

High Efficiency

Pilot Operated Safety Valve

Series 810 – Pop Action

Series 820 – Modulate Action



LESER

The-Safety-Valve.com

LESER's High Efficiency Product Group

LESER's High Efficiency Product Group consists of products that increase the efficiency and productivity of the protected plant.

These products are:

- Pilot Operated Safety Valves
- Safety Valves with Supplementary Loading System

Highlights

- ✓ LESER's pilot operated safety valves are characterized by maintaining seat tightness closer to the set pressure.
- ✓ LESER's pilot operated safety valves are distinguished by small opening and closing pressure differences.
- ✓ A solution that can be used worldwide in the market for pilot operated safety valves.

Approvals

LESER's pilot operated safety valves can be used worldwide, as they are approved according to the following international codes and standards:

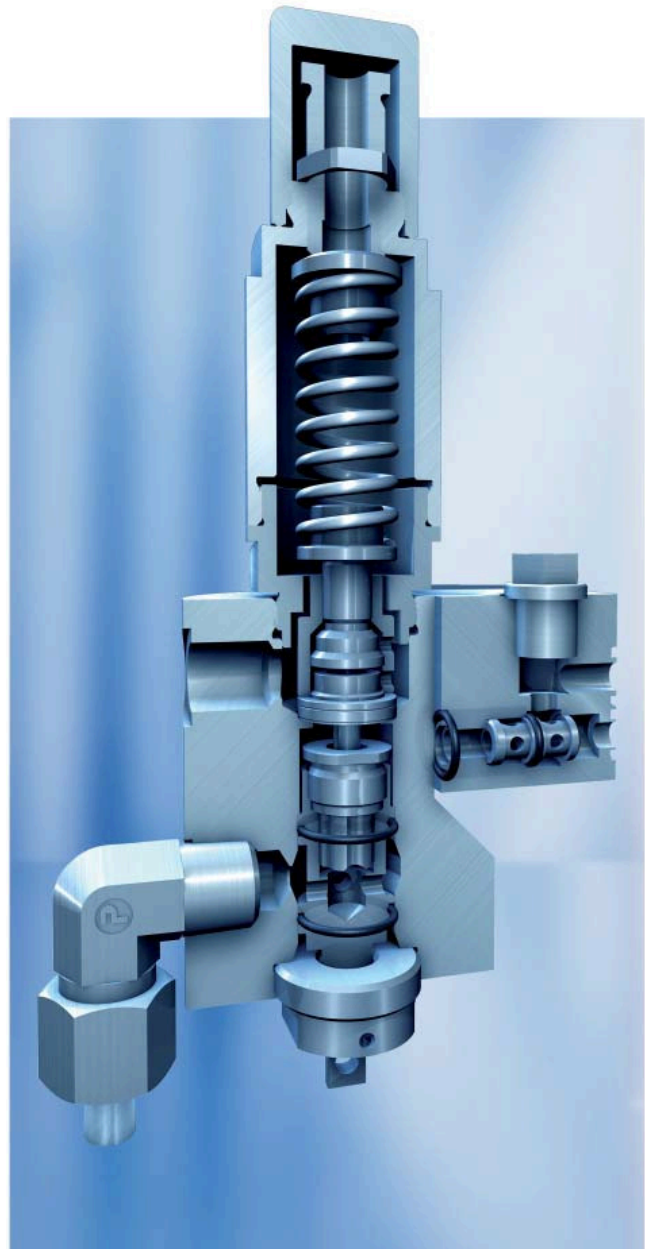
- European Community: CE marking as per Pressure Equipment Directive 97/23/EC and EN ISO 4126-4
- USA: UV-Stamp acc. to ASME Section VIII Division 1, National Board certified capacities
- Germany: VdTÜV approval as per Pressure Equipment Directive, EN ISO 4126-4, VdTÜV – Merkblatt SV 100/1

Regarding the design, manufacture and marking of LESER's pilot operated safety valves, LESER also complies with the following regulations:

EN ISO 4126-7, EN 12266-1/-2, EN 1092 Part I and II, ASME PTC 25, ASME-Code Sec. II, ASME B16.34 and ASME B16.5, API Std. 527, API RP 576

Applications

- Gas compressor stations
- Refineries
- Petrochemical industry
- Oil / gas – Onshore and Offshore
- Tank farms / tanker ships (LNG / LPG)
- Pulp and Paper industry
- Pumps



Product Profile

LESER's Pilot Operated Safety Valves

LESER's series 810 and series 820 safety valves cover a wide spectrum of models, materials, and design features for any application:

- Design in compliance with API 526 for easy replacement.
- Complete API 526 product range with valve sizes from 1" to 8", orifice D to T.
- Body materials WCB, CF8M, LCB, 1.0619, 1.4408 and a diversity of custom materials for an extended range of applications.
- One design and spring (single trim) for steam, gas and liquid applications reduces the number of spare parts and ensures low cost maintenance management.
- Back pressure independent construction allows for external back pressure > 50% of set pressure.
- Flange connections according to ASME, EN and JIS guarantee worldwide suitability.

LESER's pilot operated safety valves offer a simple, safe solution for applications with

- high operating pressures in relation to the set pressure
- high back pressure
- high set pressures with large nominal diameters
- high capacities relating to the nominal diameter
- high seat tightness requirements with operating pressures that are close to the set pressure



Series 810 and Series 820

Depending on the design principle, LESER's pilot operated safety valves open rapidly (Pop Action) or in proportion to the system pressure (Modulate Action). Pop Action pilot valves make up LESER's Series 810 and the Modulate Action pilot valves make up LESER's Series 820.

Series 810 – Pop Action

LESER's Series 810 pop action pilot operated safety valves:


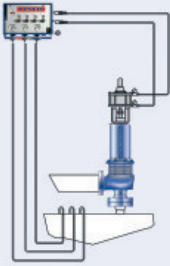
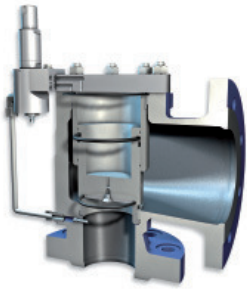
- are used mainly for vapour and gas applications where the maximum discharge capacity needs to be reached quickly.
- open completely within approx. 1% opening pressure difference and close within an adjustable blowdown of 2 – 7%.
- blowdown can be adjusted to 7% to 15% during plant operation in order to guarantee safe functioning of the safety valve in cases of high pressure losses in the inlet line.
- have an adjustable blowdown of 2 – 7% conforming to ASME VIII with an optical marking feature.
- allow spring replacement in the pilot without complete disassembly of the pilot. This eliminates the need to remove the valve from service to change the set pressure.

Series 820 – Modulate Action

LESER's Series 820 modulate action pilot operated safety valves:

- open in proportion to the overpressure to ensure that only as much mass flow as necessary is discharged from the safety valve to prevent further pressure increase.
- minimize medium losses.
- open completely at an approximate 5 – 10% overpressure and close within a blowdown of 2 – 7% for steam and gas applications.

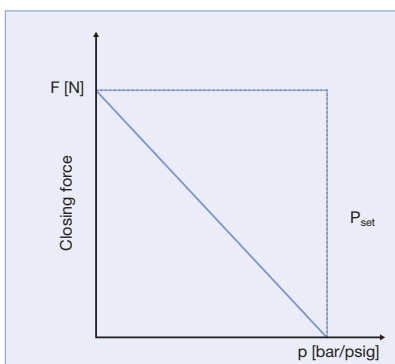
The three designs of safety valves each have specific feature profiles and benefits in their applications. The benefits of LESER's pilot operated safety valves compared to spring loaded safety valves and spring loaded safety valves with supplementary loading are shown in table below.

Benefits of ... compared to ...	Spring loaded safety valve	Spring loaded SV with supplementary loading	Pilot operated safety valve
Spring loaded safety valve		<ul style="list-style-type: none"> – seat tightness up to set pressure – higher operating to set pressure ratios – small overpressure and blowdown – fast and complete valve opening – low medium loss 	<ul style="list-style-type: none"> – small structural size, low weight – higher seat tightness – small overpressure and blowdown – higher set pressures – higher operating to set pressure ratios – higher back pressures – adjustable blowdown
Spring loaded Safety valve with supplementary loading	<ul style="list-style-type: none"> – technically simpler – lower investment costs – no supplemental energy needed 		<ul style="list-style-type: none"> – small structural size, low weight – suitable for larger operating pressure ranges – lower investment costs – lower installation effort – no supplemental energy needed
Pilot operated safety valve	<ul style="list-style-type: none"> – less sensitive – does not require “clean” medium – very good for high temperatures (hot steam) 	<ul style="list-style-type: none"> – individual control of multiple safety valves possible with one control unit – excellent for high temperatures (hot steam) – triple redundancy for control lines for high operating safety – retrofitting of competitor's valves 	

Closing forces for the three safety valve designs

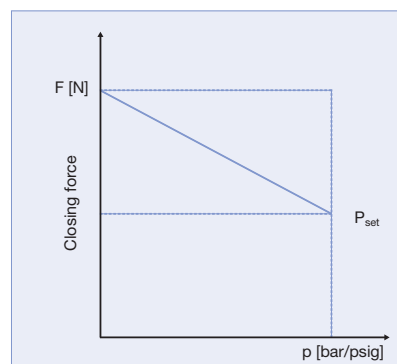
With a pilot operated safety valve, in contrast to a spring loaded safety valve, the increasing system pressure leads to an increasing closing force and hence to better seat tightness closer to the set pressure. A comparably secure clamping force can otherwise only be achieved with spring loaded safety valves with supplementary loading.

1. Spring loaded safety valve



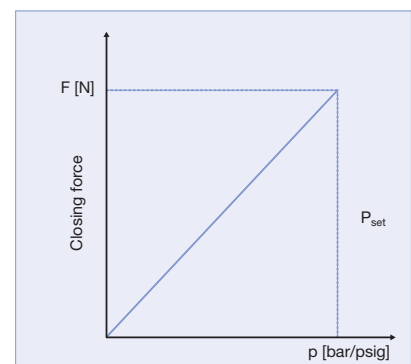
Untightness close to set pressure

2. Spring loaded SV with supplementary loading



Tight up to set pressure with active supplementary loading

3. Pilot operated safety valve



Seat tightness up to set pressure

Pilot operated safety valves are used in a large variety of applications. Typical applications are:

Compressors in Gas Main Systems

Pilot operated safety valves are frequently used for gas transport in pipelines. The reasons are:

- highest possible operating pressure to set pressure ratios facilitates maximum energy density of transport medium
- vibrations from compressors lead to leakage with spring loaded safety valves

The Pop Action pilot valve is frequently used for gas applications.



Refineries and Gas Conditioning Plants

Pilot operated safety valves acc. to API 526 are frequently used in refineries. The reasons are:

- backpressure greater than 50% of set pressure because blow-down systems often include long pipe systems
- high absolute backpressures that cannot be handled with spring loaded safety valves with stainless steel bellows

In these applications, the backpressure-independent opening characteristic of LESER pilot valves guarantees reliable protection of the equipment.



Offshore Applications

On offshore platforms, more pilot operated safety valves than spring loaded safety valves are used. The reasons are:

- lower weight and lower overall height because, compared to a spring loaded safety valve, there is no bonnet
- high set pressures with larger orifices reduce the number of valves required
- no leakage with pilot operated safety valves means a low risk of fire



Pulp and Paper Industry

Pilot operated safety valves are used with steam-heated dryer drums, for example the Yankee Cylinder. The reasons are:

- operating pressures of the dryer drums should be as close as possible to the MAWP (Maximum Allowable Working Pressure) in order to increase plant productivity
- minimized overpressure and blowdown in order to avoid a paper tear caused by fluctuating saturated steam temperatures
- usability of LESER's pilot operated safety valves as an alternative to LESER supplementary loading

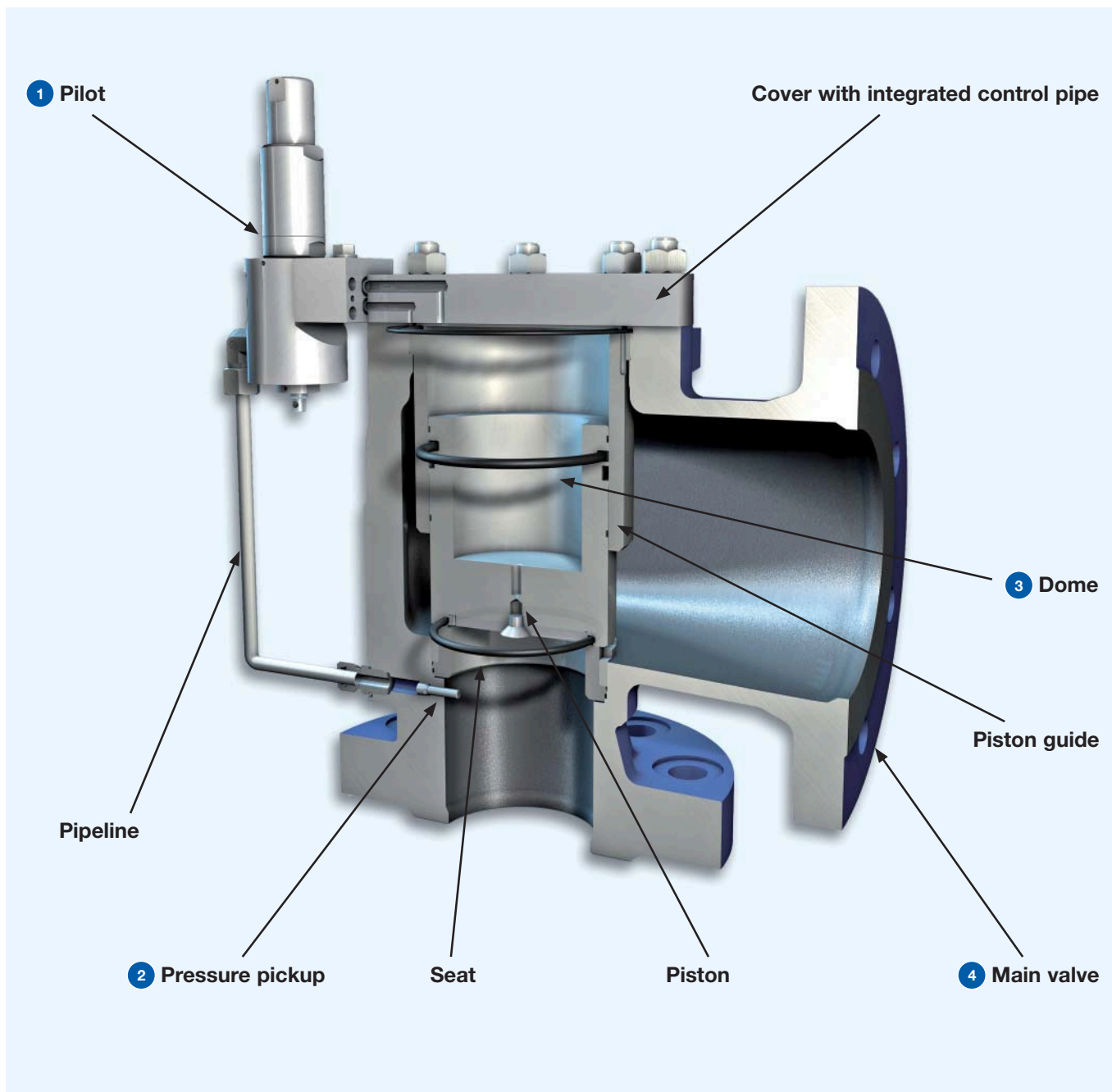


Pilot Operated Safety Valve

Overview

LESER's pilot operated safety valves facilitate seat tightness of the main valve up to the set pressure as well as opening and closing operation within very small overpressure and blowdown.

LESER's pilot operated safety valves are controlled by process medium.



Pilot Operated Safety Valve

LESER's pilot operated safety valve is controlled by process medium. The system pressure is applied to the pilot **1** (= control component for the main valve) via the pressure pickup **2**.

1. Normal Operation

Filling of the dome (as per diagram: Operating conditions of the pilot operated safety valve).

In the normal operating cycle, the system pressure is taken from the main valve inlet and channelled to the dome **3** of the main valve **4**. Since the dome area is larger than the area of the valve seat, there is always a greater force on the dome due to the hydraulic principle. This keeps the main valve tightly closed.

2. Set pressure reached

The pilot actuates when the set pressure is reached: The medium is no longer channelled to the dome **3**. Instead, the pressure in the dome **3** is released. The main valve opens. According to the design principle of the pilot, either rapidly and completely (Pop Action) or gradually and partially depending on the system pressure (Modulate Action).

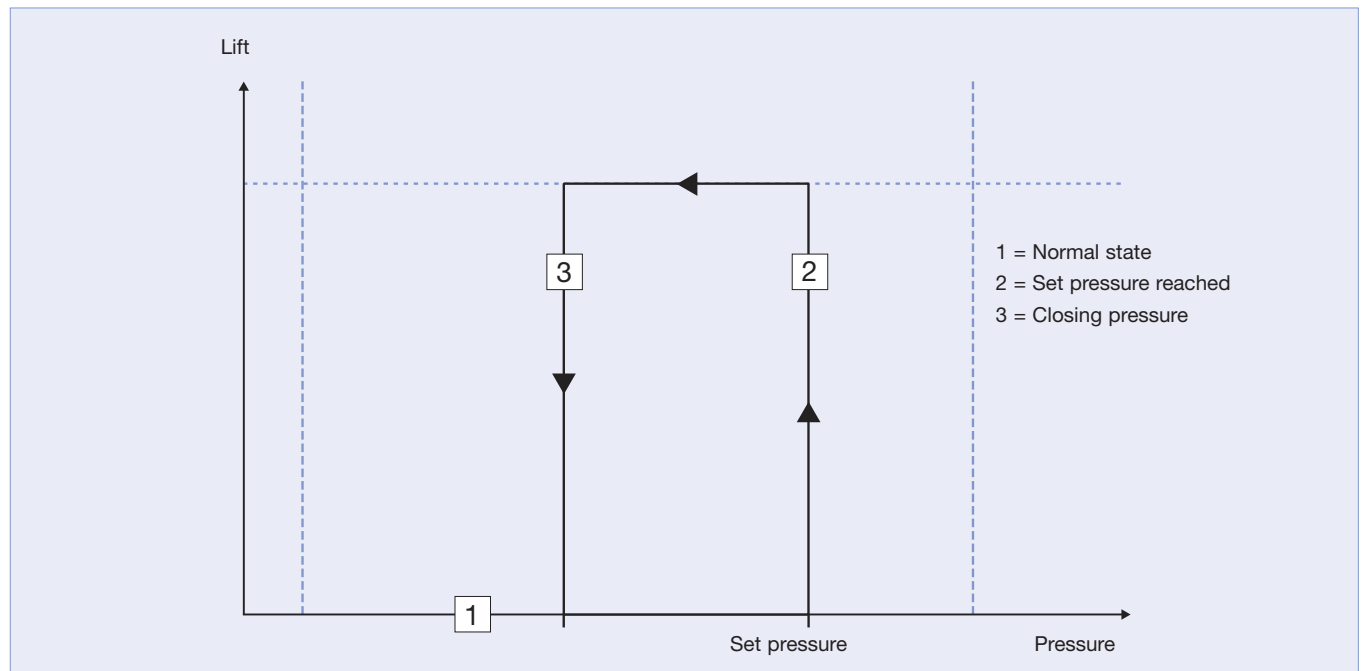
3. System pressure drops below the closing pressure

If the system pressure drops below the closing pressure, the pilot actuates and channels the medium to the dome of the main valve again. The pressure in the dome **3** builds up and the main valve **4** recloses. The closing is in accordance to the design principle of the pilot, either rapidly and completely (Pop Action) or gradually and partially depending on the system pressure (Modulate Action).

Features and benefits:

- The piping of the pilot is integrated into the cover, which minimises the danger of leakage points, pipe damage, and leads to fewer faults in the system.
- Integrated support brackets on the body for easy handling and safe installation
- The self-draining angle type body prevents residue and reduces corrosion.
- The pilot is not sensitive to vibrations due to its direct and robust connection to the main valve.
- Discs with soft seal (O-ring) fulfil increased demands of functional tightness.

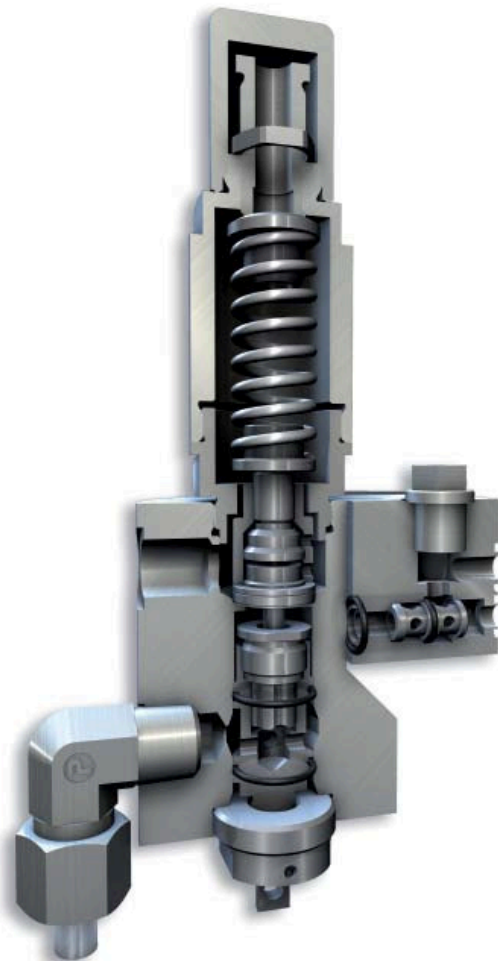
Diagram: Operating conditions of the pilot operated safety valve



Function

The Series 810 Pop Action pilot safety valve is characterized by rapid opening or pop action. Another typical terminology to characterize the function is “snap action”. The dome of the main valve is vented quickly and completely when the set pressure is reached; the main valve opens just as quickly and completely. The medium from the dome is discharged into the atmosphere.

The Pop Action pilot safety valve is mainly used for vapour and gas applications.



Features and benefits

Robust and insensitive to vibrations. The robust connection of the pilot to the main valve and the reduced exposed piping guarantees safe operating even if there are vibrations in the system.

The spring is easily accessible by removing the top section of the bonnet only. This allows easy replacement of the spring and saves time and costs. Other functional parts or seals do not have to be disassembled and therefore do not need to be replaced.

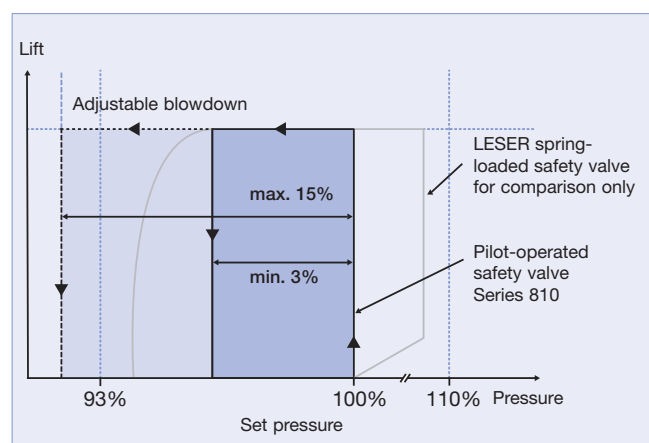
Blowdown “failsafe”. Depending on the construction, the blowdown can only be adjusted in such a way that safe functioning of the pilot remains guaranteed. Even a maximum adjustment does not lead to the pilot having unstable behavior (e.g. fluttering).

Easy blowdown setting within the requirements of codes and standards. The blowdown range of 2 – 7%, which conforms to codes and standards, can easily be adjusted with the help of an optical marking feature on the pilot. Other test devices are not necessary.

A large pressure range of 2.5 – 63 bar (36 – 1480 psig) ensures that the Series 810 Pop Action pilot safety valve can be used for a multitude of applications.

Easy material replacement. The complete pilot is machined from bar material in 1.4404/316L. Hence, all parts can also be made of custom materials.

Functional characteristics of Series 810 with Pop Action pilots

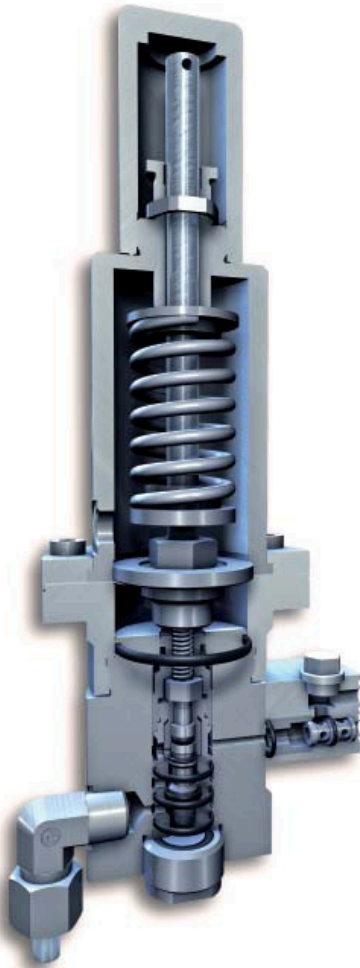


Series 820 – Modulate Action Pilot LESER

Function

The Series 820 Modulate Action pilot safety valve opens gradually and possibly only partly depending on the system overpressure. For pressures above the set pressure, this means that when the pressure increases, only as much mass flow is discharged as is needed to prevent a further pressure increase. In contrast to the Pop Action opening characteristic, the pressure drop in the system is limited and an unnecessary loss of medium is avoided.

The Modulate Action pilot safety valve is used for liquid as well as for steam and gas applications.



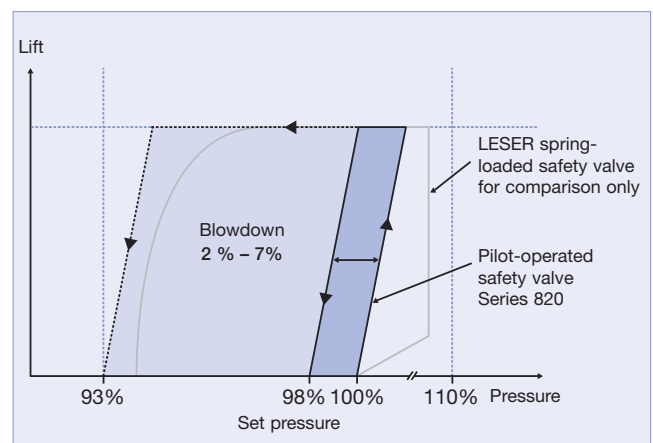
Features and benefits

The Modulate Action pilot safety valve has the same construction related benefits as the Pop Action pilot safety valve with regard to easy manufacture, delivery in custom materials, the robustness, easy spring replacement, and large pressure range of 2.5 – 63 bar (36 – 1480 psig). Furthermore, it has the following specific benefits:

Suitability for media that are harmful to health/environment. The Modulate Action pilot safety valve releases the medium from the dome into the main valve outlet and not into the atmosphere like the Pop Action pilot safety valve. Since back pressure can occur here, the Modulate Action pilot has a back pressure compensating design.

Same performance, full lift. The Modulate Action pilot safety valve has the same discharge capacity and the same lift when completely open as the Pop Action pilot valve.

Functional characteristics of Series 820 with Modulate Action pilots



The following options for LESER's pilot operated safety valves (810 and 820 series) facilitate further adaptations to specific operating conditions.

Problem	Solution with Option
Unwanted opening of the main valve from excess pressure in the discharge side (or low pressure at the pressure pickup)	Backflow preventer Prevents unwanted opening of the main valve and hence a return flow of the medium from the discharge side into the system to be secured
Chattering safety valve due to high pressure loss in the inlet line	Remote sensing <ul style="list-style-type: none"> • Pressure pickup is relocated from the main valve to the pipeline or the vessel • The pilot safety valve works independently of pressure loss in the inlet line. That way, chattering of the safety valve is prevented
The set pressure is to be tested in the plant	Field test connection <ul style="list-style-type: none"> • Facilitates quick and easy checking of the set pressure while the plant is in operation
Dirty service	Pilot supply filter <ul style="list-style-type: none"> • Filters out solids in the process media, guarantees defined purity • For liquid and gaseous media • Integrated into the inlet piping
Opening of the main valve is to be tested	Manual blowdown <ul style="list-style-type: none"> • The function of the main valve is tested without the pilot having to execute a switching operation • The dome pressure is released directly into the atmosphere
Unwanted opening of the main valve due to pulsations or pressure peaks	Pulsation damper <ul style="list-style-type: none"> • Is integrated into the pressure sensing line between the pressure pickup and the inlet of the pilot with the medium flowing through it • Dampens sudden pressure increases
Because of codes and standards or customer requests, the function of the pilot and the main valve must be tested manually	Pilot lifting device H4 <ul style="list-style-type: none"> • The main valve can be lifted manually with pilot lifting device H4 <p>Note: The set pressure is not tested by manual lifting.</p>

Dimensions and weights

Metric Units

Valve size	1 x 2				1 ½ x 2				1 ½ x 3			2 x 3			
Orifice	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
d ₀	11	14,7	18,4	23	11	14,7	18,4	29	23,6	29,4	35,7	23,6	29,4	38	48
A ₀	95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810

Flange rating class 150 x 150

a	105	105	105	105	124	124	124	124	130	130	130	137	137	137	137
b	114	114	114	114	121	121	121	121	124	124	124	124	124	124	124
H Series 810	330	330	330	330	359	359	359	359	370	370	370	386	386	386	386
H Series 820	456	456	456	456	485	485	485	485	496	496	496	512	512	512	512
S ₁	20	20	20	20	31	31	31	31	31	31	31	36	36	36	36
S ₂	24	24	24	24	24	24	24	24	29	29	29	29	29	29	29
A	143	143	143	143	152	152	152	152	160	160	160	179	179	179	179
B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
C	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
D	182	182	182	182	186	186	186	186	200	200	200	209	209	209	209
E	271	271	271	271	284	284	284	284	292	292	292	299	299	299	299
m	19,5	19,5	19,5	19,5	24	24	24	24	28	28	28	34	34	34	34

Flange rating class 300 x 150

a	111	111	111	111	124	124	124	124	130	130	130	137	137	137	137
b	114	114	114	114	121	121	121	121	124	124	124	124	124	124	124
H Series 810	336	336	336	336	359	359	359	359	370	370	370	386	386	386	386
H Series 820	462	462	462	462	485	485	485	485	496	496	496	512	512	512	512
S ₁	26	26	26	26	31	31	31	31	31	31	31	36	36	36	36
S ₂	24	24	24	24	24	24	24	24	29	29	29	29	29	29	29
A	143	143	143	143	152	152	152	152	160	160	160	179	179	179	179
B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
C	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
D	182	182	182	182	186	186	186	186	200	200	200	209	209	209	209
E	271	271	271	271	284	284	284	284	292	292	292	299	299	299	299
m	19,5	19,5	19,5	19,5	24	24	24	24	28	28	28	34	34	34	34

Flange rating class 600 x 150

a	111	111	111	111	124	124	124	124	130	130	130	137	137	137	137
b	114	114	114	114	121	121	121	121	124	124	124	124	124	124	124
H Series 810	336	336	336	336	359	359	359	359	370	370	370	386	386	386	386
H Series 820	462	462	462	462	485	485	485	485	496	496	496	512	512	512	512
S ₁	26	26	26	26	31	31	31	31	31	31	31	36	36	36	36
S ₂	24	24	24	24	24	24	24	24	29	29	29	29	29	29	29
A	143	143	143	143	152	152	152	152	160	160	160	179	179	179	179
B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
C	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
D	182	182	182	182	186	186	186	186	200	200	200	209	209	209	209
E	271	271	271	271	284	284	284	284	292	292	292	299	299	299	299
m	19,5	19,5	19,5	19,5	24	24	24	24	28	28	28	34	34	34	34

d₀ = Actual discharge diameter [mm]

A₀ = Actual discharge area [mm²]

a = Center to face [mm]

b = Center to face [mm]

H = Heights [mm]

S₁ = Inlet flange thickness [mm]

S₂ = Outlet flange thickness [mm]

A = Bracket [mm]

B = Bracket [mm]

C = Hole diameter [mm]

D = Total width [mm]

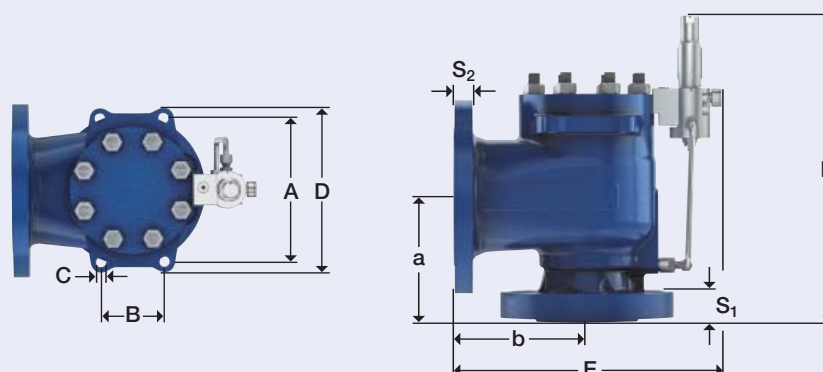
E = Total length [mm]

m = Weight [kg]

Dimensions and weights

Metric Units

Valve size	3 x 4				4 x 6					6 x 8			8 x 10	
Orifice	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+
d ₀	38	45	56	75	56	63	69	83	95	110	133	142	168	180
A ₀	1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447
Flange rating class 150 x 150														
a	156	156	156	156	197	197	197	197	197	240	240	240	276	276
b	162	162	162	162	210	210	210	210	210	241	241	241	279	279
H Series 810	428	428	428	428	481	481	481	481	481	580	580	580	668	668
H Series 820	554	554	554	554	607	607	607	607	607	706	706	706	794	794
S ₁	36	36	36	36	49	49	49	49	49	52	52	52	45	45
S ₂	29	29	29	29	30	30	30	30	30	47	47	47	35	35
A	223	223	223	223	249	249	249	249	249	320	320	320	356	356
B	110	110	110	110	110	110	110	110	110	160	160	160	160	160
C	18	18	18	18	18	18	18	18	18	18	18	18	18	18
D	259	259	259	259	305	305	305	305	305	381	381	381	430	430
E	358	358	358	358	420	420	420	420	420	516	516	516	549	549
m	56	56	56	56	86	86	86	86	86	192	192	192	260	260
Flange rating class 300 x 150														
a	156	156	156	156	197	197	197	197	197	240	240	240	276	276
b	162	162	162	162	210	210	210	210	210	241	241	241	279	279
H Series 810	428	428	428	428	481	481	481	481	481	580	580	580	668	668
H Series 820	554	554	554	554	607	607	607	607	607	706	706	706	794	794
S ₁	36	36	36	36	49	49	49	49	49	52	52	52	45	45
S ₂	29	29	29	29	30	30	30	30	30	47	47	47	35	35
A	223	223	223	223	249	249	249	249	249	320	320	320	356	356
B	110	110	110	110	110	110	110	110	110	160	160	160	160	160
C	18	18	18	18	18	18	18	18	18	18	18	18	18	18
D	259	259	259	259	305	305	305	305	305	381	381	381	430	430
E	358	358	358	358	420	420	420	420	420	516	516	516	549	549
m	56	56	56	56	86	86	86	86	86	192	192	192	260	260
Flange rating class 600 x 150														
a	162	162	162	162	197	197	197	197	197	246	246	246	297	297
b	162	162	162	162	210	210	210	210	210	241	241	241	279	279
H Series 810	434	434	434	434	481	481	481	481	481	586	586	586	689	689
H Series 820	560	560	560	560	607	607	607	607	607	712	712	712	815	815
S ₁	42	42	42	42	49	49	49	49	49	58	58	58	66	66
S ₂	29	29	29	29	30	30	30	30	30	47	47	47	35	35
A	223	223	223	223	249	249	249	249	249	320	320	320	356	356
B	110	110	110	110	110	110	110	110	110	160	160	160	160	160
C	18	18	18	18	18	18	18	18	18	18	18	18	18	18
D	259	259	259	259	305	305	305	305	305	381	381	381	430	430
E	358	358	358	358	420	420	420	420	420	516	516	516	549	549
m	56	56	56	56	86	86	86	86	86	192	192	192	260	260



How to order - Article numbers

Article numbers																															
Size		1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice		D	E	F		D	E	F		G	H		G	H	J		J	K	L		L	M	N	P		Q	R		T		
Extra Orifice					G				H			J				K+				N+					P+			R+		T+	
Body material: WCB (1.0619)																															
Pressure range	Article-No																														
150 x 150	8112.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
300 x 150	8112.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
600 x 150	8112.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130	

Article numbers																															
Size		1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice		D	E	F		D	E	F		G	H		G	H	J		J	K	L		L	M	N	P		Q	R		T		
Extra Orifice					G				H			J				K+				N+					P+			R+	T+		
Body material: CF8M (1.4408)																															
Pressure range	Article-No																														
150 x 150	8114.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
300 x 150	8114.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
600 x 150	8114.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130	

Article numbers																															
Size		1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice		D	E	F		D	E	F		G	H		G	H	J		J	K	L		L	M	N	P		Q	R		T		
Extra Orifice					G				H			J				K+				N+					P+			R+		T+	
Body material: LCB																															
Pressure range	Article-No																														
150 x 150	8113.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
300 x 150	8113.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
600 x 150	8113.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130	

How to order - Article numbers

Article numbers																															
Size		1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice		D	E	F		D	E	F		G	H		G	H	J		J	K	L		L	M	N	P		Q	R	FB	T		
Extra Orifice					G				H			J				K+				N+					P+			R+		T+	
Body material: WCB (1.0619)																															
Pressure range	Article-No																														
150 x 150	8212.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
300 x 150	8212.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
600 x 150	8212.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130	

Article numbers																														
Size	1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice	D	E	F		D	E	F		G	H			G	H	J		J	K	L		L	M	N	P		Q	R	FB	T	
Extra Orifice				G				H			J				K+				N+					P+			R+		T+	
Body material: CF8M (1.4408)																														
Pressure range	Article-No																													
150 x 150	8214.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8214.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
600 x 150	8214.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130

Article numbers																														
Size	1 x 2				1 ½ x 2				1 ½ x 3				2 x 3				3 x 4				4 x 6				6 x 8				8 x 10	
Orifice	D	E	F		D	E	F		G	H			G	H	J		J	K	L		L	M	N	P		Q	R	FB	T	
Extra Orifice				G				H			J				K+				N+					P+			R+		T+	
Body material: LCB																														
Pressure range	Article-No																													
150 x 150	8213.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8213.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
600 x 150	8213	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130

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