



SCHLESINGER®

BURSTING DISCS *BERSTSCHEIBEN*



Our company

Our family concern was established almost 100 years ago and has a long tradition of working thin sheets and foils. We started specialising in bursting discs and diaphragms approximately 35 years ago. The company is now entirely focussed on manufacturing high-quality safety products. Our original technological foundation was stamping and deep drawing technology which we use for small bursting discs. For over fifteen years our range

of possible services has included laser machining and scoring technology which we use for bursting discs for the chemical industry and container and plant construction.



▲ Quality inspection

Our distinguishing features are detailed consultancy service for customers, flexible, customer focussed production, reliability, and safety-consciousness. We attach great importance to providing good advice, reliability, and complete documentation, whatever the market and whatever the language. All materials and production steps are traceable. We do of course operate an extensive testing laboratory for all pressure, sealing, and dimensional measurements.



▲ Raw material

QA-System according to ISO 9001

Bursting discs and membranes are a matter of trust. The required properties are not easy to define and even more difficult to glance from the outside of these sometimes simple-looking components. The main property of a bursting disc – the burst pressure – can only be tested by destroying the disc. The test disc must therefore correspond to the discs supplied. This can only be achieved by a watertight quality assurance system. We are proud to have been certified in accordance to ISO 9001 back in 1994. Even more important than this

certificate is the proof of trust from our customers who have for years purchased from us their safety components. The supply of special high value materials, material testing, complete documentation, and traceability...these things are integral part of basic knowledge for us. Pressure testing of bursting discs, recording of membrane tension-expansion diagrams, sealing tests with the helium leak detector, life-cycle service tests under changing pressure loads, and pressure tests under heat are all part of the daily routine at Berstscheiben Schlesinger GmbH.



▲ Laser cutting

On account of the special qualities of bursting discs, service life problems cannot always be avoided.



▲ Certificates: ISO 9001 und ASME

This is why we attach great importance to consultancy in this regard.



▲ Heating of bursting discs

Product Range

- **Small bursting discs**

...for extinguishers, CO₂- and Gas-valves

- **Composite bursting discs**

...for chemical industry and container construction:
lowest pressures, non-fragmenting...

- **Reverse buckling discs**

...for chemical industry and container construction:
independent of temperature, resistant to fluctuating loads...

- **High pressure bursting discs**

...for pressure up to 8000 bar (115000 psig)...

- **Bursting plugs**

...easy mounting without dead space

- **High-purity-gas bursting discs**

...all-purpose pressure relief device for process and high purity gas
and small tube construction..

- **Bursting discs for clamp pipe connections**

...for sanitary and sterile use..

- **Metallic diaphragms**

...according to our wide experience in processing thin metal sheets and foils, we also handle the production of diaphragms. We provide metal diaphragms according to customer's specifications for pressure reducing valves, diaphragm seals, and pressure switches. We have experience with special materials such as Hastelloy, Duratherm, beryllium bronze, or titanium and tantalum.





Applications

Bursting discs are used in many different applications:

- in chemical processes as pressure relief device; often installed to protect safety valves
- to protect fire extinguishers from exploding during a fire
- to protect and seal small gas bottles, particularly for carbon dioxide applications and in airbag systems
- to protect plastic extruders at high pressures
- air conditioning systems, storage tanks, CNG-valves, etc.



Fields of application ▶

Our product range: We classify our range of bursting discs into three basic types:

Composite bursting discs

Reverse buckling bursting discs

Rupture discs

Rupture discs

In the case of rupture discs a foil is loaded with tensile stress by means of pressure. On reaching the tensile strength the foil ruptures. This simplest type of bursting disc is frequently used as small bursting discs and at higher pressures. In order to reduce the bursting pressure and to force non-fragmenting, defined opening behaviour, rupture discs can be scored to create a fracture line.

Crack pattern ▼



High purity gas bursting discs

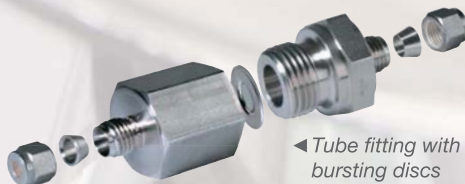
To meet the highest requirements demanded in applications containing high purity gases, process gases and semiconductor production, we have developed a special series of bursting discs. Those discs replace the seal of a standard VCR coupling. Once they have opened only the disc has to be changed while the coupling can be used several times. Minimum leakage rates of 10^{-9} mbar·l/sec can be achieved and the occurrence of particles is minimized. Depending on the customer's specifications we provide rupture discs or scored bursting discs for sizes of 1/4" up to 1". The materials that are normally used are stainless steel, nickel or nickel alloys.



◀ VCR coupling with bursting discs

Ferrule tube fittings

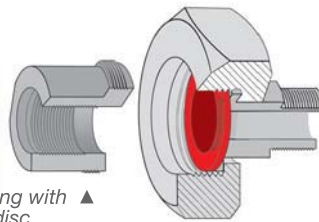
Especially for ferrule tube fittings we provide a wide range of standardised bursting discs. For example there are bursting discs for Swagelok gauge couplings in 1/4" and 1/2". We can also provide the suitable coupling.



◀ Tube fitting with bursting discs

Flanged bursting discs

Flanged bursting discs of small nominal diameter are a specialty of Berstscheiben Schlesinger GmbH. For many years, they have been used in millions of fire extinguishers, but also are produced in small batches for use in pumps, apparatus and other pressurized systems. The outstanding properties are the small space requirement, the all metal sealing surfaces, and the variety of pressures, materials and sizes. Therefrom we can provide bursting discs for nearly every kind of pipe connection.



3 part fitting with ▲ bursting disc

Bursting plugs

Screw-in plugs with a soldered or welded bursting foil are used in all applications where it is not possible or desirable for loose bursting discs to be clamped in place, for example for reasons of space or to avoid dead space. Once they have opened up, the complete bursting plug must be exchanged. Versions are plugs of brass with a soldered nickel foil (those are



for maximum temperatures of 150°C) or plugs of stainless steel for highest temperatures with laser-welded

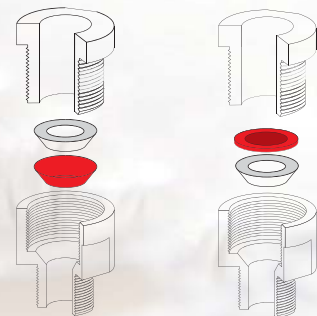
bursting foils of nickel, nickel alloys or stainless steel. To protect an extruder is for example a typical case of application.



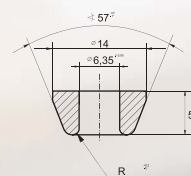
▲ Stainless steel burst plug

High pressure bursting discs

High pressure bursting discs have a nominal diameter of 1/4" and a cap-haped design as standard. They provide a seal by a conical thrust piece in the conical seating of a high-pressure screw coupling of the Dunze, Nova, and Sitec style. Those discs are made of stainless steel or nickel material, available with a short delivery time for pressures in the range of 400 bar to 5000 bar. Flat bursting discs to be mounted above the conus are provided for pressures below 400 bar.



The burst pressure can only be guaranteed by using a cone shown below:



High pressure fitting with conical ▲ or flat bursting disc

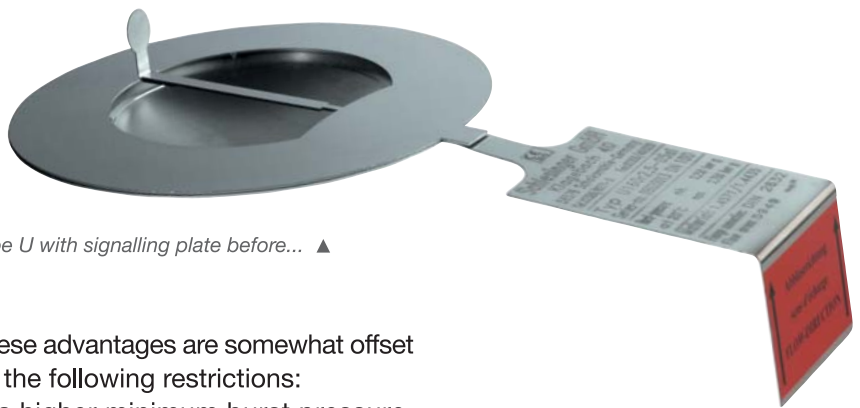
Reverse buckling bursting discs

Reverse buckling bursting discs are the most suitable type for applications with fluctuating temperatures, high temperatures, or varying loads. They work according to the Euler buckling pin principle. The disc is cambered against the direction of pressure. It buckles and opens at a prescored fracture line on reaching the burst pressure. Reverse buckling discs are scored all-metal discs. They are very resistant to high operating pressures, varying loads, and high operating temperatures. Reverse buckling bursting discs fail in compressive stress. Material creep and fatigue are considerably less in compressive stress than in tensile stress. That is why reverse buckling discs are more durable. The elasticity modulus is also less temperature dependent than the



▲
...and after bursting

tensile strength, so the bursting pressures of reverse buckling discs are stable over a wide temperature range.



Type U with signalling plate before... ▲

These advantages are somewhat offset by the following restrictions:

1. a higher minimum burst pressure than a composite bursting disc
2. there must be a gas cushion on the pressurised side of the disc
3. these discs have to be mounted in a holder supplied by Schlesinger in order to function properly.

An innovation of our range of bursting discs are reverse buckling bursting discs with a cutting ring. In contrast to our other reverse acting discs these are not scored. The calotte, mostly made of very thin metal foils, reverses at specified burst pressure and is sliced at a special shaped cutting ring. Thereby these discs can achieve very low burst pressures along with a non-fragmenting opening combined with full vacuum resistance and very good resistance against high temperature.

Construction:

non fragmenting

Operating conditions:

Gas, Vapour and Liquids with gas cushion

Operating temperature:

Burst tests can be performed from -80°C to 450°C.

Materials may stand higher operating temperatures. Limitation is due to the possibility of creeping.

Performance tolerance:

(including material, production and testing tolerances)

Standard +/- 10%

on demand +/- 5%

Features

- * operating ratio 90-95% at 20°C
- * functions without knife blades
- * good corrosion resistance
- * good resistance to varying loads
- * Ideal for application with safety valves
- * very tight seal
- * full vacuum resistance
- * tolerant of different fastening torques
- * burst surveillance possible
- * mandatory installation with a holder

Composite-bursting discs

The function of these bursting discs, which are often installed ahead of a safety valve, is to provide pressure relief at low to medium bursting pressures. Because all-metal rupture foils have rather high burst pressures and also give off fragments of foil, we use our composite design: laser cut metal foils (stainless steel, nickel or nickel alloys) open segmentally or in a hinged way at burst pressures defined by the shape of the laser cuts. Between the slit metal foils there lies a PTFE sealing diaphragm. There may also be additional vacuum supports, metal sealing foils, or coatings for sterile use. The temperature range in which composite bursting discs can be used is, however, limited to a maximum of 200°C by the internal sealing foil made of PTFE or PFA. A special feature of these composite bursting discs is the possibility of mounting them directly between flanges.



Type C directly between flanges ▲

The standard composite bursting disc opens at a defined bursting pressure to expose the full flow area. Of course we provide Composite bursting discs for acting at vacuum. These bursting discs for vacuum are used especially for tanks and container. We suggest our bi-directional bursting discs for protection against both over- and under-pressure. For all types of composite bursting disc a direct mounting between flanges is possible. If the over-pressure differs from under-pressure, a loss of flow area is

inevitable. A new feature for our range of composite bursting discs is the integrated signalling device. It provides a signal in case of bursting without being dependent on initiators or signalling membranes. This type can also be mounted directly between flanges.

Construction:

Flat, slotted, non fragmenting

Operating conditions:

Gas, Vapour and Liquids

Operating temperature:

-80°C to +150°C for PTFE sealing
 -80°C to +200°C for PFA sealing

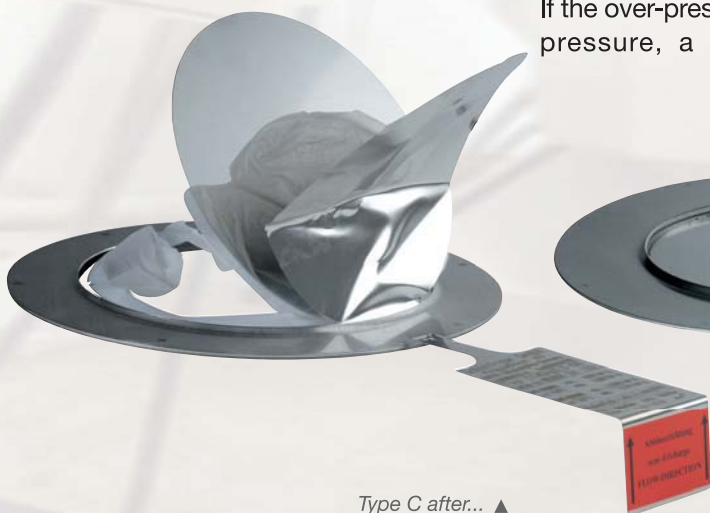
Performance tolerance:

(including material, production and testing tolerances)

Standard +/- 10%
 on request +/- 5%

Features:

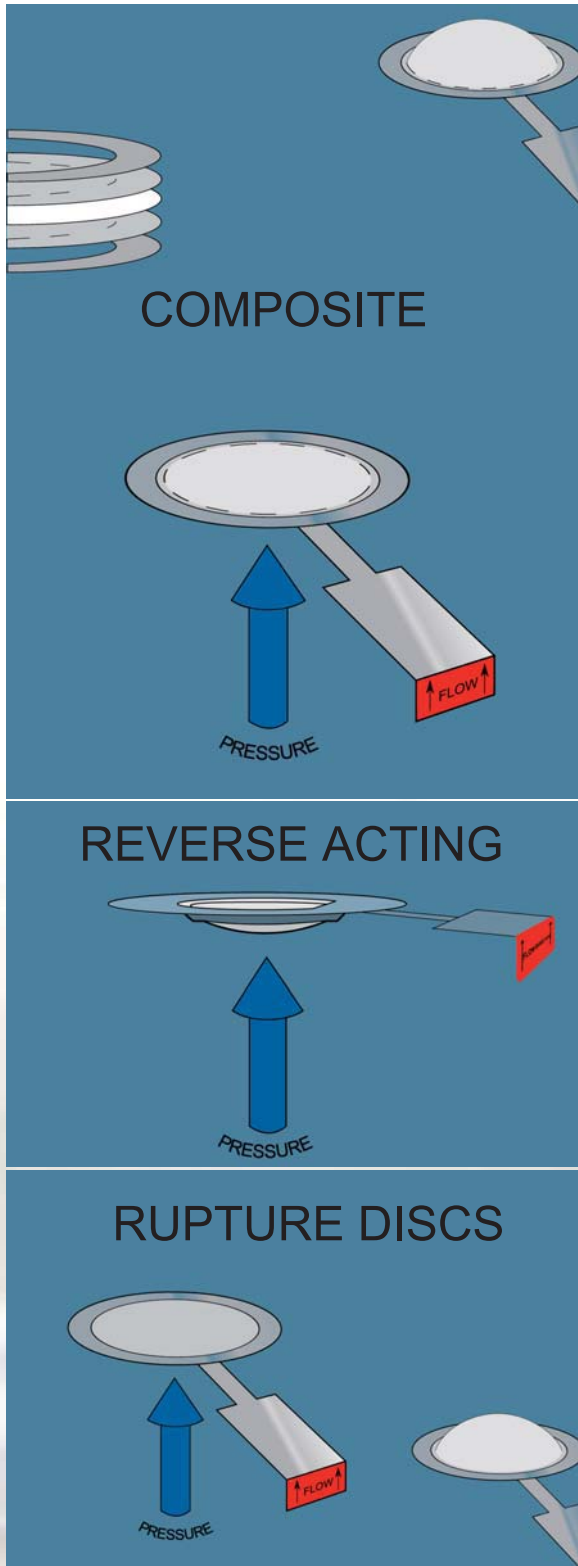
- * operating ratio 85-90% at 20°C
- * lowest burst pressure
- * low resistance against varying loads
- * suitable for applications with safety valves
- * very tight sealing
- * full vacuum resistance
- * tolerant of different fastening torques
- * burst surveillance possible
- * installation directly between flanges possible



Type C after... ▲



... and before bursting ▲

Type
Identification
NPS

Ck..
15 - 800
 1/2" - 32"

C..05
C..05V
C..05st
15 - 900
 1/2" - 36"

C..06
15 - 400
 1/2" - 16"

C..d/u
15 - 900
 1/2" - 36"

C..isi/ sii
15 - 900
 1/2" - 36"

U..
15 - 250
 1/2" - 10"

Um..
15 - 200
 1/2" - 8"

B..
15 - 200
 1/2" - 8"

Bk..
25 - 100
 1" - 4"



Burst pressure	Material	Description
0,1 barg from DN 150 to 25 barg to DN 100	Stainless steel Hastelloy Inconel Nickel Tantalum PTFE	Multi-layer design conventional domed, non-fragmenting vacuum resistant Operating ratio 85-90%* for liquids, gas or steam directly between flanges - no holder required
0,025 barg from DN 150 to 25 barg to DN 100	Stainless steel Hastelloy Inconel Nickel Tantalum PTFE	Multi-layer design, optional PTFE-coating flat construction, non-fragmenting vacuum resistant above 2 barg burst pressure Operating ratio 85-90%* for liquids, gas or steam directly between flanges - no holder required
0,025 barg from DN 150 to 25 barg to DN 100	Stainless steel Hastelloy Inconel Nickel Tantalum PTFE	Multi-layer design flat construction with vacuum support vacuum resistant, non-fragmenting Operating ratio 85-90%* for liquids, gas or steam directly between flanges - no holder required
0,025 barg from DN 150 to 25 barg to DN 100	Stainless steel Hastelloy Inconel Nickel Tantalum PTFE	Multi-layer design flat construction, non-fragmenting for both over- and under-pressure Operating ratio 85-90%* for liquids, gas or steam directly between flanges - no holder required
0,025 barg from DN 150 to 25 barg to DN 100	Stainless steel Hastelloy Inconel Nickel Tantalum PTFE	Multi-layer design flat construction with integrated signalling device vacuum resistant on request Operating ratio 85-90%* for liquids, gas or steam directly between flanges - no holder required
1 barg from DN 50 to 30 barg to DN 80	Stainless steel Hastelloy Inconel Nickel	Scored reverse buckling bursting disc Single-layer, full-metal design, domed against pressure vacuum resistant, operating ratio 90-95%* resistant to varying loads and temperature for gas or steam, a holder is required reverses at specified pressure and ruptures along a score non-fragmenting
1 barg from DN 50 to 30 barg to DN 80	Stainless steel Hastelloy Inconel Nickel	Reverse buckling bursting disc with cutting ring Single-layer, full-metal design, domed against pressure vacuum resistant, operating ratio 90-95%* resistant to varying loads and temperature for gas or steam, a holder is required reverses at specified pressure and is sliced at a cutting ring
5 barg from DN 100 to 100 barg to DN 50	Stainless steel Hastelloy Inconel Nickel Tantalum	Single-layer design flat construction operating ratio 85-90%* applicable for very high temperature for use with liquids, gas or steam directly between flanges - no holder required non-fragmenting for scored design
5 barg from DN 100 to 100 barg to DN 50	Stainless steel Hastelloy Inconel Nickel Tantalum	Single-layer design scored, conventional domed construction, non-fragmenting operating ratio 85-90%* applicable for very high temperature for use with liquids, gas or steam directly between flanges - no holder required

* of minimum burst pressure



Questionnaire for dimensioning

Customer

Organisation _____

Phone _____

Contact person _____

Fax _____

Object _____

E-mail _____

Medium (in case of bursting)

Liquid

Liquid with gas cushion

Gas or Vapour

Conditions at blow off

Temperature _____ °C

Static back pressure _____ barg

Working pressure _____ barg

Vacuum resistance required

Bursting pressure _____ barg

not required

Acceptable Materials

Nickel

SS 316

PTFE

Inconel

Monel

Hastelloy

Preferred connection

Flange DN _____

PN _____ DIN ANSI

Thread G _____

NPT _____

Clamp DN _____

Tube _____ (Da/di)

Primary pressure relief device

Second. pressure relief device

Ahead a safety valve

Number of pieces

Bursting disc _____ pieces.

(Bursting discs are manufactured only on demand. So they can not be delivered from stock. Therefore please keep in mind to order spare parts with initial order. This will lower the costs.)

Holder _____ pieces.

without holder, the disc is set directly between flanges.

Additional equipment

Bursting disc surveillance

The bursting disc is controlled by initiator that signals the case of bursting. Please regard that a holder is required.

Excess flow valve with gauge and fittings

Assurance of atmospheric pressure behind the bursting disc. Required for application with safety valve.

About bursting discs

A bursting disc is a one-time pressure relief device. It is designed for a predictable disruption at defined bursting pressure. Another important factor for the design is the nominal diameter. The necessary bursting pressure normally depends on the permissible operating pressure of the installation; the nominal diameter generally depends on the required volumetric flow rate in the event of pressure relief. Our standard discs are produced from materials that are corrosion resistant, such as stainless steel, nickel, nickel alloys, and PTFE. On request special materials are also available.

It is important to know the conditions under which the bursting discs will operate:

- vacuum conditions or varying loads
- temperature
- fluid properties
- installation: for example ahead of a safety valve
- replacement method
- liquid or gas at required maximum leakage rates

Most of the bursting discs can be manufactured as vacuum resistant if required for the application. Bursting discs are special components. Their most notable characteristic is that they are **built to fail**. This results in various special features:

- there must be sufficient headroom between the normal **operating pressure**, which the bursting disc must withstand, and the response pressure, which is the **bursting pressure** at which it should open. Otherwise the service life of the bursting disc will be shortened. A standard value is, for example, operating pressure = 80% of the nominal bursting pressure. This

value is, however, dependent on factors such as operating temperature, type of operating pressure and design of the bursting disc.

- The most important characteristic of the bursting disc, the bursting pressure, can only be **tested destructively**. The results of pieces tested must always apply to the rest of the production batch. Bursting discs are therefore always manufactured in batches. The documentation refers to one batch.

- **Installation of bursting discs** must be tailored to their unique nature: maximum sealing must be attainable, the contact forces should be controlled, the flow must not be impeded and it should be possible to replace them easily. In many cases, bursting discs can be inserted between standard flanges or in standard fittings. In other cases we either decide the installation location with our customers or the bursting discs are welded in place.



▲ Helium leakage test



▲ degreasing



▲ Raw material



▲ tool making



▲ Packing of small bursting discs