

# High Efficiency

Pilot Operated Safety Valves

Series 810 – Pop Action

Series 820 – Modulate Action



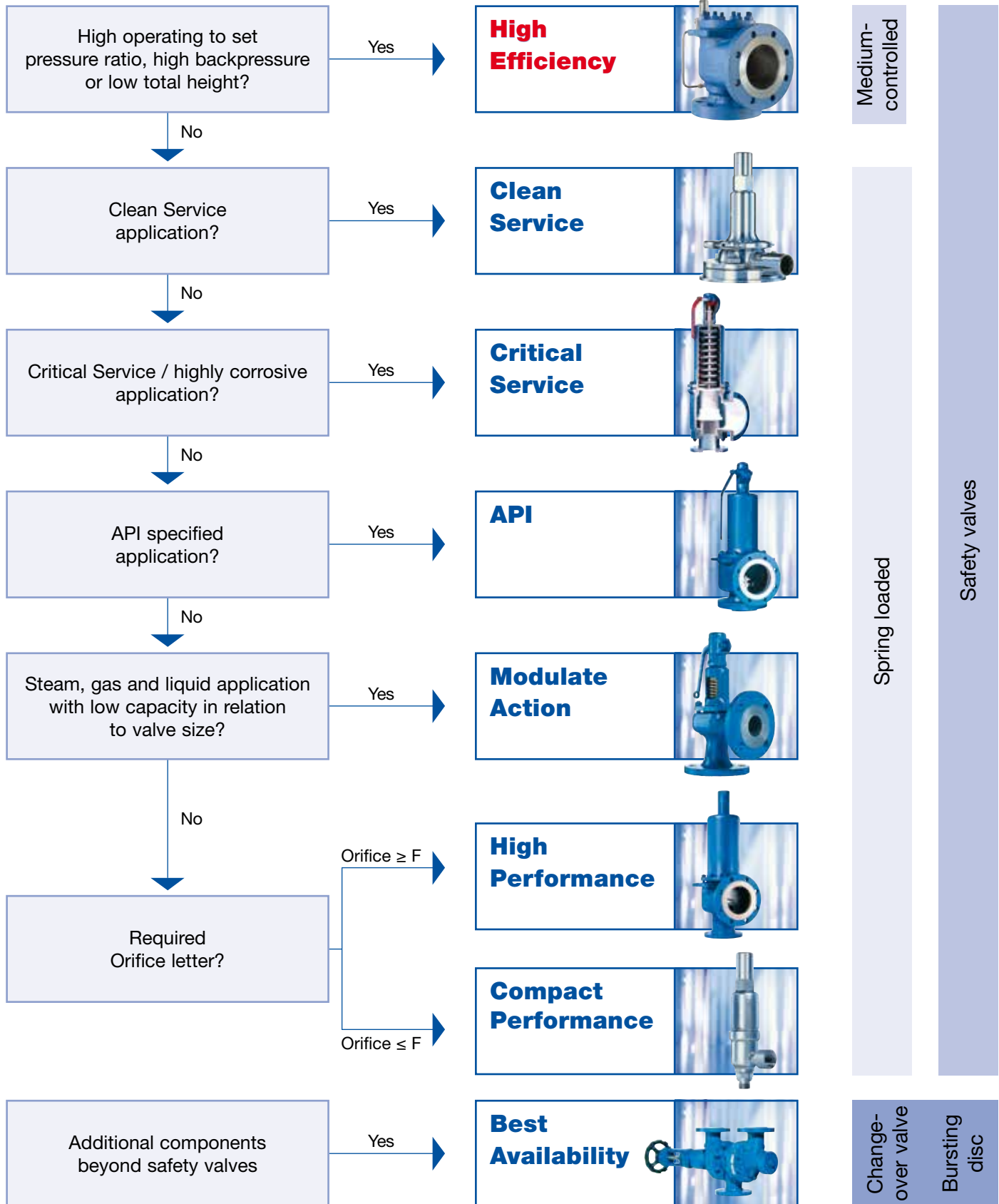
# CATALOG

**LESER**

The-Safety-Valve.com

# Valve finder

## How to find the right product group



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Pilot Operated Safety Valve



Series 810 – Pop Action pilot valve



Series 820 – Modulate Action pilot valve

## High Efficiency

### General information

#### LESER Pilot Operated Safety Valve (POSV)

LESER Pilot Operated Safety Valves (POSVs) are designed according to the API 526 standard. The full range of sizes from 1" x 2" up to 8" x 10" (DN 25 – DN 200) with all orifices from D – T is available for pressure ratings up to pressure class 2500 x 600<sup>1)</sup>.

Beyond API 526, LESER offers so-called Extra Orifices (also known as Full Port or Full Bore nozzles, see page 11). The Extra Orifices provide maximum capacity in relation to valve size. In addition, LESER POSVs come in two different functional designs, i.e. Pop Action (Series 810) and Modulate Action (Series 820). These designs determine the POSVs operating characteristics.

Depending on their design, LESER POSVs open rapidly (Series 810 – Pop Action) or gradually in proportion to system pressure (Series 820 – Modulate Action). Details are shown on page 20 – 25.

#### Series 810 – Pop Action

LESER POSVs Series 810 with rapid opening (Pop Action)

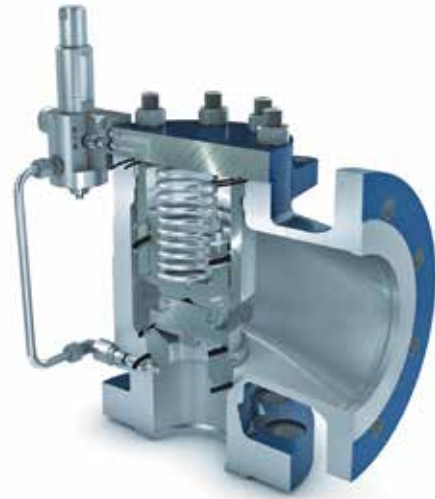
- are used for applications where the certified discharge capacity needs to be reached quickly
- are used for gas applications only
- have an adjustable blowdown of 3 – 7% of set pressure conforming to ASME VIII which can be adjusted beyond API standard up to 15%

#### Series 820 – Modulate Action

LESER POSVs Series 820 with proportional opening (Modulate Action)

- are used to minimize medium loss
- are used if medium must not discharge to atmosphere
- open in proportion to the overpressure to ensure that only as much mass flow is discharged from the safety valve as is necessary to prevent further pressure increase

<sup>1)</sup> Pressure ratings PN 400 / Class 2500 in preparation



POSV-Main Valve and Pilot Valve Series 810



Series 810 – Pop Action Pilot



Series 820 – Modulate Action Pilot

## High Efficiency Specification at a glance

The LESER Pilot Operated Safety Valve (POSV) comprises the POSV main valve and a pilot valve based on either the Pop Action (Series 810) or the Modulate Action (Series 820) designs. The table below shows their common and their specific features.

LESER Pilot Operated Safety Valve (Main Valve and Pilot Valve)		
		Common features for Series 810 and 820
Flange pressure rating <sup>1)</sup>	acc. to ASME B16.5	CL150 – CL 2500 <sup>2)</sup>
	acc. to DIN EN 1092-1	PN 10 – PN 400 <sup>2)</sup>
Materials	acc. to ASME B16.5	WCB, LCB, CF8M
	acc. to DIN EN 1092-1	1.0619, 1.4408
Pressure range	acc. to ASME B16.5	36 – 6170 psig <sup>3)</sup>
	acc. to DIN EN 1092-1	2.5 – 426 bar <sup>3)</sup>
Size	acc. to ASME B16.5	1" to 8"
	acc. to DIN EN 1092-1	DN 25 – DN 200
Temperature	acc. to ASME B16.5	-54 °F – 500 °F <sup>4)</sup>
	acc. to DIN EN 1092-1	-48 °C – 260 °C <sup>4)</sup>
Orifice system	API Standard Orifice	1 D 2 – 8 T 10
	Extra Orifice	1 G 2 – 8 T+ 10
Specific features of Series 810 and Series 820		
Series	810	820
Type	811	821
Pilot action type	Pop Action	Modulate Action
Full Open (overpressure)	1%	max. 10%
Blowdown	3 to 7% adjustable (adjustable also beyond API standard from 3 up to 15%)	max. 7% fixed
Application	Gas	Steam, gases and liquids

<sup>1)</sup> The possible flange pressure ratings depend on the size of the valve.  
Refer to page 61 to verify the correct option codes and availability of DIN EN flange ratings.  
For JIS see page 75 Extended Catalog

<sup>2)</sup> Pressure ratings PN 400 / Class 2500 in preparation

<sup>3)</sup> Set pressures > 256 bar (ASME) / 250 bar (DIN EN)  
> 3705 psig (ASME) / 3625 psig (DIN EN) in preparation






<sup>4)</sup> Temperatures outside -45 °C ... + 200 °C / -49 °F ... + 392 °F in preparation

## High Efficiency

### Good Reasons for the LESER Pilot Operated Safety Valve

Pilot operated safety valves have been a proven technology for many decades especially in ASME oriented regions. However, some of the older designs show potential for improvement in areas like external tubing, capacity and delivery times. Based on customer feedback and extended research and using Computational

Fluid Dynamics (CFD), Rapid Prototyping and one of the most modern factories for safety valves, LESER has developed the latest POSV on the market. The new LESER POSV offers unique benefits for both users and assemblers /maintenance personnel that are listed below.

	Feature	Benefit for user	Benefit for assembler / maintenance
<b>Design</b>			
	Tubing between pilot valve and main valve integrated into top plate	<ul style="list-style-type: none"> <li>• Less risk of damage to tubing</li> <li>• Resistant against vibration</li> <li>• No freezing</li> </ul>	<ul style="list-style-type: none"> <li>• Less tubing for easy removal of top plate</li> <li>• Tubing between inlet and pilot remains accessible for easy cleaning</li> </ul>
	Backflow preventer integrated into manifold block as a standard component	<ul style="list-style-type: none"> <li>• Easy ordering, no extra cost</li> <li>• Less risk of damage to backflow preventer</li> </ul>	<ul style="list-style-type: none"> <li>• No need for machining to retrofit backflow preventer</li> </ul>
	Integral cast support brackets	<ul style="list-style-type: none"> <li>• Compensation of reactive forces (high pressures)</li> <li>• Easy handling during installation</li> </ul>	
	Pilot valve manufactured completely from stainless steel	Less corrosion for higher operation reliability	NACE conversion only requires exchange of spring
	All medium-wetted parts in tubing and pilot valve are either stainless steel or nickel-coated	Corrosion resistance	



	Feature	Benefit for user	Benefit for assembler / maintenance
<b>High capacity / small size</b>			
<b>EXTRA ORIFICE</b>	Higher capacity for same valve size with Extra Orifice types. For details see page 11	Smaller valve sizes possible	Small footprint in system
	20% less space requirement than typical competitive designs	Space-saving system designs possible	Small footprint in system
<b>Modular system</b>			
	Pop Action and Modulate Action pilot valves can be exchanged without tubing modification	Easy later upgrade	Less spare parts stock required. Easy conversion between Pop Action and Modulate Action pilot valve
<b>LESER service</b>			
	Sizing with VALVESTAR	Comprehensive documentation in multiple languages	
<b>4 weeks delivery time</b>	Four weeks delivery ex works for most types	Quick availability	
		Consistently high manufacturing quality	

## High Efficiency

### Applications – Functional areas

Across applications, there are four main functional requirements covered by the LESER Pilot Operated Safety Valve (POSV).

#### High Back Pressure Applications

- LESER POSVs can be operated in applications with a back pressure ratio (i.e. a ratio of back pressure / set pressure) of up to 70%. Spring loaded safety valves can be typically used up to 50% of back pressure.
- The absolute maximum back pressure is determined by the pressure class of the main valve outlet. Typically, LESER POSVs can be used for much higher back pressures than spring loaded safety valves.

#### Applications Requiring Set Pressure Independence of Back Pressure

The LESER POSVs open and operate independently of back pressure (within back pressure operating limits, see previous). The set pressure of the POSV is not affected by back pressure of any kind, i.e. superimposed, constant or variable.

#### Applications with High Inlet Pressure Losses (above 3%)

In these applications, POSVs with remote sensing should be utilized (refer to API 520 Part 2).

#### Applications with Increased Tightness Requirements

Since closing forces increase when approaching set pressure, LESER POSVs are particularly suitable for applications with high tightness requirements. Tightness is ensured up to 97% of set pressure because the closing forces increase approaching set pressure. Together with the defined blowdown, this allows operating the system close to the set pressure of the valve.

In a POSV, the system pressure acts on the main valve piston trying to push it open. It is, however, opposed by the same pressure because system pressure is also re-directed to the dome area above the piston.

Since the area of the piston exposed to pressure is larger in the dome than on the system side, this creates a greater net closing force on the main valve disc / nozzle. Approaching set pressure, closing forces increase. Comparison see page 10 Extended Catalog.





## High Efficiency Applications – Examples

Because of their suitability for high back pressure and high tightness applications, LESER Pilot Operated Safety Valves (POSVs) are used in a number of industrial areas including the following:

### Compressors in Gas Main Systems

Pressure relief devices in these applications must allow for high operating pressures in relation to set pressure, which are required for efficient gas transport. Additionally, compressor vibrations put through requirements on the tightness of the safety valve.

LESER Series 810 and 820 POSVs offer an ideal solution for these conditions because:

- they enable highest possible operating pressure to set pressure ratios facilitating maximum energy density of transport medium
- they are not susceptible to leakage caused by compressor vibration as are spring loaded safety valves

### Downstream Oil and Gas Industry

Long pipings to the flare systems and common blow-down are frequently used in refineries. Both conditions lead to high back pressure of 50% of set pressure or more.

LESER Series 810 and 820 POSVs are used in these applications because:

- they offer high back pressure to set pressure ratios
- they operate reliably independent of back pressure

### Upstream Oil and Gas Industry

Offshore platforms have especially high tightness requirements to avoid leakage. Furthermore, the weight and size of the safety valves should be minimized due to space limitations on the platform.

LESER Series 810 and 820 POSVs are ideal for the upstream oil and gas industry because of:

- their high tightness up to set pressure
- their bonnetless design which allows lower weight and lower valve height

### Pumps in All Industries

Systems with positive displacement pumps are protected by safety valves. The medium is often discharged to the suction side of the pump which creates back pressure.

LESER Series 810 and 820 POSVs are used because:

- they operate independently of back pressure
- they allow high back pressure to set pressure ratios



## High Efficiency Design Features

The following sections discuss the specific design and functional features of LESER's Pilot Operated Safety Valves (POSV) Series 810 und 820 which enable their application benefits. These benefits include:

- API 526 design ensuring standard valve sizes, dimensions and capacities for easy exchangeability in plants designed according to API standards
- API 526 product range with valve sizes from 1" to 8", orifice D to T, and pressure ratings up to Class 2500
- Additional Extra Orifices allowing to use a smaller valve size for a given orifice letter or capacity
- Flange connections according to ASME, EN and JIS available, which guarantee worldwide suitability
- Tubing between main valve and pilot valve integrated into top plate
- One design and spring (single trim) for gas and liquid applications reduces the number of spare parts and ensures low cost maintenance
- Body materials WCB, CF8M, LCB, 1.069, 1.4408 available from stock. Further materials on request.

- Back pressure independent design allows back pressure up to 70% of set pressure in most applications
- Metal discs or o-ring discs for a wide spectrum of applications
- NACE compliant materials enable NACE applications with minimal need for parts exchange as well as short delivery times
- Backflow preventer included as a standard feature – for details see page 18 Extended Catalog
- Easy-to-repair “top loader” design. This means the valve seat is a single part and can be installed from the top without the need to remove the entire POSV from the plant

In addition, the Series 820 – Modulate Action POSV is available in a diaphragm or piston design depending on the operating pressure range. For details on these designs, see “Diaphragm or Piston Design” in the section on the Series 820 – Modulate Action POSV see page 22.



Pilot Operated Safety Valve



Pilot Operated Safety Valve  
for high pressures

## High Efficiency

### Seat Designs: API Standard Orifices and Extra Orifices

The main valve of the LESER POSV Series 810 and 820 comes in a variety of orifices. These orifices are obtained by varying the diameter of the main valve nozzle (see illustrations below). For each nominal valve size, LESER offers several orifices which are in accordance with the API orifice system. These are termed API Standard Orifices. In addition, for each nominal valve size a full

bore nozzle is also available where the orifice is beyond the API orifice system. LESER refers to this orifice as an Extra Orifice. With an Extra Orifice, the customer often has the choice to use a smaller valve size for a required orifice and capacity (for details see page 82 Extended Catalog).

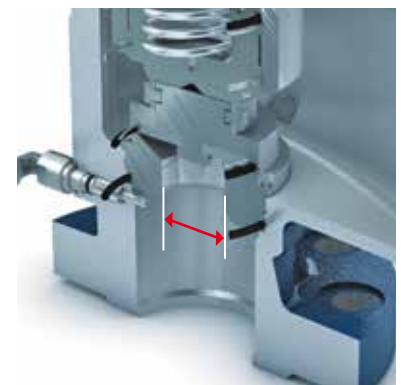
In the POSV, nominal valve sizes correspond to standard API and Extra Orifices as shown in the following table. Extra Orifice letters followed by a plus (+) sign, e.g. "K+", mean that these valves offer a minimum of 25% more capacity than specified in API 526. For capacity values for Standard and Extra Orifices see the capacity tables on page 82 Extended Catalog.

DN <sub>I+O</sub>	25 x 50	40 x 50	40 x 80	50 x 80	80 x 100	100 x 150	150 x 200	200 x 250
Valve size	1" x 2"	1½" x 2"	1½" x 3"	2" x 3"	3" x 4"	4" x 6"	6" x 8"	8" x 10"
<b>API Standard Orifice acc. to API 526</b>	D E F	D E F G	G H	G H J	J K L	L M N P	Q R	T
<b>Extra Orifice</b>		G	H	J	K+	N+	P+	R+ T+

Below are the details of the different nozzle designs for API Standard and Extra Orifices:

#### API Standard Orifice

The API Standard Orifice ensures that the safety valve is in accordance with the API 526 orifice system.



API Standard Orifice

#### Extra Orifice

The maximum drilling of the main valve seat (full bore) allows to discharge the maximum capacity in relation to the nominal valve size.

Full bore safety valves meet the API 526 except for their orifice, so their orifice is identified by a Extra Orifice letter.



Extra Orifice

## High Efficiency

### Application range of soft seal disc and metal to metal disc at ambient temperature

Different sealing designs are used for different pressure ranges to ensure maximum tightness. Generally, at lower pressures, soft sealings are used, at higher pressures

metal-to-metal sealings are used. The following chart shows which sealing is used as a standard.

#### Application range

DN I+O		25 x 50				40 x 50				40 x 80			50 x 80			
Valve size		1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Standard Orifice acc. to API 526		D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice					G				H			J				K+
<b>Set pressure</b>																
<b>p</b>	<b>[bar]</b>	<b>[psig]</b>														
<b>from</b>	<b>2.5</b>	<b>36</b>														
<b>to</b>	<b>19.7</b>	<b>286</b>	<b>Soft seal disc</b>													
<b>to</b>	<b>27.6</b>	<b>387</b>														
<b>to</b>	<b>41.3</b>	<b>599</b>														
<b>to</b>	<b>102</b>	<b>1480</b>	<b>Metal to metal disc</b>													
<b>to</b>	<b>256</b>	<b>3705</b>														

#### Application range

DN I+O		80 x 100				100 x 150				150 x 200			200 x 250		
Valve size		3" x 4"				4" x 6"				6" x 8"			8" x 10"		
API Standard Orifice acc. to API 526		J	K	L		L	M	N	P		Q	R		T	
Extra Orifice					N+					P+			R+		T+
<b>Set pressure</b>															
<b>p</b>	<b>[bar]</b>	<b>[psig]</b>													
<b>from</b>	<b>2.5</b>	<b>36</b>													
<b>to</b>	<b>19.7</b>	<b>286</b>	<b>Soft seal disc</b>												
<b>to</b>	<b>27.6</b>	<b>387</b>													
<b>to</b>	<b>41.3</b>	<b>599</b>	<b>Metal to metal disc</b>												
<b>to</b>	<b>102</b>	<b>1480</b>													
<b>to</b>	<b>256</b>	<b>3705</b>													

For soft seal material options, please refer to page 69 Extended Catalog. The chart above refers to ambient temperature conditions. For sealing materials at other temperatures, please ask LESER.

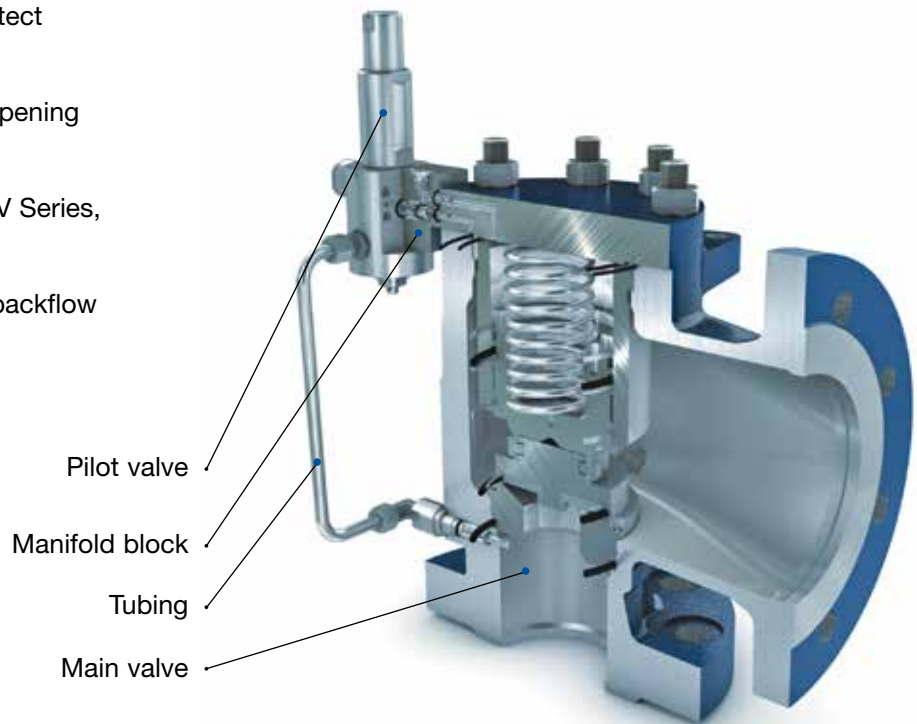


## High Efficiency Components

### POSV – Main valve, pilot valve, tubing and manifold block

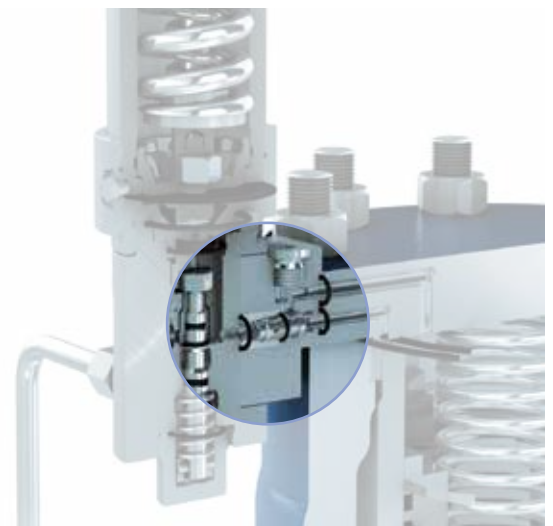
The LESER Pilot Operated Safety Valve (POSV) consists of four main components in its standard configuration:

- the main valve, which serves to protect the pressurized equipment
- the pilot valve, which controls the opening and closing of the main valve
- the tubing is identical for both POSV Series, i.e. 810 and 820
- the manifold block with integrated backflow preventer (standard feature)



### Backflow Preventer – Included in standard configuration

The backflow preventer prevents an unwanted opening of the main valve, which would cause backflow of medium from the outlet into the protected system. This problem can occur when there is back pressure that exceeds the inlet pressure (or insufficient pressure at the inlet), resulting in a net force acting on the valve piston in the opening direction, such as e.g. in a process running under vacuum.





## High Efficiency Operating Cycle

LESER Pilot Operated Safety Valve (POSV) is controlled by process medium. To achieve this, the system pressure is applied to the pilot valve (= control component for the main valve) via the pressure pickup. The pilot valve then uses the dome above the main valve piston to control the opening and closing of the main valve.

### 1. Below set pressure: normal operation

During normal operation, the system pressure is picked up at the main valve inlet and routed to the dome. Since the dome area is larger than the area of the main valve seat, the closing force is greater than the opening force. This keeps the main valve tightly closed.

### 2. At set pressure: actuating state

At set pressure, the pilot valve actuates. The medium is no longer pressure routed to the dome. This prevents a further rise in dome pressure. Also, the dome is vented. As a result, the closing force ceases as a pre-condition for the system overpressure to push the main valve open.

### 3. Main valve opening

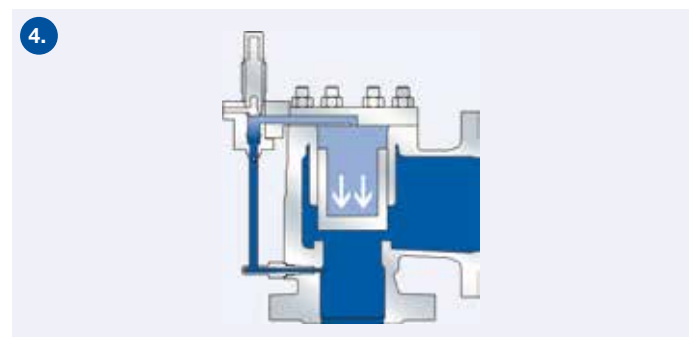
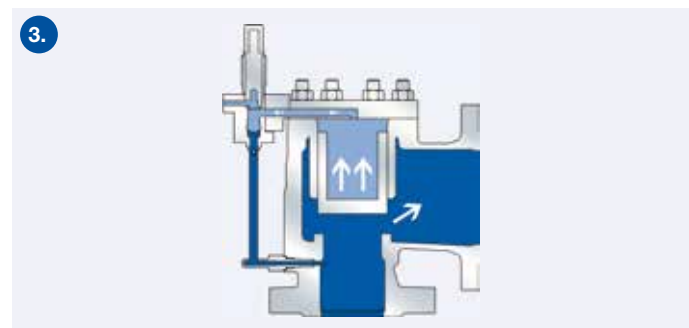
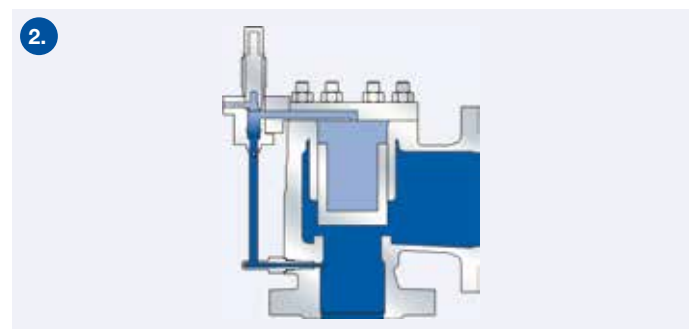
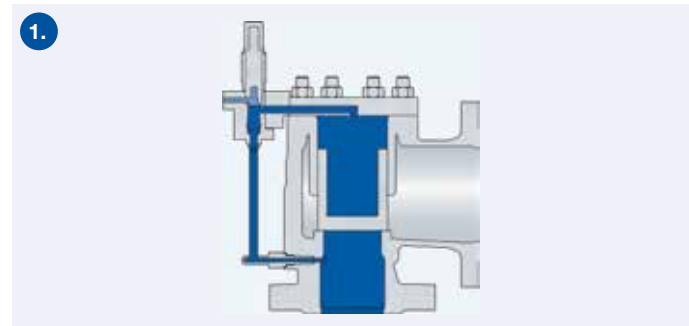
The main valve opens. Depending on the design of the pilot valve, this opening is either rapid and complete (Pop Action) or gradual and partial following system pressure (Modulate Action).

### 4. At closing pressure: refilling the dome

If system pressure drops to closing pressure, the pilot valve actuates and again routes the medium to the dome. The pressure in the dome builds up and the main valve recloses either rapid and complete (Pop Action) or gradual and partial following system pressure (Modulate Action).

While there are specific differences between the Series 810 – Pop Action POSV and the Series 820 – Modulate Action POSV, the basic operation of a LESER POSV can be described as follows. During operation, the POSV goes through these basic operating states:

### Operating states of the POSV



## High Efficiency

### Series 810 – Pop Action Operating Cycle

- 1. Below set pressure:**  
normal operation – feeding seat open,  
exhaust seat closed

When the main valve is closed the Pop Action Pilot is in a static state. During the filling process and with opened filling seat the medium is channeled via the manifold block into the dome of the main valve. In normal operational state medium does not flow. The closing force of the spring acts on the relief seat and is bigger than the acting medium opening force.

- 2. At set pressure:**  
feeding seat opening, exhaust seat closing

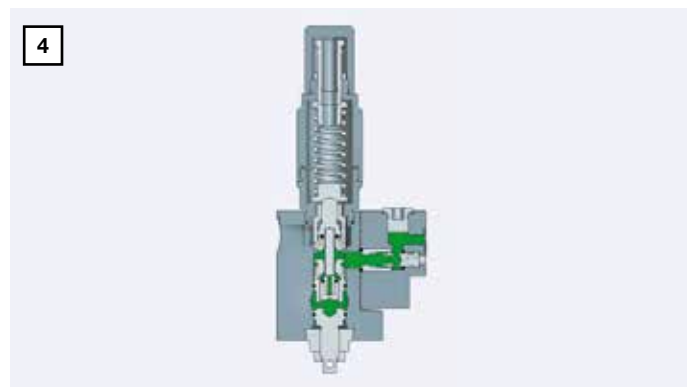
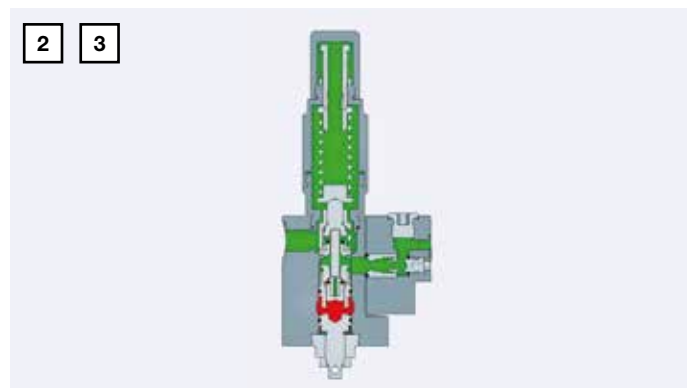
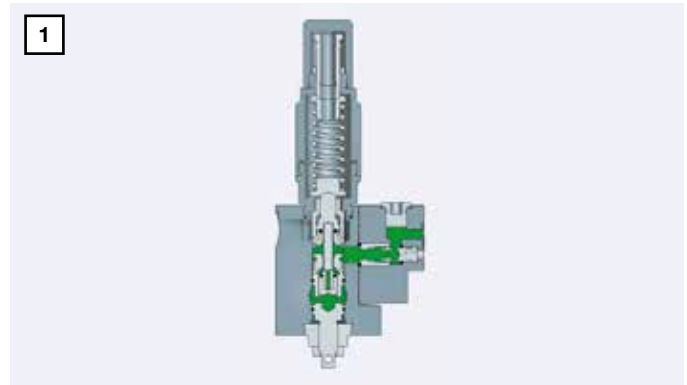
When set pressure is reached, the pilot valve opens the exhaust seat and closes the feeding seat. This releases the dome pressure. The release of dome pressure is a pre-condition for the opening of the main valve by system pressure.

- 3. At and above set pressure (+ max. 1%): pop opening**  
At set pressure, the main valve opens abruptly and completely feeding seat closed, exhaust seat open (Pop Action) (see bottom chart). The medium is channeled from the dome to atmosphere (see illustration on right).

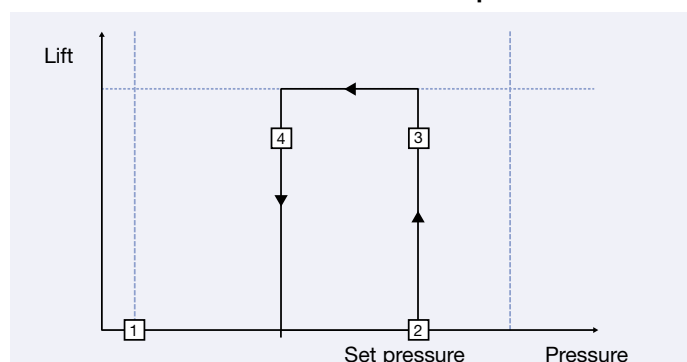
- 4. At closing pressure:**  
feeding seat open, exhaust seat closed

When the system pressure drops to closing pressure, the pilot valve actuates and again channels the system pressure to the dome of the main valve. Here, the system pressure builds up, the main valve recloses. The closing stage (blowdown) can be adjusted from at least 3% (when pressure loss at the inlet is low) to max. 15% blowdown difference.

#### Operating states Series 810



#### Opening Characteristic with Overpressure and Blowdown Difference: Series 810 Pop Action



- 1 – Below set pressure: normal operation  
2 – At set pressure  
3 – Pop opening  
4 – At closing pressure – blowdown

## High Efficiency

### Series 820 – Modulate Action Operating Cycle

The operating cycles of the Series 820 – Modulate Action and the Series 810 – Pop Action POSV differ at two points: shortly before set pressure is reached and after reaching set pressure. At this second point actual modulation takes place in the Series 820 – Modulate Action POSV. Modulation means that above set pressure the pilot valve will open the main valve in proportion to

overpressure. Thus, there may only be a partial lift of the main valve. This ensures that only as much medium is discharged as is required for pressure reduction. Any unnecessary medium loss is avoided.

#### 1. Below set pressure:

**normal operation – feeding seat open, exhaust seat closed**

The system pressure is routed to the dome, keeping the main valve tightly closed (see illustration).

#### 1a. Near set pressure:

**feeding seat closed, exhaust seat closed (not shown)**

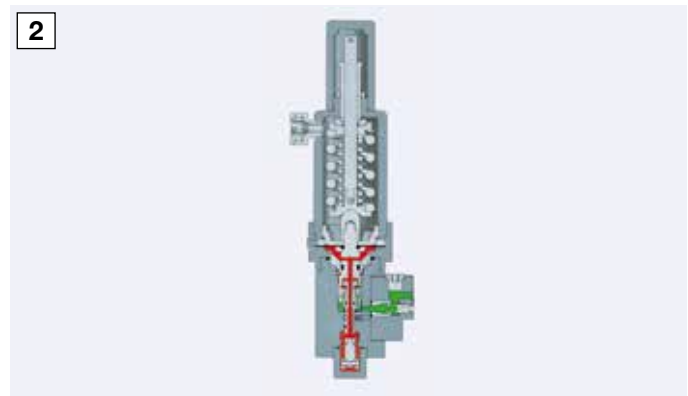
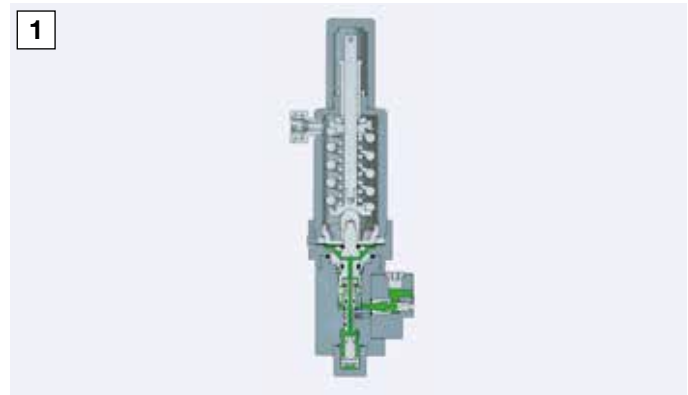
Shortly before set pressure is reached, the pilot valve closes the dome feeding seat. This keeps the dome pressure stable. A stable dome volume is the pre-condition which allows the rising system pressure to push the main valve open at set pressure.

#### 2. At set pressure (+ max. 1%):

**feeding seat closed, exhaust seat open**

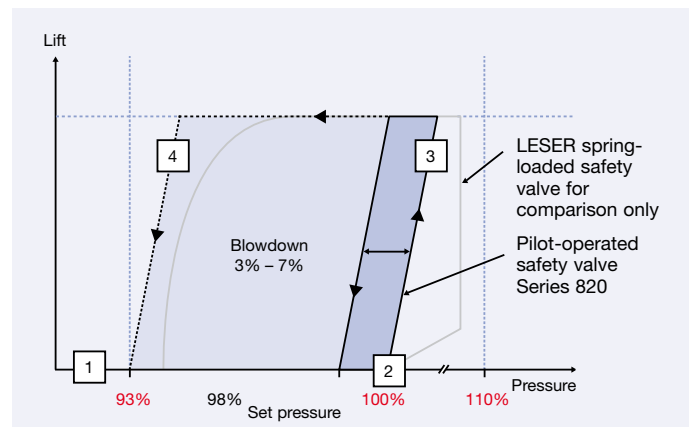
With a further slight pressure increase, set pressure is reached and the pilot valve opens the dome exhaust seat. The dome volume is discharged and the main valve starts to open.

#### Operating states Series 820



#### Opening Characteristic with Overpressure and Blowdown Difference:

#### Series 820 – Modulate Action vs. Spring Loaded Safety Valve



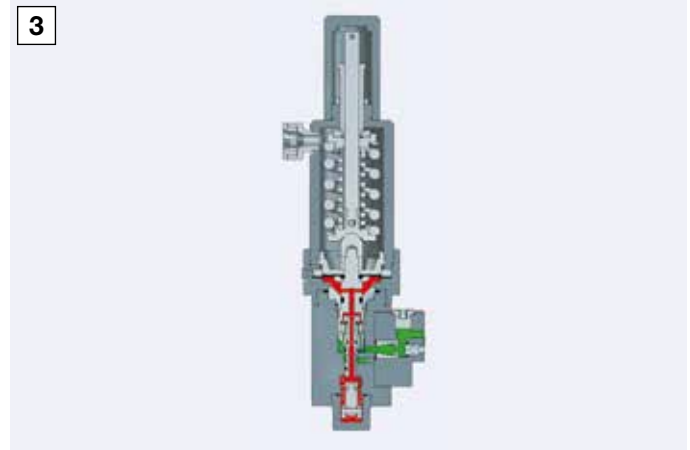
## High Efficiency

### Series 820 – Modulate Action Operating Cycle

#### 3. Modulate opening:

**feeding seat closed or open,  
exhaust seat closed or open**

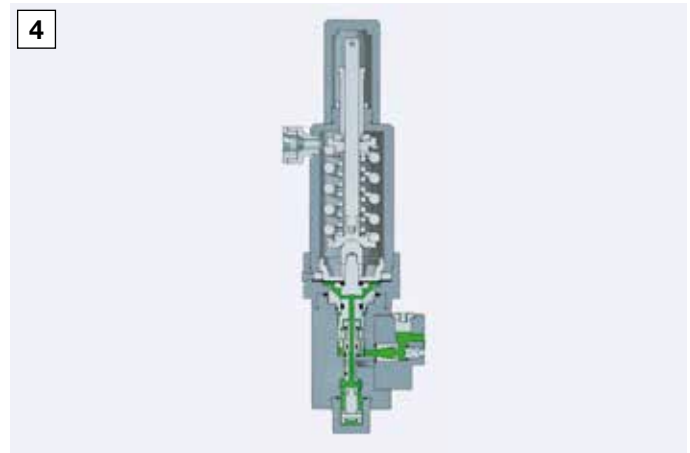
At this point, modulation takes place. This means that if overpressure remains within the modulating range of 93 – 110% of set pressure, the pilot valve will again close the exhaust seat. This stops discharge from the dome and keeps the main valve piston unchanged at the achieved lift. The achieved lift will always be enough to ensure pressure reduction, but not more than is required. During blow-off this intermediate state with a stable dome volume and main valve lift can occur repeatedly and at different pressure levels. To change the lift, there can also be partial opening movements with the exhaust seat opened, or closing movements with the feeding seat opened. Modulation ensures that only as much medium is discharged as is necessary to prevent the overpressure from exceeding the modulating range (see chart page 16).



#### 4. At closing pressure:

**full closing – feeding seat open,  
exhaust seat closed**

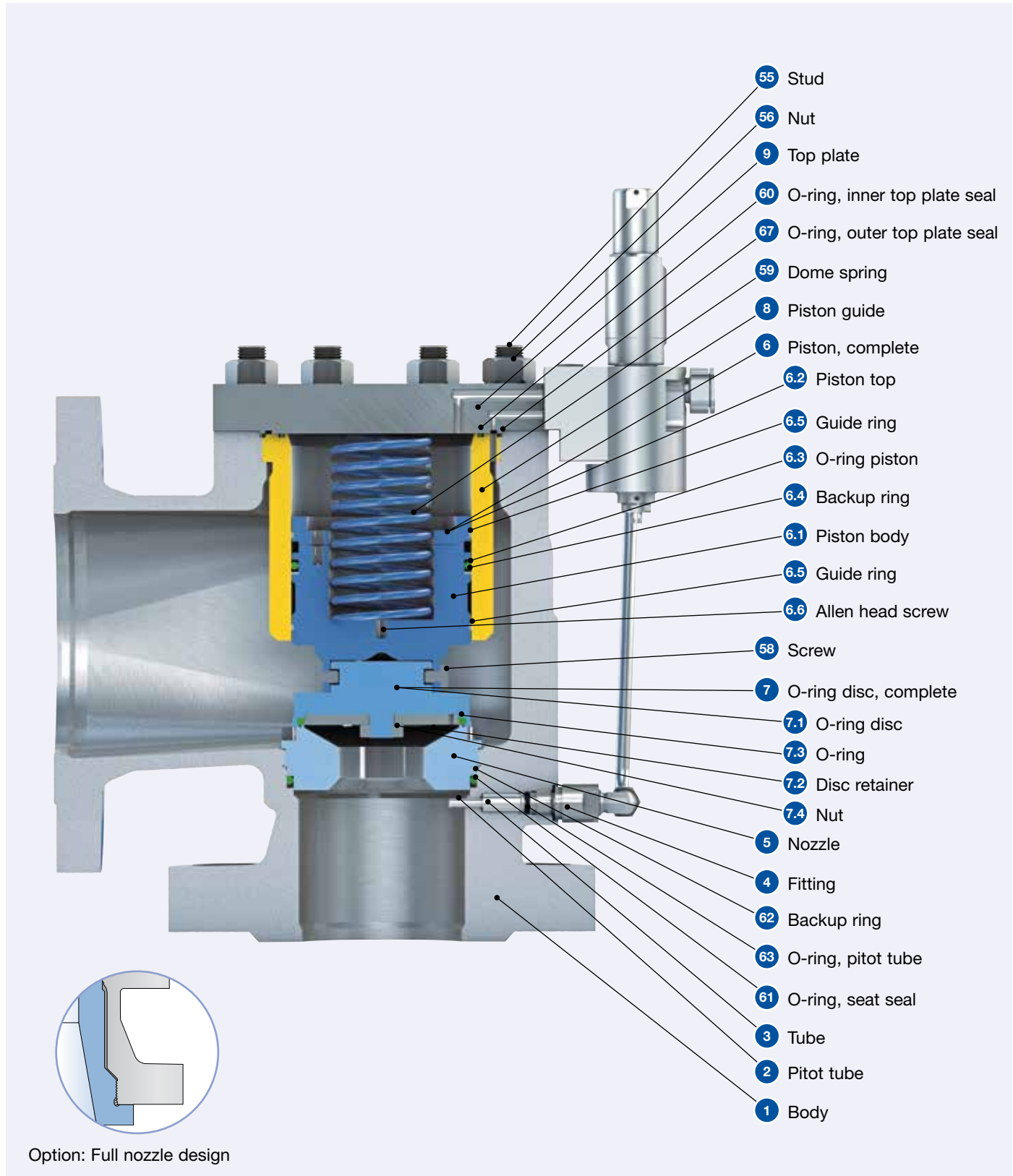
When system pressure drops below the modulating range to reach blowdown pressure, the pilot returns to its first state (with feeding seat open and exhaust seat closed). The main valve closes completely.



## High Efficiency

### Materials Series 810, 820 – Main valve

Below is a schematic drawing of the parts layout for the LESER POSV main valve including both the Standard and Extra Orifice designs. For the related parts listing, see opposite page.





## High Efficiency Materials Series 810, 820 – Main valve

### Materials

Item	Component	Type 8112 / 8212	Type 8114 / 8214	Type 8113 / 8213
1	Body	1.0619	1.4408	
		SA 216 WCB	SA 351 CF8M	SA 352 LCB
2	Pitot tube	1.4404	1.4404	1.4404
		316L	316L	316L
3	Tube	1.4404	1.4404	1.4404
		316L	316L	316L
4	Fitting	1.4404	1.4404	1.4404
		316L	316L	316L
5	Nozzle	1.4404	1.4404	1.4404
		316L	316L	316L
6	Piston, complete	1.4404	1.4404	1.4404
		316L	316L	316L
6.1	Piston body	1.4404	1.4404	1.4404
		316L	316L	316L
6.2	Piston top	1.4404	1.4404	1.4404
		316L	316L	316L
6.4	Backup ring	PTFE	PTFE	PTFE
		PTFE	PTFE	PTFE
6.5	Guide ring	PTFE with carbon	PTFE with carbon	PTFE with carbon
		PTFE with carbon	PTFE with carbon	PTFE with carbon
6.6	Allen head screw	A4-70	A4-70	A4-70
		Stainless steel	Stainless steel	Stainless steel
7	O-ring disc, complete	1.4404	1.4404	1.4404
		316L	316L	316L
7.1	O-ring disc	1.4404	1.4404	1.4404
		316L	316L	316L
7.2	Disc retainer	1.4404	1.4404	1.4404
		316L	316L	316L
7.4	Nut	A4-70	A4-70	A4-70
		Stainless steel	Stainless steel	Stainless steel
8	Piston guide	1.4404	1.4404	1.4404
		316L	316L	316L
9	Top plate	1.0460	1.4404	1.4404
		SA 105	316L	316L
55	Stud	1.7225	1.4401	1.4401
		B7M	B8M	B8M
56	Nut	1.7225	1.4401	1.4401
		2H	8M	8M
58	Screw	A4-70	A4-70	A4-70
		Stainless steel	Stainless steel	Stainless steel
59	Dome spring	1.4310	1.4310	1.4310
		Stainless steel	Stainless steel	Stainless steel
62	Backup ring	PTFE	PTFE	PTFE
		PTFE	PTFE	PTFE
<b>Option code</b>				
6.3, 6.4, 7.3, 60, 61, 63, 67	O-ring <sup>1)</sup>	*	Viton® (FKM – Fluorocarbon)	
		R05	Buna-EP® (EPDM – Ethylene-Propylene-Dine)	
		R06	Kalrez® (FFKM – Perfluor)	

**Please notice:**

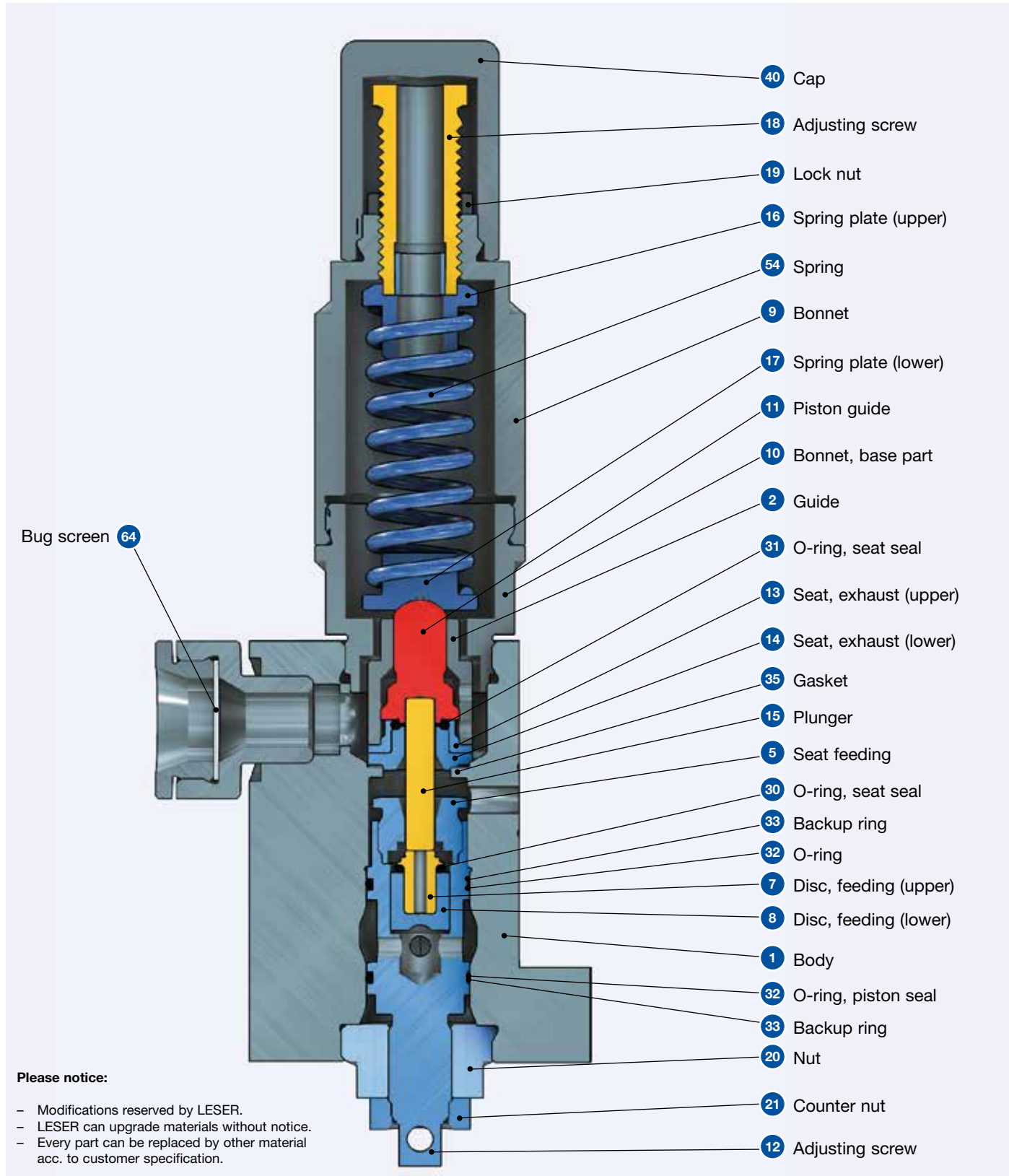
- Modifications reserved by LESER. LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

<sup>1)</sup> For further soft seal materials refer to page 69 Extended Catalog

## High Efficiency

### Materials Series 810 – Pop Action Pilot Valve

Below is a schematic drawing of the parts layout for the LESER Series 810 – Pop Action pilot valve. For the related parts listing, see opposite page.



## High Efficiency Materials Series 810 – Pop Action Pilot Valve

### Materials

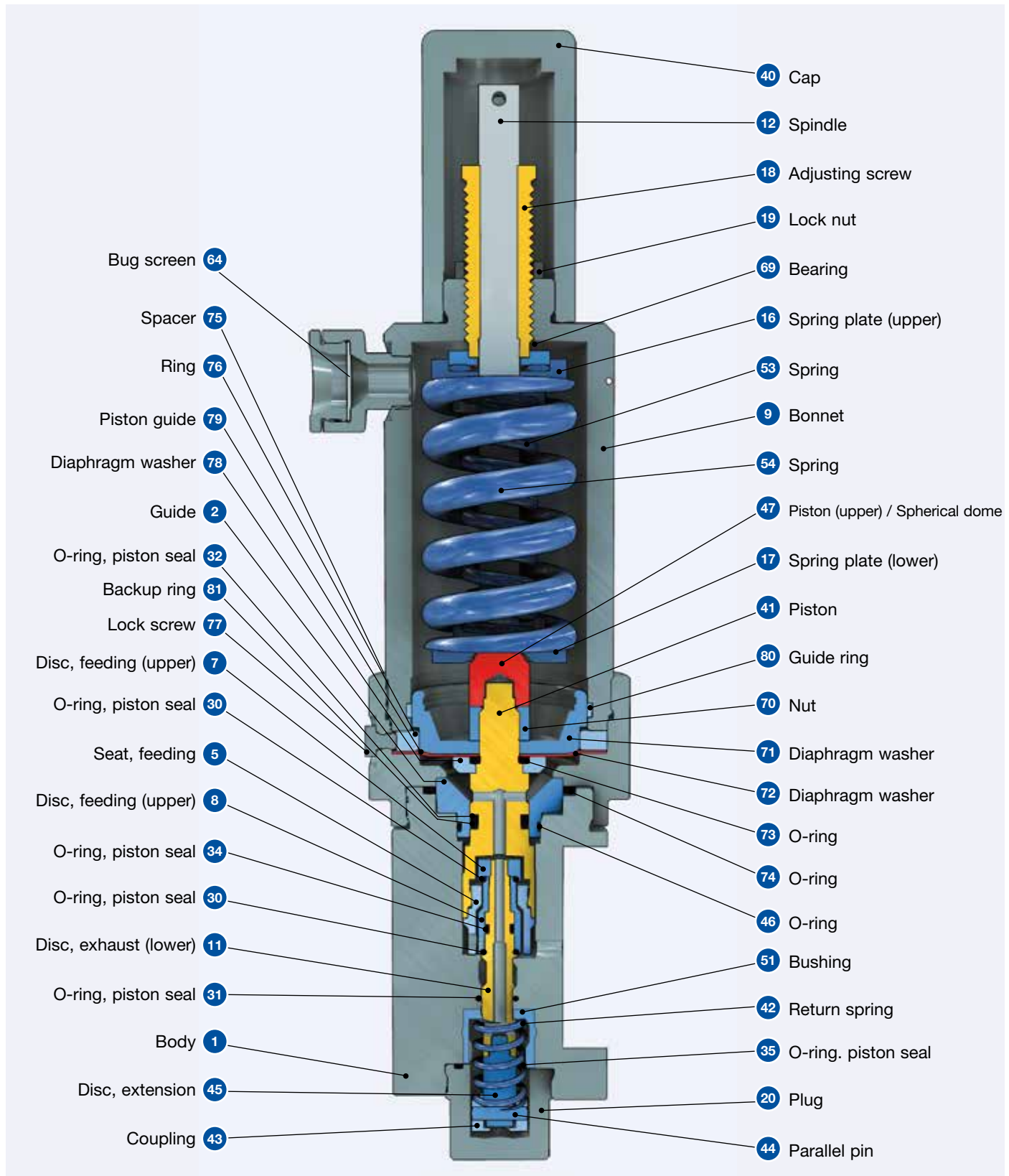
Item	Component	Standard	NACE
1	Body	1.4404	1.4404
		SA 479 316L	SA 479 316L
2	Guide	1.4404	1.4404
		316L	316L
5	Seat, feeding	1.4404	1.4404
		316L	316L
7	Disc, feeding (upper)	1.4404	1.4404
		316L	316L
8	Disc, feeding (lower)	1.4404	1.4404
		316L	316L
9	Bonnet	1.4404	1.4404
		SA 479 316L	SA 479 316L
10	Bonnet, base part	1.4404	1.4404
		SA 479 316L	SA 479 316L
11	Piston guide	1.4404	1.4404
		316L	316L
12	Adjusting screw	1.4404	1.4404
		316L	316L
13	Seat, exhaust (upper)	1.4404	1.4404
		316L	316L
14	Seat, exhaust (lower)	1.4404	1.4404
		316L	316L
15	Plunger	1.4404	1.4404
		316L	316L
16 / 17	Spring plate (upper and lower)	1.4404	1.4404
		316L	316L
18	Adjusting screw	1.4404	1.4404
		316L	316L
19	Lock nut	1.4404	1.4404
		316L	316L
20	Nut	1.4404	1.4404
		316L	316L
21	Counter nut	1.4404	1.4404
		316L	316L
26	Piston	1.4404	1.4404
		316L	316L
33	Backup ring	PTFE	PTFE
		for set pressures 151 – 256 bar only	for set pressures 151 – 256 bar only
35	Gasket	PTFE	PTFE
40	Cap	1.4404	1.4404
		316L	316L
54	Spring	1.4310	2.4669
		Stainless steel	INCONEL X750
64	Bug screen	Plastic	Plastic
		Plastic	Plastic
<b>Option code</b>			
30, 31, 32	O-ring <sup>1)</sup>	*	Viton® (FKM – Fluorocarbon)
		R05	Buna-EP® (EPDM – Ethylene-Propylene-Dine)
		R06	Kalrez® (FFKM – Perfluor)

<sup>1)</sup> For further soft seal materials refer to page 69 Extended Catalog

## High Efficiency

### Materials Series 820 – Modulate Action Pilot Valve

Below is a schematic drawing of the parts layout for the LESER Series 820 – Modulate Action pilot valve. For the related parts listing, see opposite page.



## High Efficiency Materials Series 820 – Modulate Action Pilot Valve

### Materials

Item	Component	Piston	Diaphragm
1	Body	1.4404	1.4404
		SA 479 316L	SA 479 316L
2	Guide	1.4404	1.4404
		316L	316L
5	Seat, feeding	1.4404	1.4404
		316L	316L
7	Disc, feeding (upper)	1.4404	1.4404
		316L	316L
8	Disc, feeding (lower)	1.4404	1.4404
		316L	316L
9	Bonnet	1.4404	1.4404
		SA 479 316L	SA 479 316L
11	Disc, exhaust (lower)	1.4404	1.4404
		316L	316L
12	Spindle	1.4404	1.4404
		316L	316L
16	Spring plate (upper)	1.4122	1.4122
		Stainless steel	Stainless steel
17	Spring plate (lower)	1.4122	1.4122
		Stainless steel	Stainless steel
18	Adjusting screw	1.4404	1.4404
		316L	316L
19	Lock nut	1.4404	1.4404
		316L	316L
20	Plug	1.4404	1.4404
		316L	316L
40	Cap	1.4404	1.4404
		316L	316L
41	Piston	1.4404	1.4404
		316L	316L
42	Return spring	2.4669	2.4669
		INCONEL X750	INCONEL X750
43	Coupling	1.4404	1.4404
		316L	316L
44	Parallel pin	Stainless steel	Stainless steel
		Stainless steel	Stainless steel

Item	Component	Piston	Diaphragm
45	Disc, extension	1.4404	1.4404
		316L	316L
47	Piston (upper)	1.4404	–
		316L	–
	Spherical dome	–	1.4404
51	Bushing	1.4404	1.4404
		316L	316L
54	Spring	1.4310	1.4310
		Stainless steel	Stainless steel
64	Bug screen	Plastic	Plastic
		Plastic	Plastic
69	Bearing	1.4122	1.4122
		Stainless steel	Stainless steel
70	Nut	–	1.4401
		–	Stainless steel
71	Diaphragm washer	–	1.4404
		–	316L
72	Diaphragm	–	FKM
		–	
75	Spacer	–	1.4404
		–	316L
76	Ring	–	1.4404
		–	316L
77	Lock screw	–	1.4401
		–	Stainless steel
78	Diaphragm washer	–	1.4404
		–	316L
80	Guide ring	–	1.4404
		–	316L
81	Backup ring	PTFE	–
		–	–
82	Backup ring	PTFE	–
		–	–

### Materials

Item	Component	Option code	
30, 31, 32, 34, 35, 46, 73, 74	O-ring <sup>1)</sup>	*	Viton® (FKM – Fluorocarbon)
		R05	Buna-EP® (EPDM – Ethylene-Propylene-Dine)
		R06	Kalrez® (FFKM – Perfluor)

#### Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

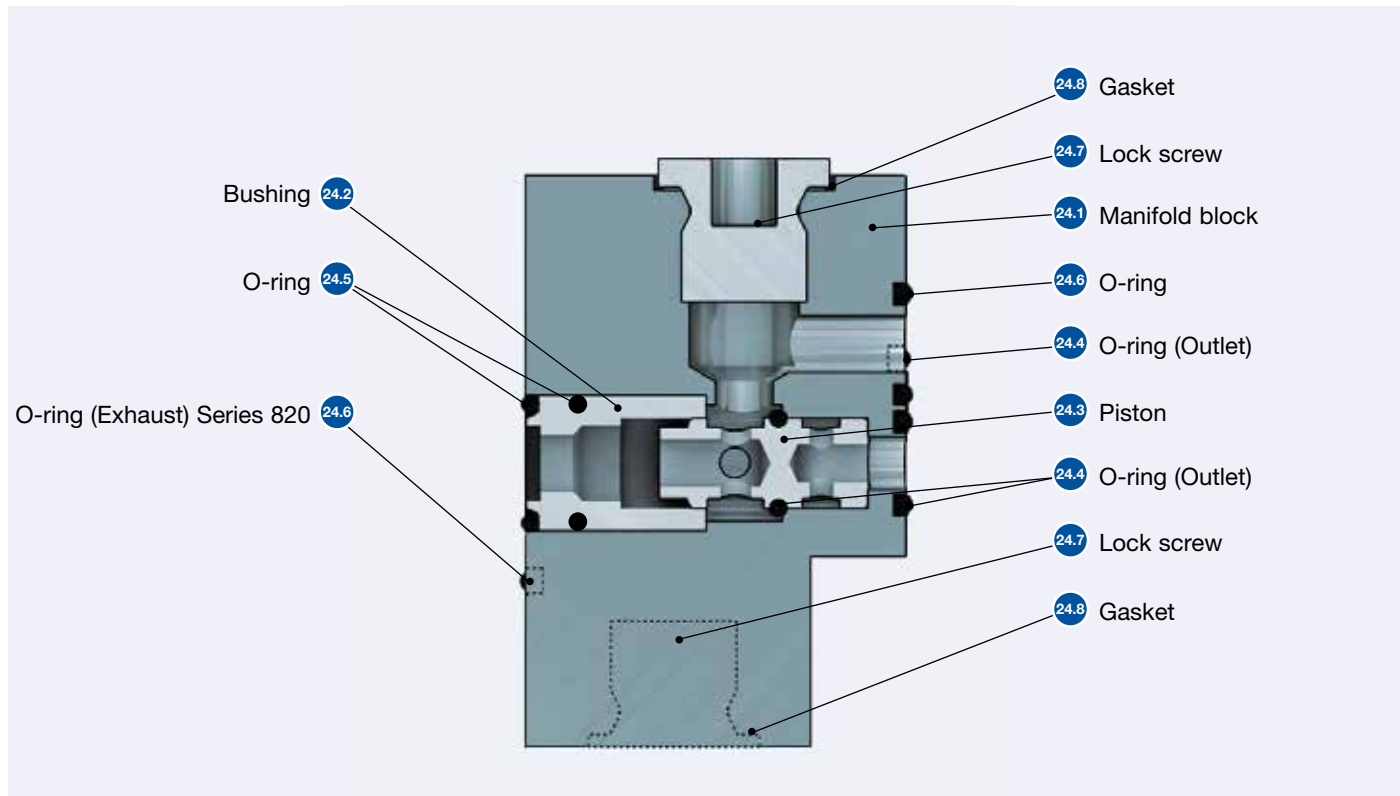
<sup>1)</sup> For further soft seal materials refer to page 69 Extended Catalog



## High Efficiency

### Materials Series 810, 820 – Manifold block

Below is a schematic drawing of the parts layout for the Manifold block.  
For the related parts listing, see opposite page.



## High Efficiency Materials Series 810, 820 – Manifold block

### Materials

Item	Component	Standard
24.1	Manifold block	1.4404
		316L
24.2	Bushing	1.4404
		316L
24.3	Piston	1.4404
		316L
24.7	Lock screw	1.4101
		Stainless steel
24.8	Gasket	1.4101
		Stainless steel
Option code		
24.4, 24.5, 24.6	O-ring <sup>1)</sup>	*
		R05
		R06
		Viton® (FKM – Fluorocarbon)
		Buna-EP® (EPDM – Ethylene-Propylene-Dine)
		Kalrez® (FFKM – Perfluor)

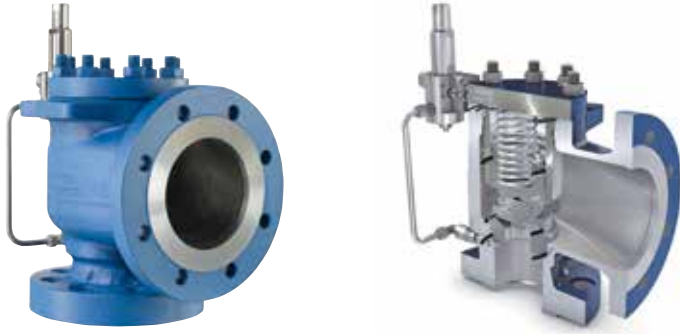
**Please notice:**

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

<sup>1)</sup> For further soft seal materials refer to page 69 Extended Catalog

## High Efficiency

### Article numbers – Series 810, Orifice D – K+



### Type 811 WCB 1.0619 – Pop Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

#### Body material: WCB 1.0619

Flange class	Art.-No.															
150 x 150	8112.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8112.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8112.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8112.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8112.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8112.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8112.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8112.															
2500 x 300	8112.	in preparation														
2500 x 600 <sup>1)</sup>	8112.															

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 810, Orifice J – T+**

Type 811 WCB 1.0619 – Pop Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

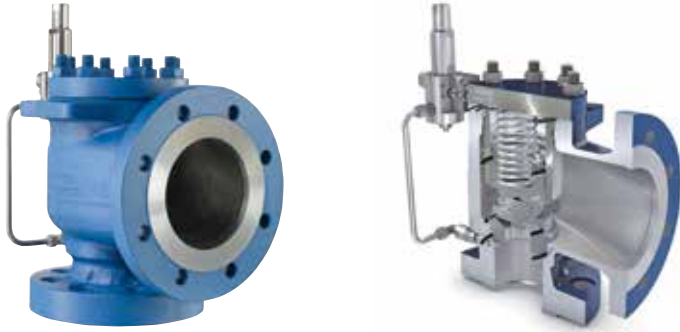
**Body material: WCB 1.0619**

Flange class	Art.-No.														
150 x 150	8112.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8112.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8112.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8112.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8112.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8112.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8112.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8112.	in preparation													
2500 x 300	8112.														
2500 x 600 <sup>1)</sup>	8112.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks

## High Efficiency

### Article numbers – Series 810, Orifice D – K+



### Type 811 CF8M 1.4408 – Pop Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

Body material: CF8M 1.4408

Flange class	Art.-No.															
150 x 150	8114.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8114.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8114.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8114.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8114.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8114.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8114.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8114.															
2500 x 300	8114.	in preparation														
2500 x 600 <sup>1)</sup>	8114.															

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 810, Orifice J – T+**

Type 811 CF8M 1.4408 – Pop Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

**Body material: CF8M 1.4408**

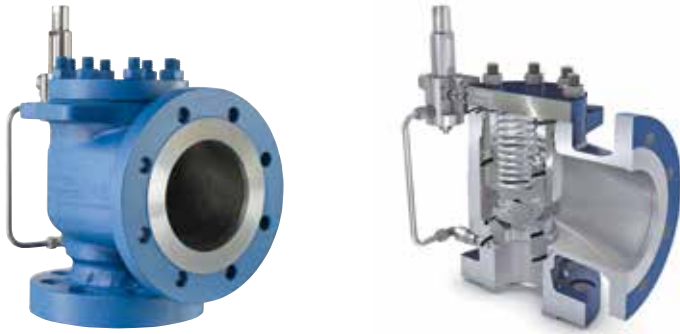
Flange class	Art.-No.														
150 x 150	8114.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8114.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8114.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8114.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8114.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8114.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8114.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8114.	in preparation													
2500 x 300	8114.														
2500 x 600 <sup>1)</sup>	8114.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks



## High Efficiency

### Article numbers – Series 810, Orifice D – K+



### Type 811 LCB – Pop Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

#### Body material: LCB

Flange class	Art.-No.															
150 x 150	8113.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8113.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8113.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8113.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8113.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8113.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8113.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8113.															
2500 x 300	8113.	in preparation														
2500 x 600 <sup>1)</sup>	8113.															

<sup>1)</sup> Flange rating class 300 and 600:

- in addition to API specification
- different center to face dimensions
- Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 810, Orifice J – T+**

Type 811 LCB – Pop Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

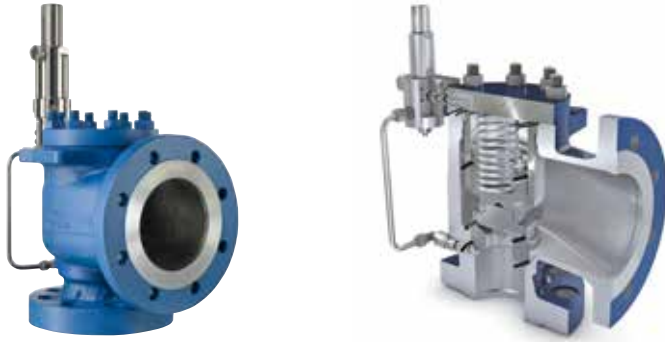
**Body material: LCB**

Flange class	Art.-No.														
150 x 150	8113.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8113.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8113.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8113.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8113.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8113.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8113.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8113.	in preparation													
2500 x 300	8113.														
2500 x 600 <sup>1)</sup>	8113.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks

## High Efficiency

### Article numbers – Series 820, Orifice D – K+



### Type 821 WCB 1.0619 – Modulate Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

#### Body material: WCB 1.0619

Flange class	Art.-No.															
150 x 150	8212.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8212.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8212.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8212.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8212.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8212.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8212.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8212.															
2500 x 300	8212.	in preparation														
2500 x 600 <sup>1)</sup>	8212.															

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 820, Orifice J – T+**

Type 821 WCB 1.0619 – Modulate Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

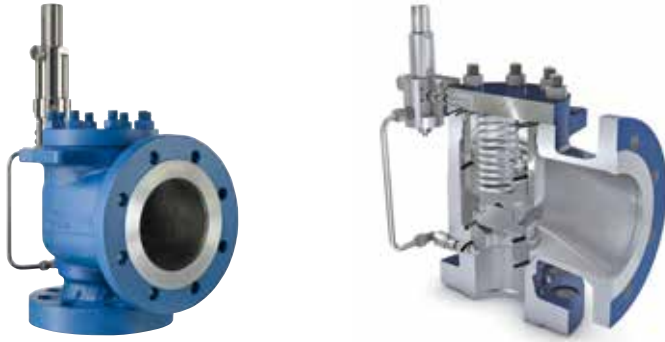
**Body material: WCB 1.0619**

Flange class	Art.-No.														
150 x 150	8212.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8212.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8212.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8212.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8212.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8212.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8212.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8212.	in preparation													
2500 x 300	8212.														
2500 x 600 <sup>1)</sup>	8212.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks

## High Efficiency

### Article numbers – Series 820, Orifice D – K+



### Type 821 CF8M 1.4408 – Modulate Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

Body material: CF8M 1.4408

Flange class	Art.-No.															
150 x 150	8214.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8214.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8214.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8214.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8214.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8214.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8214.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8214.	in preparation														
2500 x 300	8214.															
2500 x 600 <sup>1)</sup>	8214.															

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 820, Orifice J – T+**

Type 821 CF8M 1.4408 – Modulate Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

**Body material: CF8M 1.4408**

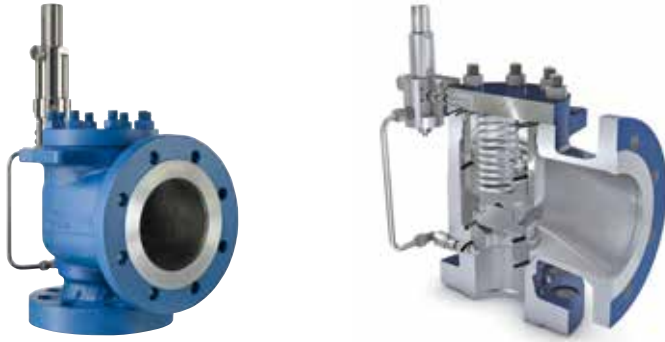
Flange class	Art.-No.														
150 x 150	8214.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8214.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8214.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8214.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8214.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8214.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8214.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8214.	in preparation													
2500 x 300	8214.														
2500 x 600 <sup>1)</sup>	8214.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks



## High Efficiency

### Article numbers – Series 820, Orifice D – K+



### Type 821 LCB – Modulate Action

Valve size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

#### Body material: LCB

Flange class	Art.-No.															
150 x 150	8213.	0010	0020	0030	1820	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
300 x 150	8213.	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
300 x 300 <sup>1)</sup>	H65 8213.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
600 x 150	8213.	0640	0650	0660	2060	0670	0680	0690	2070	0700	0710	2080	0720	0730	0740	2090
600 x 300 <sup>1)</sup>	H67 8213.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
900 x 300	8213.	1060	1070	1080		1090	1100	1110		1120	1130		1140	1150	1160	
1500 x 300	8213.	1240	1250	1260		1270	1280	1290		1300	1310		1320	1330	1340	
1500 x 600 <sup>1)</sup>	8213.															
2500 x 300	8213.	in preparation														
2500 x 600 <sup>1)</sup>	8213.															

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.

**High Efficiency**  
**Article numbers – Series 820, Orifice J – T+**

Type 821 LCB – Modulate Action

Valve size	3" x 4"				4" x 6"					6" x 8"			8" x 10"	
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T	
Extra Orifice				N+					P+			R+		T+

**Body material: LCB**

Flange class	Art.-No.														
150 x 150	8213.	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890
300 x 150	8213.	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970
300 x 300 <sup>1)</sup>	H65 8213.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
600 x 150	8213.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
600 x 300 <sup>1)</sup>	H67 8213.	1170	1180	1190		1200	1210	1220	1230		1030 <sup>2)</sup>	1040 <sup>2)</sup>		1050 <sup>2)</sup>	
900 x 300	8213.	1170	1180	1190		1200	1210	1220	1230						
1500 x 300	8213.	1350	1360	1370		1380	1390	1400	1410						
1500 x 600 <sup>1)</sup>	8213.	in preparation													
2500 x 300	8213.														
2500 x 600 <sup>1)</sup>	8213.														

<sup>1)</sup> Flange rating class 300 and 600:  
 – in addition to API specification  
 – different center to face dimensions  
 – Article number and design of higher pressure types with additional option code.  
<sup>2)</sup> Delivery time 6 – 8 weeks

## High Efficiency

### Pressure temperature ratings (ASME)

Body material: WCB

		Temperature range				
T [°C]		-29	38	93	149	204
T [°F]		-20	100	200	300	400
Inlet flange rating class						
		Pressure range [psig]				
150		285	285	260	230	200
300		740	740	680	655	635
600		1480	1480	1360	1310	1265
900		2220	2220	2035	1965	1900
1500		3705	3705	3395	3270	3170
2500		6170	6170	5655	5450	5280

Body material: CF8M

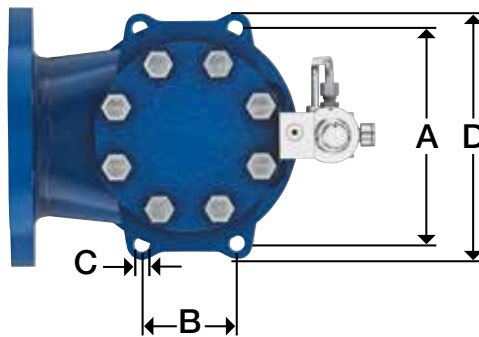
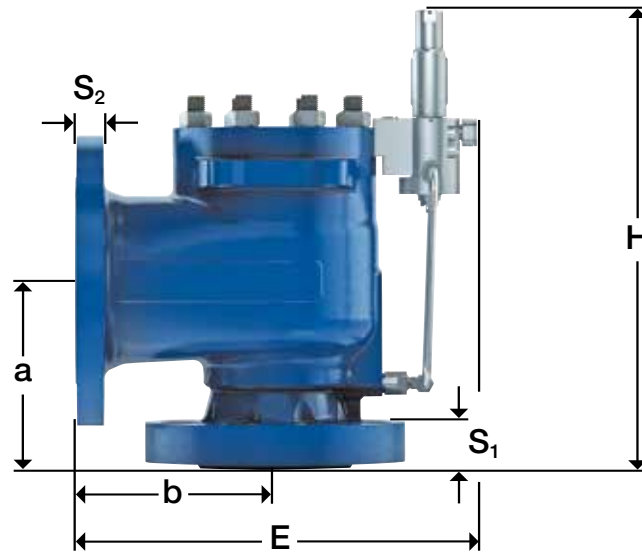
		Temperature range				
T [°C]		-29	38	93	149	204
T [°F]		-20	100	200	300	400
Inlet flange rating class						
		Pressure range [psig]				
150		275	275	235	215	195
300		720	720	620	560	515
600		1440	1440	1240	1120	1025
900		2160	2160	1860	1680	1540
1500		3600	3600	3095	2795	2570
2500		6000	6000	5160	4660	4280

Body material: LCB

		Temperature range				
T [°C]		-29	38	93	149	204
T [°F]		-20	100	200	300	400
Inlet flange rating class						
		Pressure range [psig]				
150		265	265	255	230	200
300		695	695	660	640	615
600		1395	1395	1320	1275	1230
900		2090	2090	1980	1915	1845
1500		3480	3480	3300	3190	3075
2500		5805	5805	5505	5315	5125

## High Efficiency

### Dimensions and weights – Overview



### Explanations

$d_0$  = Actual discharge diameter [mm] | [inch]  
 $A_0$  = Actual discharge area [mm<sup>2</sup>] | [inch<sup>2</sup>]  
 $a$  = Center to face [mm] | [inch]  
 $b$  = Center to face [mm] | [inch]  
 $H$  = Heights [mm] | [inch]  
 $S_1$  = Inlet flange thickness [mm] | [inch]  
 $S_2$  = Outlet flange thickness [mm] | [inch]

$A$  = Bracket [mm] | [inch]  
 $B$  = Bracket [mm] | [inch]  
 $C$  = Hole diameter [mm] | [inch]  
 $D$  = Total width [mm] | [inch]  
 $E$  = Total length [mm] | [inch]  
 $m$  = Weight [kg] | [lbs]

## High Efficiency

### Dimensions and weights – Semi nozzle

Metric units – Orifice D – K+

DN <sub>I+O</sub>	25 x 50				40 x 50				40 x 80			50 x 80			
	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
d <sub>0</sub>	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 <sub>0</sub>	95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810
<b>Flange rating class 150 x 150</b>															
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 <sub>1</sub>	20	20	20	20	31	31	31	31	31	31	31	36	36	36	36
S <sub>2</sub>	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	283	283	283	283	296	296	296	296	304	304	304	311	311	311	311
m	22,5	22,5	22,5	22,5	27	27	27	27	31	31	31	37	37	37	37
<b>Flange rating class 300 x 150</b>															
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 <sub>1</sub>	26	26	26	26	31	31	31	31	31	31	31	36	36	36	36
S <sub>2</sub>	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	283	283	283	283	296	296	296	296	304	304	304	311	311	311	311
m	19,5	19,5	19,5	19,5	24	24	24	24	28	28	28	34	34	34	34
<b>Flange rating class 300 x 300</b>															
a	125	125	125	-	149	149	149	149	162	162	-	167	167	167	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	383	383	383	-	418	418	418	418	434	434	-	449	449	449	-
H Series 820	456	456	456	-	491	491	491	491	507	507	-	522	522	522	-
S <sub>1</sub>	35	35	35	-	38	38	38	38	38	38	-	46	46	46	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	25	25	25	-	32	32	32	32	37	37	-	54	54	54	-
<b>Flange rating class 600 x 150</b>															
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 <sub>1</sub>	26	26	26	26	31	31	31	31	31	31	31	36	36	36	36
S <sub>2</sub>	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	283	283	283	283	296	296	296	296	304	304	304	311	311	311	311
m	22,5	22,5	22,5	22,5	27	27	27	27	31	31	31	37	37	37	37

## High Efficiency Dimensions and weights – Semi nozzle

Metric units – Orifice J – T+

DN I+O	80 x 100				100 x 150					150 x 200			200 x 250	
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 <sub>0</sub>	38	45	56	75	56	63	69	83	95	110	133	142	168	180
A <sub>0</sub>	1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447
<b>Flange rating class 150 x 150</b>														
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	683	683
H Series 820	554	554	554	554	607	607	607	607	607	706	706	706	809	809
S <sub>1</sub>	36	36	36	36	49	49	49	49	49	52	52	52	45	45
S <sub>2</sub>	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	370	370	370	370	432	432	432	432	432	528	528	528	561	561
m	59	59	59	59	89	89	89	89	89	195	195	195	263	263
<b>Flange rating class 300 x 150</b>														
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	683	683
H Series 820	554	554	554	554	607	607	607	607	607	706	706	706	809	809
S <sub>1</sub>	36	36	36	36	49	49	49	49	49	52	52	52	45	45
S <sub>2</sub>	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	370	370	370	370	432	432	432	432	432	528	528	528	561	561
m	59	59	59	59	89	89	89	89	89	195	195	195	263	263
<b>Flange rating class 300 x 300</b>														
a	191	191	191	-	249	249	249	249	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	496	496	496	-	567	567	567	567	-	-	-	-	-	-
H Series 820	569	569	569	-	640	640	640	640	-	-	-	-	-	-
S <sub>1</sub>	56	56	56	-	62	62	62	62	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18,0	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	89	89	89	-	132	132	132	132	-	-	-	-	-	-
<b>Flange rating class 600 x 150</b>														
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 <sub>1</sub>	42	42	42	42	49	49	49	49	49	58	58	58	66	66
S <sub>2</sub>	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	370	370	370	370	432	432	432	432	432	528	528	528	561	561
m	59	59	59	59	89	89	89	89	89	195	195	195	263	263



## High Efficiency

### Dimensions and weights – Semi nozzle

Metric units – Orifice D – K+

DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
d <sub>0</sub>	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 <sub>0</sub>	95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810
<b>Flange rating class 600 x 300</b>															
a	125	125	125	-	149	149	149	149	162	162	-	167	167	167	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	383	383	383	-	418	418	418	418	434	434	-	449	449	449	-
H Series 820	456	456	456	-	491	491	491	491	507	507	-	522	522	522	-
S <sub>1</sub>	35	35	35	-	38	38	38	38	38	38	-	46	46	46	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	25	25	25	-	32	32	32	32	37	37	-	54	54	54	-
<b>Flange rating class 900 x 300</b>															
a	125	125	125	-	149	149	149	149	162	162	-	167	167	167	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	383	383	383	-	418	418	418	418	434	434	-	449	449	449	-
H Series 820	456	456	456	-	491	491	491	491	507	507	-	522	522	522	-
S <sub>1</sub>	35	35	35	-	38	38	38	38	38	38	-	46	46	46	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	25	25	25	-	32	32	32	32	37	37	-	54	54	54	-
<b>Flange rating class 1500 x 300</b>															
a	125	125	125	-	149	149	149	149	162	162	-	167	167	167	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	383	383	383	-	418	418	418	418	434	434	-	449	449	449	-
H Series 820	456	456	456	-	491	491	491	491	507	507	-	522	522	522	-
S <sub>1</sub>	35	35	34,8	-	38	38	38	38	38	38	-	46	46	46	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195,0	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	25	25	25	-	32	32	32	32	37	37	-	54	54	54	-

## High Efficiency Dimensions and weights – Semi nozzle

Metric units – Orifice J – T+

DN I+O	80 x 100				100 x 150					150 x 200			200 x 250	
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 <sub>0</sub>	38	45	56	75	56	63	69	83	95	110	133	142	168	180
A <sub>0</sub>	1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447
<b>Flange rating class 600 x 300</b>														
a	191	191	191	-	249	249	249	249	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	496	496	496	-	567	567	567	567	-	-	-	-	-	-
H Series 820	569	569	569	-	640	640	640	640	-	-	-	-	-	-
S <sub>1</sub>	56	56	56	-	62	62	62	62	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	89	89	89	-	132	132	132	132	-	-	-	-	-	-
<b>Flange rating class 900 x 300</b>														
a	191	191	191	-	249	249	249	249	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	496	496	496	-	567	567	567	567	-	-	-	-	-	-
H Series 820	569	569	569	-	640	640	640	640	-	-	-	-	-	-
S <sub>1</sub>	56	56	56	-	62	62	62	62	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18,0	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	89	89	89	-	132	132	132	132	-	-	-	-	-	-
<b>Flange rating class 1500 x 300</b>														
a	191	191	191	-	249	249	249	249	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	496	496	496	-	567	567	567	567	-	-	-	-	-	-
H Series 820	569	569	569	-	640	640	640	640	-	-	-	-	-	-
S <sub>1</sub>	56	56	56	-	62	62	62	62	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	89	89	89	-	132	132	132	132	-	-	-	-	-	-

# High Efficiency

## Dimensions and weights – Semi nozzle

US units – Orifice D – K+

DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F	G	D	E	F	H	G	H	J	G	H	J	K+
Extra Orifice															
d <sub>0</sub>	0.433	0.579	0.724	0.906	0.433	0.579	0.724	1.142	0.929	1.157	1.406	0.929	1.157	1.496	1.890
A <sub>0</sub>	0.147	0.264	0.412	0.644	0.147	0.264	0.412	1.024	0.678	1.052	1.552	0.678	1.052	1.758	2.805
<b>Flange rating class 150 x 150</b>															
a	4 1/8	4 1/8	4 1/8	4 1/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/8	5 1/8	5 1/8	5 3/8	5 3/8	5 3/8	5 3/8
b	4 1/2	4 1/2	4 1/2	4 1/2	4 3/4	4 3/4	4 3/4	4 3/4	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8
H Series 810	13	13	13	13	14 4/32	14 4/32	14 4/32	14 4/32	14 5/8	14 5/8	14 5/8	15 6/32	15 6/32	15 6/32	15 6/32
H Series 820	18	18	18	18	19 1/8	19 1/8	19 1/8	19 1/8	19 5/8	19 5/8	19 5/8	20 6/32	20 6/32	20 6/32	20 6/32
S <sub>1</sub>	25/32	25/32	25/32	25/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 13/32	1 13/32	1 13/32	1 13/32
S <sub>2</sub>	30/32	30/32	30/32	30/32	30/32	30/32	30/32	30/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32
A	5 5/8	5 5/8	5 5/8	5 5/8	6	6	6	6	6 5/16	6 5/16	6 5/16	7 1/16	7 1/16	7 1/16	7 1/16
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16
D	7 3/16	7 3/16	7 3/16	7 3/16	7 5/16	7 5/16	7 5/16	7 5/16	7 14/16	7 14/16	7 14/16	8 4/16	8 4/16	8 4/16	8 4/16
E	11 5/32	11 5/32	11 5/32	11 5/32	11 21/32	11 21/32	11 21/32	11 21/32	11 31/32	11 31/32	11 31/32	12 1/4	12 1/4	12 1/4	12 1/4
m	49.6	49.6	49.6	49.6	59.5	59.5	59.5	59.5	68.3	68.3	68.3	81.6	81.6	81.6	81.6
<b>Flange rating class 300 x 150</b>															
a	4 3/8	4 3/8	4 3/8	4 3/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/8	5 1/8	5 1/8	5 3/8	5 3/8	5 3/8	5 3/8
b	4 1/2	4 1/2	4 1/2	4 1/2	4 3/4	4 3/4	4 3/4	4 3/4	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8
H Series 810	13 7/32	13 7/32	13 7/32	13 7/32	14 4/32	14 4/32	14 4/32	14 4/32	14 5/8	14 5/8	14 5/8	15 6/32	15 6/32	15 6/32	15 6/32
H Series 820	18 2/8	18 2/8	18 2/8	18 2/8	19 1/8	19 1/8	19 1/8	19 1/8	19 5/8	19 5/8	19 5/8	20 6/32	20 6/32	20 6/32	20 6/32
S <sub>1</sub>	1 1/32	1 1/32	1 1/32	1 1/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 13/32	1 13/32	1 13/32	1 13/32
S <sub>2</sub>	30/32	30/32	30/32	30/32	30/32	30/32	30/32	30/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32
A	5 5/8	5 5/8	5 5/8	5 5/8	6	6	6	6	6 5/16	6 5/16	6 5/16	7 1/16	7 1/16	7 1/16	7 1/16
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16
D	7 3/16	7 3/16	7 3/16	7 3/16	7 5/16	7 5/16	7 5/16	7 5/16	7 14/16	7 14/16	7 14/16	8 4/16	8 4/16	8 4/16	8 4/16
E	11 5/32	11 5/32	11 5/32	11 5/32	11 21/32	11 21/32	11 21/32	11 21/32	11 31/32	11 31/32	11 31/32	12 1/4	12 1/4	12 1/4	12 1/4
m	49.6	49.6	49.6	49.6	59.5	59.5	59.5	59.5	68.3	68.3	68.3	81.6	81.6	81.6	81.6
<b>Flange rating class 300 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	54.4	54.4	54.4	-	70.5	70.5	70.5	70.5	81.5	81.5	-	119.5	119.5	119.5	-
<b>Flange rating class 600 x 150</b>															
a	4 3/8	4 3/8	4 3/8	4 3/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/8	5 1/8	5 1/8	5 3/8	5 3/8	5 3/8	5 3/8
b	4 1/2	4 1/2	4 1/2	4 1/2	4 3/4	4 3/4	4 3/4	4 3/4	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8
H Series 810	13 7/32	13 7/32	13 7/32	13 7/32	14 4/32	14 4/32	14 4/32	14 4/32	14 5/8	14 5/8	14 5/8	15 6/32	15 6/32	15 6/32	15 6/32
H Series 820	18 2/8	18 2/8	18 2/8	18 2/8	19 1/8	19 1/8	19 1/8	19 1/8	19 5/8	19 5/8	19 5/8	20 6/32	20 6/32	20 6/32	20 6/32
S <sub>1</sub>	1 1/32	1 1/32	1 1/32	1 1/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 7/32	1 13/32	1 13/32	1 13/32	1 13/32
S <sub>2</sub>	30/32	30/32	30/32	30/32	30/32	30/32	30/32	30/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32	1 5/32
A	5 5/8	5 5/8	5 5/8	5 5/8	6	6	6	6	6 5/16	6 5/16	6 5/16	7 1/16	7 1/16	7 1/16	7 1/16
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16
D	7 3/16	7 3/16	7 3/16	7 3/16	7 5/16	7 5/16	7 5/16	7 5/16	7 14/16	7 14/16	7 14/16	8 4/16	8 4/16	8 4/16	8 4/16
E	11 5/32	11 5/32	11 5/32	11 5/32	11 21/32	11 21/32	11 21/32	11 21/32	11 31/32	11 31/32	11 31/32	12 1/4	12 1/4	12 1/4	12 1/4
m	49.6	49.6	49.6	49.6	59.5	59.5	59.5	59.5	68.3	68.3	68.3	81.6	81.6	81.6	81.6

## High Efficiency Dimensions and weights – Semi nozzle

US units – Orifice J – T+

DN I+O	80 x 100				100 x 150				150 x 200			200 x 250		
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 <sub>0</sub>	1.496	1.772	2.205	2.953	2.205	2.480	2.717	3.268	3.740	4.331	5.236	5.591	6.614	7.087
A <sub>0</sub>	1.758	2.465	3.818	6.848	3.818	4.832	5.796	8.386	10.987	14.730	21.534	24.547	34.359	39.443
<b>Flange rating class 150 x 150</b>														
a	6 1/8	6 1/8	6 1/8	6 1/8	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	9 7/16	9 7/16	9 7/16	10 7/8	10 7/8
b	6 3/8	6 3/8	6 3/8	6 3/8	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	9 1/2	9 1/2	9 1/2	11	11
H Series 810	16 27/32	16 27/32	16 27/32	16 27/32	18 15/16	18 15/16	18 15/16	18 15/16	18 15/16	22 27/32	22 27/32	22 27/32	26 2/8	26 2/8
H Series 820	21 14/16	21 14/16	21 14/16	21 14/16	23 15/16	23 15/16	23 15/16	23 15/16	23 15/16	27 13/16	27 13/16	27 13/16	31 5/16	31 5/16
S <sub>1</sub>	1 7/16	1 7/16	1 7/16	1 7/16	1 15/16	1 15/16	1 15/16	1 15/16	1 15/16	2 2/32	2 2/32	2 2/32	1 12/16	1 12/16
S <sub>2</sub>	1 2/16	1 2/16	1 2/16	1 2/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 27/32	1 27/32	1 27/32	1 6/16	1 6/16
A	8 25/32	8 25/32	8 25/32	8 25/32	9 13/16	9 13/16	9 13/16	9 13/16	9 13/16	12 19/32	12 19/32	12 19/32	14 1/32	14 1/32
B	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	6 5/16	6 5/16	6 5/16	6 5/16	6 5/16
C	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32
D	10 6/32	10 6/32	10 6/32	10 6/32	12	12	12	12	12	15	15	15	16 30/32	16 30/32
E	14 9/16	14 9/16	14 9/16	14 9/16	17	17	17	17	17	20 25/32	20 25/32	20 25/32	22 3/32	22 3/32
m	130.1	130.1	130.1	130.1	196.2	196.2	196.2	196.2	196.2	429.9	429.9	429.9	579.8	579.8
<b>Flange rating class 300 x 150</b>														
a	6 1/8	6 1/8	6 1/8	6 1/8	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	9 7/16	9 7/16	9 7/16	10 7/8	10 7/8
b	6 3/8	6 3/8	6 3/8	6 3/8	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	9 1/2	9 1/2	9 1/2	11	11
H Series 810	16 27/32	16 27/32	16 27/32	16 27/32	18 15/16	18 15/16	18 15/16	18 15/16	18 15/16	22 27/32	22 27/32	22 27/32	26 7/8	26 7/8
H Series 820	21 14/16	21 14/16	21 14/16	21 14/16	23 15/16	23 15/16	23 15/16	23 15/16	23 15/16	27 13/16	27 13/16	27 13/16	31 14/16	31 14/16
S <sub>1</sub>	1 7/16	1 7/16	1 7/16	1 7/16	1 15/16	1 15/16	1 15/16	1 15/16	1 15/16	2 2/32	2 2/32	2 2/32	1 12/16	1 12/16
S <sub>2</sub>	1 2/16	1 2/16	1 2/16	1 2/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 27/32	1 27/32	1 27/32	1 6/16	1 6/16
A	8 25/32	8 25/32	8 25/32	8 25/32	9 13/16	9 13/16	9 13/16	9 13/16	9 13/16	12 19/32	12 19/32	12 19/32	14 1/32	14 1/32
B	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	6 5/16	6 5/16	6 5/16	6 5/16	6 5/16
C	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32
D	10 6/32	10 6/32	10 6/32	10 6/32	12	12	12	12	12	15	15	15	16 30/32	16 30/32
E	14 9/16	14 9/16	14 9/16	14 9/16	17	17	17	17	17	20 25/32	20 25/32	20 25/32	22 3/32	22 3/32
m	130.1	130.1	130.1	130.1	196.2	196.2	196.2	196.2	196.2	429.9	429.9	429.9	579.8	579.8
<b>Flange rating class 300 x 300</b>														
a	7 1/2	7 1/2	7 1/2	-	9 4/5	9 4/5	9 4/5	9 4/5	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	19 1/2	19 1/2	19 1/2	-	22 1/3	22 1/3	22 1/3	22 1/3	-	-	-	-	-	-
H Series 820	22 2/5	22 2/5	22 2/5	-	25 1/5	25 1/5	25 1/5	25 1/5	-	-	-	-	-	-
S <sub>1</sub>	2 1/5	2 1/5	2 1/5	-	2 3/7	2 3/7	2 3/7	2 3/7	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	195.7	195.7	195.7	-	290.9	290.9	290.9	290.9	-	-	-	-	-	-
<b>Flange rating class 600 x 150</b>														
a	6 3/8	6 3/8	6 3/8	6 3/8	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	9 11/16	9 11/16	9 11/16	11 11/16	11 11/16
b	6 3/8	6 3/8	6 3/8	6 3/8	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	9 1/2	9 1/2	9 1/2	11	11
H Series 810	17 3/32	17 3/32	17 3/32	17 3/32	18 15/16	18 15/16	18 15/16	18 15/16	18 15/16	23 2/32	23 2/32	23 2/32	27 1/8	27 1/8
H Series 820	22 1/16	22 1/16	22 1/16	22 1/16	23 15/16	23 15/16	23 15/16	23 15/16	23 15/16	28 1/16	28 1/16	28 1/16	32 2/16	32 2/16
S <sub>1</sub>	1 10/16	1 10/16	1 10/16	1 10/16	1 15/16	1 15/16	1 15/16	1 15/16	1 15/16	2 9/32	2 9/32	2 9/32	2 10/16	2 10/16
S <sub>2</sub>	1 2/16	1 2/16	1 2/16	1 2/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 27/32	1 27/32	1 27/32	1 6/16	1 6/16
A	8 25/32	8 25/32	8 25/32	8 25/32	9 13/16	9 13/16	9 13/16	9 13/16	9 13/16	12 19/32	12 19/32	12 19/32	14 1/32	14 1/32
B	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	6 5/16	6 5/16	6 5/16	6 5/16	6 5/16
C	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32	23/32
D	10 6/32	10 6/32	10 6/32	10 6/32	12	12	12	12	12	15	15	15	16 30/32	16 30/32
E	14 9/16	14 9/16	14 9/16	14 9/16	17	17	17	17	17	20 25/32	20 25/32	20 25/32	22 3/32	22 3/32
m	130.1	130.1	130.1	130.1	196.2	196.2	196.2	196.2	196.2	429.9	429.9	429.9	579.8	579.8

# High Efficiency

## Dimensions and weights – Semi nozzle

US units – Orifice D – K+

DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
d <sub>0</sub>	0.433	0.579	0.724	0.906	0.433	0.579	0.724	1.142	0.929	1.157	1.406	0.929	1.157	1.496	1.890
A <sub>0</sub>	0.147	0.264	0.412	0.644	0.147	0.264	0.412	1.024	0.678	1.052	1.552	0.678	1.052	1.758	2.805
<b>Flange rating class 600 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	54.4	54.4	54.4	-	70.5	70.5	70.5	70.5	81.5	81.5	-	119.5	119.5	119.5	-
<b>Flange rating class 900 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	54.4	54.4	54.4	-	70.5	70.5	70.5	70.5	81.5	81.5	-	119.5	119.5	119.5	-
<b>Flange rating class 1500 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	54.4	54.4	54.4	-	70.5	70.5	70.5	70.5	81.5	81.5	-	119.5	119.5	119.5	-

## High Efficiency Dimensions and weights – Semi nozzle

US units – Orifice J – T+

DN I+O	80 x 100				100 x 150					150 x 200			200 x 250	
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 <sub>0</sub>	1.496	1.772	2.205	2.953	2.205	2.480	2.717	3.268	3.740	4.331	5.236	5.591	6.614	7.087
A <sub>0</sub>	1.758	2.465	3.818	6.848	3.818	4.832	5.796	8.386	10.987	14.730	21.534	24.547	34.359	39.443
<b>Flange rating class 600 x 300</b>														
a	7 1/2	7 1/2	7 1/2	-	9 4/5	9 4/5	9 4/5	9 4/5	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	19 1/2	19 1/2	19 1/2	-	22 1/3	22 1/3	22 1/3	22 1/3	-	-	-	-	-	-
H Series 820	22 2/5	22 2/5	22 2/5	-	25 1/5	25 1/5	25 1/5	25 1/5	-	-	-	-	-	-
S <sub>1</sub>	2 1/5	2 1/5	2 1/5	-	2 3/7	2 3/7	2 3/7	2 3/7	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	195.7	195.7	195.7	-	290.9	290.9	290.9	290.9	-	-	-	-	-	-
<b>Flange rating class 900 x 300</b>														
a	7 1/2	7 1/2	7 1/2	-	9 4/5	9 4/5	9 4/5	9 4/5	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	19 1/2	19 1/2	19 1/2	-	22 1/3	22 1/3	22 1/3	22 1/3	-	-	-	-	-	-
H Series 820	22 2/5	22 2/5	22 2/5	-	25 1/5	25 1/5	25 1/5	25 1/5	-	-	-	-	-	-
S <sub>1</sub>	2 1/5	2 1/5	2 1/5	-	2 3/7	2 3/7	2 3/7	2 3/7	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	195.7	195.7	195.7	-	290.9	290.9	290.9	290.9	-	-	-	-	-	-
<b>Flange rating class 1500 x 300</b>														
a	7 1/2	7 1/2	7 1/2	-	9 4/5	9 4/5	9 4/5	9 4/5	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	19 1/2	19 1/2	19 1/2	-	22 1/3	22 1/3	22 1/3	22 1/3	-	-	-	-	-	-
H Series 820	22 2/5	22 2/5	22 2/5	-	25 1/5	25 1/5	25 1/5	25 1/5	-	-	-	-	-	-
S <sub>1</sub>	2 1/5	2 1/5	2 1/5	-	2 3/7	2 3/7	2 3/7	2 3/7	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	195.7	195.7	195.7	-	290.9	290.9	290.9	290.9	-	-	-	-	-	-

## High Efficiency

### Dimensions and weights – Full nozzle

Metric units – Orifice D – K+

DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
d <sub>0</sub>	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 <sub>0</sub>	95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810
<b>Flange rating class 300 x 300</b>															
a	159	159	159	-	183	183	183	183	196	196	-	200	200	200	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	416	416	416	-	451	451	451	451	468	468	-	483	483	483	-
H Series 820	489	489	489	-	524	524	524	524	541	541	-	556	556	556	-
S <sub>1</sub>	69	69	69	-	72	72	72	72	72	72	-	80	80	80	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	26	26	26	-	33	33	33	33	41	41	-	58	58	58	-
<b>Flange rating class 600 x 300</b>															
a	159	159	159	-	183	183	183	183	196	196	-	200	200	200	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	416	416	416	-	451	451	451	451	468	468	-	483	483	483	-
H Series 820	489	489	489	-	524	524	524	524	541	541	-	556	556	556	-
S <sub>1</sub>	69	69	69	-	72	72	72	72	72	72	-	80	80	80	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	26	26	26	-	33	33	33	33	41	41	-	58	58	58	-
<b>Flange rating class 900 x 300</b>															
a	159	159	159	-	183	183	183	183	196	196	-	200	200	200	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	416	416	416	-	451	451	451	451	468	468	-	483	483	483	-
H Series 820	489	489	489	-	524	524	524	524	541	541	-	556	556	556	-
S <sub>1</sub>	69	69	69	-	72	72	72	72	72	72	-	80	80	80	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	26	26	26	-	33	33	33	33	41	41	-	58	58	58	-
<b>Flange rating class 1500 x 300</b>															
a	159	159	159	-	183	183	183	183	196	196	-	200	200	200	-
b	121	121	121	-	140	140	140	140	172	172	-	172	172	172	-
H Series 810	416	416	416	-	451	451	451	451	468	468	-	483	483	483	-
H Series 820	489	489	489	-	524	524	524	524	541	541	-	556	556	556	-
S <sub>1</sub>	69	69	69	-	72	72	72	72	72	72	-	80	80	80	-
S <sub>2</sub>	27	27	27	-	29	29	29	29	35	35	-	35	35	35	-
A	153	153	153	-	165	165	165	165	173	173	-	207	207	207	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	14	14	14	-	14	14	14	14	14	14	-	14	14	14	-
D	183	183	183	-	195	195	195	195	203	203	-	237	237	237	-
E	296	296	296	-	320	320	320	320	357	357	-	374	374	374	-
m	26	26	26	-	33	33	33	33	41	41	-	58	58	58	-



## High Efficiency Dimensions and weights – Full nozzle

Metric units – Orifice J – T+

DN I+O	80 x 100				100 x 150					150 x 200			200 x 250	
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 <sub>0</sub>	38	45	56	75	56	63	69	83	95	110	133	142	168	180
A <sub>0</sub>	1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447
<b>Flange rating class 300 x 300</b>														
a	224	224	224	-	283	283	283	283	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	530	530	530	-	600	600	600	600	-	-	-	-	-	-
H Series 820	603	603	603	-	673	673	673	673	-	-	-	-	-	-
S <sub>1</sub>	89	89	89	-	95	95	95	95	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	95	95	95	-	140	140	140	140	-	-	-	-	-	-
<b>Flange rating class 600 x 300</b>														
a	224	224	224	-	283	283	283	283	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	530	530	530	-	600	600	600	600	-	-	-	-	-	-
H Series 820	603	603	603	-	673	673	673	673	-	-	-	-	-	-
S <sub>1</sub>	89	89	89	-	95	95	95	95	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	95	95	95	-	140	140	140	140	-	-	-	-	-	-
<b>Flange rating class 900 x 300</b>														
a	224	224	224	-	283	283	283	283	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	530	530	530	-	600	600	600	600	-	-	-	-	-	-
H Series 820	603	603	603	-	673	673	673	673	-	-	-	-	-	-
S <sub>1</sub>	89	89	89	-	95	95	95	95	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	95	95	95	-	140	140	140	140	-	-	-	-	-	-
<b>Flange rating class 1500 x 300</b>														
a	224	224	224	-	283	283	283	283	-	-	-	-	-	-
b	181	181	181	-	233	233	233	233	-	-	-	-	-	-
H Series 810	530	530	530	-	600	600	600	600	-	-	-	-	-	-
H Series 820	603	603	603	-	673	673	673	673	-	-	-	-	-	-
S <sub>1</sub>	89	89	89	-	95	95	95	95	-	-	-	-	-	-
S <sub>2</sub>	36	36	36	-	43	43	43	43	-	-	-	-	-	-
A	242	242	242	-	265	265	265	265	-	-	-	-	-	-
B	110	110	110	-	110	110	110	110	-	-	-	-	-	-
C	18	18	18	-	18	18	18	18	-	-	-	-	-	-
D	278	278	278	-	304	304	304	304	-	-	-	-	-	-
E	402	402	402	-	466	466	466	466	-	-	-	-	-	-
m	95	95	95	-	140	140	140	140	-	-	-	-	-	-

# High Efficiency

## Dimensions and weights – Full nozzle

US units – Orifice D – K+

DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Orifice	D	E	F	G	D	E	F	H	G	H	J	G	H	J	K+
Extra Orifice				G				H			J				K+
d <sub>0</sub>	0.433	0.579	0.724	0.906	0.433	0.579	0.724	1.142	0.929	1.157	1.406	0.929	1.157	1.496	1.890
A <sub>0</sub>	0.147	0.264	0.412	0.644	0.147	0.264	0.412	1.024	0.678	1.052	1.552	0.678	1.052	1.758	2.805
<b>Flange rating class 300 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	57	57	57	-	73	73	73	73	90	90	-	126	126	126	-
<b>Flange rating class 600 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	57	57	57	-	73	73	73	73	90	90	-	126	126	126	-
<b>Flange rating class 900 x 300</b>															
a	5	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	57	57	57	-	73	73	73	73	90	90	-	126	126	126	-
<b>Flange rating class 1500 x 300</b>															
a	3 1/7	5	5	-	5 7/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	-	6 4/7	6 4/7	6 4/7	-
b	4 3/4	4 3/4	4 3/4	-	5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	6 3/4	-	6 3/4	6 3/4	6 3/4	-
H Series 810	15	15	15	-	16 1/2	16 1/2	16 1/2	16 1/2	17	17	-	17 2/3	17 2/3	17 2/3	-
H Series 820	18	18	18	-	19 1/3	19 1/3	19 1/3	19 1/3	20	20	-	20 5/9	20 5/9	20 5/9	-
S <sub>1</sub>	1 3/8	1 3/8	1 3/8	-	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	-	1 4/5	1 4/5	1 4/5	-
S <sub>2</sub>	1	1	1	-	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	-	1 3/8	1 3/8	1 3/8	-
A	6	6	6	-	6 1/2	6 1/2	6 1/2	6 1/2	6 4/5	6 4/5	-	8 1/7	8 1/7	8 1/7	-
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	5/9	5/9	5/9	-	5/9	5/9	5/9	5/9	5/9	5/9	-	5/9	5/9	5/9	-
D	7 1/5	7 1/5	7 1/5	-	7 2/3	7 2/3	7 2/3	7 2/3	8	8	-	9 1/3	9 1/3	9 1/3	-
E	11 2/3	11 2/3	11 2/3	-	12 3/5	12 3/5	12 3/5	12 3/5	14	14	-	14 5/7	14 5/7	14 5/7	-
m	57	57	57	-	73	73	73	73	90	90	-	126	126	126	-

**High Efficiency**

**Dimensions and weights – Full nozzle**

US units – Orifice J – T+

DN I+O	80 x 100				100 x 150					150 x 200			200 x 250	
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 <sub>0</sub>	1.496	1.772	2.205	2.953	2.205	2.480	2.717	3.268	3.740	4.331	5.236	5.591	6.614	7.087
A <sub>0</sub>	1.758	2.465	3.818	6.848	3.818	4.832	5.796	8.386	10.987	14.730	21.534	24.547	34.359	39.443
<b>Flange rating class 300 x 300</b>														
a	8 5/6	8 5/6	8 5/6	-	11 1/7	11 1/7	11 1/7	11 1/7	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	20 6/7	20 6/7	20 6/7	-	23 5/8	23 5/8	23 5/8	23 5/8	-	-	-	-	-	-
H Series 820	23 3/4	23 3/4	23 3/4	-	26 1/2	26 1/2	26 1/2	26 1/2	-	-	-	-	-	-
S <sub>1</sub>	3 1/2	3 1/2	3 1/2	-	3 3/4	3 3/4	3 3/4	3 3/4	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	206	206	206	-	304	304	304	304	-	-	-	-	-	-
<b>Flange rating class 600 x 300</b>														
a	8 5/6	8 5/6	8 5/6	-	11 1/7	11 1/7	11 1/7	11 1/7	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	20 6/7	20 6/7	20 6/7	-	23 5/8	23 5/8	23 5/8	23 5/8	-	-	-	-	-	-
H Series 820	23 3/4	23 3/4	23 3/4	-	26 1/2	26 1/2	26 1/2	26 1/2	-	-	-	-	-	-
S <sub>1</sub>	3 1/2	3 1/2	3 1/2	-	3 3/4	3 3/4	3 3/4	3 3/4	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	206	206	206	-	304	304	304	304	-	-	-	-	-	-
<b>Flange rating class 900 x 300</b>														
a	8 5/6	8 5/6	8 5/6	-	11 1/7	11 1/7	11 1/7	11 1/7	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	20 6/7	20 6/7	20 6/7	-	23 5/8	23 5/8	23 5/8	23 5/8	-	-	-	-	-	-
H Series 820	23 3/4	23 3/4	23 3/4	-	26 1/2	26 1/2	26 1/2	26 1/2	-	-	-	-	-	-
S <sub>1</sub>	3 1/2	3 1/2	3 1/2	-	3 3/4	3 3/4	3 3/4	3 3/4	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	206	206	206	-	304	304	304	304	-	-	-	-	-	-
<b>Flange rating class 1500 x 300</b>														
a	8 5/6	8 5/6	8 5/6	-	11 1/7	11 1/7	11 1/7	11 1/7	-	-	-	-	-	-
b	7 1/8	7 1/8	7 1/8	-	9 1/5	9 1/5	9 1/5	9 1/5	-	-	-	-	-	-
H Series 810	20 6/7	20 6/7	20 6/7	-	23 5/8	23 5/8	23 5/8	23 5/8	-	-	-	-	-	-
H Series 820	23 3/4	23 3/4	23 3/4	-	26 1/2	26 1/2	26 1/2	26 1/2	-	-	-	-	-	-
S <sub>1</sub>	3 1/2	3 1/2	3 1/2	-	3 3/4	3 3/4	3 3/4	3 3/4	-	-	-	-	-	-
S <sub>2</sub>	1 3/7	1 3/7	1 3/7	-	1 2/3	1 2/3	1 2/3	1 2/3	-	-	-	-	-	-
A	9 1/2	9 1/2	9 1/2	-	10 3/7	10 3/7	10 3/7	10 3/7	-	-	-	-	-	-
B	4 1/3	4 1/3	4 1/3	-	4 1/3	4 1/3	4 1/3	4 1/3	-	-	-	-	-	-
C	5/7	5/7	5/7	-	5/7	5/7	5/7	5/7	-	-	-	-	-	-
D	11	11	11	-	12	12	12	12	-	-	-	-	-	-
E	15 5/6	15 5/6	15 5/6	-	18 1/3	18 1/3	18 1/3	18 1/3	-	-	-	-	-	-
m	206	206	206	-	304	304	304	304	-	-	-	-	-	-

## High Efficiency

### Screw Dimensions acc. to DIN EN 1092-1

The flange thickness of the inlet and outlet flanges of the Pilot Operated Safety Valve (POSV) may differ from the standard. Therefore stud-bolts for the flange connections may also be longer than stated in DIN EN 1092-1. To simplify the calculation of the correct bolt length, the

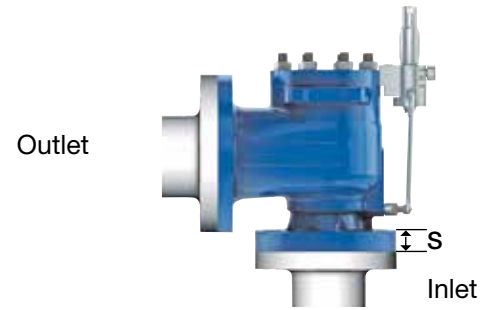
quantity and sizes of the stud-bolts and nuts for the inlet and outlet flange connections are given below. The listed screw dimensions are rounded to standard dimensions. The connection flanges are based on the DIN EN 1092-1 standard.

#### Metric units – Orifice D – K+

		DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
		Size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"			
API Standard orifice acc. to API 526		D	E	F		D	E	F		G	H	J	G	H	J		
Extra Orifice					G				H			J				K+	
d <sub>0</sub> [mm]		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 <sub>0</sub> [mm²]		95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810	
Flange Class 150 x 150																	
Inlet	Qty	Hexagon screws		PN 10	4	4	4	4	4	4	4	4	4	4	4	4	
		Nuts			4	4	4	4	4	4	4	4	4	4	4	4	4
	Hexagon screw diameter nut size [mm]		PN 16	M12	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		65	65	65	65	80	80	80	80	80	80	85	85	85	
Outlet		Qty	Hexagon screws		PN 10	4	4	4	4	4	4	4	8	8	8	8	
	Nuts		4	4		4	4	4	4	4	8	8	8	8	8	8	
	Hexagon screw diameter nut size [mm]		PN 16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		75	75	75	75	75	75	75	75	80	80	80	80	80	
Flange class 300 x 150																	
Inlet	Qty	Hexagon screws		PN 25	4	4	4	4	4	4	4	4	4	4	4	4	
		Nuts			4	4	4	4	4	4	4	4	4	4	4	4	4
	Hexagon screw diameter nut size [mm]		PN 40	M12	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		65	65	65	65	80	80	80	80	80	80	85	85	85	
Outlet		Qty	Hexagon screws		PN 10	4	4	4	4	4	4	4	8	8	8	8	
	Nuts		4	4		4	4	4	4	4	8	8	8	8	8	8	
	Hexagon screw diameter nut size [mm]		PN 16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		75	75	75	75	75	75	75	75	80	80	80	80	80	
Flange class 600 x 150																	
Inlet	Qty	Hexagon screws		PN 10	4	4	4	4	4	4	4	4	4	4	4	4	
		Nuts			4	4	4	4	4	4	4	4	4	4	4	4	4
	Hexagon screw diameter nut size [mm]		PN 16	M12	M12	M16	M16	M16	M16	M16	M16	M20	M20	M20	M20	M20	
	Screw dim	Raised face flange type [mm]		65	65	80	80	80	80	80	80	100	100	100	100	110	
Outlet		Qty	Hexagon screws		PN 10	4	4	4	4	4	4	8	8	8	8	8	
	Nuts		4	4		4	4	4	4	8	8	8	8	8	8	8	
	Hexagon screw diameter nut size [mm]		PN 16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		75	75	75	75	75	75	80	80	80	80	80	80	80	

Please note: For full nozzle design the screw lengths needs to be 30 mm longer.

**High Efficiency**  
**Screw Dimensions acc. to DIN EN 1092-1**



Metric units – Orifice J – T+

		DN I+O	80 x 100				100 x 150				150 x 200			200 x 250			
		Size	3" x 4"				4" x 6"				6" x 8"			8" x 10"			
API Standard orifice acc. to API 526		J	K	L		L	M	N	P		Q	R		T			
Extra Orifice					N+					P+			R+		T+		
d <sub>0</sub> [mm]		38	45	56	75	56	63	69	83	95	110	133	142	168	180		
A <sub>0</sub> [mm <sup>2</sup> ]		1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447		
Flange Class 150 x 150																	
Inlet	Qty	Hexagon screws		PN 10	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		PN 16	8	8	8	8	8	8	8	8	8	8	8	12	12
	Hexagon screw diameter nut size [mm]		PN 10	M16	M16	M16	M16	M16	M16	M16	M16	M16	M20	M20	M20	M20	M20
Outlet	Qty	Hexagon screws		PN 10	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		PN 16	8	8	8	8	8	8	8	8	8	8	8	12	12
	Hexagon screw diameter nut size [mm]		PN 10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M20	M20	M20	M20
Screw dim	Raised face flange type [mm]	PN 10		90	90	90	90	100	100	100	100	100	120	120	120	130	130
		PN 16		90	90	90	90	100	100	100	100	100	120	120	120	130	130
		PN 16		90	90	90	90	100	100	100	100	100	120	120	120	130	130
Inlet	Qty	Hexagon screws		PN 25	8	8	8	8	8	8	8	8	8	8	8	12	12
		Nuts		PN 40	8	8	8	8	8	8	8	8	8	8	8	8	12
	Hexagon screw diameter nut size [mm]		PN 25	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M24	M24
Outlet	Qty	Hexagon screws		PN 10	8	8	8	8	8	8	8	8	8	8	8	8	
		Nuts		PN 16	8	8	8	8	8	8	8	8	8	8	8	8	8
	Hexagon screw diameter nut size [mm]		PN 10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M20	M20	M20	M20
Screw dim	Raised face flange type [mm]	PN 25		95	95	95	95	110	110	110	110	110	130	130	130	140	140
		PN 40		95	95	95	95	110	110	110	110	110	130	130	130	150	150
		PN 16		90	90	90	90	100	100	100	100	100	120	120	120	130	130
Inlet	Qty	Hexagon screws		PN 10	8	8	8	8	8	8	8	8	8	8	8	12	12
		Nuts		PN 16	8	8	8	8	8	8	8	8	8	8	8	8	12
	Hexagon screw diameter nut size [mm]		PN 10	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M20	M20
Outlet	Qty	Hexagon screws		PN 10	8	8	8	8	8	8	8	8	8	8	8	12	12
		Nuts		PN 16	8	8	8	8	8	8	8	8	8	8	8	8	12
	Hexagon screw diameter nut size [mm]		PN 10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M20	M20	M20	M20
Screw dim	Raised face flange type [mm]	PN 10		90	90	90	90	100	100	100	100	100	120	120	120	130	130
		PN 16		90	90	90	90	100	100	100	100	100	120	120	120	130	130
		PN 16		90	90	90	90	100	100	100	100	100	120	120	120	130	130

Please note: For full nozzle design the screw lengths needs to be 30 mm longer.

## High Efficiency

### Screw Dimensions acc. to DIN EN 1092-1

Metric units – Orifice D – K+

		DN I+O	25 x 50				40 x 50				40 x 80			50 x 80				
		Size	1" x 2"				1½" x 2"				1½" x 3"			2" x 3"				
API Standard orifice acc. to API 526		D	E	F		D	E	F		G	H		G	H	J			
Extra Orifice					G				H			J				K+		
d <sub>0</sub> [mm]		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 <sub>0</sub> [mm <sup>2</sup> ]		95	170	266	415	95	170	266	661	437	679	1001	437	679	1134	1810		
Flange Class 900 x 300																		
Inlet	Qty	Hexagon screws		4				4				4			4			
		Nuts		4				4				4			4			
	Hexagon screw diameter nut size [mm]		PN 40		M12	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		80				90				90			100			
Hexagon screws		4				4				4			4					
Inlet	Qty	Hexagon screws		4				4				4			4			
		Nuts		4				4				4			4			
	Hexagon screw diameter nut size [mm]		PN 63		M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M20	M20	M20	
	Screw dim	Raised face flange type [mm]		90				100				100			110			
Hexagon screws		4				4				4			4					
Inlet	Qty	Hexagon screws		4				4				4			4			
		Nuts		4				4				4			4			
	Hexagon screw diameter nut size [mm]		PN 100		M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M24	M24	M24	
	Screw dim	Raised face flange type [mm]		90				100				100			120			
Hexagon screws		4				4				4			4					
Inlet	Qty	Hexagon screws		4				4				4			4			
		Nuts		4				4				4			4			
	Hexagon screw diameter nut size [mm]		PN 160		M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M24	M24	M24	
	Screw dim	Raised face flange type [mm]		90				110				110			120			
Hexagon screws		4				4				4			4					
Outlet	Qty	Hexagon screws		4				4				8			8			
		Nuts		4				4				8			8			
	Hexagon screw diameter nut size [mm]		PN 40		M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		80				85				85			90			
Hexagon screws		4				4				8			8					
Flange class 1500 x 300																		
Inlet	Qty	Hexagon screws		4				4				4			8			
		Nuts		4				4				4			8			
	Hexagon screw diameter nut size [mm]		PN 36		M20	M20	M20	M20	M24	M24	M24	M24	M24	M24	M24	M24	M24	
	Screw dim	Raised face flange type [mm]		100				120				120			130			
Hexagon screws		4				4				8			8					
Outlet	Qty	Hexagon screws		4				4				8			8			
		Nuts		4				4				8			8			
	Hexagon screw diameter nut size [mm]		PN 10 – PN 16		M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	
	Screw dim	Raised face flange type [mm]		80				85				85			90			
Hexagon screws		4				4				8			8					

Please note: For full nozzle design the screw lengths needs to be 30 mm longer.

## High Efficiency Screw Dimensions acc. to DIN EN 1092-1

Metric units – Orifice J – T+

		DN I+O	80 x 100				100 x 150					150 x 200			200 x 250		
		Size	3" x 4"				4" x 6"					6" x 8"			8" x 10"		
		API Standard orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T		
		Extra Orifice				N+					P+			R+		T+	
		d <sub>0</sub> [mm]	38	45	56	75	56	63	69	83	95	110	133	142	168	180	
		A <sub>0</sub> [mm²]	1134	1590	2463	4418	2463	3117	3739	5411	7088	9503	13893	15837	22167	25447	
Flange Class 900 x 300																	
Inlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 40	M16	M16	M16	M16	M20	M20	M20	M20	M20					
		Raised face flange type [mm]		110	110	110	110	130	130	130	130	130					
Inlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 63	M20	M20	M20	M20	M24	M24	M24	M24	M24					
		Raised face flange type [mm]		120	120	120	120	140	140	140	140	140					
Inlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 100	M24	M24	M24	M24	M27	M27	M27	M27	M27					
		Raised face flange type [mm]		130	130	130	130	150	150	150	150	150					
Inlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 160	M24	M24	M24	M24	M27	M27	M27	M27	M27					
		Raised face flange type [mm]		140	140	140	140	150	150	150	150	150					
Outlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 40	M20	M20	M20	M20	M24	M24	M24	M24	M24					
		Raised face flange type [mm]		100	100	100	100	120	120	120	120	120					
Flange class 1500 x 300																	
Inlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 250	M27	M27	M27	M27	M30	M30	M30	M30	M30					
Outlet	Qty	Hexagon screws	8	8	8	8	8	8	8	8	8						
		Nuts	8	8	8	8	8	8	8	8	8						
	Screw dim	Hexagon screw diameter nut size [mm]	PN 40	M20	M20	M20	M20	M24	M24	M24	M24	M24					

Please note: For full nozzle design the screw lengths needs to be 30 mm longer.



## High Efficiency

### Screw Dimensions acc. to ASME B16.5

The flange thickness of the inlet and outlet flanges of the Pilot Operated Safety Valve (POSV) may differ from the standard. Therefore stud-bolts for the flange connections may also be longer than stated in ASME B16.5. To simplify the calculation of the correct bolt length, the

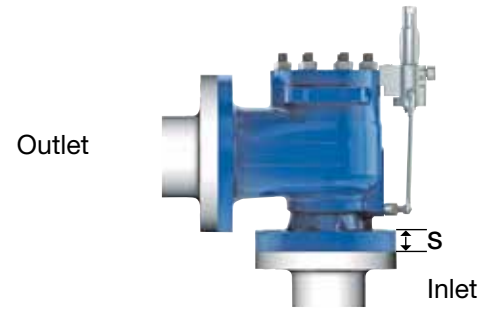
quantity and sizes of the stud-bolts and nuts for the inlet and outlet flange connections are given below. The listed screw dimensions are rounded to standard dimensions. The connection flanges are based on the ASME B16.5 standard.

#### US units – Orifice D – K+

		DN I+O	25 x 50				40 x 50				40 x 80			50 x 80			
		Size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
API Standard orifice acc. to API 526		D	E	F		D	E	F		G	H	J	G	H	J		
Extra Orifice					G				H			J				K+	
d <sub>0</sub> [inch]		0.433	0.579	0.724	0.906	0.433	0.579	0.724	1.142	0.929	1.157	1.406	0.929	1.157	1.496	1.890	
A <sub>0</sub> [inch <sup>2</sup> ]		0.147	0.264	0.412	0.644	0.147	0.264	0.412	1.024	0.678	1.052	1.552	0.678	1.052	1.758	2.805	
<b>Flange class 150 x 150</b>																	
Inlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Nuts	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Bolt dim	Stud bolt diameter nut size [inch]	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	3 1/4	3 1/4	3 1/4	3 1/4	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	4	4	4	4
Outlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Nuts	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Bolt dim	Bolt size [inch]	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	4	4	4	4	4	4	4
<b>Flange class 300 x 150</b>																	
Inlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	8	8	8	8
		Nuts	8	8	8	8	8	8	8	8	8	8	8	16	16	16	16
	Bolt dim	Bolt size [inch]	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	3 3/4	3 3/4	3 3/4	3 3/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4
Outlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Nuts	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Bolt dim	Bolt size [inch]	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	4	4	4	4	4	4	4
<b>Flange class 600 x 150</b>																	
Inlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	8	8	8	8
		Nuts	8	8	8	8	8	8	8	8	8	8	8	16	16	16	16
	Bolt dim	Bolt size [inch]	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	4	4	4	4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 1/2	4 1/2	4 1/2	4 1/2
Outlet	Qty	Stud bolts	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Nuts	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Bolt dim	Bolt size [inch]	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
		Raised face flange type [inch]	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	4	4	4	4	4	4	4

Please note: For full nozzle design the screw lengths needs to be 1 1/4 inch longer.

**High Efficiency**  
**Screw Dimensions acc. to ASME B16.5**



US units – Orifice J – T+

DN <sub>ISO</sub>		80 x 100				100 x 150					150 x 200			200 x 250			
Size		3" x 4"				4" x 6"					6" x 8"			8" x 10"			
API Standard orifice acc. to API 526		J	K	L		L	M	N	P		Q	R		T			
Extra Orifice					N+					P+			R+		T+		
d <sub>0</sub> [inch]		1.496	1.772	2.205	2.953	2.205	2.480	2.717	3.268	3.740	4.331	5.236	5.591	6.614	7.087		
A <sub>0</sub> [inch <sup>2</sup> ]		1.758	2.465	3.818	6.848	3.818	4.832	5.796	8.386	10.987	14.730	21.534	24.547	34.359	39.443		
<b>Flange class 150 x 150</b>																	
Inlet	Qty	Stud bolts		4	4	4	4	8	8	8	8	8	8	8	8	8	
		Nuts		8	8	8	8	16	16	16	16	16	16	16	16	16	16
	Bolt dim	Stud bolt diameter nut size [inch]		5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4
		Raised face flange type [inch]		4 1/2	4 1/2	4 1/2	4 1/2	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	6	6
Outlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		16	16	16	16	16	16	16	16	16	16	16	16	24	24
	Bolt dim	Bolt size [inch]		5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8
		Raised face flange type [inch]		4	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
<b>Flange class 300 x 150</b>																	
Inlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	12	12	12	12	12
		Nuts		16	16	16	16	16	16	16	16	16	24	24	24	24	24
	Bolt dim	Bolt size [inch]		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8
		Raised face flange type [inch]		5	5	5	5	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	6	6	6	7	7
Outlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		16	16	16	16	16	16	16	16	16	16	16	16	24	24
	Bolt dim	Bolt size [inch]		5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8
		Raised face flange type [inch]		4	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
<b>Flange class 600 x 150</b>																	
Inlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		16	16	16	16	16	16	16	16	16	24	24	24	24	24
	Bolt dim	Bolt size [inch]		3/4	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	1	1	1	1 1/8	1 1/8
		Raised face flange type [inch]		5 1/2	5 1/2	5 1/2	5 1/2	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	7 1/2	7 1/2	7 1/2	8 1/2	8 1/2
Outlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	12	12	
		Nuts		16	16	16	16	16	16	16	16	16	16	16	16	24	24
	Bolt dim	Bolt size [inch]		5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8
		Raised face flange type [inch]		4	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4

Please note: For full nozzle design the screw lengths needs to be 1 1/4 inch longer.

## High Efficiency

### Screw Dimensions acc. to ASME B16.5

US units – Orifice D – K+

DN I+O		25 x 50				40 x 50				40 x 80			50 x 80				
Size		1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"				
API Standard orifice acc. to API 526		D	E	F		D	E	F		G	H		G	H	J		
Extra Orifice					G				H			J				K+	
d <sub>0</sub> [inch]		0.433	0.579	0.724	0.906	0.433	0.579	0.724	1.142	0.929	1.157	1.406	0.929	1.157	1.496	1.890	
A <sub>0</sub> [inch <sup>2</sup> ]		0.147	0.264	0.412	0.644	0.147	0.264	0.412	1.024	0.678	1.052	1.552	0.678	1.052	1.758	2.805	
<b>Flange class 900 x 300</b>																	
Inlet	Qty	Stud bolts		4	4	4	4	4	4	4	4	4	4	4	4	4	
		Nuts		8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Stud bolt diameter nut size [inch]		1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1	1	1	1
	Bolt dim	Raised face flange type [inch]		5 3/4	5 3/4	5 3/4	5 3/4	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6	6	6
Ring type joint flange [inch]		6	6	6	6	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 1/4	6 1/4	6 1/4	6 1/4	
Outlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	8	8	
		Nuts		16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Bolt size [inch]		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
	Bolt dim	Raised face flange type [inch]		4	4	4	4	4	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
Ring type joint flange [inch]		4 1/4	4 1/4	4 1/4	4 1/4	4 1/2	4 1/2	4 1/2	4 1/2	5	5	5	5	5	5	5	
<b>Flange class 1500 x 300</b>																	
Inlet	Qty	Stud bolts		4	4	4	4	4	4	4	4	4	4	4	4	4	
		Nuts		8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Bolt size [inch]		1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1	1	1	1
	Bolt dim	Raised face flange type [inch]		5 3/4	5 3/4	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	6 1/4	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2
Ring joint flange [inch]		6	6	6	6	6 1/2	6 1/2	6 1/2	6 1/2	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4	
Outlet	Qty	Stud bolts		8	8	8	8	8	8	8	8	8	8	8	8	8	
		Nuts		16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Bolt size [inch]		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
	Bolt dim	Raised face flange type [inch]		4	4	4	4	4	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
Ring type joint flange [inch]		4 1/4	4 1/4	4 1/4	4 1/4	4 1/2	4 1/2	4 1/2	4 1/2	5	5	5	5	5	5	5	

Please note: For full nozzle design the screw lengths needs to be 1/4 inch longer.

## High Efficiency Screw Dimensions acc. to ASME B16.5

US units – Orifice J – T+

DN I+O		80 x 100				100 x 150					150 x 200			200 x 250		
Size		3" x 4"				4" x 6"					6" x 8"			8" x 10"		
API Standard orifice acc. to API 526		J	K	L		L	M	N	P		Q	R		T		
Extra Orifice					N+					P+			R+		T+	
d <sub>0</sub> [inch]		1.496	1.772	2.205	2.953	2.205	2.480	2.717	3.268	3.740	4.331	5.236	5.591	6.614	7.087	
A <sub>0</sub> [inch <sup>2</sup> ]		1.758	2.465	3.818	6.848	3.818	4.832	5.796	8.386	10.987	14.730	21.534	24.547	34.359	39.443	
<b>Flange class 900 x 300</b>																
Inlet	Qty	Stud bolts		8	8	8	8	8	8	8	8					
		Nuts		16	16	16	16	16	16	16	16	16				
	Stud bolt diameter nut size [inch]		1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4				
	Bolt dim	Raised face flange type [inch]		7	7	7	7	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4				
Ring type joint flange [inch]		7 1/4	7 1/4	7 1/4	7 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2						
Outlet	Qty	Stud bolts		8	8	8	8	12	12	12	12	12				
		Nuts		16	16	16	16	24	24	24	24	24				
	Bolt size [inch]		7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8				
	Bolt dim	Raised face flange type [inch]		4 3/4	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2				
Ring type joint flange [inch]		5	5	5	5	6	6	6	6	6						
<b>Flange class 1500 x 300</b>																
Inlet	Qty	Stud bolts		8	8	8	8	8	8	8	8					
		Nuts		16	16	16	16	16	16	16	16	16				
	Bolt size [inch]		1 1/4	1 1/4	1 1/4	1 1/4	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8				
	Bolt dim	Raised face flange type [inch]		8	8	8	8	9	9	9	9	9				
Ring type joint flange [inch]		8 1/4	8 1/4	8 1/4	8 1/4	9 1/4	9 1/4	9 1/4	9 1/4	9 1/4						
Outlet	Qty	Stud bolts		8	8	8	8	12	12	12	12	12				
		Nuts		16	16	16	16	24	24	24	24	24				
	Bolt size [inch]		7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8				
	Bolt dim	Raised face flange type [inch]		4 3/4	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2				
Ring type joint flange [inch]		5	5	5	5	6	6	6	6	6						

Please note: For full nozzle design the screw lengths needs to be 1 1/4 inch longer.

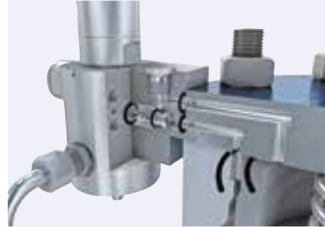
## High Efficiency Available options

**Field test connection**  
R26



Set pressure testing with external test medium.

**Backflow preventer**  
(Standard)



Prevents return flow of the medium from the discharge into the system to be secured.

**Pilot supply filter**  
R30



Filter to prevent plugging of the pilot.

**Manual blowdown**  
R27 to atmosphere  
R24 into main valve outlet



Functional test of main valve piston.

**NACE sour gas application**  
R70



**Remote Sensing**  
R28

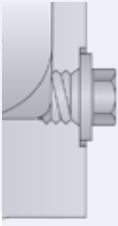


**Soft sealing POSV complete**  
O-ring disc, Piston guide, Seat, Tubing, Cover  
R05: EPDM  
R06: FFKM  
R04: FKM (Standard)

**Main valve disc**  
R71 metal sealing



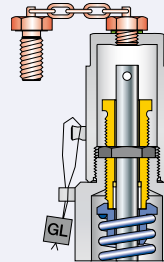
**Drain hole**  
J19: G $\frac{1}{2}$ "  
R48: NPT  $\frac{1}{2}$ "



**Pilot lifting device**  
R25

Mechanical lifting of pilot for verification of POSV operation.

**Pilot test gag**  
R33

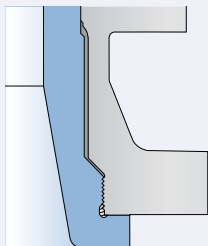


Blocking of operation in case of required hydrostatic testing of vessel.

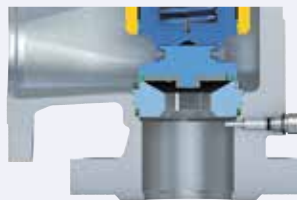
**Blowdown**  
adjusted to x%  
R44

Blowdown adjusted: Closing pressure difference as a fixed value between 3 – 15%. Standard adjustment between 3 – 7%.

**Full nozzle**  
R69



**Flange rating class**  
300 x 300, 600 x 300  
H65, H67



**ED-Design**  
(Explosive decompression)  
R3A (FKM)



\* Actual operating pressure sensed to pilot. No influence of inlet pressure losses, stable function of POSV.

## High Efficiency

### Flange drillings acc. to DIN EN 1092

As a standard, the Types 811 and 821 are equipped with flanges according to ASME B 16.5. Flanges according to DIN EN 1092 can be specified with the option codes below. Use the right half of the selection table to deter-

mine if an article number exists for your required combination of pressure classes. Then use the left half of the same table to establish the two option codes (inlet/outlet) for that combination.

#### Option codes for inlet/outlet DIN connections with DIN EN 1092 flange drillings

Standard Orifice		D	E	F		D	E	F		G	H		G	H	J			
Extra Orifice					G				H		J					K+		
Valve size DN				25 x 50				40 x 50				40 x 80			50 x 80			
Inlet		Outlet		Art.-No.														
Flange rating class	Option code	Flange rating class	Option code															
PN 10	H44	PN 10	H50	0220	0230	0240	1900	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
PN 16	H45	PN 16	H51	0220	0230	0240	1900	0040	0050	0060	1830	0070	0080	1840	0090	0100	0110	1850
PN 25	H46	PN 10	H50	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
		PN 16	H51	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
PN 40	H47	PN 10	H50	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
		PN 16	H51	0220	0230	0240	1900	0250	0260	0270	1910	0280	0290	1920	0300	0310	0320	1930
		PN 25	H52	1060	1070	1080		1090	1100	1110	1130	1120	1130		-	-	-	
		PN 40	H15	1060	1070	1080		1090	1100	1110	1130	1120	1130		-	-	-	
PN 63	H10	PN 10	H50	8214.	-	-	-	-	-	-	-	-	-	-	0720	0730	0740	2090
		PN 16	H51	8113.	-	-	-	-	-	-	-	-	-	-	0720	0730	0740	2090
		PN 25	H52	8213.	1060	1070	1080		1090	1100	1110	1130	1120	1130		1140	1150	1160
		PN 40	H15	8213.	1060	1070	1080		1090	1100	1110	1130	1120	1130		1140	1150	1160
PN 100	H11	PN 25	H52	1060	1070	1080		1090	1100	1110	1130	1120	1130		1140	1150	1160	
		PN 40	H15	1060	1070	1080		1090	1100	1110	1130	1120	1130		1140	1150	1160	
PN 160	H11	PN 40	H15	1060	1070	1080		1090	1100	1110	1130	1120	1130		1140	1150	1160	
PN 250	H12	PN 40	H15	1240	1250	1260		1270	1280	1290	1310	1300	1310		1320	1330	1340	

Standard Orifice		J	K	L		L	M	N	P		Q	R		T				
Extra Orifice					N+					P+			R+		T+			
Valve size DN				80 x 100				100 x 150				150 x 200			200 x 250			
Inlet		Outlet		Art.-No.														
Flange rating class	Option code	Flange rating class	Option code															
PN 10	H44	PN 10	H50	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
PN 16	H45	PN 16	H51	0120	0130	0140	1860	0150	0160	0170	0180	1870	0190	0200	1880	0210	1890	
PN 25	H46	PN 10	H50	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
		PN 16	H51	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
PN 40	H47	PN 10	H50	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
		PN 16	H51	0330	0340	0350	1940	0360	0370	0380	0390	1950	0400	0410	1960	0420	1970	
		PN 25	H52	-	-	-		-	-	-	-		-	-		-		
		PN 40	H15	-	-	-		-	-	-	-		-	-		-		
PN 63	H10	PN 10	H50	8214.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
		PN 16	H51	8113.	0750	0760	0770	2100	0780	0790	0800	0810	2110	0820	0830	2120	0840	2130
		PN 25	H52	8213.	1170	1180	1190		1200	1210	1220	1230		1030	1040		1050	
		PN 40	H15	8213.	1170	1180	1190		1200	1210	1220	1230		1030	1040		1050	
PN 100	H11	PN 25	H52	1170	1180	1190		1200	1210	1220	1230		1030	1040		1050		
		PN 40	H15	1170	1180	1190		1200	1210	1220	1230		1030	1040		1050		
PN 160	H11	PN 40	H15	1170	1180	1190		1200	1210	1220	1230		1030	1040		1050		
PN 250	H12	PN 40	H15	1350	1360	1370		1380	1390	1400	1410		1030	1040		1050		

Flange dimensions of LESER Type 811, 821 may exceed flange dimensions as mentioned in ASME / ANSI B 16.5, DIN EN 1092 and JIS B 2220. The exceedance is in accordance e.g. with API Standard 526 Sec. 2.4. For flange facings, please see page 62.

## High Efficiency Flange facings

The following table shows the various specifications for flange facings according to ASME B16.5 or DIN EN.

### Flange facings

Acc. to ASME B16.5										
DN / NPS			Smooth Finish <sup>2)</sup>		Serrated Finish		RTJ-groove			
			Inlet	Outlet	Inlet	Outlet	Inlet			Outlet
Type	Inlet	Outlet	Option code		Option code		CL150	CL300	CL600	CL150
811, 821	All	All	L52	L53	*	*	H62			H63

Acc. to DIN EN 1092				
Flange facing		Inlet	Outlet	Note
		PN 10 – PN 40	PN 10 – PN 40	(Rz-data according to DIN EN 1092 in µm)
Raised face	Form B1	*	*	Facing: Rz = 12.5 – 50
	Form B2	L36	L38	Facing: Rz = 3.2 – 12.5
Tongue face C <sup>1)</sup>		H94	H92	Steel flanges only
Groove face D <sup>1)</sup>		H93	H91	
Male face E		H96	H98	
Female face F		H97	H99	
O-ring male face G		J01	J02	
O-ring female face H		J03	J04	

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If you require a turned surface in the bottom of the groove according to DIN 2512 and/or DIN EN 1092-1 an additional option code is necessary: "S01: bottom of the groove turned." Groove and tongue for PN160 flanges refer to DIN2512/ WI 3313.32.

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.



## High Efficiency Approvals – Series 810 and 820

LESER Pilot Operated Safety Valves can be used world-wide, as they comply with the following international codes and standards:

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

The design, manufacture and marking of LESER's Pilot Operated Safety Valves also complies with the following regulations:

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



### Approvals

		Serie 810	Serie 820
<b>United States</b>		<b>Coefficient of discharge K</b>	
ASME Sec. VIII Div. 1	Steam	Approval No.	Not approved
		Coefficient of discharge K	Not approved
	Gas	Approval No.	M37268
		Coefficient of discharge K	0.82
	Liquid	Approval No.	Not approved
		Coefficient of discharge K	Not approved
<b>European Community</b>		<b>Coefficient of discharge <math>K_{dr}</math></b>	
DIN EN ISO 4126-4	Approval No.	07 202 1321 Z 0038/9/01	
	S/G	G: 0.82	S/G: 0.82
	L	Not approved	
<b>Germany</b>		<b>Coefficient of discharge <math>\alpha_w</math></b>	
AD 2000-Merkblatt A2	Approval No.	TÜV SV 10-1126	
	S/G	G: 0.82	S/G: 0.82
	L	Not approved	
<b>Canada</b>		<b>Coefficient of discharge K</b>	
Canada: CRN	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>	
	Steam	Coefficient of discharge K	Not approved
	Gas	Coefficient of discharge K	0.82
	Liquid	Coefficient of discharge K	Not approved
<b>China</b>		<b>Coefficient of discharge <math>\alpha_w</math></b>	
AQSIQ	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>	
	S/G	G: 0.82	S/G: 0.82
	L	Not approved	
<b>Russia</b>		<b>Coefficient of discharge <math>\alpha_w</math></b>	
TR / TRN	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>	
	S/G	G: 0.82	S/G: 0.82
	L	Not approved	

## High Efficiency Spare parts kits

The spare part kit provides all spare parts which are recommended by LESER to be replaced during rework of a safety valve.

### Materials – Main valve

Item	Component	Material	Quantity
	Lubricant	Molykote D	1
	Lubricant oil	Halocarbon oil 56S	1
6.3, 7.3, 60, 61, 63, 67	O-ring	FKM / EPDM / FFKM	6
6.4	Backup ring	PTFE	1
6.5	Guide ring	PTFE-carbon filler	2
10	Parallel pin	1.4310	1
58	Screw	1.4310	2
62	Backup ring	PTFE	1

### Spare parts kits – Type 811 – Pop Action

Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+
<b>Soft sealing FKM</b>															
	Art.-No.														
<b>Main valve</b>	<b>5012.</b>	<b>1130</b>			<b>1131</b>				<b>1132</b>			<b>1133</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1163</b>			<b>1163</b>				<b>1163</b>			<b>1163</b>			
<b>Soft sealing EPDM</b>															
	Art.-No.														
<b>Main valve</b>	<b>5012.</b>	<b>1138</b>			<b>1139</b>				<b>1140</b>			<b>1141</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1164</b>			<b>1164</b>				<b>1164</b>			<b>1164</b>			
<b>Soft sealing FFKM</b>															
	Art.-No.														
<b>Main valve</b>	<b>5012.</b>	<b>1146</b>			<b>1147</b>				<b>1148</b>			<b>1149</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1165</b>			<b>1165</b>				<b>1165</b>			<b>1165</b>			

## High Efficiency Spare parts kits

### Materials – Type 811 – Pop Action

Item	Component	Material	Quantity
	Lubricant	Molykote D	1
	Lubricant oil	Halocarbon oil 56S	1
64	Bug screen	Plastic	1
15	Plunger	1.4404 / 316L	1
6, 7, 8	O-ring Field test connection	FKM / EPDM / FFKM	3
24.4, 24.5, 24.6	O-ring Manifold bloc	FKM / EPDM / FFKM	3
30, 31, 32	O-ring	FKM / EPDM / FFKM	4
24.8	Gasket	1.4401	1
35	Gasket	PTFE	1
48	Screen	1.4404 / 316L	1
49	Support ring	Plastic	2

### Spare parts kits – Type 811 – Pop Action

Valve size	3" x 4"				4" x 6"				6" x 8"		8" x 10"		
Standard Orifice acc. to API 526	J	K	L		L	M	N	P		Q	R		T
Extra Orifice				N+					P+			R+	T+
<b>Soft sealing FKM</b>													
	Art.-No.												
<b>Main valve</b>	<b>5012.</b>	<b>1134</b>			<b>1135</b>			<b>1136</b>		<b>1137</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1163</b>			<b>1163</b>			<b>1163</b>		<b>1163</b>			
<b>Soft sealing EPDM</b>													
	Art.-No.												
<b>Main valve</b>	<b>5012.</b>	<b>1142</b>			<b>1143</b>			<b>1144</b>		<b>1145</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1164</b>			<b>1164</b>			<b>1164</b>		<b>1164</b>			
<b>Soft sealing FFKM</b>													
	Art.-No.												
<b>Main valve</b>	<b>5012.</b>	<b>1150</b>			<b>1151</b>			<b>1152</b>		<b>1153</b>			
<b>Pilot 2.5 – 102 bar 36 – 1480 psig</b>	<b>5012.</b>	<b>1165</b>			<b>1165</b>			<b>1165</b>		<b>1165</b>			

## High Efficiency Spare parts kits

The spare part kit provides all spare parts which are recommended by LESER to be replaced during rework of a safety valve.

### Materials – Main valve

Item	Component	Material	Quantity
	Lubricant	Molykote D	1
	Lubricant oil	Halocarbon oil 56S	1
6.3, 7.3, 60, 61, 63, 67	O-ring	FKM / EPDM / FFKM	6
6.4	Backup ring	PTFE	1
6.5	Guide ring	PTFE-carbon filler	2
10	Parallel pin	1.4310	1
58	Screw	1.4310	2
62	Backup ring	PTFE	1

### Spare parts kits – Type 821 – Modulate Action

Valve size	1" x 2"				1 1/2" x 2"				1 1/2" x 3"			2" x 3"			
Standard Orifice acc. to API 526	D	E	F		D	E	F		G	H		G	H	J	
Extra Orifice				G				H			J				K+

#### Soft sealing FKM

	Art.-No.															
<b>Main valve</b>	<b>5012.</b>	<b>1130</b>				<b>1131</b>				<b>1132</b>			<b>1133</b>			
<b>Diaphragm design</b> 2.5 – 30 bar 36 – 435 psig	<b>5012.</b>	<b>1157</b>				<b>1157</b>				<b>1157</b>			<b>1157</b>			
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	<b>5012.</b>	<b>1160</b>				<b>1160</b>				<b>1160</b>			<b>1160</b>			

#### Soft sealing EPDM

	Art.-No.															
<b>Main valve</b>	<b>5012.</b>	<b>1138</b>				<b>1139</b>				<b>1140</b>			<b>1141</b>			
<b>Diaphragm design</b> 2,5 – 30 bar 36 – 435 psig	<b>5012.</b>	<b>1158</b>				<b>1158</b>				<b>1158</b>			<b>1158</b>			
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	<b>5012.</b>	<b>1161</b>				<b>1161</b>				<b>1161</b>			<b>1161</b>			

#### Soft sealing FFKM

	Art.-No.															
<b>Main valve</b>	<b>5012.</b>	<b>1146</b>				<b>1147</b>				<b>1148</b>			<b>1149</b>			
<b>Diaphragm design</b> 2,5 – 30 bar 36 – 435 psig	<b>5012.</b>	<b>1159</b>				<b>1159</b>				<b>1159</b>			<b>1159</b>			
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	<b>5012.</b>	<b>1162</b>				<b>1162</b>				<b>1162</b>			<b>1162</b>			

## High Efficiency Spare parts kits

### Materials –Type 821 – Modulate Action

Item	Component	Material	Diaphragm design	Piston-design
			Quantity	Quantity
	Lubricant	Molykote D	1	1
	Lubricant oil	Halocarbon Öl 56S	1	1
64	Bug screen	Plastic	1	1
6, 7, 8	O-ring	FKM	3	3
24.4, 24.5, 24.6	Field test connection			
	O-ring Manifold bloc	FKM	6	6
24.8	Gasket	1.4401	2	2
30, 31, 32, 34, 35, 46	O-ring	FKM	9	9
44	Parallel pin	Stainless steel	1	1
48	Screen (high pressure application)	1.4404 / 316L	1	1
49	Support ring	Plastic	1	1
69	Bearing	1.4122	1	1
72	Diaphragm	FKM	1	–
73, 74	O-ring	FKM	9	–
77	Lock screw	1.4401 / Stainless steel	1	–
80	Guide ring	1.4404 / 316L	1	–

### Spare parts kits – Type 821 – Modulate Action

Valve size Standard Orifice acc. to API 526	3" x 4"			4" x 6"				6" x 8"		8" x 10"	
	J	K	L	L	M	N	P	Q	R	T	
Extra Orifice				N+				P+		R+	T+

#### Soft sealing FKM

	Art.-No.										
<b>Main valve</b>	5012.	1134				1135				1136	1137
<b>Diaphragm design</b> 2,5 – 30 bar 36 – 435 psig	5012.	1157				1157				1157	1157
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	5012.	1160				1160				1160	1160

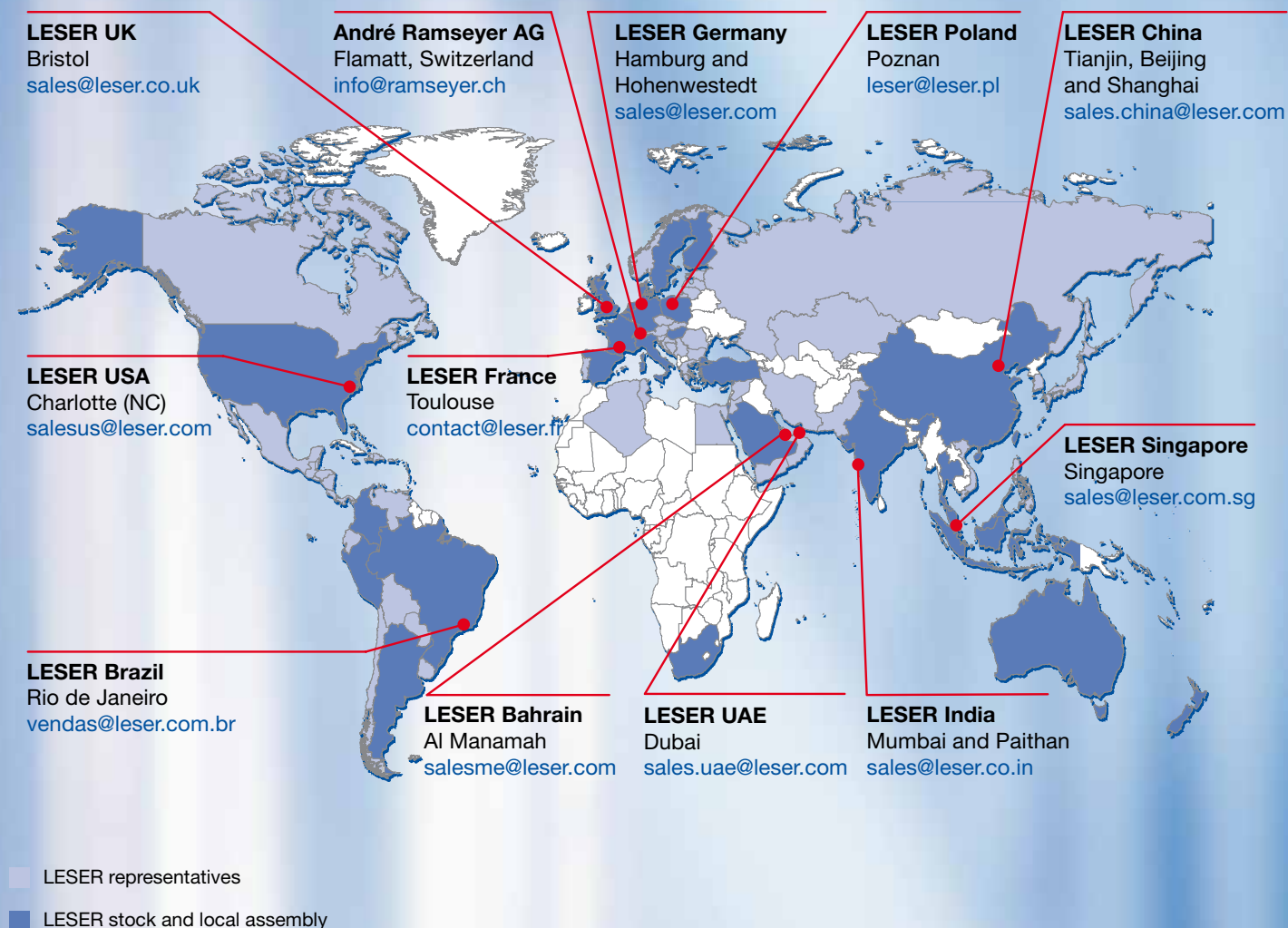
#### Soft sealing EPDM

	Art.-No.										
<b>Main valve</b>	5012.	1142				1143				1144	1145
<b>Diaphragm design</b> 2,5 – 30 bar 36 – 435 psig	5012.	1158				1158				1158	1158
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	5012.	1161				1161				1161	1161

#### Soft sealing FFKM

	Art.-No.										
<b>Main valve</b>	5012.	1150				1151				1152	1153
<b>Diaphragm design</b> 2,5 – 30 bar 36 – 435 psig	5012.	1159				1159				1159	1159
<b>Piston design</b> 30,01 – 102 bar > 435 – 1480 psig	5012.	1162				1162				1162	1162

# LESER Worldwide



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# LESER

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