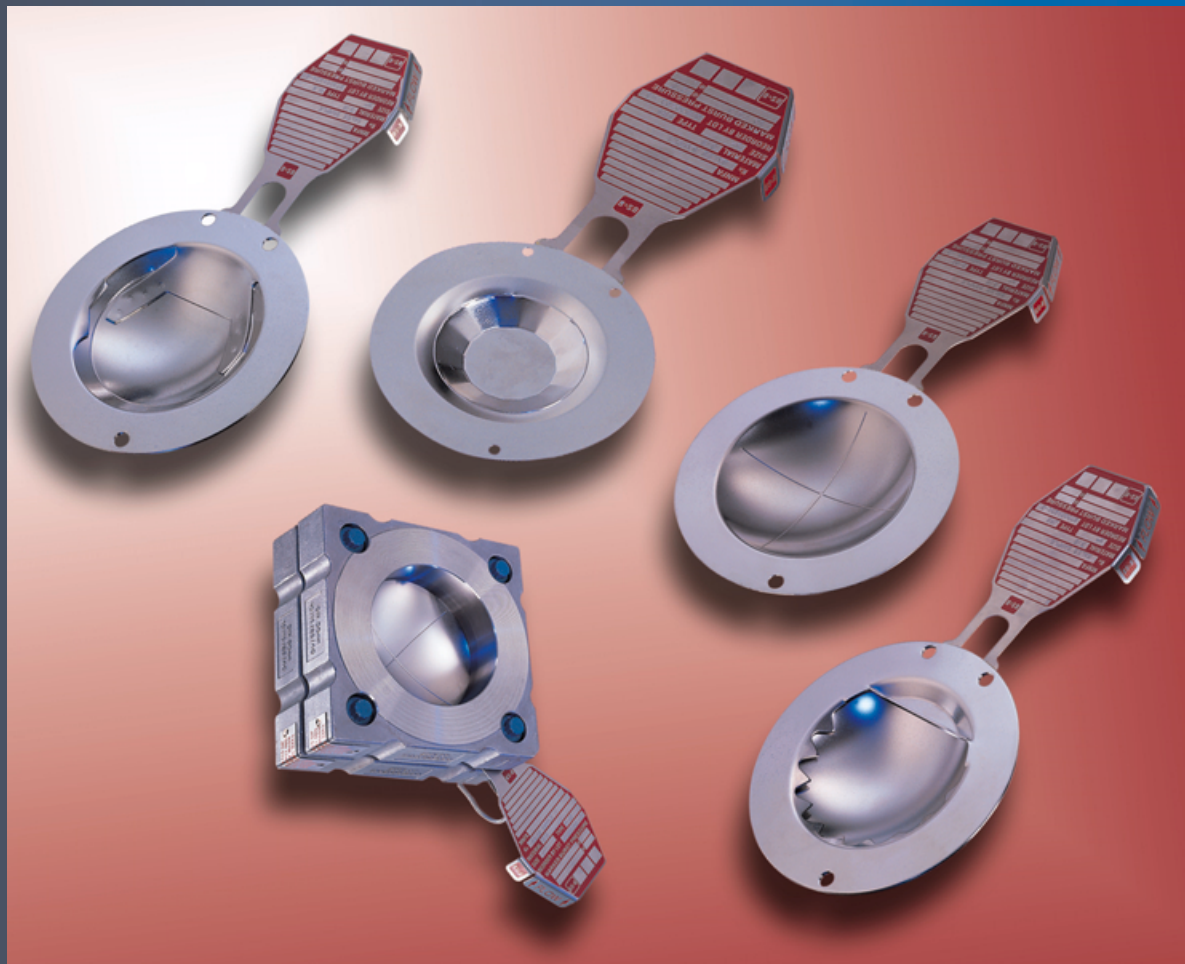




BS&B SAFETY SYSTEMS, L.L.C.  
BS&B SAFETY SYSTEMS, LTD.

# The Sta-Saf® System



## Reverse Buckling Technology

Visit our websites at [www.bsbsystems.com](http://www.bsbsystems.com) and [www.bsb.ie](http://www.bsb.ie) for the most complete, up-to-date information.

# Standard Features of the Sta-Saf® Family

## Sta-Saf® Rupture Disks:

- ♦ 90% or greater operating ratio
- ♦ 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

## STA-SAF® Safety Heads:

- ♦ Disk dome shielded by safety head inlet for all sizes
- ♦ Locating pins ensure centering and correct orientation of the disk within the safety head
- ♦ “Bite-type” seal for sizes 2”/50mm and larger to optimize leak tightness when appropriately installed
- ♦ Flow arrow to indicate direction of flow after installation
- ♦ Optional tell-tale connection in safety head outlet
- ♦ Spiral groove with 125-250 AARH finish on both inlet and outlet safety head external mating surfaces to enhance gasket performance

# The Sta-Saf® System

The Sta-Saf system combines six Rupture Disk types and three safety head options that provide the user with extended service life reverse buckling disk technology in sizes from 1”/25mm to 36”/900mm at burst pressures ranging from 5 psi/**0.34 bar** to 2000 psi/**137.9 bar**.

This catalog describes the types JRS™, S-90™, RLS™, and FRS™ Rupture Disks and their Safety Head (holder) options. The most extensive size and set pressure capability is offered through these widely applied designs that are in service in well over 50,000 installations worldwide.

The most capable Sta-Saf technologies, SK<sub>R</sub>™ & Sigma™ Rupture Disks, have their own dedicated catalogs (77-4003 and 77-4011 respectively).

*Sigma EXL Rupture Disk*



## Sta-Saf® Rupture Disk Material Options

Standard materials and their maximum recommended service temperatures for the Sta-Saf range of Rupture Disks are:

Material	Disk Types	Maximum Recommended Temperature
Nickel (alloy 200)	S-90, RLS, JRS, FRS, SK <sub>R</sub> , Sigma	750° F 399° C
Monel® (alloy 400)	S-90, RLS, JRS, FRS, SK <sub>R</sub> , Sigma	900° F 482° C
Inconel® (alloy 600)	S-90, RLS, JRS, FRS, SK <sub>R</sub> , Sigma	1100° F 593° C
Stainless Steel	S-90, RLS, JRS, FRS, SK <sub>R</sub> , Sigma	750° F 400° C
Hastelloy® C-276 (alloy C-276)	S-90, RLS, JRS, SK <sub>R</sub> , Sigma	900° F 482° C
Tantalum	RLS, SK <sub>R</sub>	500° F 260° C
Titanium	SK <sub>R</sub>	572° F 300° C
Aluminum	S-90	250° F 120° C
Fluoropolymer Film Liners (TEF)	S-90, RLS, JRS, FRS, SK <sub>R</sub> , Sigma	500° F 260° C

For each material the upper temperature limit has been determined from the recommendations of material manufacturers and user experience. Rupture disk technology uses Nickel and its alloys to provide the user with a range of excellent corrosion resistance, and thermal stability particularly in the case of alloy 600.

Hastelloy is a trademark of Haynes International

Inc., Monel and Inconel are trademarks of Inco Alloys International, Inc. BS&B may use equivalent materials from other sources.

Fluoropolymer film liners are available as an additional corrosion barrier with most Sta-Saf Rupture Disks. Order as "TEF LINER" when required. Liners are applied to the inlet/process side of the Rupture Disk, unless otherwise agreed.

Teflon® materials are typically used (for example FEP, PFA, PTFE).

Teflon is an E.I. duPont de Nemours and Company Corporation trademark.

This wide material range provides the user with options in the selection of a Rupture Disk material that is resistant to the process media. Corrosion of disk material will affect performance and may result in premature burst or leakage through the disk.



## Operating Pressure Ratio

Sta-Saf reverse buckling Rupture Disks can be operated to 90% of their marked burst pressure (or to 95% of their minimum burst pressure) for burst pressures of 40 psi (2.76 bar) and higher.

For lower burst pressures, the operating pressure ratio is 90% of minimum burst pressure. For applications that demand a closer relationship between operating pressure and burst pressure, select type Sigma EXL™ (see catalog 77-4011) which can operate up to 100% of minimum burst pressure.

## Differential Pressure

Rupture disks respond to differential pressure. Please take into account the service conditions at the inlet and outlet of a Rupture Disk when completing specifications.

## Burst Pressure Tolerances

All of the Sta-Saf Rupture Disks offer the same tolerance considerations when completing a specification. Whether the ASME/North American or European/ISO approach to burst pressure and tolerance is used, BS&B applies both a burst tolerance and an optional manufacturing design range.

**Burst tolerance** is the +/- range of pressure over which a Rupture Disk can be expected to burst. Burst tolerance is either +/-5% of burst pressure or +/- 2 psi (+/-0.138 bar) for disks rated below 40 psi (2.76 bar).

**Manufacturing design range** is a range of pressure, always applied to the minus side of the user requested burst pressure for Sta-Saf Rupture Disks, that simplifies disk fabrication testing and provides economic benefit to the user where such an added tolerance can be accommodated by the application.

Manufacturing Design Range (MDR) choices are provided for all Sta-Saf Rupture Disks:

MDR= 0: where the user requires the tightest margin between normal service pressure and burst pressure, a zero range disk shall be used.

MDR= -5%: applied to the requested burst pressure,

a -5% range allows an additional 5% tolerance applied on the minus side of the user requested burst pressure.

MDR= -10%: applied to the requested burst pressure, a -10% range allows an additional 10% tolerance applied on the minus side of the user requested burst pressure.

Note: MDR and burst tolerance are additive. In the European/ISO case, the burst tolerance and MDR are simply combined. In the ASME case, the 'marked burst pressure' for a lot of Rupture Disks must be a value within the agreed manufacturing design range and then the burst tolerance is applied.

### The two-step approach to set pressure specification:

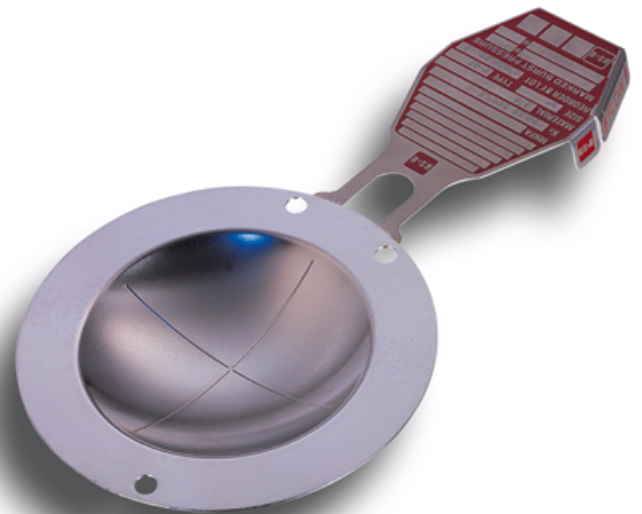
1. Decide between ASME/North American (with or without 'UD' stamp) and European (with or without 'CE' mark) / ISO standards.
2. Select the manufacturing design range appropriate to the application and check that it is available for the disk type selected. (0, -5 or -10%)

## Pressure/Temperature Relationship

The burst pressure of all Rupture Disks is partially determined by the physical properties of the material employed. Tensile strength varies with temperature, which leads to variation in burst pressure. Reverse buckling technology is the least sensitive to temperature variations and is used by all Sta-Saf Rupture Disks. However, for the highest accuracy of performance, BS&B certifies Sta-Saf Rupture Disks by testing at the users' chosen burst temperature.

Where operating pressure and temperature may rise rapidly, the user should carefully select the temperature of the Rupture Disk. BS&B can provide advice for such applications. Inconel (alloy 600) provides excellent thermal stability for applications that experience a wide range of service temperatures at which over-pressure might occur.

The burst pressure of each lot of Sta-Saf Rupture Disks is tested at the users specified temperature (burst temperature). Should the disk be rated above or below ambient temperature, burst testing for product certification shall be conducted at this coincident burst temperature to ensure the best product accuracy. For applications which have operating temperatures that may exceed the burst temperature, please review with BS&B Safety Systems, L.L.C. or BS&B Safety Systems, Ltd.



*S-90 Rupture Disk*

## K<sub>R</sub>: Flow Resistance Factor

Flow resistance factor "K<sub>R</sub>" may be used to determine the relieving capacity of a system when using techniques such as those described in Crane Technical Paper No. 410.

Individual K<sub>R</sub> values have been established for both gas & liquid service, where appropriate, for Sta-Saf Rupture Disks. Care must be taken to use the correct value for sizing purposes.

When K<sub>R</sub> values are marked on Sta-Saf Rupture Disk tags, those for gas service are shown as K<sub>RG</sub> or K<sub>R</sub> (GAS), and those for liquid service are shown as K<sub>RL</sub> or K<sub>R</sub> (LIQ). When using K<sub>R</sub> value for sizing calculations, the nominal pipe size (assuming schedule 40 pipe) of the vent system is used. When using 'coefficient of discharge' sizing techniques, the Minimum Net Flow Area (MNFA) or Net Relief Area (NRA) of the Rupture Disk device is used.

The S-90 Rupture Disk manufactured from Inconel (alloy 600) material has the lowest available "K<sub>RG</sub>" value of 0.232. K<sub>R</sub>.

You can obtain MNFA and NRA values at our website at [www.bsbsystems.com](http://www.bsbsystems.com) or from our sales representatives and distributors.

## Installation

The Sta-Saf family of Rupture Disk devices is designed for installation between pipe flanges. Compatibility with all international flange standards is available, including: ANSI, DIN, JIS, BS, ISO, AFNOR and UNI. Between the Safety Head and the pipe flanges an application compatible gasket is used for sealing purposes.

The unique configuration of the SRB-7RS Safety Head design enables the same holder to be installed between flanges covering a range of flange specifications. For example: a single design of 1"/25mm SRB-7RS Safety Head is compatible with ANSI 150/300/600, DIN PN10/16/25/40, and JIS PN10/16/20/30/40 flanges. This will reduce the inventory of Safety Heads required by the user, and provide simplicity of common installation practices.

## Double Disk Assemblies

Double disk assemblies consist of three flange components, an inlet, a mid-flange and an outlet flange with a second disk between the mid-flange and outlet flange. The SRB-7RS Safety Head and the S90-7R Safety Head are available as double disk assemblies.



Applications:

1. Prevention of leakage of corrosive, toxic or expensive process materials and disk service life extension in continuous processes. The first disk isolates and protects the second disk from a corrosive process medium. Leakage caused by fatigue or corrosion through the first disk will be prevented from escaping by the second disk. Maintenance replacement can be through a planned shutdown. (Use of a tell-tale assembly between the two Rupture Disks is required.)
2. Elimination of back pressure - the second Rupture Disk withstands the system back pressure, isolating the first disk. Any change in pressure differential across the first disk induced by back pressure is eliminated and it will rupture at its rated burst pressure. (The second Rupture Disk may be rated at a lower burst pressure to compensate for the maximum back pressure that may coincide with a burst condition).
3. Quick Opening Valve. The volume between the two disks is pressurized. The evacuation of this pressure causes both disks to rupture virtually simultaneously providing an immediate full relief opening when the inlet pressure exceeds the disk burst pressure.

## Code Compliance

The Sta-Saf family of products is designed to meet the requirements of the international Rupture Disk standards.

Certification to the following codes is available:

ASME Section VIII (including 'UD' stamp) and Section III  
CEN ISO 4126 part2 (pending); 'CE' Mark  
ISO 6718, BS2915, SVTI, Stoomwezen  
TUV AD Merkblatt A1

The Sta-Saf family of Rupture Disk devices is compliant with API RP520 Part 1 recommendations.

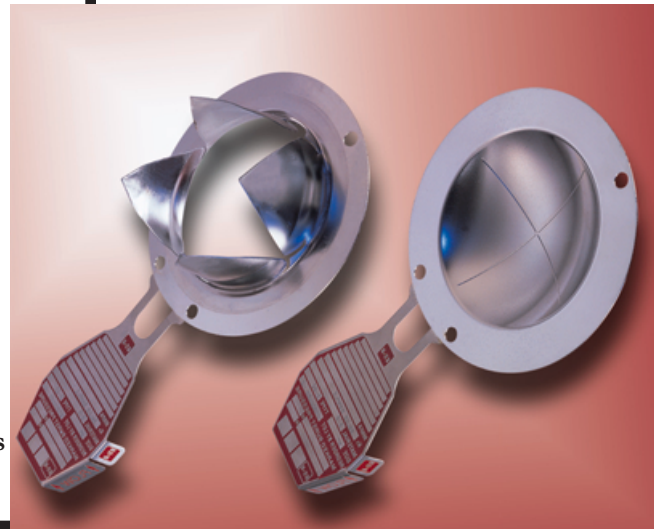
# Precision Cross-Scored Reverse Buckling Rupture Disk

# S-90™

The S-90 is a domed, solid metal, precision scored reverse buckling disk, which, upon over-pressure, reverses and opens along pre-weakened cross-score lines to provide a full relief opening.

The compression loaded S-90 disk offers an extended service life under pressure cycling conditions compared to a conventional tension loaded disk. The S-90 disk exhibits excellent fatigue resistance in cyclic pressure service, surviving 1,000,000 pressure cycles from 0-90% of its marked burst pressure.

- ◆ Designed for non-fragmentation
- ◆ Withstands full vacuum and back pressure equal to or less than burst pressure (higher upon request)
- ◆ Suitable for operating pressure to 90% of the marked burst pressure and 95% of the minimum burst pressure (CEN ISO 4126-2 standard pending)
- ◆ Gas service (acceptable for liquid service with a compressible gas/vapor pocket between the liquid and disk)
- ◆ Damage safety ratio 1.5. An S-90 disk damaged or installed incorrectly will burst at or below 1.5 times its marked burst pressure
- ◆ Reversal safety ratio equal to or less than 1.5. An S-90 disk and Safety Head installed upside down in the pressure system will burst at 1.5 times its marked burst pressure or less
- ◆ Optimum fatigue resistance in pressure pulsating or cycling conditions
- ◆ Ideal for safety relief valve isolation
- ◆ Inconel material has the lowest published  $K_R$  (Gas) of 0.232
- ◆ Optional TEF liners to enhance corrosion resistance (on the inlet/process and/or down-stream side of the disk). Order as "TEF Liner" or identify special material requirements



Disk Material

Disk Size	Disk Material																				
	Aluminum (Al)				Nickel Alloy 200 (Ni)				Hastelloy® Alloy C-276 (Hast C-276) & 316 Stainless (316SS)				Inconel® Alloy 600 (Inc)				Monel® Alloy 400 (Mon)				
	Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.		
in	mm	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg
1	25	75	5.17	125	8.61	125	8.62	1000	68.9	328	22.6	1000	68.9	150	10.3	1000	68.9	150	10.3	1000	68.9
1.5	40	54	3.72	90	6.2	90	6.21	1000	68.9	282	19.4	1000	68.9	110	7.58	1000	68.9	110	7.58	1000	68.9
2	50	45	3.1	75	5.17	75	5.17	1000	68.9	230	15.9	1000	68.9	90	6.21	1000	68.9	90	6.21	1000	68.9
3	80	36	2.48	60	4.14	60	4.14	1000	68.9	167	11.5	1000	68.9	72	4.96	1000	68.9	72	4.96	1000	68.9
4	100	30	2.06	50	3.45	50	3.45	800	55.2	132	9.10	800	55.2	60	4.14	800	55.2	60	4.14	800	55.2
6	150	24	1.65	40	2.76	40	2.76	800	55.2	92	6.34	800	55.2	48	3.31	800	55.2	48	3.31	800	55.2
8	200	n.a.	n.a.	n.a.	n.a.	35	2.41	700	48.3	n.a.	n.a.	n.a.	n.a.	42	2.89	700	48.3	42	2.89	700	48.3
10	250	n.a.	n.a.	n.a.	n.a.	30	2.07	700	48.3	n.a.	n.a.	n.a.	n.a.	36	2.48	700	48.3	36	2.48	700	48.3
12	300	n.a.	n.a.	n.a.	n.a.	27	1.87	600	41.4	n.a.	n.a.	n.a.	n.a.	33	2.28	600	41.4	33	2.28	600	41.4
14	350	n.a.	n.a.	n.a.	n.a.	25	1.72	500	34.5	n.a.	n.a.	n.a.	n.a.	30	2.07	500	34.5	30	2.07	500	34.5
16	400	n.a.	n.a.	n.a.	n.a.	23	1.59	100	6.89	n.a.	n.a.	n.a.	n.a.	28	1.93	180	12.4	28	1.93	180	12.4
18	450	n.a.	n.a.	n.a.	n.a.	22	1.52	92	6.34	n.a.	n.a.	n.a.	n.a.	26	1.79	160	11.0	26	1.79	160	11.0
20	500	n.a.	n.a.	n.a.	n.a.	21	1.45	84	5.79	n.a.	n.a.	n.a.	n.a.	24	1.65	142	9.79	24	1.65	142	9.79
24	600	n.a.	n.a.	n.a.	n.a.	20	1.38	70	4.82	n.a.	n.a.	n.a.	n.a.	22	1.52	118	8.14	22	1.52	118	8.14
30	750	n.a.	n.a.	n.a.	n.a.	20	1.38	70	4.82	n.a.	n.a.	n.a.	n.a.	20	1.38	80	5.52	20	1.38	80	5.52

US Patent numbers: 4441350, 4481850 and other international patents apply. TEF liners available at all burst pressures. For burst pressures below S-90 minimums use the JRS, FRS, SKR or Sigma type disks. For pressures above the S-90 maximums use the RLS disk or the S90-HP (contact BS&B Safety Systems Inc. or BS&B Safety Systems Limited for details). Hastelloy is a trademark of Haynes International Inc., Monel and Inconel are trademarks of Inco Alloys International, Inc.

# RLS™

## Precision Circular-Scored Reverse Buckling Rupture Disk

The RLS is a Precision Circular-Scored Reverse Buckling Rupture Disk. When over-pressurized, this domed, solid metal, reverse buckling disk reverses and opens along a pre-weakened circular score line on the down-stream side of the disk. A patented hinge welded to the disk facilitates relief opening along the score line and retains the disk's central petal preventing fragmentation even at high burst pressures.



- ◆ Gas and full liquid service
- ◆ Designed for non-fragmentation
- ◆ Withstands full vacuum
- ◆ Suitable for operating pressure to 90% of the marked burst pressure and 95% of the minimum burst pressure (CEN ISO 4126-2 Standard pending)
- ◆ Damage safety ratio 1.5. A damaged RLS disk will burst at or below 1.5 times its marked burst pressure
- ◆ Optimum fatigue resistance in pressure pulsating or cycling conditions
- ◆ Recommended for safety relief valve isolation
- ◆ Optional TEF liner on the process and/or down-stream side of the disk. Order as “TEF Liner” or identify special requirements

Disk Material

Disk Size		Tantalum				Nickel Alloy 200				Hastelloy® Alloy C-276 & 316 Stainless				Inconel® Alloy 600				Monel® Alloy 400			
in	mm	Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.	
		psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg
1	25	125	8.62	2000	137.9	125	8.62	2000	137.9	175	12.07	2000	137.9	150	10.3	2000	137.9	150	10.3	2000	137.9
1fi	40	85	5.86	1800	124.1	85	5.86	1800	124.1	145	10	1800	124.1	105	7.24	1800	124.1	105	7.24	1800	124.1
2	50	70	4.83	1800	124.1	70	4.83	1800	124.1	115	7.93	1800	124.1	85	5.86	1800	124.1	85	5.86	1800	124.1
3	80	55	3.79	1600	110.3	55	3.79	1600	110.3	75	5.17	1600	110.3	65	4.48	1600	110.3	65	4.48	1600	110.3
4	100	45	3.10	1050	72.4	45	3.10	1050	72.4	65	4.48	1050	72.4	55	3.79	1050	72.4	55	3.79	1050	72.40
6	150	35	2.41	650	44.8	35	2.41	650	44.8	45	3.10	650	44.8	40	2.76	650	44.8	40	2.76	650	44.8
8	200	n.a.	n.a.	n.a.	n.a.	35	2.41	400	27.6	45	3.10	400	27.6	40	2.76	400	27.6	40	2.76	400	27.6
10	250	n.a.	n.a.	n.a.	n.a.	35	2.41	250	17.2	45	3.10	250	17.2	40	2.76	250	17.2	40	2.76	250	17.2
12	300	n.a.	n.a.	n.a.	n.a.	35	2.41	150	10.34	45	3.10	150	10.34	40	2.76	150	10.34	40	2.76	150	10.3
14	350	n.a.	n.a.	n.a.	n.a.	35	2.41	130	8.96	45	3.10	130	8.96	40	2.76	130	8.96	40	2.76	130	8.96
16	400	n.a.	n.a.	n.a.	n.a.	25	1.72	110	7.58	35	2.41	110	7.58	30	2.07	110	7.58	30	2.07	110	7.58
18	450	n.a.	n.a.	n.a.	n.a.	25	1.72	90	6.21	35	2.41	90	6.21	30	2.07	90	6.21	30	2.07	90	6.21

US Patent number: 4,404,982 and other international patents. The hinge attached to the disk is 316SS. TEF liners available at all burst pressures. For burst pressures below RLS minimums use JRS, FRS, SKR, Sigma or S-90 type disks. Hastelloy is a trademark of Haynes International Inc., Monel and Inconel are trademarks of Inco Alloys International, Inc.

# Solid Metal Reverse Buckling Rupture Disk **JRS™**

A domed, solid metal low-pressure reverse buckling disk, the JRS reverses on over-pressure and opens by cutting along a teeth ring attached to the atmospheric side of the disk. A hinge integral to the teeth ring on the downstream side of the disk retains the disk's central petal preventing fragmentation.



- ◆ Designed for non-fragmentation
- ◆ Withstands full vacuum
- ◆ Suitable for operating pressure to 90% of the marked burst pressure or 95% of the minimum burst pressure (CEN ISO 4126-2 Standard pending)
- ◆ Suitable for operating pressure of 90% of the minimum burst pressure for burst pressures below 40 psi (2.76 bar)
- ◆ Gas service (acceptable for liquid service with a compressible gas/vapor pocket between the liquid and disk)
- ◆ Recommended for safety relief valve isolation

- ◆ Damage safety ratio 1.5. A damaged JRS disk will burst at or below 1.5 times its marked burst pressure
- ◆ Optimum fatigue resistance in pressure pulsating or cycling conditions
- ◆ Optional TEF liner on the process side of the disk. Order as "TEF Liner" or identify special requirements

Disk Material

Disk Size		Nickel Alloy 200				Inconel® Alloy 600				Monel® Alloy 400				316SS				Hastelloy® Alloy C-276			
in	mm	Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.	
		psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg
1	25	22	1.52	125	8.62	22	1.52	150	10.34	22	1.52	150	10.34	24	1.65	180	12.41	24	1.65	180	12.41
1 1/2	40	20	1.38	90	6.21	20	1.38	110	7.58	20	1.38	110	7.58	22	1.52	150	10.34	22	1.52	150	10.34
2	50	18	1.24	75	5.17	18	1.24	90	6.21	18	1.24	90	6.21	20	1.38	120	8.27	20	1.38	120	8.27
3	80	16	1.1	60	4.14	16	1.1	72	4.96	16	1.1	72	4.96	18	1.24	80	5.52	18	1.24	80	5.52
4	100	14	0.97	50	3.45	14	0.97	60	4.14	14	0.97	60	4.14	16	1.1	70	4.83	16	1.1	70	4.83
6	150	12	0.83	40	2.76	12	0.83	48	3.31	12	0.83	48	3.31	14	0.97	50	3.45	14	0.97	50	3.45
8	200	12	0.83	35	2.41	12	0.83	42	2.89	12	0.83	42	2.89	12	0.83	42	2.89	12	0.83	42	2.89
10	250	12	0.83	30	2.07	12	0.83	36	2.48	12	0.83	36	2.48	12	0.83	36	2.48	n.a.	n.a.	n.a.	n.a.
12	300	12	0.83	27	1.86	12	0.83	33	2.28	12	0.83	33	2.28	12	0.83	33	2.28	n.a.	n.a.	n.a.	n.a.
14	350	9	0.62	25	1.72	9	0.62	30	2.07	9	0.62	30	2.07	9	0.62	30	2.07	n.a.	n.a.	n.a.	n.a.
16	400	7	0.48	23	1.59	7	0.48	28	1.93	7	0.48	28	1.93	7	0.48	28	1.93	n.a.	n.a.	n.a.	n.a.
18	450	6	0.41	22	1.52	6	0.41	26	1.79	6	0.41	26	1.79	6	0.41	26	1.79	n.a.	n.a.	n.a.	n.a.
20	500	5	0.34	21	1.45	5	0.34	24	1.65	5	0.34	24	1.65	5	0.34	24	1.65	n.a.	n.a.	n.a.	n.a.
24	600	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	0.34	22	1.52	n.a.	n.a.	n.a.	n.a.
30	750	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	0.34	14	0.97	n.a.	n.a.	n.a.	n.a.
36	900	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	0.34	14	0.97	n.a.	n.a.	n.a.	n.a.

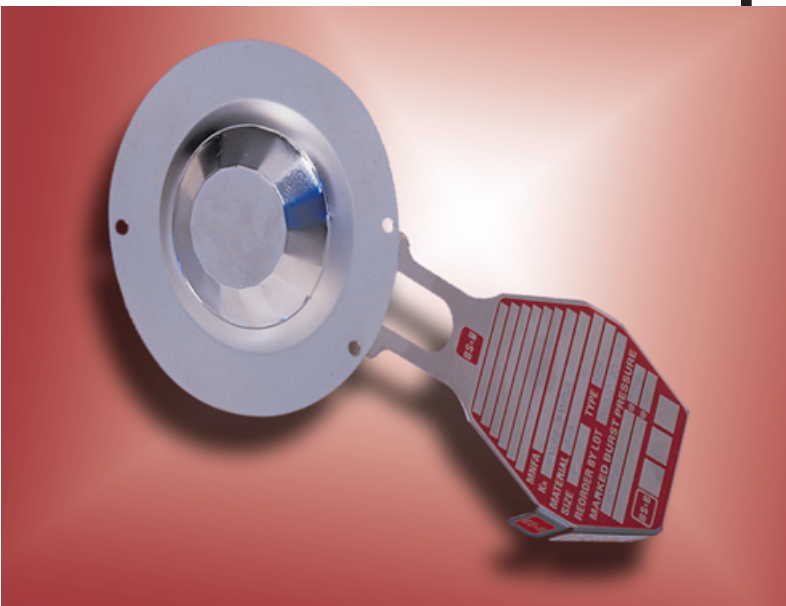
US Patent numbers: 4236648 and other international patents. TEF liner available for disk sizes 2" and larger. JRS teeth ring attached to the disk is 316SS. Other materials upon request. Minimum burst pressures are applicable at all temperatures, maximum burst pressures are at 72°F (32°C). For burst pressures below JRS minimums use the FRS type disk. For Pressures above the JRS maximums use disk types S-90, RLS, SK<sub>R</sub>, and Sigma. Hastelloy is a trademark of Haynes International Inc., Monel and Inconel are trademarks of Inco Alloys International, Inc.

# FRS™

## Precision Circular-Scored Reverse Buckling Rupture Disk

A domed, low-pressure frustum-shaped, reverse buckling disk, the FRS reverses on overpressure and opens along a pre-weakened circular score line on the downstream side of the disk. The circular score line has an interrupted “hinge” segment which retains the disk’s central petal and prevents fragmentation.

US patent number 4,526,303 and 5,082,133 other international patents apply. For burst pressures above the FRS maximums use the JRS, S-90, RLS, SK<sub>R</sub>, and Sigma type disks. Minimum burst pressures are with TEF liner. For operating temperatures over 350 F, consult BS&B Safety Systems, Inc. or BS&B Safety Systems, Ltd.

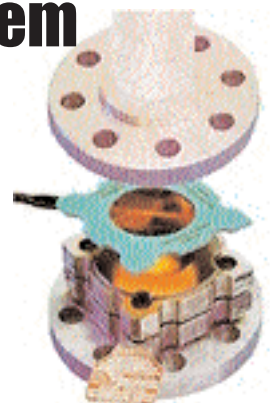


- ◆ Lowest burst pressure in the Sta-Saf range
- ◆ Available Materials: 316 Stainless Steel, Nickel (alloy 200), Inconel (alloy 600), and Monel (alloy 400)
- ◆ Gas and full liquid service - order as type FRL™ for liquid
- ◆ Designed for non-fragmentation
- ◆ Withstands full vacuum
- ◆ Suitable for operating pressure to 90% of the marked burst pressure and 95% of the minimum burst pressure (CEN ISO 4126-2 Standard pending)
- ◆ Suitable for operating pressure of 90% of the minimum burst pressure for burst pressures below 40 psi (2.76 bar)
- ◆ Damage Safety Ratio of 1 or less. A damaged disk will burst at its marked burst pressure or lower
- ◆ Recommended for safety relief valve isolation
- ◆ Optional TEF liner on the process or downstream side of the disk. Order as “TEF Liner” or identify special material requirements

Monel and Inconel are trademarks of Inco Alloys International, Inc.

## Burst Alert™ Sensors & SmartDisk™ System

Burst Alert Sensors are installed downstream of the Rupture Disk device and provide a convenient means of generating an electrical signal when appropriately integrated into plant control systems, or connected to the BS&B Safety Systems Burst Disk Monitor. The Burst Alert Sensor is a “membrane switch” that changes from closed circuit to open circuit when the upstream Rupture Disk (or relief valve) opens. Consult BS&B for proper sensor selection and specification. (Refer to catalog 77-1012 for more information.)



# SAFETY HEADS SRB-7RS™, S90-7R™ and SRB-7FS™

- ◆ Three asymmetric locating pins ensure centering and correct orientation of the disk within the Safety Head
- ◆ A "bite-type" seal for sizes 2" (50mm) and larger engages with the disk flange creating a metal-to-metal 'bubble tight' seal
- ◆ Disk dome protected by Safety Head inlet
- ◆ Maximized flow with full circular opening
- ◆ Flow arrows indicate direction of flow
- ◆ Special configurations available

## Specifications: Safety Head Type S90-7R

Size		Safety Head Flange Rating			Face-to-Face Dimensions
in	mm	ANSI	DIN	JIS	in
1	25	150	10/16	10/16	1.250
1	25	300/600	25/40	20/30/40	1.250
1	25	900/1500	-	-	1.750
1.5	40	150	10/16	10/16	1.250
1.5	40	300/600	25/40	20/30/40	1.250
1.5	40	900/1500	-	-	1.440
2	50	150	10/16	10/16	1.250
2	50	300/600	25/40	20/30/40	1.250
2	50	900/1500	-	-	1.620
3	80	150	10/16	10/16	1.376
3	80	300/600	25/40	20/30/40	1.500
3	80	900	-	-	1.750
4	100	150	10/16	10/16	1.719
4	100	300	25/40	20/30/40	1.719
4	100	600	-	-	1.719
6	150	150	10/16	10/16	2.500
6	150	300	25/40	20/30/40	2.500
6	150	600	-	-	3.125
8	200	150	-	-	3.375
8	200	300	-	-	3.375
10	250	150	-	-	6.000
10	250	300	-	-	6.000
12	300	150	-	-	5.688
12	300	300	-	-	5.500
14	350	150	-	-	5.625
14	350	300	-	-	5.625
16	400	150	-	-	6.375
16	400	300	-	-	7.125
18	450	150	-	-	7.500
18	450	300	-	-	7.500
20	500	150	-	-	6.250
20	500	300	-	-	8.625
24	600	150	-	-	7.000
24	600	300	-	-	7.750
30*	750	-	-	-	12.000
36*	900	-	-	-	15.000

\*30" and 36" torque value applies to MSS SP-44 Class 150 flanges  
Hastelloy is a trademark of Haynes International Inc., Monel and Inconel are trademarks of Inco Alloys International, Inc.

## Standard Materials:

316 Stainless Steel and Carbon Steel. Also available (Monel®) Alloy 400, (Inconel®) Alloy 600, (Hastelloy®) Alloy C, 316L Stainless Steel, Titanium and (Hastelloy®) Alloy C-276.

Hastelloy is a trademark of Haynes International Inc., Monel and Inconel are trademarks of Inco Alloys International.

Rupture Disk	Use in Safety Head Type:
S90	SRB-7RS, SRB-7FS, S90-7R
JRS	SRB-7RS and SRB-7FS
FRS	SRB-7RS, SRB-7FS, S90-7R
RLS	SRB-7RS and SRB-7FS

## S90-7R™ Pre-Assembled Safety Head

Locates inside the studs between two companion flanges.

Offers pre-assembly of S-90 or FRS disks into the Safety Head before installation into the pressure system.

Standard Materials:

316 Stainless Steel and Carbon Steel.

Disks cannot be reinstalled into the pressure system with a pre-assembled Safety Head. The disk would not seat within the Safety Head in the same manner each time risking leakage and compromising service life.

## Pre-Assembled Design



S90-7R  
Safety Head

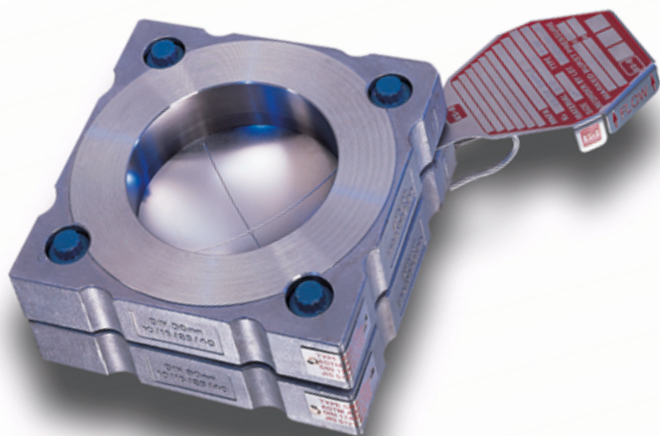
## SRB-7RS™ Pre-torqued Safety Head

The original pre-torqued Safety Head, the SRB-7RS allows proper clamping of a Rupture Disk to be completed in the workshop before installation between companion flanges. A disk installed in a pre-torqued type SRB-7RS Safety Head may be taken out of service, inspected, cleaned (if appropriate) and reinstalled provided the cap screws are not loosened and the torque value is maintained.

Locates inside the studs between two companion flanges.

A J-bolt ensures the Safety Head is fitted in the required direction between companion flanges by

### Pre-Torqued Design



SRB-7RS Safety Head

US Patent 4751938 and other international patents apply.

engaging a blind hole drilled on the inlet companion flange perimeter. The J-bolt provides a constant visible signal of correct installation.

Multiple pipe flange compatibility, the SRB-7RS fits pipe flanges conforming to a wide range of International Standards, including ANSI, DIN, BS, AFNOR, UNI and JIS.

Fluoropolymer coated capscrews (blue color) for enhanced corrosion protection are recommended, while standard carbon steel cap screws are available.

## Specifications: Safety Head Type S90-7R

Size		Safety Head Flange Rating			Face-to-Face Dimensions
in	mm	ANSI	DIN	JIS	in
1	25	150	10/16	10/16	1.480
1	25	300/600	25/40	20/30/40	1.480
1	25	900/1500	-	-	3.000
1.5	40	150	10/16	10/16	1.680
1.5	40	300/600	25/40	20/30/40	1.680
1.5	40	900/1500	-	-	2.600
2	50	150	10/16	10/16	1.880
2	50	300/600	25/40	20/30/40	1.880
2	50	900/1500	-	-	3.375
3	80	150	10/16	10/16	2.170
3	80	300/600	25/40	20/30/40	2.170
3	80	900	-	-	3.500
4	100	150	10/16	10/16	2.880
4	100	300	25/40	20/30/40	2.880
4	100	600	-	-	2.500
6	150	150	10/16	10/16	3.624
6	150	300	25/40	20/30/40	3.624
6	150	600	-	-	3.062
8	200	150	-	-	3.750
8	200	300	-	-	3.750
10	250	150	-	-	4.313
10	250	300	-	-	4.313
12	300	150	-	-	4.625
12	300	300	-	-	5.250
14	350	150	-	-	5.250
14	350	300	-	-	5.875
16	400	150	-	-	6.375
16	400	300	-	-	7.125
18	450	150	-	-	7.375
18	450	300	-	-	7.875
20	500	150	-	-	8.437
20	500	300	-	-	8.625
24	600	150	-	-	10.250
24	600	300	-	-	10.750
30*	750	-	-	-	12.000
36*	900	-	-	-	15.000

\*30" and 36" to fit MSS SP-44 Class 150 flanges.

## SRB-7FS™ Pre-Torqued Safety Head

Full-bolted option sharing the design features of the type SRB-7RS Safety Head. The type SRB-7FS Safety Head installs between companion flanges with the studs passing through bolt holes in the perimeter of the holder. Recommended for RTJ, tongue and groove flange facings, or for a Safety Head in Nickel Alloy 200 or Tantalum (above 1 1/2", 40mm size).

Standard Materials:

316 Stainless Steel and Carbon Steel. Also available in Nickel Alloy 200 and Tantalum.



BS&B SAFETY SYSTEMS, L.L.C.  
BS&B SAFETY SYSTEMS, LTD.

## Contact Us

### **BS&B SAFETY SYSTEMS, L.L.C.**

7455 East 46th Street, Tulsa, OK 74145, USA

Tel: 1-918-622-5950. Fax: 1-918-665-3904

Toll Free: 1-800-BSB-DISK

E-mail: [mktg@tul.bsbsystems.com](mailto:mktg@tul.bsbsystems.com)

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

### **BS&B SAFETY SYSTEMS LTD.**

Bay G-1, Raheen Business Park, Limerick, Ireland

Tel: +353 61 227022. Fax: +353 61 227987

E-mail: [sales@bsb.ie](mailto:sales@bsb.ie)

[www.bsb.ie](http://www.bsb.ie)

### **BS&B SAFETY SYSTEMS (UK) LTD.**

Adamson House, Towers Business Park,

Wilmslow Road, Manchester M20 2YY, England

Tel: +44 161-955 4202. Fax :+44 161-955 4282

E-mail: [sales@bsb-systems.co.uk](mailto:sales@bsb-systems.co.uk)

Products, specifications and all data in this literature are subject to change without notice. Questions regarding product selection and specifications for specific applications should be directed to BS&B Safety Systems, L.L.C. or BS&B Safety Systems Ltd.

All sales are subject to BS&B Safety Systems, L.L.C. or BS&B Safety Systems, Ltd. standard terms and conditions of sale. Nothing herein should be construed as a warranty of merchantability or fitness for a particular purpose.

Printed in the USA, 6.2001

