Catalog # 77-4014

# The GCR™ Series Reverse Buckling Disks

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US Patents 5,996,605 and 6,178,983 apply; International patents pending

Pictured: The GCR-S™ series reverse buckling disk uses innovative SAF™ (Structural Apex Forming) technology offering a wide range of burst pressures for hygenic/aseptic applications in the pharmaceutical, biotechnology and food industries.

The type GR-C™ outlet (pictured on the back) provides quick and easy installation of the GCR series reverse buckling disk onto an existing standard sanitary inlet fittings. The uniquely designed gasket helps eliminate inverted installation of the rupture disk.

**Disk Specification Min / Max Burst Pressure at 72°F (22°C)**

| Sanitary Fitting | | Burst Pressure | | | | Overall Height | | OD | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal Disk Size | | Min | | Max | | | | | |
| 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

## Features

- One disk design for gas and liquid service
- "Fail-safe" design damage safety ratio < 1.0
- Wide range of pressures
- Ideal for CIP / SIP service
- Installed with integral sanitary gaskets
- 8 to 16 micro-inch typical disk surface finish
- Suitable for operating pressures up to 90% of marked burst pressure* or 95% of the specified minimum burst pressure
- Meets ASME BPE standards
- Designed for non-fragmentation
- 0% standard Manufacturing Design Range - optional -5%, -10%
- Withstands full vacuum at all burst pressures
- Available SAS™ (Sanitary Alert Sensor) or LDS (Leak Detector Sensor) with leak sensing capability
- Integral burst disk sensor option

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

## Design

The GCR 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 series uses SAF™ technology enabling very low burst pressures to be achieved with excellent opening characteristics.

## 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™ for use between standard sanitary fittings to provide warning of a burst rupture disk. Leaking disk detection is also available; consult BS&B for details.*

## Materials

The GCR series disks and GR-C outlet fitting are available in 316L stainless steel as standard. Alternative materials are available on request.

## SAF™ Technology: Damage-Safety Ratio < 1

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

## Manufacturing Design Range

0% standard MDR (Manufacturing Design Range) - The user's requested burst pressure will be the marked burst pressure. An optional MDR of -5% and -10% may be selected as operating conditions permit. The MDR is applied only to the minus side of the requested burst pressure.

*MDR 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*

**Example:**

- Requested burst pressure 100 psig (6.89barg)
- Agreed MDR - 10%
- Therefore the marked burst pressure shall be between 90 psig (6.21barg) and 100 psig (6.89barg)

Gasket cross section for GCR-SM™ and GCR-SMS™

| Burst Tolerance | |
|---|---|
| Marked burst pressure | Burst tolerance |
| ≤40 psig (2.76bar) | ±2 psig (0.14bar) |
| >40 psig (2.76bar) | ±5% |

The GCR series disks may also be marked with a minimum / maximum burst pressure or the specified burst pressure and +/- performance tolerance to meet the requirements of the CE standard.

## Flow Performance

The GCR series 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 openingin all service phases.

Flow resistance factor, $K_R$ may be used to determine the relieving capacity of a system according to the ASME and CE codes and standards. Individual KR values have been established for both gas and liquid service for the disk. MNFA (minimum net flow area) for each disk size is provided to assist with ASME sizing calculations. For simple systems, NRA (net relief area) has been provided for sizing according to European and International standards.

## Gaskets

The GCR series may be supplied with FDA approved silicone, Viton® (white or black), and EPDM (white or black) gaskets ensuring correct and leak-tight installations in type GR-C™ or FM-C™ disk holders.

| Material | Service temperature | |
|---|---|---|
| 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) |
| Stainless Steel and PTFE blend | -20°F (-29°C) | 450°F (232°C) |

## Liners

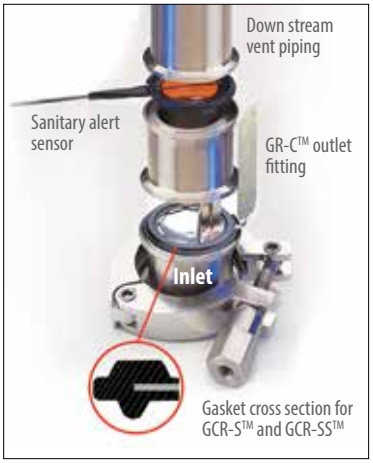
Liners are available in all sizes as optional on the process side of the disk. FEP or PFA are generally used.

| Size | | Minimum burst pressure for lined disks at 72°F (22°C) | |
|---|---|---|---|
| in | mm | psig | barg |
| 1.5 | 40 | 36 | 2.48 |
| 2 | 50 | 36 | 2.48 |
| 3 | 80 | 16 | 1.1 |
| 4 | 100 | 12 | 0.83 |

| $K_R$ Values MNFA and NRA | | | | |
|---|---|---|---|---|
| Disk size | 1 1/2 in (40mm) | 2 in (50mm) | 3 in (80mm) | 4 in (100mm) |
| $K_{RG}$ | 1.95 | 1.25 | 1.95 | 1.95 |
| $K_{RL}$ | 4.95 | 2.90 | 4.95 | 4.95 |
| *MNFA (in²) | 1.50 | 2.70 | 5.29 | 9.78 |
| **NRA (cm²) | 9.67 | 17.4 | 34.1 | 63.1 |

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

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




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

## Installation

The GR-C™ and FM-C™ ensure correct direction and leak tight rupture disk installation. BS&B recommends the assembly of GCR series rupture disks using a Tri-Clamp® 13 MHHS clamp (or equivalent) with a hexagonal nut enabling control of installation torque. The GCR series disk range exhibits minimum sensitivity to changes in clamp loading on the disk induced by service temperature variations.

## GCR 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.

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) fittings.

The GCR-SE™ and GCR-SES™ are installed in an FM-C™ or FT-C™ safety head. The FM-C provides for flush mounting of the disk with the interior wall of the vessel while the FT-C accomplishes the same flush mounting in an "in-line" pipe configuration, both achieving minimal dead leg between the disk and process fluid. Similar flush installation is achieved with GCR-N™ and GCR-NS™ 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 and GCR-NS. The GCR-SW™ is a welded ferrule assembly with the disk is welded between standard fittings.

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