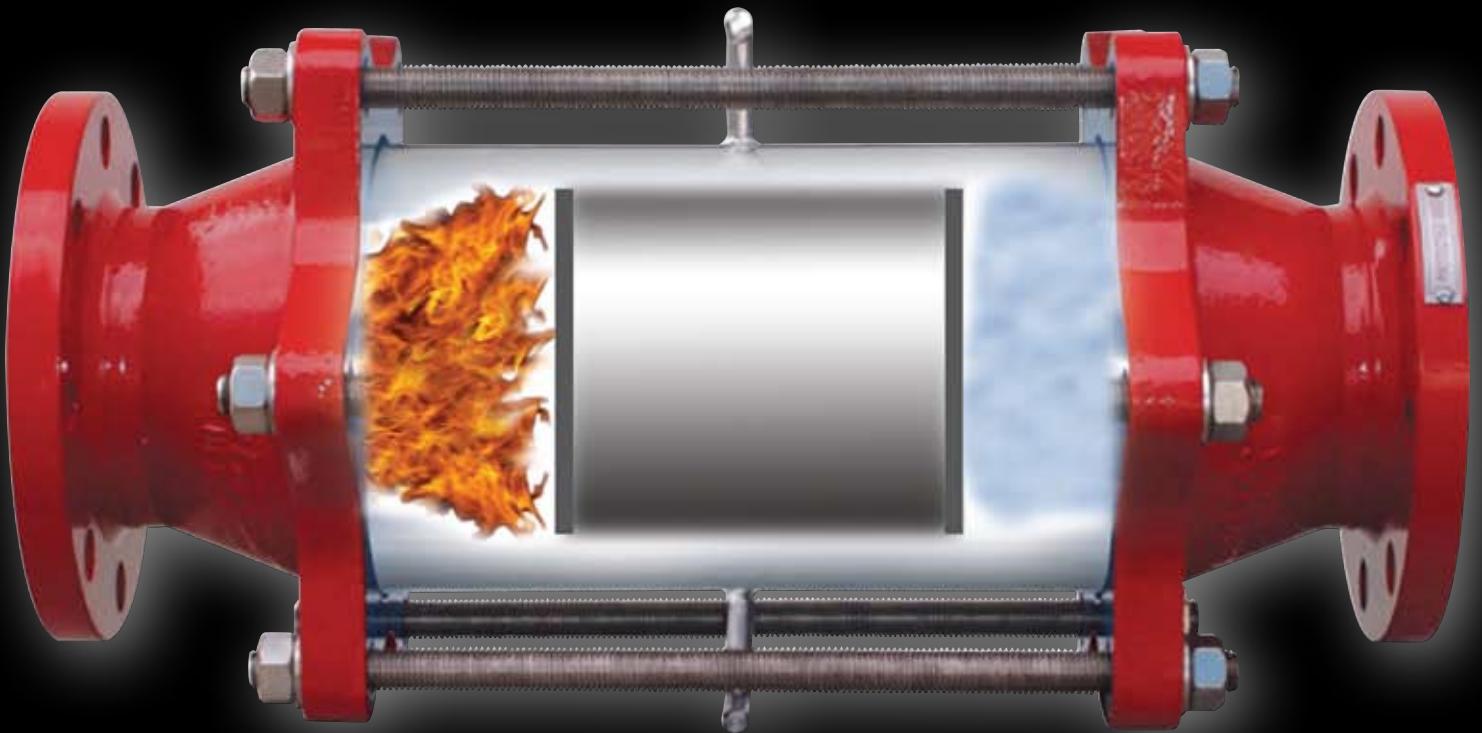


FLAME Arrestors

A U S T R A L I A

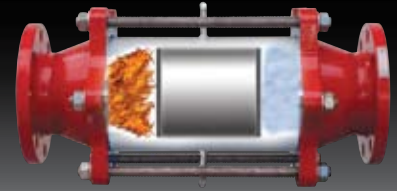


***Flame Arrestors
with Proven
Performance
and Safety***

(A Division of Pressure Systems Pty Ltd)

FLAME Arrestors

A U S T R A L I A



The most straight-forward protection device against flame propagation is a Flame Arrestors Australia product.

As federal, state and local air quality regulations become more stringent, incineration of gases becomes a more viable option rather than venting to atmosphere. In addition, there are regulations that require gas with any significant sour content be flared because of foul smell and toxicity.

Companies that engage in this type of activity understandably have important safety concerns.

Protect against flashback in systems that contain flammable liquid products becomes a serious issue.

Flame arrestors have been utilised in a variety of applications over the past fifty years. Old and new applications would include:

- Storage tank vents
- Offshore drilling platform vents
- Oil/petrochemical refineries
- Chemical Processing plants
- Marine loading systems
- Natural gas supply lines
- Flare stacks
- Pulp and paper NCG processing
- Vapour incineration systems
- Vapour recovery systems
- Landfill gas incineration
- Sewage treatment vapour processing
- Pharmaceutical



PRODUCTS

End of Line Flame Arrestors

End of line or free vent flame arrestors allow free venting in combination with flame protection for vertical vent applications.

They prevent flame propagation by absorbing and dissipating heat using spiral wound crimped ribbon 316Lss flame cells.

The KSFE unit gives the protection needed. For sizes 4" and under after ignition of the out flowing gases a fusible element melts, the spring loaded cover automatically opens and the full surface of the flame arrestor is exposed so that the flame arrestor element will not attain the ignition temperature through heat absorption.

Housing construction are Aluminium, Cast Iron, Cast Steel, 304ss and 316Lss.

Hood construction is stainless steel and the element is 316Lss.

Sizes are from 50mm through to 300mm.

Cast iron and cast steel units are epoxy coated both inside and outside.



KSFE



KSFF
Explosion proof type

Inline Flame Arrestors

Inline flame arrestors can be installed either vertically or horizontally within a designated distance from the potential ignition source.

The units are passive devices with no moving parts. They prevent the propagation of flame from the exposed side of the unit to the protected side by the use of a 316L stainless steel crimped metal ribbon type flame cell element. This construction produces a matrix of uniform openings that are carefully constructed to quench the flame by absorbing the heat. This provides an extinguishing barrier to the ignited vapour mixture.

The standard flame cell is suitable for IEC 11A or NEC group D gases. Cells for other gas groups are available as additional extras.

The flame arrestors are available with either aluminium, nodular iron, cast steel, 304ss, 316ss and 316Lss housings. Iron and steel housings are supplied epoxy coated.

Sizes range from 15mm to 600mm.



KSFI

Deflagration & Explosion proof type



KSFH

Deflagration & Explosion proof type



KSFL

Deflagration & Explosion proof type

Detonation Flame Arrestors

Detonation flame arrestors provide positive protection against flame propagation in piping systems that are manifolded or have long runs.

The arrestors are designed to stop an ignited flammable vapour mixture travelling at subsonic or supersonic velocities. They are also designed to protect against continuous burning against the SS316L flame cell for a specific period.

The standard flame cell is suitable for IEC IIA or NEC group D gases. Cells for other gas groups are available as additional extras.

The flame arrestors are available with either carbon steel (epoxy coated), SS304, or SS316 housings with SS316L flame cells.

Sizes range from 50mm to 600mm.

These arrestors can be located at great distances from the ignition source.



KSFD

Detonation & Explosion proof type



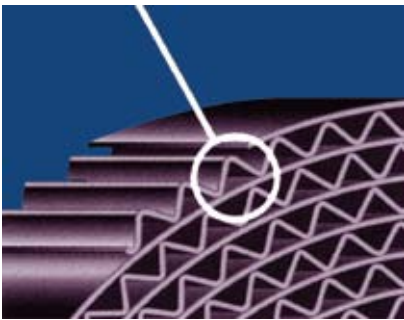
UFD

Detonation Flame Arrestor

HOW FLAME ARRESTORS WORK

Flame arrestors are passive devices with no moving parts. They prevent the propagation of flame from the exposed side of the unit to the protected side by the use of wound crimped metal ribbon type flame cell element. This construction produces a matrix of uniform openings that are carefully constructed to quench the flame by absorbing the heat of the flame. This provides an extinguishing barrier to the ignited vapour mixture.

Flame Cell Channel



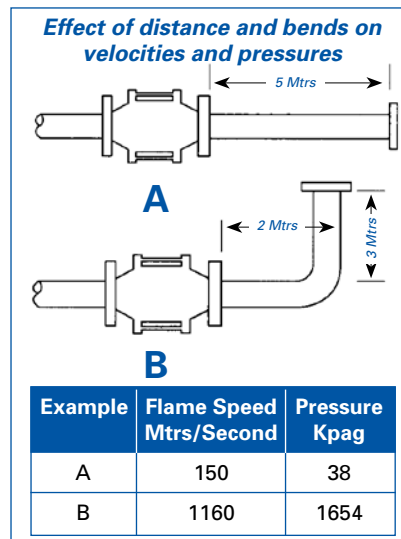
Under normal operating conditions the flame arrestor permits a relatively free flow of gas or vapour through the piping system. If the mixture is ignited and the flame begins to travel back through the piping, the arrestor will prohibit the flame from moving back to the gas source.

In-line flame arrestors have specifically designed heat transfer characteristics for slow moving flames and low to medium pressure fronts (low to medium pressure deflagration). But flames moving at higher velocity and carrying higher pressure fronts (high pressure deflagration and detonations) can pass through a standard in-line flame arrestor. That is why it is critical that

the proper flame arrestor be installed to meet the requirements of both the application, operating conditions and the flame state to which the arrestor will be exposed.

Pipe length, bends and/or flow obstructions

Extended lengths of pipe allow the flame to advance into more severe states of flame propagation such as high pressure deflagrations and detonations.



Bends in piping, pipe expansions and/or contractions, valves, or flow obstruction devices of any kind, cause turbulent flow. Turbulent flow enhances the mixing of the combustible gases, greatly increasing the combustion intensity. This can result in increased flame speeds, higher flame temperatures, and higher flame front pressures than would occur in laminar flow conditions.

Initial operating pressures

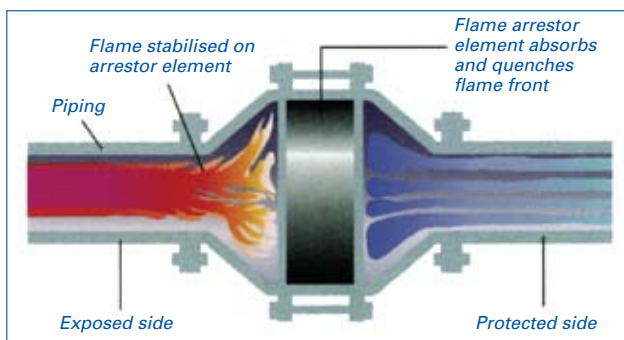
High pressure deflagrations and detonations can occur more easily at higher system operating pressures than at near atmospheric levels. Elevated pressures condense the ignitable gas giving the flame more matter and energy to release thereby boosting flame heat intensity.

Flame stabilisation on the element

A critical concern in flame arrestor installation is the possibility of a flame stabilising on the face of the flame cell element. A flame that continuously burns against the flame arrestor element for a period of time can heat the element above the gas autoignition temperature resulting in flame propagation through the element. The time period varies with the type of element, mixture of air and gas, type of gas, and velocity at which the gas stream is moving.

MESG (Maximum Experimental Safe Gap)

Measurement of the maximum gap between two equatorial flanges on a metal sphere that will prevent a flame from being transmitted from the sphere to the surrounding flammable mixture. MESG is dependent on gas composition. The stoichiometric mixture is used to determine the minimum MESG value for a given gas.



IEC	NEC	MESG	Test Gas List
Group IIC	Group A	0.25	Acetylene
Group IIC	Group B	0.28	Hydrogen
Group IIB	Group B	0.65	Ethylene
Group IIA	Group D	0.90	Propane
Group I	G.M.	1.1	Methane

SELECTION CRITERIA

Flame propagation poses significant dangers to systems and personnel in industries worldwide. Careful consideration must be taken to determine whether to use a Flame Arrestor or a Detonation Flame Arrestor. There are two basic determinations when evaluating the intended application:

- the location of the ignition source from the flame arrestor, and;
- what needs to be protected.

First, determine the location of all potential ignition sources (i.e. flare, vacuum pump, blower, burner, lightning strike, static discharge, etc).

Second, evaluate the system to determine exactly what should be protected (i.e., the gas source, process component, personnel, upstream process facility, tank, etc.).

When you have determined the ignition source(s) and what is to be protected, the following parameters should be evaluated in order to determine the appropriate flame arrestment protective device:

1. Length and configuration of pipe and pipe between ignition source and arrestor.
2. System gas grouping.
2. Initial operating pressure.
3. Flame stabilisation on element.

All of these variables affect the performance of the arrestor and can also affect the dynamics of flame propagation.

Inline and End of Line Applications

The inline flame arrestor and the end of line (free vent) arrestor are used to stop flame propagation of confined and unconfined low pressure deflagrations. They are typically used for limited piping applications when the system operating pressure is near atmospheric levels.

Detonation application

The detonation flame arrestor is an advanced technology flame arrestor. They are used to stop the high pressures and velocities associated with detonation. They stop confined

and unconfined low and high pressure deflagrations, stable and overdriven detonations.

Application parameters for the detonation flame arrestors far exceed those of flame arrestors for pipe lengths, configurations, system operating pressures, and flame stabilisation. Our flame arrestors are designed, manufactured and tested according to API2000, BS7244 and BSEN12874 test standards and codes.

System gas grouping

The type of gas in the system and it's corresponding gas group determines the design of the arrestor element. The SS316L element must be designed to accommodate the specific gas group that could possibly ignite and propagate in the system. The available designs consist of International Electric Code (IEC) group gases into IIC, IIB, IIA and I, the National Electric Code (NEC) groups gases into A, B, C and D categories depending on the MESG value of the gas.

GAS GROUP CHART

Group A

Acetylene

Group B (IIC)

Butadiene
Ethylene oxide
Hydrogen
Manufactured gases containing more than 30% Hydrogen (by volume)
Propylene oxide
Propyl nitrate

Group C (IIB3)

Acetaldehyde
Cyclopropane
Diethyl ether
Dimethyl hydrazine
Ethylene
Hydrogen sulfide
* Methanol (methyl alcohol)
Methyl mercaptan
Unsymmetrical dimethyl hydrazine (UDMN)

Group D (IIA)

Acetone
Acrylonitrile
Ammonia
Benzene
Butylene
1-Butanol (butyl alcohol)
2-Butanol (secondary butyl alcohol)
Cyclohexane
N-Butyle acetate
Isobutyl acetate
Ethane
Ethanol (ethyl alcohol)
Ethyl acetate
Ethyl acrylate
Ethylene dichloride
Gasoline
Heptanes
Hexanes
Isoprene
Methane (natural gas)
Methyl acrylate
Methylamine
Methyl ethyl ketone
Methyl mercaptan

Group D (IIA) (continued)

3-Methyl-1-butanol (isoamyl alcohol)
Methyl isobutyl ketone
2-Methyl-1-propanol (isobutyl alcohol)
2-Methyl-2-propanol (tertiary butyl alcohol)
Naphtha (petroleum)
N-Propyl acetate
Octanes
Pentanes
1-Pentanol (amyl alcohol)
Propane
1-Propanol (propyl alcohol)
2-Propanol (isopropyl alcohol)
Propylene
Styrene
Toluene
Turpentine
Vinyl acetate
Vinyl chloride
Xylenes

*Flame Arrestors with
Proven Performance and Safety*

FLAME Arrestors

A U S T R A L I A

(A Division of Pressure Systems Pty Ltd)

Head Office:

35 Sir Laurence Drive, Seaford, Victoria, 3198 Australia
PO Box 154, Seaford, Victoria 3198 Australia
Telephone 03 9776 9477 Facsimile 03 9766 9606
web www.pressuresystems.com.au