Critical service

PTFE-Lined Safety Relief Valves

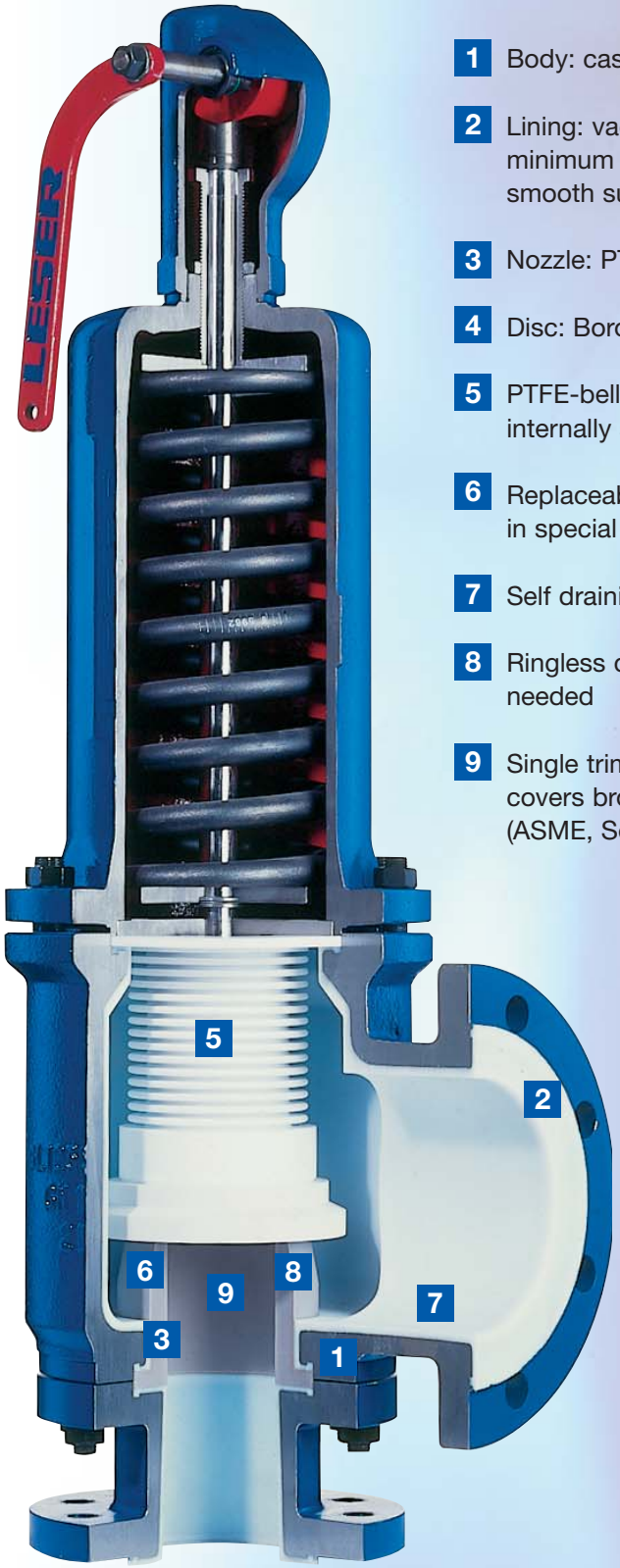
Series 447

CATALOG

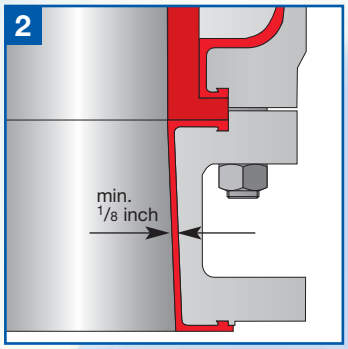
LESER

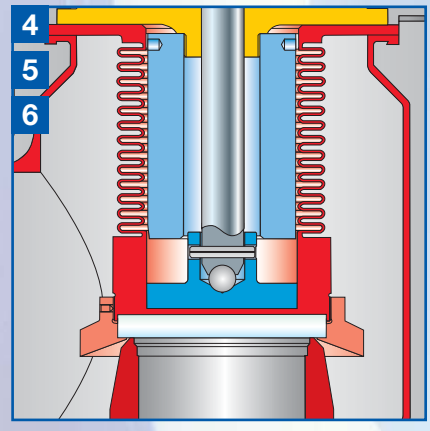
The Safety Valve

Design Features



1. Body: cast steel WCB, PTFE-Lined for superior corrosion protection
2. Lining: vacuum-proof, isostatic lining in virgin PTFE, minimum thickness 1/8 inch, smooth surfaces (R_a = 64 µinch) avoid adherence
3. Nozzle: PTFE / glass reinforced, sintered under inert gas
4. Disc: Borofloat glass for maximum chemical resistance
5. PTFE-bellows: protects bonnet area against corrosive media, internally supported for longer product life
6. Replaceable nozzle, disc and inlet body are available in special materials for specific applications
7. Self draining body avoids residues
8. Ringless design: no adjustments needed
9. Single trim for gas and liquid, covers broad range of applications (ASME, Sec. VIII)





LESER's critical service valves are spring loaded safety relief valves developed in close cooperation with plant engineers and service specialists to protect highly corrosive processes and installations against inadmissible overpressure. Compared to standard full nozzle safety relief valves with high alloy trim, Type 447 provides for a very cost effective solution.

LESER's critical service valves are designed and manufactured to highest standards, compliant with and approved according to ASME (Sec. VIII, Div. 1), the Canadian CRN, the European PED standard (CE), the German AD 2000-Merkblatt A2 and those of many other countries, covering requirements from end-users, OEM's and engineering companies worldwide.

Applications

LESER's critical service valves represent the ultimate and cost effective solution for highly corrosive applications with gas or liquid, such as

- Chemical equipment and piping
- Chlorine manufacture and processing
- Reducing acids
  (e.g., hydrochloric acid, acetic acid)
- Alkalis
  (e.g., NaOH solution)

Features and Benefits

Scope of design

- Four valve sizes from 1" through 4"
- Materials:
  - body: WCB, PTFE-lined
  - nozzle: PTFE / 25 % glass reinforcement
- Gastight cap or packed lever

Critical service and high performance

- PTFE-lining is resistant against most chemicals
- Smooth inside surfaces avoid adherence of corrosive matters
- All wetted parts are PTFE-lined, a PTFE bellows protects the bonnet area against product influences
- Lining in special materials for improved corrosion resistance are available. Please ask LESER's specialists.

Ease of plant design, installation, operation and maintenance

- Ringless design for minimum parts counts
- Single trim for gas and liquid
- Replaceable sealing plate and nozzle

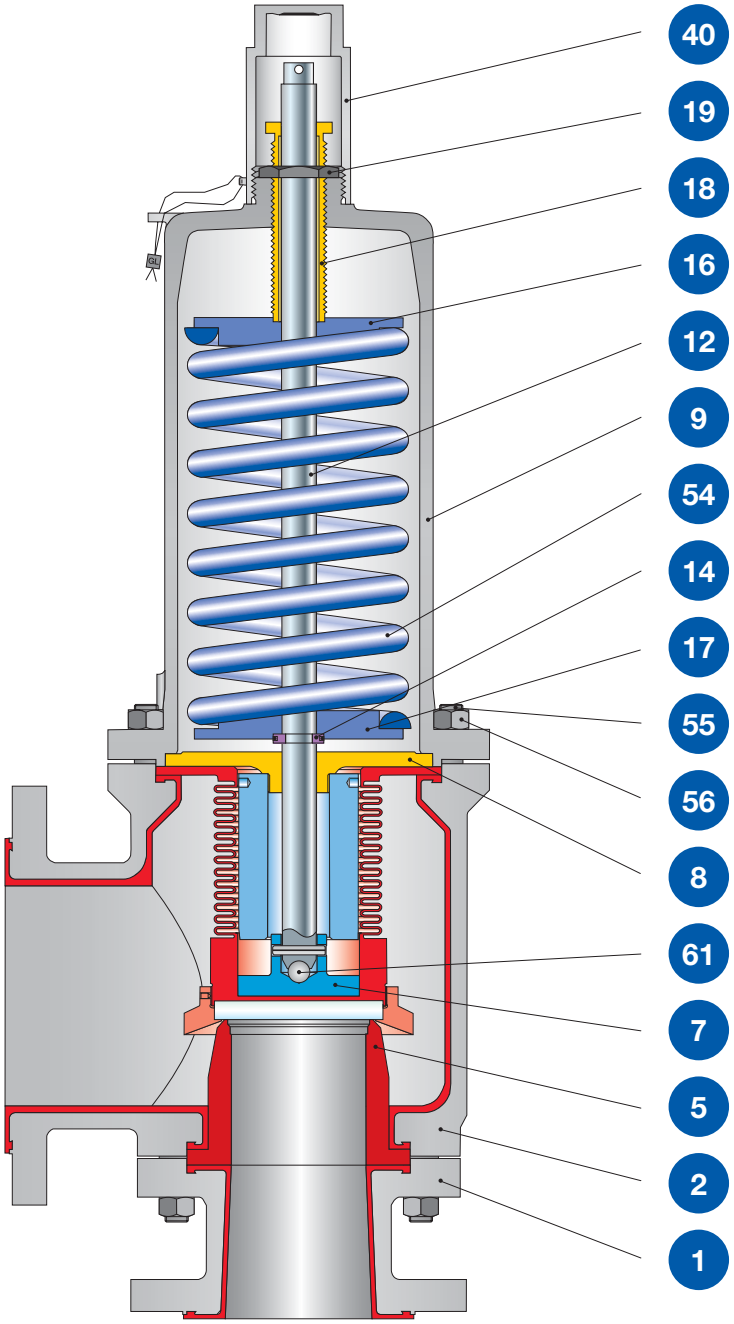
Codes and Standards

LESER's critical service valves comply with the following codes and standards:

- ASME Section VIII – National Board certified capacities (single trim for gas and liquid service):
  UV-stamp
- ASME Section II - materials
- ASME B16.34 and ASME B16.5-flanging
- API 527
- CRN
- EN ISO 4126-1
- PED 97 / 23 / EC (CE-marking),
  VdTUEV-SV 100,
  AD 2000-Merkblatt A2
- Others

Materials

Item	Part Name	Type 4472	
1	Inlet Body	SA 105 / lining: virgin PTFE	
2	Outlet Body	SA 216 WCB / lining: virgin PTFE	
5	Nozzle	up to 150 psig: PTFE with 25 % glass reinforcement	above 150 psig: Hastelloy®, Nickel or similar
7	Disc / Bellows	up to 150 psig: Borofloat glass / virgin PTFE	above 150 psig: Hastelloy®, Nickel or similar / virgin PTFE
8	Guide	316L	
9	Bonnet	Gr. 60-40-48	
12	Spindle	AISI 420	
14	Split ring	316L	
16 / 17	Spring plate	Steel	
18	Adjusting screw with bushing	AISI 430F PTFE	
19	Lock nut	316L	
40	Cap H2	Steel	
54	Spring	Carbon steel	
55	Stud	B7	
56	Nut	2H	
61	Ball	316	



How to order

Article Numbers Type 447

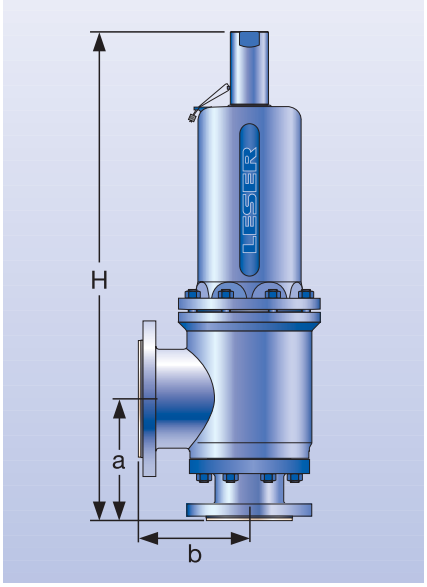
Valve Size [Inch]	Orifice Area [Inch²]	ANSI Flange Class		Body Material SA 105 / SA 216 WCB	
		Inlet	Outlet	Cap H2	Packed lever H4
1" x 2"	0.644	#150	#150	4472.3872	4472.3874
2" x 3"	2.576			4472.3882	4472.3884
3" x 4"	4.383			4472.3892	4472.3894
4" x 6"	10.304			4472.3902	4472.3904

Dimensions and Weights US Units

Valve Size [Inch]	Center to Face [Inch]		Height [Inch]	Weight [lbs]
	Inlet a	Outlet b	H	m
1" x 2"	4 1/8	3 15/16	18 15/32	33
2" x 3"	6	4 6/8	23 25/32	64
3" x 4"	6 1/8	6 1/8	30 15/16	110
4" x 6"	8 11/16	7 7/8	37 1/8	232

Dimensions and Weights Metric Units

Valve Size [Inch]	Center to Face [mm]		Height [mm]	Weight [kg]
	Inlet a	Outlet b	H	m
1" x 2"	105	100	469	15
2" x 3"	152	120	604	29
3" x 4"	155	155	786	50
4" x 6"	220	200	943	105

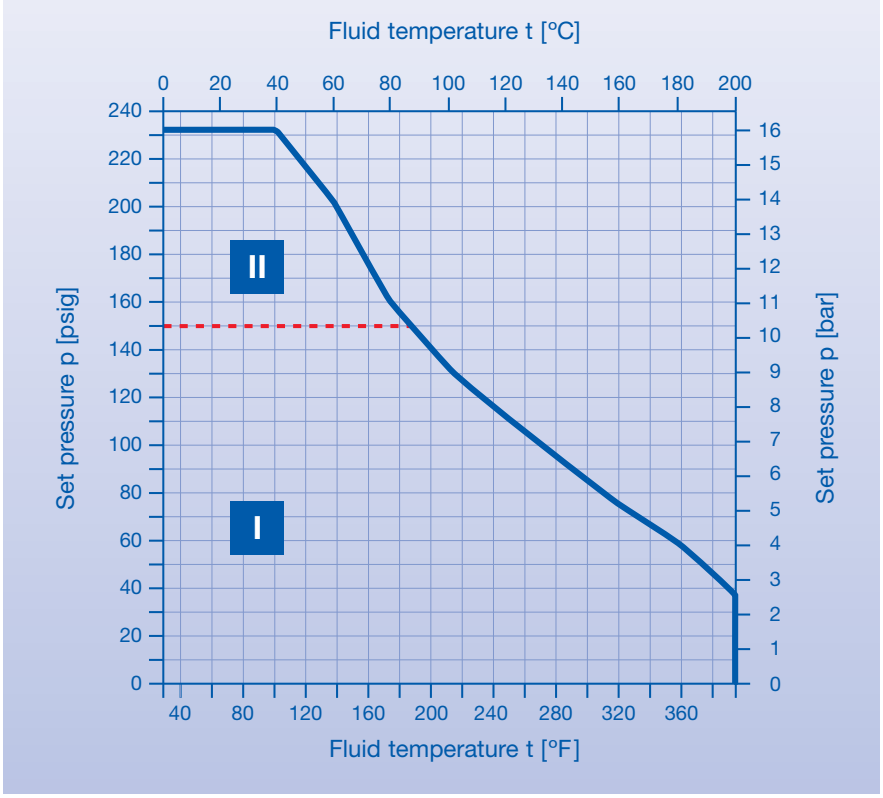


Pressure Temperature Ratings US Units

Valve Size [Inch]	Set Pressure max. [psig]	Set Pressure min. [psig]	ANSI Flange Class		Temperature Range acc. to ASME °F	
			Inlet RF	Outlet RF	min.	max.
All	232	1.5	# 150	# 150	- 20	+ 392

Pressure Temperature Ratings Metric Units

Valve Size [Inch]	Set Pressure max. [bar]	Set Pressure min. [bar]	ANSI Flange Class		Temperature Range acc. to ASME °C	
			Inlet RF	Outlet RF	min.	max.
All	16	0.1	# 150	# 150	- 29	+ 200



Pressure Temperature Rating

The pressure temperature rating of Type 447 is depending on the PTFE-parts in the valve. The diagramm shows the application range of:

- **I** Standard valve assembly with PTFE / glass - nozzle and borofloat sealing plate
- **II** Valve assembly with metal nozzle and sealing plate (Hastelloy®, Nickel or similar)

Approvals

Approvals and Coefficients of discharge

Country	Code	Fluid	Approval No.	Coefficient of Discharge[1] ASME certified K	Coefficient of Discharge[1] ASME measured K_D
United States	ASME Sec. VIII	G	M37123	0.617	0.686
		L	M37134	0.431	0.479
Canada	CRN	G / L	OG1018.9C	Refer to ASME-code	

Country	Code	Fluid	Approval No.	Certified Coefficient of Discharge K_{dr} 1" x 2"	2" x 3"	3" x 4"	4" x 6"
Europe	PED 97 / 23 / EC (CE-marking)	G	072020111 Z0008/0/09	0.7	0.72	0.7	0.65
		L		0.48	0.47	0.51	0.42
Germany	AD 2000-Merkblatt A2	G / L	TUEV SV 979	α_w			
				0.7	0.72	0.7	0.65
				0.48	0.47	0.51	0.42
Others	China:	SELO / AQSIQ (SQL BPV)					
	CIC (Russia):	GOST, GOSGORTECHNADZOR					

Note: [1]Acc. to ASME Sec. VIII the rated coefficient of discharge K is calculated by K = 0.9 * K_D
For sizing acc. to ASME Sec. VIII K must be used in the sizing equations.

AIR

ASME Section VIII
[S.C.F.M.]

WATER

ASME Section VIII
[US - G.P.M.]

AIR

ASME Section VIII
[Sm^3/h]

WATER

ASME Section VIII
[$10^3 kg/h$]

Capacities US Units

Valve Size	1" x 2"		2" x 3"		3" x 4"		4" x 6"	
Set pressure [psig]	Orifice [Inch²] 0.644		2.576		4.383		10.304	
	Air	Water	Air	Water	Air	Water	Air	Water
15	238	44.7	952	179	1620	304	3809	715
20	274	50.5	1098	202	1868	344	4392	808
40	428	69.9	1710	279	2910	476	6841	1118
60	588	86.0	2352	342	4002	582	9407	1369
80	748	99.0	2993	395	5093	672	11973	1581
100	909	110	3635	442	6184	752	14539	1767
120	1069	121	4276	484	7276	824	17105	1936
140	1229	131	4918	523	8367	890	19671	2091
160	1390	140	5559	559	9459	951	22237	2236
180	1550	148	6201	593	10550	1009	24803	2371
200	1711	156	6842	625	11642	1063	27368	2499
220	1871	164	7484	655	12733	1115	29934	2621

Capacities Metric Units

Valve Size	1" x 2"		2" x 3"		3" x 4"		4" x 6"	
Set pressure [bar]	Orifice [mm²] 415		1662		2827		6648	
	Air	Water	Air	Water	Air	Water	Air	Water
1	398	10.0	1594	40.0	2712	68	6375	160
2	578	13.5	2313	54.1	3935	92	9251	217
3	775	16.5	3099	66.2	5272	113	12395	265
4	972	19.1	3890	76.4	6618	130	15558	306
5	1170	21.4	4680	85.4	7964	145	18722	342
6	1368	23.4	5471	93.6	9309	159	21885	374
7	1566	25.3	6262	101	10655	172	25049	404
8	1763	27.0	7053	108	12001	184	28212	432
9	1961	28.7	7844	115	13346	195	31376	459
10	2159	30.2	8635	121	14692	206	34539	483
12	2554	33.1	10217	132	17383	225	40866	529
14	2950	35.7	11798	143	20074	243	47193	572
16	3345	38.2	13380	153	22766	260	53520	611

Capacities according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 60 °F (Air) or 68 °F (Water). Capacities at 30 psig and below are based on 3 psig overpressure.

The isostatical manufacturing process

LESER Series 447 use PTFE materials for:

- linings (e.g. inlet body and outlet body)
- completed parts (e.g. bellows)
- preforms (e.g. nozzle)

Linings made out of isostatically processed PTFE have proved successfully wherever extremely aggressive media are conveyed and controlled.

Lining Procedure

The PTFE lining for castings is produced according to the isostatic compressing procedure. The manufacturing of the PTFE lined bodies takes place in 3 steps: preparation for lining, lining and finishing.

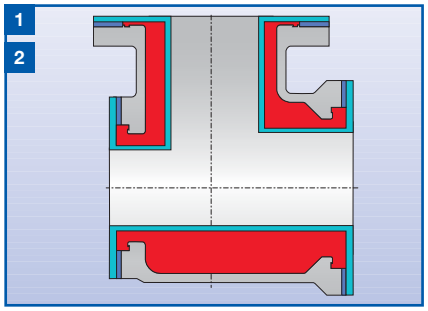
Main production steps:

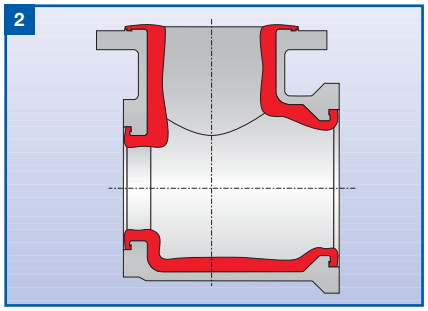
1 Preparation (sand blasting) of the surfaces on the metal bodies to be lined

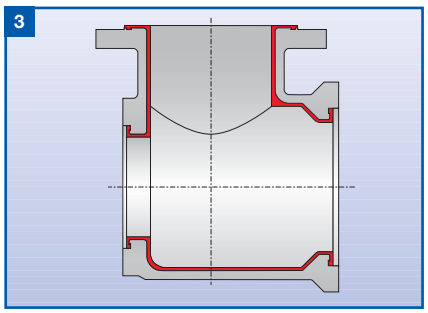
2 Placing the compression moulds over the surfaces and filling with PTFE powder

- Pressing in a pressure vessel where the pressure acts evenly from all directions
- Removing from the mould
- Sintering

3 Machining of the functional surfaces (seatings / flanges)





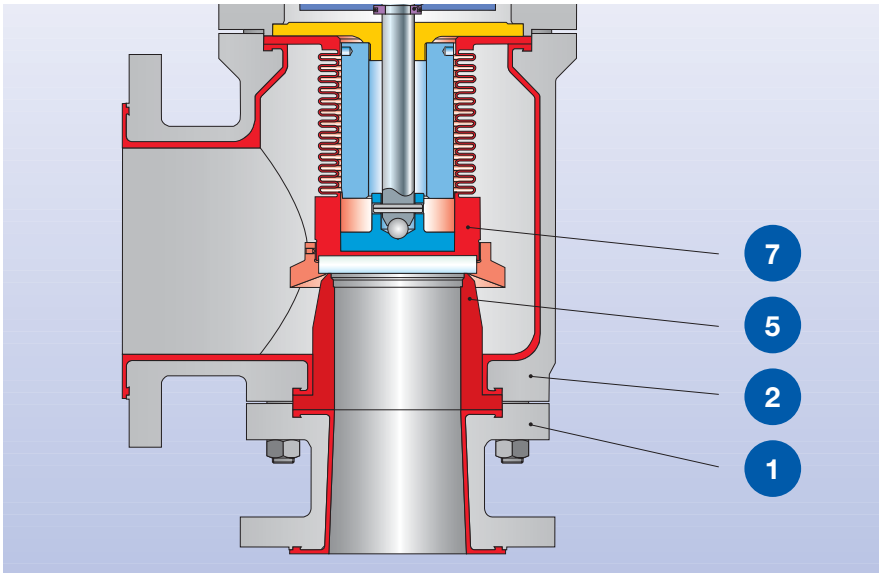


Advantages of the process

- The use of cost-effective body materials like carbon steel is possible compared to high alloy materials like Hastelloy®
- The PTFE-powder is applied homogeneously under a pressure which acts evenly from all directions.
- Linings are non-sensitive against impact loads and thermal shocks
- Suitable for full vacuum service

PTFE Materials

Material	Inlet Body Item 1	Outlet Body Item 2	Nozzle Item 5	Bellows Item 7
PTFE, virgin	Standard	Standard	–	Standard
PTFE, electrically conductive	Option	Option	Option	–
Super PTFE (TFM™ PTFE)	–	–	–	Option for chlorine service
PTFE 25 % glass reinforcement	–	–	Standard	–



Lining Material

Standard PTFE Materials

Virgin PTFE

Standard material for:
- **Inlet Body (Item 1)**
- **Outlet Body (Item 2)**
- **Bellows (Item 3)**

Properties of **virgin PTFE**:

- color: white
- almost universal chemical resistance
- broad operating temperature range: minus 328° F / 200° C to plus 500° F / 260° C
- optimum electrical insulating properties and good dielectric properties
- light- and weather-resistant
- no aging
- physiological physiologically stable up to 392° F / 200° C
- excellent frictional characteristics; no “stick-slip” effect
- self-lubricating
- anti-adhesive behavior
- non-flammable
- absolutely no water absorption

PTFE with 25 % glass

Standard material for:
- **Nozzle (Item 5)**

Properties of **PTFE with 25 % glass** reinforcement:

- color: beige
- increased resistance to compression (higher than virgin PTFE and Super PTFE), the parts are dimensionally more stable
- increased tensile strength, the material withstands higher loads
- higher resistance to wear and dimensional change
- lower thermal expansion than unfilled PTFE, that leads to a better dimensional stability over a wide temperature range
- filler is not resistant to alkalis
- restricted use in hot water
- broad operating temperature range: minus 328° F / 200° C to plus 500° F / 260° C
- light- and weather-resistant
- no aging
- very good frictional characteristics; no “stick-slip” effect
- self-lubricating
- anti-adhesive behavior
- non-flammable
- FDA-conformity
- recommended if high dimensional accuracy is demanded and / or for use with high temperatures and loads

Special PTFE Materials

Some applications require special material properties that can be achieved by choosing modified PTFE.

Examples are:
· explosives areas, where sparks could cause damage (Atex)
· applications where extremely low permeation is allowed like chlorine service

Electrically conductive PTFE

Optional material for:
· **Inlet Body (Item 1)**
· **Outlet Body (Item 2)**
· **Nozzle (Item 5)**

Properties of **electrically conductive PTFE**:
- color: black
- volume resistivity less than 10^6 Ω cm, the material is electrically conductive[1]
- surface resistance about 10^3 Ω, the material cannot be electrostatically charged
- good chemical resistance, but the filler can be attacked by extremely oxidizing media
- broad operating temperature range: minus 328° F / 200° C to plus 500° F / 260° C
- light- and weather-resistant
- no aging
- excellent frictional characteristics; no “stick-slip” effect
- self-lubricating
- anti-adhesive behavior
- non-flammable
- no water absorption
- compound is recommended for explosive areas, where sparks could cause great damage (Atex)

Super PTFE

Optional material for:
· **Bellows (Item 7)**

Due to an incorporating of a PPVE modifier into the molecular structure of PTFE with a content less than 1%, the superior performance of Super PTFE (TFM™ PTFE) is achieved.

Advantages of **Super PTFE** (modified PTFE) in comparison to common virgin PTFE:
- substantially lower deformation under load
- lower permeation due to denser polymer structure and fewer voids
- improved stress recovery, particularly at elevated temperatures
- smoother surface finishes
- recommended when very low permeation and lower deformation under load is required

Super PTFE is used especially for chlorine service.

Note: [1] Materials with a lower volume resistivity than 10^6 Ω cm are considered to be electrically conductive.
Materials with a lower surface resistance than 10^9 Ω are considered to be antistatic.

First in safety ...

... a not so brief history of LESER

History

The company started in 1818 as a brass foundry and over the decades developed a product portfolio of components for mechanical equipment and machines during the “industrial revolution”. At first LESER specialized on tough applications and its level gauges for steam boilers were famous. Soon, the company delivered their first safety valve and as a consequence of quick growing industrialization and improving demand for safety, LESER rapidly became the specialist for safety valves.

Safe solutions from the specialist

Today, LESER´s product range includes 23 different designs with a variety of materials and sizes from 1/2” to 16”, providing safe solutions for almost every application with

- Full lift safety valves
- High-pressure safety valves
- Safety valves according to API 526
- Relief and safety relief valves
- Clean service safety relief valves
- Safety valves for critical service conditions
- Safety valves according to special standards and regulation
- Safety valves with supplementary pneumatic load
- Special versions

Where to find LESER

Headquartered in Germany, with a state-of-the-art factory and more than 290 employees, LESER is present through subsidiaries and qualified partners in over 40 countries, providing products and services worldwide.

For the nearest source please contact us at:

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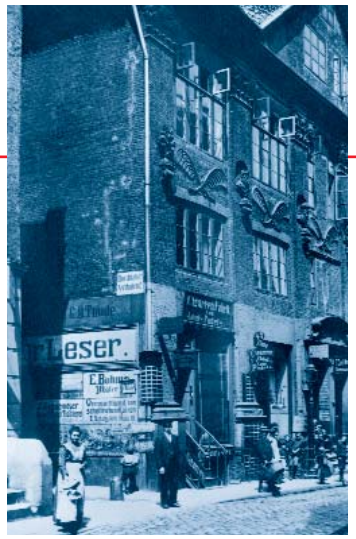
LESER’s factory today



LESER Headquarter
1818 – 1914

LESER The Safety Valve