

Best Availability
Product Profile and Functions



Objectives of this Presentation. Knowledge to learn.

1. [Objectives](#) | 2. [General](#) | 3. [Differentiation](#) | 4. [Construction](#) | 5. [Function](#) | 6. [Combination](#) | 7. [Materials](#) | 8. [Burst Pressure](#) | 9. [Approvals](#)

The aim of this presentation is to give an overview of the **LESER Product Group Best Availability – Safety Valves and Bursting Discs in combination and their function.**



LESER

The-Safety-Valve.com

General. Best Availability – Safety Valves and Bursting Discs in Combination.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

Why the **combination of safety valve and bursting disc**?

The combination of bursting disc (US: rupture disc) and safety valve conforms to highest tightness requirements and combines the advantages of safety valves and bursting discs.

Benefits:

- Absolutely tight – for dirty, toxic or expensive media
- Conforms to highest tightness requirements, such as “TA Luft”
- Prolongs the maintenance intervals and thus increases the plant productivity
- Enables a functionality test of the safety valve during operation and reduces plant downtimes in this way.
- Avoids high safety valve costs and long delivery times for applications requiring special materials.
- Avoids immoderate heat at the safety valve at high temperature applications. High-temperature resisting materials are not necessary, then.



LESER

The-Safety-Valve.com

General. Applications and References.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

LESER safety valves and bursting discs in combination are approved by **TÜV** and offer solutions for the following applications:

- Protection of the safety valve from corrosion or plate-out
- Protection from operation conditions, which could affect the functionality of the safety valve.
- Process protection with best possible tightness
- Prevention of a complete medium loss after bursting of the bursting disc
- Realization of cost advantages in case of aggressive media



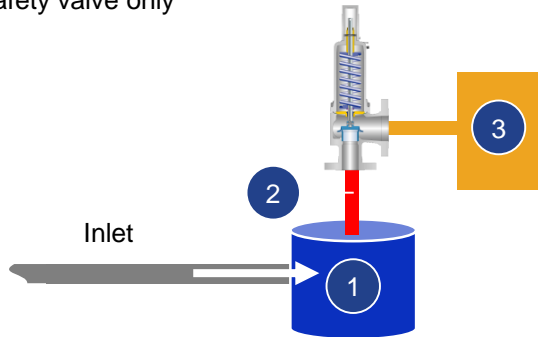
LESER

The-Safety-Valve.com

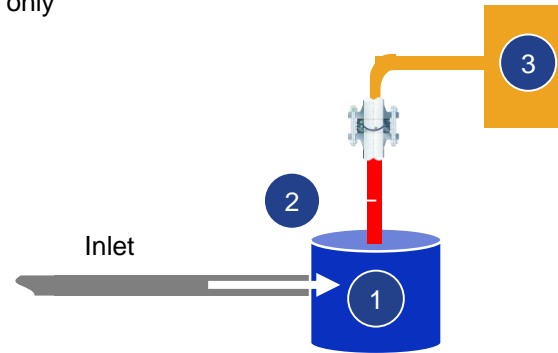
Differentiation. Protection of Pressure Vessels.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

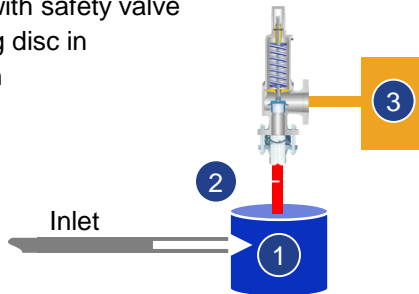
Protection with a safety valve only



Protection with a bursting disc only



Protection with safety valve and bursting disc in combination



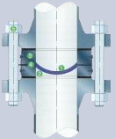
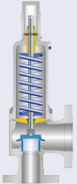
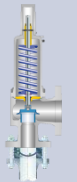
- 1 Vessel
- 2 Inlet line
- 3 Blow-off line

LESER

The-Safety-Valve.com

Differentiation. Comparison of bursting discs and safety valves.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

	Component	Advantages	Disadvantages
	Bursting disc	<ul style="list-style-type: none">▪ Robust▪ Well-priced▪ Absolutely tight	<ul style="list-style-type: none">▪ Not reusable▪ Replacement necessary▪ Plant downtime▪ (Possibly burst pressure decline due to aging)
	Safety valve	<ul style="list-style-type: none">▪ Closes after pressure drop▪ No plant downtime	<ul style="list-style-type: none">▪ High quality requirements for sealing surface▪ No absolute tightness
	Safety valve + bursting disc	<p>A combination of safety valve and bursting disc unites advantages of both.</p>	

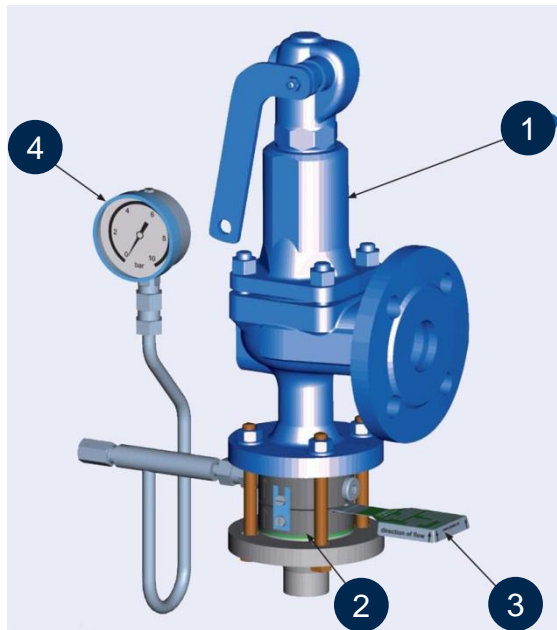
LESER

The-Safety-Valve.com

Construction.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

Components of a safety valve in combination with a bursting disc



Position	Part name
General components	
1	Safety valve
2	Bursting disc carrier (two-piece holder)
3	Bursting disc
4	Gap monitoring with manometer and relief valve

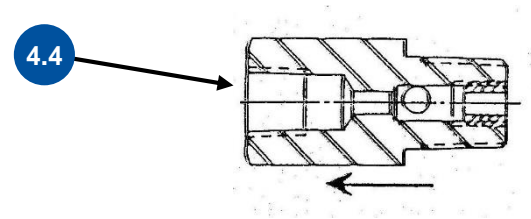
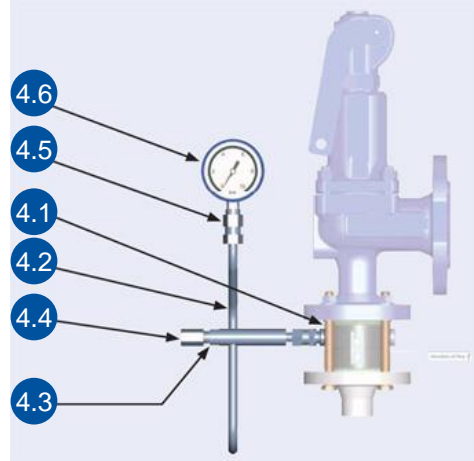
LESER

The-Safety-Valve.com

Construction.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

Components of the gap monitoring



Position	Part name
Components	
4.1	Pipe fitting
4.2	Siphon
4.3	Edge sealing ring
4.4	Relief valve
4.5	Manometer connection incl. edge sealing ring
4.6	Manometer

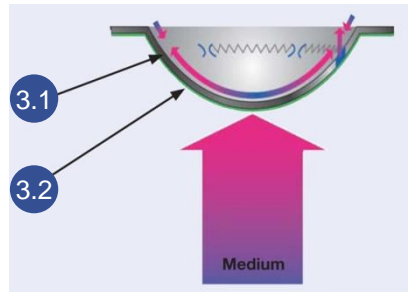
LESER

The-Safety-Valve.com

Construction.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

Components of the reverse acting bursting disc



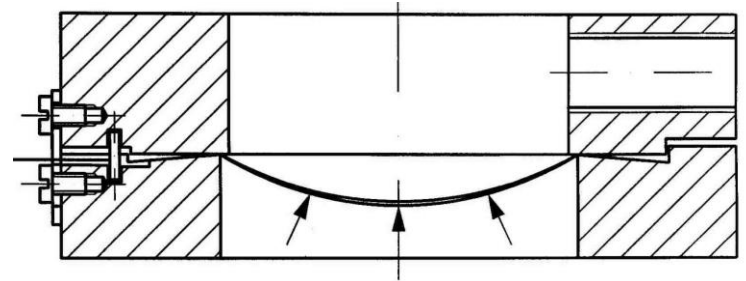
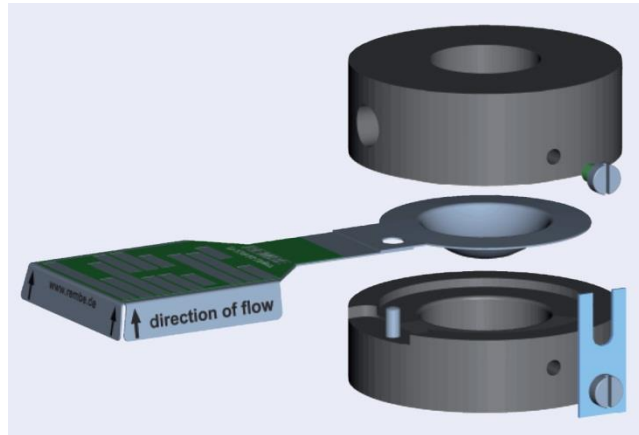
Position	Part name
Components	
3.1	Bursting element
3.2	Sealing membrane
3.3	Bursting disc flag

LESER

The-Safety-Valve.com

Construction of a Bursting Disc. Two-piece holder.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals



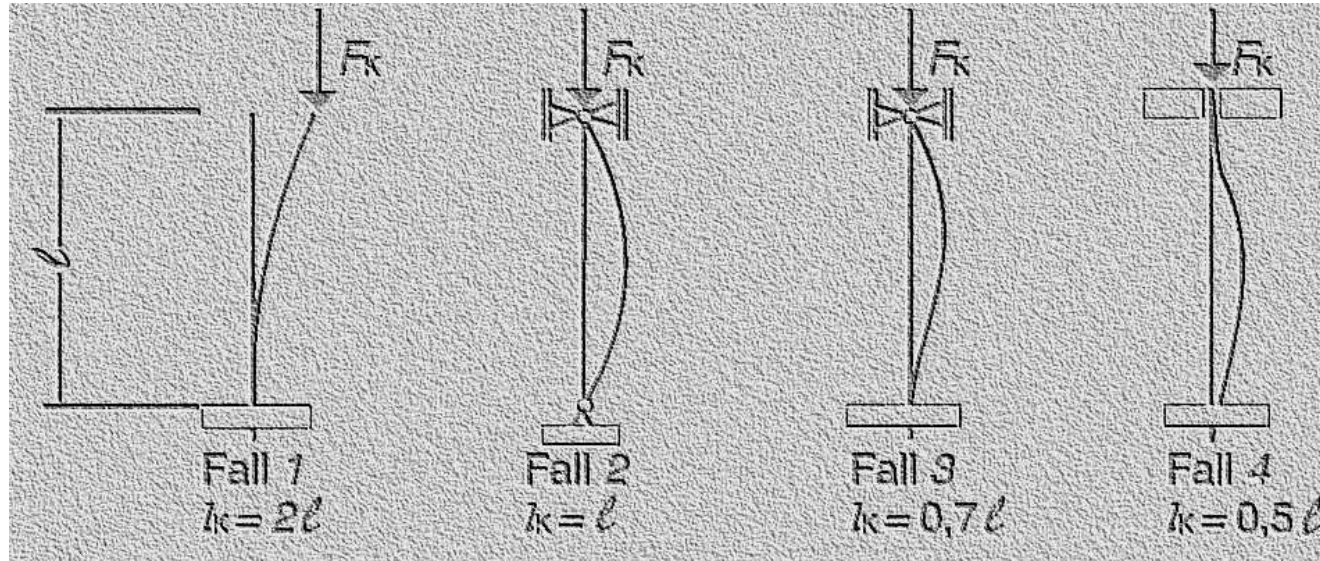
- Upper and lower retainer unit with the bursting disc
- Medium flow direction indicated with arrows
- Two designs:
 - S for safety valve with semi-nozzle
 - HS for safety valve with full-nozzle

LESER

The-Safety-Valve.com

Function of a Bursting Disc. Functional Principle.

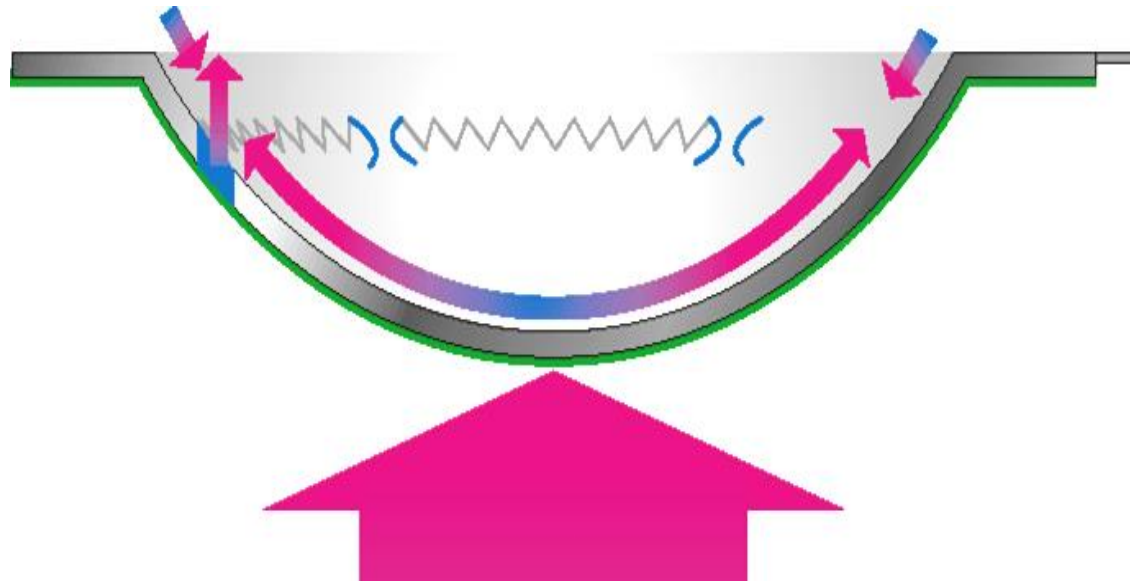
1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals



- The principle of the reverse acting bursting disc (KUB) is based on the principle of Leonard Euler.
- This principle is used for the bursting disc technology.

Function of a Bursting Disc. Mode of Action.

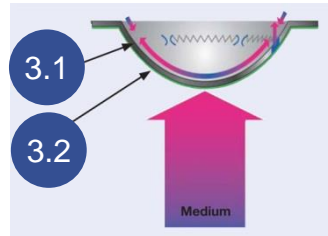
1. [Objectives](#) | 2. [General](#) | 3. [Differentiation](#) | 4. [Construction](#) | 5. [Function](#) | 6. [Combination](#) | 7. [Materials](#) | 8. [Burst Pressure](#) | 9. [Approvals](#)



- Medium-wetted side is the convex side of the bursting disc.
- The buckling pin calculation and design is done for an individual set pressure.

Functions. Bursting element, Sealing Membrane, Bursting Disc.

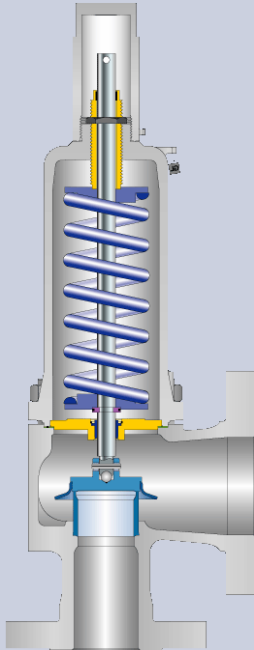
1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals



Position	Part Name	Function / Feature
Components		
3.1	Bursting element	<ul style="list-style-type: none"> ▪ Averted to medium ▪ Plate thickness pressure-dependent ▪ Laser-perforated with buckling pin elements ▪ Buckling pin principle acc. to Euler ▪ Fragmentation-free opening ▪ Metallic sealing; Seal face two-piece holder/ upper connection piece
3.2	Sealing Membrane	<ul style="list-style-type: none"> ▪ In contact to medium ▪ Corrosion protection ▪ Metallic sealing; Seal face two-piece holder / lower connection piece ▪ Only foil thickness
3.3	Bursting Disc Flag	<ul style="list-style-type: none"> ▪ Technical data <ul style="list-style-type: none"> - Bursting pressure - Medium temperature - ...

Combination. Sizing combination of bursting disc type BT-KUB or IG-LS.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. **Combination** | 7. Materials | 8. Burst Pressure | 9. Approvals



- Unaffected are:
 - Performance
 - Coefficient of discharge
 - Opening characteristics
- There is no influence of the opened bursting disc on the proper function of the safety valve.
- Pressure loss by bursting disc is not relevant ($< 3\%$)

Acc. to European Standards:

- Application of the combination is like a single safety valve
- Documented in the VdTÜV data sheets of the safety valves

Acc. to American Standards:

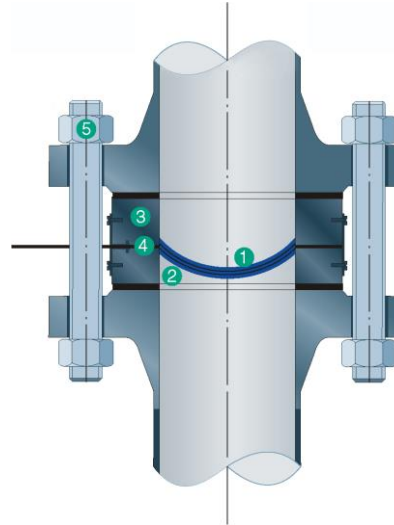
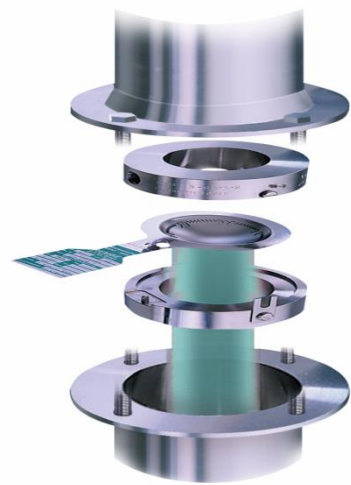
- Capacity reducing factor of 0.9 is always required

LESER

The-Safety-Valve.com

Combination. Assembly of the Bursting Disc.

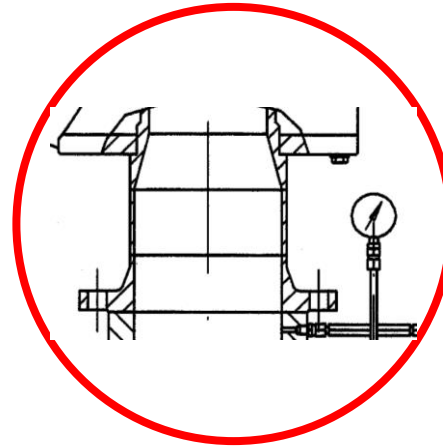
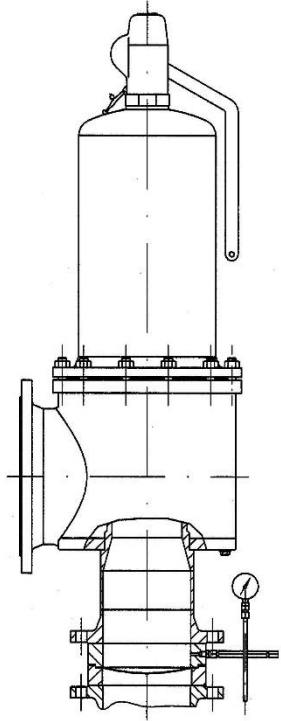
1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. **Combination** | 7. Materials | 8. Burst Pressure | 9. Approvals



The bursting disc in the holder is clamped between the flanges.

Combination. Special Case – Long Inlet.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. **Combination** | 7. Materials | 8. Burst Pressure | 9. Approvals



Long inlet to ensure complete opening of the bursting disc

LESER

The-Safety-Valve.com

Materials. For the KUB Bursting Disc.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

Depending on the aggressiveness of the medium different material combinations are possible. The minimum and maximum possible bursting pressures are depending on the bursting temperature and the nominal size. Possible examples for material combinations as indicated here:

Metric units																				
Material	Standard						Special material													
Bursting element	1.4404 / 316L		Nickel		Incone®		Monel®		1.4404 / 316L		Hastelloy®		1.4404 / 316L		Titanium		1.4404 / 316L		Tantalum	
Sealing membrane	1.4401/316		Nickel		Incone®		Monel®		Hastelloy®		Hastelloy®		Titanium		Titanium		Tantalum		Tantalum	
Medium temperature ¹⁾	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
	°C	-30	320	-30	420	-30	550	-30	400	-30	320	-30	420	-30	150	-30	150	-30	230	-30
Nominal diameter	Set pressures at 22 °C medium temperature [bar] ²⁾																			
DN	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
25	3.0	130.0	2.0	120.0	5.0	120.0	2.0	120.0	10.0	120.0	5.0	120.0	5.0	120.0	6.0	120.0	6.0	120.0	6.0	120.0
40	2.0	100.0	2.0	100.0	4.5	100.0	2.0	100.0	8.0	100.0	4.5	100.0	4.5	100.0	6.0	100.0	6.0	100.0	6.0	100.0
50	2.0	90.0	1.8	90.0	3.0	90.0	1.8	90.0	5.0	90.0	3.0	90.0	3.0	90.0	5.0	90.0	5.0	90.0	5.0	90.0
65	2.0	70.0	1.8	70.0	3.0	70.0	1.8	70.0	5.0	70.0	3.0	70.0	3.0	70.0	5.0	70.0	5.0	70.0	5.0	70.0
80	1.5	70.0	1.0	70.0	2.0	70.0	1.0	70.0	4.0	70.0	2.0	70.0	2.0	70.0	4.0	70.0	4.0	70.0	4.0	70.0
100	0.6	50.0	0.5	50.0	2.0	50.0	0.5	50.0	2.0	50.0	2.0	50.0	2.0	50.0	1.0	50.0	1.0	50.0	1.0	50.0
150	0.5	30.0	0.4	30.0	0.7	30.0	0.4	30.0	2.0	30.0	0.7	30.0	0.7	30.0	0.8	30.0	0.8	30.0	0.8	30.0

US units																				
Material	Standard						Special material													
Bursting element	1.4404 / 316L		Nickel		Incone®		Monel®		1.4404 / 316L		Hastelloy®		1.4404 / 316L		Titanium		1.4404 / 316L		Tantalum	
Sealing membrane	1.4401/316		Nickel		Incone®		Monel®		Hastelloy®		Hastelloy®		Titanium		Titanium		Tantalum		Tantalum	
Medium temperature ¹⁾	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
	°F	-22	608	-22	788	-22	1022	-22	752	-22	608	-22	788	-22	302	-22	302	-22	446	-22
Nominal diameter	Set pressures at 72 °F medium temperature [bar] ²⁾																			
Valve size	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
1"	43.5	1740.0	29.0	1740.0	72.5	1740.0	29.0	1740.0	145.0	1740.0	72.5	1740.0	72.5	1740.0	87.0	1740.0	87.0	1740.0	87.0	1740.0
1 1/2"	29.0	1450.0	29.0	1450.0	65.3	1450.0	29.0	1450.0	116.0	1450.0	65.3	1450.0	65.3	1450.0	87.0	1450.0	87.0	1450.0	87.0	1450.0
2"	29.0	1305.0	26.1	1305.0	43.5	1305.0	26.1	1305.0	72.5	1305.0	43.5	1305.0	43.5	1305.0	72.5	1305.0	72.5	1305.0	72.5	1305.0
2 1/2"	29.0	1015.0	26.1	1015.0	43.5	1015.0	26.1	1015.0	72.5	1015.0	43.5	1015.0	43.5	1015.0	72.5	1015.0	72.5	1015.0	72.5	1015.0
3"	21.8	1015.0	14.5	1015.0	29.0	1015.0	14.5	1015.0	58.0	1015.0	29.0	1015.0	29.0	1015.0	58.0	1015.0	58.0	1015.0	58.0	1015.0
4"	8.7	725.0	7.3	725.0	29.0	725.0	7.3	725.0	29.0	725.0	29.0	725.0	29.0	725.0	14.5	725.0	14.5	725.0	14.5	725.0
6"	7.3	435.0	5.8	435.0	10.2	435.0	5.8	435.0	29.0	435.0	10.2	435.0	10.2	435.0	11.6	435.0	11.6	435.0	11.6	435.0

¹⁾ Temperatures below -30°C / -22°F upon request
²⁾ Set pressures for other temperatures upon request



Bursting Pressure. Depending on Nominal Size and Material.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. **Burst Pressure** | 9. Approvals

Bursting element		Stainless Steel	Stainless Steel	Hastelloy
Sealing Membrane		Stainless Steel	Hastelloy	Hastelloy
Temperature in °C		-30 ... +320 °C	-30 ... +320 °C	-30 ... +420 °C
Nominal Size				
DIN	ANSI			
25	1"	3,0 ... 120	6,0 ... 120	6,0 ... 120
50	2"	1,7 ... 90	2,5 ... 90	2,5 ... 90
100	4"	0,6 ... 50	2,0 ... 50	2,0 ... 50

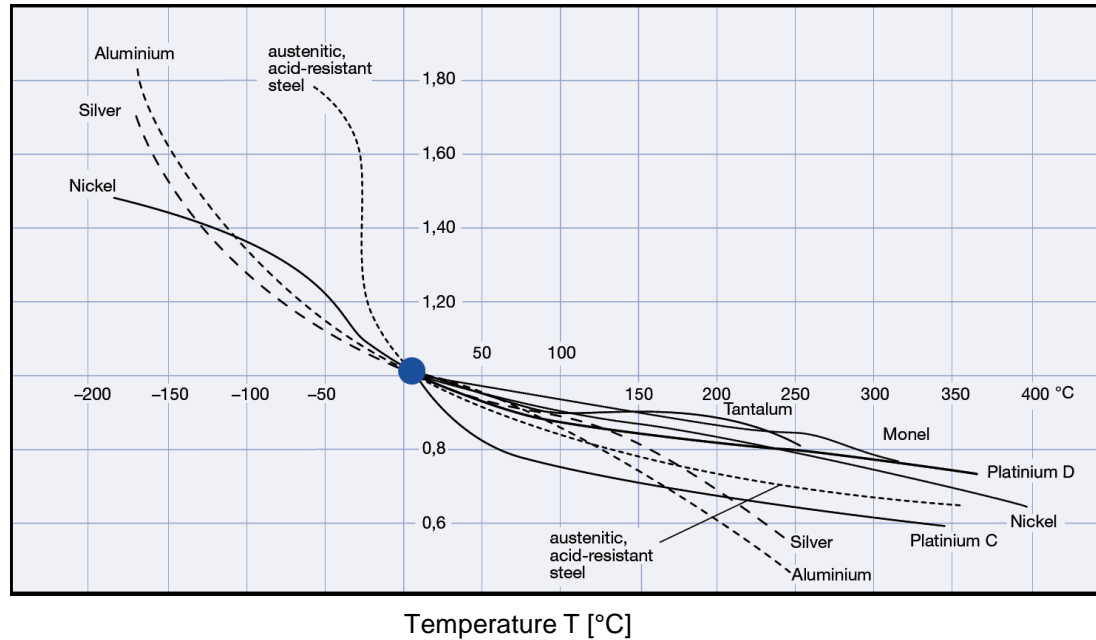
Minimum and maximum set pressure at 22°C medium temperature in bar (barg)

LESER

The-Safety-Valve.com

Bursting Pressure. Depending on the Operating Temperature.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals



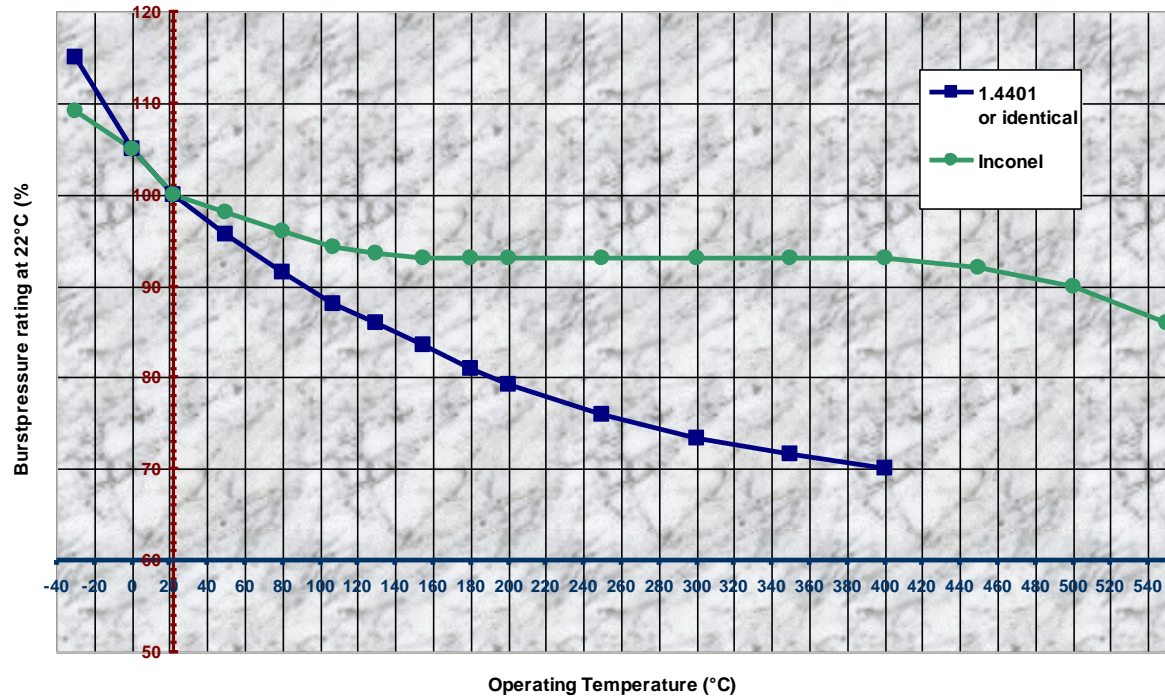
Source: Wagner, W. :Sicherheitsarmaturen Vogel Buchverlag, 1. Aufl. 1999

LESER

The-Safety-Valve.com

Bursting Pressure. Depending on the Operating Temperature.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals



LESER

The-Safety-Valve.com

Approvals.

1. Objectives | 2. General | 3. Differentiation | 4. Construction | 5. Function | 6. Combination | 7. Materials | 8. Burst Pressure | 9. Approvals

LESER safety valves and bursting discs are individually approved acc. to numerous standards and therefore applicable all over the world. Examples are:

Country	Safety Valve Approval	Bursting Disc Approval
Europe	<ul style="list-style-type: none">▪ CE label acc. to pressure equipment directive 97/23/EG▪ EN ISO 4126-1	<ul style="list-style-type: none">▪ CE label acc. to pressure equipment directive 97/23/EG▪ EN ISO 4126-2
Germany	<ul style="list-style-type: none">▪ VdTÜV approval acc. to<ul style="list-style-type: none">- AD 2000-Merkblatt A2- EN ISO 4126-1- TÜV SV 100	<ul style="list-style-type: none">▪ VdTÜV approval acc. to<ul style="list-style-type: none">- AD 2000-Merkblatt A1- EN ISO 4126-2/ -6
USA	<ul style="list-style-type: none">▪ UV-Stamp acc. to ASME Section VIII Div. 1▪ National Board certified capacities	<ul style="list-style-type: none">▪ UD-Stamp acc. to ASME Section VIII Div. 1▪ National Board certified capacities



LESER

The-Safety-Valve.com

Best Availability

Thank you for your attention.



LESER

The-Safety-Valve.com