# High Efficiency

## Pilot Operated Safety Valves

Series 810 – Pop Action
Series 820 – Modulate Action


# EXTENDED CATALOG

LESER

The-Safety-Valve.com

# Valve finder

## How to find the right product group

High operating to set pressure ratio, high backpressure or low total height?

Yes → **High Efficiency**

No

Clean Service application?

Yes → **Clean Service**

No

Critical Service / highly corrosive application?

Yes → **Critical Service**

No

API specified application?

Yes → **API**

No

Steam, gas and liquid application with low capacity in relation to valve size?

Yes → **Modulate Action**

No

Required Orifice letter?

Orifice ≥ F → **High Performance**

Orifice ≤ F → **Compact Performance**

Additional components beyond safety valves

Yes → **Best Availability**

Medium-controlled

Spring loaded

Safety valves

Change-over valve

Bursting disc

# Contents



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[1)].

Beyond API 526, LESER offers so-called Extra Orifices (also known as Full Port or Full Bore nozzles, see page 15). 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 28 – 33.

POSV-Main Valve and Pilot Valve Series 810

### 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 810 – Pop Action Pilot

### 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

Series 820 – Modulate Action Pilot

[1)] Pressure ratings PN 400 / Class 2500 in preparation

# 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**[1] | acc. to ASME B16.5 | CL150 – CL 2500[2] | |
| | acc. to DIN EN 1092-1 | PN 10 – PN 400[2] | |
| **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[3] | |
| | acc. to DIN EN 1092-1 | 2.5 – 426 bar[3] | |
| **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[4] | |
| | acc. to DIN EN 1092-1 | -48 °C – 260 °C[4] | |
| **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 |

[1] The possible flange pressure ratings depend on the size of the valve.
Refer to page 74 to verify the correct option codes and availability of DIN EN and JIS flange ratings.
[2] Pressure ratings PN 400 / Class 2500 in preparation
[3] Set pressures > 256 bar (ASME) / 250 bar (DIN EN)
> 3705 psig (ASME) / 3625 psig (DIN EN) in preparation
[4] 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 |
|---|---|---|---|
| **Design** | | | |
|  | Tubing between pilot valve and main valve integrated into top plate | • Less risk of damage to tubing<br>• Resistant against vibration<br>• No freezing | • Less tubing for easy removal of top plate<br>• Tubing between inlet and pilot remains accessible for easy cleaning |
|  | Backflow preventer integrated into manifold block as a standard component | • Easy ordering, no extra cost<br>• Less risk of damage to backflow preventer | • No need for machining to retrofit backflow preventer |
|  | Integral cast support brackets | • Compensation of reactive forces (high pressures)<br>• Easy handling during installation | |
| | 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 |
|---|---|---|---|
| **High capacity / small size** | | | |
| **EXTRA ORIFICE** | Higher capacity for same valve size with Extra Orifice types. For details see page 15 | 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 |
| **Modular system** | | | |
|  | 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 |
| **LESER service** | | | |
|  | Sizing with VALVESTAR | Comprehensive documentation in multiple languages | |
| **4 weeks delivery time** | 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 sytem 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.

# 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 blowdown 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
## Operating Concepts in Comparison

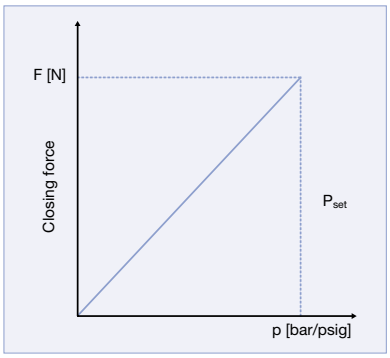
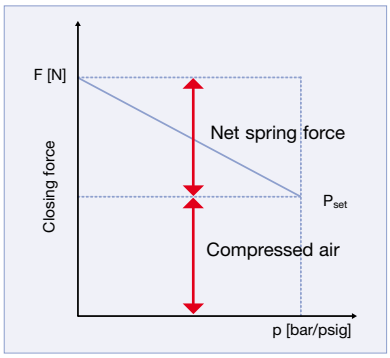
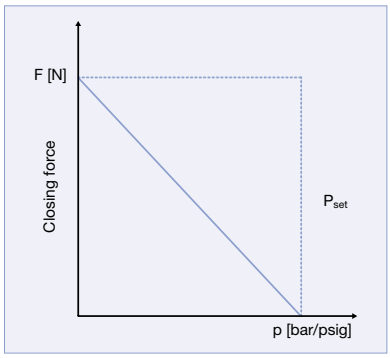
Based on the operating concept, the LESER product range can be broadly divided into:

– Spring loaded safety valves (Series 526, 441, 459)
– Safety valves with added control capabilities (Series 700, 810, 820)

Since control improves efficiency, LESER has named the products providing added control the High Efficiency group. The High Efficiency group includes:

– Pilot Operated Safety Valves (POSVs)
– Supplementary Loading System (SLS)

The following table summarizes the different operating concepts across the LESER product range.

| | LESER High Efficiency product group | | Other LESER product groups |
|---|---|---|---|
| **Products** | **LESER POSV (Series 810, 820) Pilot Operated Safety Valve** | **LESER SLS (Series 700) Supplemetary Loading System** | **LESER SLSV (Series 526, 441, 459) Spring Loaded Safety Valves** |
| |  |  |  |
| **Operating concepts** | In the POSV, a pilot valve actuates the main valve based on the pressure sensed at the inlet. | SLS are systems which use external compressed air to control and support the action of a spring loaded safety valve. | SLSV operated by a spring force. |
| **Closing force** |  |  |  |
| | 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.<br><br>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. | The SLS uses external compressed air and an actuator to apply constant pressure on the main valve in addition to the spring force. This ensures seat tightness up to set pressure.<br><br>Without supplementary loading, the safety valve works like a standard spring loaded safety valve. | When system pressure approaches set pressure, the net closing force of the disc / nozzle decreases.<br><br>At set pressure, the closing force is equal to the opening force created by system pressure. |

These safety valve products differ in their design and functional characteristics. They each have their specific benefits and applications.

# High Efficiency
## Operating Concepts in Comparison

LESER offers a large variety of types, materials and options to suit any application.

The overview below presents these features and benefits with a focus on the High Efficiency product group.

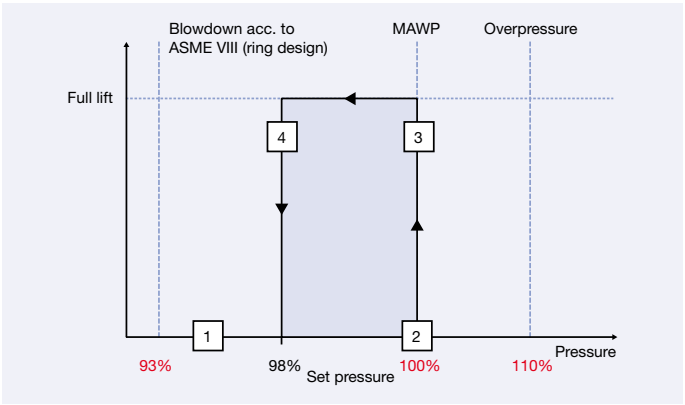
| | LESER High Efficiency product group | | Other LESER product groups |
|---|---|---|---|
| Feature / Product | **LESER POSV (Series 810, 820) Pilot Operated Safety Valve** | **LESER SLS (Series 700) Supplemetary Loading System** | **LESER SLSV (Series 526, 441, 459) Spring Loaded Safety Valves** |
| **Typical applications** | Gas transmission (compressors) | Pulp and paper | Chemical and petrochemical plants |
| | Oil and gas: upstream, downstream (refineries, storage vessels) | Drum and superheater in sugar beet plants | Compressors |
| | Pulp and paper | | Pumps |
| | Pumps | | |
| **Seat tightness** | Tight up to 97% of set pressure | Tight up to set pressure | Tight up to 90% of set pressure |
| | Relieving and reseating close to set pressure | Relieving and reseating close to set pressure | |
| | Complies with API 527 | Complies with API 527 | |
| **Full open (overpressure)** | min. 1% | min. 1% | min. 5% |
| | max. 10% | max. 1% | max. 10% |
| **Blowdown** | min. 3% | min. 3% | min. 7% |
| | max. 15% | max. 3% | max. 20% |
| **Opening characteristic** | Pop action: complete valve opening within 1% overpressure<br><br>Modulate action: proportional opening up to 10% overpressure | Complete valve opening within 1% overpressure | Full lift valve: complete opening within 5% overpressure<br><br>Other valve types: proportional opening up to 10% overpressure |
| **Back pressure ratio** | Up to 70% possible | > 50% possible | Up to 50% possible |
| | Absolute back pressure depending on flange rating of outlet flange | Absolute back pressure depending on outlet flange rating and on design (conventional or bellows) | Absolute back pressure depending on design (conventional or bellows) and on outlet flange rating |
| **Investment and installation costs** | Low | Moderate | Low |
| **Control capability** | Control capability with no supplementary energy needed | Control capability for multiple safety valves | No control capability, no need for supplementary energy |
| **Design** | Small structural size | Actuator and control unit | Simple and sturdy design |
| | Low weight | | |
| **Dirty service** | Sensitive to dirty medium | Insensitive to dirty medium | Insensitive to dirty medium |
| | | Requires clean instrument air | |
| **Temperature** | -49 to 500 °F (ASME) | Suitable for hot steam applications (with condensate separator protecting control unit from medium) | Suitable for hot steam applications |
| | -48 to 260 °C (DIN) | | |
| **Approvals** | World wide approvals | Approval acc. to PED | World wide approvals |
| **Control line** | Single pressure sensing to pilot | Triple redundancy control lines for high operating safety | No control line needed |
| **Exchangability/ Retrofitting** | API dimensions for easy exchangeability (API 526) | Existing valves can be retrofitted | API dimensions for easy exchangeability (API 526) |
| **Valve size** | 1" to 8" | 1" to 16" | 1" to 16" |
| | DN 25 to DN 200 | DN 25 to DN 400 | DN 25 to DN 400 |
| **Set pressure** | 36 psig to 6170 psig (acc. to ASME B16.5) | Depending on the pressure range of the safety vavle | 1.5 psig to 4350 psig |
| | 2.5 bar to 426 bar (acc. to DIN EN 1092-1) | | 0.1 bar to 300 bar |

# High Efficiency
# Operating Characteristic Curves of LESER Safety Valves

These curves show the operating characteristic that are specific to the LESER Pilot Operated Safety Valve or POSV (POSV Series 810, Pop Action, and 820, Modulate Action), to the Supplementary Loading System (SLS) and to spring loaded safety valves. Other POSV features are explained on page 14.

The operating characteristic refers to the different patterns of opening and closing of a safety valve product in response to pressure change. It affects crucial benefits like the ability to operate a plant at maximum operating temperature or the amount of medium loss.

## POSV Series 810 – Pop Action



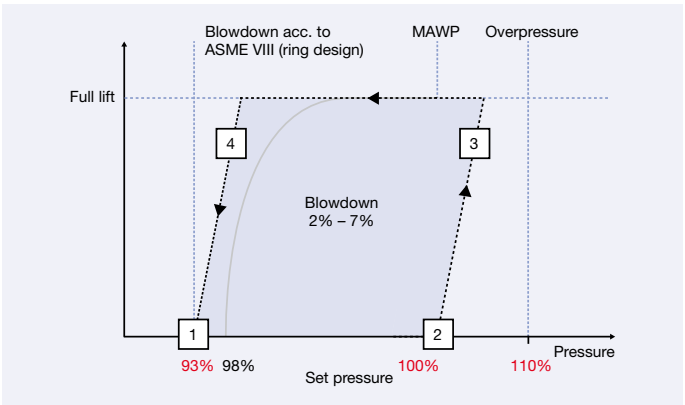

### Valve Operating State / Action

1) Standard operating pressure
2) Set pressure reached
3) Opening: Rapid opening, Pop Action behavior
4) Rapid closing (blowdown customer adjustable from 3 – 7%, or up to 15% beyond API standard)

### Benefits

- Higher operating pressure, short blowdown = higher plant efficiency
- Seat tightness up to set pressure = low vibration sensitivity
- Immediate full lift = maximum discharge
- Short blowdown

## POSV Series 820 – Modulate Action



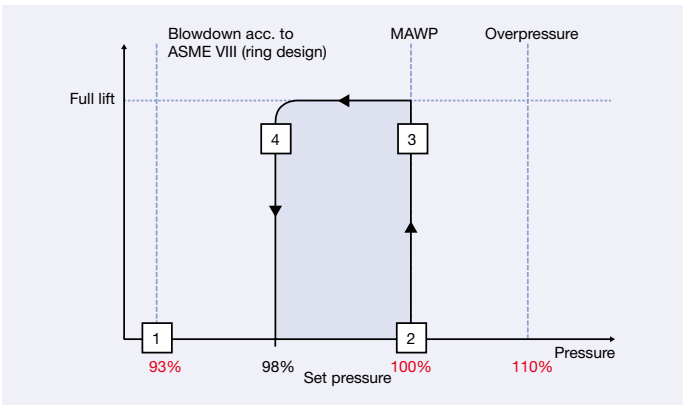

### Valve Operating State / Action

1) Standard operating pressure
2) Set pressure reached
3) Opening: Modulate Action behavior, partial opening possible
4) Modulate closing, smooth (blowdown fixed at factory at max. 7%)

### Benefits

- Higher operating pressure = higher plant efficiency
- Seat tightness up to set pressure = low vibration sensitivity
- Lift adapted to pressure increase = only necessary amount is discharged
- Medium loss is minimized

## Supplementary Loading System (SLS)




### Valve Operating State / Action

1) Standard operating pressure
2) Set pressure reached
3) Rapid opening up to maximum lift
4) Rapid closing from max. lift down to 0

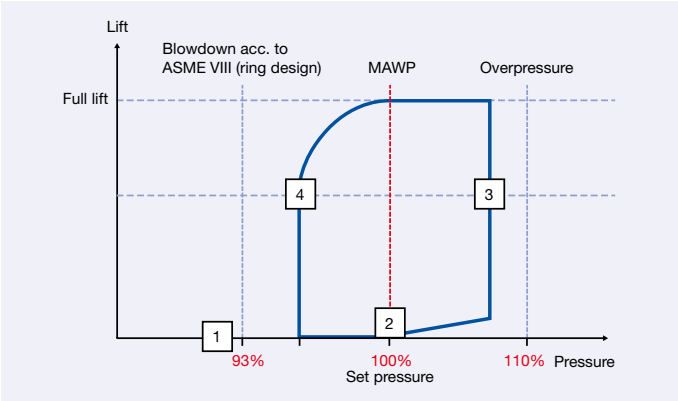
### Benefits

- Higher operating pressure, short blowdown = higher plant efficiency
- Seat tightness up to set pressure = low vibration sensitivity
- Immediate full lift = maximum discharge
- Additional control capability for other plant equipment

## High Efficiency

# Operating Characteristic Curves of LESER Safety Valves

### Spring loaded safety valve: Valve set at first audible discharge (LESER setting)



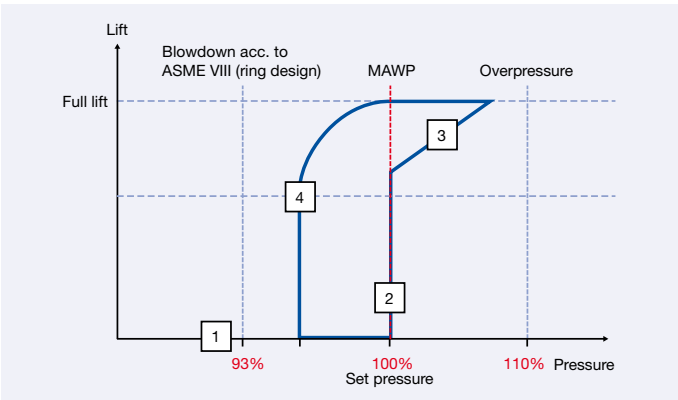

### Valve Operating State / Action

1) Standard operating pressure (usually less than 90%)
2) Set pressure reached, first audible discharge
3) Rapid opening after popping point
4) Rapid closing with proper reseating (typical blowdown ring design 7%)

### Benefits

- Cost efficient
- Low medium loss and low risk of valve damage when testing set pressure

### Spring loaded safety valve: Valve set at pop




### Valve Operating State / Action

1) Standard operating pressure (usually less than 90%)
2) Set pressure reached, with pop action up to commonly 70% of max. lift
3) Pressure increase to reach max. lift
4) Rapid closing with proper reseating (typical blowdown ring design 7%)

### Benefits

- Cost efficient

## 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
- 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 30.

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).

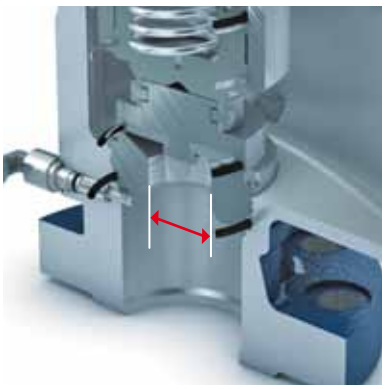
In the POSV, nominal valve sizes correspond to standard API and Extra Orifices as shown in the following table. Extra Orifice letters followed by a plus (+) sign, e.g. “K+”, mean that these valves offer a minimum of 25% more capacity than specified in API 526. For capacity values for Standard and Extra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

| $DN_{i+o}$ | 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" | | | | 1 1/2" x 2" | | | | | 1 1/2" x 3" | | | 2" x 3" | | | | 3" x 4" | | | | 4" x 6" | | | | | 6" x 8" | | | 8" x 10" | |
| API Standard Orifice acc. to API 526 | D | E | F | | D | E | F | G | | G | H | | G | H | J | | J | K | L | | L | M | N | P | | Q | R | | T | |
| Extra Orifice | | | | G | | | | | H | | | J | | | | K+ | | | | N+ | | | | | P+ | | | R+ | | T+ |

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+ |
| **Set pressure** | | | | | | | | | | | | | | | | | |
| **p** | **[bar]** | **[psig]** | | | | | | | | | | | | | | | |
| **from** | **2.5** | **36** | | | | | | | | | | | | | | | |
| **to** | **19.7** | **286** | | | | | | | | | | | | | | | |
| **to** | **27.6** | **387** | | | | | | | | | | | | | | | |
| **to** | **41.3** | **599** | | | | | | | | | | | | | | | |
| **to** | **102** | **1480** | | | | | | | | | | | | | | | |
| **to** | **256** | **3705** | | | | | | | | | | | | | | | |

**Soft seal disc**

**Metal to metal disc**

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

## High Efficiency

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

## 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+ |
| **Set pressure** | | | | | | | | | | | | | | | | |
| **p** | **[bar]** | **[psig]** | | | | | | | | | | | | | | |
| **from** | **2.5** | **36** | | | | | **Soft seal disc** | | | | | | | | | |
| **to** | **19.7** | **286** | | | | | | | | | | | | | | |
| **to** | **27.6** | **387** | | | | | | | | | | | | | | |
| **to** | **41.3** | **599** | | | | | | | | | | | | | | |
| **to** | **102** | **1480** | | | | | **Metal to metal disc** | | | | | | | | | |
| **to** | **256** | **3705** | | | | | | | | | | | | | | |

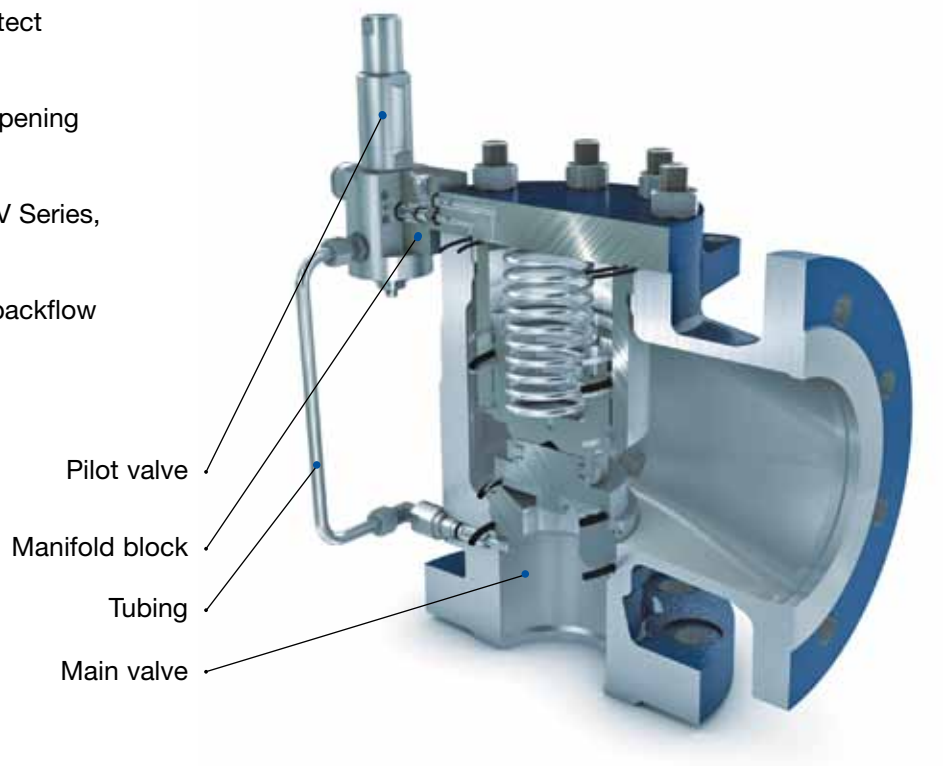
For soft seal material options, please refer to page 69.
The chart above refers to ambient temperature conditions.
For sealing materials at other temperatures, please ask LESER.

# High Efficiency
# Components

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

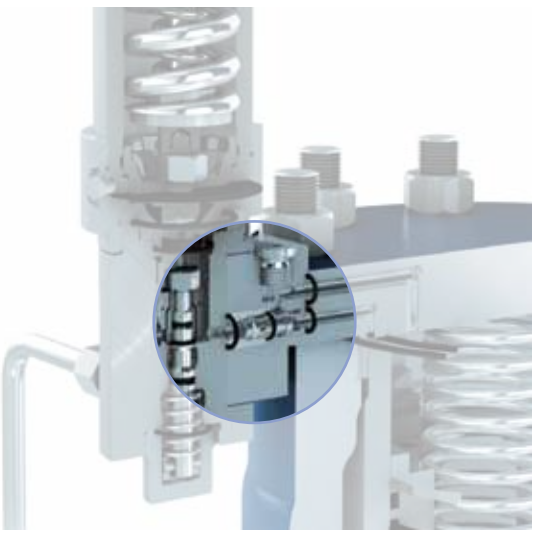
The LESER Pilot Operated Safety Valve (POSV) consists of four main components in its standard configuration:

- 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.

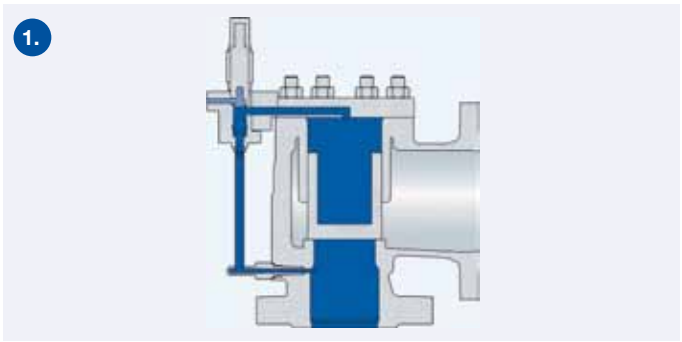
**2. At set pressure: actuating state**
At set pressure, the pilot valve actuates. The medium is no longer routed to the dome. This prevents a further rise in dome pressure. Also, the dome is vented. As a result, the closing force ceases as a pre-condition for the system overpressure to push the main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

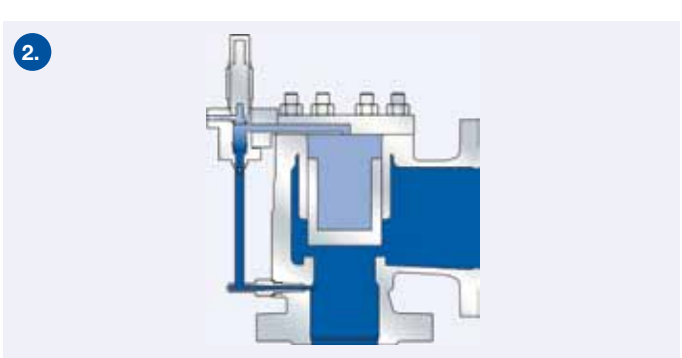
**3. Main valve opening**
The main valve opens. Depending on the design of the pilot valve, this opening is either rapid and complete (Pop Action) or gradual and partial following system pressure (Modulate Action).

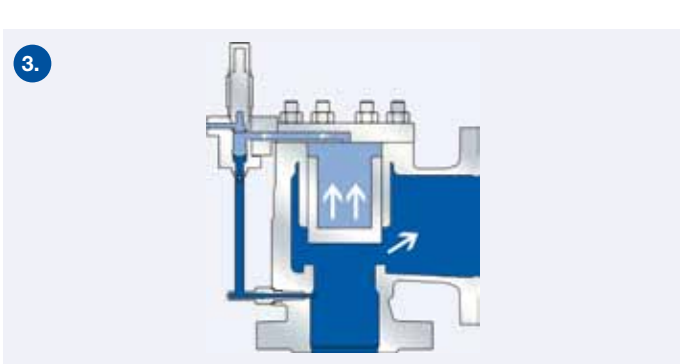
**4. At closing pressure: refilling the dome**
If system pressure drops to closing pressure, the pilot valve actuates and again routes the medium to the dome. The pressure in the dome builds up and the main valve recloses either rapid and complete (Pop Action) or gradual and partial following system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

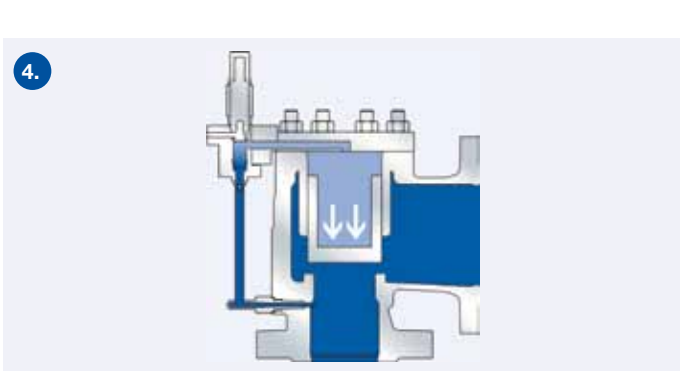
While there are specific differences between the Series 810 – Pop Action POSV and the Series 820 – Modulate Action POSV, the basic operation of a LESER POSV can be described as follows. During operation, the POSV goes through these basic operating states:

**Operating states of the POSV**



## High Efficiency
# Series 810 – Pop Action Features

The Series 810 – Pop Action Pilot Operated Safety Valve (POSV) is characterized by rapid opening, or pop action. When set pressure is reached, the dome of the main valve is vented quickly and completely and the main valve opens just as quickly and completely. The medium from the dome is discharged to atmosphere. The Pop Action POSV is used mainly for gas applications.

**Product Features**

**Robust and insensitive to vibrations.** The robust connection of the pilot valve (= control valve for the main valve) to the main valve and the reduced exposed piping guarantee safe operation even if there are vibrations in the system.

**Easy spring replacement.** The spring is easily accessible. This allows simple replacement of the spring, saving time and costs. In order to replace the spring only the top section of the bonnet needs to be removed. Other functional parts or soft goods do not have to be disassembled and therefore do not need to be replaced.

**Easy blowdown setting within the requirements of codes and standards.** LESER sets the blowdown in the range of 3 – 7%, which conforms to codes and standards. This setting can easily be adjusted. Other testing devices are not required.

**A large pressure range** of 2.5 – 426 bar (36 – 6170 psig) ensures that the Series 810 Pop Action POSV can be used for a wide variety of applications.

**Series 810**
**Pop Action Pilot Valve**

## Pop Action Pilot designs

| Pressure | Design | Pilot Article number |
|---|---|---|
| 2.5 – 151 bar<br>36 – 2190 psig | Design 1 | **8104.1000** |
| 151,01 – 256 bar<br>> 2190 – 3705 psig | Design 2 | **8104.2000** |

## 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.

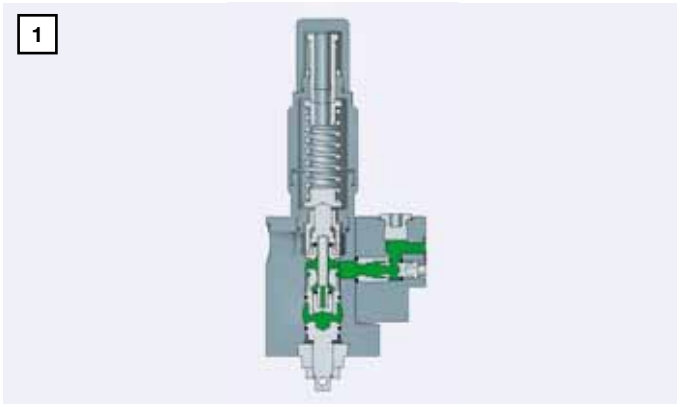
**3. At and above set pressure (+ max. 1%): pop opening**

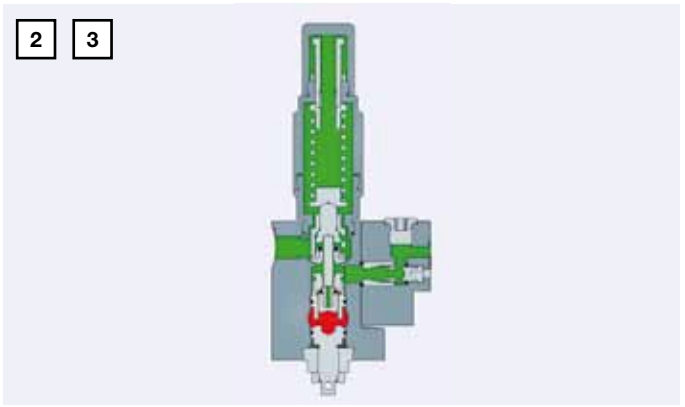
At set pressure, the main valve opens abruptly and completely feeding seat closed, exhaust seat open (Pop Action) (see bottom chart). The medium is channeled from the dome to atmosphere (see illustration on right).

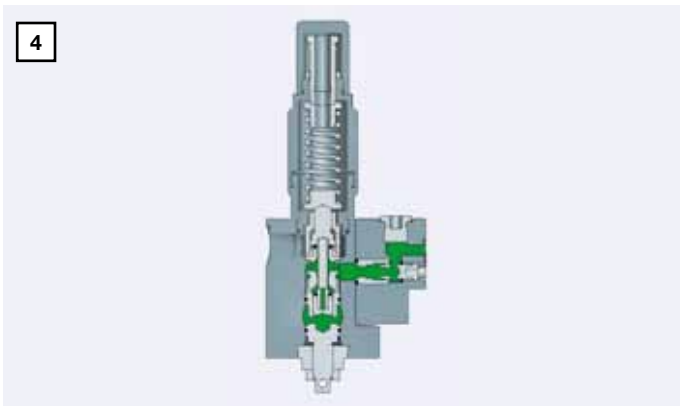
**4. At closing pressure:**
**feeding seat open, exhaust seat closed**

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.

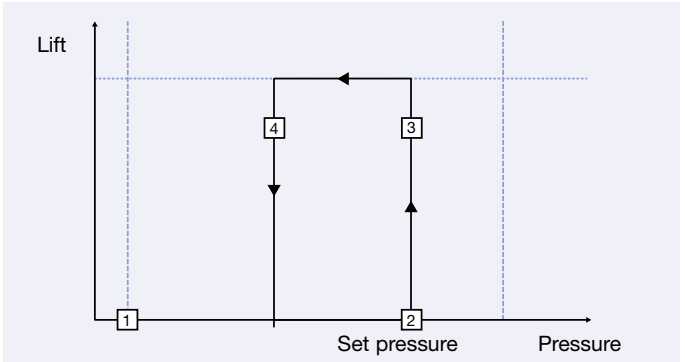
**Operating states Series 810**




**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 Features

The pilot valve in the Series 820 – Modulate Action Pilot Operated Safety Valve (POSV) does not open the main valve abruptly after reaching set pressure (pop action), but in modulating to the system overpressure (modulate action). Above set pressure, only as much mass flow is discharged as is needed to prevent a further pressure increase. This avoids an unnecessary loss of medium.

The LESER Modulate Action POSV is suitable for liquid as well as for steam and gas applications.

**Product Features**

The LESER Series 820 – Modulate Action POSV has the same design related benefits as the Series 810 – Pop Action POSV. It is robust, spare replacement is uncomplicated and it has a large pressure range of 2.5 – 426 bar (36 – 6170 psig). Furthermore, it offers the following specific benefits:

Suitability for media that are harmful to health / environment. The Series 820 – Modulate Action POSV releases the medium from the dome into the main valve outlet and not into the atmosphere like the Pop Action POSV. Since back pressure can occur here, the Modulate Action pilot valve has a back pressure compensating design.

Same performance, full lift. The LESER Series 820 – Modulate Action POSV has the same discharge capacity and the same lift when completely open as the Series 810 – Pop Action POSV.

**Series 820**
**Modulate Action Pilot Valve**
**(Diaphragm design)**

## High Efficiency

# Series 820 – Modulate Action: Diaphragm or Piston design

Depending on the set pressure, Series 820 – Modulate Action Pilot Operated Safety Valves (POSVs) are equipped with

– a diaphragm for set pressures of 2.5 – 30 bar (36 – 435 psig)
– a piston for set pressures of 30.01 – 426 bar (> 435 – 6170 psig)

The pilot valve uses the same springs in both designs.

**2.5 – 30 bar (36 – 435 psig) – Diaphragm**
In the lower pressure range a frictionless diaphragm in the pilot valve accurately transmits system pressure. Approaching set pressure, system pressure builds up underneath the diaphragm. This upward force is opposed by the greater force of the spring pushing downwards. The spring force can be adjusted within the designated pressure range using an adjustment screw. On reaching set pressure, the diaphragm triggers the opening mechanism in the pilot valve. The diaphragm lift is restricted to 1.5 mm by design to protect against tearing.

**30.01 – 426 bar (> 435 – 6170 psig) – Piston**
In the range of 30.01 – 426 bar (> 435 – 6170 psig) a piston is used to transmit the system pressure to the pilot valve and to trigger the main valve's opening when set pressure is reached.

Depending on the diaphragm or piston designs, specific parts and dimensions (e.g. the mounting of the diaphragm or piston dimensions) in the pilot may differ. Materials see page 30.

## Modulate Action Pilot designs

| Pressure | Design | Pilot Article number |
|---|---|---|
| 2,5 – 30 bar<br>36 – 435 psig | Diaphragm Design | **8204.1000** |
| 30,01 – 102 bar<br>> 435 – 1480 psig | Piston 1 | **8204.2000** |
| 102,01 – 256 bar<br>> 1480 – 3705 psig | Piston 2 | **8204.3000** |

## 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).

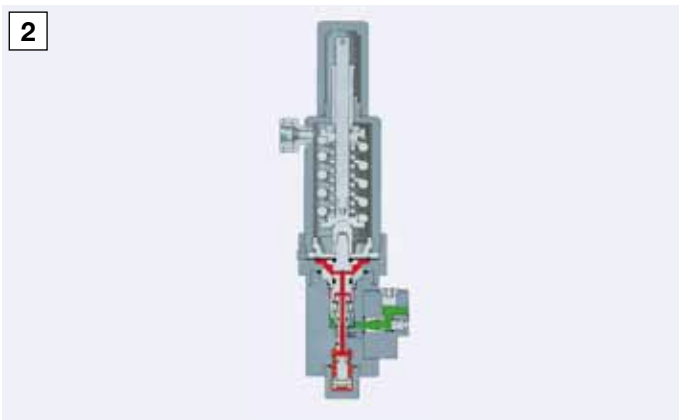
**1a. Near set pressure:**
**feeding seat closed, exhaust seat closed (not shown)**

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.

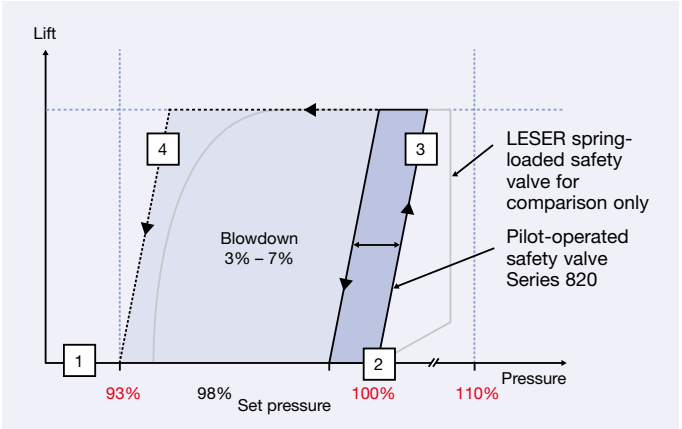
**2. At set pressure (+ max. 1%):**
**feeding seat closed, exhaust seat open**

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**




**1** – Below set pressure: normal operation
**2** – At set pressure
**3** – Modulate opening
**4** – At closing pressure – blowdown

## 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 24).

3

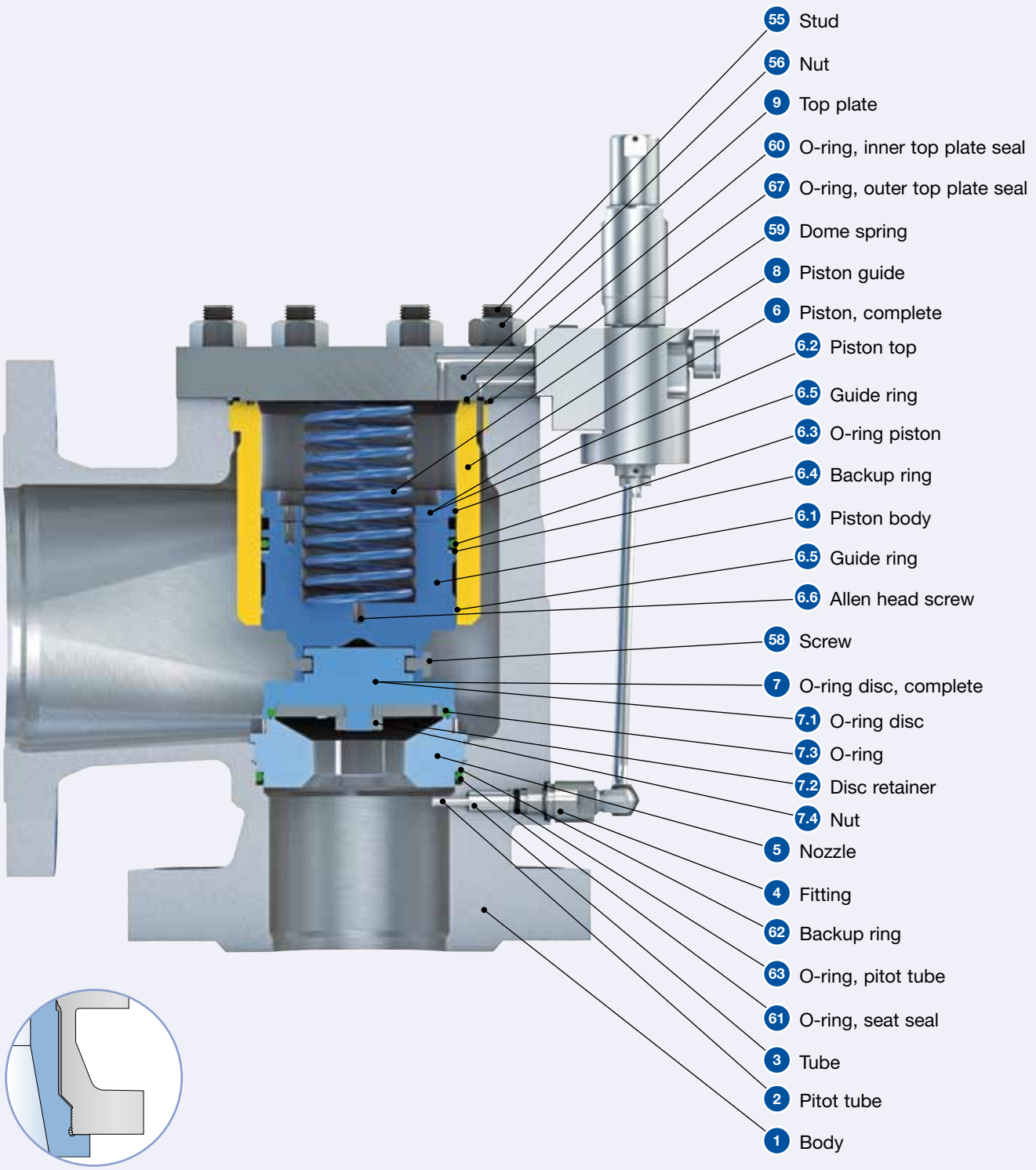
**4. At closing pressure:**
**full closing – feeding seat open,**
**exhaust seat closed**

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.

4

## 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.




Option: Full nozzle design

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

## Materials

| Item | Component | Type 8112 / 8212 | Type 8114 / 8214 | Type 8113 / 8213 |
|---|---|---|---|---|
| **1** | Body | 1.0619<br>SA 216 WCB | 1.4408<br>SA 351 CF8M | <br>SA 352 LCB |
| **2** | Pitot tube | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **3** | Tube | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **4** | Fitting | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **5** | Nozzle | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **6** | Piston, complete | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **6.1** | Piston body | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **6.2** | Piston top | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **6.4** | Backup ring | PTFE<br>PTFE | PTFE<br>PTFE | PTFE<br>PTFE |
| **6.5** | Guide ring | PTFE with carbon<br>PTFE with carbon | PTFE with carbon<br>PTFE with carbon | PTFE with carbon<br>PTFE with carbon |
| **6.6** | Allen head screw | A4-70<br>Stainless steel | A4-70<br>Stainless steel | A4-70<br>Stainless steel |
| **7** | O-ring disc, complete | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **7.1** | O-ring disc | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **7.2** | Disc retainer | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **7.4** | Nut | A4-70<br>Stainless steel | A4-70<br>Stainless steel | A4-70<br>Stainless steel |
| **8** | Piston guide | 1.4404<br>316L | 1.4404<br>316L | 1.4404<br>316L |
| **9** | Top plate | 1.0460<br>SA 105 | 1.4404<br>316L | 1.4404<br>316L |
| **55** | Stud | 1.7225<br>B7M | 1.4401<br>B8M | 1.4401<br>B8M |
| **56** | Nut | 1.7225<br>2H | 1.4401<br>8M | 1.4401<br>8M |
| **58** | Screw | A4-70<br>Stainless steel | A4-70<br>Stainless steel | A4-70<br>Stainless steel |
| **59** | Dome spring | 1.4310<br>Stainless steel | 1.4310<br>Stainless steel | 1.4310<br>Stainless steel |
| **62** | Backup ring | PTFE<br>PTFE | PTFE<br>PTFE | PTFE<br>PTFE |

| | | Option code | |
|---|---|---|---|
| **6.3, 6.4, 7.3, 60, 61, 63, 67** | O-ring[1)] | * | Viton® (FKM – Fluorocarbon) |
| | | R05 | Buna-EP® (EPDM – Ethylene-Propylene-Dine) |
| | | R06 | Kalrez® (FFKM – Perfluor) |

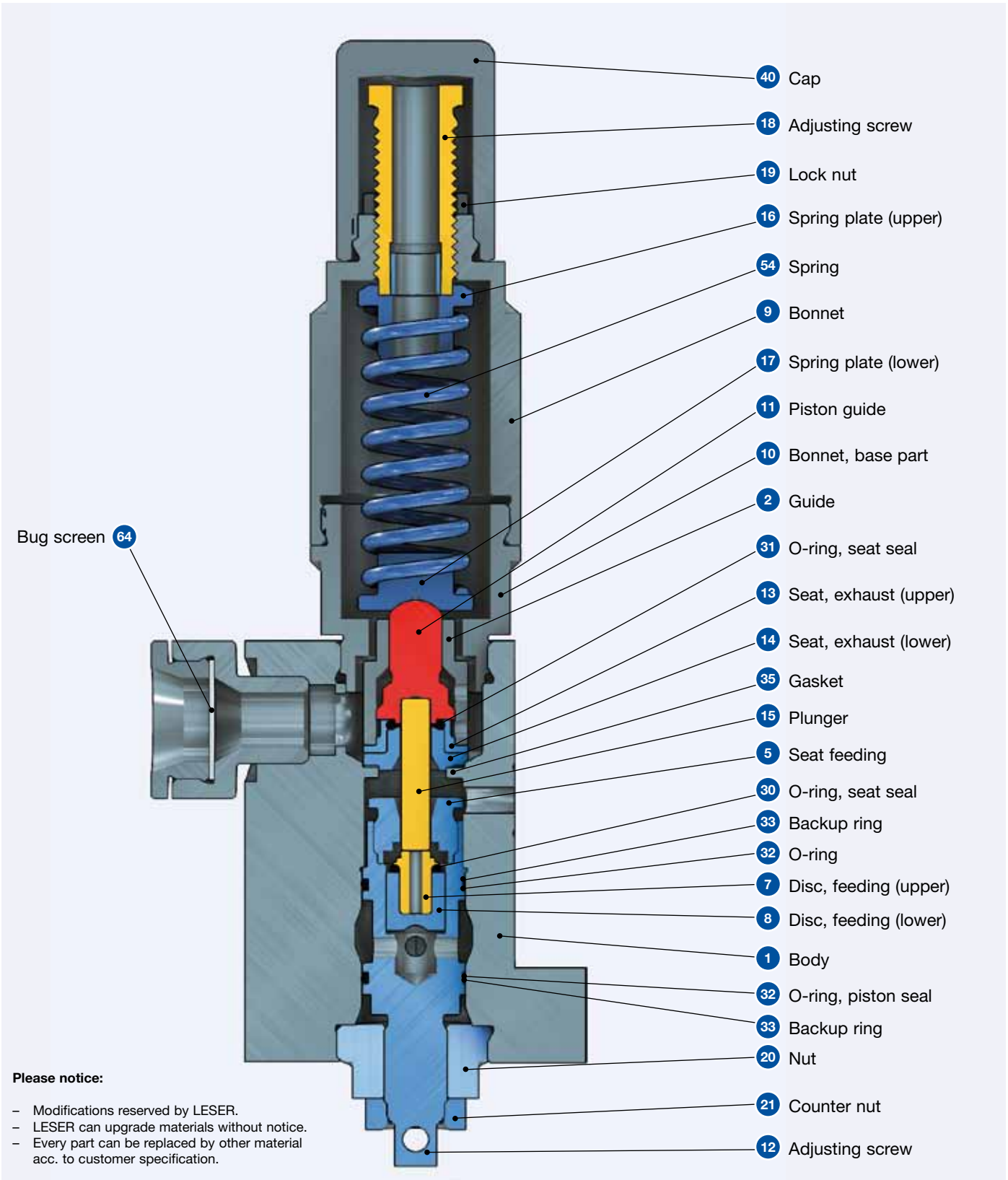
**Please notice:**

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

[1)] For further soft seal materials refer to page 69

## 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.




**Please notice:**

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

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

## Materials

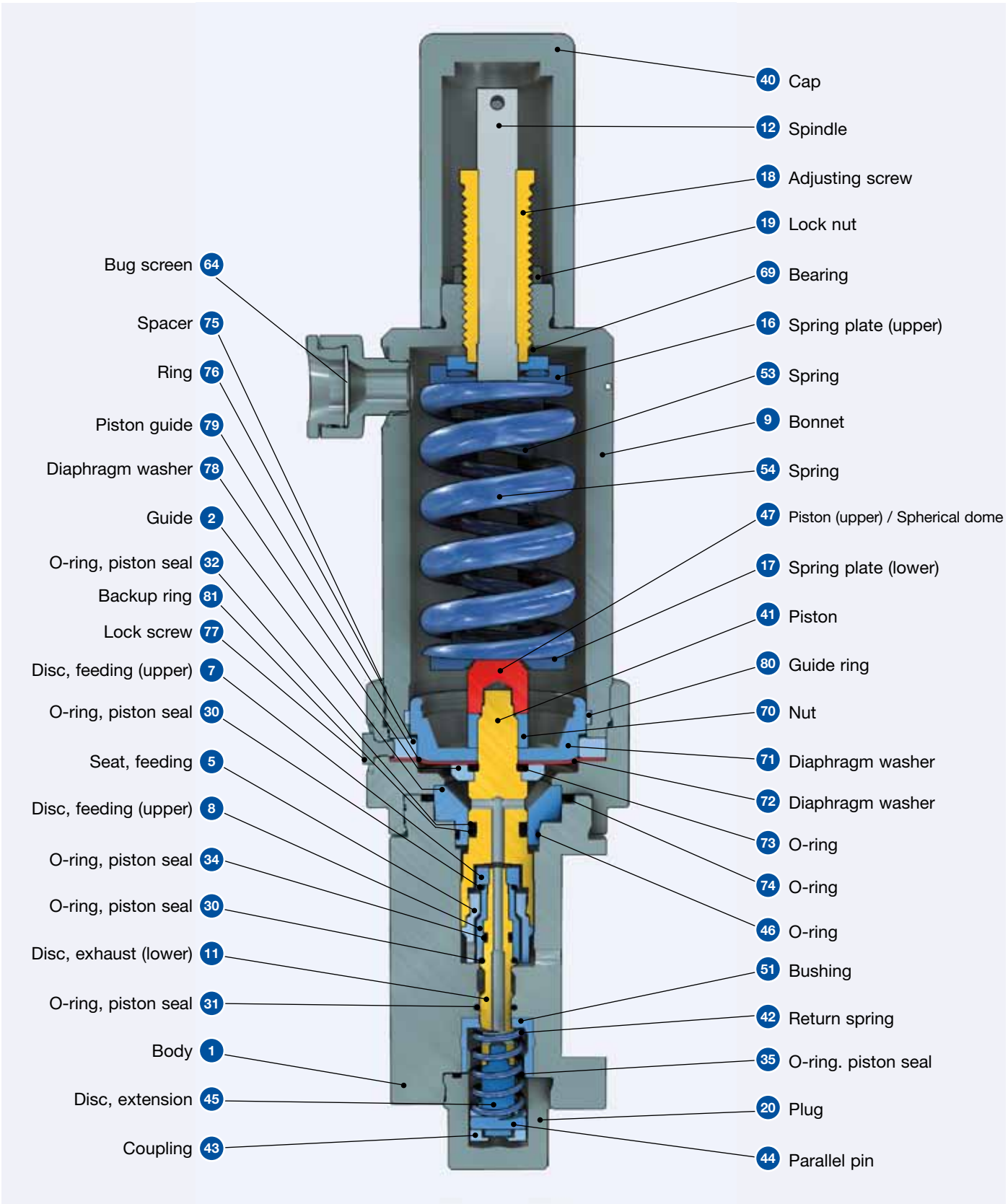
| Item | Component | | Standard | NACE |
|---|---|---|---|---|
| | | | | |
| 1 | Body | | 1.4404 | 1.4404 |
| | | | SA 479 316L | SA 479 316L |
| 2 | Guide | | 1.4404 | 1.4404 |
| | | | 316L | 316L |
| 5 | Seat, feeding | | 1.4404 | 1.4404 |
| | | | 316L | 316L |
| 7 | Disc, feeding (upper) | | 1.4404 | 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 |
| | | Option code | | |
| 30, 31, 32 | O-ring[1)] | * | Viton® (FKM – Fluorocarbon) | |
| | | R05 | Buna-EP® (EPDM – Ethylene-Propylene-Dine) | |
| | | R06 | Kalrez® (FFKM – Perfluor) | |

[1)] For further soft seal materials refer to page 69

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

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

## Materials

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

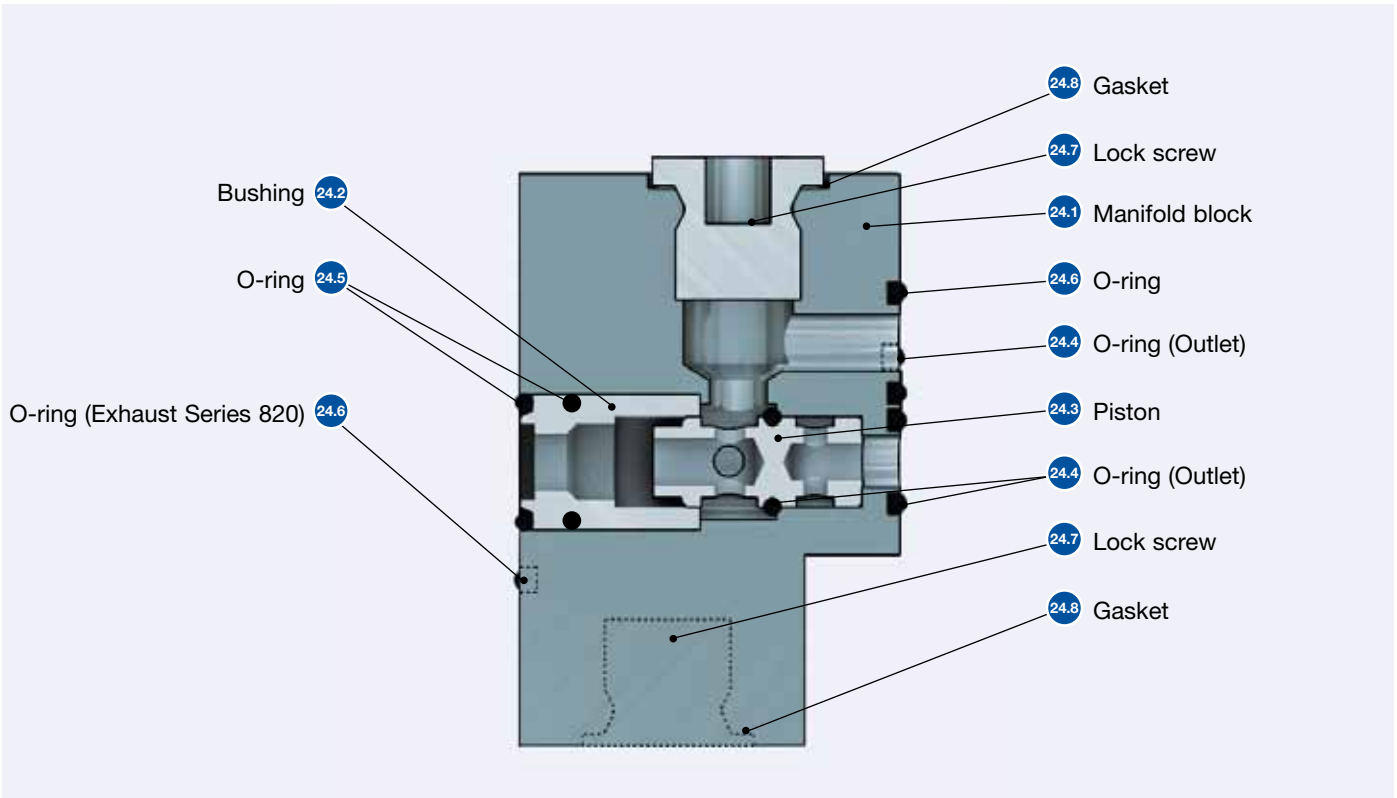
**Please notice:**

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

[1)] For further soft seal materials refer to page 69

## 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[1)] | * | 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.

[1)] For further soft seal materials refer to page 69

## 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[1)]** | 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[1)]** | 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[1)]** | **8112.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8112.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8112.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8112.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8112.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8112.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8112.** | | | | | | | | | | | | | | |
| **2500 x 300** | **8112.** | in preparation | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8112.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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[1)]** | 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[1)]** | 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[1)]** | **8114.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8114.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8114.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8114.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8114.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8114.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8114.** | in preparation | | | | | | | | | | | | | |
| **2500 x 300** | **8114.** | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8114.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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[1)]** | 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[1)]** | 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[1)]** | **8113.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8113.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8113.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8113.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8113.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8113.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8113.** | in preparation | | | | | | | | | | | | | |
| **2500 x 300** | **8113.** | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8113.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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[1)]** | 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[1)]** | 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[1)]** | **8212.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8212.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8212.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8212.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8212.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8212.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8212.** | in preparation | | | | | | | | | | | | | |
| **2500 x 300** | **8212.** | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8212.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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[1)]** | 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[1)]** | 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[1)]** | **8214.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8214.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8214.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8214.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8214.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8214.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8214.** | in preparation | | | | | | | | | | | | | |
| **2500 x 300** | **8214.** | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8214.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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[1)]** | 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[1)]** | 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[1)]** | **8213.** | in preparation | | | | | | | | | | | | | | |
| **2500 x 300** | **8213.** | | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8213.** | | | | | | | | | | | | | | | |

[1)] 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[1)]** | H65 **8213.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **600 x 150** | **8213.** | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| **600 x 300[1)]** | H67 **8213.** | **1170** | **1180** | **1190** | | **1200** | **1210** | **1220** | **1230** | | **1030[2)]** | **1040[2)]** | | **1050[2)]** | |
| **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[1)]** | **8213.** | in preparation | | | | | | | | | | | | | |
| **2500 x 300** | **8213.** | | | | | | | | | | | | | | |
| **2500 x 600[1)]** | **8213.** | | | | | | | | | | | | | | |

[1)] 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.

[2)] 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 |

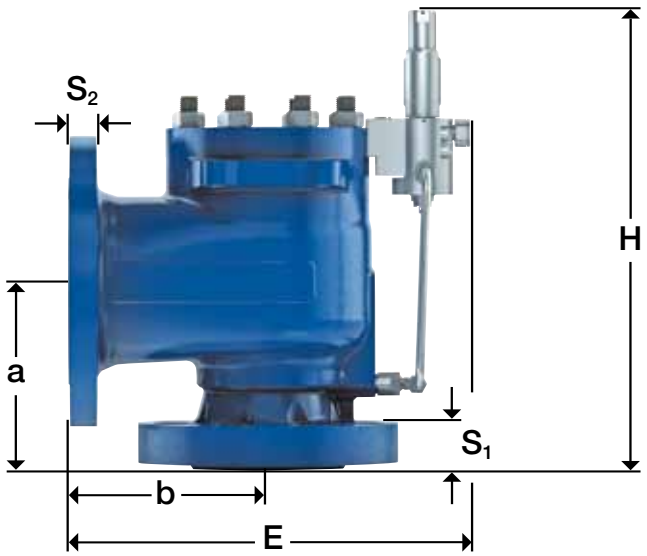
### Body material: CF8M

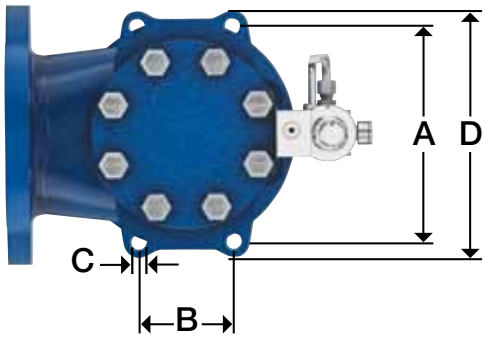
| | Temperature range | | | | |
|---|---|---|---|---|---|
| T [°C] | -29 | 38 | 93 | 149 | 204 |
| T [°F] | -20 | 100 | 200 | 300 | 400 |
| **Inlet flange rating class** | | | | | |
| | Pressure range [psig] | | | | |
| 150 | 275 | 275 | 235 | 215 | 195 |
| 300 | 720 | 720 | 620 | 560 | 515 |
| 600 | 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 [mm²] | [inch²]
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 $_{I+O}$ | 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+ |
| $d_0$ | 11 | 14.7 | 18.4 | 23 | 11 | 14.7 | 18.4 | 29 | 23,6 | 29.4 | 35.7 | 23.6 | 29.4 | 38 | 48 |
| $A_0$ | 95 | 170 | 266 | 415 | 95 | 170 | 266 | 661 | 437 | 679 | 1001 | 437 | 679 | 1134 | 1810 |
| **Flange rating class 150 x 150** | | | | | | | | | | | | | | | |
| a | 105 | 105 | 105 | 105 | 124 | 124 | 124 | 124 | 130 | 130 | 130 | 137 | 137 | 137 | 137 |
| b | 114 | 114 | 114 | 114 | 121 | 121 | 121 | 121 | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| H Series 810 | 330 | 330 | 330 | 330 | 359 | 359 | 359 | 359 | 370 | 370 | 370 | 386 | 386 | 386 | 386 |
| H Series 820 | 456 | 456 | 456 | 456 | 485 | 485 | 485 | 485 | 496 | 496 | 496 | 512 | 512 | 512 | 512 |
| $S_1$ | 20 | 20 | 20 | 20 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 36 | 36 | 36 | 36 |
| $S_2$ | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| A | 143 | 143 | 143 | 143 | 152 | 152 | 152 | 152 | 160 | 160 | 160 | 179 | 179 | 179 | 179 |
| B | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| C | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| D | 182 | 182 | 182 | 182 | 186 | 186 | 186 | 186 | 200 | 200 | 200 | 209 | 209 | 209 | 209 |
| E | 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 |
| **Flange rating class 300 x 150** | | | | | | | | | | | | | | | |
| a | 111 | 111 | 111 | 111 | 124 | 124 | 124 | 124 | 130 | 130 | 130 | 137 | 137 | 137 | 137 |
| b | 114 | 114 | 114 | 114 | 121 | 121 | 121 | 121 | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| H Series 810 | 336 | 336 | 336 | 336 | 359 | 359 | 359 | 359 | 370 | 370 | 370 | 386 | 386 | 386 | 386 |
| H Series 820 | 462 | 462 | 462 | 462 | 485 | 485 | 485 | 485 | 496 | 496 | 496 | 512 | 512 | 512 | 512 |
| $S_1$ | 26 | 26 | 26 | 26 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 36 | 36 | 36 | 36 |
| $S_2$ | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| A | 143 | 143 | 143 | 143 | 152 | 152 | 152 | 152 | 160 | 160 | 160 | 179 | 179 | 179 | 179 |
| B | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| C | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| D | 182 | 182 | 182 | 182 | 186 | 186 | 186 | 186 | 200 | 200 | 200 | 209 | 209 | 209 | 209 |
| E | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 35 | 35 | 35 | – | 38 | 38 | 38 | 38 | 38 | 38 | – | 46 | 46 | 46 | – |
| $S_2$ | 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 | – |
| **Flange rating class 600 x 150** | | | | | | | | | | | | | | | |
| a | 111 | 111 | 111 | 111 | 124 | 124 | 124 | 124 | 130 | 130 | 130 | 137 | 137 | 137 | 137 |
| b | 114 | 114 | 114 | 114 | 121 | 121 | 121 | 121 | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| H Series 810 | 336 | 336 | 336 | 336 | 359 | 359 | 359 | 359 | 370 | 370 | 370 | 386 | 386 | 386 | 386 |
| H Series 820 | 462 | 462 | 462 | 462 | 485 | 485 | 485 | 485 | 496 | 496 | 496 | 512 | 512 | 512 | 512 |
| $S_1$ | 26 | 26 | 26 | 26 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 36 | 36 | 36 | 36 |
| $S_2$ | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| A | 143 | 143 | 143 | 143 | 152 | 152 | 152 | 152 | 160 | 160 | 160 | 179 | 179 | 179 | 179 |
| B | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| C | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| D | 182 | 182 | 182 | 182 | 186 | 186 | 186 | 186 | 200 | 200 | 200 | 209 | 209 | 209 | 209 |
| E | 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+ |
| $d_0$ | 38 | 45 | 56 | 75 | 56 | 63 | 69 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ | 1134 | 1590 | 2463 | 4418 | 2463 | 3117 | 3739 | 5411 | 7088 | 9503 | 13893 | 15837 | 22167 | 25447 |
| **Flange rating class 150 x 150** | | | | | | | | | | | | | | |
| a | 156 | 156 | 156 | 156 | 197 | 197 | 197 | 197 | 197 | 240 | 240 | 240 | 276 | 276 |
| b | 162 | 162 | 162 | 162 | 210 | 210 | 210 | 210 | 210 | 241 | 241 | 241 | 279 | 279 |
| H Series 810 | 428 | 428 | 428 | 428 | 481 | 481 | 481 | 481 | 481 | 580 | 580 | 580 | 683 | 683 |
| H Series 820 | 554 | 554 | 554 | 554 | 607 | 607 | 607 | 607 | 607 | 706 | 706 | 706 | 809 | 809 |
| $S_1$ | 36 | 36 | 36 | 36 | 49 | 49 | 49 | 49 | 49 | 52 | 52 | 52 | 45 | 45 |
| $S_2$ | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 47 | 47 | 47 | 35 | 35 |
| A | 223 | 223 | 223 | 223 | 249 | 249 | 249 | 249 | 249 | 320 | 320 | 320 | 356 | 356 |
| B | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 160 | 160 | 160 | 160 | 160 |
| C | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| D | 259 | 259 | 259 | 259 | 305 | 305 | 305 | 305 | 305 | 381 | 381 | 381 | 430 | 430 |
| E | 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 |
| **Flange rating class 300 x 150** | | | | | | | | | | | | | | |
| a | 156 | 156 | 156 | 156 | 197 | 197 | 197 | 197 | 197 | 240 | 240 | 240 | 276 | 276 |
| b | 162 | 162 | 162 | 162 | 210 | 210 | 210 | 210 | 210 | 241 | 241 | 241 | 279 | 279 |
| H Series 810 | 428 | 428 | 428 | 428 | 481 | 481 | 481 | 481 | 481 | 580 | 580 | 580 | 683 | 683 |
| H Series 820 | 554 | 554 | 554 | 554 | 607 | 607 | 607 | 607 | 607 | 706 | 706 | 706 | 809 | 809 |
| $S_1$ | 36 | 36 | 36 | 36 | 49 | 49 | 49 | 49 | 49 | 52 | 52 | 52 | 45 | 45 |
| $S_2$ | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 47 | 47 | 47 | 35 | 35 |
| A | 223 | 223 | 223 | 223 | 249 | 249 | 249 | 249 | 249 | 320 | 320 | 320 | 356 | 356 |
| B | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 160 | 160 | 160 | 160 | 160 |
| C | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| D | 259 | 259 | 259 | 259 | 305 | 305 | 305 | 305 | 305 | 381 | 381 | 381 | 430 | 430 |
| E | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 56 | 56 | 56 | – | 62 | 62 | 62 | 62 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 600 x 150** | | | | | | | | | | | | | | |
| a | 162 | 162 | 162 | 162 | 197 | 197 | 197 | 197 | 197 | 246 | 246 | 246 | 297 | 297 |
| b | 162 | 162 | 162 | 162 | 210 | 210 | 210 | 210 | 210 | 241 | 241 | 241 | 279 | 279 |
| H Series 810 | 434 | 434 | 434 | 434 | 481 | 481 | 481 | 481 | 481 | 586 | 586 | 586 | 689 | 689 |
| H Series 820 | 560 | 560 | 560 | 560 | 607 | 607 | 607 | 607 | 607 | 712 | 712 | 712 | 815 | 815 |
| $S_1$ | 42 | 42 | 42 | 42 | 49 | 49 | 49 | 49 | 49 | 58 | 58 | 58 | 66 | 66 |
| $S_2$ | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 47 | 47 | 47 | 35 | 35 |
| A | 223 | 223 | 223 | 223 | 249 | 249 | 249 | 249 | 249 | 320 | 320 | 320 | 356 | 356 |
| B | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 160 | 160 | 160 | 160 | 160 |
| C | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| D | 259 | 259 | 259 | 259 | 305 | 305 | 305 | 305 | 305 | 381 | 381 | 381 | 430 | 430 |
| E | 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+ |
| $d_0$ | 11 | 14.7 | 18.4 | 23 | 11 | 14.7 | 18.4 | 29 | 23,6 | 29.4 | 35.7 | 23.6 | 29.4 | 38 | 48 |
| $A_0$ | 95 | 170 | 266 | 415 | 95 | 170 | 266 | 661 | 437 | 679 | 1001 | 437 | 679 | 1134 | 1810 |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 35 | 35 | 35 | – | 38 | 38 | 38 | 38 | 38 | 38 | – | 46 | 46 | 46 | – |
| $S_2$ | 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 | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 35 | 35 | 35 | – | 38 | 38 | 38 | 38 | 38 | 38 | – | 46 | 46 | 46 | – |
| $S_2$ | 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 | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 35 | 35 | 34,8 | – | 38 | 38 | 38 | 38 | 38 | 38 | – | 46 | 46 | 46 | – |
| $S_2$ | 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+ |
| $d_0$ | 38 | 45 | 56 | 75 | 56 | 63 | 69 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ | 1134 | 1590 | 2463 | 4418 | 2463 | 3117 | 3739 | 5411 | 7088 | 9503 | 13893 | 15837 | 22167 | 25447 |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 56 | 56 | 56 | – | 62 | 62 | 62 | 62 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 56 | 56 | 56 | – | 62 | 62 | 62 | 62 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 56 | 56 | 56 | – | 62 | 62 | 62 | 62 | – | – | – | – | – | – |
| $S_2$ | 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 | | D | E | F | | G | H | | G | H | J | |
| Extra Orifice | | | | G | | | | H | | | J | | | | K+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 150 x 150** | | | | | | | | | | | | | | | |
| 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 |
| $S_1$ | 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 |
| $S_2$ | 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 |
| **Flange rating class 300 x 150** | | | | | | | | | | | | | | | |
| 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 |
| $S_1$ | 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 |
| $S_2$ | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 600 x 150** | | | | | | | | | | | | | | | |
| 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 |
| $S_1$ | 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 |
| $S_2$ | 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+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 150 x 150** | | | | | | | | | | | | | | |
| 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 |
| $S_1$ | 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 |
| $S_2$ | 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 |
| **Flange rating class 300 x 150** | | | | | | | | | | | | | | |
| 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 |
| $S_1$ | 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 |
| $S_2$ | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 2 1/5 | 2 1/5 | 2 1/5 | – | 2 3/7 | 2 3/7 | 2 3/7 | 2 3/7 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 600 x 150** | | | | | | | | | | | | | | |
| 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 | 221/16 | 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 |
| $S_1$ | 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 |
| $S_2$ | 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 | 913/16 | 913/16 | 913/16 | 913/16 | 1219/32 | 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 | 1630/32 | 1630/32 |
| 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+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 2 1/5 | 2 1/5 | 2 1/5 | – | 2 3/7 | 2 3/7 | 2 3/7 | 2 3/7 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 2 1/5 | 2 1/5 | 2 1/5 | – | 2 3/7 | 2 3/7 | 2 3/7 | 2 3/7 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 2 1/5 | 2 1/5 | 2 1/5 | – | 2 3/7 | 2 3/7 | 2 3/7 | 2 3/7 | – | – | – | – | – | – |
| $S_2$ | 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 ½" x 2" | | | | 1 ½" x 3" | | | 2" x 3" | | | |
| API Orifice | D | E | F | | D | E | F | | G | H | | G | H | J | |
| Extra Orifice | | | | G | | | | H | | | J | | | | K+ |
| $d_0$ | 11 | 14.7 | 18.4 | 23 | 11 | 14.7 | 18.4 | 29 | 23,6 | 29.4 | 35.7 | 23.6 | 29.4 | 38 | 48 |
| $A_0$ | 95 | 170 | 266 | 415 | 95 | 170 | 266 | 661 | 437 | 679 | 1001 | 437 | 679 | 1134 | 1810 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 69 | 69 | 69 | – | 72 | 72 | 72 | 72 | 72 | 72 | – | 80 | 80 | 80 | – |
| $S_2$ | 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 | – |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 69 | 69 | 69 | – | 72 | 72 | 72 | 72 | 72 | 72 | – | 80 | 80 | 80 | – |
| $S_2$ | 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 | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 69 | 69 | 69 | – | 72 | 72 | 72 | 72 | 72 | 72 | – | 80 | 80 | 80 | – |
| $S_2$ | 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 | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 69 | 69 | 69 | – | 72 | 72 | 72 | 72 | 72 | 72 | – | 80 | 80 | 80 | – |
| $S_2$ | 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+ |
| $d_0$ | 38 | 45 | 56 | 75 | 56 | 63 | 69 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ | 1134 | 1590 | 2463 | 4418 | 2463 | 3117 | 3739 | 5411 | 7088 | 9503 | 13893 | 15837 | 22167 | 25447 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 89 | 89 | 89 | – | 95 | 95 | 95 | 95 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 89 | 89 | 89 | – | 95 | 95 | 95 | 95 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 89 | 89 | 89 | – | 95 | 95 | 95 | 95 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 89 | 89 | 89 | – | 95 | 95 | 95 | 95 | – | – | – | – | – | – |
| $S_2$ | 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 | | D | E | F | | G | H | | G | H | J | |
| Extra Orifice | | | | G | | | | H | | | J | | | | K+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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 | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | | |
| 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 | – |
| $S_1$ | 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 | – |
| $S_2$ | 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+ |
| $d_0$ | 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 |
| $A_0$ | 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 |
| **Flange rating class 300 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 3 1/2 | 3 1/2 | 3 1/2 | – | 3 3/4 | 3 3/4 | 3 3/4 | 3 3/4 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 600 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 3 1/2 | 3 1/2 | 3 1/2 | – | 3 3/4 | 3 3/4 | 3 3/4 | 3 3/4 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 900 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 3 1/2 | 3 1/2 | 3 1/2 | – | 3 3/4 | 3 3/4 | 3 3/4 | 3 3/4 | – | – | – | – | – | – |
| $S_2$ | 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 | – | – | – | – | – | – |
| **Flange rating class 1500 x 300** | | | | | | | | | | | | | | |
| 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 | – | – | – | – | – | – |
| $S_1$ | 3 1/2 | 3 1/2 | 3 1/2 | – | 3 3/4 | 3 3/4 | 3 3/4 | 3 3/4 | – | – | – | – | – | – |
| $S_2$ | 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

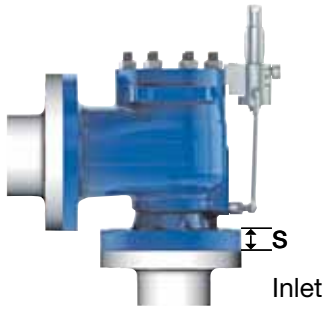
The flange thickness of the inlet and outlet flanges of the Pilot Operated Safety Valve (POSV) may differ from the standard. Therefore stud-bolts for the flange connections may also be longer than stated in DIN EN 1092-1. To simplify the calculation of the correct bolt length, the quantity and sizes 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" | | | | 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+ |
| | | $d_0$ [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 |
| | | $A_0$ [mm$^2$] | | 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 – PN 16 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M12 | M12 | M12 | M12 | M16 | M16 | 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 | 80 | 85 | 85 | 85 | 85 |
| Outlet | Qty | Hexagon screws | PN 10 – PN 16 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | 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 | 80 | 80 |
| **Flange class 300 x 150** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 25 – PN 40 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M12 | M12 | M12 | M12 | M16 | M16 | 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 | 80 | 85 | 85 | 85 | 85 |
| Outlet | Qty | Hexagon screws | PN 10 – PN 16 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | 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 | 80 | 80 |
| **Flange class 600 x 150** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 10 – PN 16 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M12 | M12 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 |
| | Screw dim | Raised face flange type [mm] | | 65 | 65 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 100 | 100 | 100 | 100 | 110 | 110 |
| Outlet | Qty | Hexagon screws | PN 10 – PN 16 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | 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 | 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+ |
| | | | | $d_0$ [mm] | 38 | 45 | 56 | 75 | 56 | 63 | 69 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| | | | | $A_0$ [mm²] | 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 – PN 16 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | Hexagon screw diameter nut size [mm] | | | | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 |
| | Screw dim | | Raised face flange type [mm] | | 90 | 90 | 90 | 90 | 100 | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 130 | 130 |
| Outlet | Qty | | Hexagon screws | PN 10 – PN 16 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 |
| | | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 |
| | Hexagon screw diameter nut size [mm] | | | PN 10 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 |
| | | | | PN 16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M24 | M24 |
| | Screw dim | | Raised face flange type [mm] | PN 10 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 100 | 100 |
| | | | | PN 16 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 110 | 110 |
| **Flange class 300 x 150** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | | Hexagon screws | PN 25 – PN 40 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | Hexagon screw diameter nut size [mm] | | | PN 25 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 |
| | | | | PN 40 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 |
| | 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 |
| Outlet | Qty | | Hexagon screws | PN 10 – PN 16 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | | Nuts | | 8 | 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 |
| | | | | PN 16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M24 | M24 |
| | Screw dim | | Raised face flange type [mm] | PN 10 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 100 | 100 |
| | | | | PN 16 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 110 | 110 |
| **Flange class 600 x 150** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | | Hexagon screws | PN 10 – PN 16 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 |
| | Hexagon screw diameter nut size [mm] | | | | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 |
| | Screw dim | | Raised face flange type [mm] | | 90 | 90 | 90 | 90 | 100 | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 130 | 130 |
| Outlet | Qty | | Hexagon screws | PN 10 – PN 16 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 |
| | | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 12 | 12 |
| | Hexagon screw diameter nut size [mm] | | | PN 10 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 |
| | | | | PN 16 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M24 | M24 |
| | Screw dim | | Raised face flange type [mm] | PN 10 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 100 | 100 |
| | | | | PN 16 | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 110 | 110 |

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" | | | | 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+ |
| | | $d_0$ [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 |
| | | $A_0$ [mm²] | | 95 | 170 | 266 | 415 | 95 | 170 | 266 | 661 | 437 | 679 | 1001 | 437 | 679 | 1134 | 1810 |
| **Flange Class 900 x 300** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 40 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M12 | M12 | M12 | M12 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 |
| | Screw dim | Raised face flange type [mm] | | 80 | 80 | 80 | 80 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 100 | 100 | 100 | 100 |
| Inlet | Qty | Hexagon screws | PN 63 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M20 |
| | Screw dim | Raised face flange type [mm] | | 90 | 90 | 90 | 90 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 110 | 110 | 110 | 110 |
| Inlet | Qty | Hexagon screws | PN 100 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 |
| | Screw dim | Raised face flange type [mm] | | 90 | 90 | 90 | 90 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 |
| Inlet | Qty | Hexagon screws | PN 160 | 4 | 4 | 4 | 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 | 4 | 4 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 |
| | Screw dim | Raised face flange type [mm] | | 90 | 90 | 90 | 90 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 120 | 120 | 120 | 120 |
| Outlet | Qty | Hexagon screws | PN 40 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 |
| | Screw dim | Raised face flange type [mm] | | 80 | 80 | 80 | 80 | 85 | 85 | 85 | 85 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| **Flange class 1500 x 300** | | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 36 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 | M24 | M24 | M24 | M24 | M24 | M24 |
| | Screw dim | Raised face flange type [mm] | | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 130 | 130 | 130 | 130 |
| Outlet | Qty | Hexagon screws | PN 10 – PN 16 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | Nuts | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 | M16 |
| | Screw dim | Raised face flange type [mm] | | 80 | 80 | 80 | 80 | 85 | 85 | 85 | 85 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |

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+ |
| $d_0$ [mm] | | | | 38 | 45 | 56 | 75 | 56 | 63 | 69 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ [mm$^2$] | | | | 1134 | 1590 | 2463 | 4418 | 2463 | 3117 | 3739 | 5411 | 7088 | 9503 | 13893 | 15837 | 22167 | 25447 |
| **Flange Class 900 x 300** | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 40 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M20 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 110 | 110 | 110 | 110 | 130 | 130 | 130 | 130 | 130 | | | | | |
| Inlet | Qty | Hexagon screws | PN 63 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 120 | 120 | 120 | 120 | 140 | 140 | 140 | 140 | 140 | | | | | |
| Inlet | Qty | Hexagon screws | PN 100 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M24 | M24 | M24 | M24 | M27 | M27 | M27 | M27 | M27 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 130 | 130 | 130 | 130 | 150 | 150 | 150 | 150 | 150 | | | | | |
| Inlet | Qty | Hexagon screws | PN 160 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M24 | M24 | M24 | M24 | M27 | M27 | M27 | M27 | M27 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 140 | 140 | 140 | 140 | 150 | 150 | 150 | 150 | 150 | | | | | |
| Outlet | Qty | Hexagon screws | PN 40 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 | 120 | | | | | |
| **Flange class 1500 x 300** | | | | | | | | | | | | | | | | | |
| Inlet | Qty | Hexagon screws | PN 250 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M27 | M27 | M27 | M27 | M30 | M30 | M30 | M30 | M30 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 150 | 150 | 150 | 150 | 170 | 170 | 170 | 170 | 170 | | | | | |
| Outlet | Qty | Hexagon screws | PN 40 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | | Nuts | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | | | | | |
| | Hexagon screw diameter nut size [mm] | | | M20 | M20 | M20 | M20 | M24 | M24 | M24 | M24 | M24 | | | | | |
| | Screw dim | Raised face flange type [mm] | | 100 | 100 | 100 | 100 | 120 | 120 | 120 | 120 | 120 | | | | | |

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 | | G | H | J | |
| | | Extra Orifice | | | | G | | | | H | | | J | | | | K+ |
| | | $d_0$ [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 |
| | | $A_0$ [inch²] | 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 |
| **Flange class 150 x 150** | | | | | | | | | | | | | | | | | |
| 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 |
| | 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [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 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 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [inch] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 |
| **Flange class 300 x 150** | | | | | | | | | | | | | | | | | |
| 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 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [inch] | 3 3/4 | 3 3/4 | 3 3/4 | 3 3/4 | 4 1/2 | 4 1/2 | 4 1/2 | 4 1/2 | 4 1/2 | 4 1/2 | 4 1/2 | 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 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [inch] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 |
| **Flange class 600 x 150** | | | | | | | | | | | | | | | | | |
| 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 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [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 3/4 | 4 3/4 | 4 3/4 | 4 3/4 |
| 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 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 |
| | Bolt dim | 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 |
| | | Ring type joint flange [inch] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 |

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

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# 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+ |
| | | | $d_0$ [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 |
| | | | $A_0$ [inch²] | 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 |
| **Flange class 150 x 150** | | | | | | | | | | | | | | | | | |
| Inlet | Qty | | Stud bolts | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | | Nuts | 8 | 8 | 8 | 8 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| | | | 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 4 3/4 | 4 3/4 | 4 3/4 | 4 3/4 | 5 | 5 | 5 | 5 | 5 | 5 3/4 | 5 3/4 | 5 3/4 | 6 1/4 | 6 1/4 |
| Outlet | Qty | | Stud bolts | 8 | 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 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 3/4 | 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 |
| **Flange class 300 x 150** | | | | | | | | | | | | | | | | | |
| 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 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 5 1/2 | 5 1/2 | 5 1/2 | 5 1/2 | 5 3/4 | 5 3/4 | 5 3/4 | 5 3/4 | 5 3/4 | 6 1/4 | 6 1/4 | 6 1/4 | 7 1/4 | 7 1/4 |
| Outlet | Qty | | Stud bolts | 8 | 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 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 3/4 | 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 |
| **Flange class 600 x 150** | | | | | | | | | | | | | | | | | |
| Inlet | Qty | | Stud bolts | 8 | 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 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 5 1/2 | 5 1/2 | 5 1/2 | 5 1/2 | 6 1/2 | 6 1/2 | 6 1/2 | 6 1/2 | 6 1/2 | 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 | 8 | 12 | 12 |
| | | | Nuts | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 24 | 24 |
| | | | 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 |
| | Bolt dim | | 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 |
| | | | Ring type joint flange [inch] | 4 1/4 | 4 1/4 | 4 1/4 | 4 1/4 | 4 3/4 | 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 |

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+ |
| | | $d_0$ [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 |
| | | $A_0$ [inch²] | 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 |
| **Flange class 900 x 300** | | | | | | | | | | | | | | | | | |
| 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 |
| | | 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 | 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 | 8 | 8 |
| | | Nuts | 16 | 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 | 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 |
| **Flange class 1500 x 300** | | | | | | | | | | | | | | | | | |
| 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 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 | 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 | 8 | 8 |
| | | Nuts | 16 | 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 | 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 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+ |
| | | $d_0$ [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 |
| | | $A_0$ [inch²] | 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 |
| **Flange class 900 x 300** | | | | | | | | | | | | | | | | |
| Inlet | Qty | Stud bolts | 8 | 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 | | | | | |
| | 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 | | | | | |
| | 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 | | | | | |
| **Flange class 1500 x 300** | | | | | | | | | | | | | | | | |
| Inlet | Qty | Stud bolts | 8 | 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 | | | | | |
| | 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 | | | | | |
| | 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 | | | | | |

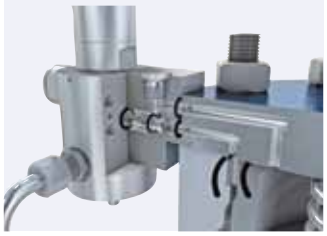
Please note: For full nozzle design the screw lengths needs to be 1 1/4 inch longer.

# 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.

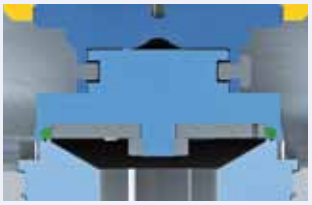
**NACE sour gas application**
R70

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

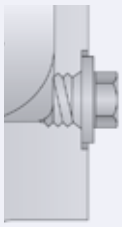
**Remote Sensing**
R28

**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



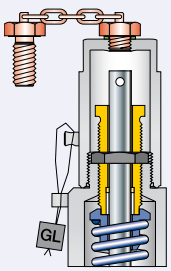
**Drain hole**
J19: G$^1/_2$
R48: NPT $^1/_2$"



**Pilot lifting device**
R25

Mechanical lifting of pilot for verification of POSV operation.

**Pilot test gag**
R33



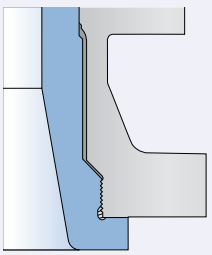

Blocking of operation in case of required hydrostatic testing of vessel.

**Blowdown**
adjusted to x%
R44

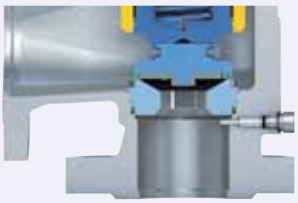
Blowdown adjusted: Closing pressure difference as a fixed value between 3 – 15%. Standard adjustment between 3 – 7%.

## High Efficiency
## Available options

**Full nozzle**
R69



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



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

## Selecting of Soft Seal Material – Main Valve and Pilot

Use the option codes in this table to order the required soft sealing material for your LESER POSV main valve.

### Soft seal (Complete valve)

| ASTM 1418 Abbrevation | | Commercial name | Code letter[1] | Option code | $T_{min}$ [°C] | $T_{min}$ [°F] | $T_{max}$ [°C] | $T_{max}$ [°F] | Application[2] |
|---|---|---|---|---|---|---|---|---|---|
| **Soft Seal Disc (O-ring), Main Valve** | | | | | | | | | |
| FKM | FDA | Viton® (Fluorocarbon) | L | * | -15 | 5 | 200 | 392 | High temperature service (no superheated steam), mineral oil and grease, silicone oil and grease, vegetable and animal grease and oil, ozone, FDA compliant compound available on request |
| EPDM | FDA, USP VI | Buna-EP (Ethylene-Propylene-Dine) | D | R05 | -45 | -49 | 150 | 302 | Hot water and superheated steam up to 150 °C, 302 °F, some organic and inorganic acids, silicone oil and grease, FDA compliant |
| FFKM | FDA, USP VI | Kalrez® (Perfluor) | C | R06 | 0 | 32 | 200 | 392 | Nearly all chemicals, standard compound is Kalrez® 6375 with steam resistance, FDA compliant compound available on request |
| Other than listed | | | X | For other materials please contact your local representive or sales@leser.com | | | | | |

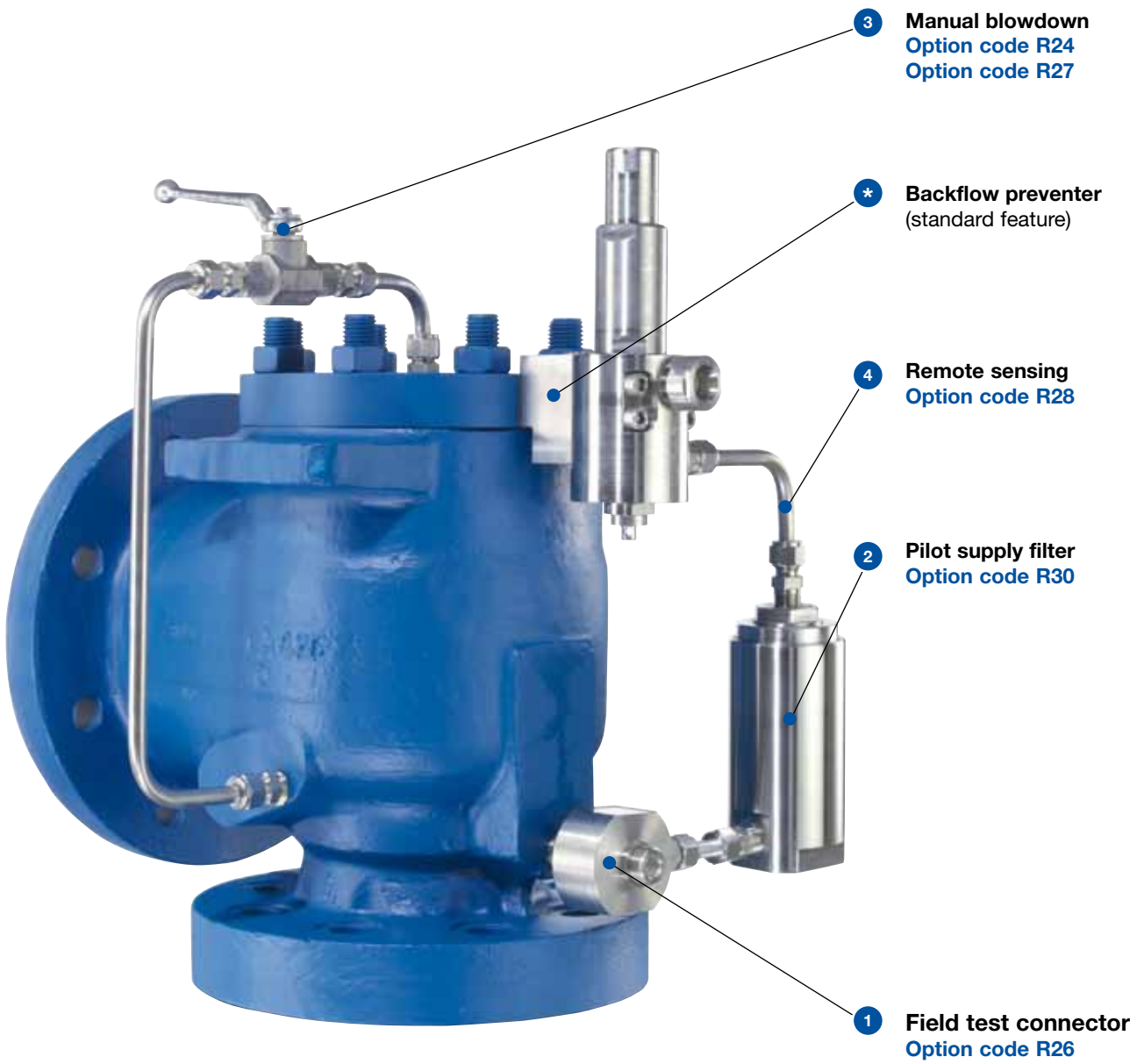
[1] The code letters will be stamped on the disc.
[2] Pressure and temperature service must be considered in any case.
Chemical resistance and the temperature limits ddepend on O-ring manufacturer information.
LESER can not take any warranty.

* Standard

# High Efficiency
# Accessories

For both series of the LESER Pilot Operated Safety Valve (POSV) the following accessories are available.
The accessories allow the adaptation of your safety valve to various special operating conditions.

## Overview – Maximum configuration



# High Efficiency
# Accessories

The available accessories for Series 810 and 820 provide solutions for the following special operating conditions:

## 1 – Field Test Connector – Option code R26

**Operating condition:**
The pilot setting shall be tested without system shut-down and without increasing the system pressure.

**Solution provided:**
A field test connector is recommended when set pressure shall be tested. This allows a quick and simple verification of set pressure while the valve remains in service.

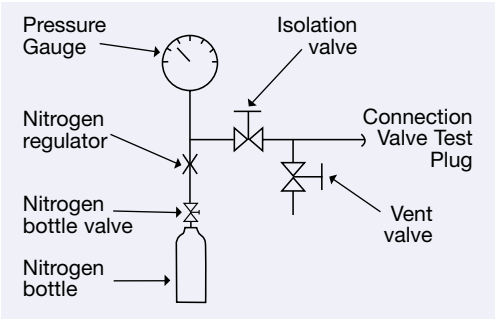
To use the field test connector, the following additional equipment is required and must be provided by the customer:

– external test medium, e.g. by a pressure cylinder
– pressure gauge

**Customer benefit:**
No plant shutdown necessary for set pressure testing
No dismounting of valve necessary.

**Technical data:**
Material: 316L / 1.4404
Connection size: G $^1/_2$ male and NPT $^1/_4$" female

Regular Testing of the Pilot Valve Setting required




## 2 – Pilot Supply Filter – Option code R30

**Operating condition:**
The POSV is used for applications involving “dirty” medium which require shorter maintenance intervals. These are undesirable.

**Solution provided:**
For dirty medium service, a pilot supply filter is available to prevent plugging of the pilot valve and tubing. The filter is suitable for liquid and gaseous media. With the filter added, the filter area is enlarged by a multiple in comparison to the standard pilot valve filter that is integrated into the inlet piping to the pilot valve. The maintenance cycles depend on the following conditions:
1) frequency of operation of the POSV
2) how “dirty” the medium is

**Customer benefit:**
Extended maintenance intervals of the POSV.

**Technical data:**
Housing material: 316L / 1.4404
Mesh size: 25µm

Dirty Medium Service

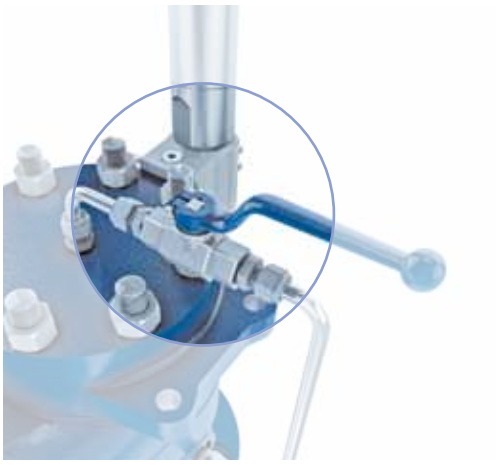
# High Efficiency
# Accessories

## 3 – Manual Blowdown – Option code R27 (blowdown to atmosphere), R24 (blowdown to main valve outlet)

**Operating condition:**
The lifting of the piston shall be tested without switching of the pilot valve. To achieve a piston lift the dome volume must be released manually and refilling of the dome must be avoided. The testing of the piston may be required when the medium tends to block the piston. Manual blowdown cannot be used for set pressure testing.

**Solution provided:**
The manual blowdown allows lifting of the main valve by bypassing the pilot valve. Thus, the piston dome pressure can be discharged:
1) to atmosphere (Option Code R27) or
2) to the main valve outlet (Option Code R24)

**Customer benefit:**
No plant shutdown necessary to test valve lifting
No dismounting of the safety valve necessary for testing purposes



Valve Lifting Test **without** Actuation of Pilot Valve required

## 4 – Remote sensing – Option code R28

**Operating condition:**
Due to an unfavourable position or length of the inlet pipe excessive pressure loss may occur. This can lead to chattering of the safety valve especially with Pop Action POSVs and the safety valve cannot discharge as much medium as required. This may also damage the safety valve.

**Solution provided:**
The pilot valve pressure pick up is piped to a location which is remote from the main valve. The pilot will operate independently of a possible pressure loss in the inlet pipe. The tapping point must be chosen so as to avoid pressure loss resulting from flow influences.
LESER supplies the plug at the main valve and the fitting (NPT $^{3}/_{8}$") for the customer remote sensing pipe to the pilot. The pipe itself and its welding to the system must be provided by the customer. Parameters determining the maximum length of the inlet pipe are the pipe diameter, the static height of the medium and the viscosity of the medium.

**Customer benefit:**
No reworking of inlet pipe necessary in case of high inlet pressure drop.

Inlet pressure drop

## 5 – Sealing Accessoires – Option code see page 69

LESER offers two different types of discs for different applications to achieve optimum tightness:

**O-Ring**
Standard application

**Metal disc**
High tempertaure
and high pressure

## 5 – NACE requirements – Option code R70

For material details see page 29.

# High Efficiency
# Sour Gas Applications (NACE)

LESER Pilot Operated Safety Valves (POSVs) are available for sour gas ($H_2S$) service.

### Regulatory Requirements

The material requirements for hydrogen sulfide ($H_2S$) service (sour gas service) are specified in the NACE standards, MR0175/ISO 15156 (Upstream processes), and MR0103 (Downstream processes). Since the body of the pilot valve is manufactured from stainless steel, only the spring in the pilot valve of the Series 810 Pop Action POSV and the dome spring in the main valve need to be replaced for compliance with NACE MR0175 standard.

| Standard | MR0175/ISO 15156 | MR0103 |
|---|---|---|
| | | |
| **Application** | Upstream processes | Downstream processes (Refineries) |
| **Content** | Petroleum and natural gas industries<br>– Materials for use in $H_2S$-containing environments in oil and gas production | Materials resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining environments |
| | – Rigid requirements for materials resistant to SSC for petroleum production, drilling, gathering, flow line equipment and field processing facilities to be used in $H_2S$ bearing hydrocarbon service | – Provides a standard set of requirements for materials used in sour petroleum refinery equipment |
| | – Applies to upstream processes (gas production and treatment) | – Applies to downstream (e.g. refining and gas processing) environments (broader range of sour environments) |
| **Material** | | |
| **Carbon Steel** | 22 HRC max. and more stringent welding requirement | No base metal hardness requirements on P-No. 1 Group 1 or 2 (WCB, A105 forgings, LCB) |
| **Austenitic Stainless Steel (316 SS)** | Maximum hardness of 22 HRC | Maximum hardness of 22 HRC<br>No temperature limitations |

The following parts of the LESER POSV are affected by NACE sour gas standards requirements. Parts with a check mark are compliant with the relevant standard (Option code R70).

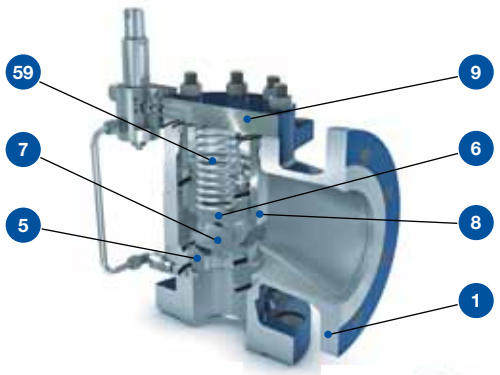
## Main Valve NACE-compliant materials

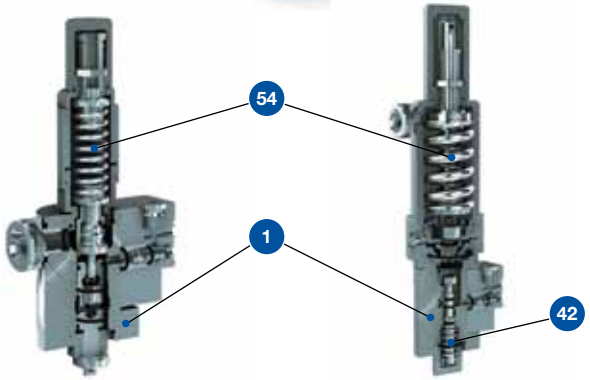
| | | |
|---|---|---|
| **1** | Body | ✓ |
| **5** | Nozzle | ✓ |
| **6** | Piston | ✓ |
| **7** | Disc | ✓ |
| **8** | Piston guide | ✓ |
| **9** | Cover | ✓ |
| **59** | Dome spring | Inconel® |

## Pilot Valve

| | | Series 810 | Series 820 |
|---|---|---|---|
| **1** | Pilot body | ✓ | ✓ |
| **42** | Return spring | N/A | ✓ |
| **54** | Spring | Inconel® | Not affected |

To achieve NACE International conformity for Series 810, only the spring needs to be manufactured in Inconel® material. Spring (**54**) of Series 820 is not affected by the medium and therefore does not need to be exchanged. Return spring (**42**) is manufactured in Inconel® material as a standard material. To order the NACE compliant LESER POSV, please select option code R70.




Pilot Series 810 Pilot Series 820

## 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 determine 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 | 8112. 8212. 8114. 8214. 8113. 8213. | | 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 | | | – | – | – | – | – | – | – | – | – | – | – | 0720 | 0730 | 0740 | 2090 |
| | | PN 16 | H51 | | | – | – | – | – | – | – | – | – | – | – | – | 0720 | 0730 | 0740 | 2090 |
| | | 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 100 | | 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 | 8112. 8212. 8114. 8214. 8113. 8213. | | – | – | – | | – | – | – | – | | – | – | | – | |
| | | PN 40 | H15 | | | – | – | – | | – | – | – | – | | – | – | | – | |
| PN 63 | H10 | PN 10 | H50 | | | 0750 | 0760 | 0770 | 2100 | 0780 | 0790 | 0800 | 0810 | 2110 | 0820 | 0830 | 2120 | 0840 | 2130 |
| | | PN 16 | H51 | | | 0750 | 0760 | 0770 | 2100 | 0780 | 0790 | 0800 | 0810 | 2110 | 0820 | 0830 | 2120 | 0840 | 2130 |
| | | 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 100 | | 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 76.

## High Efficiency
# Flange drillings acc. to JIS B2220

As a standard, the Types 811 and 821 are equipped with flanges according to ASME B 16.5. Flanges according to JIS can be specified with the option codes below. Use the right half of the selection table to determine 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 JIS flange drillings

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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+ |
| **Inlet** | | **Outlet** | | | | | | | | | | | | | | | |
| **Flange rating class** | **Option code** | **Flange rating class** | **Option code** | **Art.-No.** | | | | | | | | | | | | | | | |
| 10K 16K | R53 R54 | 10K | R49 | **8112. 8212. 8114. 8214. 8113. 8213.** | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| | | 16K | R50 | | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| 20K | R55 | 10K | R49 | | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| | | 16K | R50 | | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| 30K | R56 | 10K | R49 | | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| | | 16K | R50 | | **0220** | **0230** | **0240** | **1900** | **0250** | **0260** | **0270** | **1910** | **0280** | **0290** | **1920** | **0300** | **0310** | **0320** | **1930** |
| 40K | R57 | 10K | R49 | | **0640** | **0650** | **0660** | **2060** | **0670** | **0680** | **0690** | **2070** | **0700** | **0710** | **2080** | **0720** | **0730** | **0740** | **2090** |
| 63K | R60 | 16K | R50 | | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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+ |
| **Inlet** | | **Outlet** | | | | | | | | | | | | | | |
| **Flange rating class** | **Option code** | **Flange rating class** | **Option code** | **Art.-No.** | | | | | | | | | | | | | | | |
| 10K 16K | R53 R54 | 10K | R49 | **8112. 8212. 8114. 8214. 8113. 8213.** | **0330** | **0340** | **0350** | **1940** | **0360** | **0370** | **0380** | **0390** | **1950** | **0400** | **0410** | **1960** | **0420** | **1970** |
| | | 16K | R50 | | **0330** | **0340** | **0350** | **1940** | **0360** | **0370** | **0380** | **0390** | **1950** | **0400** | **0410** | **1960** | **0420** | **1970** |
| 20K | R55 | 10K | R49 | | **0330** | **0340** | **0350** | **1940** | **0360** | **0370** | **0380** | **0390** | **1950** | **0400** | **0410** | **1960** | **0420** | **1970** |
| | | 16K | R50 | | **0330** | **0340** | **0350** | **1940** | **0360** | **0370** | **0380** | **0390** | **1950** | **0400** | **0410** | **1960** | **0420** | **1970** |
| 30K | R56 | 10K | R49 | | **0330** | **0340** | **0350** | **1940** | **0360** | **0370** | **0380** | **0390** | **1950** | **0400** | **0410** | **1960** | **0420** | **1970** |
| | | 16K | R50 | | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| 40K | R57 | 10K | R49 | | **0750** | **0760** | **0770** | **2100** | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |
| 63K | R60 | 16K | R50 | | – | – | – | – | **0780** | **0790** | **0800** | **0810** | **2110** | **0820** | **0830** | **2120** | **0840** | **2130** |

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 76.

# 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**

| | | | Smooth Finish[2] | | Serrated Finish | | RTJ-groove | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Inlet | Outlet | Inlet | Outlet | Inlet | | | Outlet |
| | DN / NPS | | | | | | CL150 | CL300 | CL600 | CL150 |
| Type | Inlet | Outlet | Option code | | Option code | | Option code | | | |
| 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 | Steel flanges only |
| Tongue face C[1] | | H94 | H92 | | |
| Groove face D[1] | | 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 | | |

[1] 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.
[2] 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 worldwide, as they comply with the following international codes and standards:

- **United States:** 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 |
|---|---|---|---|---|
| **United States** | | | **Coefficient of discharge K** | |
| ASME Sec. VIII Div. 1 | Steam | Approval No. | Not approved | M37280 |
| | | Coefficient of discharge K | Not approved | 0.82 |
| | Gas | Approval No. | M37268 | |
| | | Coefficient of discharge K | 0.82 | 0.82 |
| | Liquid | Approval No. | Not approved | M37268 |
| | | Coefficient of discharge K | Not approved | 0.689 |
| **European Community** | | | **Coefficient of discharge $K_{dr}$** | |
| 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 | 0.69 |
| **Germany** | | | **Coefficient of discharge $\alpha_w$** | |
| AD 2000-Merkblatt A2 | | Approval No. | TÜV SV 10-1126 | |
| | | S/G | G: 0.82 | S/G: 0.82 |
| | | L | Not approved | 0.69 |
| **Canada** | | | **Coefficient of discharge K** | |
| Canada: CRN | | Approval No. | For current approval no. see www.leser.com | |
| | Steam | Coefficient of discharge K | Not approved | 0.82 |
| | Gas | Coefficient of discharge K | 0.82 | 0.82 |
| | Liquid | Coefficient of discharge K | Not approved | 0.689 |
| **China** | | | **Coefficient of discharge $\alpha_w$** | |
| AQSIQ | | Approval No. | For current approval no. see www.leser.com | |
| | | S/G | G: 0.82 | S/G: 0.82 |
| | | L | Not approved | 0.69 |
| **Russia** | | | **Coefficient of discharge $K_{dr}$** | |
| TR / TRN | | Approval No. | For current approval no. see www.leser.com | |
| | | S/G | G: 0.82 | S/G: 0.82 |
| | | L | Not approved | 0.69 |

# 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 ½" x 2" | | | | 1 ½" 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. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1130** | | | | **1131** | | | | **1132** | | | **1133** | | | |
| **Pilot** 2.5 – 102 bar 36 – 1480 psig | **5012.** | **1163** | | | | **1163** | | | | **1163** | | | **1163** | | | |
| **Soft sealing EPDM** | | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1138** | | | | **1139** | | | | **1140** | | | **1141** | | | |
| **Pilot** 2.5 – 102 bar 36 – 1480 psig | **5012.** | **1164** | | | | **1164** | | | | **1164** | | | **1164** | | | |
| **Soft sealing FFKM** | | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1146** | | | | **1147** | | | | **1148** | | | **1149** | | | |
| **Pilot** 2.5 – 102 bar 36 – 1480 psig | **5012.** | **1165** | | | | **1165** | | | | **1165** | | | **1165** | | | |

# 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+ |
| **Soft sealing FKM** | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1134** | | | | **1135** | | | | | **1136** | | | **1137** | |
| **Pilot** 2.5 – 102 bar<br>36 – 1480 psig | **5012.** | **1163** | | | | **1163** | | | | | **1163** | | | **1163** | |
| **Soft sealing EPDM** | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1142** | | | | **1143** | | | | | **1144** | | | **1145** | |
| **Pilot** 2.5 – 102 bar<br>36 – 1480 psig | **5012.** | **1164** | | | | **1164** | | | | | **1164** | | | **1164** | |
| **Soft sealing FFKM** | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1150** | | | | **1151** | | | | | **1152** | | | **1153** | |
| **Pilot** 2.5 – 102 bar<br>36 – 1480 psig | **5012.** | **1165** | | | | **1165** | | | | | **1165** | | | **1165** | |

# 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 ½" x 2" | | | | 1 ½" 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. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1130** | | | | **1131** | | | | **1132** | | | **1133** | | | |
| **Diaphragm design**<br>2.5 – 30 bar<br>36 – 435 psig | **5012.** | **1157** | | | | **1157** | | | | **1157** | | | **1157** | | | |
| **Piston design**<br>30.01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1160** | | | | **1160** | | | | **1160** | | | **1160** | | | |
| **Soft sealing EPDM** | | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1138** | | | | **1139** | | | | **1140** | | | **1141** | | | |
| **Diaphragm design**<br>2,5 – 30 bar<br>36 – 435 psig | **5012.** | **1158** | | | | **1158** | | | | **1158** | | | **1158** | | | |
| **Piston design**<br>30,01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1161** | | | | **1161** | | | | **1161** | | | **1161** | | | |
| **Soft sealing FFKM** | | | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1146** | | | | **1147** | | | | **1148** | | | **1149** | | | |
| **Diaphragm design**<br>2,5 – 30 bar<br>36 – 435 psig | **5012.** | **1159** | | | | **1159** | | | | **1159** | | | **1159** | | | |
| **Piston design**<br>30,01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1162** | | | | **1162** | | | | **1162** | | | **1162** | | | |

# High Efficiency
# Spare parts kits

## Materials –Type 821 – Modulate Action

| | | | Diaphragm design | Piston-design |
|---|---|---|---|---|
| **Item** | **Component** | **Material** | **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<br>Field test connection | FKM | 3 | 3 |
| 24.4, 24.5, 24.6 | 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<br>(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 | 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+ |
| **Soft sealing FKM** | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1134** | | | **1135** | | | | | **1136** | | | **1137** | |
| **Diaphragm design**<br>2,5 – 30 bar<br>36 – 435 psig | **5012.** | **1157** | | | **1157** | | | | | **1157** | | | **1157** | |
| **Piston design**<br>30,01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1160** | | | **1160** | | | | | **1160** | | | **1160** | |
| **Soft sealing EPDM** | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1142** | | | **1143** | | | | | **1144** | | | **1145** | |
| **Diaphragm design**<br>2,5 – 30 bar<br>36 – 435 psig | **5012.** | **1158** | | | **1158** | | | | | **1158** | | | **1158** | |
| **Piston design**<br>30,01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1161** | | | **1161** | | | | | **1161** | | | **1161** | |
| **Soft sealing FFKM** | | | | | | | | | | | | | | |
| | Art.-No. | | | | | | | | | | | | | |
| **Main valve** | **5012.** | **1150** | | | **1151** | | | | | **1152** | | | **1153** | |
| **Diaphragm design**<br>2,5 – 30 bar<br>36 – 435 psig | **5012.** | **1159** | | | **1159** | | | | | **1159** | | | **1159** | |
| **Piston design**<br>30,01 – 102 bar<br>> 435 – 1480 psig | **5012.** | **1162** | | | **1162** | | | | | **1162** | | | **1162** | |

## High Efficiency
# Capacities – Steam – for Series 820 only

Calculation of the capacity for saturated steamacc. to AD 2000-Merkblatt A2 based on set pressure plus 10% overpressure at 0° C and 1013 mbar. Capacities at 1 bar (14.5 psig) and lower are based on 0.1 bar (1.45 psig) overpressure.

## Metric units – AD 2000-Merkblatt A2 [kg/h]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [mm] | 11 | 14,7 | 18,4 | 23 | 23,6 | 29 | 29,4 | 35,7 | 38 | 45 | 48 |
| $A_0$ [mm²] | 95 | 169.7 | 265.9 | 415.5 | 437.4 | 660.5 | 678.9 | 1001 | 1134.1 | 1590.4 | 1809.6 |
| **Set pressure** [bar] | **Capacity** [kg/h] | | | | | | | | | | |
| **2.5** | 164 | 293 | 460 | 718 | 756 | 1138 | 1174 | 1725 | 1961 | 2750 | 3119 |
| **3** | 187 | 335 | 525 | 820 | 863 | 1303 | 1339 | 1975 | 2237 | 3138 | 3570 |
| **4** | 234 | 417 | 654 | 1021 | 1075 | 1623 | 1668 | 2460 | 2787 | 3909 | 4447 |
| **5** | 279 | 499 | 782 | 1221 | 1286 | 1942 | 1996 | 2943 | 3334 | 4676 | 5320 |
| **6** | 325 | 580 | 909 | 1421 | 1496 | 2259 | 2322 | 3423 | 3879 | 5439 | 6189 |
| **7** | 371 | 662 | 1037 | 1620 | 1705 | 2575 | 2647 | 3903 | 4422 | 6201 | 7055 |
| **8** | 416 | 743 | 1164 | 1818 | 1914 | 2891 | 2971 | 4381 | 4963 | 6960 | 7919 |
| **9** | 461 | 824 | 1290 | 2016 | 2123 | 3205 | 3295 | 4858 | 5504 | 7718 | 8782 |
| **10** | 506 | 904 | 1417 | 2214 | 2331 | 3520 | 3618 | 5334 | 6044 | 8475 | 9643 |
| **12** | 597 | 1066 | 1670 | 2609 | 2747 | 4148 | 4263 | 6286 | 7122 | 9987 | 11363 |
| **14** | 687 | 1227 | 1922 | 3003 | 3162 | 4775 | 4908 | 7236 | 8198 | 11497 | 13081 |
| **16** | 777 | 1388 | 2175 | 3398 | 3577 | 5402 | 5552 | 8186 | 9275 | 13007 | 14799 |
| **18** | 867 | 1549 | 2427 | 3792 | 3993 | 6029 | 6197 | 9137 | 10352 | 14518 | 16518 |
| **20** | 958 | 1711 | 2680 | 4187 | 4409 | 6657 | 6842 | 10089 | 11430 | 16029 | 18238 |
| **22** | 1048 | 1872 | 2933 | 4583 | 4825 | 7286 | 7488 | 11041 | 12510 | 17543 | 19960 |
| **24** | 1139 | 2034 | 3187 | 4979 | 5242 | 7916 | 8136 | 11996 | 13591 | 19060 | 21686 |
| **26** | 1230 | 2196 | 3441 | 5376 | 5660 | 8547 | 8784 | 12952 | 14675 | 20579 | 23415 |
| **28** | 1321 | 2359 | 3695 | 5774 | 6079 | 9179 | 9434 | 13911 | 15761 | 22102 | 25147 |
| **30** | 1412 | 2521 | 3951 | 6173 | 6499 | 9813 | 10086 | 14872 | 16850 | 23629 | 26885 |
| **32** | 1503 | 2685 | 4207 | 6573 | 6920 | 10449 | 10739 | 15835 | 17941 | 25160 | 28627 |
| **34** | 1595 | 2849 | 4463 | 6974 | 7342 | 11087 | 11395 | 16802 | 19036 | 26696 | 30374 |
| **36** | 1687 | 3013 | 4721 | 7376 | 7766 | 11727 | 12052 | 17771 | 20135 | 28236 | 32126 |
| **38** | 1780 | 3178 | 4979 | 7780 | 8191 | 12368 | 12712 | 18744 | 21237 | 29781 | 33885 |
| **40** | 1872 | 3343 | 5238 | 8185 | 8618 | 13013 | 13374 | 19720 | 22343 | 31332 | 35649 |
| **50** | 2341 | 4180 | 6550 | 10234 | 10775 | 16269 | 16721 | 24655 | 27935 | 39174 | 44572 |
| **60** | 2819 | 5035 | 7889 | 12326 | 12977 | 19596 | 20140 | 29696 | 33646 | 47184 | 53685 |
| **70** | 3310 | 5910 | 9260 | 14469 | 15234 | 23003 | 23642 | 34860 | 39496 | 55387 | 63019 |
| **80** | 3813 | 6810 | 10670 | 16671 | 17552 | 26504 | 27240 | 40165 | 45507 | 63817 | 72610 |
| **90** | 4333 | 7738 | 12123 | 18943 | 19944 | 30115 | 30951 | 45638 | 51708 | 72512 | 82503 |
| **100** | 4871 | 8699 | 13630 | 21297 | 22422 | 33857 | 34798 | 51309 | 58133 | 81523 | 92755 |

## High Efficiency
# Capacities – Steam – for Series 820 only

## Metric units – AD 2000-Merkblatt A2 [kg/h]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [mm] | 56 | 63 | 69 | 75 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ [mm²] | 2463 | 3117.3 | 3739.3 | 4417.9 | 5410.6 | 7088.2 | 9503.3 | 13892.9 | 15836.8 | 22167 | 25446.9 |
| **Set pressure** [bar] | **Capacity** [kg/h] | | | | | | | | | | |
| **2.5** | 4259 | 5390 | 6444 | 7614 | 9355 | 12216 | 16378 | 23943 | 27294 | 38203 | 43856 |
| **3** | 4859 | 6150 | 7377 | 8716 | 10674 | 13984 | 18748 | 27408 | 31243 | 43731 | 50201 |
| **4** | 6053 | 7661 | 9190 | 10858 | 13298 | 17421 | 23356 | 34144 | 38922 | 54480 | 62541 |
| **5** | 7241 | 9164 | 10993 | 12988 | 15907 | 20839 | 27939 | 40844 | 46559 | 65169 | 74811 |
| **6** | 8424 | 10661 | 12789 | 15110 | 18505 | 24243 | 32502 | 47515 | 54164 | 75814 | 87031 |
| **7** | 9603 | 12154 | 14579 | 17224 | 21095 | 27636 | 37052 | 54166 | 61745 | 86425 | 99213 |
| **8** | 10779 | 13642 | 16364 | 19334 | 23679 | 31020 | 41590 | 60800 | 69307 | 97011 | 111364 |
| **9** | 11953 | 15128 | 18147 | 21440 | 26258 | 34399 | 46119 | 67422 | 76855 | 107576 | 123493 |
| **10** | 13125 | 16612 | 19926 | 23542 | 28833 | 37773 | 50642 | 74034 | 84393 | 118127 | 135605 |
| **12** | 15466 | 19575 | 23481 | 27742 | 33976 | 44510 | 59676 | 87240 | 99446 | 139197 | 159792 |
| **14** | 17805 | 22535 | 27031 | 31937 | 39113 | 51241 | 68699 | 100432 | 114484 | 160245 | 183955 |
| **16** | 20143 | 25494 | 30581 | 36131 | 44250 | 57970 | 77721 | 113620 | 129518 | 181289 | 208113 |
| **18** | 22482 | 28454 | 34132 | 40326 | 49388 | 64701 | 86747 | 126815 | 144559 | 202342 | 232280 |
| **20** | 24824 | 31418 | 37687 | 44526 | 54532 | 71440 | 95780 | 140022 | 159613 | 223414 | 256470 |
| **22** | 27168 | 34385 | 41246 | 48731 | 59682 | 78187 | 104826 | 153246 | 174688 | 244514 | 280692 |
| **24** | 29517 | 37357 | 44812 | 52944 | 64841 | 84945 | 113888 | 166493 | 189788 | 265650 | 304956 |
| **26** | 31870 | 40335 | 48384 | 57165 | 70010 | 91717 | 122967 | 179766 | 204919 | 286829 | 329268 |
| **28** | 34228 | 43320 | 51965 | 61395 | 75191 | 98505 | 132068 | 193070 | 220084 | 308056 | 353636 |
| **30** | 36593 | 46313 | 55555 | 65636 | 80386 | 105310 | 141191 | 206407 | 235287 | 329337 | 378065 |
| **32** | 38964 | 49314 | 59154 | 69889 | 85594 | 112133 | 150339 | 219781 | 250533 | 350676 | 402562 |
| **34** | 41342 | 52323 | 62764 | 74155 | 90818 | 118977 | 159515 | 233195 | 265823 | 372078 | 427130 |
| **36** | 43727 | 55343 | 66386 | 78433 | 96058 | 125842 | 168719 | 246650 | 281161 | 393547 | 451776 |
| **38** | 46121 | 58372 | 70019 | 82726 | 101316 | 132729 | 177953 | 260150 | 296549 | 415087 | 476503 |
| **40** | 48522 | 61411 | 73665 | 87034 | 106591 | 139641 | 187219 | 273696 | 311991 | 436701 | 501315 |
| **50** | 60667 | 76782 | 92103 | 108818 | 133270 | 174592 | 234079 | 342200 | 390079 | 546003 | 626789 |
| **60** | 73071 | 92480 | 110934 | 131066 | 160518 | 210288 | 281937 | 412164 | 469833 | 657635 | 754938 |
| **70** | 85775 | 108559 | 130222 | 153854 | 188427 | 246850 | 330957 | 483827 | 551523 | 771978 | 886200 |
| **80** | 98830 | 125082 | 150041 | 177270 | 217105 | 284420 | 381328 | 557463 | 635462 | 889470 | 1021076 |
| **90** | 112296 | 142124 | 170484 | 201423 | 246685 | 323172 | 433283 | 633417 | 722043 | 1010660 | 1160197 |
| **100** | 126250 | 159785 | 191670 | 226453 | 277339 | 363331 | 487125 | 712129 | 811768 | 1136250 | 1304369 |

# High Efficiency
## Capacities – Air

Calculation of the capacity for air acc. to AD 2000-Merkblatt A2 based on set pressure plus 10% overpressure at 0° C and 1013 mbar. Capacities at 1 bar (14.5 psig) and lower are based on 0.1 bar (1.45 psig) overpressure.

### Metric units – AD 2000-Merkblatt A2 [$mn^3/h$]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [mm] | 11 | 14.7 | 18.4 | 23 | 23.6 | 29 | 29.4 | 35.7 | 38 | 45 | 48 |
| $A_0$ [$mm^2$] | 95.0 | 169.7 | 265.9 | 415.5 | 437.4 | 660.5 | 678.9 | 1001 | 1134.1 | 1590.4 | 1809.6 |
| **Set pressure** [bar] | **Capacity** [$m_n^3/h$] | | | | | | | | | | |
| **2.5** | 211 | 376 | 589 | 921 | 969 | 1459 | 1505 | 2211 | 2513 | 3525 | 3997 |
| **3** | 241 | 431 | 675 | 1055 | 1111 | 1678 | 1724 | 2543 | 2881 | 4040 | 4597 |
| **4** | 303 | 541 | 848 | 1325 | 1395 | 2106 | 2164 | 3191 | 3615 | 5070 | 5769 |
| **5** | 365 | 651 | 1020 | 1594 | 1678 | 2534 | 2604 | 3840 | 4350 | 6100 | 6941 |
| **6** | 426 | 761 | 1192 | 1863 | 1961 | 2961 | 3044 | 4488 | 5085 | 7131 | 8113 |
| **7** | 488 | 871 | 1364 | 2132 | 2245 | 3389 | 3484 | 5136 | 5820 | 8161 | 9285 |
| **8** | 549 | 981 | 1537 | 2401 | 2528 | 3817 | 3923 | 5785 | 6554 | 9191 | 10458 |
| **9** | 611 | 1091 | 1709 | 2670 | 2811 | 4245 | 4363 | 6433 | 7289 | 10222 | 11630 |
| **10** | 672 | 1201 | 1881 | 2939 | 3095 | 4673 | 4803 | 7082 | 8024 | 11252 | 12802 |
| **12** | 795 | 1421 | 2226 | 3478 | 3661 | 5529 | 5682 | 8379 | 9493 | 13313 | 15147 |
| **14** | 919 | 1640 | 2570 | 4016 | 4228 | 6385 | 6562 | 9675 | 10962 | 15373 | 17491 |
| **16** | 1042 | 1860 | 2915 | 4554 | 4795 | 7240 | 7441 | 10972 | 12432 | 17434 | 19836 |
| **18** | 1165 | 2080 | 3259 | 5093 | 5362 | 8096 | 8321 | 12269 | 13901 | 19494 | 22180 |
| **20** | 1288 | 2300 | 3604 | 5631 | 5928 | 8952 | 9201 | 13566 | 15370 | 21555 | 24525 |
| **22** | 1411 | 2520 | 3948 | 6169 | 6495 | 9808 | 10080 | 14863 | 16840 | 23615 | 26869 |
| **24** | 1534 | 2740 | 4293 | 6707 | 7062 | 10663 | 10960 | 16160 | 18309 | 25676 | 29214 |
| **26** | 1657 | 2960 | 4637 | 7246 | 7629 | 11519 | 11839 | 17457 | 19779 | 27737 | 31558 |
| **28** | 1780 | 3180 | 4982 | 7784 | 8195 | 12375 | 12719 | 18754 | 21248 | 29797 | 33903 |
| **30** | 1904 | 3400 | 5326 | 8322 | 8762 | 13231 | 13598 | 20051 | 22717 | 31858 | 36247 |
| **32** | 2027 | 3619 | 5671 | 8861 | 9329 | 14087 | 14478 | 21347 | 24187 | 33918 | 38591 |
| **34** | 2150 | 3839 | 6015 | 9399 | 9896 | 14942 | 15357 | 22644 | 25656 | 35979 | 40936 |
| **36** | 2273 | 4059 | 6360 | 9937 | 10462 | 15798 | 16237 | 23941 | 27125 | 38039 | 43280 |
| **38** | 2396 | 4279 | 6704 | 10476 | 11029 | 16654 | 17116 | 25238 | 28595 | 40100 | 45625 |
| **40** | 2519 | 4499 | 7049 | 11014 | 11596 | 17510 | 17996 | 26535 | 30064 | 42161 | 47969 |
| **50** | 3135 | 5598 | 8771 | 13705 | 14430 | 21789 | 22394 | 33019 | 37411 | 52464 | 59692 |
| **60** | 3750 | 6698 | 10494 | 16397 | 17263 | 26067 | 26791 | 39504 | 44758 | 62766 | 71414 |
| **70** | 4366 | 7797 | 12216 | 19088 | 20097 | 30346 | 31189 | 45988 | 52105 | 73069 | 83137 |
| **80** | 4982 | 8897 | 13939 | 21780 | 22931 | 34625 | 35587 | 52473 | 59452 | 83372 | 94859 |
| **90** | 5597 | 9996 | 15662 | 24471 | 25765 | 38904 | 39985 | 58957 | 66798 | 93675 | 106581 |
| **100** | 6213 | 11096 | 17384 | 27163 | 28598 | 43183 | 44382 | 65441 | 74145 | 103978 | 118304 |
| **120** | 6223 | 11114 | 17413 | | 28646 | | 44456 | | 74268 | 104150 | |
| **140** | 7457 | 13316 | 20864 | | 34322 | | 53266 | | 88986 | 124790 | |
| **160** | 8690 | 15519 | 24314 | | 39999 | | 62076 | | 103704 | 145429 | |
| **180** | 9923 | 17721 | 27765 | | 45676 | | 70886 | | 118422 | 166069 | |
| **200** | 11156 | 19924 | 31216 | | 51353 | | 79696 | | 133140 | 186709 | |
| **220** | 12390 | 22126 | 34667 | | 57030 | | 88506 | | 147858 | 207349 | |
| **240** | 13623 | 24329 | 38117 | | 62706 | | 97316 | | 162576 | 227989 | |
| **260** | 14856 | 26531 | 41568 | | 68383 | | 106126 | | 177294 | 248629 | |
| **280** | 16090 | 28734 | 45019 | | 74060 | | 114936 | | 192012 | 269268 | |
| **300** | 17323 | 30936 | 48470 | | 79737 | | 123746 | | 206730 | | |
| **350** | 18556 | 33139 | 51921 | | 85414 | | 132556 | | 221448 | | |
| **400** | 21639 | 38645 | 60548 | | 99606 | | 154581 | | 258243 | | |
| **426** | 24723 | 44151 | 69174 | | 113798 | | 176606 | | 295037 | | |

# High Efficiency
## Capacities – Air

### Metric units – AD 2000-Merkblatt A2 [$mn^3/h$]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [mm] | 56 | 63 | 69 | 75 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ [$mm^2$] | 2463.0 | 3117.3 | 3739.3 | 4417.9 | 5410.6 | 7088.2 | 9503.3 | 13892.9 | 15836.8 | 22167.0 | 25446.9 |
| **Set pressure** [bar] | **Capacity** [$m_n^3/h$] | | | | | | | | | | |
| **2.5** | 5459 | 6909 | 8260 | 9759 | 11991 | 15658 | 20993 | 30690 | 34984 | 48968 | 56213 |
| **3** | 6256 | 7918 | 9498 | 11222 | 13744 | 18005 | 24140 | 35290 | 40227 | 56307 | 64638 |
| **4** | 7852 | 9938 | 11921 | 14084 | 17249 | 22597 | 30296 | 44290 | 50487 | 70667 | 81123 |
| **5** | 9447 | 11957 | 14343 | 16946 | 20754 | 27189 | 36452 | 53290 | 60746 | 85027 | 97608 |
| **6** | 11043 | 13976 | 16765 | 19808 | 24259 | 31780 | 42609 | 62290 | 71005 | 99387 | 114092 |
| **7** | 12639 | 15996 | 19188 | 22670 | 27764 | 36372 | 48765 | 71289 | 81264 | 113747 | 130577 |
| **8** | 14234 | 18015 | 21610 | 25532 | 31269 | 40964 | 54921 | 80289 | 91523 | 128107 | 147062 |
| **9** | 15830 | 20034 | 24032 | 28393 | 34774 | 45556 | 61077 | 89289 | 101782 | 142467 | 163546 |
| **10** | 17425 | 22054 | 26455 | 31255 | 38279 | 50147 | 67234 | 98289 | 112041 | 156827 | 180031 |
| **12** | 20616 | 26093 | 31299 | 36979 | 45289 | 59331 | 79546 | 116289 | 132560 | 185547 | 213000 |
| **14** | 23807 | 30131 | 36144 | 42703 | 52299 | 68515 | 91859 | 134289 | 153078 | 214267 | 245969 |
| **16** | 26999 | 34170 | 40988 | 48427 | 59309 | 77698 | 104172 | 152288 | 173596 | 242987 | 278939 |
| **18** | 30190 | 38209 | 45833 | 54151 | 66319 | 86882 | 116484 | 170288 | 194115 | 271706 | 311908 |
| **20** | 33381 | 42247 | 50678 | 59875 | 73329 | 96065 | 128797 | 188288 | 214633 | 300426 | 344877 |
| **22** | 36572 | 46286 | 55522 | 65598 | 80339 | 105249 | 141109 | 206288 | 235151 | 329146 | 377846 |
| **24** | 39763 | 50325 | 60367 | 71322 | 87349 | 114432 | 153422 | 224288 | 255669 | 357866 | 410816 |
| **26** | 42954 | 54364 | 65212 | 77046 | 94359 | 123616 | 165735 | 242287 | 276188 | 386586 | 443785 |
| **28** | 46145 | 58402 | 70056 | 82770 | 101369 | 132800 | 178047 | 260287 | 296706 | 415306 | 476754 |
| **30** | 49336 | 62441 | 74901 | 88494 | 108379 | 141983 | 190360 | 278287 | 317224 | 444026 | 509724 |
| **32** | 52527 | 66480 | 79746 | 94217 | 115389 | 151167 | 202672 | 296287 | 337743 | 472746 | 542693 |
| **34** | 55718 | 70519 | 84590 | 99941 | 122399 | 160350 | 214985 | 314287 | 358261 | 501466 | 575662 |
| **36** | 58909 | 74557 | 89435 | 105665 | 129409 | 169534 | 227297 | 332286 | 378779 | 530185 | 608631 |
| **38** | 62101 | 78596 | 94280 | 111389 | 136419 | 178717 | 239610 | 350286 | 399297 | 558905 | 641601 |
| **40** | 65292 | 82635 | 99124 | 117113 | 143429 | 187901 | 251923 | 368286 | 419816 | 587625 | 674570 |
| **50** | 81247 | 102828 | 123348 | 145732 | 178480 | 233819 | 313486 | 458285 | 522407 | 731225 | 839416 |
| **60** | 97203 | 123022 | 147571 | 174351 | 213530 | 279737 | 375049 | 548284 | 624998 | 874824 | 1004262 |
| **70** | 113158 | 143216 | 171794 | 202970 | 248580 | 325655 | 436612 | 638283 | 727590 | 1018424 | 1169109 |
| **80** | 129114 | 163409 | 196017 | 231589 | 283630 | 371572 | 498175 | 728282 | 830181 | 1162023 | 1333955 |
| **90** | 145069 | 183603 | 220241 | 260209 | 318680 | 417490 | 559738 | 818281 | 932773 | 1305623 | 1498801 |
| **100** | 161025 | 203797 | 244464 | 288828 | 353731 | 463408 | 621301 | 908280 | 1035364 | 1449222 | 1663648 |
| **120** | 193254 | 244588 | 293394 | | 424531 | | | | | | |
| **140** | 225218 | 285042 | 341921 | | 494747 | | | | | | |
| **160** | 257182 | 325496 | 390447 | | 564963 | | | | | | |
| **180** | 289145 | 365950 | 438974 | | 635180 | | | | | | |
| **200** | 321109 | 406404 | 487500 | | 705396 | | | | | | |
| **220** | 353073 | 446858 | 536027 | | 775612 | | | | | | |
| **240** | 385037 | 487312 | 584553 | | 845828 | | | | | | |
| **260** | 417000 | 527766 | 633080 | | 916044 | | | | | | |
| **280** | | | | | | | | | | | |
| **300** | | | | | | | | | | | |
| **350** | | | | | | | | | | | |
| **400** | | | | | | | | | | | |
| **426** | | | | | | | | | | | |

## High Efficiency
# Capacities – Water – for Series 820 only

Calculation of the capacity for water acc. to AD 2000-Merkblatt A2 based on set pressure plus 10% overpressure at 20° C (68° F). Capacities at 1 bar (14.5 psig) and lower are based on 0.1 bar (1.45 psig) overpressure.

## Metric units – AD 2000-Merkblatt A2 [$10^3$ kg/h]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [mm] | 11 | 14.7 | 18.4 | 23 | 23.6 | 29 | 29.4 | 35.7 | 38 | 45 | 48 |
| $A_0$ [mm²] | 95.0 | 169.7 | 265.9 | 415.5 | 437.4 | 660.5 | 678.9 | 1001 | 1134.1 | 1590.4 | 1809.6 |
| **Set pressure** [bar] | **Capacity** [$10^3$ kg/h] | | | | | | | | | | |
| **2.5** | 5.53 | 9.88 | 15.5 | 24.2 | 25.5 | 38.4 | 39.5 | 58.3 | 66.0 | 92.6 | 105 |
| **3** | 6.06 | 10.8 | 17.0 | 26.5 | 27.9 | 42.1 | 43.3 | 63.8 | 72.3 | 101 | 115 |
| **4** | 7.00 | 12.5 | 19.6 | 30.6 | 32.2 | 48.6 | 50.0 | 73.7 | 83.5 | 117 | 133 |
| **5** | 7.82 | 14.0 | 21.9 | 34.2 | 36.0 | 54.4 | 55.9 | 82.4 | 93.3 | 131 | 149 |
| **6** | 8.57 | 15.3 | 24.0 | 37.5 | 39.4 | 59.6 | 61.2 | 90.3 | 102 | 143 | 163 |
| **7** | 9.25 | 16.5 | 25.9 | 40.5 | 42.6 | 64.3 | 66.1 | 97.5 | 110 | 155 | 176 |
| **8** | 9.89 | 17.7 | 27.7 | 43.3 | 45.5 | 68.8 | 70.7 | 104 | 118 | 166 | 188 |
| **9** | 10.5 | 18.7 | 29.4 | 45.9 | 48.3 | 72.9 | 75.0 | 111 | 125 | 176 | 200 |
| **10** | 11.1 | 19.8 | 31.0 | 48.4 | 50.9 | 76.9 | 79.0 | 117 | 132 | 185 | 211 |
| **12** | 12.1 | 21.6 | 33.9 | 53.0 | 55.8 | 84.2 | 86.6 | 128 | 145 | 203 | 231 |
| **14** | 13.1 | 23.4 | 36.6 | 57.2 | 60.2 | 91.0 | 93.5 | 138 | 156 | 219 | 249 |
| **16** | 14.0 | 25.0 | 39.2 | 61.2 | 64.4 | 97.3 | 100 | 147 | 167 | 234 | 266 |
| **18** | 14.8 | 26.5 | 41.5 | 64.9 | 68.3 | 103 | 106 | 156 | 177 | 248 | 283 |
| **20** | 15.6 | 27.9 | 43.8 | 68.4 | 72.0 | 109 | 112 | 165 | 187 | 262 | 298 |
| **22** | 16.4 | 29.3 | 45.9 | 71.7 | 75.5 | 114 | 117 | 173 | 196 | 275 | 312 |
| **24** | 17.1 | 30.6 | 47.9 | 74.9 | 78.9 | 119 | 122 | 181 | 205 | 287 | 326 |
| **26** | 17.8 | 31.9 | 49.9 | 78.0 | 82.1 | 124 | 127 | 188 | 213 | 299 | 340 |
| **28** | 18.5 | 33.1 | 51.8 | 80.9 | 85.2 | 129 | 132 | 195 | 221 | 310 | 352 |
| **30** | 19.2 | 34.2 | 53.6 | 83.8 | 88.2 | 133 | 137 | 202 | 229 | 321 | 365 |
| **32** | 19.8 | 35.3 | 55.4 | 86.5 | 91.1 | 138 | 141 | 208 | 236 | 331 | 377 |
| **34** | 20.4 | 36.4 | 57.1 | 89.2 | 93.9 | 142 | 146 | 215 | 243 | 341 | 388 |
| **36** | 21.0 | 37.5 | 58.7 | 91.8 | 96.6 | 146 | 150 | 221 | 250 | 351 | 400 |
| **38** | 21.6 | 38.5 | 60.3 | 94.3 | 99.3 | 150 | 154 | 227 | 257 | 361 | 411 |
| **40** | 22.1 | 39.5 | 61.9 | 96.7 | 102 | 154 | 158 | 233 | 264 | 370 | 421 |
| **50** | 24.7 | 44.2 | 69.2 | 108 | 114 | 172 | 177 | 261 | 295 | 414 | 471 |
| **60** | 27.1 | 48.4 | 75.8 | 118 | 125 | 188 | 194 | 285 | 323 | 453 | 516 |
| **70** | 29.3 | 52.3 | 81.9 | 128 | 135 | 203 | 209 | 308 | 349 | 490 | 557 |
| **80** | 31.3 | 55.9 | 87.5 | 137 | 144 | 217 | 224 | 330 | 373 | 524 | 596 |
| **90** | 33.2 | 59.3 | 92.9 | 145 | 153 | 231 | 237 | 350 | 396 | 555 | 632 |
| **100** | 35.0 | 62.5 | 97.9 | 153 | 161 | 243 | 250 | 368 | 417 | 585 | 666 |
| **120** | 38,3 | 68,4 | 107 | | 176 | | 274 | | 457 | 641 | |
| **140** | 41,4 | 73,9 | 116 | | 191 | | 296 | | 494 | 693 | |
| **160** | 44,2 | 79,0 | 124 | | 204 | | 316 | | 528 | 740 | |
| **180** | 46,9 | 83,8 | 131 | | 216 | | 335 | | 560 | 785 | |
| **200** | 49,5 | 88,3 | 138 | | 228 | | 353 | | 590 | 828 | |
| **220** | 51,9 | 92,7 | 145 | | 239 | | 371 | | 619 | 868 | |
| **240** | 54,2 | 96,8 | 152 | | 249 | | 387 | | 647 | 907 | |
| **260** | 56,4 | 101 | 158 | | 260 | | 403 | | 673 | 944 | |
| **280** | 58,5 | 105 | 164 | | 269 | | 418 | | 699 | | |
| **300** | 60,6 | 108 | 170 | | 279 | | 433 | | 723 | | |
| **350** | 65,4 | 117 | 183 | | 301 | | 467 | | 781 | | |
| **400** | 70,0 | 125 | 196 | | 322 | | 500 | | 835 | | |
| **426** | 72,2 | 129 | 202 | | 332 | | 516 | | 862 | | |

## High Efficiency
# Capacities – Water – for Series 820 only

## Metric units – AD 2000-Merkblatt A2 [$10^3$ kg/h]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [mm] | 56 | 63 | 69 | 75 | 83 | 95 | 110 | 133 | 142 | 168 | 180 |
| $A_0$ [mm²] | 2463.0 | 3117.3 | 3739.3 | 4417.9 | 5410.6 | 7088.2 | 9503.3 | 13892.9 | 15836.8 | 22167.0 | 25446.9 |
| **Set pressure** [bar] | **Capacity** [$10^3$ kg/h] | | | | | | | | | | |
| **2.5** | 143 | 181 | 218 | 257 | 315 | 413 | 553 | 809 | 922 | 1290 | 1481 |
| **3** | 157 | 199 | 238 | 282 | 345 | 452 | 606 | 886 | 1010 | 1413 | 1622 |
| **4** | 181 | 229 | 275 | 325 | 398 | 522 | 700 | 1023 | 1166 | 1632 | 1873 |
| **5** | 203 | 257 | 308 | 364 | 445 | 583 | 782 | 1143 | 1303 | 1824 | 2094 |
| **6** | 222 | 281 | 337 | 398 | 488 | 639 | 857 | 1253 | 1428 | 1999 | 2294 |
| **7** | 240 | 304 | 364 | 430 | 527 | 690 | 925 | 1353 | 1542 | 2159 | 2478 |
| **8** | 256 | 325 | 389 | 460 | 563 | 738 | 989 | 1446 | 1649 | 2308 | 2649 |
| **9** | 272 | 344 | 413 | 488 | 597 | 783 | 1049 | 1534 | 1749 | 2448 | 2810 |
| **10** | 287 | 363 | 435 | 514 | 630 | 825 | 1106 | 1617 | 1843 | 2580 | 2962 |
| **12** | 314 | 397 | 477 | 563 | 690 | 904 | 1212 | 1771 | 2019 | 2826 | 3245 |
| **14** | 339 | 429 | 515 | 608 | 745 | 976 | 1309 | 1913 | 2181 | 3053 | 3505 |
| **16** | 363 | 459 | 551 | 650 | 797 | 1044 | 1399 | 2046 | 2332 | 3264 | 3747 |
| **18** | 385 | 487 | 584 | 690 | 845 | 1107 | 1484 | 2170 | 2473 | 3462 | 3974 |
| **20** | 405 | 513 | 616 | 727 | 891 | 1167 | 1564 | 2287 | 2607 | 3649 | 4189 |
| **22** | 425 | 538 | 646 | 763 | 934 | 1224 | 1641 | 2399 | 2734 | 3827 | 4393 |
| **24** | 444 | 562 | 674 | 797 | 976 | 1278 | 1714 | 2505 | 2856 | 3997 | 4589 |
| **26** | 462 | 585 | 702 | 829 | 1016 | 1330 | 1784 | 2608 | 2972 | 4160 | 4776 |
| **28** | 480 | 607 | 728 | 860 | 1054 | 1381 | 1851 | 2706 | 3085 | 4318 | 4956 |
| **30** | 497 | 628 | 754 | 891 | 1091 | 1429 | 1916 | 2801 | 3193 | 4469 | 5130 |
| **32** | 513 | 649 | 779 | 920 | 1127 | 1476 | 1979 | 2893 | 3298 | 4616 | 5299 |
| **34** | 529 | 669 | 803 | 948 | 1161 | 1521 | 2040 | 2982 | 3399 | 4758 | 5462 |
| **36** | 544 | 688 | 826 | 976 | 1195 | 1565 | 2099 | 3068 | 3498 | 4896 | 5620 |
| **38** | 559 | 707 | 848 | 1002 | 1228 | 1608 | 2156 | 3152 | 3593 | 5030 | 5774 |
| **40** | 573 | 726 | 870 | 1028 | 1260 | 1650 | 2212 | 3234 | 3687 | 5160 | 5924 |
| **50** | 641 | 811 | 973 | 1150 | 1408 | 1845 | 2473 | 3616 | 4122 | 5770 | 6623 |
| **60** | 702 | 889 | 1066 | 1260 | 1543 | 2021 | 2710 | 3961 | 4515 | 6320 | 7255 |
| **70** | 759 | 960 | 1152 | 1361 | 1666 | 2183 | 2927 | 4278 | 4877 | 6827 | 7837 |
| **80** | 811 | 1026 | 1231 | 1454 | 1781 | 2334 | 3129 | 4574 | 5214 | 7298 | 8378 |
| **90** | 860 | 1089 | 1306 | 1543 | 1889 | 2475 | 3319 | 4851 | 5530 | 7741 | 8886 |
| **100** | 907 | 1147 | 1376 | 1626 | 1992 | 2609 | 3498 | 5114 | 5829 | 8159 | 9367 |
| **120** | 993 | 1257 | 1508 | | 2182 | | | | | | |
| **140** | 1073 | 1358 | 1629 | | 2356 | | | | | | |
| **160** | 1147 | 1451 | 1741 | | 2519 | | | | | | |
| **180** | 1216 | 1539 | 1847 | | 2672 | | | | | | |
| **200** | 1282 | 1623 | 1946 | | 2817 | | | | | | |
| **220** | 1345 | 1702 | 2041 | | 2954 | | | | | | |
| **240** | 1404 | 1778 | 2132 | | 3085 | | | | | | |
| **260** | 1462 | 1850 | 2219 | | 3211 | | | | | | |
| **280** | | | | | | | | | | | |
| **300** | | | | | | | | | | | |
| **350** | | | | | | | | | | | |
| **400** | | | | | | | | | | | |
| **426** | | | | | | | | | | | |

# High Efficiency
## Capacities – Steam – for Series 820 only

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

### US units – ASME Section VIII [lb/h]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [inch] | 0.433 | 0.579 | 0.724 | 0.906 | 0.929 | 1.142 | 1.157 | 1.406 | 1.496 | 1.772 | 1.890 |
| $A_0$ [inch²] | 0.147 | 0.263 | 0.412 | 0.644 | 0.678 | 1.024 | 1.052 | 1.552 | 1.758 | 2.465 | 2.805 |
| **Set pressure** [psig] | **Capacity** [lb/h] | | | | | | | | | | |
| **35** | 331 | 591 | 926 | 1447 | 1523 | 2300 | 2364 | 3485 | 3949 | 5538 | 6301 |
| **40** | 365 | 652 | 1022 | 1596 | 1681 | 2538 | 2608 | 3846 | 4357 | 6110 | 6952 |
| **50** | 434 | 774 | 1213 | 1895 | 1996 | 3013 | 3097 | 4567 | 5174 | 7256 | 8255 |
| **60** | 502 | 896 | 1405 | 2195 | 2311 | 3489 | 3586 | 5287 | 5990 | 8401 | 9558 |
| **70** | 570 | 1019 | 1596 | 2494 | 2626 | 3965 | 4075 | 6008 | 6807 | 9546 | 10861 |
| **80** | 639 | 1141 | 1787 | 2793 | 2940 | 4440 | 4563 | 6729 | 7624 | 10691 | 12164 |
| **90** | 707 | 1263 | 1979 | 3092 | 3255 | 4916 | 5052 | 7449 | 8440 | 11836 | 13467 |
| **100** | 776 | 1385 | 2170 | 3391 | 3570 | 5391 | 5541 | 8170 | 9257 | 12981 | 14770 |
| **120** | 913 | 1630 | 2553 | 3989 | 4200 | 6342 | 6519 | 9612 | 10890 | 15272 | 17376 |
| **140** | 1049 | 1874 | 2936 | 4588 | 4830 | 7294 | 7496 | 11053 | 12523 | 17562 | 19982 |
| **160** | 1186 | 2118 | 3319 | 5186 | 5460 | 8245 | 8474 | 12495 | 14156 | 19852 | 22587 |
| **180** | 1323 | 2363 | 3702 | 5784 | 6090 | 9196 | 9451 | 13936 | 15790 | 22143 | 25193 |
| **200** | 1460 | 2607 | 4085 | 6383 | 6720 | 10147 | 10429 | 15377 | 17423 | 24433 | 27799 |
| **220** | 1597 | 2852 | 4468 | 6981 | 7350 | 11098 | 11407 | 16819 | 19056 | 26723 | 30405 |
| **240** | 1734 | 3096 | 4851 | 7579 | 7980 | 12050 | 12384 | 18260 | 20689 | 29013 | 33011 |
| **260** | 1870 | 3340 | 5234 | 8178 | 8610 | 13001 | 13362 | 19702 | 22322 | 31304 | 35617 |
| **280** | 2007 | 3585 | 5617 | 8776 | 9240 | 13952 | 14339 | 21143 | 23955 | 33594 | 38223 |
| **300** | 2144 | 3829 | 6000 | 9374 | 9870 | 14903 | 15317 | 22585 | 25589 | 35884 | 40828 |
| **320** | 2281 | 4074 | 6382 | 9973 | 10500 | 15854 | 16295 | 24026 | 27222 | 38175 | 43434 |
| **340** | 2418 | 4318 | 6765 | 10571 | 11130 | 16805 | 17272 | 25468 | 28855 | 40465 | 46040 |
| **360** | 2555 | 4562 | 7148 | 11169 | 11759 | 17757 | 18250 | 26909 | 30488 | 42755 | 48646 |
| **380** | 2692 | 4807 | 7531 | 11767 | 12389 | 18708 | 19227 | 28351 | 32121 | 45045 | 51252 |
| **400** | 2828 | 5051 | 7914 | 12366 | 13019 | 19659 | 20205 | 29792 | 33755 | 47336 | 53858 |
| **420** | 2965 | 5296 | 8297 | 12964 | 13649 | 20610 | 21183 | 31234 | 35388 | 49626 | 56463 |
| **440** | 3102 | 5540 | 8680 | 13562 | 14279 | 21561 | 22160 | 32675 | 37021 | 51916 | 59069 |
| **460** | 3239 | 5784 | 9063 | 14161 | 14909 | 22513 | 23138 | 34116 | 38654 | 54207 | 61675 |
| **480** | 3376 | 6029 | 9446 | 14759 | 15539 | 23464 | 24115 | 35558 | 40287 | 56497 | 64281 |
| **500** | 3513 | 6273 | 9829 | 15357 | 16169 | 24415 | 25093 | 36999 | 41920 | 58787 | 66887 |
| **600** | 4197 | 7495 | 11743 | 18349 | 19319 | 29171 | 29981 | 44207 | 50086 | 70239 | 79916 |
| **700** | 4881 | 8717 | 13658 | 21340 | 22468 | 33927 | 34869 | 51414 | 58252 | 81690 | 92945 |
| **800** | 5566 | 9939 | 15572 | 24332 | 25618 | 38683 | 39757 | 58621 | 66418 | 93142 | 105975 |
| **900** | 6250 | 11161 | 17487 | 27323 | 28768 | 43438 | 44645 | 65829 | 74584 | 104593 | 119004 |
| **1000** | 6934 | 12383 | 19402 | 30315 | 31917 | 48194 | 49533 | 73036 | 82750 | 116045 | 132033 |
| **1100** | 7618 | 13605 | 21316 | 33306 | 35067 | 52950 | 54421 | 80243 | 90916 | 127496 | 145062 |
| **1200** | 8303 | 14827 | 23231 | 36298 | 38216 | 57706 | 59309 | 87451 | 99082 | 138948 | 158091 |
| **1300** | 8987 | 16049 | 25145 | 39289 | 41366 | 62462 | 64197 | 94658 | 107248 | 150399 | 171121 |
| **1400** | 9657 | 17247 | 27022 | 42222 | 44453 | 67124 | 68988 | 101722 | 115251 | 161623 | 183892 |
| **1480** | 10254 | 18313 | 28692 | 44831 | 47201 | 71272 | 73252 | 108010 | 122375 | 171613 | 195258 |

## High Efficiency
# Capacities – Steam – for Series 820 only

## US units – ASME Section VIII [lb/h]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [inch] | 2.205 | 2.480 | 2.717 | 2.953 | 3.268 | 3.740 | 4.331 | 5.236 | 5.591 | 6.614 | 7.087 |
| $A_0$ [inch²] | 3.818 | 4.832 | 5.796 | 6.848 | 8.386 | 10.987 | 14.730 | 21.534 | 24.547 | 34.359 | 39.443 |
| **Set pressure** [psig] | **Capacity** [lb/h] | | | | | | | | | | |
| **35** | 8576 | 10854 | 13020 | 15383 | 18840 | 24681 | 33091 | 48375 | 55144 | 77186 | 88607 |
| **40** | 9463 | 11977 | 14366 | 16974 | 20788 | 27233 | 36512 | 53377 | 60845 | 85167 | 97768 |
| **50** | 11236 | 14221 | 17059 | 20155 | 24684 | 32337 | 43355 | 63380 | 72248 | 101128 | 116090 |
| **60** | 13010 | 16466 | 19751 | 23336 | 28579 | 37441 | 50197 | 73384 | 83651 | 117088 | 134413 |
| **70** | 14783 | 18710 | 22444 | 26517 | 32475 | 42544 | 57040 | 83387 | 95054 | 133049 | 152735 |
| **80** | 16557 | 20955 | 25136 | 29697 | 36371 | 47648 | 63883 | 93390 | 106457 | 149010 | 171057 |
| **90** | 18330 | 23199 | 27828 | 32878 | 40267 | 52752 | 70725 | 103393 | 117860 | 164971 | 189380 |
| **100** | 20104 | 25444 | 30521 | 36059 | 44162 | 57855 | 77568 | 113396 | 129263 | 180932 | 207702 |
| **120** | 23650 | 29932 | 35905 | 42421 | 51954 | 68063 | 91253 | 133403 | 152068 | 212853 | 244347 |
| **140** | 27197 | 34421 | 41290 | 48783 | 59745 | 78270 | 104938 | 153409 | 174874 | 244775 | 280992 |
| **160** | 30744 | 38910 | 46675 | 55145 | 67537 | 88477 | 118623 | 173416 | 197680 | 276696 | 317636 |
| **180** | 34291 | 43399 | 52060 | 61507 | 75328 | 98685 | 132309 | 193422 | 220485 | 308618 | 354281 |
| **200** | 37838 | 47888 | 57444 | 67869 | 83120 | 108892 | 145994 | 213428 | 243291 | 340540 | 390926 |
| **220** | 41385 | 52377 | 62829 | 74231 | 90911 | 119099 | 159679 | 233435 | 266097 | 372461 | 427570 |
| **240** | 44931 | 56866 | 68214 | 80593 | 98703 | 129307 | 173364 | 253441 | 288902 | 404383 | 464215 |
| **260** | 48478 | 61355 | 73599 | 86955 | 106495 | 139514 | 187049 | 273448 | 311708 | 436304 | 500860 |
| **280** | 52025 | 65844 | 78983 | 93317 | 114286 | 149722 | 200735 | 293454 | 334514 | 468226 | 537504 |
| **300** | 55572 | 70333 | 84368 | 99679 | 122078 | 159929 | 214420 | 313461 | 357319 | 500148 | 574149 |
| **320** | 59119 | 74822 | 89753 | 106041 | 129869 | 170136 | 228105 | 333467 | 380125 | 532069 | 610794 |
| **340** | 62666 | 79311 | 95137 | 112403 | 137661 | 180344 | 241790 | 353473 | 402931 | 563991 | 647439 |
| **360** | 66213 | 83800 | 100522 | 118764 | 145452 | 190551 | 255476 | 373480 | 425736 | 595913 | 684083 |
| **380** | 69759 | 88289 | 105907 | 125126 | 153244 | 200758 | 269161 | 393486 | 448542 | 627834 | 720728 |
| **400** | 73306 | 92778 | 111292 | 131488 | 161035 | 210966 | 282846 | 413493 | 471348 | 659756 | 757373 |
| **420** | 76853 | 97267 | 116676 | 137850 | 168827 | 221173 | 296531 | 433499 | 494153 | 691677 | 794017 |
| **440** | 80400 | 101756 | 122061 | 144212 | 176618 | 231380 | 310216 | 453506 | 516959 | 723599 | 830662 |
| **460** | 83947 | 106245 | 127446 | 150574 | 184410 | 241588 | 323902 | 473512 | 539765 | 755521 | 867307 |
| **480** | 87494 | 110734 | 132831 | 156936 | 192201 | 251795 | 337587 | 493518 | 562570 | 787442 | 903951 |
| **500** | 91040 | 115223 | 138215 | 163298 | 199993 | 262002 | 351272 | 513525 | 585376 | 819364 | 940596 |
| **600** | 108775 | 137668 | 165139 | 195108 | 238950 | 313039 | 419698 | 613557 | 699404 | 978972 | 1123820 |
| **700** | 126509 | 160113 | 192063 | 226917 | 277908 | 364076 | 488124 | 713589 | 813433 | 1138580 | 1307043 |
| **800** | 144243 | 182558 | 218986 | 258727 | 316866 | 415113 | 556550 | 813621 | 927461 | 1298188 | 1490267 |
| **900** | 161977 | 205003 | 245910 | 290537 | 355823 | 466150 | 624976 | 913653 | 1041489 | 1457796 | 1673490 |
| **1000** | 179712 | 227447 | 272834 | 322346 | 394781 | 517186 | 693402 | 1013686 | 1155518 | 1617404 | 1856714 |
| **1100** | 197446 | 249892 | 299757 | 354156 | 433739 | 568223 | 761828 | 1113718 | 1269546 | 1777012 | 2039937 |
| **1200** | 215180 | 272337 | 326681 | 385965 | 472696 | 619260 | 830255 | 1213750 | 1383575 | 1936620 | 2223161 |
| **1300** | 232914 | 294782 | 353605 | 417775 | 511654 | 670297 | 898681 | 1313782 | 1497603 | 2096228 | 2406384 |
| **1400** | 250297 | 316782 | 379995 | 448954 | 549839 | 720322 | 965750 | 1411830 | 1609370 | 2252671 | 2585974 |
| **1480** | 265768 | 336362 | 403482 | 476704 | 583824 | 764844 | 1025442 | 1499095 | 1708845 | 2391908 | 2745813 |

# High Efficiency
## Capacities – Air

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F).
Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure

### US units – ASME Section VIII [S. C. F. M.]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [inch] | 0.433 | 0.579 | 0.724 | 0.906 | 0.929 | 1.142 | 1.157 | 1.406 | 1.496 | 1.772 | 1.890 |
| $A_0$ [inch²] | 0.147 | 0.263 | 0.412 | 0.644 | 0.678 | 1.024 | 1.052 | 1.552 | 1.758 | 2.465 | 2.805 |
| **Set pressure** [psig] | **Capacity** [S. C. F. M.] | | | | | | | | | | |
| **35** | 118 | 210 | 329 | 514 | 541 | 818 | 840 | 1239 | 1404 | 1969 | 2240 |
| **40** | 130 | 232 | 363 | 567 | 597 | 902 | 927 | 1367 | 1549 | 2172 | 2471 |
| **50** | 154 | 275 | 431 | 674 | 709 | 1071 | 1101 | 1623 | 1839 | 2579 | 2934 |
| **60** | 178 | 319 | 499 | 780 | 821 | 1240 | 1275 | 1879 | 2129 | 2986 | 3398 |
| **70** | 203 | 362 | 567 | 886 | 933 | 1409 | 1448 | 2136 | 2420 | 3393 | 3861 |
| **80** | 227 | 406 | 635 | 993 | 1045 | 1578 | 1622 | 2392 | 2710 | 3800 | 4324 |
| **90** | 251 | 449 | 703 | 1099 | 1157 | 1747 | 1796 | 2648 | 3000 | 4207 | 4787 |
| **100** | 276 | 492 | 771 | 1205 | 1269 | 1916 | 1970 | 2904 | 3290 | 4614 | 5250 |
| **120** | 324 | 579 | 908 | 1418 | 1493 | 2255 | 2317 | 3417 | 3871 | 5429 | 6176 |
| **140** | 373 | 666 | 1044 | 1631 | 1717 | 2593 | 2665 | 3929 | 4452 | 6243 | 7103 |
| **160** | 422 | 753 | 1180 | 1843 | 1941 | 2931 | 3012 | 4441 | 5032 | 7057 | 8029 |
| **180** | 470 | 840 | 1316 | 2056 | 2165 | 3269 | 3360 | 4954 | 5613 | 7871 | 8955 |
| **200** | 519 | 927 | 1452 | 2269 | 2389 | 3607 | 3707 | 5466 | 6193 | 8685 | 9882 |
| **220** | 568 | 1014 | 1588 | 2481 | 2613 | 3945 | 4055 | 5979 | 6774 | 9499 | 10808 |
| **240** | 616 | 1101 | 1724 | 2694 | 2837 | 4283 | 4402 | 6491 | 7354 | 10313 | 11734 |
| **260** | 665 | 1187 | 1860 | 2907 | 3060 | 4621 | 4750 | 7003 | 7935 | 11127 | 12660 |
| **280** | 714 | 1274 | 1996 | 3120 | 3284 | 4959 | 5097 | 7516 | 8515 | 11941 | 13587 |
| **300** | 762 | 1361 | 2133 | 3332 | 3508 | 5297 | 5445 | 8028 | 9096 | 12756 | 14513 |
| **320** | 811 | 1448 | 2269 | 3545 | 3732 | 5636 | 5792 | 8540 | 9676 | 13570 | 15439 |
| **340** | 859 | 1535 | 2405 | 3758 | 3956 | 5974 | 6140 | 9053 | 10257 | 14384 | 16366 |
| **360** | 908 | 1622 | 2541 | 3970 | 4180 | 6312 | 6487 | 9565 | 10837 | 15198 | 17292 |
| **380** | 957 | 1709 | 2677 | 4183 | 4404 | 6650 | 6835 | 10078 | 11418 | 16012 | 18218 |
| **400** | 1005 | 1796 | 2813 | 4396 | 4628 | 6988 | 7182 | 10590 | 11998 | 16826 | 19144 |
| **420** | 1054 | 1882 | 2949 | 4608 | 4852 | 7326 | 7530 | 11102 | 12579 | 17640 | 20071 |
| **440** | 1103 | 1969 | 3085 | 4821 | 5076 | 7664 | 7877 | 11615 | 13160 | 18454 | 20997 |
| **460** | 1151 | 2056 | 3221 | 5034 | 5300 | 8002 | 8225 | 12127 | 13740 | 19268 | 21923 |
| **480** | 1200 | 2143 | 3358 | 5246 | 5524 | 8340 | 8572 | 12640 | 14321 | 20083 | 22849 |
| **500** | 1249 | 2230 | 3494 | 5459 | 5747 | 8679 | 8920 | 13152 | 14901 | 20897 | 23776 |
| **600** | 1492 | 2664 | 4174 | 6522 | 6867 | 10369 | 10657 | 15714 | 17804 | 24967 | 28407 |
| **700** | 1735 | 3099 | 4855 | 7586 | 7987 | 12060 | 12395 | 18276 | 20706 | 29038 | 33039 |
| **800** | 1978 | 3533 | 5535 | 8649 | 9106 | 13750 | 14132 | 20838 | 23609 | 33108 | 37670 |
| **900** | 2222 | 3967 | 6216 | 9712 | 10226 | 15441 | 15870 | 23400 | 26512 | 37179 | 42301 |
| **1000** | 2465 | 4402 | 6897 | 10776 | 11345 | 17131 | 17607 | 25962 | 29414 | 41249 | 46933 |
| **1100** | 2708 | 4836 | 7577 | 11839 | 12465 | 18822 | 19345 | 28523 | 32317 | 45320 | 51564 |
| **1200** | 2951 | 5271 | 8258 | 12903 | 13584 | 20512 | 21082 | 31085 | 35220 | 49391 | 56196 |
| **1300** | 3194 | 5705 | 8938 | 13966 | 14704 | 22203 | 22820 | 33647 | 38122 | 53461 | 60827 |
| **1400** | 3438 | 6139 | 9619 | 15029 | 15824 | 23893 | 24557 | 36209 | 41025 | 57532 | 65458 |
| **1500** | 3687 | 6585 | 10316 | | 16971 | | 26338 | | 44000 | 61704 | |
| **2000** | 4905 | 8760 | 13725 | | 22578 | | 35040 | | 58538 | 82091 | |
| **2500** | 6123 | 10935 | 17133 | | 28185 | | 43742 | | 73075 | 102477 | |
| **3000** | 7341 | 13111 | 20542 | | 33793 | | 52444 | | 87612 | 122863 | |
| **3500** | 8560 | 15286 | 23950 | | 39400 | | 61145 | | 102150 | 143250 | |
| **4000** | 9778 | 17462 | 27358 | | 45007 | | 69847 | | 116687 | | |
| **4500** | 10996 | 19637 | 30767 | | 50614 | | 78549 | | 131224 | | |
| **5000** | 12214 | 21813 | 34175 | | 56221 | | 87251 | | 145761 | | |
| **5500** | 13432 | 23988 | 37584 | | 61828 | | 95953 | | 160299 | | |
| **6000** | 14650 | 26164 | 40992 | | 67435 | | 104655 | | 174836 | | |

# High Efficiency
# Capacities – Air

## US units – ASME Section VIII [S. C. F. M.]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [inch] | 2.205 | 2.480 | 2.717 | 2.953 | 3.268 | 3.740 | 4.331 | 5.236 | 5.591 | 6.614 | 7.087 |
| $A_0$ [inch²] | 3.818 | 4.832 | 5.796 | 6.848 | 8.386 | 10.987 | 14.730 | 21.534 | 24.547 | 34.359 | 39.443 |
| **Set pressure** [psig] | **Capacity** [S. C. F. M.] | | | | | | | | | | |
| **35** | 3049 | 3858 | 4628 | 5468 | 6697 | 8773 | 11763 | 17196 | 19602 | 27437 | 31496 |
| **40** | 3364 | 4257 | 5107 | 6033 | 7389 | 9680 | 12979 | 18974 | 21628 | 30274 | 34753 |
| **50** | 3994 | 5055 | 6064 | 7164 | 8774 | 11495 | 15411 | 22529 | 25682 | 35947 | 41266 |
| **60** | 4625 | 5853 | 7021 | 8295 | 10159 | 13309 | 17843 | 26085 | 29735 | 41621 | 47779 |
| **70** | 5255 | 6651 | 7978 | 9426 | 11544 | 15123 | 20276 | 29641 | 33788 | 47294 | 54292 |
| **80** | 5885 | 7449 | 8935 | 10556 | 12928 | 16937 | 22708 | 33197 | 37841 | 52967 | 60804 |
| **90** | 6516 | 8246 | 9892 | 11687 | 14313 | 18751 | 25140 | 36752 | 41895 | 58641 | 67317 |
| **100** | 7146 | 9044 | 10849 | 12818 | 15698 | 20565 | 27572 | 40308 | 45948 | 64314 | 73830 |
| **120** | 8407 | 10640 | 12763 | 15079 | 18468 | 24194 | 32437 | 47420 | 54055 | 75661 | 86856 |
| **140** | 9668 | 12236 | 14677 | 17341 | 21237 | 27822 | 37302 | 54531 | 62161 | 87008 | 99882 |
| **160** | 10928 | 13831 | 16591 | 19602 | 24007 | 31450 | 42166 | 61643 | 70268 | 98355 | 112908 |
| **180** | 12189 | 15427 | 18505 | 21863 | 26776 | 35079 | 47031 | 68754 | 78374 | 109702 | 125933 |
| **200** | 13450 | 17023 | 20419 | 24125 | 29546 | 38707 | 51895 | 75866 | 86481 | 121049 | 138959 |
| **220** | 14711 | 18618 | 22333 | 26386 | 32316 | 42335 | 56760 | 82977 | 94587 | 132396 | 151985 |
| **240** | 15971 | 20214 | 24247 | 28648 | 35085 | 45964 | 61624 | 90089 | 102694 | 143743 | 165011 |
| **260** | 17232 | 21810 | 26162 | 30909 | 37855 | 49592 | 66489 | 97200 | 110800 | 155090 | 178037 |
| **280** | 18493 | 23405 | 28076 | 33171 | 40624 | 53220 | 71354 | 104312 | 118907 | 166437 | 191063 |
| **300** | 19754 | 25001 | 29990 | 35432 | 43394 | 56849 | 76218 | 111423 | 127014 | 177784 | 204088 |
| **320** | 21015 | 26596 | 31904 | 37693 | 46164 | 60477 | 81083 | 118535 | 135120 | 189131 | 217114 |
| **340** | 22275 | 28192 | 33818 | 39955 | 48933 | 64105 | 85947 | 125646 | 143227 | 200477 | 230140 |
| **360** | 23536 | 29788 | 35732 | 42216 | 51703 | 67734 | 90812 | 132758 | 151333 | 211824 | 243166 |
| **380** | 24797 | 31383 | 37646 | 44478 | 54472 | 71362 | 95676 | 139870 | 159440 | 223171 | 256192 |
| **400** | 26058 | 32979 | 39560 | 46739 | 57242 | 74990 | 100541 | 146981 | 167546 | 234518 | 269217 |
| **420** | 27318 | 34575 | 41474 | 49001 | 60012 | 78619 | 105406 | 154093 | 175653 | 245865 | 282243 |
| **440** | 28579 | 36170 | 43388 | 51262 | 62781 | 82247 | 110270 | 161204 | 183759 | 257212 | 295269 |
| **460** | 29840 | 37766 | 45302 | 53523 | 65551 | 85875 | 115135 | 168316 | 191866 | 268559 | 308295 |
| **480** | 31101 | 39362 | 47216 | 55785 | 68320 | 89504 | 119999 | 175427 | 199973 | 279906 | 321321 |
| **500** | 32361 | 40957 | 49130 | 58046 | 71090 | 93132 | 124864 | 182539 | 208079 | 291253 | 334346 |
| **600** | 38665 | 48936 | 58701 | 69353 | 84938 | 111274 | 149187 | 218096 | 248612 | 347988 | 399476 |
| **700** | 44969 | 56914 | 68271 | 80661 | 98786 | 129415 | 173510 | 253654 | 289145 | 404722 | 464605 |
| **800** | 51273 | 64892 | 77841 | 91968 | 112634 | 147557 | 197833 | 289212 | 329677 | 461457 | 529734 |
| **900** | 57577 | 72871 | 87412 | 103275 | 126482 | 165699 | 222155 | 324769 | 370210 | 518191 | 594863 |
| **1000** | 63881 | 80849 | 96982 | 114582 | 140330 | 183840 | 246478 | 360327 | 410743 | 574926 | 659992 |
| **1100** | 70185 | 88827 | 106552 | 125889 | 154178 | 201982 | 270801 | 395885 | 451276 | 631661 | 725121 |
| **1200** | 76488 | 96806 | 116123 | 137196 | 168026 | 220124 | 295124 | 431442 | 491809 | 688395 | 790250 |
| **1300** | 82792 | 104784 | 125693 | 148503 | 181874 | 238265 | 319447 | 467000 | 532341 | 745130 | 855379 |
| **1400** | 89096 | 112762 | 135264 | 159810 | 195722 | 256407 | 343770 | 502558 | 572874 | 801865 | 920508 |
| **1500** | 95558 | 120940 | 145073 | | 209916 | | | | | | |
| **2000** | 127129 | 160897 | 193004 | | 279270 | | | | | | |
| **2500** | 158700 | 200855 | 240935 | | 348624 | | | | | | |
| **3000** | 190271 | 240812 | 288866 | | 417978 | | | | | | |
| **3500** | 221843 | 280770 | 336796 | | 487333 | | | | | | |
| **4000** | | | | | | | | | | | |
| **4500** | | | | | | | | | | | |
| **5000** | | | | | | | | | | | |
| **5500** | | | | | | | | | | | |
| **6000** | | | | | | | | | | | |

## High Efficiency

# Capacities – Water – for Series 820 only

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

## US units – ASME Section VIII [US-G.P.M.]

| API Standard Orifice acc. to API 526 | D | E | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | G | | H | | J | | | K+ |
| $d_0$ [inch] | 0.433 | 0.579 | 0.724 | 0.906 | 0.929 | 1.142 | 1.157 | 1.406 | 1.496 | 1.772 | 1.890 |
| $A_0$ [inch²] | 0.147 | 0.263 | 0.412 | 0.644 | 0.678 | 1.024 | 1.052 | 1.552 | 1.758 | 2.465 | 2.805 |
| **Set pressure** [psig] | **Capacity** [US-G.P.M.] | | | | | | | | | | |
| **35** | 23.9 | 42.7 | 67.0 | 105 | 110 | 166 | 171 | 252 | 286 | 400 | 456 |
| **40** | 25.6 | 45.7 | 71.6 | 112 | 118 | 178 | 183 | 269 | 305 | 428 | 487 |
| **50** | 28.6 | 51.1 | 80.0 | 125 | 132 | 199 | 204 | 301 | 341 | 479 | 545 |
| **60** | 31.3 | 56.0 | 87.7 | 137 | 144 | 218 | 224 | 330 | 374 | 524 | 597 |
| **70** | 33.8 | 60.4 | 94.7 | 148 | 156 | 235 | 242 | 356 | 404 | 566 | 644 |
| **80** | 36.2 | 64.6 | 101 | 158 | 167 | 251 | 258 | 381 | 432 | 605 | 689 |
| **90** | 38.4 | 68.5 | 107 | 168 | 177 | 267 | 274 | 404 | 458 | 642 | 731 |
| **100** | 40.4 | 72.2 | 113 | 177 | 186 | 281 | 289 | 426 | 483 | 677 | 770 |
| **120** | 44.3 | 79.1 | 124 | 194 | 204 | 308 | 317 | 467 | 529 | 742 | 844 |
| **140** | 47.9 | 85.5 | 134 | 209 | 220 | 333 | 342 | 504 | 571 | 801 | 911 |
| **160** | 51.2 | 91.4 | 143 | 224 | 236 | 356 | 365 | 539 | 611 | 856 | 974 |
| **180** | 54.3 | 96.9 | 152 | 237 | 250 | 377 | 388 | 572 | 648 | 908 | 1033 |
| **200** | 57.2 | 102 | 160 | 250 | 263 | 398 | 409 | 603 | 683 | 957 | 1089 |
| **220** | 60.0 | 107 | 168 | 262 | 276 | 417 | 429 | 632 | 716 | 1004 | 1142 |
| **240** | 62.7 | 112 | 175 | 274 | 288 | 436 | 448 | 660 | 748 | 1049 | 1193 |
| **260** | 65.2 | 116 | 182 | 285 | 300 | 453 | 466 | 687 | 778 | 1092 | 1242 |
| **280** | 67.7 | 121 | 189 | 296 | 312 | 470 | 484 | 713 | 808 | 1133 | 1289 |
| **300** | 70.1 | 125 | 196 | 306 | 322 | 487 | 500 | 738 | 836 | 1173 | 1334 |
| **320** | 72.4 | 129 | 202 | 316 | 333 | 503 | 517 | 762 | 864 | 1211 | 1378 |
| **340** | 74.6 | 133 | 209 | 326 | 343 | 518 | 533 | 786 | 890 | 1248 | 1420 |
| **360** | 76.7 | 137 | 215 | 336 | 353 | 533 | 548 | 808 | 916 | 1284 | 1461 |
| **380** | 78.9 | 141 | 221 | 345 | 363 | 548 | 563 | 831 | 941 | 1320 | 1501 |
| **400** | 80.9 | 144 | 226 | 354 | 372 | 562 | 578 | 852 | 965 | 1354 | 1540 |
| **420** | 82.9 | 148 | 232 | 362 | 382 | 576 | 592 | 873 | 989 | 1387 | 1578 |
| **440** | 84.8 | 152 | 237 | 371 | 391 | 590 | 606 | 894 | 1013 | 1420 | 1616 |
| **460** | 86.8 | 155 | 243 | 379 | 399 | 603 | 620 | 914 | 1035 | 1452 | 1652 |
| **480** | 88.6 | 158 | 248 | 387 | 408 | 616 | 633 | 933 | 1058 | 1483 | 1687 |
| **500** | 90.4 | 162 | 253 | 395 | 416 | 629 | 646 | 953 | 1079 | 1514 | 1722 |
| **600** | 99.1 | 177 | 277 | 433 | 456 | 689 | 708 | 1044 | 1182 | 1658 | 1887 |
| **700** | 107 | 191 | 299 | 468 | 493 | 744 | 764 | 1127 | 1277 | 1791 | 2038 |
| **800** | 114 | 204 | 320 | 500 | 527 | 795 | 817 | 1205 | 1365 | 1915 | 2178 |
| **900** | 121 | 217 | 340 | 531 | 559 | 843 | 867 | 1278 | 1448 | 2031 | 2311 |
| **1000** | 128 | 228 | 358 | 559 | 589 | 889 | 914 | 1347 | 1526 | 2141 | 2436 |
| **1100** | 134 | 240 | 375 | 587 | 618 | 932 | 958 | 1413 | 1601 | 2245 | 2555 |
| **1200** | 140 | 250 | 392 | 613 | 645 | 974 | 1001 | 1476 | 1672 | 2345 | 2668 |
| **1300** | 146 | 260 | 408 | 638 | 671 | 1014 | 1042 | 1536 | 1740 | 2441 | 2777 |
| **1400** | 151 | 270 | 423 | 662 | 697 | 1052 | 1081 | 1594 | 1806 | 2533 | 2882 |
| **1500** | 157 | 280 | 438 | | 721 | | 1119 | | 1870 | 2622 | |
| **2000** | 181 | 323 | 506 | | 833 | | 1292 | | 2159 | 3027 | |
| **2500** | 202 | 361 | 566 | | 931 | | 1445 | | 2414 | 3385 | |
| **3000** | 222 | 396 | 620 | | 1020 | | 1583 | | 2644 | 3708 | |
| **3500** | 239 | 427 | 670 | | 1101 | | 1709 | | 2856 | 4005 | |
| **4000** | 256 | 457 | 716 | | 1178 | | 1827 | | 3053 | | |
| **4500** | 271 | 485 | 759 | | 1249 | | 1938 | | 3238 | | |
| **5000** | 286 | 511 | 800 | | 1317 | | 2043 | | 3413 | | |
| **5500** | 300 | 536 | 839 | | 1381 | | 2143 | | 3580 | | |
| **6000** | 313 | 560 | 877 | | 1442 | | 2238 | | 3739 | | |

## High Efficiency
# Capacities – Water – for Series 820 only

## US units – ASME Section VIII [US-G.P.M.]

| API Standard Orifice acc. to API 526 | L | M | N | | P | | Q | R | | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra Orifice | | | | N+ | | P+ | | | R+ | | T+ |
| $d_0$ [inch] | 2.205 | 2.480 | 2.717 | 2.953 | 3.268 | 3.740 | 4.331 | 5.236 | 5.591 | 6.614 | 7.087 |
| $A_0$ [inch²] | 3.818 | 4.832 | 5.796 | 6.848 | 8.386 | 10.987 | 14.730 | 21.534 | 24.547 | 34.359 | 39.443 |
| **Set pressure** [psig] | **Capacity** [US-G.P.M.] | | | | | | | | | | |
| **35** | 620 | 785 | 942 | 1112 | 1362 | 1785 | 2393 | 3498 | 3988 | 5582 | 6408 |
| **40** | 663 | 839 | 1007 | 1189 | 1457 | 1908 | 2558 | 3740 | 4263 | 5967 | 6850 |
| **50** | 741 | 938 | 1125 | 1330 | 1628 | 2133 | 2860 | 4181 | 4766 | 6672 | 7659 |
| **60** | 812 | 1028 | 1233 | 1457 | 1784 | 2337 | 3133 | 4580 | 5221 | 7308 | 8390 |
| **70** | 877 | 1110 | 1332 | 1573 | 1927 | 2524 | 3384 | 4947 | 5640 | 7894 | 9062 |
| **80** | 938 | 1187 | 1424 | 1682 | 2060 | 2698 | 3618 | 5289 | 6029 | 8439 | 9688 |
| **90** | 995 | 1259 | 1510 | 1784 | 2185 | 2862 | 3837 | 5610 | 6395 | 8951 | 10275 |
| **100** | 1048 | 1327 | 1592 | 1880 | 2303 | 3017 | 4045 | 5913 | 6741 | 9435 | 10831 |
| **120** | 1148 | 1453 | 1743 | 2060 | 2523 | 3305 | 4431 | 6478 | 7384 | 10336 | 11865 |
| **140** | 1240 | 1570 | 1883 | 2225 | 2725 | 3570 | 4786 | 6997 | 7976 | 11164 | 12816 |
| **160** | 1326 | 1678 | 2013 | 2379 | 2913 | 3816 | 5117 | 7480 | 8526 | 11935 | 13700 |
| **180** | 1407 | 1780 | 2135 | 2523 | 3090 | 4048 | 5427 | 7934 | 9044 | 12659 | 14531 |
| **200** | 1483 | 1876 | 2251 | 2659 | 3257 | 4267 | 5720 | 8363 | 9533 | 13343 | 15318 |
| **220** | 1555 | 1968 | 2361 | 2789 | 3416 | 4475 | 6000 | 8771 | 9998 | 13995 | 16065 |
| **240** | 1624 | 2055 | 2466 | 2913 | 3568 | 4674 | 6266 | 9161 | 10443 | 14617 | 16779 |
| **260** | 1690 | 2139 | 2566 | 3032 | 3713 | 4865 | 6522 | 9535 | 10869 | 15214 | 17465 |
| **280** | 1754 | 2220 | 2663 | 3146 | 3854 | 5048 | 6768 | 9895 | 11279 | 15788 | 18124 |
| **300** | 1816 | 2298 | 2757 | 3257 | 3989 | 5226 | 7006 | 10242 | 11675 | 16342 | 18760 |
| **320** | 1875 | 2373 | 2847 | 3364 | 4120 | 5397 | 7236 | 10578 | 12058 | 16878 | 19375 |
| **340** | 1933 | 2447 | 2935 | 3467 | 4246 | 5563 | 7459 | 10904 | 12429 | 17397 | 19972 |
| **360** | 1989 | 2517 | 3020 | 3568 | 4370 | 5724 | 7675 | 11220 | 12790 | 17902 | 20551 |
| **380** | 2044 | 2586 | 3103 | 3666 | 4489 | 5881 | 7885 | 11527 | 13140 | 18392 | 21114 |
| **400** | 2097 | 2654 | 3183 | 3761 | 4606 | 6034 | 8090 | 11827 | 13481 | 18870 | 21662 |
| **420** | 2148 | 2719 | 3262 | 3854 | 4720 | 6183 | 8290 | 12119 | 13814 | 19336 | 22197 |
| **440** | 2199 | 2783 | 3339 | 3944 | 4831 | 6329 | 8485 | 12404 | 14139 | 19791 | 22720 |
| **460** | 2248 | 2846 | 3414 | 4033 | 4939 | 6471 | 8675 | 12683 | 14457 | 20236 | 23230 |
| **480** | 2297 | 2907 | 3487 | 4120 | 5046 | 6610 | 8862 | 12955 | 14768 | 20671 | 23730 |
| **500** | 2344 | 2967 | 3559 | 4205 | 5150 | 6746 | 9045 | 13223 | 15073 | 21098 | 24219 |
| **600** | 2568 | 3250 | 3899 | 4606 | 5641 | 7390 | 9908 | 14485 | 16511 | 23111 | 26531 |
| **700** | 2774 | 3510 | 4211 | 4975 | 6093 | 7982 | 10702 | 15645 | 17834 | 24963 | 28656 |
| **800** | 2965 | 3753 | 4502 | 5318 | 6514 | 8533 | 11441 | 16725 | 19066 | 26686 | 30635 |
| **900** | 3145 | 3980 | 4775 | 5641 | 6909 | 9051 | 12135 | 17740 | 20222 | 28305 | 32493 |
| **1000** | 3315 | 4196 | 5033 | 5946 | 7283 | 9541 | 12791 | 18700 | 21316 | 29836 | 34251 |
| **1100** | 3477 | 4401 | 5279 | 6236 | 7638 | 10006 | 13416 | 19612 | 22356 | 31293 | 35923 |
| **1200** | 3632 | 4596 | 5513 | 6514 | 7978 | 10451 | 14012 | 20484 | 23350 | 32684 | 37520 |
| **1300** | 3780 | 4784 | 5738 | 6780 | 8303 | 10878 | 14584 | 21321 | 24304 | 34019 | 39052 |
| **1400** | 3923 | 4964 | 5955 | 7036 | 8617 | 11289 | 15135 | 22126 | 25221 | 35303 | 40526 |
| **1500** | 3922 | 4964 | 5955 | | 8617 | | | | | | |
| **2000** | 4060 | 5139 | 6164 | | 8919 | | | | | | |
| **2500** | 4688 | 5934 | 7118 | | 10299 | | | | | | |
| **3000** | 5242 | 6634 | 7958 | | 11515 | | | | | | |
| **3500** | 5742 | 7267 | 8717 | | 12614 | | | | | | |
| **4000** | 6202 | 7849 | 9416 | | 13624 | | | | | | |
| **4500** | | | | | | | | | | | |
| **5000** | | | | | | | | | | | |
| **5500** | | | | | | | | | | | |
| **6000** | | | | | | | | | | | |

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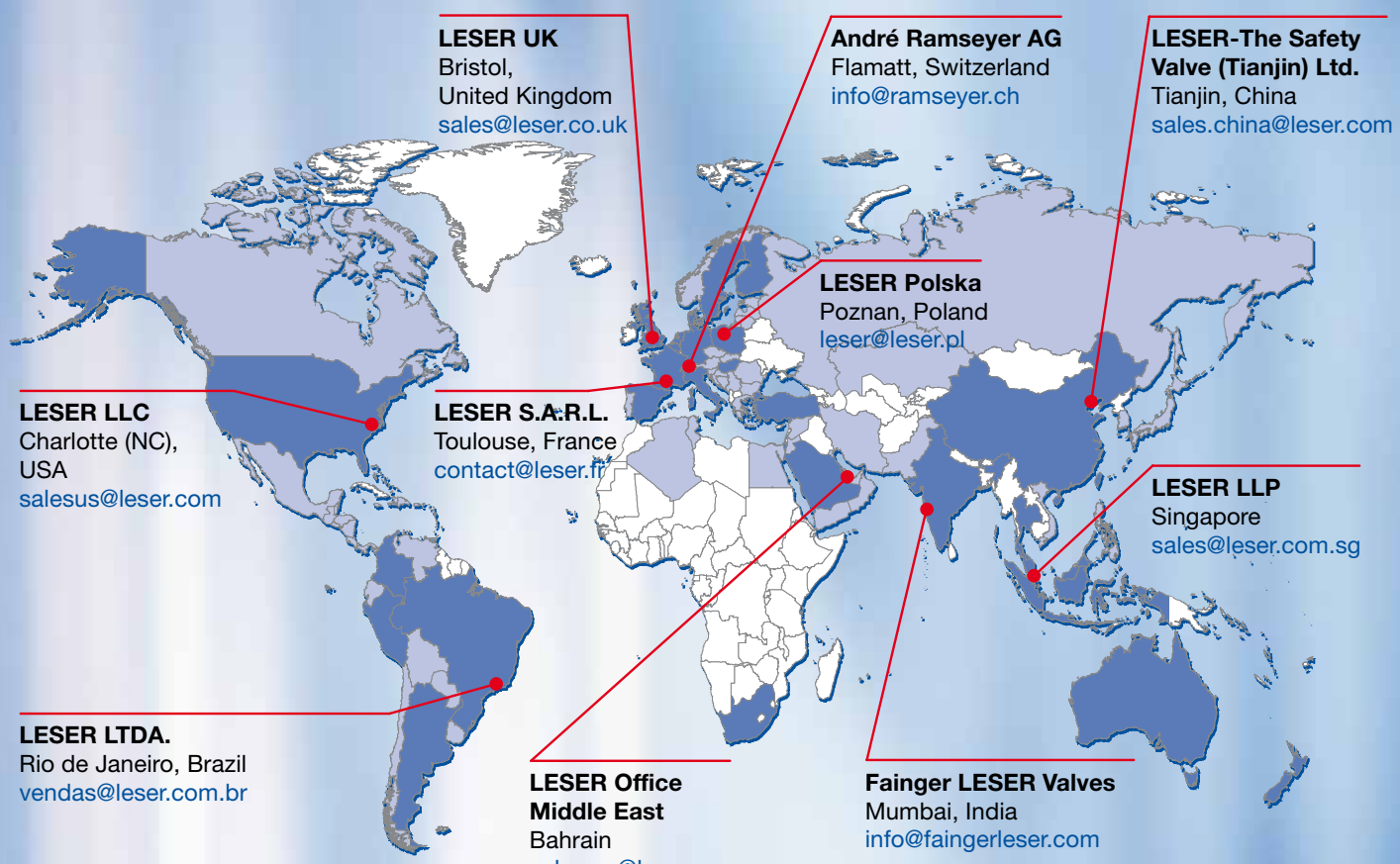


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The-Safety-Valve.com

**LESER GmbH & Co. KG**
**20537 Hamburg, Wendenstr. 133-135**
**20506 Hamburg, P.O. Box 26 16 51**
**Fon +49 (40) 251 65-100**
**Fax +49 (40) 251 65-500**
E-Mail: sales@leser.com
www.leser.com