

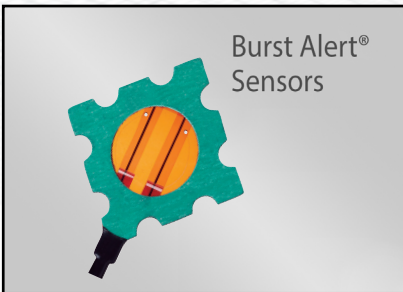
Rupture Disks



Rupture Disk
Assemblies



Burst Alert®
Sensors



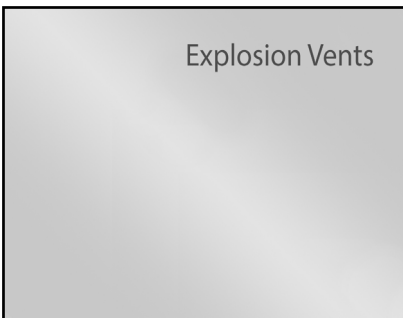
Flame Arresters
and Tank Vents



Buckling Pin Valves



Explosion Vents



Overpressure Relief Technology SELECTION GUIDE



Sta-Saf® System

The Sta-Saf® system is the combination of solid metal reverse buckling disks with proprietary design safety heads.

STANDARD RUPTURE DISK FEATURES

- Operating ratio up to 100% (CE/ PED) / 95% (ASME)
- Full vacuum resistant
- Solid metal construction enabling optimum leak tightness
- Designed for non-fragmentation
- Recommended for isolation of pressure relief valves
- Metal tag with product identification and traceability data as well as code symbol stamps as appropriate
- Superior pressure cycle resistance

Note: Rupture disks are differential pressure devices.

SAFETY HEADS

- SRI-7RS, SRB-7RS, SRB-7FS and TR-Series pre-torqued safety heads
- S90-7R, SPR-7R, SR-7R, SMR-7R and TR Series pre-assembled safety heads.

STA-SAF® Reverse Buckling Disks

	Sigma™ / Sigma EXL™	SKR™	SKI™	LPS™	LSR™
Disk Sizes	1–24 inches (25–600mm)	1–24 inches (25–600mm)	1–8 inches (25–200mm)	1–12 inches (25–300mm)	1–6 inches (25–150mm)
Burst Pressures	15–500 psig (1–34.5 barg)	10–500 psig (0.60–34.5 barg)	5–500 psig (3.45–34.5 barg)	5–70 psig (0.3 – 4.8 barg)	2–300 psig (0.14–20 barg)
Material	*Standard, except aluminum	*Standard	*Standard, except aluminum	*Standard	*Standard, except aluminum
Loading (Direction of Flow)					
Service Phase	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid
Manufacturing Design Range	5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Best	Best	Best	Best	Best
Operating Ratio**	95% ASME (100% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)
Vacuum Support Required	No	No	No	No	No
Designed for Non-Fragmentation	Yes	Yes	Yes	Yes	Yes
Safety Relief Valve Isolation	Yes	Yes	Yes	Yes	Yes
Safety Head	SRI-7RS, SRB-7RS, SRB-7FS, and TR-Series	SRI-7RS, SRB-7RS, SRB-7FS, S90-7R, SPR-7R, SR-7R and TR-Series	SRI-7RS, SRB-7RS, SRB-7FS, and TR-Series	SRI-7RS, SRB-7RS, S90-7R, SRB-7FS, SPR-7R, SR-7R and TR-Series	SRI-7RS, SRB-7RS, SRB-7FS, S90-7R and TR-Series

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276)
Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium. See page 20 for proprietary material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

Ⓜ SRI-7RS safety head, US patent 10,704,698 applies & international patents apply.
SKI rupture disk, US patent 10,975,977 applies & international patents pending.
US and international patents are pending for LSR rupture disk

STA-SAF® Reverse Buckling Disks

	RLS™	SRD™ / SRD-L™	FRS™ / FRL™	S-90™	JRS™
Disk Sizes	1–20 inches (25–500 mm)	1–24 inches (25–600 mm)	1–2 inches (25–50mm)	1–40 inches (25–1,016 mm)	1–42 inches (25–1050 mm)
Burst Pressures	20 –2,000 psig (1.4–138 barg)	11–750 psig (0.83–51.7 barg)	11.5–150 psig (0.8–10.3barg)	5–180 psig (0.4–12.4 barg)	11–750 psig (0.83–51.7 barg)
Material	*Standard, except aluminum	*Standard except Aluminum	*Standard, except aluminum	*Standard, except aluminum	*Standard except Aluminum
Loading (Direction of Flow)					
Service Phase	Gas or liquid	Gas or liquid	FRS = gas FRL = liquid	Gas or liquid with gas pocket. Consult BS&B	Gas or Liquid
Manufacturing Design Range	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Best	Best	Best	Best	Best
Operating Ratio**	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)
Vacuum Support Required	No	No	No	No	No
Designed for Non-Fragmentation	Yes	Yes	Yes	Yes	Yes
Safety Relief Valve Isolation	Yes	Yes	Yes	Yes	Yes
Safety Head	SRI-7RS, SRB-7RS, S90-7R, SRB-7FS, SPR-7R, SR-7R and TR-Series	SRI-7RS, SRB-7RS, S90-7R, SRB-7FS, SPR-7R, SR-7R and TR-Series	SRI-7RS, SRB-7RS, S90-7R, SRB-7FS, SPR-7R, SR-7R and TR-Series	SRI-7RS, SRB-7RS, SRB-7FS S90-7R, SPR-7R, SMR-7R. and TR-Series	SRI-7RS, SRB-7RS, SRB-7FS, SR-7R, and TR-Series

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276)
Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium. See page 20 for proprietary material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

Ⓜ US patent 10,704,698 applies to SRI-7RS safety head. International patents also apply
Insert design safety heads locate inside the bolt circle of the companion flanges between which they are installed.



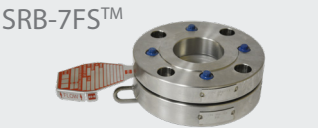
Safety Heads



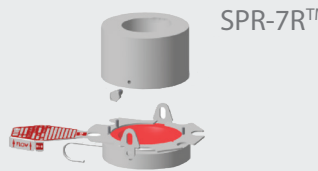
Compact Pretorqued Insert Design



Pretorqued Insert Design



Pretorqued Full-Bolted Design



Preassembled Insert Design
Extended Outlet / Disk Petal Containment



Preassembled Insert Design for use with Burst Alert® Magnetic Sensors



Preassembled Insert Design

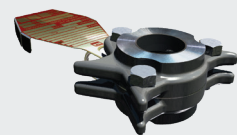


Safety Heads

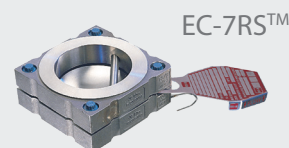


Pretorqued Insert Design

US patent 10,704,698 applies. CRI-7RS™
International patents pending



Compact Pretorqued Insert Design



Pretorqued Insert Design



Preassembled Insert Design



Preassembled Insert Design



Union Holder

REVERSE BUCKLING Disk Technology

	Sure-Saf™ CSI™	Eco-Saf™ ECR™	RB-90™	SKR-U™	LPS-U™
Disk Sizes	1–10 inches (25–250mm)	1–24 inches (25–600mm)	1–42 inches (25–1050mm)	0.5–1 inches (15–25mm)	0.5–1 inches (15–25mm)
Burst Pressures	30–800 psig (2.1–55 barg)	1–100 psig (0.07–6.9 barg)	10–1800 psig (0.7–124 barg)	† 55–500 psig (4–34.5 barg)	5–70 psig (0.35 – 4.8 barg)
Material	*Standard, except aluminum	*Standard, except aluminum with gaskets	*Standard	*Standard, except aluminum	*Standard, except aluminum
Loading (Direction of Flow)					
Service Phase	Gas or liquid	Gas or liquid	Gas or liquid with gas pocket. Consult BS&B	Gas or liquid	Gas or liquid
Manufacturing Design Range	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Best	Best	Best	Best	Best
Operating Ratio**	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)
Vacuum Support Required	No	***	No	No	No
Designed for Non- Fragmentation	Yes	Yes	Yes	Yes	Yes
Safety Relief Valve Isolation	Yes	Yes	Yes	Yes	Yes
Safety Head	CSR-7RS, CSI-7RS and TR-Series	EC-7RS and EC-7R	RB-7R	UR-2	UR-2

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276).
Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium. See page 20 for proprietary
material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** Some pressure combinations may require a vacuum support.

† Refer to RLS-U for higher burst pressures

VAC-SAF® Rupture Disks

HiLo™	RLBP™/ RLBV™	DKB™ and P/DKB™	AVB™ and P/AVB™	AV™ ****	
2–8 inches (50–200mm)	2–8 inches (50–200mm)	2–8 inches (50–200mm)	3–8 inches (80–200mm)	2 – 42 inches (50–1050mm)	Disk Sizes
5 – 300 inches WC (low) 3 – 75 psig (high) 12–747 mbar (low) 0.2 – 5.2 barg (high)	5 – 300 inches WC 12–747 mbar	5.5 – 44 inches WC (low) 7 – 170 psig (high) 14 – 110 mbar (low) 0.5 – 12 bar (high)	3–100 psig (0.2–6.9 barg)	0.5 – 150 psig (0.035 – 10.35 barg)	Burst Pressures
*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special	Material
*** 		*** 	*** 	*** 	Loading (Direction of Flow)
Gas or liquid with gas pocket. Consult BS&B	Gas or liquid with gas pocket. Consult BS&B	Gas or liquid with gas pocket. Consult BS&B	Gas or liquid	Gas or liquid	Service Phase
10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	Manufacturing Design Range
Better	Better	Better	Better	Good	Cycle Life (Resistance to Fatigue)
80% ASME (90% for some designs) (85% CE)	80% ASME (90% for some designs) (85% CE)	60% ASME (85% CE)	80% ASME (85% CE)	60% ASME (65% CE)	Operating Ratio**
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Optional when 1 way burst pressure	Vacuum Support Required
Yes	Yes	Yes	Yes	Yes	Designed for Non- Fragmentation
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Yes (@ outlet)	Safety Relief Valve Isolation
HL-7RS™ and HL-7R™	HL-7RS™ and HL-7R™	KB-7R™, PKB-7R™	VB-7R™	No safety head required.	Safety Head

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy®
(alloy C-276). Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium.
See page 20 for proprietary material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** Red & Blue flow arrows indicate products with available burst pressure calibration in both directions.

**** AV type disks are supplied with gaskets on both sides of the disk. Klingsil® is the standard material; alternatives
available upon request.



Safety Heads



Pretorqued Insert Design

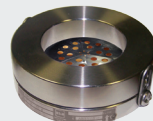


Preassembled Insert Design



Preassembled Insert Design

VB-7R™



Preassembled Insert Design



Sanitary Vac-Saf®
Safety Heads



Bio-Saf® Sanitary
Safety Heads



GCR-SW™

Single-piece assembly consisting of the rupture disk welded between sanitary clamp connections.

Sanitary VAC-SAF® Rupture Disks

	HiLo-S™	RLBP-S™ / RLBV-S™	AVB-ST™	VKB-S™ / P/VKB-S™	GHI™
					 Safety head not required
Disk Sizes	2–8 inches (50–200mm)	2–8 inches (50–200mm)	2–8 inches (50–200mm)	2–8 inches (50–200mm)	1.5–4 inches (40–100mm)
Burst Pressures	5–300 inches WC (low) 3–75 psig (high) 12–747 mbar (low) 0.2–5.2 barg (high)	3 in. WC - 75 psig (7 mbar - 5.2 psig)	3-100 psig (0.2-6.9 barg)	5.5-44 inches WC (low) 7-170psi (high) 14–110 mbar (low) 0.5–12 bar (high)	5-91 inches WC (low) 8-29 psi (high) 13–226 mBar (low) 0.5–2.0 bar (high)
Material	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)
Loading (Direction of Flow)					
Service Phase	Gas or liquid with gas pocket. Consult BS&B.	Gas or liquid with gas pocket. Consult BS&B.	Gas or liquid	Gas or liquid with gas pocket. Consult BS&B.	Gas or liquid with gas pocket. Consult BS&B.
Manufacturing Design Range	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Better	Better	Better	Better	Better
Operating Ratio**	80% ASME (90% for some designs) (85% CE)	80% ASME (90% for some designs) (85% CE)	60% ASME (85% CE)	80% ASME (85% CE)	80% ASME (90% for some designs) (85% CE)
Vacuum Support Required ***	No	No	No	No	No
Designed for Non-Fragmentation	Yes	Yes	Yes	Yes	Yes
Safety Relief Valve Isolation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Safety Head	HL-C™	KB-C™, P/KB-C™	VB-C™	KB-C™, P/KB-C™	Not applicable

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276). Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium. Gasket material options for the GCR and SLP series includes silicone, Viton®, EPDM and Polysteel. See page 20 for proprietary material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** Please verify the level of vacuum resistance required; disk types on this page may be available with partial vacuum resistance
The rupture disks on this page can be supplied with burst pressure calibration in 1 or 2 directions.

Sanitary BIO-SAF® Rupture Disks



See page 6 for
Safety Head
information.

GCR™ Series***	GCR-SW™	GFR-S™	GFR-SW™	SLP-S™	GLR-S™	GLP-S™	
1.5–4 inches (40–100mm)	1.5–4 inches (40–100mm)	1–3 inches (25–80mm)	1–3 inches (25–80mm)	1.5–3 inches (40–80mm)	1.5 inches (40mm)	1-3 inches (25–80mm)	Disk Sizes
10–300 psig (0.7–20.7barg)	10–300 psig (0.7–20.7barg)	11.5–300 psig (0.8–21 barg)	11.5–300 psig (0.8–21 barg)	5–70 psig (0.3–4.8barg)	175–350 psig (12–24 barg)	11,5–300 psig (0.5–21barg)	Burst Pressures
*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	*Standard and special (not aluminum)	Material
							Loading (Direction of Flow)
Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Service Phase
10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	Manufacturing Design Range
Best	Best	Best	Best	Best	Best	Best	Cycle Life (Resistance to Fatigue)
90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	90% ASME (95% CE)	Operating Ratio**
No	No	No	No	No	No	No	Vacuum Support Required
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Designed for Non-Fragmentation
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Safety Relief Valve Isolation
GR-C™****	Not Applicable	GR-C™	Not Applicable	GR-C™	GR-C™	LP-C™	Safety Head

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276). Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625), and niobium. Gasket material options for the GCR and SLP series includes silicone, Viton®, EPDM and Polysteel. See page 20 for proprietary material references.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** GCR-Series™ includes rupture disks GCR-S™, GCR-SS™, GCR-SM, GCR-SMS, GCR-SE, GCR-SES, GCR-N, GCR-NS, and GCR-SW™

**** GCR-SM, GCR-SMS, GCR-SW do not require the GR-C outlet safety head ferrule.



FORWARD ACTING Rupture Disks

	B™	D™	XN85™	XT™	XB™	XN™	LCN™
Disk Sizes	1/8 - 44 inches (3 - 1100mm)	2 - 44 inches (25 - 1100mm)	1-24 inches (25-600mm)	1-10 inches (25-225mm)	1-24 inches (25-600mm)	1-12 inches (25-300mm)	1-24 inches (25-600mm)
Burst Pressures	2 - 100,000 psig (0.1 - 6,900 barg)	3-2,000 psig (0.2 - 138 barg)	30-1,800 psig (2.1-124.1barg)	40-1,450 psig (5.5-100 barg)	60-6,000 psig (4.1-414 barg)	55-1450 psig (3.8-100 barg)	3-188 psig (0.2-13barg)
Material	*Standard	*Standard and special	*Standard and special	*Standard and special	*Standard and special	*Standard and special	*Standard and special
Loading (Direction of Flow)							
Service Phase	Gas or Liquid	Gas or Liquid	Gas or liquid with gas pocket (Consult BS&B)	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid
Manufacturing Design Range	Full, 1/2, 1/4, 0%	Full, 1/2, 1/4, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%	10%, 5%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Good	Good	Better	Better	Better	Better	Better
Operating Ratio**	70% ASME (75% CE)	80% ASME (85% CE)	85% ASME (90% CE)	85% ASME (90% CE)	85% ASME (90% CE)	85% ASME (90% CE)	80% ASME (85% CE)
Vacuum Support Required	Yes	Yes	No	No	No	No	No
Designed for Non-Fragmentation	No	† Yes (Consult BS&B)	Yes	Yes	Yes	Yes	† Yes (Consult BS&B)
Safety Relief Valve Isolation	Not recommended	Not recommended	Yes	Yes	Yes	Yes	Not recommended
Safety Head	FA-7R Quick-Sert	FA-7R Quick-Sert	NFI-7RS™, NF-7RS™, NXV-7R™ & NF-7R™	NFI-7RS™, NF-7RS, NX-7R, NXV-7R, and TL-7R™	NFI-7RS™, NF-7RS and NX-7R	NFI-7RS™, NF-7RS and NX-7R	NX-7R and NXV-7R

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276) Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625). See page 20 for proprietary material information.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

† Some seal material may be released.



SAF-T-GRAF® Graphite Rupture Disks

MB™ *AMB™	IMB™ *AIMB™	IMBL™ *AIMBL™	FSM™ *AFSM™	RE™ / REL™ / REV™	
0.5-24 inches (15-600mm)	0.5-24 inches (15-600mm)	0.5-24 inches (15-600mm)	0.5-24 inches (15-600mm)	0.5-24 inches (15-600mm)	Disk Sizes
0.25 – 150 psig (0.017 – 10.3 bar)	0.3 – 1,000 psig (0.021 – 1172 bar)	0.3 – 1,000 psig (0.021 – 1172 bar)	0.3 – 1,000 psig (0.021 – 1172 bar)	1 – 435 psig (0.1 – 30 bar)	Burst Pressures
Graphite	Graphite	Graphite	Graphite	Graphite	Material
					Loading (Direction of Flow)
Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Service Phase
Yes (AMB)	Yes (AIMB)	Yes (AIMBL)	Yes (AFSM)	-	Armored
Order as MBV or AMBV	Not applicable	Not applicable	Not applicable	Order as REV	**Vacuum Support Option
80% ASME (85% PED)	80% ASME (85% PED)	80% ASME (85% PED)	80% ASME (85% PED)	80% ASME (85% PED)	Operating Ratio
-100°F to +400°F (-73°C to +205°C)	-100°F to +400°F (-73°C to +205°C)	-100°F to +400°F (-73°C to +205°C)	-100°F to +400°F (-73°C to +205°C)	-100°F to +400°F (-73°C to +205°C)	Standard Temperature Range
Type AMB-HTA Disk<800°F (427°C)	Type AIMB-HTA Disk<800°F (427°C)	-	-	-	High Temperature Range
No	No	Yes	No	Yes (REL)	Fluoropolymer liner
>22 psi (>1.52bar)	>22 psi (>1.52bar)	>22 psi (>1.52bar)	>22 psi (>1.52bar)	>22 psi (>1.52bar)	Vacuum Resistant

* Armor is recommended for all graphite disks for added safety, easier installation and elimination of breakage during installation. Armor consists of a steel ring encircling the outside diameter of the graphite rupture disk.

** Note: Required for disks rated below 22 psig (1.5 barg) where the disk may be exposed to a vacuum. Vacuum supports are non opening and will reduce the flow area; dial type or bar type supports may be used. Consult BS&B for details.

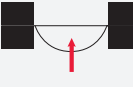
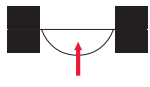
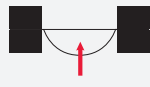
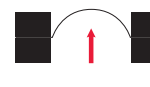


Custom Solutions to Unique Problems
for OEM, Aerospace, Transportation and Energy Industries

- Standard and custom design rupture disk assemblies are available
- Assemblies are supplied ready to use and are single use devices.
- Quality engineering requirements are tailored to customer requirements
- 1/8 - 44 inches (3 - 1100mm).
- Burst pressures from 1-100,000 psig (0.07-6,900 barg).
- Disk assemblies include soldered, welded, crimped and threaded designs.

Note: Rupture disks are differential pressure devices.

CUSTOM ENGINEERED PRODUCTS
Standard Assembly Rupture Disks

	FRB™ / FRB-L™	QRB™	MRB™	XT™
				
Disk Sizes	1/8" – 1" (3mm – 25mm)	1/4" – 3/4" (6mm – 19mm)	1/4" – 8" (6mm – 200mm)	1/4" – 8" (6mm – 200mm)
Burst Pressures	15 – 1,000 psig (1 – 67 bar)	350 – 17,000 psig (24 – 1172 bar)	1500 – 70,000 psig (100 – 1100 bar)	50 – 30,000 psig (3.4 – 2000 bar)
Material	*Standard and Special	*Standard and Special	C276 and INC 600	*Standard and Special
Loading (Direction of Flow)				
Service Phase	FRB: gas service FRB-L: liquid service	Gas or liquid	Gas or liquid	Gas or liquid
Manufacturing Design Range	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%
Cycle Life (Resistance to Fatigue)	Best	Best	Best	Better
Operating Ratio**	80% ASME (85% CE)	90% ASME (95% CE)	90% ASME (95% CE)	80% ASME (85% CE)
Vacuum Support Required	No	No	No	No
Designed for Non-Fragmentation	Yes	Yes	Yes, subject to design review	Yes
Safety Relief Valve Isolation	Yes	Yes	No	Yes
Safety Head	***	***	***	***

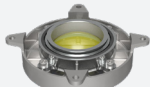
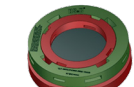
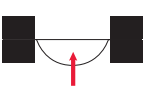
* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276) Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625). See page 20 for proprietary material information.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** Application interface choices included threaded, welded, clamped, in-line, bolted, and torqued.



BATTERY PACK VENTS / CELL VENTS
Low Pressure Relief Devices for Lithium Batteries

eVent LPS™	eVent HL™	eVent G™	ORB™ / OFA™	
				
1 - 12 inches (25 - 300mm)	1 -2.5 inches (23 - 64mm)	1 - 24 inches (25-600mm)	3/8" x 1" (10mm x 25mm) and larger	Disk Sizes
5 – 70 psig (0.34 – 4.83 bar)	0.3 – 4.1 psig (20mbar – 220 mbar)	0.5 – 4 psig (34 mbar– 276 mbar)	15 – 2000 psig (1 – 138 barg)	Burst Pressures
*Standard	Fluoropolymer Film & Stainless Steel	Graphite	Metal	Disk Material
				Loading (Direction of Flow)
Gas or liquid	Gas or liquid	Gas or liquid	Gas or liquid	Service Phase
10%, 5%, 0%	10%, 5%, 0%	10%, 5%, 0%	10, 5%, 0%	Manufacturing Design Range
Best	Best	Best	Best	Cycle Life (Resistance to Fatigue)
90% ASME (95% CE)	80% ASME (85% CE)	80% ASME (85% CE)	90% ASME (95% CE)	Operating Ratio**
No	Yes	Yes	No	Vacuum Support Required
Yes	Yes	Yes, subject to design review	Yes	Designed for Non-Fragmentation
Yes	No	No	No	Safety Relief Valve Isolation
***	***	***	***	Safety Head

* Standard materials: aluminum, nickel (alloy 200), Inconel® (alloy 600), Monel® (alloy 400), 316L ss, Hastelloy® (alloy C-276) Special materials: tantalum, titanium, Hastelloy® (alloy C-22), Inconel® (alloy 625). See page 20 for proprietary material information.

** ASME refers to marked burst pressure and CE/PED refers to minimum burst pressure.

*** Application interface choices include threaded, welded, clamped, in-line, bolted, and torqued.

Battery Pack and Cell Vents

Protecting Lithium Batteries and Battery Packs from Runaway Thermal Events

- BS&B manufactures battery pack and cell pressure relief vents for use in the OEM, Aerospace, Transportation, and Energy Industries, and emobility industries
- Millions of battery vents supplied by BS&B
- Low, Medium, and High Volume Manufacturing
- Vent interface choices include threaded, clamped, bolted, snap-fit, quarter turn, or adhesive bonding.



Shown Model 937-E
Deflagration Arrester

Flame Arresters and Tank Vents

The BS&B FlameSaf product lineup 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.

Benefits

- Low pressure drops to minimize flow resistance, maintain system efficiency and reduce the risk of excessive back pressure.
- Design and performance features that include compact and light weight construction with low pressure loss in flowing conditions
- Ease of maintenance through readily accessible internal components leads to lower cost of ownership.

Product Type Descriptions

Breather Vents / Tank Vents				
Flanged	Type	ATM Deflagration Protection	Burning Category	Refer to Model
✓	Pressure Only	Deflagration	Endurance Burning	935
✓	Pressure Only	Deflagration	No Burn	935-E
✓	Vacuum Only	Deflagration	No Burn	936-E
✓	Pressure and Vacuum	Deflagration	No Burn	937-E
✓	Pressure and Vacuum	Deflagration	Endurance Burning	937-P
✓	Vacuum Only	N/A	N/A	943
✓	Pressure and Vacuum	N/A	N/A	944
✓	Pressure and Vacuum	N/A	N/A	945
✓	Pressure and Vacuum	N/A	N/A	945-EL
✓	Pressure and Vacuum	N/A	N/A	945-PA
✓	Pressure and Vacuum	Deflagration	No Burn	945-EL-E
✓	Vacuum Only	N/A	N/A	943-VM

For more information about individual models listed in these tables, please refer to the BS&B website located at www.bsbsystems.com.



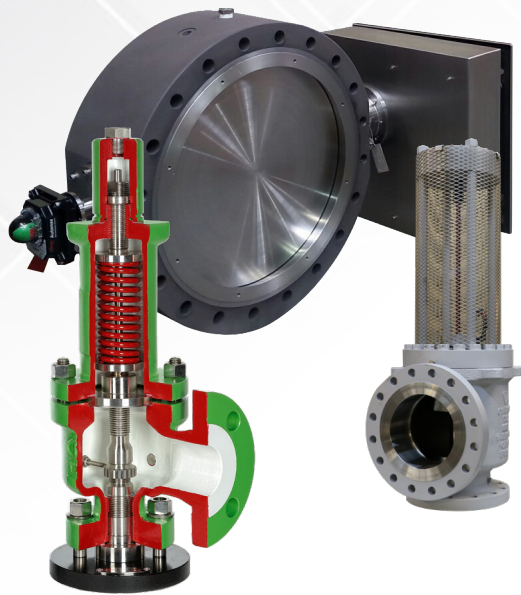
Product Type Descriptions

In-line Deflagration Flame Arresters			
Threaded	Flanged	Continuous Burning Category	Refer to Model
✓		No Burn	931
			931-B
			931-T
			933-G
✓		Short-time Burning	931-T
			933-G
✓		Endurance Burning	931
			931-B
			931-T
			933-G
	✓	No Burn	931-A
			931-A-T
			931-CA
			933-A
			933-S
			933-SE
	✓	Short-time Burning	931-A-T
			931-CA
			933-A
			933-S
	✓	Endurance Burning	931-A
			931-A-T
			931-CA
			933-A
			933-S
			933-SE

For more information about individual models listed in these tables, please refer to the BS&B website located at www.bsbsystems.com.

In-line Stable Detonation Flame Arresters			
Threaded	Flanged	Continuous Burning Category	Refer to Model
✓		No Burn	931
			931-B
			933-G
✓		Short-time Burning	933-G
✓		Endurance Burning	931
			931-B
	✓	No Burn	931-A
			933-A
			933-S
			933-SE
	✓	Short-time Burning	933-A
			933-S
			933-SE

In-line Unstable Detonation Flame Arresters			
Threaded	Flanged	Continuous Burning Category	Refer to Model
✓		No Burn	931
			933-G
✓		Short-time Burning	933-G
✓		Endurance Burning	931-B
	✓	No Burn	933-A
			933-S
			938-V
	✓	Short-time Burning	933-A
			933-S
			938-V



Specialty Valves:

The BS&B specialty valve technology offers the highest flow capacity available from both buckling pin valves and spring loaded pressure relief valves. BS&B valves are fast acting / quick opening pressure relief devices that offer rapid and easy field reset, dramatically reducing plant downtime after activation. Traditional spring loaded pressure relief valves compliment the BS&B specialty valve range.

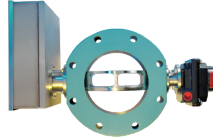
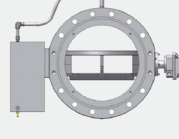
Benefits

- Continuous processing (fast reset in the line)
- High flow capacity
- High operating pressure to set pressure ratio
- Hazardous service (limits operator exposure)
- Large line size (convenient reset in the line)
- Sizes from 1 inch (25 mm) to 78 inches (1950 mm), buckling pin relief valves
- 1 x 1.5 inches (25 x 40 mm) to 8 x 10 inches (200 x 250 mm) size range, buckling pin angle valves; Larger sizes available upon request
- Sizes 1/2" x 3/4" up to 8" x 10", safety relief valves, Larger sizes available upon request.
- ASME "UD" stamped Section XIII
- Safety relief valves tested for combination capacity with BS&B rupture disks.

Safety Relief Valves

Model 6400	Model 5100	Model 5500	Model 3-50
			
API Standard Safety Valve, suitable for all overpressure process applications requiring a flanged connection and a recloseable relief technology. For gas and liquid use.	Safety valve at 90° between the inlet and the outlet connections, threaded and flanged options available. full nozzle, spring loaded, with pop action and full lift. For gas and liquid use.	Full orifice design for high capacity applications with flanged connections, semi nozzle, direct action and spring loaded. For gas and liquid use.	With threaded connections, the 3-50 is an high performance, full nozzle, direct action and spring loaded. Gas and liquid use.
SIZES Dimensions: 1" x 2" to 12" x 16" (DN20x32 up to DN150xDN250) PRESSURES Set Pressure available from 15 to 6,000 psig	SIZES Dimensions: 1/2" x 3/4" up to 1" x 1" DN20x32 up to DN150xDN250 PRESSURES Set Pressure available from 7.5 to 6,000 psig	SIZES Dimensions: DN 25 x DN 40 up to DN 80 x DN 125 Flanges: Inlet PN 16 to PN 40, outlet PN 16 (also available in ANSI B16.5 flanges)	SIZES Dimensions: 1/2" x 3/4" up to 1" x 1" Screwed connections: NPTF ANSI B1.20; BSP-BS 21

Buckling Pin Relief Valves

BPRV™ Buckling Pin Relif Valve	BPIV™ Buckling Pin Inlet Valve	BPSV™ Buckling Pin Safety Valve	BPAV™ Buckling Pin API-Series Valve
			
Inline buckling pin relief valve for overpressure protection nominal size 2" to 96" (50mm to 2400mm) available with ASME and CE certification.	Inline buckling pin relief valve for overpressure protection nominal size 2" to 96" (50mm to 2400mm) available with ASME and CE certification. Similar to the BPRV but activated on inlet pressure not differential pressure.	The BPSV employs a torque assistance mechanism that allows the valve to seal without restriction of medium pressure and friction to the sealing system. Low set pressures are obtained by minimizing the frictions of sealing systems by reducing the intensity of pressure between the sealing elements.	API configuration buckling pin angle valve for overpressure protection nominal size from 1" x 1.5" to 8" X 10" (25mm x 40mm to 200mm x 250mm) available with ASME and CE certification.
Features Externally reset in minutes, without the need to open the pipeline. Continuous processing (fast inline external reset). High flow capacity. ASME "UD" stamped, section XIII European Pressure Equipment Directive "CE" marked	Features A Buckling Pin Inlet Pressure Valve – Utilizes a sensing line to activate based on inlet pressure only. Externally reset in minutes, without the need to open the pipeline. ASME "UD" stamped, section XIII European Pressure Equipment Directive "CE" marked.	Features Rated for Cryogenic temperature operation. Fast opening for immediate pressure relief. The set pressure of valve is independent of back pressure. Sealing grade can be guaranteed until the pin buckles. The valve is designed for cryogenic service.	Features A Buckling Pin API Valve – Designed with API 526 standard piping configurations. A back pressure independent device that is suitable for variable or constant back pressures. ASME "UD" stamped, section XIII European Pressure Equipment Directive "CE" marked.

Buckling Pin Angle Valves

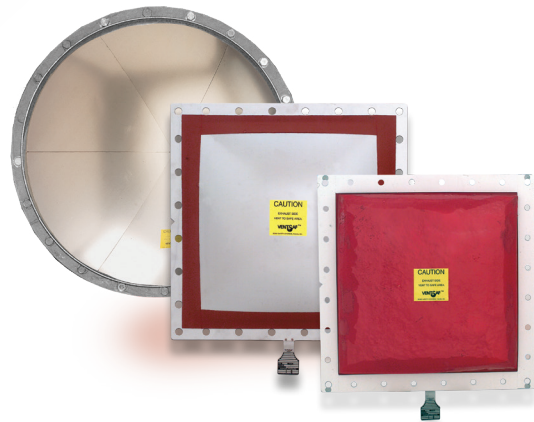
BPPV™ Buckling Pin Pilot Valve	BPCV™ Common Inlet and Outlet Connection Size	EORV™ Enhanced Oil Recovery Valve	IDV™ Inline Design Valve
			
The BPPV is a buckling pin pilot valve ranging from 6 x 6 inches through 30 x 30 inches (150 x 150mm through 1,220 x 1,220mm) with a set pressure from 10 to 275 psig (0.69 to 18.96 barg). Larger sizes to 48 x 48 inches are also available.	The BPCV™ is a Buckling Pin Common Inlet and Outlet Valve for oil and gas services. The valve provides overpressure relief with high flow capacity, up to seven-times the capacity of standard safety relief valves of the same line size.	The BS&B Enhanced Oil Recovery Valve (EORV™) is a high pressure overpressure relief valve designed to protect chemical, liquid and injection pumps' skids from overpressure. Ⓢ US patent 10,451,190 and international patents apply.	The IDV™ provides similar functional performance as Safety Relief Valve, but with inline configuration, which allows the IDV to offer up to 1.5 times the capacity of a conventional API Safety Relief Valve. Ⓢ US patent 11,073,218 and international patents apply.
Features Externally reset in minutes, without the need to open the pipeline. Continuous processing (fast inline external reset). ASME "UD" stamped, section XIII European Pressure Equipment Directive "CE" marked.	Features A back pressure independent device that is suitable for variable or constant back pressures. ASME "UD" stamped, section XIII European Pressure Equipment Directive "CE" marked.	Features Full bore relief for maximum flow capacity; 1.164 GPM, SQ. RT. PSID for liquid. Fast acting valve reaching full relief in less than 15 milliseconds. Suitable for liquid and two-phase flow. ANSI / ASME; EN / DIN; API; JIS flange compatibility. ASME "UD" stamped, Section XIII, CE.	SIZES Compact and light weight compared to traditional API safety relief valves. Superior capacity to API safety relief valves. ANSI/ASME B 16.5 and International flange connections.



Vent-Saf® Explosion Venting

Explosion vents are low burst pressure membranes attached over an opening on a structure and designed to protect equipment and processes against excessive internal, explosion-incurred pressures, by means of pressure relief.

- Tested according to NFPA 68 or ATEX Standards
- Round & rectangular shapes with over 100 standard sizes
- Delivered ready to use with integral gaskets
- Designed for non fragmentation upon activation



Type VSP™/VSS™	Type VSM™	Type VSP-L™	Type VSE™	Type VSB™
Domed single section metal explosion vents with integral gaskets. The dome resists vacuum and vacuum cycling.	A single section explosion panel with integral outlet frame and gaskets designed for applications in dust collectors, cyclones, conveyors.	General purpose flat explosion vent with integral outlet frame and gaskets.	A flat, single section metal explosion vent with integral gaskets designed for near static operating pressures.	Building vent for protection of building structures by very low pressure explosion vents. Optional translucent construction
SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm Round 16" (406mm) – 44" (1,118mm)	SIZES Rectangular from 9" x 12" to 44.5" x 68" 227mm x 305mm to 1130mm x 1727mm)	SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm Round 16" (406mm) – 44" (1,118mm)	SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm Round 16" (406mm) – 44" (1,118mm)	SIZES Rectangular Sizes up to 48" x 72" (1220mm x 1830mm)

Type EXP™	Type EXP-V™	Type EXP-DV™	Type LCV™	Type HTV™
A flat vent with a slotted 316ss top section and FEP / PTFE seal. Available with high temperature insulation	A flat vent with a slotted 316ss top section and FEP / PTFE seal, inlet side light duty vacuum support, and gaskets.	A round domed explosion vent of composite construction with integral inlet side light duty vacuum support and gaskets.	A flat, single section metal explosion vent with integral gaskets designed for light cycling duty.	A domed vent with insulation for high temperature service to 1,000°F (538°C) and above.
SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm	SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm	SIZES Round 16" (406mm) – 44" (1,118mm)	SIZES Rectangular from 9" x 12" to 44.5" x 68" 230mm x 305mm to 1130mm x 1727mm	SIZES Rectangular from 9" x 12" to 44.5" x 68" 227mm x 305mm to 1130mm x 1727mm)



Vent-Saf® Explosion Venting

R-IQ™ Rectangular FlameFree™ Explosion Venting	IQR™ Round FlameFree™ Venting Flap Valve	Vent-Saf® Vent Deflector	Vent-Saf® Vent Sensors
R-IQ™ protects process equipment by safely releasing the rapidly expanding gases generated by a dust explosion through a stainless-steel mesh, while preventing the ejection of flame into the surrounding area.	The IQR™ system comprises of two parts, an explosion vent and a quenching module. The explosion vent responds to the rapidly building pressure of a deflagration and opens to relieve this pressure.	A vent deflector arrangement may be applied directly to the outlet side of flat and lightly domed explosion vents to encourage an upwards path for the pressure wave and flame ball released by a deflagration. A deflector device will reduce the effective explosion vent relief area, requiring additional vent panels. Consult BS&B for assistance.	BS&B vent sensors are designed to provide immediate indication in the event of an explosion vent. The MBS is a magnetically activated sensor, spot welded to the vent or disk. Warning of a ruptured disk or vent and its location are given by the MBS when the current flowing through is disrupted. Shown with EXP/V vent fitted into red painted carbon steel frame.
SIZES from sizes 7" x 19" to 44" x 44" (170mm x 470mm to 1130mm x 1130mm)	SIZES from 8" to 32" (200mm x 800mm)		

Explosion Protection: Mechanical Isolation Barriers

Equipment isolation barriers should be used to prevent flame propagation and to prevent a primary dust explosion from becoming a secondary (and typically much more severe) event. Solutions may include float, gate or pinch style valves.

Ventex® Float Valve	Saf-t-Flap™ Valve	Redex® Active Isolation Valve	ESI-P™ External Activated Valve	Type IVE™ Acting Pinch Valve
Ventex® Float Valves are suitable for explosion protection in one or both directions. These valves are passive and provide protection without an external energy source.	Passive protection system, no need for detection and control. Can be used in combination with explosion venting and explosion suppression	The Slide Valve RSV-D protects systems conveying dust against explosion propagation.	The active explosion protection valve ESI-P is operated with external energy and also enables effective protection against fires thanks to its special mode of operation.	The Type IVE™ Acting Pinch Valve is an explosion-protected industrial pinch valve designed to prevent the propagation of a deflagration
SIZES 4" (100mm) – 24" (600mm)	SIZES 4" (100mm) – 54" (1350mm)	SIZES 2" (50mm) – 20" (500mm)	SIZES 4" (100mm) – 24" (600mm)	SIZES 3" (80mm) – 12" (300mm)



Type IPD™ Systems: Explosion Suppression and Isolation Systems

The BS&B Type IPD™ explosion suppression system detects the earliest stage of a deflagration. The cannons immediately discharge the suppression agent (food compatible sodium bicarbonate), which extinguishes the flameball inside the vessel therefore showing no evidence, externally from the process, that a deflagration event occurred.

The BS&B Type IPD Chemical Isolation System provides protection to interconnected equipment in the event of an explosion. Ducting and piping connecting process equipment can propagate an explosion originating within a single piece of equipment.



Type IPD™ Explosion Suppression Systems	Type IPD™ Explosion Chemical Isolation Systems
The BS&B Type IPD™ Explosion Suppression System provides protection of process enclosures. The early stages of the pressure rise associated with a dust explosion are detected by the Explosion Detection Triplex Sensor which is mounted to the dust collector that is pictured below as an example.	The Type IPD™ Explosion Isolation System is designed to inject a suppression agent into ducting and piping to interrupt the transport of burning material to connected vessels and process equipment. For example, an application of Type IPD Isolation System to ducting connected to a dust collector.

Codes and Standards

Type IPD explosion systems are FM approved for the protection of equipment handling dusts. The monitoring and firing circuits conform to FM 3610, CSA 22.2 and EN 50 014 and 020.

Type IPD systems conform to ATEX, IEC Ex Electrical and ATEX electrical certified.



Type IPD™ System Components

The below includes the Cannon™; Triplex™ Sensor; System Monitor and Sensors Electronics Box. Depending upon the application, the capacity of the explosion suppression cannon is selected from standard modules identified as 5, 10, 20, 40, and 60 pound capacity (the 5 pound module is shown). Multiple cannons and sensors may be deployed.

Cannon™	Triplex™ Sensor	System Monitor
The Explosion Suppression Cannon(s) installed on the equipment causing the pulverized suppression agent (food compatible sodium bicarbonate) to be energized & discharged from the front of the Cannon into the equipment. This extinguishes the early stages of combustion of the process material before it builds into a deflagration which can generate a pressure (Pma.) exceeding the strength of the process equipment.	Explosion Detection Triplex Sensor to detect initiation of explosion; pressure sensors are compensated for operation at negative pressure. When at least two of three individual pressure sensors within the Unitized Sensor respond, an electrical signal activates the Explosion Suppression Cannon(s) installed on the equipment	A System monitor provides electrical power to the Unitized Sensor and the Explosion Suppression Cannon(s) at intrinsically safe power levels.

SparkEx™ Spark Detection and Extinguishing Systems

Spark detection and extinguishing technology is employed to manage the risk of fire and explosion ignition due to sparks and burning embers that are transported through a combustible dust handling system.

External MonitoringPanel (Optional)	Control Unit DCI	Automatic Extinguishing Device	Sensors Electronics Box
Optional external monitoring is provided that can serve multiple SD&E systems. The critical components of the SD&E system are monitored by the control unit to ensure reliable operation.	The control unit along with the supporting sensors and nozzle units are certified for use in the dusty work area. This minimizes local wiring and allows plant personnel direct access to the status of the equipment. In the event of an alarm condition, an operator can see directly which process system is at risk.	An electrical signal generated by the sensor activates control circuits that are typically used to operate an automatic water extinguishing curtain, which quickly and efficiently eliminates ignition sources. Production continues while the BS&B SparkEx system operates.	The BS&B SparkEx™ System uses highly accurate type SDN or SDD sensors to detect sparks, embers, and flame to prevent explosion or fire in dry powder processing & handling facilities.

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Catalog #77-1003