

**COMPLETE SYSTEMS FOR
MANUFACTURING EQUIPMENT**



**MARKET AND PRODUCT
INFORMATION**

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Background Information

Fire risk Assessment

Considering the **strategic role** of machines in the production, and their price **from thousands to million Euros**, manufacturing operators have to deal seriously with that sensitive equipment thanks to risk management approach.

When it comes to fire, statistics are clear: **66% of fires begin in the shop floor every year**, according to the estimation of NFPA issued in 2012.

Reported fire in or at industrial/manufacturing facilities in the US (1)	
Number of fires	42.800
Direct property damage	\$ 951 million (682 million EUR)
Direct property damage per fire	\$ 22.220 (15 934 EUR)
Downtime consequences	Unmeasurable

(1) National Fire Protection Association in the US – Study from 2006 to 2010 – Issued 2012

With the new tools of plant management, such as lean manufacturing, many machinery have a **Maximum Supportable Downtime** near from zero. Identifying these machines and those presenting higher risks of fire is important: **strategic and critical machines, which could disrupt the production process, must be protected**. Otherwise, when a fire occurs inside or near from this sort of machines, the **business activity** can be **severely affected**.



Do you have a
bottle-neck
analytical grid?

The equipment might be completely destroyed, and the production interrupted for several weeks due to **replacement time**. Even costly raw materials and components might be wasted. This leads to potential late orders and **loss of clients**, and thus significant **financial loss**.

Furthermore, since 2006 and the 2010 updated **EU Machinery Directive 2006-42EC**, in cases in which fire risks cannot be reduced by other measures (avoiding the use or production of combustible materials, avoiding contact between combustible and ignition sources, preventing overheating, or reducing the concentration of oxygen), **machines shall be fitted with built in extinguishing systems**. (2)

(2) Guide to application of the Machinery Directive 2006/42/EC, pages 205-206

Fire Causes

The major risks in manufacturing machinery have different causes:

- **Malfunction of the coolant system**
- **Tool breakage**
- **Hot metal chips**
- **Static electricity due to friction**
- **Poor and little maintenance time vs. long machining process**
- **High friction**
- **Operator error**

When a fire occurs, even if manual fire extinction is always possible, **human beings are not always on side and aware of the proper action**, compared to an automatic fire detection system. Machining area doors are often locked during production cycles and burning oils generate dense black smoke that inhibits operators getting close to the fire.

Plus, who would really like to open the door where fire and smoke are present? ☺

How FireDETEC works?

Principle

Rotarex FireDETEC systems use a continuous linear **thermal sensor tube** that reliably detects in a **360° environment** and actuates release of the extinguishing agent. It is **more flexible**, **space efficient** and **cost effective** versus alternative mechanical or electronic systems that are not adequate due to dust or suspended particles and hence cause false alarms. Indeed, the revolutionary pneumatic design secures individual high-risk areas like electrical and mechanical equipment that were previously not practical to protect.

· Installation closer to the source

Because the sensor tubing is flexible, it can easily be installed directly inside machines and enclosures – directly among circuitry and mechanics. This installation enables early fire detection.

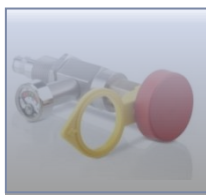
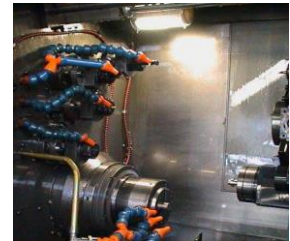
· Instant Suppression

The sudden tube depressurization actuates the special valve and floods the enclosed area with extinguishing agent. The fire is quickly suppressed just moments after.

Functioning

Indirect High Pressure (IHP) or **Indirect Low Pressure (ILP)** cylinder valves are operated with the FireDETEC thermal sensor tubing and release the agent through a separated discharge line. The FireDETEC sensor tubing is connected to the valve on the low-pressure side of the cylinder valve and installed in the fire hazard area.

The **FireDETEC sensor tubing** is **resistant to oil, dust and chemicals vapor**. Depending on the sort of tube, at 110 or 175°C, the pressure in the FireDETEC sensor tubing releases suddenly. The sudden release of pressure activates the cylinder valve and floods the protected area with extinguishing agent. This **unique** type of fire detection and suppression has many benefits, since it adapts to the machine: it is totally **flexible** and thus easy to install. So, it enables to **reduce installation costs**.



A **manual release device** can be installed at the end of the FireDETEC sensor tubing for a supplemental manual system activation. In case of fire, by simply pulling the yellow safety device and pushing the red handle, the FireDETEC system activates. A **solenoid actuator** can also be installed in order to connect an additional detection system, which enables the actuation via electronic sensor or control room.

Additionally, a **pressure switch** enables secondary electronic operations such as sounding an alarm when the system actuates, and informing the central alarm system.

DIMES (Digital Measuring System) is the **only permanent electronic contents control** for CO₂. It is a capacitive measuring method for determining the gas mass in CO₂ storage tanks. It represents a real benefit to manufacturing facilities applications, reducing **maintenance costs**, since it eliminates the need to periodically dismount and weigh cylinders to verify fill levels.

Moreover, DIMES technology is **easy to install** (integrated in the valve body), and offers **easy read-out**. It has a **long distance data transmission**.

All the advantages of DIMES technology enable the FireDETEC system to work with CNC machines, without losing time in maintenance, and thus have a **normal business activity**.



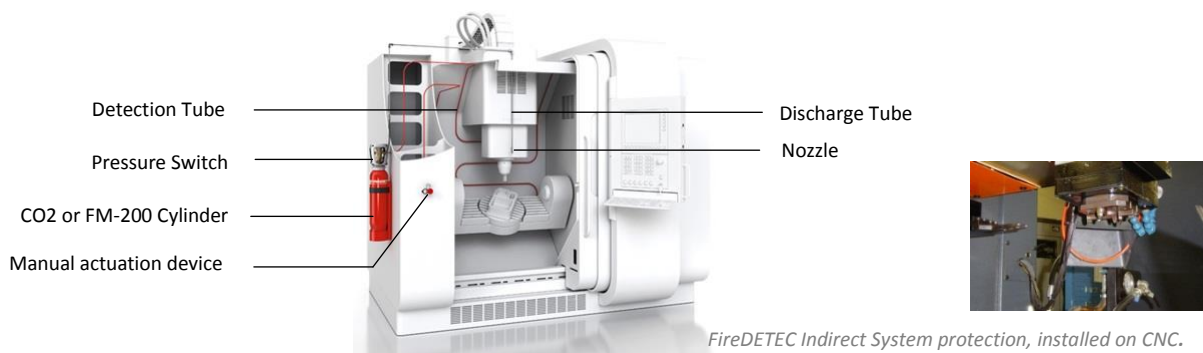
Applications for Manufacturing Facilities

FireDETEC systems can be installed in almost all manufacturing facilities. They are used to protect:

- **CNC Machines**
- **EDM Machines**
- **Turning Machines and Lathes**
- **Presses**
- **Grinders**
- **Electrical Control Cabinets**
- **Air filters**
- **Dust extractors...**

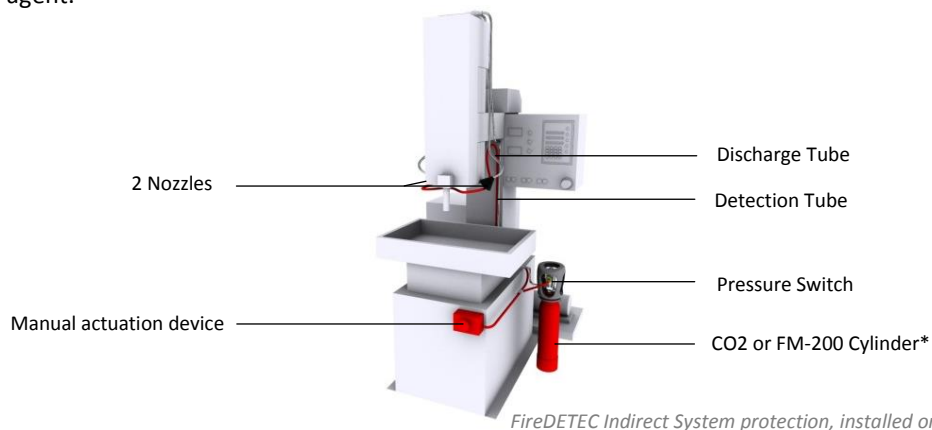
CNC Machines

FireDETEC Detection Tube is ideal for fire protection and detection in CNC machines as it tolerates the vibration, dirt, extreme temperature of the environment. Being pneumatically operated, they require no power to run and do not rely on any electronic sensor equipment. So, the system discharges only if there is a fire.



EDM Machines

A typical EDM machine (Electrical Discharge Machining machine) can be protected using an Indirect High Pressure system. The FireDETEC Detection Tube is installed onto the base of the ram, which is centered **directly above the work area**. The ram will move up and down, but the base will remain stationary. Two nozzles discharge the agent.



*Mass of CO2 released in open spaces is defined in Vds 2093.

Dust and Mist Extractors

Dust and mist extractors are exposed to the risk of fire too. They can be protected thanks to an indirect FireDETEC system, filled with an appropriate extinguishing agent, whether it is oil mist or magnesium dust.

The FireDETEC Detection Tube is installed directly within the main housing an over all of the vents.

Concrete Action of FireDETEC

FireDETEC systems do avoid damages to lots of companies' machinery room. For example, in a UK-based firm, an ONA D360 EDM machine caught fire at 4.00am, due to part of the 600 Liters of dielectric, which suddenly dropped below the work head igniting the dielectric.

Hopefully, the company had a FireDETEC system, which activated automatically and extinguished the fire within a few seconds. The operator was not nearby, as the machine can run without supervision.

The speed of operation of FireDETEC system has prevented any damage to the machine and the surrounding area. It also electrically isolated the machine to prevent it from operating and catching fire again.

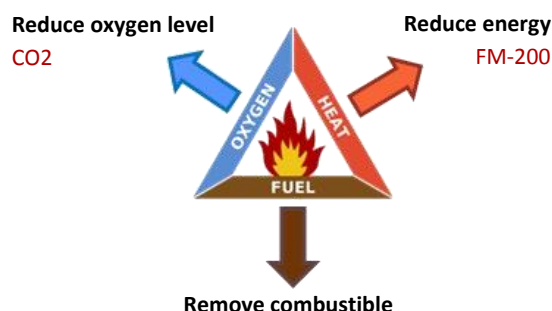
An engineer of ours was sent to refill the unit and change any parts that required replacing. Thus, it allows the company to have minimal down time on this machine.



ONA D360 EDM machine
Courtesy: www.apexauctions.co.uk

Extinguishing Agents Used for Manufacturing Facilities

The extinguishing agent's choice acts on the way a fire is extinguished.



The FireDETEC fire detection system for manufacturing facilities can be offered with two agents:

- **CO2:**

Carbon dioxide is a **naturally occurring chemical compound** and extinguishes fires by **displacing oxygen**, or taking away the oxygen element of the fire triangle. The carbon dioxide is also very cold as it comes out of the extinguisher, so it cools the fuel as well.



Advantages	Disadvantages
<ul style="list-style-type: none"> • Non-conductive: ideal agent for electronic equipment • No residues: no post-fire clean up → Time and money savings • Liquid under pressure: Storage space gain • Excellent environment profile: 0% ODP • Low cost 	<ul style="list-style-type: none"> • Toxic: human evacuation when used in large quantities NB: Object Protection does not mean total flooding of the shop floor: not used in large quantities

- **FM-200:**

An alternative extinguishing agent used in FireDetec systems for manufacturing facilities is FM-200.



It is a **colorless, non-toxic gas** (Heptafluoropropane), which acts on the **heat of the fire triangle**. It can stop ordinary combustible, electrical, and flammable liquid fires before they cause significant damage.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Less extinguishing agent needed • Effective fire suppression agent : Reach extinguishing levels in 10 seconds • Excellent environment profile: 0% ODP • Non-toxic for human 	<ul style="list-style-type: none"> • Fog during discharge • Machine must be fully enclosed • High cost

Approvals and References for the FireDETEC Technology

Approvals & Certifications for FireDETEC system



Applicable Standards



References for Manufacturing Equipment

	Client	Country
Index		France
Triumph		Germany
Walter Maschinenbau		Germany
Deckel Maho		Germany
Gildemeister		Germany
Riello		Italy
Tornos		Switzerland
Doosan		Luxembourg

Appendixes

FireDETEC[®] Sensor Tubing Tests

Description of the tests realized on red and black tubing as part of the FM & UL approval tests for certifying entire FireDETEC pre-engineered systems.

Leakage Rate

The FireDETEC[®] Sensor Tubing passed the FM Approvals *One Year Leakage Test*. Six FireDETEC[®] indirect systems were filled with HFC 227ea and pressurized to the nominal working pressure, 240 psi (16.5 bar). Samples were weighed initially and then placed in a secure storage area for a period of one year. None of the systems leaked in excess of the allowed 0.25% of charge weight over the period of test. Discharge tests were then performed successfully, and post-discharge inspection revealed not a single sign of the tube deterioration.

Aging Test

FM Approvals and UL 2166 *Air-Oven Aging Test* was performed with one 2 ft. (0.6 m) sample of FireDETEC[®] Sensor Tubing. The tube was subjected to air-oven aging at a temperature of 212°F (100°C) for 180 days. Following the test, the sample exhibited no signs of any cracking temperature. A hydrostatic test was then performed on the tubing: the sample was pressurized to six times the nominal operating pressure, 900 psi (62.1 bar), for a period of one minute. No signs of damage were observed.

30-Day Extreme Temperature

Leakage Test

According to FM Approvals *30-Day Extreme Temperature Leakage Test*, twelve FireDETEC[®] indirect systems were filled with HFC 227ea and pressurized to the nominal working pressure, 240 psi (16.5 bar). Six samples of these systems were conditioned to the maximum operating temperature, 130°F (54°C), for a period of 30 days, while six other sample were conditioned to the minimum operating temperature, 32°F (0°C),

for the same period. All samples were weighed before and after the test period. None of the assemblies leaked in excess of the allowed 0.021% of charge weight over this time. Discharge tests were then performed successfully, and post-discharge inspection revealed no signs of deterioration.

Corrosion – Salt Spray

Two pressurized systems and separate components were subjected to a 240 hour, 20 percent salt fog corrosion test per ASTM B117, *Standard for Salt Spray Testing*. Components, including the FireDETEC[®] Sensor Tubing, were then examined to verify they exhibited no corrosion, galvanic action, loss of legibility of markings, or separation of protective coatings that would impair future functionality. Every sample passed the test. Furthermore, Discharge tests were performed on each system successfully.

ROTAREX Quality Control

Applying 90 years expertise, ROTAREX products are manufactured with the highest quality standards to ensure consistent reliable performance even in the most severe conditions. The entire FireDETEC range is designed and produced in Europe to meet the most stringent requirements in terms of quality.

For the FireDETEC[®] Sensor Tube, Rotarex focuses on all the steps of the supply chain. This level of rigour is a key point for such a high value-added product.

FireDETEC is a trademark of the CEODEUX Extinguisher Valves Technology S.A., part of the group ROTAREX S.A.

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