alnab

Catalog # 77-9000

BS&B®

Flame Arresters, Detonation Arresters, Breather Vents

About BS&B FlameSaf

BS&B FlameSaf Limited is a safety company dedicated to protecting industrial plants and personnel from the dangers of explosion and fire propagation. The company's rich history spans more than 80 years with the BS&B name being well known for its innovative solutions for personal protection against dangerous over pressurizations and explosions within industrial settings.

BS&B offers a comprehensive portfolio of products and services that meet and exceed rigorous industry standards for quality and reliability. Our integrated solutions have been time-tested and fine-tuned to deliver maximum value and greater efficiencies to individual engineering processes.

BS&B is a certified manufacturer of flame arresters, detonation arresters and pressure / vacuum vents both with and without flame arrester function. Our flame arresters and Breather Vents (pressure/vacuum vents, P/V vents) incorporate impressive design and performance features that include compact and light weight construction, with low pressure loss in flowing conditions. The easy to assemble design enables quick installation of replacement parts when required.

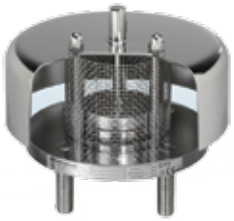
Certification

All products have been certified through an independent certification body as per the EC Directive 94/9/EC and awarded the CE mark of conformity.

Our state of the art flow and dimensional measurement techniques ensure the user receives high quality safety devices compliant with Industry Standards. Product performance features are controlled according to EN 10204 and in line with customer special requirements.

The BS&B FlameSaf quality assurance system is monitored by Det Norske Veritas (DNV), who issue certification according to ISO 9001 to BS&B.

Metal foil element



Model 942-EV

Model 937-E Breather Vent with integrated Flame Arrester

Flame Arresters

Flame arresters are used as protection against explosions by preventing the transmission of flame and explosion transfer in machines, equipment and plant, containing inflammable gas or steam-air mixtures of inflammable liquids. These autonomous safety systems limit the effects of the explosions, rendering them harmless, they are intended to allow flow but prevent flame transmission.

BS&B FlameSaf arrester products use the technical principle of a 'quenching gap'. Precision coiled arrester elements are manufactured to allow normal flow to occur and to present a barrier to flame propagation. The quenching gap selected for the combustion condition of each application is too small for flame to pass and burning is 'arrested'. Precision coiled arrester elements offer superior safety as compared to mesh type arresters which offer less stability of quenching gap.

The BS&B FlameSaf product line includes arrester technology suited to safe management of deflagration and detonation risks in piping systems and equipment. End-of-line and in-line devices are available along with P/V vents that offer integral arresters.

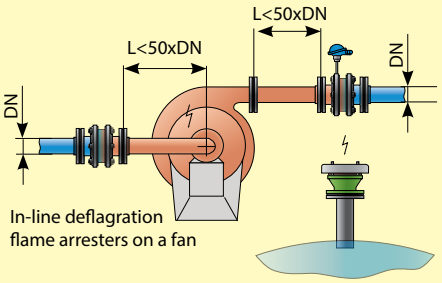
Functions of Flame Arrester

Protects systems for generating, storing, and transporting gases and liquids of every hazard category against dangers such as deflagration, detonation and stabilized burning.

Deflagration

A deflagration is an explosive combustion process in which the flames propagate at subsonic velocity. There are end-of-line and in-line deflagration flame arresters. It is imperative to adhere to the maximum distance (L) from the ignition source when installing in-line flame arresters.

(Refer to page 11 of this document for combustion reference data.)



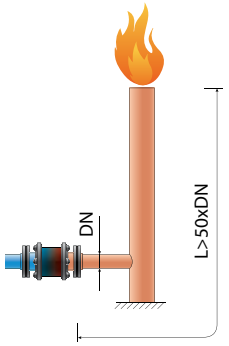
In-line deflagration flame arresters on a fan

End of line deflagration flame arrester on a tank

Detonation

A detonation is an explosion propagating at supersonic velocity characterized by a shock wave. Detonations occur in pipelines with long distances to the ignition source (L > 50 x DN being an example for explosion group IIA).

The flame arresting capability and mechanical strength of an in-line detonation flame arrester is much greater than an in-line deflagration flame arrester. Devices designed for detonation conditions will provide deflagration protection as well.

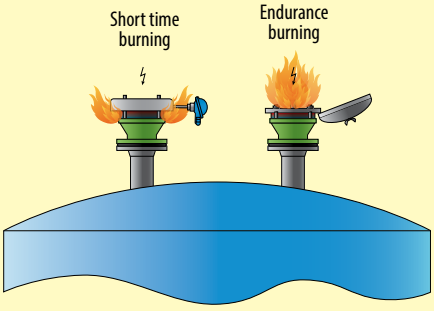


In-line detonation flame arrester on a flare

Stabilized Burning

Stablized burning is the steady burning of a flame at or on a flame arrester element. Survival of such conditions requires the selection of an arrester model designed for endurance conditions.

BS&B FlameSaf short time burning flame arresters have an integral temperature sensor for the user to monitor temperature. If a pre-determined limit is exceeded, the user must initiate a process shut down to end the combustion event within a defined time period specific to the application.



End-of-line flame arresters on a tank

Flame Arrester Reference Guide:

Flame arresters are suitable for a variety of explosive atmospheres within industrial applications. The next several pages showcases the benefits of the BS&B lineup of flame arresters. Please reference these pages for solutions to protect your application. For detailed information, please visit our website at www.BSBflamearrester.ie.

Flame Arrester

In-Line Flame Arrester

	Model 931	Model 931-A	Model 931-B	Model 931-T
				
Purpose	Deflagration, stable and unstable detonation endurance burning	Deflagration, stable and unstable detonation endurance burning	Deflagration, stable and unstable detonation	Deflagration, short-time burning
Application	Gas / air- or vapor / air- mixtures of the explosion groups: IIA, I (methane)	Gas / air or vapor / air mixtures of the explosion groups: IIA, I (methane)	Gas / air or vapor / air mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air or vapor / air mixtures of the explosion groups: IIA, I (methane)
Nominal Diameter	Metric: 8, 10, 15, 20, 25 and 32mm Imperial: 1/4, 3/8, 1/2, 3/4, 1 and $1^{1/4}$ inch	Metric: 15, 20, 25 and 32mm Imperial: 1/2, 3/4, 1 and $1^{1/4}$ inch	Metric: 6, 8, 10 and 15mm Imperial: 1/8, 1/4, 3/8 and 1/2 inch	Metric: 40mm Imperial: $1^{1/2}$ inch
Connection	Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	DIN 2501 PN10 ANSI B16.5 - 150 RF	Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	DIN 2501 PN10 ANSI B16.5 - 150 RF
Approval	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852
Metal Foil Element	Stainless Steel	Stainless Steel	Stainless Steel, Special Alloy	Stainless Steel
Housing of Metal Foil Element	-	-	-	-
Body / Cover	Carbon Steel, Stainless Steel	Carbon Steel, Stainless Steel	Stainless Steel, Special Alloy	Carbon Steel, Stainless Steel
Coating	Optional	Optional	-	Optional
Temperature Sensor	-	-	-	Resistance thermometer with ignition protection type: - Inherently safe (E Ex i) - Pressure resistant enclosure (E Ex d)

Reference Guide

In-Line Flame Arrester

Model 931-A-T	Model 933-A	Model 933-G	Model 933-S	
				
Deflagration, short-time burning	Deflagration, stable and unstable detonation, short-time burning	Deflagration, stable and unstable detonation	Deflagration, stable and unstable detonation short time burning	Purpose
Gas / air- or vapor / air- mixtures of the explosion groups: IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Application
Metric: 40mm Imperial: $1^{1/2}$ inch	Metric: 25, 32, 40, 50, 65 and 80mm Imperial: 1, $1^{1/4}$, $1^{1/2}$, 2, $2^{1/2}$ and 3 inch	Metric: 25, 32, 40, 50, 65 and 80mm Imperial: 1, $1^{1/4}$, $1^{1/2}$, 2, $2^{1/2}$ and 3 inch	Metric: 50, 65, 80, 100, 125, 150, 200, 250, 300, 350 , 400 and 500mm Imperial: 2, $2^{1/2}$, 3, 4, 5, 6, 8, 10, 12, 14, 16 and 20 inch	Nominal Diameter
Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	DIN 2501 PN10 ANSI B16.5 - 150 RF	DIN 2501 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	Connection
EC-type-examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	Approval
Stainless Steel	Stainless Steel, Special Alloy	Stainless Steel, Special Alloy	Stainless Steel, Special Alloy	Metal Foil Element
-	Stainless Steel, Special Alloy	Stainless Steel, Special Alloy	Stainless Steel, Special Alloy	Housing of Metal Foil Element
Carbon Steel, Stainless Steel	Body: Carbon Steel, Stainless Steel, Special Alloy	Body: Carbon Steel, Stainless Steel, Special Alloy	Body: Ductile Iron, Carbon Steel, Stainless Steel, Special Alloy	Body / Cover
Optional	Optional	Optional	Optional	Coating
Resistance thermometer with ignition protection type: – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	Resistance thermometer with ignition protection type: – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	Resistance thermometer with ignition protection type: – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	Resistance thermometer with ignition protection type: – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	Temperature Sensor

Flame Arrester

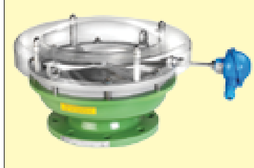
In-Line Flame Arrester / End-Of-Line Endurance Burning Flame Arrester

	Model 933-SE
	
Purpose	Deflagration, stable detonation short time burning
Application	Gas / air- or vapor / air- mixtures of the explosion groups: IIA, IIB1, I (methane)
Nominal Diameter	Metric: 50, 80, 100, 125, 150, 200 and 250mm Imperial: 2, 3, 4, 5, 6, 8 and 10 inch
Connection	ISO 7005 PN10 ANSI B16.5 - 150 RF
Approval	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852
Metal Foil Element	Stainless Steel, Special Alloy
Housing of Metal Foil Element	Stainless Steel, Special Alloy
Body / Cover	Ductile Iron, Carbon Steel, Stainless Steel
Coating	Optional
Temperature Sensor	Resistance thermometer with ignition protection type – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)

	Model 934-BM	Model 934-BP
		
Purpose	Deflagration, endurance burning	Deflagration, endurance burning
Application	Gas / air or vapor / air mixtures of the explosion groups: IIA, IIB, IIB3, I (methane)	Gas / air or vapor / air mixtures of the explosion groups: IIA, IIB3, I (methane)
Nominal Diameter	Metric: 40, 50, 65 and 80mm Imperial: $1^{1/2}$, 2, $2^{1/2}$ and 3 inch	Metric: 25, 32, 40 and 50mm Imperial: 1, $1^{1/4}$, $1^{1/2}$ and 2 inch
Connection	ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3
Approval	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852
Metal Foil Element	Carbon Steel, Stainless Steel	Carbon Steel, Stainless Steel
Housing of Metal Foil Element	Stainless Steel, Special Alloy	Stainless Steel, Special Alloy
Body / Cover	Body: Carbon Steel, Stainless Steel Hood: Stainless Steel	Body: Carbon Steel, Stainless Steel Hood: Plexiglass
Coating	Optional	Optional
Temperature Sensor	-	-

Reference Guide

End-Of-Line Deflagration Flame Arrester

Model 934-B-E	Model 934-B-T	Model 934-BP-E	Model 934-BP-T	
				
Deflagration	Deflagration, short-time burning	Deflagration	Deflagration, Short Time Burning	Purpose
Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIC, IIB3, IIA, I (methane)	Application
Metric: 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350 and 400mm Imperial: 1, $1^{1/4}$, $1^{1/2}$, 2, $2^{1/2}$, 3, 4, 5, 6, 8, 10, 12, 14 and 16 inch	Metric: 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350 and 400mm Imperial: 1, $1^{1/4}$, $1^{1/2}$, 2, $2^{1/2}$, 3, 4, 5, 6, 8, 10, 12, 14 and 16 inch	Metric: 25, 32, 40, 50, 65, and 80mm Imperial: 1, $1^{1/4}$, $1^{1/2}$, 2, $2^{1/2}$ and 3 inch	Metric: 50, 65, 80, 100, 125, 150, 200, 250, 300, 350 and 400mm Imperial: 2, $2^{1/2}$, 3, 4, 5, 6, 8, 10, 12, 14 and 16 inch	Nominal Diameter
ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	ISO 7005 PN10 ANSI B16.5 - 150RF Rp to ISO 7-1 (DIN 2999) BSP to BS 21 NPTF to ANSI B1.20.3	Connection
EC-type-examination certificate based on Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852	Approval
Carbon Steel, Stainless Steel, Special Alloy	Carbon Steel, Stainless Steel, Special Alloy	Carbon Steel, Stainless Steel, Special Alloy	Carbon Steel, Stainless Steel, Special Alloy	Metal Foil Element
Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Housing of Metal Foil Element
Body: Carbon Steel, Stainless Steel, Special Alloy Hood: Stainless Steel	Body: Carbon Steel, Stainless Steel, Special Alloy Hood: Stainless Steel	Body: Carbon Steel, Stainless Steel, Special Alloy Hood: Plexiglass	Body: Carbon Steel, Stainless Steel, Special Alloy Hood: Plexiglass	Body / Cover
Optional	Optional	Optional	Optional	Coating
-	Resistance thermometer with ignition protection type – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	-	Resistance thermometer with ignition protection type – Inherently safe (E Ex i) – Pressure-resistant enclosure (E Ex d)	Temperature Sensor

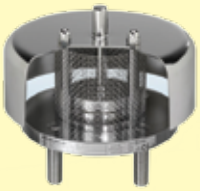
Flame Arrester

End-Of-Line Breather Vent, with Integrated Flame Arrester

	Model 935	Model 935-E	Model 936-E	Model 937-E
				
Purpose	Pressure vent: deflagration and endurance burning	Pressure vent: deflagration	Vacuum vent: deflagration	Pressure and vacuum vent: deflagration
Application	Gas / air- or vapor / air- mixtures of the explosion groups: IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIB3, IIA, I (methane)	Gas / air- or vapor / air- mixtures of the explosion groups: IIB3, IIA, I (methane)
Nominal Diameter	Metric: 50 and 80mm Imperial: 2 and 3 inch	Metric: 50 and 80mm Imperial: 2 and 3 inch	Metric: 50, 80, 100, 125, 150 and 200mm Imperial: 2, 3, 4, 5, 6 and 8 inch	Metric: 50, 80, 100, 125, 150, 200 and 250mm Imperial: 2, 3, 4, 5, 6, 8 and 10 inch
Connection	ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF
Approval	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852, EN 13463-1 and EN 13463-5	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852, EN 13463-1 and EN 13463-5	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852, EN 13463-1 and EN 13463-5	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852, EN 13463-1 and EN 13463-5
Metal Foil Element	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys
Housing of Metal Foil Element	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys	Stainless Steel, Special Alloys
Body / Cover	Ductile Iron, Stainless Steel	Stainless Steel, Special Alloys	Ductile iron, Stainless Steel	Ductile Iron, Stainless Steel
Coating	Optional	Optional	Optional	Optional
Temperature Sensor	-	-	-	-

Reference Guide

End-Of-Line Breather Vent

Model **937-P**	Model **942-EV**	Model **943**	Model **944**	
including Flame Arrester 				
Pressure and vacuum vent: deflagration and endurance burning	(Emergency vent) pressure vent (no arrester element)	Vacuum vent (no arrester element)	Pressure and vacuum vent (no arrester element)	Purpose
Gas / air- or vapor / air- mixtures of the explosion groups: IIA, I (methane)	Gas / air- or vapor / air- mixtures: II 1/2 G c IIB T X	Gas / air- or vapor / air- mixtures: II 1/2 G c IIB T X	Gas / air- or vapor / air- mixtures: II 1/2 G c IIB T X	Application
Metric: 50mm Imperial: 2 inch	Metric: 50, 80, 100, 125, 150, 200 and 250mm Imperial: 2, 3, 4, 5, 6, 8 and 10 inch	Metric: 50, 80, 100, 125, 150 and 200mm Imperial: 2, 3, 4, 5, 6 and 8 inch)	Metric: 50, 80, 100, 125, 150, 200 and 250mm Imperial: 2, 3, 4, 5, 6, 8 and 10 inch	Nominal Diameter
ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	ISO 7005 PN10 ANSI B16.5 - 150 RF	Connection
EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and ISO 16852, EN 13463-1 and EN 13463-5	EC-type examination certificate based upon Directive 94/9/EC, according to ATEX 95 and EN 13463-1, EN 13463-5	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and EN 13463-1, EN 13463-5	EC-type examination certificate based on Directive 94/9/EC, according to ATEX 95 and EN 13463-1, EN 13463-5	Approval
Stainless Steel, Special Alloys	N/A	N/A	N/A	Metal Foil Element
Stainless Steel, Special Alloys	N/A	N/A	N/A	Housing of Metal Foil Element
Ductile Iron, Stainless Steel	Carbon Steel, Stainless Steel	Ductile Iron, Stainless Steel	Ductile Iron, Stainless Steel	Body / Cover
Optional	-	Optional	Optional	Coating
-	-	-	-	Temperature Sensor

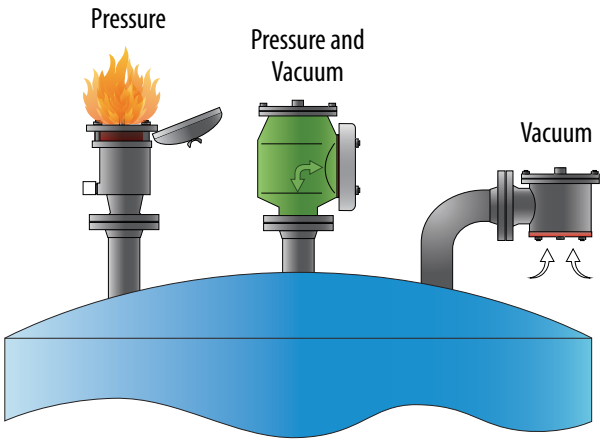
Vents Without Flame Arrester Element

Vents are used for independent ventilation of vessels and storage tanks therefore offering safety for both normal and emergency venting situations, as detailed in API 2000/ISO 28300.

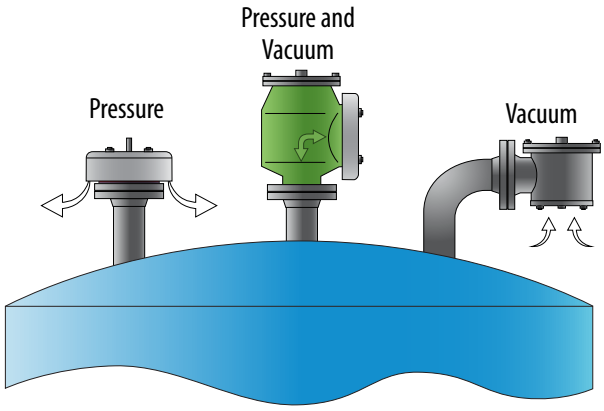
BS&B FlameSaf vents have weight loaded valve discs which attain their full valve lift as soon as pressures exceed 10% above the set pressure. This enables us to offer the customer maximum performance with lowest product losses.

Standard valve seats, discs and spindles are manufactured from corrosion-resistant material. For minimizing the leak rate, the sealing between valve disc and seat is made of a sealing foil and an air cushion over it. The sealing is made of metal if set pressures are high.

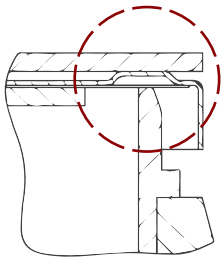
The suitability of all vents used in explosive atmospheres has been proved in an ignition hazard assessment. As devices of Device Group II Category 1G, they are approved for use in vessels and equipment with inflammable mixtures.



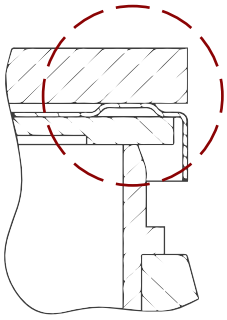
Breather vents including flame arrester element on a tank



Breather vents on a tank



Sealing with foil and air cushion



Metallic sealing

Vents Including Flame Arrester Element

The weight loaded pressure and vacuum vents are additionally equipped with flame arrester elements. In addition to the test as device for inflammable mixtures, the vents have also been tested and certified as safety systems in accordance with the EC Directive 94/9/EC.

The combination of vent and flame arrester element combines the merits of the two systems in a single compact device.

Combustion Reference Data

Explosion group		MESG [4] of mixture	Example
IEC [1]	NEC [2]	in mm	
I [3]		≥1.14	Methane
IIA	D	≥0.90	Fuel
IIB1	C	≥0.85	Ethanol
IIB2		≥0.75	Dimethyl ether
IIB3		≥0.65	Ethylene
IIB		≥0.50	Carbon monoxide
IIC	B	<0.50	Hydrogen

1) *IEC International Electric Code*

2) *NEC National Electric Code*

3) *in accordance with ISO 16852 Explosion group IIA1*

4) *Maximum experimental safe gap (MESG): Maximum gap of the joint between the two parts of the interior chambers of a test apparatus, which when the internal gas mixture is ignited under specific conditions, prevents ignition of the external gas mixture through a 25 mm long joint for all concentrations of the tested gas or vapor in air. The maximum experimental safe gap is a feature of the respective gas mixture (EN 1127-1:2011).*

Selection of Explosion Group IIA (D) (*Substances in the explosion group I)

Gases	Liquids	
Biogas	Acetaldehyde (C_2H_4O)	Aviation fuel
Butane (C_4H_{10})	Acetone (C_3H_6O)	Methanol (CH_4O)
Butene (C^4H_8)	Acetonitrile (C_2H_3N)	Petrol Super Petroleum
Land-fill gas*	Formic acid (CH_2O_2)	Vegetable oils (e.g. turpentine
Natural gas	Ammonia (NH_3)	oil, pine oil)
Liquefied gas	Aniline (C_6H_7N)	Solvent Naptha
Power gas (suction gas)	Benzol (C_6H_6)	Special benzine (e.g. petrol-
Furnace gas	Cumene (C_9H_{12})	ether, mineral turpentine)
Carbon oxysulphide (COS)	Dichloromethane (CH_2C_{l2})	Toluol (C_7H_8)
Digester gas*	Diesel fuel	Trichlorethylene (C_2HCl_3)
Methane (CH_4)*	Jet petrol	Xylol (C_8H_{10})
Methyl nitrite (CH_3NO_2)	Petroleum (crude oils)	
Monochlor difluorethane ($C_2H_3ClF_2$)	Acetic acid ($C_2H_4O_2$)	
Propane (C_3H_8)		
Propene (C_3H_6)		
Trimethylamine (C_3H_9N)		
Vinyl chloride (C_2H_3Cl)		
1,1,1-Trifluorethane ($C_2H_3F_3$)		

Selection of Explosion Group IIB1-IIB (C)

Gases	Liquids
Butadiene -1,3 (C_4H_6)	Oxobutanoic acid ($C_5H_8O_3$)
Dimethyl ether (C_2H_6O)	Acrylonitrile (C_3H_3N)
Ethylene (C_2H_4)	Cyclohexadiene -1,3 (C_6H_8)
Ethylenoxide (C_2H_4O)	Diethyl carbonate ($C_5H_{10}O_3$)
Formaldehyde (CH_2O)	Divinyl ether (C_4H_6O)
Carbon monoxide (CO) Coke oven gas	Ethanol (C_2H_6O)
Hydrogen sulphide (H_2S)	Ethyl benzol (C_8H_{10})
	Furan (C_4H_4O)
	Isoprene (C_5H_8)
	Methacrylate ($C_4H_6O_2$)
	Nitrobenzol ($C_6H_5NO_2$)
	Propylenoxide (C_3H_6O)

Selection of Explosion Group IIC (B)

Gases	Liquids
Hydrogen (H_2)	Carbon disulfide (CS_2)

Service Station Products

Safety Components at Service Stations: Biofuels (E85)

There are various technical solutions for the worldwide increased safety requirements for explosion protection. One of these challenges in particular; securing service stations, is met by BS&B FlameSaf Limited with a newly developed range of compact flame arresters and vents.

The vents serve to recirculate the petrol fumes safely, as well as secure ventilation. The development of various solutions became necessary, as the mineral oil companies worldwide all have their own safety philosophies. The new range is conceived in such a way that they are also in line with the increased technical requirements, which arose from the use of alternative fuels. In particular the continuing worldwide introduction of bioalcohol mixtures (E85) was taken into account. Therefore a sustainably fire resistant over and under pressure valve is a worldwide novelty for E85, which was matched to the particular technical requirements, has an interesting design and is produced in line with excellent quality standards.

The compact design allows cost effective production which is reflected in a customer friendly price. With the new range, of which a large number of various valves has already been installed in Sweden, we hope to increase the popularity of BS&B FlameSaf outside of the natural gas provision sector.

Safety Equipment for Vapor Recovery and Venting Systems of Service Stations

Gasoline vapors are released to the atmosphere every time a fuel tank is filled with gasoline. This includes filling a large underground storage tank as well as the fuel tank of a motor vehicle.

Stage 1: Vapor recovery refers to the capture of gasoline vapors generated when a tank truck delivers gasoline to a storage tank at a gasoline station. As the storage tank is filled, the vapors are transferred to the tank truck, which then carries the vapors to the gasoline distribution terminal. During loading of the truck, the vapors are returned to the terminal and then condensed into liquid gasoline or are incinerated.

Stage 2: Vapor recovery refers to the capture of gasoline vapors generated when a motor vehicle fuel tank is filled at a gasoline station. Using a specially designed nozzle, the vapors are transferred from the fuel tank in the vehicle to the storage tank at the station as the vehicle fuel tank is filled.

Service Station Products Specifications

Item: 934-ES 2 inch
Description: End of line flame arrester deflagration and endurance burning
Explosion group: IIA and / or E85
Dimension: DN50

Item: 944-ES 2 inch
Description: End of line pressure / vacuum vent
Dimension: DN50

Item: 937-ES 2 inch
Description: End of line flame arrester endurance burning proof with pressure / vacuum vent
Explosion group: IIA and / or E85
Dimension: DN50

Item: 941-D-ES 2 inch
Description: In-line pressure / vacuum vent
Explosion group: IIB
Dimension: DN50

Item: 931-ES 2 inch
Description: In-line deflagration flame arrester
Explosion group: IIA
Dimension: DN50

Item: 933-G 2 inch
Description: In-line detonation flame arrester
Explosion group: IIA and / or IIB3
Dimension: DN50

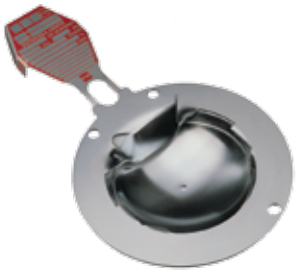
Item: 933-A 3 inch
Description: In-line detonation flame arrester
Explosion group: IIA and / or IIB3
Dimension: DN80

Item: 931-ES 1 inch
Description: In-line deflagration flame arrester
Explosion group: IIA
Dimension: DN25

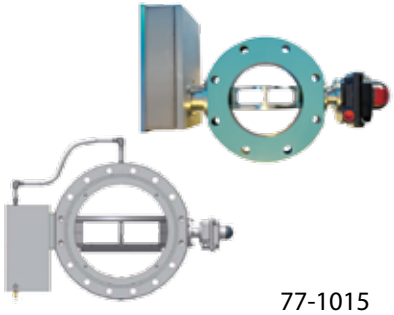
Item: 931-ES 3 inch
Description: In-line deflagration flame arrester
Explosion group: IIA
Dimension: DN50

Item: 931-ES 2 inch
Description: In-line detonation flame arrester
Explosion group: IIA
Dimension: DN50

Other Pressure

Rupture Disk Devices	Saf-T-Graf® Monobloc and replaceable element Graphite Disks	Custom Engineered Products
	 77-8550	 77-7005
Rupture disks (bursting disks) are non-reclosing, pressure relief devices that activate at a specified pressure and temperature. They may be used as stand-alone pressure relief devices, or in parallel or in series with safety / pressure relief valves.	Graphite disks are made from impregnated graphite offering low burst pressure and excellent corrosion resistance. BS&B graphite disks are supplied with integral gaskets for direct installation between international pipe flanges. The replaceable element range is installed in graphite or stainless steel safety heads before installation between pipe flanges.	• A wide range of standard and custom-designed rupture disk assemblies are available for your specific application • Assemblies are designed to be discarded after disk rupture; other designs permit the replacement of the ruptured disk • Customized designs are available for customer applications which cannot be met using standard assembly designs • 3-150mm (1/8-6 inches) • Burst pressures from 0.69-6,900barg (10-100,000 psig) • Disk assemblies include soldered, welded, crimped and threaded designs
Pressure relief solution for burst pressures ranging from a few inches of water column / a few millibar to over 4,800bar (70,000 psig)	• 15-600mm (0.5-24 inches) • Burst pressures 0.02-69barg (0.25-1,000 psig) • Temperatures to 205°C (400°F) - higher operating temperatures to 427°C (800°F) are achieved using a 'high temperature assembly'	
Disk designs for industrial process, sanitary / aseptic pharmaceutical and biotech and highly viscous process media applications.	A steel armoring ring around the disk for added safety and easier installation is recommended.	

Relief Solutions

Industrial Explosion Protection	Vent-Saf® and Vent-Saf® Plus	Specialty Valves
 77-8024	 77-8003 77-8015	 77-1015
Type IPD system - explosion suppression and isolation systems detect the earliest stage of a deflagration by sensing the pressure wave that comes ahead of the flameball and uses the signal to activate delivery of an extinguishing agent A typical system consists of the following: • Sensor • Power supply module • System monitor • Several explosion suppression 'cannons'	• Designed to protect equipment against damage in the event of deflagration of combustible materials • Explosion panels are low burst pressure membranes which are designed to be fastened over an opening of calculated size to provide rapid pressure relief • BS&B utilizes NFPA 68 and VDI-3673 venting guidelines, which are recognized worldwide	**Buckling pin pressure relief technology** (BPRV™) • Fast acting, quick opening buckling pin activate pressure relief devices designed to protect personnel, equipment and the environment from danger of overpressure • Ability to 'field-reset' while remaining installed after an over pressure event
The BS&B companies have proven to be the fastest growing manufacturers of industrial explosion protection technology with products designed to meet the requirements of the United States OSHA Combustible Dust National Emphasis program, NFPA standards and European ATEX Directive.	BS&B offers a complete line of explosion vents including types VSPTM, VSSTM, VSETM, VSBTM, EXPTM, EXP-DVTM, LCVTM and HTVTM.	**BPRV**™ - offers the highest flow capacity and convenient inline installation • 50-1,500mm (2-60 inches) • ASME "UD" stamped • European Pressure Equipment Directive "CE" marked **BPAV**™ - controlled by a precision buckling pin that is calibrated to respond to the forces generated by inlet pressure acting on the valve plug

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