Fire Protection for Server and Telecommunications Enclosures

“Micro Environment” Protection

FIRETRACE®

AUTOMATIC FIRE SUPPRESSION SYSTEMS

Details on fires in server and telecommunications enclosures and how to suppress them using Firetrace® automatic suppression systems

The Firetrace Companies

FIRETRACE®

AUTOMATIC FIRE SUPPRESSION SYSTEMS

FIREPANEL™

VEHICULAR FIRE PROTECTION SYSTEMS

FA Firetrace Aerospace™

HELPING ENSURE A SAFE RETURN

E4

About Firetrace

FIRETRACE manufactures reliable, cost-effective, automatic fire detection and suppression systems designed to protect "micro-environments" – i.e., any small enclosed space where high value/mission critical assets are located or where an increased risk of fire could be mitigated by an automatic fire suppression system. Firetrace systems are completely self-contained, require no electrical power, and are easy to install and maintain.

FIRETRACE systems are compatible with most commercially available fire-suppressing clean agents, foams, and dry chemicals and are the only systems of their type to carry major listings and approvals from UL, ULC, CE, FM, and more than 20 other international agencies.

FIRETRACE pre-engineered systems are specially designed to protect small enclosures of all kinds. The system type, size and fire extinguishing agent are be determined by the contents of the enclosure.

FIRETRACE low-pressure clean agent options are typically 300 cubic feet (8.5 cubic meters) or smaller, with options for dry chemical and high pressure agents up to 1500 cubic feet (42 cubic meters).

FIRETRACE also manufacturers Engineered 500psi / 34.5 bar Total Flooding Clean Agent Systems which are available with 3M™ Novec™ 1230 Fire Suppression Fluid. Total Flooding systems are available in eight capacities with fill volumes ranging from 8 to 1300 lbs. (4 to 590 kg). The 1300 lbs. / 590 kg cylinder is the largest in the industry, so even the largest of facilities can be effectively protected.

FIRETRACE has facilities in London, Singapore, Sidney, New Delhi, Dubai and Sao Paulo to better serve clients worldwide.

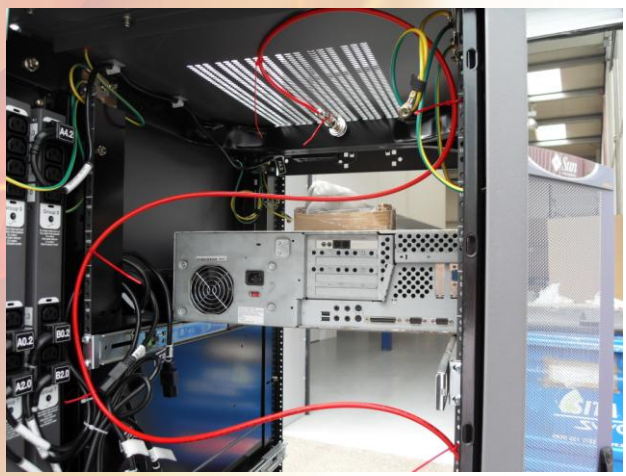
- **FIRETRACE** International is a division of Firetrace USA, a privately held LLC
- **FIRETRACE** USA companies have sold than 250,000 fire suppression systems worldwide
- **FIRETRACE** is an ISO 9001:2008 / AS 9100C Registered company
- **FIRETRACE** maintains a 65,000 sq. ft. USA facility and a 3,500 sq. ft. UK facility
- **FIRETRACE** manufacturers fire suppression systems for commercial and industrial applications

Introduction

The risk of a fire is very real in today's hot-running and overcrowded server racks and closets. A minor server fire can cost a company thousands of dollars in lost revenues and productivity; a catastrophic server fire has the potential to bankrupt a business. Statistics show that nearly half of all businesses that permanently lose their data from a fire or other disaster file for bankruptcy within 90 days.

*Rack level fire protection from **FIRETRACE** keeps valuable IT equipment safe!*

FIRETRACE automatic fire detection and suppression systems are the industry's leading solution for localized fire protection for server racks and telecommunications closets.



Featuring the unique, pneumatic **FIRETRACE** Detection Tubing (FDT), and clean fire extinguishing agents such as DuPont™ FM-200® and 3M™Novec™ 1230 Fluid, a Firetrace system will quickly and reliably detect and suppress a server fire before it can spread to adjacent equipment or activate an overhead sprinkler system, thus reducing or eliminating equipment damage and downtime.

How Firetrace Works

FIRETRACE employs a unique, proprietary detection and delivery system called Firetrace Detection Tubing (FDT). The flexible tubing is manufactured from specially processed polymer materials to achieve the desired heat detection and delivery characteristics.

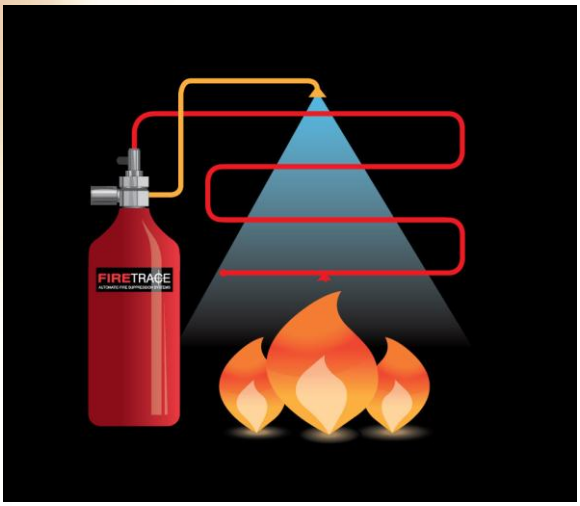
The Firetrace Detection Tubing, which is pressurized with nitrogen, is placed within an enclosed area above potential fire hazards. In the event of a fire, the FDT bursts at the point of highest heat, triggering the release of the fire extinguishing agent. Extinguishing agents can be matched to the particular application. Various system sizes are available to accommodate the appropriate amount of agent. The systems require no power to operate and require minimum maintenance.

Direct Release System

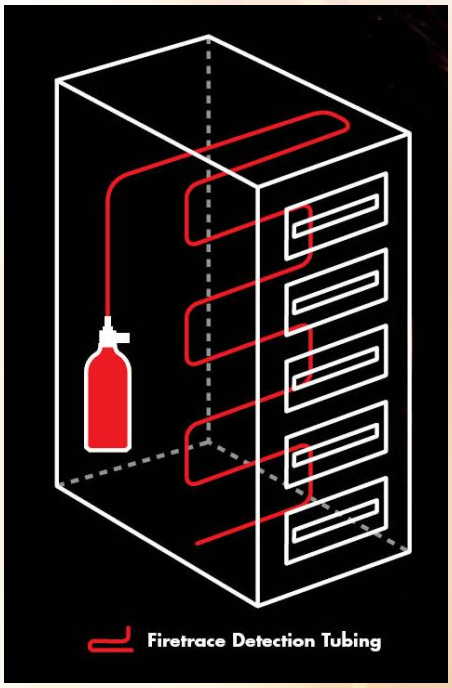
The Direct Release System utilizes the Firetrace Detection Tubing as both the fire detection device and the fire suppressant delivery system. The portion of the tube nearest the hottest point of the fire ruptures, forming an effective discharge “nozzle”. The pressure drop in the tube releases the entire contents of the cylinder through this nozzle.

Indirect Release System

With the Indirect Release System, the Firetrace Detection Tubing is used only as a detection device. The fire suppression agent is delivered via copper tubing, stainless steel tubing or braided hose. When the tubing “bursts”, the suppressant is discharged through strategically placed nozzles within the fume cabinet.



Targeting the Application

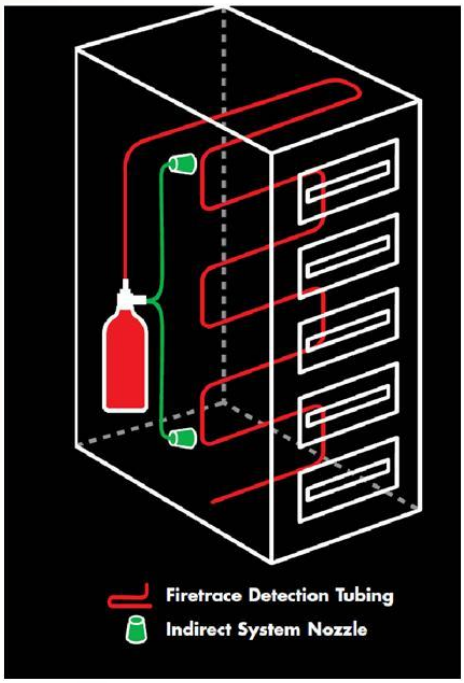


Direct Low Pressure System (DLP)

The **FIRETRACE** Direct Low Pressure System provides a simple and reliable fire protection solution for open and semi-enclosed server racks. The Direct system utilizes pressurized Firetrace Detection Tubing as both a fire detecting sensor and extinguishment delivery device. The flexible red Detection Tubing can be routed throughout a server rack, ensuring detection and suppression of a fire right at its source. The tubing is designed to burst at the point of highest heat, forming an effective discharge "nozzle."

Indirect Low Pressure System (ILP)

The **FIRETRACE** Indirect Low Pressure System provides a simple and reliable fire protection solution for fully-enclosed server racks and closets. In contrast to the DLP system, the ILP system uses the pressurized red Firetrace Detection Tubing as a detection-only device. When the tubing ruptures, it triggers the release of the extinguishing agent through separate network of hoses or piping to one or more dispersion nozzles that flood the enclosure with suppressing agent quickly and completely. Although designed to activate automatically, ILP systems can also be fitted with an optional manual release.



Just a few of the many causes of server fires include: *Faulty electrical connections; short circuits; malfunctioning power supplies; power line surges; and intermittent electrical arcing.*

Detection Tubing (FDT)

The heart of every **FIRETRACE** system is the Firetrace Detection Tubing (FDT). This flexible, pneumatic tubing is the primary fire detection and unit activation method used in all Firetrace automatic fire suppression systems. The FDT is flexible enough to be used in the most difficult installations, yet durable enough to withstand harsh conditions and continue to perform as intended.

Firetrace Detection Tubing

The FDT is a linear, pneumatic, fire detection device that responds to a combination of heat and radiant energy generated by a fire. When exposed to these conditions, the properties of the FDT in this localized area change. The material becomes softer and weaker than the surrounding areas. In this weakened state, the gas contained inside of the FDT is able to burst through, releasing the pressure in the entire length of FDT. This rupture and depressurization of the FDT is what activates the rest of the system, which discharges the fire suppression agent.

FDT after Detection

The FM Approved Firetrace Detection Tubing (FDT) is non-porous, so it can contain internal pressure for an extended time. The FDT is also resilient to most common chemicals or substances. The FDT is made of an inert, non-conductive blend of proprietary resins, and then extruded using a special process to ensure that the tubing is non-porous. This unique blend of materials gives the FDT the following attributes:

- Excellent Physical Durability and Flexibility
- High Pressure Performance
- Wide Temperature Range
- Good Chemical Resistance*
- Excellent UV Resistance

*Tests on chemical resistivity performed by Oxford University

Telecom Enclosures

Firetrace systems are ideal for protecting telecommunications enclosures and cabinets. The various electronic devices installed in these cabinets present a significant fire risk, which is why localized fire protection is so important. Telecommunications cabinets can be found in virtually every industrial and commercial facility. In some cases the enclosure may be a single small cabinet, while in others it could involve a large room filled with electrical boxes. Should a fire occur in one of these cabinets, it would typically destroy the contents; left unchecked, the fire could destroy the room or even the building, resulting in extensive costs and downtime.

FIRETRACE *offers fast-acting and reliable fire protection for telecommunications equipment.*

By containing the fire to the individual enclosure damage is limited to that enclosure and the collateral damage so often caused by water-based fire suppression is avoided. Firetrace fire suppression systems are critical to the safety of your facility.

Remote Telecom Equipment

Remote telecommunications equipment is typically located harsh environments, often in remote locations away from a ready power source. **FIRETRACE** offers the perfect solution for protecting remote telecom equipment. **FIRETRACE** systems require no electrical power to operate, are fully automatic and require minimal maintenance and thus can be relied to operate for long periods of time.

FIRETRACE systems can be easily retrofitted to existing equipment with minimal intrusion. The system can independently monitor the enclosure for fire, automatically suppress it if it does happen and also signal that a fire has occurred in a specific piece of equipment.

If there are multiple hazards to protect then different fire extinguishing agents can be used to ensure that each risk receives the correct protection. For example, in BTS shelters, there are sensitive electronics as well as generators and cable trays, all of which can have dedicated system tailored to provide maximum protection against multiple risks.

Cable Trays and Trenches

Direct **FIRETRACE** systems can be applied to cable tunnels and trenches under machinery to complete the protection in a power generation facility. Cables are often a source of fire situations in confined spaces such as tunnels. Often tightly packed together and in large quantities, they can generate a lot of heat which can cause the cable to burn at any point along its length, which makes detection and extinguishment of a cable fire particularly tricky.

By running the **FIRETRACE** detection tubing along the cables length it will not only react to any abnormally high heat sources but will also "burst" at the exact point of highest point, which will deliver the fire suppressing agent directly at the source of the fire. Conventional fixed nozzle systems would require masses of pipe work and large number of nozzles to cover a significant distance; whereas the simple yet effective **FIRETRACE** tubing provide a "virtual nozzle" at any point along its length.

FIRETRACE provides fast, reliable, automatic detection and suppression for critical IT assets

FIRETRACE Detection Tubing is installed at the rack level to assure the fastest possible detection and suppression

FIRETRACE systems require no internal or external electrical power to operate

FIRETRACE systems can protect both open and enclosed server racks

FIRETRACE localized fire suppression provides around-the-clock protection for equipment and data

FIRETRACE provides a pressure gauge for quick and easy system “charged and operational” status

FIRETRACE systems are compatible with “clean” extinguishing that require no clean up

FIRETRACE systems only activate in the event of an actual fire, there are no “false alarm” discharges

FIRETRACE systems can be quickly and cost effectively serviced and recharged after a fire

Total Flooding Systems

Firetrace has recently introduced E^4 Engineered Total Flooding Clean Agent Systems, which are capable of protecting entire data centers.

Firetrace Total Flooding systems will quickly fill a room to a specific concentration with fire suppressing “clean” agent. Once this concentration is achieved, the fire will be effectively suppressed. Like the clean agents used in tube-based Firetrace systems, the agent will not harm people or equipment, is safe for the environment, and does not leave any residue or require any clean up.

The two FIRETRACE system types complement one another by adding protection in the areas with an elevated fire risk with a small system that can be easily and inexpensively recharged, while still maintaining complete room protection, no matter where the fire starts.

Firetrace offers two approaches to data center fire suppression: The pre-engineered Firetrace system utilizes the proprietary Firetrace Detection Tubing for racks and small spaces; the E4 line of engineered clean agent systems is designed to protect large rooms and other spaces.

Small Fire – Large Risk

A small fire in an electrical cabinet can have major consequences. The photo below shows a burnt out electrical control cabinet which did not have fire protection. This particular cabinet housed a critical asset that controlled the company's manufacturing line.

The company suffered more than $100,000 in losses from manufacturing downtime. However, in a sense the company got off easy. A fire in an isolated electrical cabinet in the cargo handling section of Turkey's Ataturk Airport in June 2006 knocked out operations for nearly a week, resulting in tens of millions of dollars in losses to the airport.

*Protecting electrical cabinets with a cost effective **FIRETRACE** fire suppression system can be a responsible part of an organization's fire risk reduction program.*

Clean Suppressing Agents

3M™ Novec™1230 Fire Protection Fluid

Once clean extinguishing agent used in **FIRETRACE** pre-engineered automatic fire suppression units is Dodecafluoro-2-methylpentan-3-one, more commonly known as 3M Novec 1230 Fire Protection Fluid.

Novec 1230 is a colourless low odour fluid, low in toxicity, is electrically non-conductive, leaves no residue and is an extremely effective fire suppression agent. Novec 1230 is included in NFPA-2001, under the generic name FK-5-1-12, and has been evaluated and approved for use in occupied areas as a total flooding agent; when used as specified under the U.S. Environmental Protection Agency (EPA) SNAP Program rules. Refer to the SNAP Program rules for more information.

Novec 1230 is clean and leaves no residue, thereby minimizing after fire clean up along with keeping expensive downtime to a minimum. Most materials such as steel, aluminium, stainless steel, brass, as well as plastics, rubber and electronic components are not affected by exposure to Novec 1230. This agent is also environmentally friendly, having ozone depletion potential (ODP) of 0.00 and an atmospheric lifetime of 5 days (the closest halocarbon alternative is 33 years). *(Source: 3M, 2003)*

HFC-227ea Extinguishing Agent

Another clean suppressing agent used in **FIRETRACE** pre-engineered automatic direct fire suppression units for electrical enclosures is Heptafluoropropane, more commonly known as HFC-227ea, or FM200. HFC-227ea (1,1,1,2,3,3,3-heptafluoropropane, CF_3CHFCF_3) is a colourless odourless gas, low in toxicity, electrically non-conductive, leaves no residue, and is an extremely effective fire suppression agent.

HFC227ea has been the standard clean agent for many years and is well know and trusted worldwide.

HFC-227ea is included in NFPA-2001 and has been evaluated and approved for use in occupied areas as a Total Flooding agent.

Fire Alarm Integration

The **FIRETRACE** system is available with a normally open / normally closed low pressure switch. This allows the discharge of a **FIRETRACE** system to be monitored and integrated with a fire alarm panel or building management system.

This output signal can perform other functions as required, such as sounding an alarm, shutting down power, activating dampers, closing fire doors, etc.

The **FIRETRACE** systems do not need to be connected to an external power supply source so even in the event of a general power failure the **FIRETRACE** System is always on and ready to protect critical assets against the risk of fire.

Approvals and Listings

FIRETRACE International's systems carry several internationally recognised approvals and listings and have been independently tested by third parties for exposure to many types of chemicals, solvents and UV radiation. As an **ISO 9001** accredited company you can be sure of the fact that all systems are manufactured and tested in a quality environment.

Australia – SSL Listing No. AFP 1368 Scientific Services Laboratory, Victoria, Australia
Austria – Prufstelle fur Brandschutztechnik
Bahrain – State of Bahrain Ministry of the Interior, Protection and Prevention Section
Belgium – ANPI/NVBB Rapport D'essai no. SPT/ME 020/1987.12.08
China – CNACL No. China National Accreditation of Laboratories
Czech Rep – Strojirensky Zkusebni Ustav S.P Engineering Test Institute
Denmark – Danish Institute of Fire Technology
France – CNPP GC01 0017 CNPP IE 99 5585
Germany – BAM/TUEV Approval
Greece – Approval Report 44672 701.6
Hungary – Belugyminiszterium Tuezoltosag Orszagos Parancnoksag Szum 188/31/1999
Israel – The Standards Institution of Israel Test Certificate 8013107171
Italy – TESI No. 094/B Tecnologie Sviluppo Industriale
Netherlands – TNO Netherlands Project Ref 006.10329.01.02
Romania – SC Instal Somet SA Act de Omologare No. 7/2000
Qatar – Civil Defence
Sweden – SBF 128:1 Swedish Bus Approval
United States - Factory Mutual Approval / UL & ULC Listing

Addendum

FIRETRACE *Detection Tube Testing*

Leakage rate:

The FDT passed the Underwriters Laboratories and Factory Mutual Research long term leakage tests. Twelve sample systems, each with 52 feet of FDT were weighed and then placed in a secure storage area. The maximum allowable leakage rate was 0.0075 ounces leakage over a period of one year. Each quarter of a year, 4 random samples were selected and weighed. At the end of the full year, all twelve samples were weighed. There was no measurable leakage. The FDT passed the test.

Exposure to UV radiation:

Samples of FDT, each 12 inches in length, were subjected to the UV Light and Water Test in accordance with ASTM 154 utilizing the UVB 313 Lamp. Test duration was 1000 hours. Following this test, the samples were examined for cracking or deterioration. None was found. These same samples were then subjected to a hydrostatic test of six times the normal operating pressure (150 x 6 = 900 psi) of the tubing for a period of one minute. There was no burst or leakage as a result of this test. Pressure was then raised to 1000 psi for a period of one minute with no burst. Each sample was then raised to burst pressure. Average burst pressure of the twelve samples was 1200 psi.

Aging Test:

A total of twelve samples of FDT, each twelve inches in length, were subjected to an air-oven aging test for 180 days at 212°F (100°C). Following this test, the samples were examined for cracking or deterioration. None was found. These same samples were then subjected to a hydrostatic test of six times the normal operating pressure (150 x 6 = 900 psi) of the tubing for a period of one minute. There was no burst or leakage as a result of this test. Pressure was then raised to 1000 psi for a period of one minute with no burst. Each sample was then raised to burst pressure. Average burst pressure of the twelve samples was 1200 psi.

30 Day Extreme Temperature Leakage Test:

A total of twelve fully charged **FIRETRACE** Indirect systems, charged with FM-200 Clean Extinguishing Agent and super pressurized with nitrogen to 150 psi and including 24 inches of detection tubing (also charged to 150 psi) were exposed to the temperature extremes, 0°C (32°F) to 54.44°C (130°F), for a period of 30 days. A total of six charged systems were exposed to 0°F and six charged systems were exposed to 130°F. Weight (in grams) was recorded before and after the test. There was no loss of weight noted of any of the samples at the end of the test. Following this test the systems were discharged with a standard propane torch impinging on the FDT. System actuation was within two seconds and in each case, discharged as intended.

Frequently Asked Questions

What pressure is the system working to?

The **FIRETRACE** systems are super pressurized with Nitrogen between 10.3bar to 13.4bar

What happens if I have more than one fire simultaneously?

Because the system is design is based on the volume of the enclosure, there is sufficient agent within the container to "total flood" the whole space. Should there be more than one fire, the Fire Detection Tube will burst at the hottest point first and all of the agent will be dispersed from that point. The whole area however, will rapidly fill with a cloud of dry chemical agent which will quickly suppress any other fires that there may be.

How can the operator check if the system is available and functioning?

A **FIRETRACE** system is fitted with two monitoring devices. A pressure gauge for visual inspection and also as described above the systems can be fitted with a set of low pressure switches which change state on 5bar falling pressure and can create "a fault" signal on a fire control panel. (Control panels normally supplied by 3rd parties but **FIRETRACE** can supply these also).

If the system is activated, do I need to replace the whole system?

No. Should you have the unfortunate incident of a fire, the system will operate as intended and some service will be needed to bring the system back into operation again. This involves re-charging the contents of the container via an approved agent, or for speed purposes, replacing the container with an identical one that is already filled. The Fire Detection Tube will not normally need to be replaced, as the burst point can be cut from the tube and the tube can then be re-connected with a straight adapter. The system can then be pressurized and reset for use.

In theory, your system could be operational again within only a few minutes and at minimal cost.

I've heard about HF, will this cause damage to my equipment?

The agents themselves are described as "Clean Agents" as they will not damage any equipment, or leave any residue, should they come into contact with any electrical components. However, they decompose at high temperatures and it is therefore important to avoid applications involving hazards where continuously hot surfaces are involved. Upon exposure to flame these agents will breakdown to form halogen acids. Their presence will be readily detected by a sharp, pungent odour long before maximum hazardous exposure levels are reached. It has been concluded from fire toxicity studies that decomposition products from the fire itself especially carbon monoxide, smoke, oxygen depletion and heat may create a greater hazard.

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Firetrace currently has more than 20 international approvals and listings, including: UL, CE, FM, ULC & ISO9001. Approvals and listings vary by system type and agent.