of the greatest risks for this equipment, smoke.

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| Minimum space requirement |
| High extinguishing capability |
| No chemical reaction with the materials |
| Rapid temperature drop |
| Protection of large areas |
| Smaller pipe sizes |
| Easy installation |
| Easy maintenance |

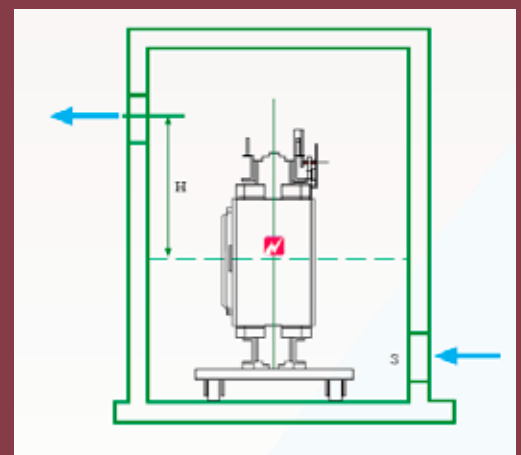
We have the largest number of approvals and European certification in these systems for both total flooding and local application.

DETERMINING FACTORS

One of the fundamental requirements in these rooms is **VENTILATION**.

To avoid excessive and damaging overheating, it is necessary to dissipate the thermal energy produced by the transformer during operation. Since natural ventilation is generally found to be insufficient, fans may be installed to increase the air flow in the room.

It is especially important to analyze these openings as they limit the types of extinguishing agent which can be used in these hazards.





Its low cost, high cooling and smothering capacity and density make it ideal for the protection of transformers, whether dry or oil-filled. Sys-

tems can be designed for both total flooding and local application. With CO₂, unlike other gases, it is possible to have designs with openings in the enclosures. It is therefore an ideal solution for protecting transformer rooms, as all such rooms must have ventilation ducts.

CO₂ is 1.5 times denser than air and tends to settle in the lower levels of the room. The amount of CO₂ that can leak through the lower openings is greater than for the upper openings. So normally the openings in transformers are located in the upper part of these enclosures.

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| Custom application |
| Immediate extinguishing |
| Does not contaminate products |
| Does not damage equipment |
| Cost-effective and easy to obtain |
| Appropriate and stable in extreme temperatures |

Our commitment

CHOICE OF SYSTEMS

SIEX has the widest range of products and systems to suit different needs, both as regards pressures and extinguishing agents.

COMPETITIVE PRICE

Optimizing all of our processes make us more and more competitive worldwide.

SPECIALIZED ENGINEERING

Our highly qualified staff ensure the best service for customers both as regards technical advice on the choice of system, and solving any problems that might arise after installation. Backed up by our extensive experience and a track record of successful projects.

INNOVATION

At the forefront of innovation in every product we develop, ensuring the technical features offered.

QUALITY GUARANTEE

All products meet the highest quality requirements and internationally recognised official approvals.

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| Automatic and standalone extinguishing operation. |
| Effective for different kinds of hazard and design constraints. |
| Fast acting, prevent serious damage to the production chain. |
| Non-corrosive and non-conductive. |
| Do not damage the ozone layer. |



Powder systems are mainly applicable in fires that require rapid flame knock-down, such as flammable and/or combustible liquid fires, or leaks of com-

bustible liquids or gases during transfer, loading or unloading, surface fires in solids, and are very useful in fires on live electrical equipment.

Dry chemical discharge is suitable for both total flooding and local application.

They are very useful for electrical equipment fires such as transformers, turbines and generators; although it must be borne in mind that this is a transit suppressant, not intended to produce a lasting inert atmosphere above the surface of a flammable liquid.



Inert gases allow an innocuous action that protects these special devices without harming its components or

affecting its operability. Rooms need to be sealed, so reignition is also avoided. SIEX offers full range of allowed gases: Our wide range includes:

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| ideal for occupied areas |
| Obtained from the atmosphere |
| Low-cost agent |
| Excellent visibility for evacuation |
| Chemically neutral |
| Storage pressures of 150, 200 and 300 bar. |
| Long pipe runs. |

INERT-SIEX™ 01 – Argon.

INERT-SIEX™ 55 – 50% argon and nitrogen.

INERT-SIEX™ 100 – Nitrogen.

INERT-SIEX™ 541: 52% N₂ + 4 % Ar + 8% CO₂

OTHER SPECIAL HAZARDS PROTECTING BY SIEX:

SERVICE STATIONS

ARCHIVES AND LIBRARIES

DPC's

PAINT SPRAY BOOTHS

ELECTRICAL PANELS

INDUSTRIAL KITCHEN

TURBINES AND GENERATORS

ROAD TUNNELS

NATURAL GAS PLANTS

CLEAN ROOMS

CABLE TUNNELS

TELECOMMUNICATION CENTRES

HOTELS

HOSPITALS

EDUCATIONAL ESTABLISHMENTS

TRAIN AND UNDERGROUND STATIONS

TRAINS

TRANSFORMERS

OFFSHORE PLATFORMS

SOLAR THERMAL PLANTS

MACHINE TOOLS

PRINTING INDUSTRY

HISTORIC BUILDINGS

ROBOTIC PARKINGS

WIND TURBINES

STEEL INDUSTRY

BANKS

OFFICES

LARGE VEHICLES

CONVEYOR BELTS

GAS PUMPS

OIL & GAS

TIMBER INDUSTRY



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