GCR-S™ Reverse Buckling Disk

CATALOG
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SECTION D

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

US Patents 5,050,630; 5,996,605 and 6,178,983 apply. Other Patents pending.

The type GR-C™ Safety Head holder with sanitary/aseptic fittings provides quick and easy installation of the GCR-S™ reverse buckling disk onto existing standard sanitary inlet ferrule. The uniquely designed gasket helps eliminate inverted installation of the rupture disk.

Innovative design using SAF™ (Structural Apex Forming) technology offering a wide range of burst pressures for sanitary/aseptic applications in the pharmaceutical, biotechnology and food industries.

- One disk design for gas and liquid service
- "Fail-safe" design - Damage-Safety Ratio ≤1
- Low to high burst pressures
- Ideal for CIP/SIP Service*
- Installed with integral sanitary/aseptic gaskets
- 8 to 16 micro-inch typical disk surface finish
- Minimum dead space between process fluid and the disk
- Suitable for operating pressures up to 90% of Marked Burst Pressure** or 95% of the specified minimum burst pressure (CEN standard pending)
- Designed for non-fragmentation
- 0% Standard Manufacturing Design Range, optional -5%, -10%
- Withstands full vacuum at all burst pressures
- Available SAS™ (Sanitary Alert Sensor) with leak sensing option
- Integral burst disk sensor option
- Worldwide patents pending

**Clean/Steam in Place*

***At marked burst pressures of 40 psig (2.76 barg) and below, the recommended maximum operating pressure is 90% of the marked burst pressure, less 2 psig (0.138 barg) tolerance.*

GCR-S DISK SPECIFICATION MIN/MAX BURST PRESSURE AT 72°F (22°) PSIG (BAR)

Sanitary Fitting		Burst Pressure				Overall Height		OD	
Nominal Disk Size		Minimum		Maximum		(A)		(B)	
in	mm	psi	bar	psi	bar	in	mm	in	mm
1.5	40	10	0.69	300	20.7	1.62	41	1.98	50.3
2	50	10	0.69	300	20.7	1.62	41	2.52	64
3	80	10	0.69	175	12.1	1.81	46	3.58	90.9
4	100	10	0.69	75	5.2	1.81	46	4.68	118.9

Other burst pressures may be available, consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd.

Design

The GCR-S™ family of reverse buckling disks is designed with a circular score line located at the edge of the domed area. At the marked burst pressure the disk's dome reverses and opens by shearing around the circular score line. The GCR-S™ uses SAF™ technology enabling very low burst pressures to be achieved with excellent opening characteristics. An integral energy absorbing hinge located on the downstream side of the disk enables the disk to perform in gas or liquid service with superior flow performance. The hinge design interacts with the holder outlet bore to retain the disk on opening, avoiding fragmentation.

Sensors

The GCR-S™ and GCR-SM™ disks are also available with integral sensors to provide warning of a burst rupture disk, specify types GCR-SS™ and GCR-SMS™.

Optional SAS™ (Sanitary Alert Sensor) for use between standard sanitary/aseptic ittings to provide warning of a burst rupture disk. Leaking disk detection is also available; consult BS&B Safety Systems, Inc or BS&B Safety Systems Ltd for details.

Manufacturing Design Range†

The standard Manufacturing Design Range for the GCR-S™ disk is 0%. The user's requested burst pressure will be the Marked burst Pressure. Optional Manufacturing Design Ranges of -5% and -10% may be selected as operating conditions permit. The Manufacturing Design Range is applied only to the minus side of the requested burst pressure.

Example:
Requested Burst Pressure 100 psig (6.89 bar).
Agreed Manufacturing Design Range - 10%.
Therefore the Marked Burst Pressure shall be between 90 psig (6.21 bar) and 100 psig (6.89 bar).

† *Manufacturing Design Range is a range of pressures within which the marked burst pressure must fall to be acceptable for a particular requirement as agreed upon between the Rupture Disk Manufacturer and the user or his agent.*

Burst Tolerance

Marked Burst Pressure	Burst Tolerance
≤40 psig (2.76 bar)	±2 psig (0.14 bar)
>40 psig (2.76 bar)	±5%

The GCR-S™ disks may also be marked with a minimum-maximum burst pressure or the specified burst pressure & +/- performance tolerance to meet the requirements of the CEN standard (pending).

Flow Performance

The GCR-S™ Reverse Buckling Disk has been specifically developed to produce superior flow performance at all burst pressures in gas or liquid service. The circular score on the disk's dome, coupled with the non-restrictive hinge on the outlet side of the disk, ensures an excellent pressure relief opening.

Flow Resistance Factor, K_R may be used to determine the relieving capacity of a system according to the ASME and CEN (pending) codes. Individual K_R values have been established for both gas and liquid service for the disk. Minimum Net Flow Area (MNFA) for each disk size is provided to assist with ASME sizing calculations.

Net Relief Area has been provided for sizing according to European and International standards.

Gaskets

The GCR-S™ is supplied with FDA approved Silicone, Viton® (white or black), EPDM (white or black) and Tef-Steel® gaskets ensuring correct and leak-tight installations in type GR-C™ or FM-C™ disk holders.

Gasket Service Temperature

Material	Service Temperature	
	Minimum	Maximum
Silicone	-67°F (-55°C)	450°F (232°C)
Viton®	-40°F (-40°C)	400°F (204°C)
EPDM	-67°F (-55°C)	300°F (149°C)
Tef-Steel®	-20°F (-29°C)	450°F (232°C)

Materials

The disk is available in 316 SS and 316L SS as standard. Alternative materials are available on request.

Liners

Liners are available in all sizes as optional on the process side of the disk. FEP or PFA are generally used.

Temperature Range FEP -40°F to 400°F (-40°C to 204°C)
PFA -40°F to 500°F (-40°C to 260°C)

Size		Minimum Burst Pressure for lined disks at 72°F (22°C)	
in	mm	psi	bar
1.5	40	36	2.48
2	50	36	2.48
3	80	16	1.10
4	100	12	0.83

SAF™ technology: Damage-Safety Ratio <1

Structural Apex Forming (SAF) technology, the central "dimple," present in all GCR-S rupture disks, combined with the unique energy absorbing hinge design ensures a damaged disk will rupture at or below the marked burst pressure.

K_R values MINIMUM NET FLOW AREA (MNFA), NRA values

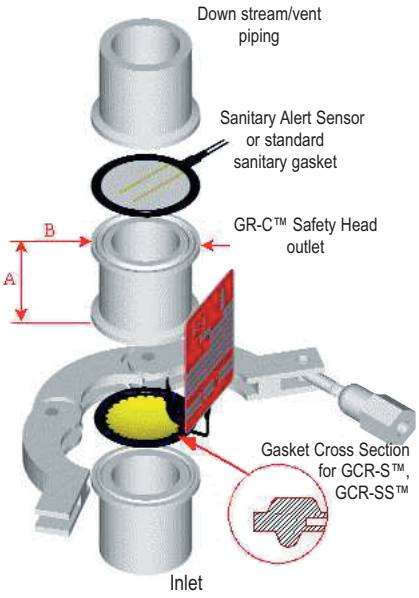
Disk Size	11/2" 40mm	2" 50mm	3" 80mm	4" 100mm
K_RG	1.95	1.25	1.95	1.95
K_RL	4.95	2.90	4.95	4.95
*MNFA in^2	1.50	2.70	5.29	9.78
**NRA cm^2	9.67	17.4	34.1	63.1

** Use MNFA in^2 when sizing according to ASME Code, para UG-127(a)(2)(a)*
***Use NRA cm^2 (Net Relief/Area) when sizing according to European standards*

CE marking of the GCR-S family of rupture disks, according to the European Pressure Equipment Directive, is available.

GCR-S Disk Types

GCR-S™ and **GCR-SS™** with uniquely designed FDA approved gaskets are installed between a standard inlet ferrule and the GR-C™ outlet ensuring correct direction of disk and leak tight installation.



STANDARD SANITARY INLET FITTING

The **GCR-SM™** and **GCR-SMS™** have a symmetric gasket configuration on both sides of the disk and fit between standard Tri-Clamp® (or equivalent) ferrules.

The **GCR-SE™** is installed in a FM-C™ Safety Head. The inlet of the FM-C™ Safety Head is welded to the vessel wall, and permits the rupture disk to be installed flush with the interior wall of the vessel. The space between the process fluid and the disk is minimized. Similar flush installation is achieved with **GCR-N™** and **GCR-NS™** (integral sensor) type disks when installed in NA-Connect® holders. An integral Burst Alert Sensor is provided on the outlet side of the disk with disk types GCR-SS, GCR-SMS, GCR-NS.

GCR-SW™ is a welded ferrule assembly, the disk is welded between standard ferrules.

Installation

The GR-C™ and FM-C™ holder designs ensure correct direction and leak tight rupture disk installation. We recommend the assembly of GCR-S™ rupture disks into their respective holders using a Tri-Clamp® 13 MHHS clamp (or equivalent) with a hexagonal nut enabling control of installation torque.

The GCR-S™ disk range, using SAF™ technology, exhibits minimum sensitivity to changes in clamp loading on the disk induced by service temperature variations. However an adequate clamping load to maintain leak tightness must be maintained.

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