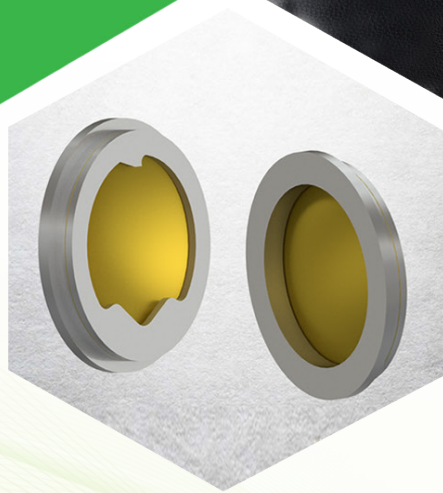
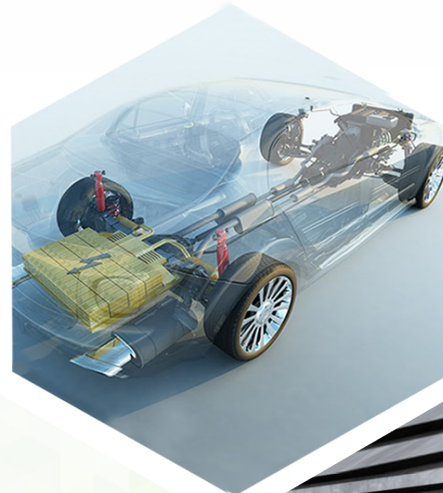
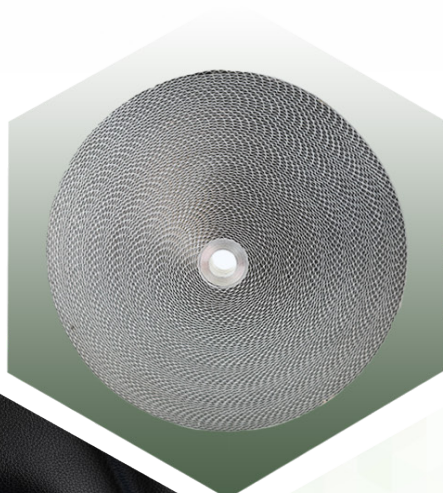


Catalog #77-7011

Pressure Safety Management for e-mobility Systems

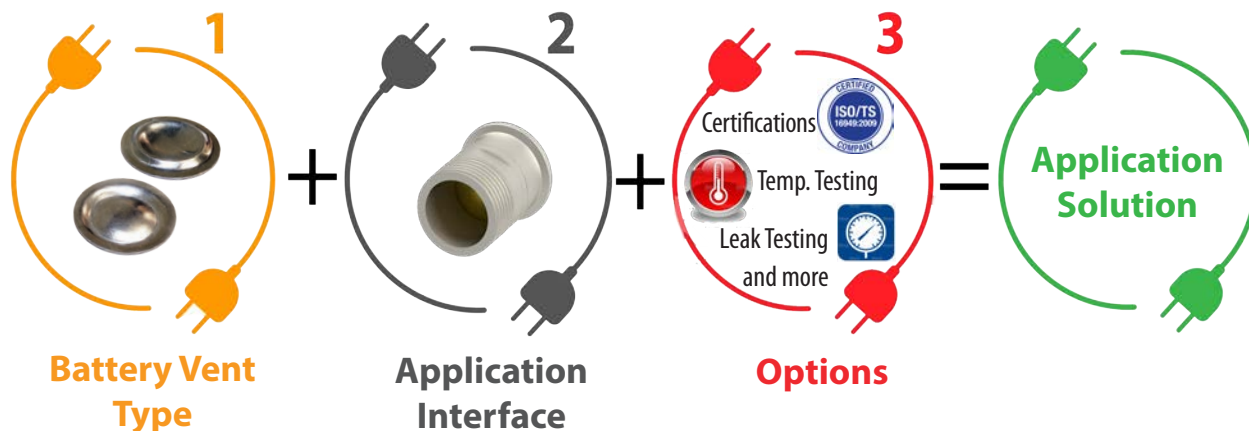




BS&B manufactures battery pack and cell pressure relief eVents used for the battery mobility market. We offer a personalized approach for each project to ensure flexibility in design and burst pressures. 90-percent of BS&B projects require customized solutions. We take great pride in

“solving the impossible”. Our custom engineered products team rallies around decades of machining experience, most-recently 3d printing, to offer inexpensive tooling solutions for new pressure relief products.

Custom Engineered Products: Application Solutions



1 Battery Vent Type

Rupture Disk Type		Pressure Range	Size Range
eVent® Series FRB™		from 10 psig to 900 psig (from 0.69 barg to 62.05 barg)	from 1/8" to 1" (from 3mm to 25mm)
eVent® Series LPS™		from 5 psig to 70 psig (from 0.34 to 4.83 barg)	from 1" to 12" (from 25mm to 300mm)
eVent® Series HL™		from 3.5 psig to 16 psig (from 0.24 barg to 1.1 barg)	from 1/4" to 8" (from 6mm to 200mm)
eVent® Series G™		from 1.5 to 16 psig (from 0.04 to 10.3 barg)	from 1/4" to 8" (from 6mm to 200mm)

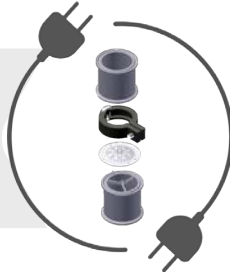
Select the nominal eVent relief pressure from the above indicated range of values.

2 Application Interface

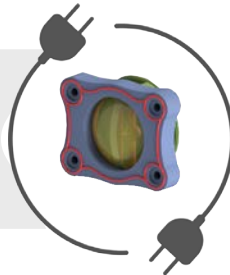
Threaded



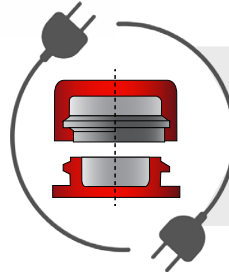
Clamped



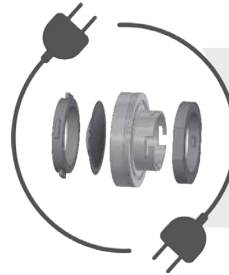
Bolted



Snap-fit



Quarter-turn



Adhesive Bonding



3 Options

PACKAGING	INVENTORY MANAGEMENT	MARKING	ACTUATIONS
CLEANING	LEAK TESTING	FAST PROTOTYPING	FLAME ARRESTERS
CERTIFICATIONS	VALIDATION TESTING	TEMPERATURE TESTING	BURST ALERT SENSORS

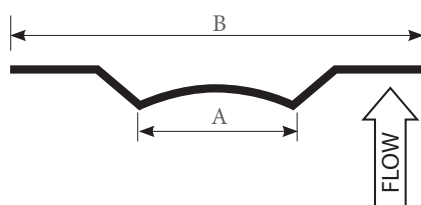


eVent™ Series FRB™

Battery manufacturers rely on the event FRB™ lithium cell for overpressure protection due to its small size, low-pressure capabilities, and fast response time (milliseconds). From 1/8" (3mm) to 1" (25mm) Nominal flow diameters, and 10 psig (0.69 barg) to 900 psig (62 barg) activation pressures, the FRB is the perfect solution for your lithium cell design requirements.

Features

- Standard sizes: 1/8, 1/4, 3/8, 1/2, 3/4 and 1 inch (3, 6, 9, 12 19 and 25 mm)
- Pressure ratings from 20 to 900 psig (1.4 to 62 barg)
- Full opening along circular score
- Solid metal, reverse buckling technology
- Standard materials: 316ss, nickel 200, Inconel® 600 and aluminum
- Standard and custom holder designs are available
- Low volume, starting at one unit
- High volume, automated manufacturing



BS&B also offers the added advantage of integrating the FRB disk with laser welding expertise, and with the Prototype Introduction Track "PIT" program, BS&B supports your lithium cell and pack development program with fast completion of your initial welded cell prototypes.

Nominal Size		A		B	
		Flow Diameter		Outside Diameter Options	
in	mm	in	mm	in	mm
1/8	3	0.125	3.175	0.312	7.925
1/4	6	0.215	5.461	0.500, 0.550	12.700, 13.970
3/8	9	0.350	8.890	0.670, 0.750, 0.935, 1.000	17.018, 19.05, 23.749, 25.400
1/2	12	0.525	13.335	0.935, 1.000	23.749, 25.400
3/4	19	0.787	19.990	1.181	29.997
1	25	0.95		1.425, 1.500	36.195

These dimensions are for information only, exact FRB disk installation design shall be determined by BS&B for each application.

FRB Battery eVent Burst Pressure Capabilities

Pressure ratings at 72°F (22°C) for gas or vapor service

Disk Size		Disk Material*															
		Nickel 200				Inconel® 600				316ss				Aluminum			
		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
1/8	3	200	13.79	500	34.47	250	17.24	850	58.61	300	20.68	900	62.05	125	8.62	400	27.58
1/4	6	100	6.89	450	31.03	150	10.34	800	55.16	150	10.34	850	58.61	60	4.14	300	20.68
3/8	9	50	3.45	400	27.58	60	4.14	750	51.71	60	4.14	800	55.16	35	2.41	250	17.24
1/2	13	35	2.41	200	13.79	45	3.10	650	44.82	45	3.10	675	46.54	25	1.72	200	13.79
3/4	19	20	1.39	100	6.89	25	1.72	325	22.40	25	1.72	360	24.82	15	1.03	100	6.89
1	25	10	0.69	65	4.48	15	1.03	160	11.03	15	1.03	190	13.10	10	0.69	50	3.45

Pressure ratings at 72°F (22°C) for liquid service

Disk Size		Disk material*															
		Nickel 200				Inconel® 600				316ss				Aluminum			
		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
1/8	3	Consult factory															
1/4	6	250	17.24	450	31.03	250	17.24	800	55.16	250	17.24	850	58.61	60	4.14	300	20.68
3/8	9	150	10.34	400	27.58	150	10.34	750	51.71	150	10.34	800	55.16	35	2.41	250	17.24
1/2	13	80	5.52	200	13.79	80	5.52	650	44.82	80	5.52	675	46.54	25	1.72	200	13.79
3/4	19	Consult factory															
1	25	Consult factory															

eVent™ Series LPS™

The eVent LPS™ provides low burst pressures starting at 5 psig (0.35 barg). The LPS is a reverse buckling metal rupture disk using SAF™ technology, which enables low burst pressures to be achieved while maintaining excellent opening characteristics.

BS&B offers a variety of choices for application interface designs using LPS rupture disk technology including interface designs for plastic body; metal body, cassette; snap fit, quarter-turn; and even adhesive bonding.

BS&B partners with you to solve overpressure requirements for pressurized systems. Solutions may include off-the-shelf assemblies or a customized designs requiring unique sealing and interface options to meet the constraints placed by the assembly and production of your product. Since 90-percent of our applications require a customized solution, you can count on BS&B as your team member and to help guide you through the process. It's what we do.

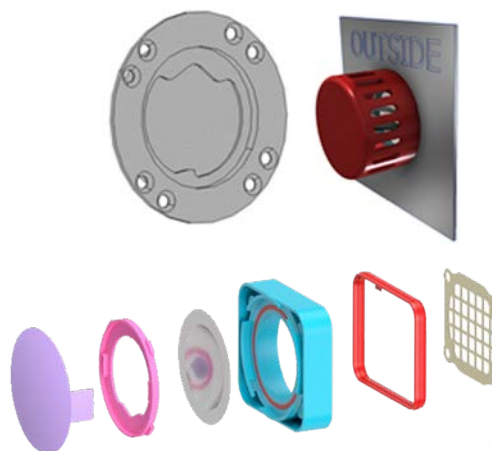
LPS technology is validated for many conditions including:

- Burst Pressure Performance
- Effective Sealing
- Advanced Life Pressure Cycle Testing
- Mechanical Shock Drop Testing
- Random Vibration Endurance Test
- Salt Spray with Humidity Functional Endurance Test
- Fluid Corrosion
- Tested for many types of automotive related fluid
- Climatic Sequence Testing
- Thermal Life Test



Features

- Established technology for over 10 years
- Solid metal design provide leak tight performance
- Low burst pressure capability from 5psig (0.35barg)
- Fail safe: Damage Safety Ratio ≤ 1
- Designed for non-fragmentation
- High operating ratio: 90% of minimum burst pressure
- High backpressure resistance
- Vent area predictable and reliable
- Custom designs available.
- Stainless steel and aluminum construction



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

Disk Size		Nickel Alloy 200				316ss				Monel® Alloy 400, Inconel® Alloy 600 and Tantalum				Hastelloy® Alloy C-276				Aluminum			
in	mm	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
1	25	15	70	1.03	4.83	15	70	1.03	4.83	20	70	1.38	4.83	15	70	1.03	4.83	-	-	-	-
1.5	40	6	55	0.41	3.79	6	55	0.41	3.79	10	55	0.69	3.79	7	55	0.48	3.79	-	-	-	-
2	50	5	40	0.34	2.76	5	40	0.34	2.76	8	40	0.55	2.76	6	40	0.41	2.76	3	0.20	0.55	2.76
3	80	5	35	0.34	2.41	5	35	0.34	2.41	7	35	0.48	2.41	5	35	0.34	2.41	2.5	35	0.17	2.41
4	100	5	30	0.34	2.06	5	30	0.34	2.06	7	30	0.48	2.06	5	30	0.34	2.06	2.5	30	0.17	2.06



eVent™ Series HL™



Features

- Reverse buckling plastic rupture disk combines air breathing capability and accurate pressure relief
- Low burst pressure from 3.5 psig (0.24 bar) – 16 psig (1.1 bar)
- Sizes range: ¼" - 8" (6 mm – 19 mm)
- 0.1 mm thick sintered PTFE membrane
- Air flow permitted under normal operation
- Water entry pressure \geq 500 mbar
- Withstands up to 1 m water backpressure
- Operating pressure -40°C to 80°C
- Corrosion resistance
- Vent area predictable and reliable
- Custom designs available
- Environmental performance compliance:
 - IP6KX, avoid dust ingress
 - IPX6K, avoids pressure wash water ingress
 - IPX69K, resists steam cleaning
- Vent area predictable and reliable
- Custom designs available

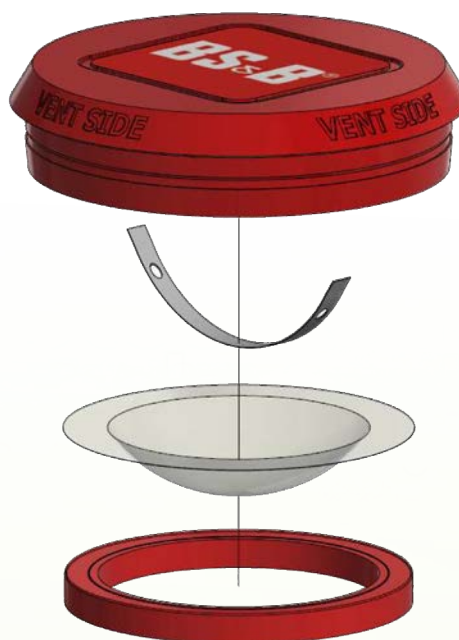
The eVent HL is a Reverse buckling plastic rupture disk that combines air breathing capability with accurate pressure relief. Burst pressure is controlled by metal support arch, which retains the plastic domed rupture disk under normal operating conditions. The assembly is an injection moulded engineered plastic part. The general design and assembly is customizable to meet specific customer modifications, which provides immediate high flow rate under overpressure relief conditions.

The HL has an integrated cutting member to pierce seal upon arch activation, and its precision engineered metal strip is designed to activate at customer required burst pressure. The burst pressure is controlled by shape details and thickness of material.

For battery packs intended to be "sealed-for-life", the eVent Series FRB & eVent Series LPS products is recommended.

The eVent breathable HL vent is intended for battery packs with weak flexible containers that must be stabilized close to atmospheric pressure (e.g. +/- 20 mbar) while having an emergency venting device in case of fire or other over-pressure generating event. From this arises the requirement for a breathable rupture disk device.

US & International Patent Pending

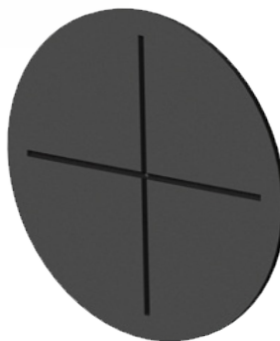


eVent™ Series G

graphite rupture disks

The eVent Series G is manufactured from high quality graphite impregnated with an environmentally friendly high temperature resin. With its excellent corrosion resistance and low-pressure properties, the Series G is a cost-effective solution for the Battery Pack application. The Series G is customizable and available in a variety of designs to meet different nominal sizes and pressure requirements.

The eVent Series G satisfies most applications requiring the capabilities of a low burst pressure, full opening, broadly corrosion resistant rupture disk where the application can accept the fragmentation of a graphite disk activation.



Features

- High Quality Graphite Design
- Low burst pressure capability from 1.5 psig (0.1 bar) – 16 psig (1.1 bar)
- Graphite Disk in sizes: ¼" – 8" (6mm–200mm)
- Operation Ratio: 80% of Minimum Burst Pressure
- Full Opening
- Corrosion resistance

PIT™ PROGRAM

(Prototype Introduction Track)



Similar to a Race Car Pit Team, the BS&B Prototype Introduction Track combines special skill sets to work in unison with the common goal of giving the customer an excellent prototype order experience.

- Rapid response Prototype Introduction Track
- Schedule management to assure on time performance
- Focus on your needs, not a 'cookie cutter' approach
- Engineering engagement throughout
- Plan For Success™ approach
- Access to Engineering and Quality from design to delivery



AMERICAS

Tulsa, OK USA
T: +1 918 622 5950
E: sales@bsbsystems.com

Houston, TX USA
T: +1 713 682 4515
E: sales@bsbsystems.com

Minneapolis, MN USA
T: +1 952 941 0146
E: sales@bsbipd.com

Edmonton, AB Canada
T: +1 780 955 2888
E: contacts@bsbprocess.com

Monterrey, Mexico
T: +52 81 8299 5861
E: sales@bsbsystems.com

Sao Paulo, Brasil
T: +55 11 2084 4800
E: sales@bsbbrazil.com

EUROPE, MIDDLE EAST & AFRICA

Limerick, Ireland
T: +353 61 484700
E: sales@bsb.ie

Düsseldorf, Germany
T: +49 211 930550
E: info@bormann-neupertbsb.de

Manchester, UK
T: +44 161 955 4202
E: sales@bsb-systems.co.uk

Moscow, Russia
T: +7 495 747 5916
E: sales@bsbsystems.ru

The Hague, The Netherlands
T: +31 20 399 9965
E: info@bsbsystems.nl

Copenhagen, Denmark
T: +45 3318 9000
E: info@bsbsystems.dk

United Arab Emirates
T: +971 (0) 55 518 0314
E: sales@bsbsystems.ae

ASIA PACIFIC

Singapore
T: +65 6513 9780
E: sales@bsb.com.sg

Yokohama, Japan
T: +81 45 450 1271
E: information@bsb-systems.co.jp

Seoul, South Korea
T: +82 2 2636 9110
E: sales@bsbsystems.kr

Shanghai, China
T: +86 21 6391 2299
E: sales@bsbsystems.com

Chennai, India
T: +91 44 2450 4200
E: sales@bsbsystems.com

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