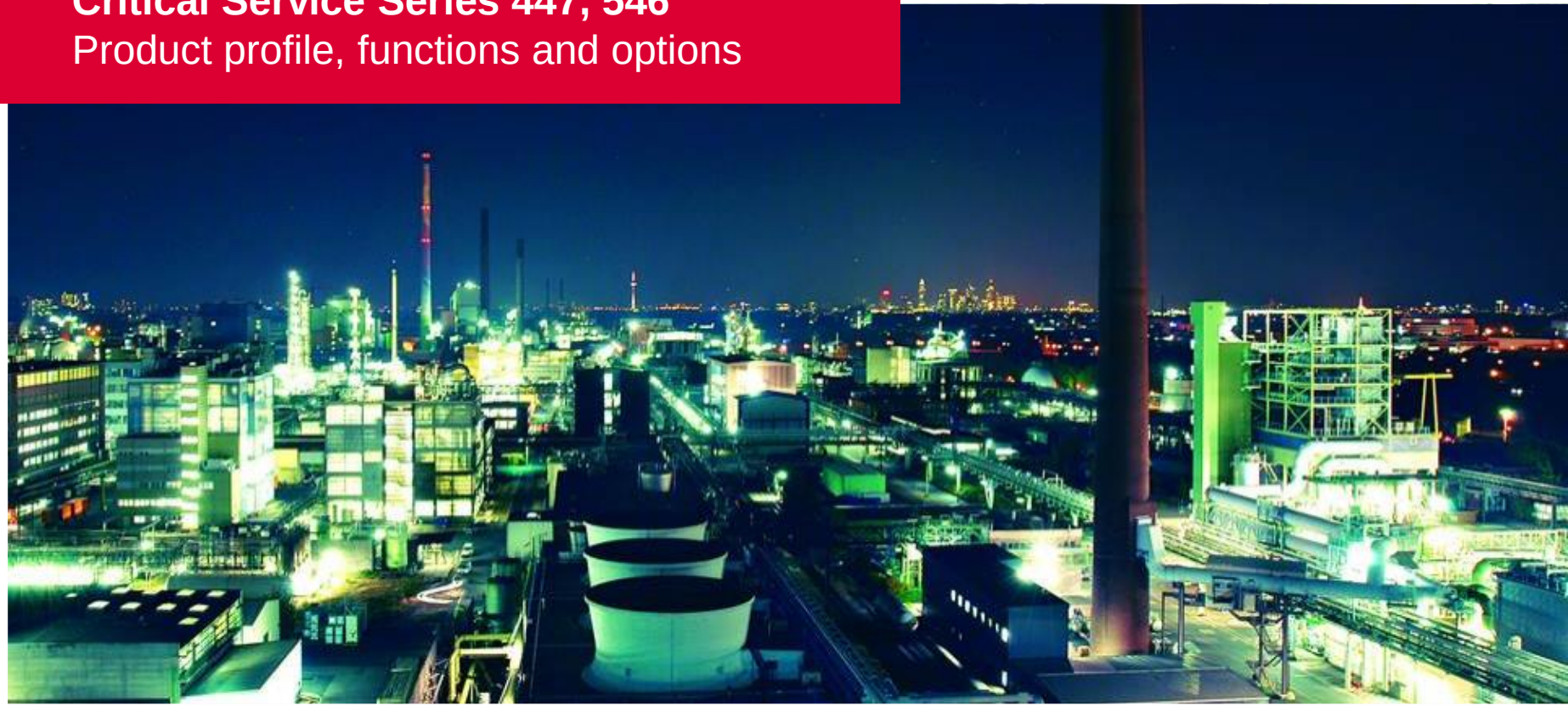
Critical Service Series 447, 546

Product profile, functions and options



Objectives of this Presentation. The expansion of your specialist knowledge.

The objective of this presentation is to provide **an overview of the LESER CRITICAL Service product group**.

General Remarks. Critical Service safety valves.

LESER **Critical Service safety valves** are the first choice for securing highly corrosive and toxic media in all **industrial applications of steams, gases and fluids**.

Advantages:

- Standardised solutions for special applications with critical media
- Optimum adaptation to system-specific requirements
- Alternatives to nickel-based alloys (e.g. Hastelloy®)
- The protection of fixtures against corrosion has a significant impact on the total cost of ownership (TCO) and plays a key role in system safety.
- Polytetrafluoroethylene (PTFE) is a high-performance plastic which has become widely accepted in the chemical industry due to its unique properties.

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Area of application. Applications and references.

Areas of application of the LESER **Critical Service safety valves** include:

- Chlorine production and processing, especially wet chlorine gas
- Chemical systems and pipelines
- Reducing media such as acids (e.g. hydrochloric acid, acetic acid, etc.)
- Alkaline solutions (such as sodium hydroxide applications)
- As well as all intermediate products
- Intermediate products include amines, dioles, and polyalcohol. They are used as raw materials for coatings, plastics, pharmaceuticals, textile fibres, detergents and pesticides, among other things.

BAYER BASF The Chemical Company DOW WACKER

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Level concept. Overview.

Type	Level	Description
447 	**3**	Type 447 is the most economical alternative for applications in which there is also a highly corrosive atmosphere in the outlet chamber, which requires optimum protection through a PTFE lining.
5466 	**2**	Type 5466 is the solution for applications in which activation of the safety valve rarely occurs and the protective coating together with the bellows provides adequate corrosion protection on the outlet side.
546 	**1**	Type 546 is the solution for applications in which activation of the safety valve is very unlikely due to the large difference between the operating and set pressure.

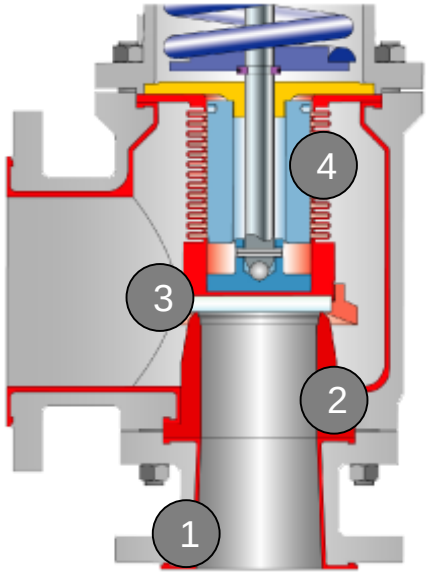
Level concept. Type 447 – Level 3.

Design features

1. Inlet supports and outlet housings are lined with virgin PTFE for the utmost corrosion resistance
2. Nozzles made of gas-tight sintered virgin PFTE-TFM + 25 % glass for the prevention of corrosion in the inlet of the body.
3. Sealing plate of BOROFLOAT glass for high chemical resistance. A metallic sealing plate support ensures high mechanical stability of the disc unit. Coupling of materials PTFE-nozzle – disc with sealing plate of BOROFLOAT glass for high tightness.
4. PTFE bellows hermetically seal the bonnet space and protect against soiling and corrosion.

Corrosion resistance

Inlet	■■■
Outlet	■■■
Bonnet space - as standard with PTFE bellows	■■■



■■■	Highly corrosion resistant
■■	Corrosion resistant
■	Slightly corrosion resistant

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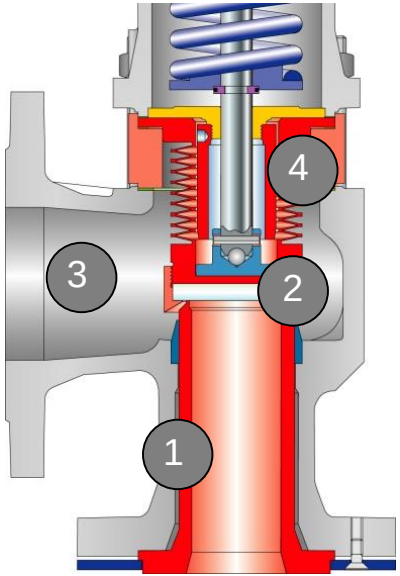
Level concept. Type 5466 – Level 2.

Design features

1. Nozzles made of gas-tight sintered PTFE-carbon compound for the prevention of corrosion in the inlet of the body. Metallic support of the nozzle prevents flowing of the PTFE-carbon compound under pressure.
2. The sealing plate made of a PTFE carbon compound ensures high chemical resistance. A metallic sealing plate support ensures the high mechanical stability of the disc unit.
3. Additional corrosion protection by coating the outlet chamber of the body with conductive two-component paint.
4. PTFE bellows hermetically seal the bonnet space and protect against soiling and corrosion.

Corrosion resistance

Inlet	■■■
Outlet	■■□
Bonnet space - as standard with PTFE bellows	■■■



■■■	Highly corrosion resistant
■■□	Corrosion resistant
■□□	Slightly corrosion resistant

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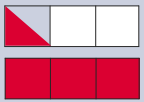
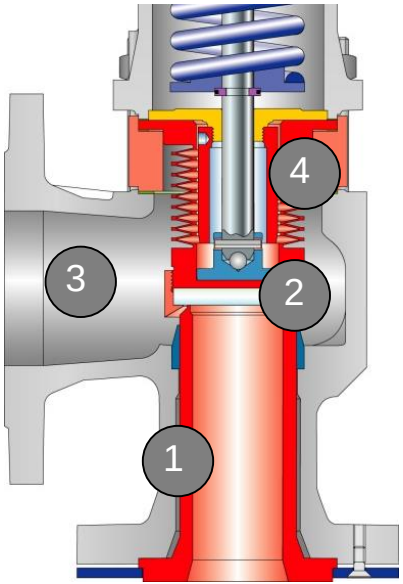
Level concept. Type 546 – Level 1.

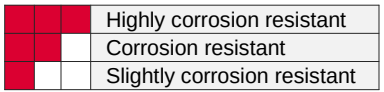
Design features

1. Nozzles made of gas-tight sintered PFTE for the prevention of corrosion in the inlet of the body. Metallic support of the nozzle prevents flowing of the PTFE under pressure.
2. Possible to protect the bonnet space and the sliding components against corrosion with balanced bellows.
3. Sealing plate of BOROFLOAT glass for high chemical resistance. A metallic sealing plate support ensures the high mechanical stability of the disc unit.
4. The PTFE (nozzle) and BOROFLOAT glass (disc sealing plate) material pairing guarantees premium tightness.

Corrosion resistance

Inlet	
Outlet	
Bonnet space - without bellows as standard - optionally with stainless steel bellows	





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Main features. Figures in metric units.

	Series 546		Series 447
	Type 546	**Type 5466**	**Type 447**
Size	DN 25 – DN 100	DN 25 – DN 100	DN 25 – DN 100
d_0	23 – 87 mm	23 – 87 mm	23 – 92 mm
Set pressure	0.5 bar – 16 bar	0.5 bar – 16 bar	0.1 bar – 16 bar
Temperature range	-85 °C … +200 °C	-85 °C … +200 °C	-85 °C … +200 °C
Pressure ratings	PN 16	PN 16	PN 16

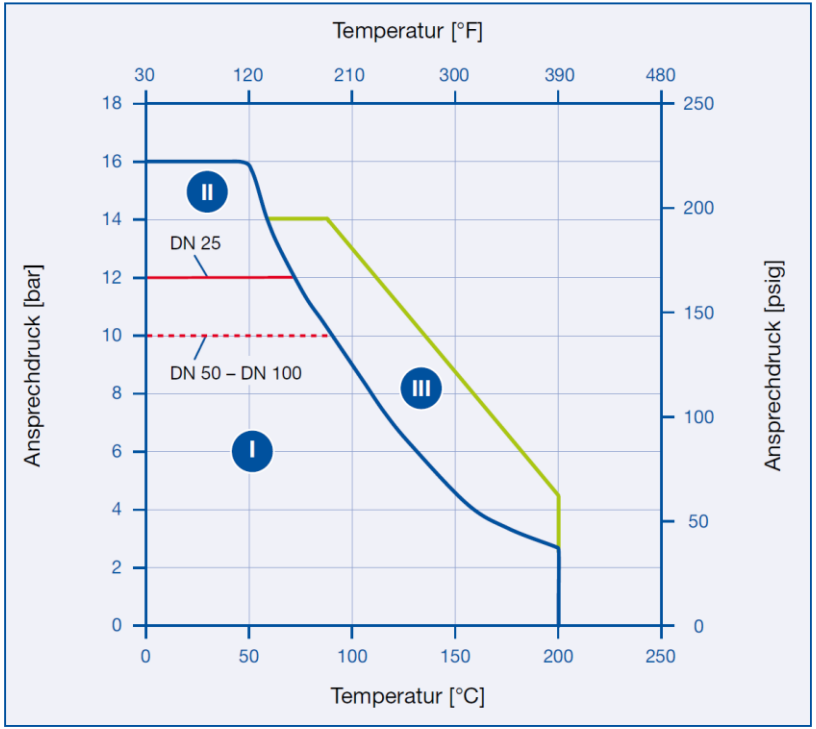
Main features. Figures in US units.

	Series 546		Series 447
	Type 546	**Type 5466**	**Type 447**
Size	1" x 1 ½" - 4" x 6"	1" x 1 ½" - 4" x 6"	1" x 2" - 4" x 6"
d_0	23 – 87 mm	23 – 87 mm	23 – 92 mm
Set pressure	7.25 - 232 psig	7.25 - 232 psig	1.45 psig – 232 psig
Temperature range	121 °F … +392 °F	121 °F … +392 °F	-121 °F … +392 °F
Pressure ratings	Class 150	Class 150	Class 150

Note: no ASME approval for series 546

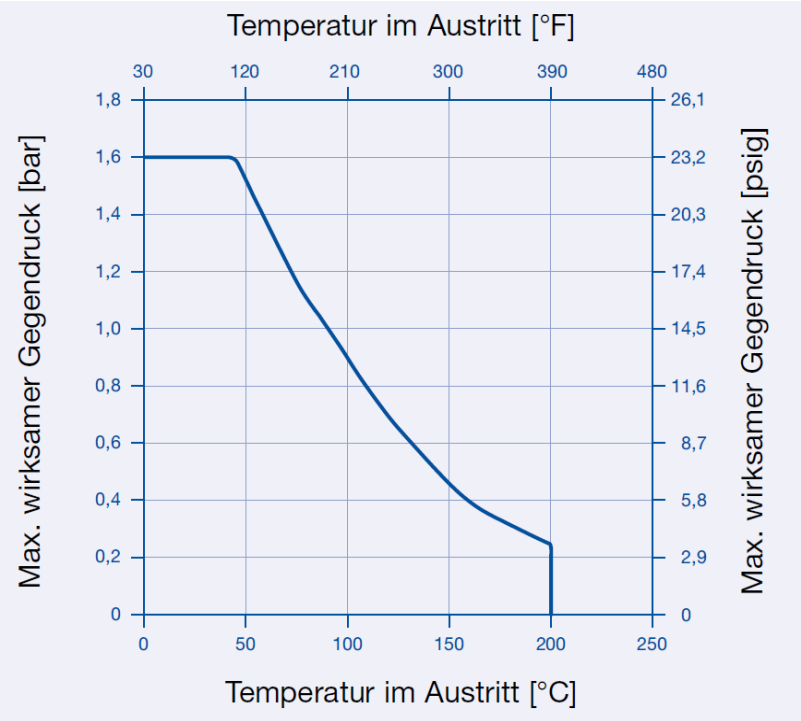
Main features. PTFE nozzle temperature application limits for type 447.

- Entirely designed analog to API 526 for **easy compatibility**
- **One design and spring** for steam, gas, liquid and multi-phase (single trim)
- One-piece spindle for **optimized setting accuracy** and **less friction**
- Few spare parts **ensures minimized product life cycle costs**
- Self-draining body design **prevents from residues and reduces corrosion**
- Integral cast support brackets for **easy handling and safe installation**



Main features. PTFE bellows and outlet pressure.

- Maximum outlet pressure on the PTFE bellows may equal 35% of the set pressure
- But never more than 1.6 bar with respect to the pressure/temperature diagram provided on the left.
- The PTFE bellows are back-pressure compensating within these limits.
- The maximum back pressure is comprised of the built-up back pressure that occurs when blowing off the valve and the external back pressure, which may occur from a blowdown system.
- The temperature at the outlet refers to the constant effective temperature in the outlet chamber of the valve. A short-term higher temperature while blowing off the valve is permissible.



Materials. Overview of the PTFE materials.

General properties:

- General application temperature range is from -200°C / -328° F to +260°C / +500 ° F
- Resistant to almost all chemicals
- Outstanding anti-frictional properties, no "stick-slip" effect (build-ups),
- High dimensional accuracy even under strain
- Light and water resistant as well as non-flammable

	Virgin pure PTFE (TF)	PTFE (PTFE-TFMTM), modified PTFE	PTFE-TFM with 25% glass	PTFE-TFM with 25% carbon	PTFE, antistatic and electrically conductive
Part	Lining inlet and outlet	Bellows	Nozzle	Sealing plate	Option
Colour	White	White	Grey-beige	Black	Black

Materials. Overview of the PTFE materials.

Virgin PTFE-TF, polytetrafluoroethylene is a thermoplastic with a linear and semi-crystalline structure

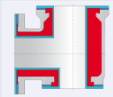
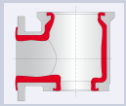
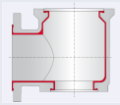
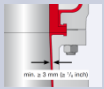
Modified PTFE, type PTFE-TFM™, the 2nd generation, is produced by adding less than 1% PPVE, which changes the molecular structure of virgin PTFE. This structure change gives it high form stability under strain and better gas-tightness.

For 25% glass-modified PTFE-TFM™, fiber glass is added to the production process to improve impact and compression strength.

For 25% carbon-modified PTFE-TFM™, graphite carbon is added to the production process to achieve a lower volume resistance and also improve impact and compression strength.

Antistatic and electrically conductive PTFE, suitable for explosion prone areas

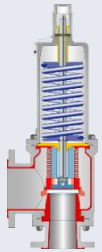
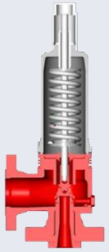
Materials. Production of the PTFE lining.

Main production steps		
Preparation for lining		Machining of the body surfaces to be lined / coated. Roughening of the surfaces by subsequent sand blasting.
Lining with a sintering process		Press moulds are placed over the surfaces to be lined and filled with powdery PTFE.
		The body is put under pressure of > 500 bar in all directions in a pressure vessel. This tightly compresses the PTFE powder and presses it onto the roughened surface of the metal. This results in a form-locked and friction-locked connection between the PTFE and metal. Afterwards, the casing is sintered, which gives the lining its strength and low permeability.
Finishing		Machining of all surfaces
		The minimum PTFE wall thickness is ≥ 3 mm (≥ 1/8 inch).

Special feature. Application with chlorine.

- Chlorine takes the form of gas if no water-dissolved chlorine is present or the chlorine gas does not come into contact with moisture.
- If chlorine is present in a gaseous state, then the standard version of a LESER Critical Service Safety Valve type 447 can be used.
- The reducing effect of chlorine is amplified when water-dissolved chlorine exists. Hydrochloric acid (HCI) with a highly corrosive effect is formed even when chlorine is exposed only to atmospheric humidity (humid chlorine).
- Because a diffusion in the bonnet space cannot be entirely eliminated when long-term exposure to humid chlorine exists, LESER recommends the use of 447 chlorine.
- In the chlorine design, the disc, ball, spindle, guide and split rings are made of high alloy materials

Differentiation. Comparison of the Critical Service – API.

	Critical Service Type 447	API Type 526 – High Alloy
Design		
Inlet is resistant to corrosive media	✓	✓
Outlet is resistant to corrosive media	✓*	✓
Set pressure < 16 bar	✓	✓
Set pressure > 16 bar	-	✓
Temperature < 200 °C	✓	✓
Temperature > 200 °C	-	✓
Construction and design as with API 526	(✓)**	✓

* Available for less and with quick delivery for type 447.
** Nominal widths and center to face dimensions are largely identical to API 526.

Advantages.

- Types 546 and 447 with PTFE nozzles provide a cost-effective alternative to high alloyed metals.
- **A fitting and a spring** for steams, gases, fluids and multiphase applications (single trim)
- The one-part spindle **reduces friction and guarantees optimal guidance and reliable operation**
- Keeping the spare parts to an absolute minimum
  ensures cost-effective maintenance
- The self-emptying body **prevents residue and reduces corrosion**

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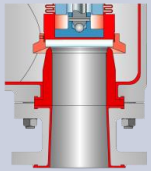
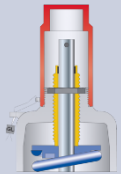
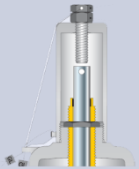
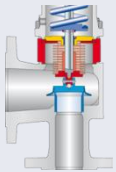
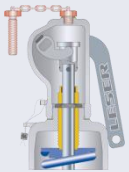
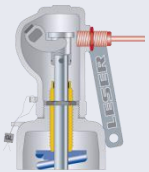
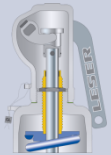
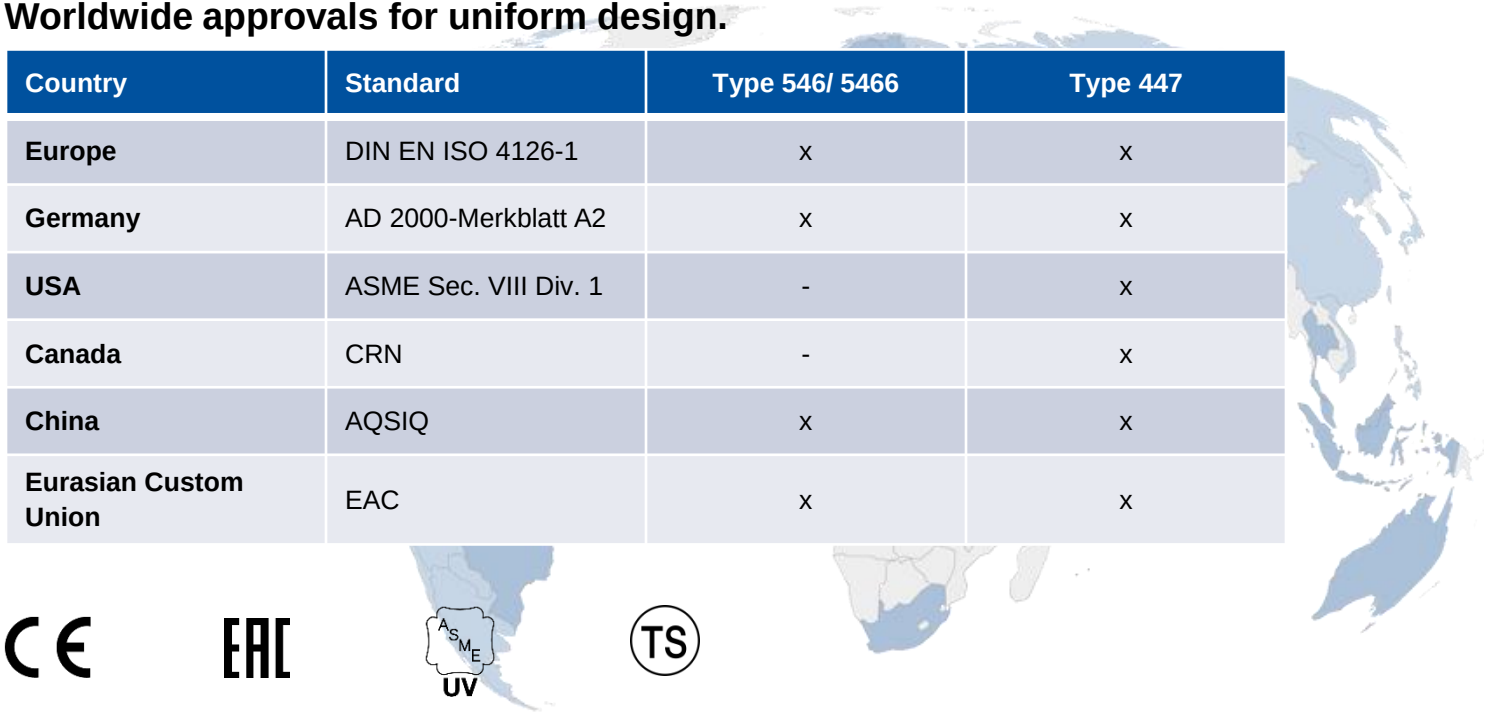
Options.

 Inlet body with virgin or electrically conductive PTFE	 Screwed cap H2	 Lift stoppers
 Balanced bellows	 Test gag	 Lift indicator
 Packed lever H4	CL Chlorine design	Electrically conductive design

Approvals.

Worldwide approvals for uniform design.

Country	Standard	Type 546/ 5466	Type 447
Europe	DIN EN ISO 4126-1	x	x
Germany	AD 2000-Merkblatt A2	x	x
USA	ASME Sec. VIII Div. 1	-	x
Canada	CRN	-	x
China	AQSIQ	x	x
Eurasian Custom Union	EAC	x	x



CE EAC ASME UV TS

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Critical Service Series 447, 546

Thank you for your attention.