

VAC-SAF™ SYSTEM



*Rupture disks offering
two-way pressure relief
protecting vessels and
plant from excess
vacuum or overpressure*



THE VAC-SAF™ SYSTEM

APPLICATIONS FOR THE PROTECTION OF

- ▶ Storage Tanks
- ▶ Silos
- ▶ Fermentation Systems
- ▶ Glycol re-boilers

USED IN PROCESSES

- ▶ Aseptic
- ▶ Food
- ▶ Dairy
- ▶ Beverage
- ▶ Pharmaceutical
- ▶ Applications where contamination is unacceptable

U.S. Patent No.4657157 and the following international patents:

Belgium Patent No.8700096
Canada Patent No.1270173
France Patent No.87.00964
Great Britain Patent No.2191819
Italy Patent No.1201183
Japan Patent No.1845832
Netherlands Patent No.191637
West Germany Patent No.3702557

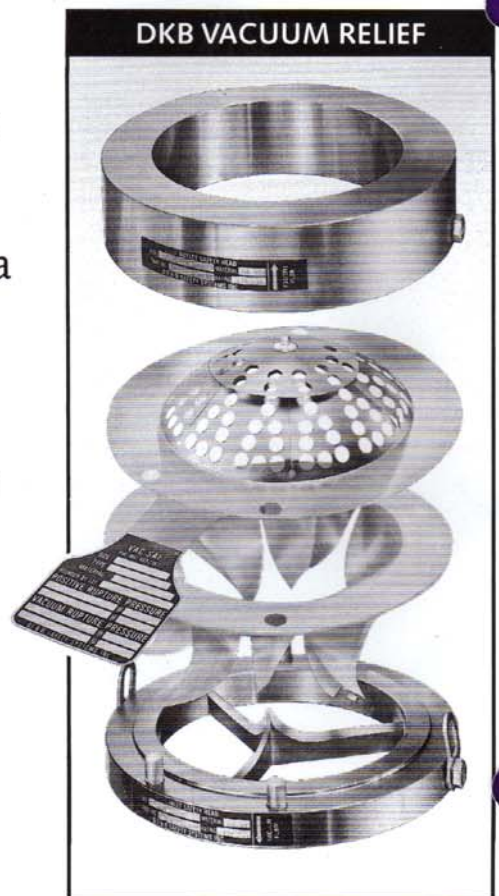
VAC-SAF™

The VAC-SAF™ System rupture disks offer two-way relief to provide maximum protection of gas or liquid storage vessels and plant from damage caused by excessive vacuum or overpressure.

There are two modes of protection. First, vessels and plant are protected from implosion, which could occur when excessive vacuum is created during liquid withdrawal, accidental product loss or during routine steam cleaning (e.g. for sterilization). Secondly, protection is provided by the same disk to relieve positive overpressure.

The unique advantage of the VAC-SAF™ System is that it reacts to an abnormal condition **immediately** giving a **full relief area** instantaneously.

The VAC-SAF™ System can also offer relief of **light overpressure**.



THE VAC-SAF DISK COMPONENTS

VAC-SAF™ rupture disks consist of three main parts:

- 1 A perforated and slotted metal section.
- 2 A Teflon® seal with integral Teflon® button.
- 3 A Teflon® slit cover between the Teflon® seal and the metal section prevents damage to the seal by the slits in the metal section .

*Teflon® is generally used, other appropriate fluorocarbons may be supplied.
Teflon® is a registered trademark of DuPont.

The VAC-SAF™ System rupture disks can be utilised in various ways:

Type DKB™ . For vacuum and overpressure relief in a KB-7R™ Safety Head, for installation between standard pipe flanges.

Type VKB™ . For vacuum and overpressure relief in a KB-C™ Safety Head with sanitary/hygienic fittings.

Type P/DKB™ . For light overpressure relief in a PKB-7R™ Safety Head, for installation between standard pipe flanges.

Type P/VKB™ . For light overpressure relief in a PKB-C™ Safety Head with sanitary/hygienic fittings.

The VKB rupture disk with the KB-C Safety Head

meets the requirements of the American 3A Sanitary Standards. The KB-C Safety Head and VKB disk provide a uniformly smooth, non-contaminating and non-corrosive environment towards the products. The assembly is ideal for situations where frequent dismantling is required for product changes and cleaning purposes.



RUPTURE DISKS TYPES DKB™ & VKB™

- ▶ Unique two-way acting disks prevent vessel damage from implosion under vacuum or overpressure
- ▶ Available in sizes (2") 50mm to (8") 200mm
- ▶ Vacuum relief pressures available from 44"WC (110 mbar) down to 5.5"WC (13.7 mbar)
- ▶ For gas or liquid applications
- ▶ Disk offers smooth surface towards the process which prevents product accumulation and facilitates cleaning of the disk
- ▶ Asymmetric alignment pins in the Safety Head mate with locating holes in the rupture disk ensures centering and orientation of the disk in the Safety Head.
- ▶ The standard material of the disk's metal section is 316SS. Consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd. regarding other materials, e.g. Inconel Alloy 600, Nickel 200, Monel Alloy 400, and Hastelloy Alloy C-276. The disk's seal material is Teflon®

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

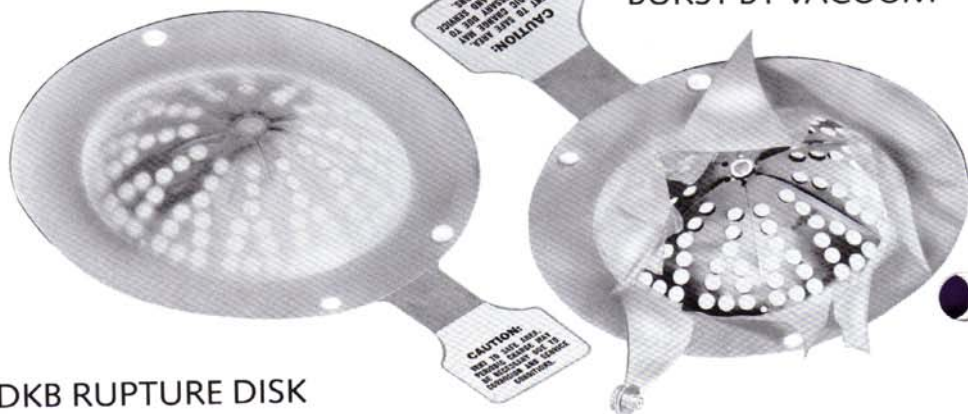
How the System works ...

Vacuum Relief

At the rated vacuum relief pressure the disk's seal separates from the perforated metal section to snap against knife blades located in the Safety Head inlet, cutting the seal into three segments. The perforated metal section remains intact and flow through the holes in the metal section relieves the vacuum condition.



DKB RUPTURE DISK BURST BY VACUUM



DKB RUPTURE DISK

VAC-SAF™

RUPTURE DISKS TYPES DKB™ & VKB™

STANDARD HYGIENIC SYSTEM

VKB rupture disk and KB-C Safety Head with quick release sanitary fittings provide easy dismantling for routine maintenance. The O-ring seal provides leak-tight connection. The clamp is supplied with an extended hexagonal nut for accurate torquing instead of the wing type nut shown.

KB-C SAFETY HEAD



VKB RUPTURE DISK

VAC-SAF™

VACUUM RELIEF

Burst Range

Disks are available with a burst range of ± 1.5 "WC (± 3.75 mbar) for pressures up to 8"WC (20 mbar) and $\pm 20\%$ for pressures above 8"WC (20 mbar). All tolerances are included in the Burst Range.

Markings

A disk with vacuum relief

pressure of 7.23"WC (18 mbar) will be shown on the disk tag as min 5.73"WC (14.25 mbar) to maximum 8.73"WC (21.75 mbar).

Operating Pressure

The system may operate up to 80% of the minimum of the Burst Range without affecting the service life of the disk.

OVERPRESSURE RELIEF

Manufacturing Design Range

Disks are available with a ± 2 psi (± 0.138 bar) or 10% manufacturing design range depending on the burst pressure.

Burst Pressure	Manufacturing Design Range
up thru 2.76 bar	± 0.138 bar
above 2.76 bar	-10%
up thru 40 psi	± 2 psi
above 40 psi	-10%

Example

A burst pressure of 58 psi (4 bar) is requested with a 10% manufacturing design range. The average value of the burst tests carried out during manufacture is used as the marked burst pressure shown on the tag and will be between 52.2 psi (3.6 bar) and 58 psi (4 bar).

Burst Tolerance

Tolerances are the maximum variation from the marked burst pressure shown on the disk tag.

Marked Burst Pressure (bar)	(psi)	Burst Tolerance
0.41 – 0.55	6 – 8	$\pm 20\%$
0.62 – 0.83	9 – 12	$\pm 15\%$
0.90 – 1.17	13 – 17	$\pm 10\%$
1.24 – 1.72	18 – 25	$\pm 7\%$
1.79 and above	26 up	$\pm 5\%$

Operating Pressure

The System may operate up to 80% of the marked burst pressure without affecting the service life of the disk.

Operating Temperature Range

Minimum -40°C (-40°F) to maximum 79.44°C (175°F)
Disks may be steam cleaned at 260°F (126°C) but low pressures must be maintained, consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd.

RUPTURE DISKS TYPES P/DKB™ & P/VKB™

- ▶ Unique two-way acting disks prevent vessel damage from light overpressure or implosion under vacuum
- ▶ Available in sizes 2" to 8" (50mm to 200mm)
- ▶ Rupture pressures available from 44"WC (110 mbar) down to 5.5"WC (13.7 mbar)
- ▶ For gas or liquid applications
- ▶ Asymmetric alignment pins in the Safety Head mate with locating holes in the rupture disk ensures centering and orientation of the disk in the Safety Head
- ▶ The standard material of the disk's metal section is 316SS. Consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd. regarding other materials, e.g. Inconel Alloy 600, Nickel 200, Monel Alloy 400, and Hastelloy Alloy C-276. The disk's seal material is Teflon®

How the System works ...

Overpressure relief

At the rated burst pressure the disk's seal separates from the perforated metal section snapping against knife blades, located in the Safety Head outlet, cutting the seal into three segments. The perforated metal section remains intact and flow through the holes in the metal section relieves the overpressure.

P/DKB OVERPRESSURE RELIEF



PRESSURE RANGE FOR LIGHT OVERPRESSURE AND VACUUM RELIEF FOR DISK TYPES P/DKB AND P/VKB AT 72°F (22°C)

Overpressure Relief ("WC and mbar)							
Disk Size		Minimum		Maximum		Relief Area	
Inch	mm	"WC	mbar	"WC	mbar	Sq. Inch	Sq. cm
2	50	7.50	18.68	44	109.59	1.50	9.68
3	80	6.50	16.19	30	74.72	3.57	23.03
4	100	5.50	13.70	30	74.72	5.93	38.26
6	150	5.50	13.70	30	74.72	12.30	79.35
8	200	5.50	13.70	20	49.81	18.50	119.35

Note: 4"WC = 10 mbar. Consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd. for other service temperatures.

VACSAF™

OVERPRESSURE RELIEF

Burst Range

Disks are available with a Burst Range of +/-1.5"WC (3.75mbar) for pressure to 8"WC (20 mbar) and +/-20% for pressures above 8"WC (20 mbar). All tolerances are included in the Burst Range.

Markings

A disk with a burst pressure of 16"WC (39.8 mbar) will be shown on the disk tag as Min.12.8"WC (31.9 mbar)

Max 19.2"WC (47.8 mbar).

Operating Pressure

The system may operate up to 80% of the minimum of the Burst Range without affecting the service life of the disk.

Operating Temperature Range

Minimum -40°C (-40°F) to Maximum 79.44°C (175°F)

Disks may be steam cleaned at 260°F (126°C) but low pressures must be maintained.

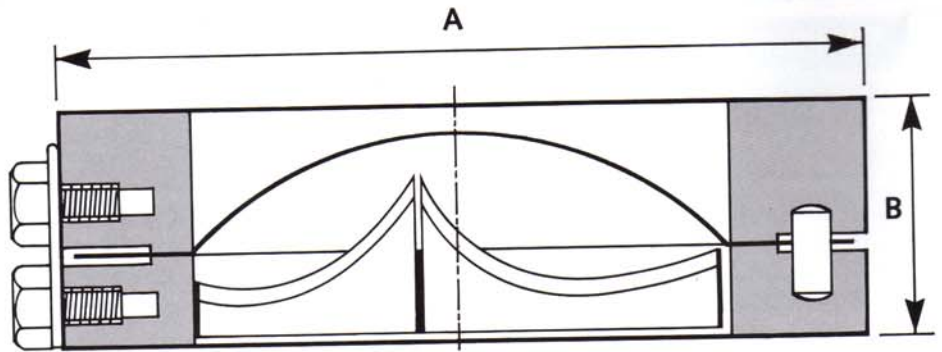
Vacuum Relief

The disk may be used also to relieve vacuum depending on specific requirements.



SAFETY HEADS INSERT TYPES KB-7R & PKB-7R

- ▶ Quik-Sert reduced diameter Safety Head fits inside the studs of two companion flanges
- ▶ Asymmetric alignment pins in the Safety Head mate with locating holes in the rupture disk ensures centering and orientation of the disk in the Safety Head
- ▶ The inlet and outlet of the Safety Heads are held together by side lugs
- ▶ Standard materials are 316SS, 304SS and carbon steel. Consult BS&B Safety Systems, Inc. or BS&B Safety Systems Ltd. for other materials
- ▶ Knife blade material is 301SS



The dome of the disk is protected by the Safety Head

SAFETY HEAD SPECIFICATIONS

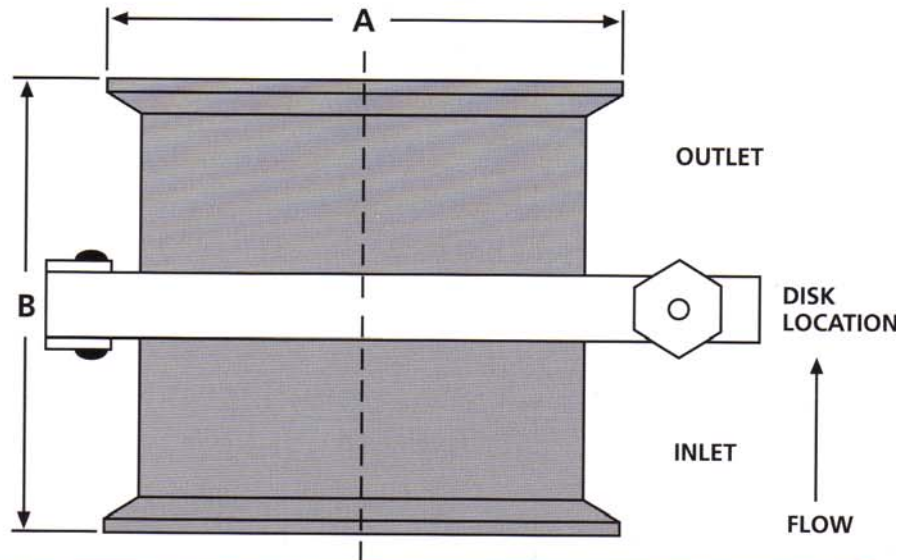
Rupture Disk Nominal Size		PN10		ANSI 150	
		'A' Outside Diameter	'B' Overall Height	'A' Outside Diameter	'B' Overall Height
2"	50mm	107mm	46.5mm	4"	1.83"
3"	80mm	142mm	47.5mm	5.25"	1.83"
4"	100mm	162mm	59.0mm	6.75"	2.32"
6"	150mm	218mm	66.0mm	8.62"	2.58"
8"	200mm	273mm	71.5mm	10.88"	2.83"



VACSAF™

SAFETY HEADS HYGIENIC TYPES KB-C & PKB-C

- ▶ Sanitary fittings permit quick installation or dismantling
- ▶ O-Ring seal provides leak tight connection
- ▶ Asymmetric alignment pins in the Safety Head mate with locating holes in the rupture disk ensures centering and orientation of the disk in the Safety Head
- ▶ Knife blade material is 301SS
- ▶ Safety Head material 300 series stainless steel
- ▶ Internal Surface Finish
No. 4 Mill Finish, 150 Grit



SAFETY HEAD SPECIFICATIONS

Rupture Disk Nominal Size		'A' Outside Diameter		'B' Overall Height		Sanitary Fitting Size	
Inch	mm	Inch	mm	Inch	mm	Inch	mm
2	50	3.56	90.4	3.0	76.2	3	76.2
3	80	4.68	118.8	3.0	76.2	4	101.6
4	100	6.56	166.6	4.0	101.6	6	152.4
6	150	8.56	217.4	4.0	101.6	8	203.2
8	200	10.56	268.2	4.5	114.3	10	254.0



VAC-SAFTM SYSTEM



SAFETY SYSTEMS, INC
SAFETY SYSTEMS LTD

BS&B Safety Systems Inc.
7455 East 46th Street,
P.O. Box 470590
Tulsa, Oklahoma 74147-0590, USA
Telephone: 918/622-5950
Facsimile: 918/665-3904
Toll Free: 1-888-272-7755

BS&B Safety Systems Ltd.
Centre House, 68 Sheen Lane
London SW14 8LP, England
Telephone: +44-181-392-1333
Facsimile: +44-181-876-0573

Visit our Website:
www.bsbsystems.com

ISO 9001 Quality System Certification



NOTE: 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, Inc. or BS&B Safety Systems Ltd.

All sales subject to BS&B Safety Systems, Inc.'s and BS&B Safety Systems Ltd.'s standard terms and conditions of sale.