



Leading the world in explosion protection



**Elmac  
Technologies®**

Innovative Safety Solutions

# Introducing the experts in flame and explosion protection

## Welcome to Elmac Technologies®, the technical leaders in flame and explosion protection systems for use in the world's most challenging industrial environments.

Established in 1948 – and now part of The Greenfield Group – we developed our first flame arrester for use with highly combustible town gas.

That pioneering safety solution was quickly adopted across the gas processing and distribution industries and played a valuable part in forming the global reputation we enjoy today.

Renowned for the design, manufacture and supply of innovative safety systems for the broadest range of sectors, we are extremely proud of our technical expertise.

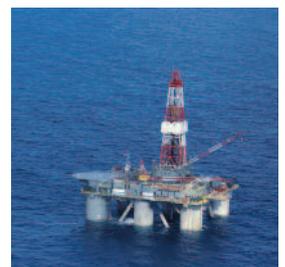
We offer a comprehensive range of in-line detonation arresters and both in-line and end-of-line deflagration arresters.

Investing heavily in new product development, we work closely with our customers to provide world-class solutions that keep people and plant safe.

Over the following pages, we provide a brief insight into our explosion protection capabilities.

To find out more, please visit our website, or email [info@elmactechnologies.com](mailto:info@elmactechnologies.com) or call **+44 (0) 1352 717600**.

[www.elmactechnologies.com](http://www.elmactechnologies.com)



# Providing safe workplaces

Flame arresters are used to protect people, plant and equipment by preventing the transmission of flames or explosions while allowing process gases to flow. Arresters may be fitted in-line, at the end of any pipeline or on a tank or vessel where flammable gases or vapours are present.

Most flame arresters consist of an element and housing suitable for installation into pipework or process plant. When a flame front reaches the element, the flame is extinguished and the accompanying shock wave is attenuated.

Arresters have no moving parts; an element is typically made of a metallic gauze pack (deflagration arrester) or crimped metal ribbon design (detonation arrester).

Depending on the application, a flame arrester may be installed on its own or as part of a more comprehensive system.



## Global industries served

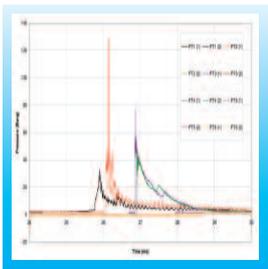
- Oil, gas and petrochemicals
- Bio-fuels
- Mining
- Pharmaceuticals
- Power generation
- Agro-chemicals and fertilisers
- Food, flavours and fragrance
- Waste treatment
- Equipment manufacturers

## Typical applications

- Flare stacks
- Flammable liquid storage tank vents
- Feeds to burners
- Isolation of rotating equipment
- Flammable liquid charging and discharging systems
- Hazardous environment engine protection systems
- Chemical / petrochemical process plant
- Coal mine ventilation systems
- Sewage digester plant
- Gas pressure regulators
- Gas analysis instrumentation
- Nuclear waste treatment
- Vapour recovery processes
- Fuel cells
- Vacuum pumps
- Fuel delivery systems



# Understanding the lifecycle of a gas explosion



An unconfined deflagration results from the ignition of a flammable gas or vapour that is present in atmospheric air. The flame front will rapidly progress through the gas, with pressure and heat dissipating in all directions.

A flame arrester may be used to prevent the flame from entering a plant breather or vent. When the flammable gas is in a pipe also containing air, a flame may travel along that pipe initially at subsonic velocity in a confined deflagration.

As the pressure builds up and the flame accelerates to supersonic speed, a shock wave occurs accompanied by a sudden increase in pressure. This condition is known as detonation. A stable detonation (typical velocities 1600 m/s – 2200 m/s) progresses without major change to velocity and pressure.

Prior to this state, however, an unstable detonation is experienced with a peak instantaneous explosion pressure often exceeding 100bar. A passive means of explosion protection, a flame arrester acts by attenuating shock waves and/or dissipating heat to the point where an explosion will not be transmitted further down the pipe. Elmac detonation arresters are all suitable for unstable explosion conditions.

## Gas groups

Different gases and vapours react quite differently when a flame front moves through them. Therefore, for simple classification, they are grouped according to their behavioural characteristics. A test gas is then selected to represent all gases and vapours of a particular characteristic and used when testing a flame arrester.

Gas group limits are defined using the Maximum Experimental Safety Gap (MESG). This is a measurable characteristic of a gas and its reactivity. MESG is expressed as the maximum gap in millimetres between two metal plates in a specified experimental set-up that will prevent the transmission of flame between an identical gas mixture on either side.

Gas groups and their properties						
European Standard		US Equivalent		European Standard		
Gas Group	MESG (mm)	Gas Group	MESG (mm)	Test Gas	Gas Volume (%% in air)	Typical Gases
IIA	>0.90	D	>0.75	Propane	4.2	Methane, alkanes, alcohols, acetone, benzene
IIB3	≥0.65			Ethylene	6.5	Ethylene, ethylene ether
IIB	≥0.50	C	>0.45	Hydrogen	45.0	
IIC	<0.50			B (part)	≤0.45	Hydrogen
		A	n/a	Acetylene only		

# Accredited to global standards

Acutely aware of the need for excellence across every aspect of its business, Elmac Technologies® proudly upholds all standards relevant to its operations and activities. These standards include:

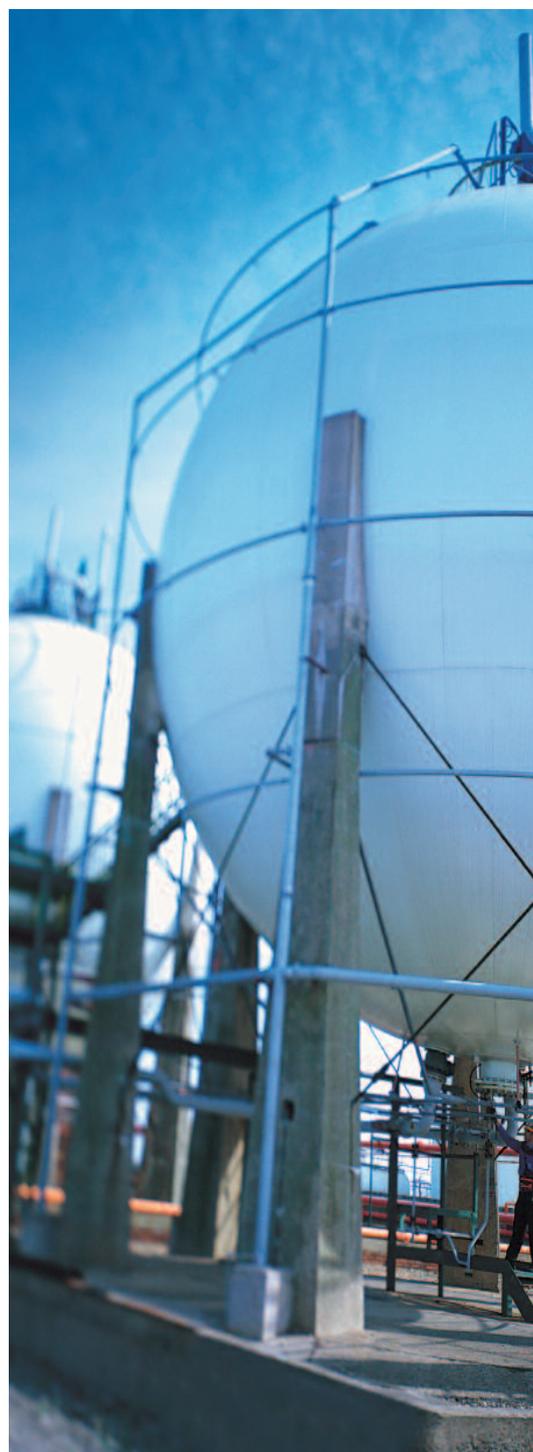
- BS EN 12874:2001 – under the umbrella of the ATEX 95 Equipment Directive (94/9/EC)
- US Coast Guard (USCG) – under the umbrella of FM
- The Pressure Equipment Directive (PED 97/23/EC)
- BS EN ISO 9001:2000 – the total quality assurance management standard
- BS EN ISO 14001:2004 – the environmental management standard
- OHSAS 18001:1999 – the international occupational Health & Safety standard

## ATEX and PED

The ATEX 95 Equipment Directive (94/9/C) was introduced to harmonise standards across the EU for equipment and protective systems intended for use in potentially explosive atmospheres.

Similarly, the Pressure Equipment Directive (PED 97/23/EC) came into force in 1999. All items of pressure equipment including vessels, piping, safety accessories and pressure accessories, marketed within the European Economic Area (EEA) after May 2002, are required to comply with the Directive. Evidence of compliance is provided by means of the CE mark which is shown on all Elmac Technologies® products.

To assist our customers to comply with the ATEX 137 Workplace Directive (99/92/EC) which defines the minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres, Elmac Technologies® provides site surveys, technical presentations and the evaluation of existing flame arrester installations.



## Innovative solutions



### Explosion testing

Designed and built to uncompromising standards, flame arresters from Elmac Technologies® are independently flame and explosion type-tested and certified.

All tests are conducted in compliance with relevant international standards and testing guidelines (eg BS EN 12874:2001, USCG) under the supervision of accredited notified bodies, and include a significant safety margin for use under typical operating conditions.

### Industry-leading technology

In addition, we have also recently commissioned our own highly advanced flame arrester test facility.

This is available for use when standard test procedures do not reflect the final application, or when clients wish to investigate the characteristics of particular gases or vapours.

Taking the lead in our industry – and embracing the latest high resolution data acquisition system – this state-of-the-art resource utilises the most modern analytical equipment available for testing flame arrester performance.

### Flow testing

By nature of their design, all flame arresters offer a degree of resistance to process gas flow. This is called pressure drop. Elmac Technologies® has the facility to measure this flow resistance for air and the capability to predict the pressure drop for other gases.

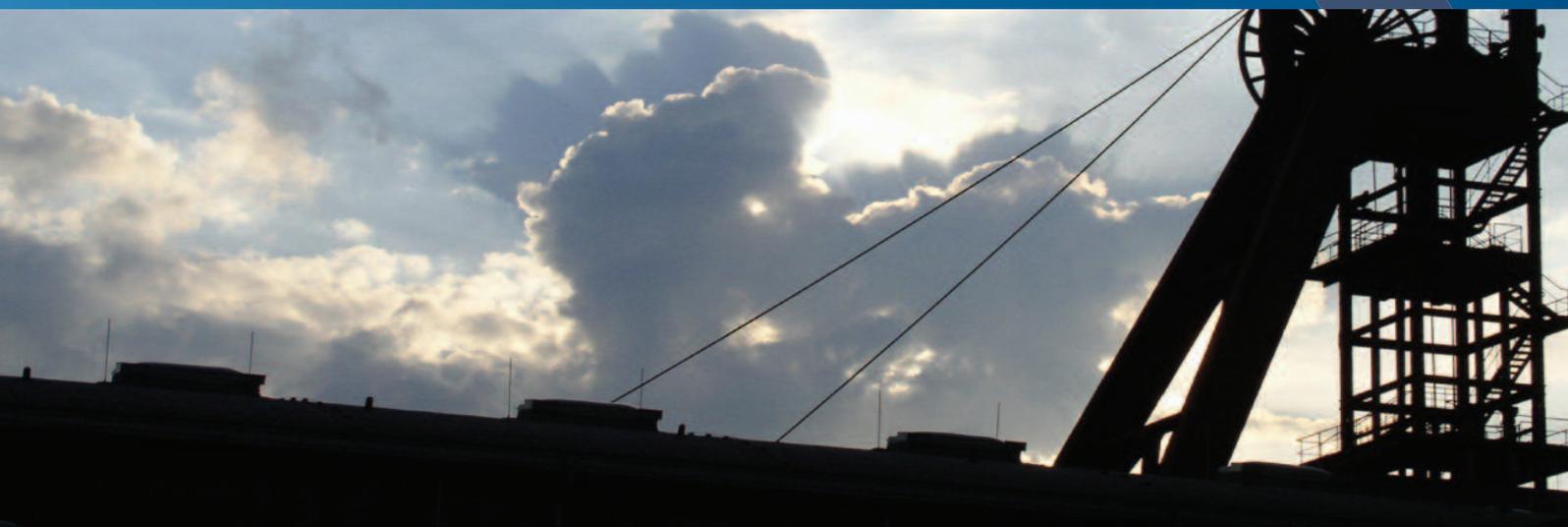
Elmac flame arresters are designed to provide minimum pressure drop while meeting the flame and explosion quenching requirements of BS EN 12874:2001.

### Influencing the industry

Not only are Elmac Technologies® ahead of the field in terms of the testing facilities available, but we have also built a very strong technical team of highly qualified and experienced engineers and scientists to develop innovative products and provide quality support to our customers.

Members of this team also play an important role in shaping the future of this industry through contribution to conferences and active participation in the development of flame arrester standards, including the new international standard due for publication in 2008.

# Your partner in explosion protection



## Meeting your specific needs

At Elmac Technologies®, we take an holistic approach to each customer's flame arrester requirements; we also appreciate how the demands placed on flame arresters can vary significantly.

For that reason, we view each application on its individual merits in order to provide the most appropriate protection solution.

By combining outstanding technical expertise, with one of the most comprehensive product ranges on the market, we are also able to ensure that the very best performance characteristics are achieved.

Offering exceptional customer service at all levels of our business through a global network of representatives, we provide outstanding technical support, a rapid response to all enquiries, competitive pricing, short lead times and totally reliable supply.

## The Elmac Technologies Data Centre

Accessible via our website, our data centre provides access to in-depth technical information about our products and explosion protection. Visit our data centre at [www.elmactechnologies.com](http://www.elmactechnologies.com).



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