



LSR[™] Reverse Buckling Rupture Disk

US Patent 7,784,482 applies. Other US and International patents pending.



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LSR™ Reverse Buckling Rupture Disk

The LSR rupture disk is a circular scored reverse buckling disk. Burst pressures are determined by the domed metal structure shape, its material of construction, and the support of this structure by the safety head holder arrangement in which it is used. A single piece of material is used for each LSR rupture disk; the patented proprietary score design provides the required hinge action to allow the LSR disk to open as a single petal designed for non-fragmentation and to provide a high flow area for pressure relief. The 'curl' at the ends of the circular score line has an engineered geometry that manages the desired opening pattern, improving upon a key feature of any circular scored reverse buckling disk that typically requires a second downstream hinge component.

Single piece construction LSR reverse buckling rupture disks install directly into an appropriate BS&B safety head to provide the best seal for the application operating conditions. A 'bite seal' feature in the safety head engages with the disk material to concentrate the clamping force applied to the LSR rupture disk flange providing at least a bubble tight seal to both sides of the disk.

BS&B proprietary SAF™ technology (Structural Apex Forming) is applied to the apex of the LSR disk dome as an additional burst pressure control feature. This often widens the choice of material thickness that may be used to build a specific burst pressure LSR rupture disk – an important supply chain benefit.

Manufacturing Design Range (MDR)

The standard LSR manufacturing design ranges are 0%, -5%, -10%. For tantalum, the MDR options are -5% and -10% only.

Vacuum and Back Pressure Resistance

The LSR rupture disk is designed to resist vacuum at all burst pressures. Vacuum resistance confirms a back pressure resistance of 1 atmosphere (14.5 psi / 1 bar) at all burst pressures. For LSR rupture disks having a burst pressure above 14.5 psi (1 bar), the back pressure resistance is equivalent to the rated burst pressure of the disk. For such higher rated burst pressures a combination of vacuum and back pressure up to the burst pressure is permitted.

All rupture disk devices respond to differential pressure and therefore the application pressure conditions on both sides of the device must be considered in order to select the appropriate burst pressure for the application. BS&B and its sales representatives are always ready to assist with burst pressure selection.



Features

- Solid metal single piece construction
- Domed metal reverse buckling disk
- Structural Apex Forming (SAF™ technology) is applied to the disk dome
- Circular score with proprietary curl feature
- Designed for non-fragmentation
- Vacuum & back pressure resistant
- High operating ratio; 90% of minimum burst pressure
- Wide range of burst pressure capability from 2 psi (0.14 bar) upwards
- Size availability 1" to 6" (25mm to 150mm)
- US and international patents pending

Sustainability Focus

From the commencement of product development activity, the LSR rupture disk was created with a strong focus on sustainability. The design brief was to minimize the amount of raw material required while using processes that avoid the consumption of water and use the least amount of energy. Key sustainability points for the LSR rupture disk, the safety head in which it is typically used, and the facility in which it is produced are as follows:

- Single piece construction, minimizing product material content and end of life material disposal.
- Compatible with SRI-7RS safety heads which are designed with reduced material content as a result of their patented casting based design.
- Reduced product mass (LSR rupture disk and SRI-7RS series safety heads) which minimizes carbon footprint of product transportation activity as well as providing direct benefit with respect to shipping fees charged by weight.
- No water consumed in the LSR rupture disk manufacturing process.
- Manufactured in a facility with ISO14001-2015 environmental management certification.
- LSR rupture disks are individually packaged for protection in recyclable cardboard cartons marked with clear disposal identification for the user to follow.

LSR™ Disk Specifications Minimum / Maximum Pressure with Rating at 72°F (22°C)

Disk Size		Nickel Alloy 200				316ss				Inconel® Alloy 600				Monel® Alloy 400				Hastelloy® Alloy C-276				Tantalum and Titanium			
in	mm	psig		barg		psig		barg		psig		barg		psig		barg		psig		barg		psig		barg	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1	25	9	300	0.62	20	9	300	0.62	20	9	300	0.62	20	9	300	0.62	20	9	300	0.62	20	9	300	0.62	20
1.5	40	4	300	0.27	20	4	300	0.27	20	4	300	0.27	20	4	300	0.27	20	4	300	0.27	20	4	300	0.27	20
2	50	3	300	0.21	20	3	300	0.21	20	3	300	0.21	20	3	300	0.21	20	3	300	0.21	20	3	300	0.21	20
3	80	2.5	300	0.17	20	2.5	300	0.17	20	2.5	300	0.17	20	2.5	300	0.17	20	2.5	300	0.17	20	2.5	300	0.17	20
4	100	2	250	0.14	17	2	250	0.14	17	2	250	0.14	17	2	250	0.14	17	2	250	0.14	17	2	250	0.14	17
6	150	2	200	0.14	17	2	200	0.14	17	2	200	0.14	17	2	200	0.14	17	2	200	0.14	17	2	200	0.14	17

Fluoropolymer liners are available as an option for enhanced corrosion resistance at burst pressures of 14.5 psi (1 bar) and above. Hastelloy® is a trademark of Haynes International Inc. Monel® and Inconel® are registered trademarks of Special Metals Corporation and its subsidiaries.

Cycle Resistance / Temperature Influence / Service Life

The cycle resistance of the LSR disk is a function of the application operating conditions. Under highly cyclic operating conditions, the cycle life of the LSR disk is determined by the frequency and magnitude of pressure change from positive to negative pressure differential. When all of the pressure cycling takes place within the operating pressure ratio of the LSR disk and at a positive differential pressure, the service life shall be maximized. Should the operating pressure cycle between full vacuum and positive pressure, the service life of the LSR disk can be anticipated at several hundred cycles.

Cycle and service life for every rupture disk depends upon its unique application operating conditions. Custom testing can be conducted by BS&B as an engineering support service.

It is particularly important to allow for the temperature influence on burst pressure. Just as the strength of a raw material varies as a function of temperature, the burst pressure of a rupture disk device is temperature sensitive. Reverse buckling disks such as the type LSR which are loaded in compression have a lower sensitivity to temperature than forward acting tension loaded rupture disk devices. If the rated burst temperature of the disk is selected too low, a higher actual temperature may reduce the disk burst pressure. Seek advice from BS&B Safety Systems regarding rated burst temperature (also referred to as 'coincident temperature').

Other application factors including corrosion, erosion, abrasion, product build up, and vibration, affect the service life of a rupture disk and must be considered by the user.

Safety Heads For The LSR Rupture Disk

Certified for use in BS&B safety head types SRB-7RS, *SRI-7RS, and SRB-7RS-TR. Both SRI-7RS and SRB-7RS-TR are torque resistant versions which optimize the relationship between the rupture disk, the safety head, and the users piping system. The primary sealing action between the rupture disk and the safety head (the rupture disk device)

Maximum Recommended Temperatures

Material	Max. Temperature
Nickel (alloy 200)	750°F (399°C)
Monel® (alloy 400)	900°F (482°C)
Inconel® (alloy 600)	1100°F (593°C)
316 stainless steel	900°F (482°C)
Hastelloy® C-276 (alloy C-276)	900°F (482°C)
Titanium	572°F (300°C)
Tantalum	500°F (260°C)
Fluoropolymer liner (PTFE)	500°F (260°C)
Fluoropolymer liner (FEP, PFA)	400°F (204°C)

Burst Tolerance

Burst Pressure		Burst Tolerance (per ASME)
psig	barg	
28 and higher	1.93 and higher	±5%
20 to <28	1.38 to <1.93	±7%
10 to <20	0.69 to <1.38	±10%
<10	<0.69	±15%
Alternate:		±2 psi (0.138 bar)
<40	<2.76	

is achieved by following the BS&B installation instructions and in particular the torque applied to the high tensile capscrews that engage the proprietary 'bite seal' within the safety head.

Sealing of the rupture disk device to the user companion flange arrangement depends upon the bolting system and gasket technology selected by the user. Typically either compressed fiber or spiral wound gaskets are used for companion flange sealing. The force required to engage gasket materials is provided by the torque applied to the companion flange bolts. A wide range of bolt torque values arises to cover the range of gasket materials available. The SRB-7RS-TR and SRI-7RS safety heads are specifically designed to accept this wide range of bolt torque requirements. The BS&B safety head installation instructions shall be followed by the user.

The LSR rupture disk may also be supplied as a part of a welded assembly designed for either flange or threaded piping system installation. BS&B may permit the LSR rupture disk to be used in additional BS&B safety head models; check our web site and the LSR disk installation instructions for details.

***SRI-7RS™ Reduced Mass**
Pretorqued Safety Head



SRB-7RS™

Pretorqued Safety Head

* US patent 10,704,698 applies to the SRI-7RS safety head, international patents pending.

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