

SchuF Flush-Mounted Valves

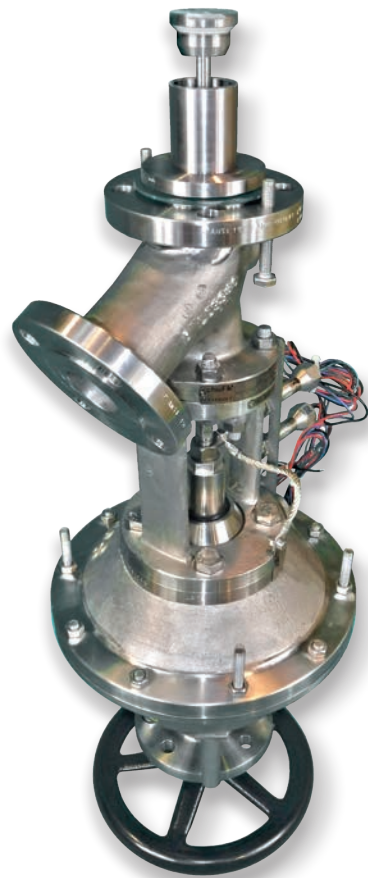
Draining / Injection / Sampling



SchuF 

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SchuF is fully registered,
accredited and certified
worldwide

SchuF Worldwide Group

For over 100 years SchuF valves have stood for innovation and quality at the highest level.

SchuF invented the first bottom outlet valve over 100 years ago, and today, the SchuF Group offers flush-mounted valves with a disc or piston design in various materials and classes, with many options.

These valves are custom-manufactured to exact tolerances for use in specialised processes with often challenging operating conditions. SchuF Valves can be found in standard and severe service applications in the Chemical, Polymer, Pharma, Oil, Gas, Offshore and Refining industries. Continuing research and development in materials and design enable SchuF to offer valve solutions for applications with high pressure, high temperature and difficult media, or a combination of all three.

SchuF flush-mounted valves are ideal for draining tanks, reactors or pipelines containing both viscous and non-viscous media.

Right: A SchuF disc-rising pneumatically-actuated valve, as designed for the pharmaceutical industry, which incorporates P.A.T. technology



Why use a SchuF flush-mounted valve?

One of the most obvious benefits of a SchuF Valve is that of dead-space elimination. In the example below we can see how a SchuF valve is designed to perfectly match vessel dimensions. The use of a simple

ball-valve in such an installation (as seen in the near image), with associated serious dead-space issues, can lead to blockage of the outlet nozzle.



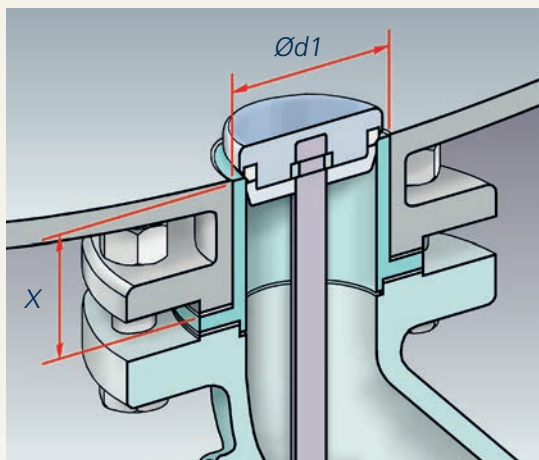
Customer-driven design

| Flush-Mounted Valves- Features and Options | |
|---|---|
| Flush-Mounted Custom Seats | SchuF will use the exact nozzle/piping dimensions to design custom valve seats to eliminate dead-space. |
| Material Choice | Cast-steel, stainless steel, nickel-based alloys including Hastelloy®, Incolloy®, Inconel®, Monel®, plus Titanium, Zirconium and many others. Valve lining can be PTFE, PFA or glass. Hard-face options include Stellite, Tungsten Carbide, ceramic, etc. |
| Actuation | Options include electric, pneumatic, hydraulic or manual operation, possibly in combination. |
| Heating/Cooling Jackets | Jackets or shells offering heating or cooling. |
| Seal to Atmosphere | Stuffing-box with live-loaded packing and optional bellows seal. |
| Control & Automation | SchuF provides a wide range of instrumentation and flow control accessories |
| Flushing | SchuF valves can be supplied with system flushing or purging ports as required. |
| Sampling/Injection | Sampling and Injection ports can be supplied. |
| Fire-Safe | Fire-safe certification to BS 6755 Part 2 (1987), to ISO 10497, or to API 607. Fire-Safe Blankets are a further option. |
| Process Analytical Technology (P.A.T.) | A SchuF valve with integral P.A.T. sensor allows process monitoring with fully-immersed PAT probes such as FTIR (mid- and near-IR ranges), RAMAN, FBRM, PVM, ATR, LiquiSonic®, pH and turbidity probes. |
| Temperature Sensors | Temperature sensors mounted within the disc or ram/piston allow accurate monitoring of the vessel/reactor contents, even with small batches- removing any need for extra nozzle access while also allowing for fast probe removal. |

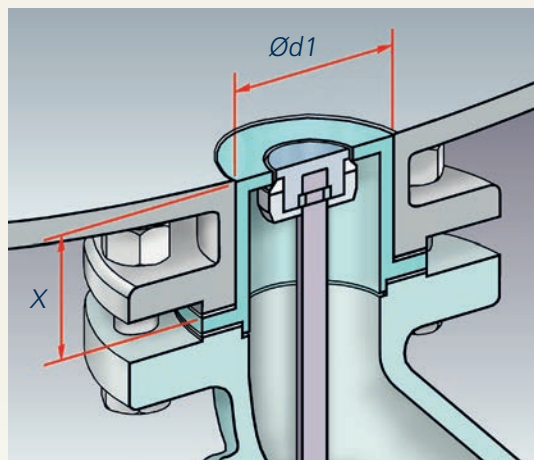


Disc Flush-Mounted Drain Valves

SchuF disc valves are available in both *Disc Rising* and *Disc Lowering* variants, each with advantages in certain vessel/pipe installation situations. Both types are also suitable for use as injection valves.



Type 25 (Disc Rising) valves utilise the vessel pressure forces to help seal the valve in a flow-to-close design, thereby requiring smaller actuator forces to achieve a seal, especially in high-pressure systems. Type 25 valves also provide a crust-breaking function.



Type 24 (Disc Lowering) valves operate in a flow-to-open arrangement, and can be mounted on vessels where low-mounted agitators operate very close to the vessel bottom outlet.

There are a number of further seat arrangement options specific to both Type 24 & Type 25 valves. Please go to www.schuf.com or contact us for more details.



Left- a **Type 25** disc-rising valve, with spring-retained short-stroke pneumatic actuator, limit-switch accessories and manual override.



Right- a **Type 24** disc-lowering valve, also with a spring-retained short-stroke pneumatic actuator- note the actuator's opposite orientation to that of the Type 25 valve, left

Disc Flush-Mounted Drain Valves

Disc Bottom Outlet Valves are ideal when addressing the following process requirements:

- Lower stem-sealing forces are required
- There are space restrictions underneath the reactor
- Absolute tight shut-off to atmosphere is necessary (bellows-seal)
- Short travel is advantageous
- Low initial and maintenance costs are a factor
- The valve size is above 8"/DN200
- Flushing of the valve body cavity during reaction is desirable
- The valve is for lethal service

Selecting the ideal Disc Bottom Outlet Valve Type

- Is pressure helping to close the valve?
- Is crust-breaking needed at the bottom of the reactor?
- Is the best possible flow required?

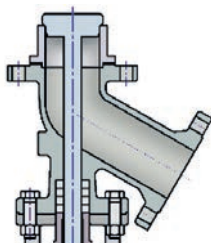
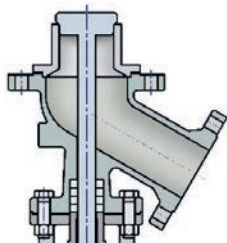
Disc-Rising BOV

- Metal or soft seal in the vessel
- Different sized inlet and outlet

- Metal or soft seal in the vessel
- Same sized inlet and outlet

TYPE 25BS/BF

TYPE 19BS



- Is this for a vacuum application?
- Is the agitator close to the bottom of reactor?
- Is cleaning the disc between batches important?

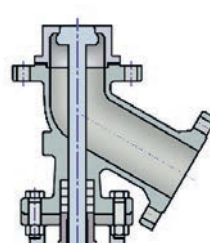
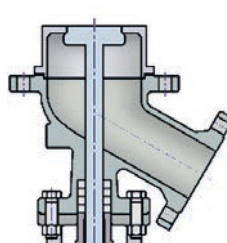
Disc-Lowering BOV

- Metal or soft seal in the vessel
- Different-sized inlet and outlet

- Metal or soft seal in the vessel
- Same sized inlet and outlet

TYPE 24BS

TYPE 18BS



Disc Flush-Mounted Drain Valves

SchuF is the inventor (in 1923) of the Disc Bottom Outlet Valve. These valves are ideal for draining tanks, reactors or pipelines, and are widely used in the pharmaceutical, fine chemical, biochemical, and mineral-refining industries.

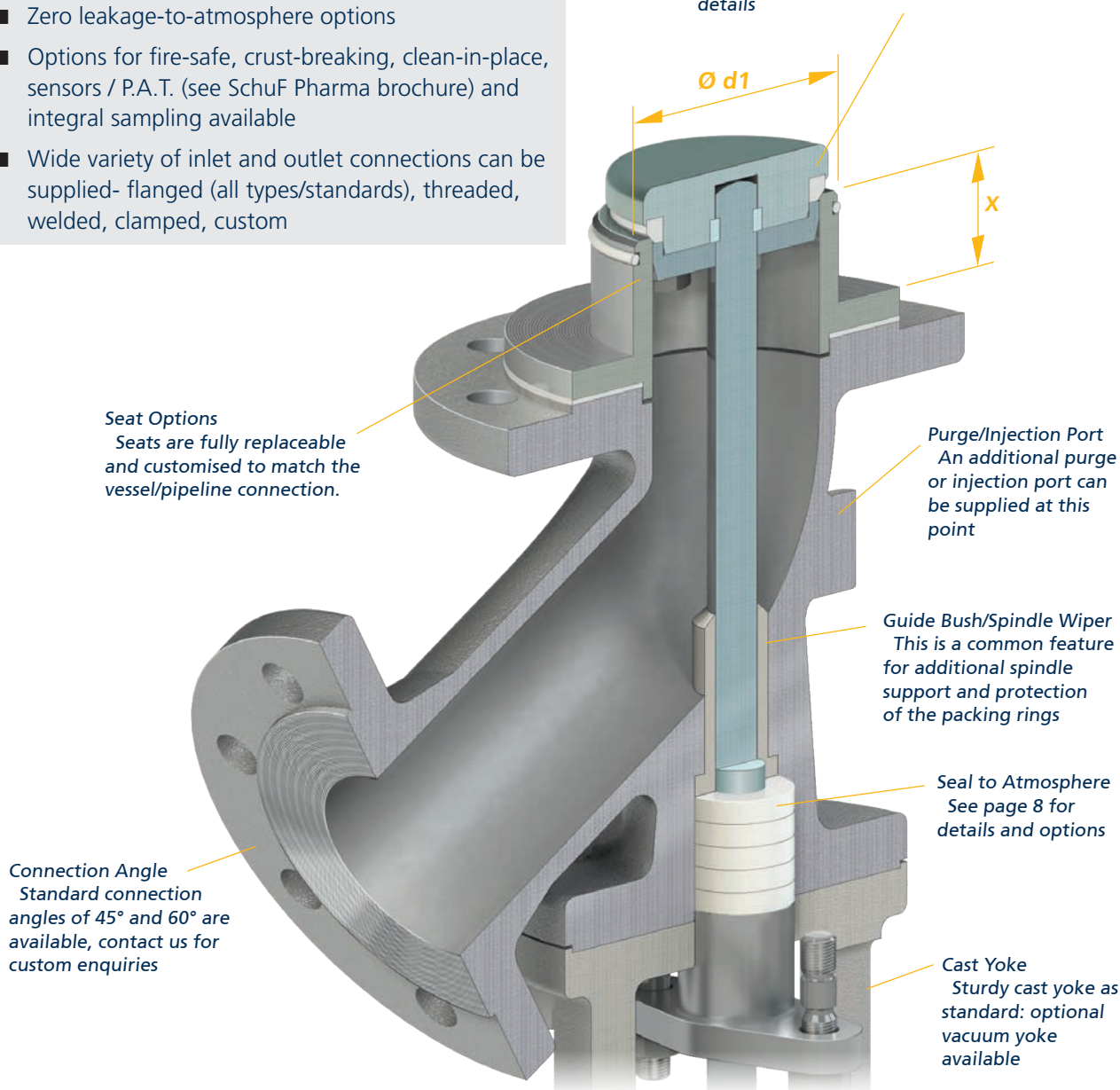
Key Features

- Dead-space-free nozzle connection
- Space- and weight-saving valve design due to short-stroke operation,
- Smaller, faster, lighter actuation
- Zero leakage-to-atmosphere options
- Options for fire-safe, crust-breaking, clean-in-place, sensors / P.A.T. (see SchuF Pharma brochure) and integral sampling available
- Wide variety of inlet and outlet connections can be supplied- flanged (all types/standards), threaded, welded, clamped, custom

Disc Options

In this example, we see a loose, self-centring, rising disc (see page 6), with soft sealing ring. Discs are also available with metal or hard-faced sealing surfaces.

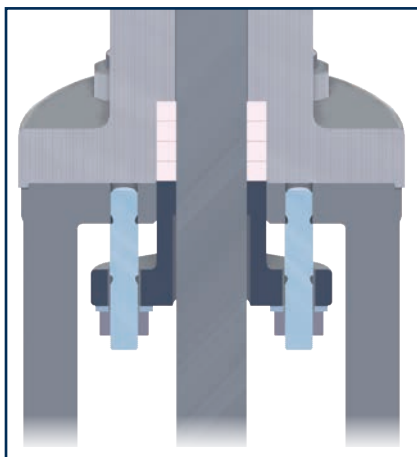
For further details on this and other disc arrangements, please visit www.schuF.com or contact us for more details



Disc Flush-Mounted Drain Valves- Features and Options

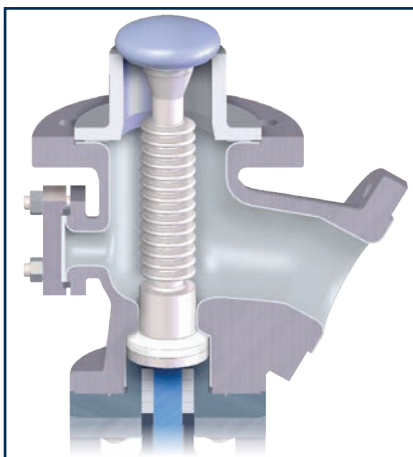
Seal to Atmosphere

Minimising or even eliminating fugitive emissions to atmosphere is a highly important aspect of valve performance. All SchuF valves can be supplied with a number of different arrangements to suit any customer requirements in this area.



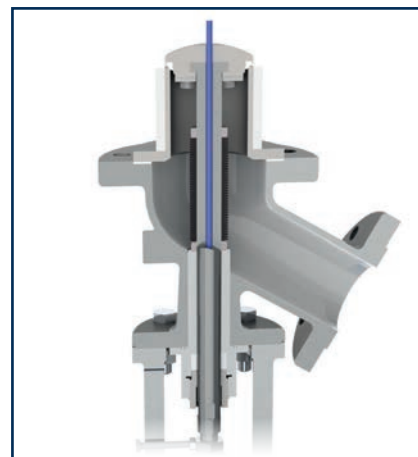
Standard Packing

Packing rings are compressed using a stuffing-box gland, which can be regularly tightened as required using standard studs/nuts



Bellows Seal

This utilises an expanding/contracting bellows (PTFE shown here; metal also available) and incorporates a back-up stuffing-box-seal section



Live-Loaded Packing

Here, cup-springs are employed to maintain the required minimum sealing pressure, even as the packing-rings compress over time

Sensors and Process Analytical Technology [PAT]

- SchuF can provide sensor functionality in a number of ways, from basic temperature sensors to full PAT systems.
- A SchuF-patented Multiprobe valve with single-shaft design (below left) can utilise an Infra-Red PAT probe with an incorporated 1xPT100 (single-sensor) temperature sensor.
- The double-probe arrangement, below centre, can house a standard 2xPT100 (double-sensor) temperature sensor alongside a separate PAT probe.
- Other probe types (e.g. a *SensoTech Liquisonic®* probe, shown below, far right) are also available.

Right: SchuF Single-Shaft Multiprobe™ Disc Valve, DN50 / 2" or larger



Right: SchuF Double-Shaft Multiprobe™ Disc Valve, DN50 / 2" or larger



Right: SchuF Disc Valve with a *SensoTech Liquisonic®* probe.



For further details see brochure 'Valves for the Pharmaceutical and Fine Chemical Industries' at www.schuf.com

Disc Flush-Mounted Drain Valves- Special Options

Lined Valves

SchuF flush-mounted disc valves see extensive service in the bulk pharmaceutical and fine chemical industries. The Type 25 bottom-outlet valve with **lining in glass, PTFE/PFA, tantalum, or other materials such as rubber**, provides the ideal solution when customers require a flush-mounted, custom fitted valve with high corrosion resistance and complete operational reliability in order to maximise their system's high-level functionality. Bespoke design requirements can be incorporated into each valve alongside tried and tested standard design features, such as **elimination of dead-space in the vessel outlet, FDA and GMP compliance, full cleaning capability (Clean In Place, CIP) and fire-safe certification.**

These valves can be supplied with **bellows or stuffing-box seal to atmosphere.** Additional options include **temperature/PAT sensors**, accessories such as **positioners, limit switches or solenoid valves, actuator manual over-ride, leak detection and live-loaded packing.**



Above is an example of a low-profile glass-lined valve, with glass disc, PTFE/PFA seat, spring-returned short-stroke side-mounted pneumatic actuator, and internal temperature-sensor with connecting head



Above- two more examples of SchuF lined valves.
Near right, we see a valve with glass-lined body with PTFE bellows seal to atmosphere.
Further right, a valve with PTFE/PFA-lined body and glass-lined spindle, stuffing-box seal to atmosphere, and temperature sensor with integral connecting head.

Filter Valve

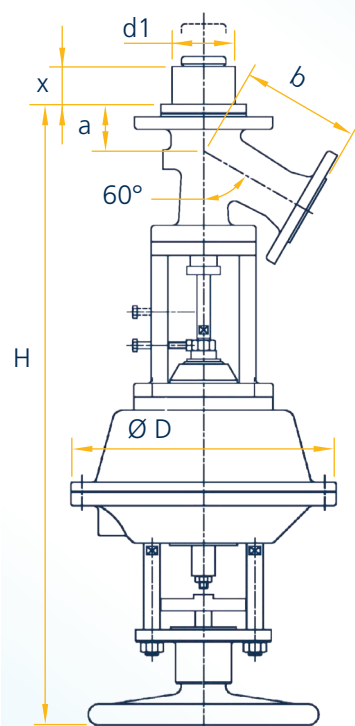
SchuF has developed a disc-rising drain valve with the ability to measure real-time process reaction parameters while utilising fine-control multi-level filtering in order to achieve specific product crystallisation dimensions. This functionality may otherwise only have been obtainable by utilising a set of reactors and separators in a costly and lengthy process



Disc Valves- Standard Dimension Sheets

All dimensions in mm

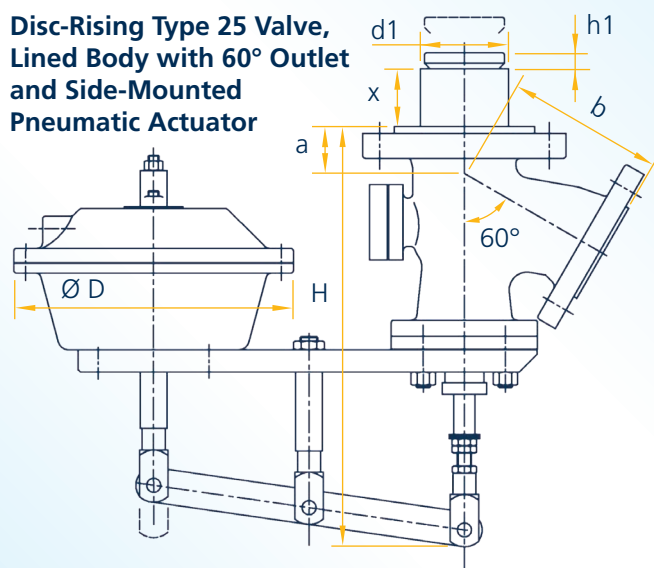
Disc-Rising Type 19/25 Valve, Pneumatic Actuator with Manual Override



| Rating and variable Valve Size ↓ | PN16 | | | | PN25/40 | | | |
|-------------------------------------|------|-----|-----|-----|---------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| DN 25/25 | 50 | 108 | 682 | 315 | 52 | 110 | 684 | 315 |
| DN 40/25 | 70 | 110 | 692 | 315 | 85 | 140 | 732 | 315 |
| DN 40/40 | 54 | 140 | 733 | 315 | 56 | 142 | 735 | 315 |
| DN 50/25 | 85 | 138 | 732 | 315 | 87 | 140 | 734 | 315 |
| DN 50/50 | 62 | 145 | 749 | 315 | 62 | 145 | 749 | 315 |
| DN 80/50 | 62 | 145 | 749 | 315 | 66 | 146 | 758 | 315 |
| DN 80/80 | 75 | 180 | 802 | 315 | 76 | 180 | 803 | 315 |
| DN 100/80 | 68 | 180 | 805 | 315 | 66 | 204 | 813 | 315 |
| DN 100/100 | 79 | 197 | 838 | 390 | 82 | 200 | 838 | 390 |
| DN 125/100 | 81 | 197 | 844 | 390 | 84 | 200 | 840 | 390 |
| DN 150/100 | 72 | 197 | 840 | 390 | 78 | 201 | 846 | 390 |
| DN 150/150 | 94 | 237 | 900 | 402 | 116 | 274 | 968 | 450 |
| DN 200/150 | 85 | 237 | 896 | 402 | | | | |

| Rating and variable Valve Size ↓ | ASME 150 | | | | ASME 300 | | | |
|-------------------------------------|----------|-----|-----|-----|----------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| 1"/1" | 48 | 106 | 680 | 315 | 52 | 110 | 684 | 315 |
| 1½"/1" | 85 | 135 | 732 | 315 | 88 | 139 | 735 | 315 |
| 2"/1" | 86 | 135 | 733 | 315 | 89 | 139 | 736 | 315 |
| 1½"/1½" | 54 | 140 | 736 | 315 | 59 | 149 | 757 | 315 |
| 2"/1½" | 55 | 140 | 737 | 315 | 60 | 149 | 758 | 315 |
| 2"/2" | 61 | 144 | 748 | 315 | 64 | 147 | 754 | 315 |
| 3"/2" | 66 | 145 | 758 | 315 | 72 | 147 | 758 | 315 |
| 3"/3" | 76 | 180 | 803 | 315 | 81 | 185 | 808 | 315 |
| 4"/3" | 72 | 184 | 809 | 315 | 74 | 209 | 806 | 315 |
| 4"/4" | 82 | 200 | 838 | 390 | 90 | 208 | 846 | 390 |
| 6"/4" | 76 | 201 | 841 | 390 | 87 | 209 | 855 | 390 |
| 6"/6" | 97 | 240 | 893 | 450 | 127 | 285 | 977 | 450 |
| 8"/6" | 90 | 238 | 924 | 450 | 103 | 250 | 937 | 450 |

Disc-Rising Type 25 Valve, Lined Body with 60° Outlet and Side-Mounted Pneumatic Actuator

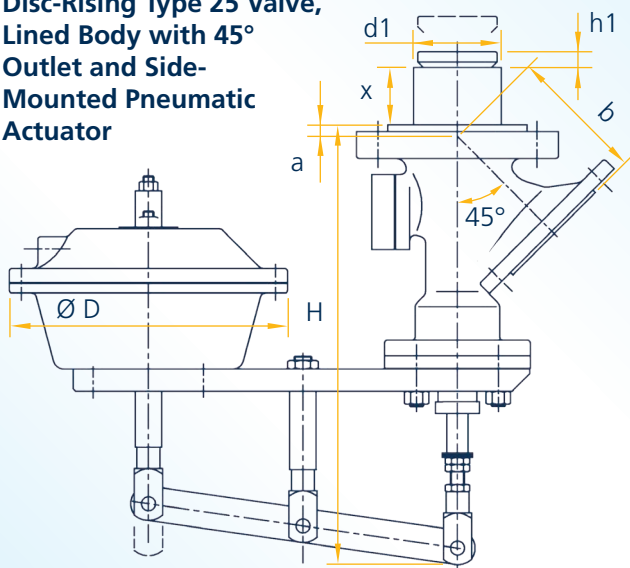


| Valve Size; Metric / Imperial Variable ↓ | 50/40 | 80/50 | 100/80 | 150/100 | 200/150 |
|---|---------|----------|----------|----------|----------|
| | 2"/1½" | 3"/2" | 4"/3" | 6"/4" | 8"/6" |
| x (standard) | 50 | 52 | 66 | 81 | 100 |
| d1 (standard) | 49 | 79 | 99 | 148 | 198 |
| x min/max | 30 - 75 | 52 - 100 | 66 - 150 | 81 - 180 | 40 - 180 |
| a | 94 | 57 | 55 | 75 | 110 |
| b | 160 | 167 | 180 | 200 | 240 |
| h1 | 17 | 18 | 25 | 23 | 42 |
| H (PS) | 475 | 480 | 480 | 500 | 700 |
| Stroke | 30 | 35 | 40 | 40 | 60 |
| Ø D | 315 | 315 | 315 | 315 | 390 |

Disc Valves- Standard Dimension Sheets

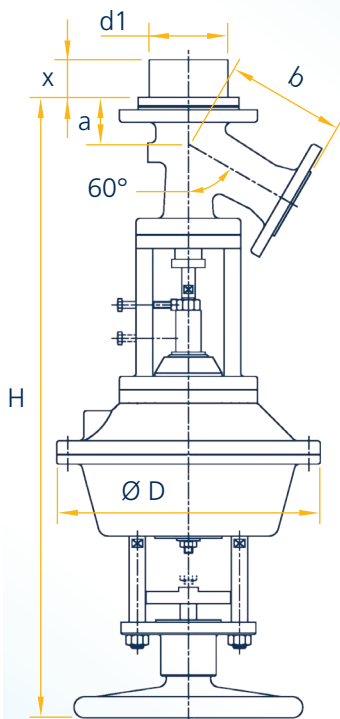
All dimensions in mm

**Disc-Rising Type 25 Valve,
Lined Body with 45°
Outlet and Side-
Mounted Pneumatic
Actuator**



| Valve Size; Metric / Imperial Variable ↓ | 50/40 | 80/50 | 100/80 | 150/100 | 200/150 |
|---|---------|----------|----------|----------|----------|
| | 2"/1½" | 3"/2" | 4"/3" | 6"/4" | 8"/6" |
| x (standard) | 50 | 52 | 66 | 81 | 100 |
| d1 (standard) | 49 | 79 | 99 | 148 | 198 |
| x min/max | 30 - 75 | 52 - 100 | 66 - 150 | 81 - 180 | 40 - 180 |
| a | 43 | 14 | 14 | 14 | 65 |
| b | 160 | 115 | 155 | 175 | 330 |
| h1 | 17 | 18 | 25 | 23 | 42 |
| H (PS) | 475 | 480 | 510 | 550 | 675 |
| Stroke | 30 | 35 | 40 | 40 | 60 |
| Ø D | 315 | 315 | 315 | 315 | 390 |

**Disc-Lowering Type 18/24
Valve, Pneumatic Actuator
with Manual Override**



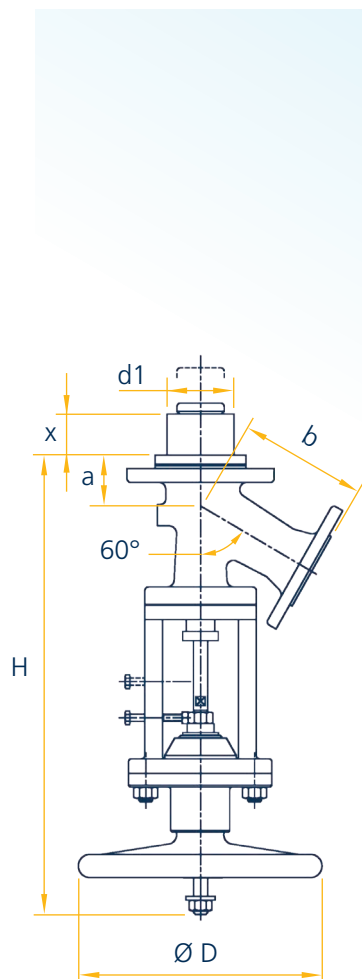
| Rating and variable Valve Size ↓ | PN16 | | | | PN25/40 | | | |
|---|------|-----|-----|-----|---------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| DN 40/25 | 70 | 110 | 709 | 315 | 85 | 140 | 749 | 315 |
| DN 50/25 | 85 | 138 | 749 | 315 | 87 | 140 | 751 | 315 |
| DN 40/40 | 54 | 140 | 750 | 315 | 56 | 142 | 752 | 315 |
| DN 50/40 | 56 | 144 | 771 | 315 | 58 | 146 | 773 | 315 |
| DN 50/50 | 62 | 145 | 766 | 315 | 50 | 145 | 766 | 315 |
| DN 80/50 | 62 | 145 | 766 | 315 | 66 | 146 | 775 | 315 |
| DN 80/80 | 75 | 180 | 836 | 390 | 76 | 180 | 837 | 390 |
| DN 100/80 | 68 | 180 | 839 | 450 | 66 | 204 | 847 | 390 |
| DN 100/100 | 79 | 197 | 855 | 450 | 82 | 200 | 855 | 450 |
| DN 150/100 | 72 | 197 | 857 | 450 | 78 | 201 | 863 | 450 |
| DN 150/150 | 94 | 237 | 917 | 450 | 116 | 274 | 985 | 450 |
| DN 200/150 | 85 | 237 | 913 | 450 | | | | |

| Rating and variable Valve Size ↓ | ASME 150 | | | | ASME 300 | | | |
|---|----------|-----|-----|-----|----------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| 1½"/1" | 85 | 135 | 749 | 315 | 88 | 139 | 752 | 315 |
| 2"/1" | 86 | 135 | 750 | 315 | 89 | 139 | 753 | 315 |
| 1½"/1½" | 54 | 140 | 753 | 315 | 59 | 149 | 774 | 315 |
| 2"/1½" | 55 | 140 | 754 | 315 | 60 | 149 | 775 | 315 |
| 2"/2" | 61 | 144 | 765 | 315 | 64 | 147 | 771 | 315 |
| 3"/2" | 66 | 145 | 775 | 315 | 72 | 147 | 775 | 315 |
| 3"/3" | 76 | 180 | 837 | 390 | 81 | 185 | 842 | 390 |
| 4"/3" | 72 | 184 | 843 | 390 | 74 | 209 | 840 | 390 |
| 4"/4" | 82 | 200 | 855 | 450 | 90 | 208 | 863 | 450 |
| 6"/4" | 76 | 201 | 858 | 450 | 87 | 209 | 872 | 450 |
| 6"/6" | 97 | 240 | 910 | 450 | 127 | 285 | 994 | 450 |
| 8"/6" | 90 | 238 | 941 | 450 | 103 | 250 | 954 | 450 |

Disc Valves- Standard Dimension Sheets

All dimensions in mm

Disc-Rising Type 19/25 Valve, Manual Actuator



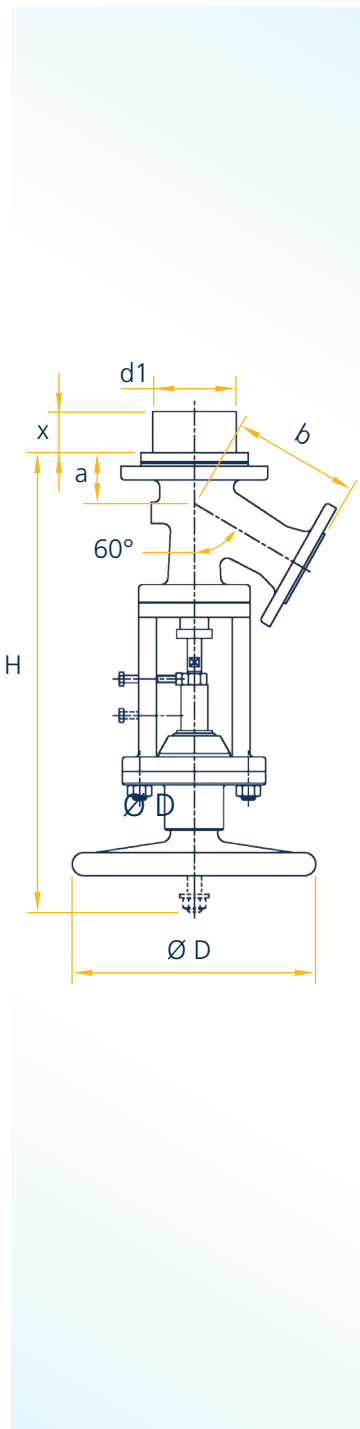
| Rating and Valve Size → ↓ | PN16 | | | | PN25/40 | | | |
|------------------------------------|------|-----|-----|-----|---------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| DN 40/25 | 70 | 110 | 345 | 120 | 85 | 140 | 381 | 120 |
| DN 50/25 | 85 | 138 | 381 | 120 | 87 | 140 | 383 | 120 |
| DN 40/40 | 52 | 138 | 372 | 160 | 54 | 140 | 374 | 160 |
| DN 50/40 | 56 | 144 | 395 | 160 | 58 | 146 | 397 | 160 |
| DN 50/50 | 62 | 145 | 383 | 160 | 62 | 145 | 386 | 160 |
| DN 80/50 | 62 | 145 | 383 | 160 | 66 | 146 | 387 | 160 |
| DN 80/80 | 75 | 180 | 466 | 225 | 76 | 180 | 460 | 225 |
| DN 100/80 | 68 | 180 | 465 | 225 | 66 | 204 | 475 | 225 |
| DN 100/100 | 79 | 197 | 478 | 225 | 82 | 200 | 476 | 225 |
| DN 150/100 | 72 | 197 | 483 | 225 | 78 | 201 | 486 | 225 |
| DN 150/150 | 94 | 237 | 585 | 280 | 128 | 276 | 627 | 280 |
| DN 200/150 | 85 | 237 | 572 | 280 | | | | |

| Rating and Valve Size → ↓ | ASME 150 | | | | ASME 300 | | | |
|------------------------------------|----------|-----|-----|-----|----------|-----|-----|-----|
| | a | b | H | Ø D | a | b | H | Ø D |
| 1"/1" | 48 | 106 | 327 | 120 | | | | |
| 1½"/1" | 85 | 135 | 382 | 120 | 88 | 139 | 367 | 120 |
| 2"/1" | 86 | 135 | 383 | 120 | 89 | 139 | 368 | 120 |
| 1½"/1½" | 54 | 140 | 372 | 160 | 59 | 149 | 372 | 160 |
| 2"/1½" | 55 | 140 | 373 | 160 | 60 | 149 | 374 | 160 |
| 2"/2" | 61 | 144 | 385 | 160 | 64 | 147 | 370 | 160 |
| 3"/2" | 66 | 145 | 387 | 160 | 72 | 147 | 374 | 160 |
| 3"/3" | 76 | 180 | 460 | 225 | 80 | 184 | 439 | 225 |
| 4"/3" | 72 | 184 | 469 | 225 | 74 | 209 | 453 | 225 |
| 4"/4" | 82 | 200 | 476 | 225 | 90 | 208 | 459 | 225 |
| 6"/4" | 76 | 201 | 483 | 225 | 87 | 209 | 470 | 225 |
| 6"/6" | 97 | 240 | 583 | 225 | 127 | 285 | 612 | 280 |
| 8"/6" | 90 | 238 | 596 | 225 | 103 | 250 | 573 | 280 |

Disc Valves- Standard Dimension Sheets

All dimensions in mm

Disc-Lowering Type 18/24 Valve, Manual Actuator



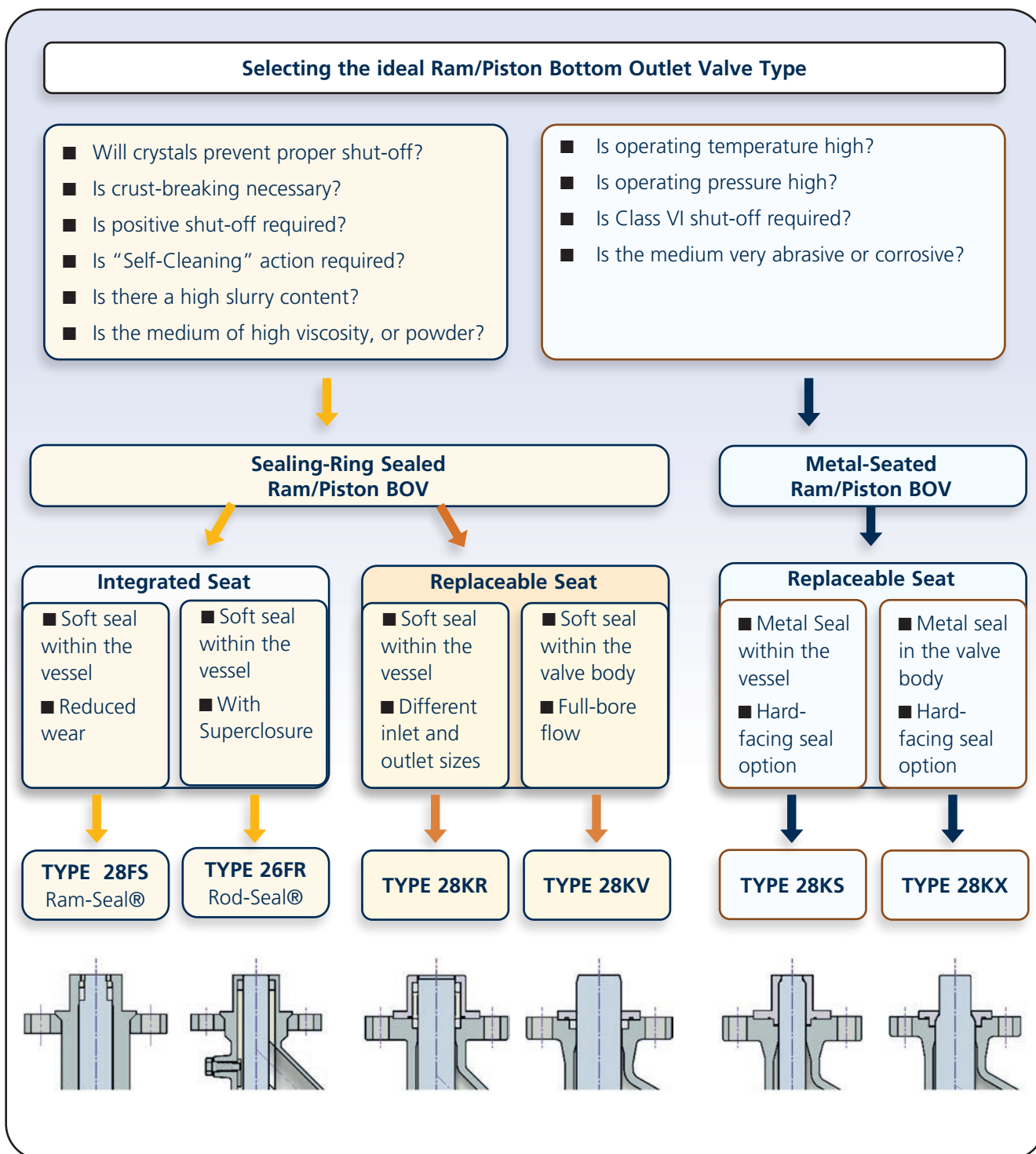
| Rating and Valve Size → ↓ | PN16 | | | | PN25/40 | | | |
|------------------------------------|------|-----|-----|------|---------|-----|-----|------|
| | a | b | H | Ø D | a | b | H | Ø D |
| DN 25/25 | 50 | 108 | 682 | 500 | 50 | 108 | 682 | 500 |
| DN 40/25 | 70 | 110 | 692 | 750 | 70 | 110 | 692 | 750 |
| DN 40/40 | 54 | 140 | 733 | 1000 | 54 | 140 | 733 | 1000 |
| DN 50/40 | 56 | 144 | 754 | 1000 | 56 | 144 | 754 | 1000 |
| DN 50/50 | 62 | 145 | 749 | 1000 | 62 | 145 | 749 | 1000 |
| DN 80/50 | 62 | 145 | 749 | 1100 | 62 | 145 | 749 | 1100 |
| DN 80/80 | 75 | 180 | 802 | 1200 | 75 | 180 | 802 | 1200 |
| DN 100/80 | 68 | 180 | 805 | 1200 | 68 | 180 | 805 | 1200 |
| DN 100/100 | 79 | 197 | 838 | 1500 | 79 | 197 | 838 | 1500 |
| DN 125/100 | 81 | 197 | 844 | 1500 | 81 | 197 | 844 | 1500 |
| DN 125/125 | 90 | 222 | 862 | 1700 | 90 | 222 | 862 | 1700 |
| DN 150/150 | 94 | 237 | 900 | 1700 | 94 | 237 | 900 | 1700 |
| DN 200/150 | 85 | 237 | 896 | 2200 | 85 | 237 | 896 | 2200 |

| Rating and Valve Size → ↓ | ASME 150 | | | | ASME 300 | | | |
|------------------------------------|----------|-----|-----|------|----------|-----|-----|------|
| | a | b | H | Ø D | a | b | H | Ø D |
| 1½"/1" | 50 | 108 | 682 | 500 | 50 | 108 | 682 | 500 |
| 2"/1" | 70 | 110 | 692 | 750 | 70 | 110 | 692 | 750 |
| 1½"/1½" | 54 | 140 | 733 | 1000 | 54 | 140 | 733 | 1000 |
| 2"/1½" | 56 | 144 | 754 | 1000 | 56 | 144 | 754 | 1000 |
| 2"/2" | 62 | 145 | 749 | 1000 | 62 | 145 | 749 | 1000 |
| 3"/2" | 62 | 145 | 749 | 1100 | 62 | 145 | 749 | 1100 |
| 3"/3" | 75 | 180 | 802 | 1200 | 75 | 180 | 802 | 1200 |
| 4"/3" | 68 | 180 | 805 | 1200 | 68 | 180 | 805 | 1200 |
| 4"/4" | 79 | 197 | 838 | 1500 | 79 | 197 | 838 | 1500 |
| 6"/4" | 81 | 197 | 844 | 1500 | 81 | 197 | 844 | 1500 |
| 6"/6" | 90 | 222 | 862 | 1700 | 90 | 222 | 862 | 1700 |
| 8"/6" | 94 | 237 | 900 | 1700 | 94 | 237 | 900 | 1700 |

Ram/Piston Flush-Mounted Drain Valves

Ram/Piston Bottom Outlet Valves are ideal when addressing the following process requirements:

- Is it necessary to have full-bore flow through the drain valve?
- Is the nominal bore of the valve 1" or smaller?
- Can deposits on the seat of the valve be a problem?
- Is sampling before vessel-draining necessary?



Ram/Piston Flush-Mounted Drain Valves

SchuF is the inventor of the Ram/Piston Bottom Outlet Valve (1926). These valves are most commonly used to quickly drain or inject media into or out of vessels, tanks, reactors or pipelines, and are especially effective in handling high-viscosity media and slurry flow through smaller bores.

Key Features

- Dead-space-free nozzle connection
- Full-bore flow allows for rapid vessel drainage
- Zero leakage-to-atmosphere options
- Options for fire-safe, crust-breaking, sensors (P.A.T.) and sampling available

Seat Options

Seats are fully replaceable and customised to match the vessel/pipeline connection. The vessel bore is matched using the variable $\varnothing d1$, and the depth of seat insertion is referenced as X. For further seat/connection options, see page 16

Ram/Piston Sealing Methods

In this example, we see a metal-to-metal seat. Rams/Pistons are also available with soft sealing surfaces. For other sealing arrangements, see also pages 16 & 17

Purge/Injection Port

An additional purge or injection port can be supplied at this point

Seal to Atmosphere

Stuffing-box gland arrangements, such as the one shown here, can be supplied with packing rings in a variety of materials and in different configurations. This example shows an extended packing ring arrangement. For further options see www.schuf.com

Connection Angle

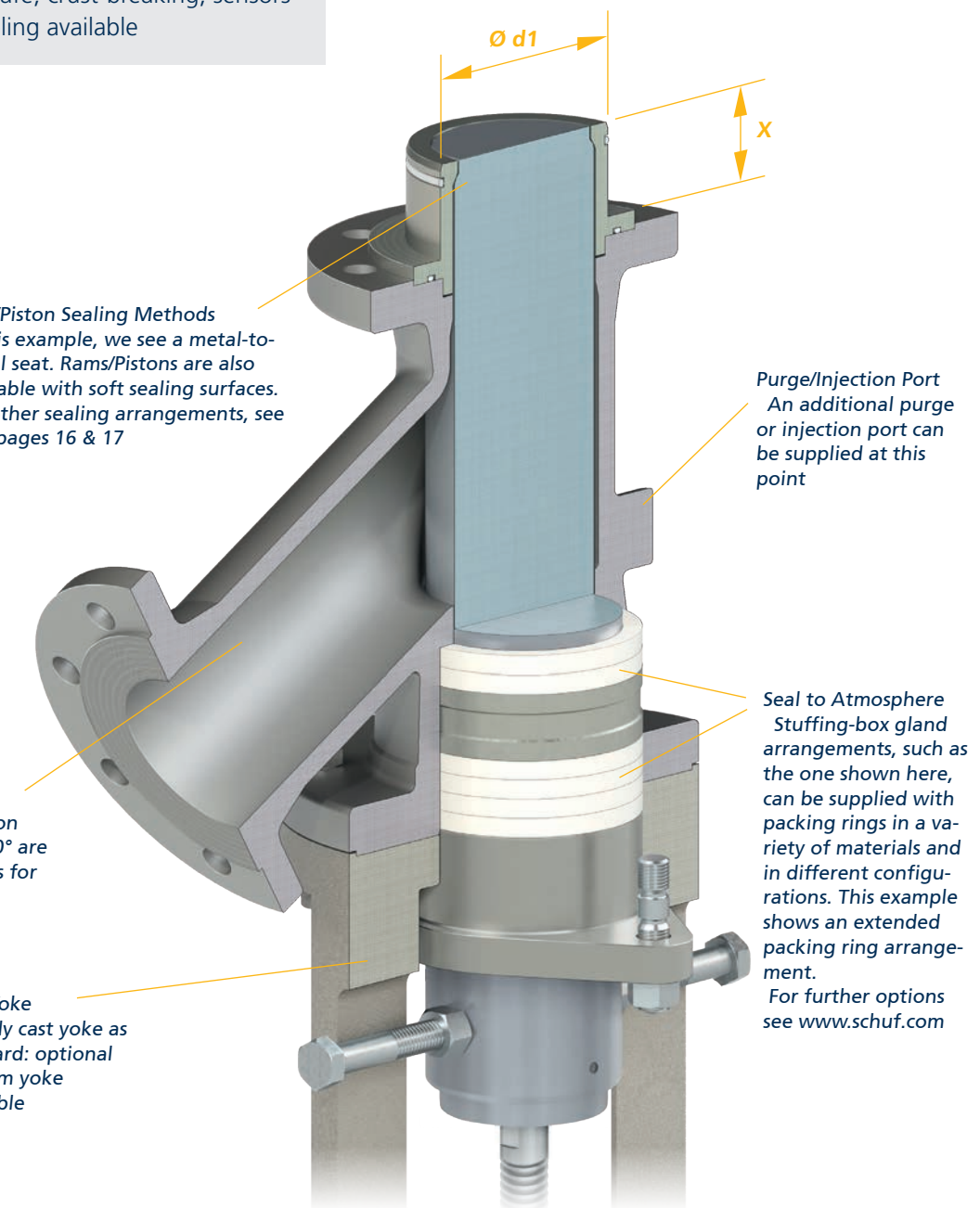
Standard connection angles of 45° and 60° are available- contact us for custom enquiries

Cast Yoke

Sturdy cast yoke as standard: optional vacuum yoke available

Actuator

A wide variety of custom actuators is available, with options including electric, pneumatic, hydraulic and manual operation

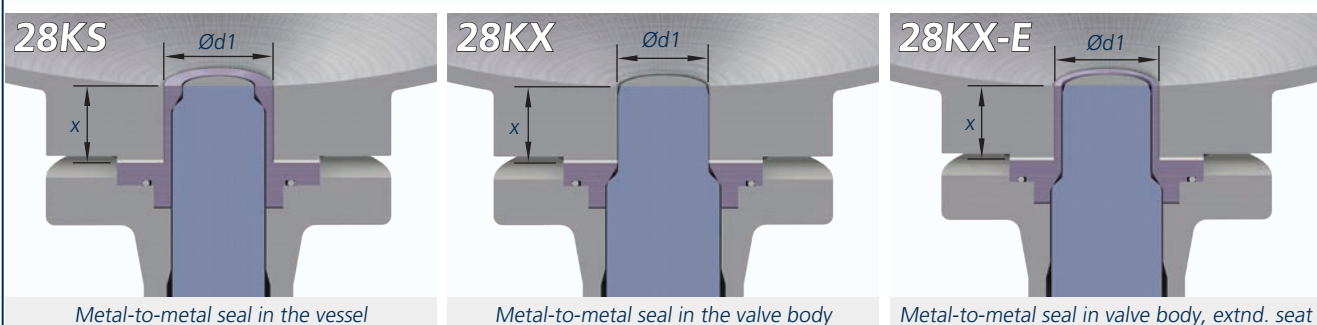


Ram/Piston Flush-Mounted Drain Valves- Sealing Options

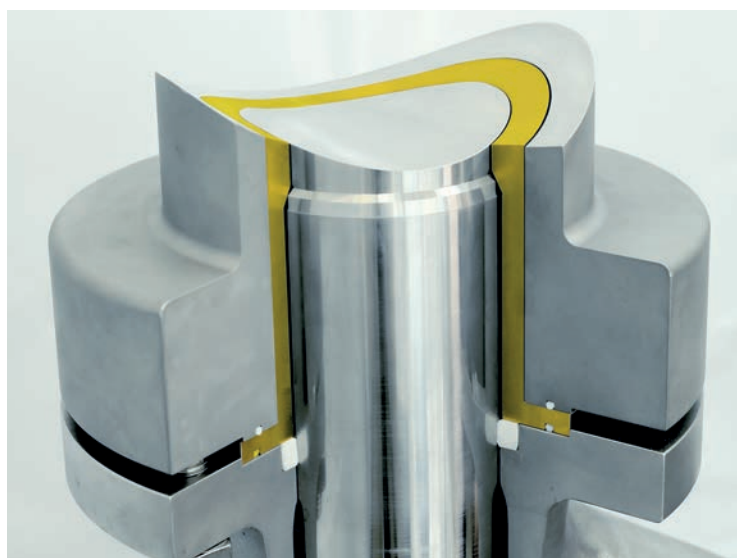
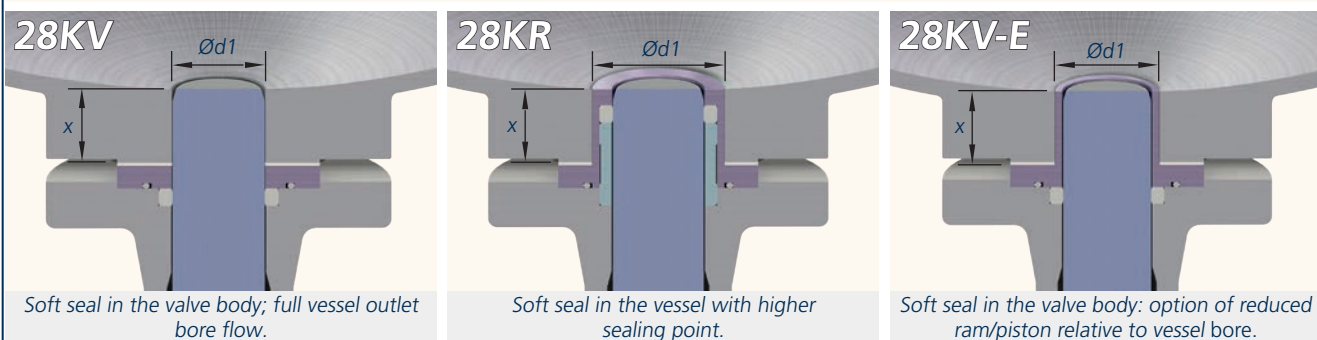
SchuF Rams/Pistons are available with different seal-to-process options, such as soft-seal (using a radial sealing ring) or metal-to-metal seal. A further option is a hard-faced metal-to-metal seal.

Replaceable Seats

Metal or hard-faced seal (Below): This type of sealing arrangement is particularly suited for applications involving severe service with abrasive, corrosive, or dirty media, including slurries, as well as for processes involving extreme temperatures or high-pressure conditions. Seats are fully customised and replaceable. A variety of hard-faced materials for use on wetted surfaces is available to extend service life.

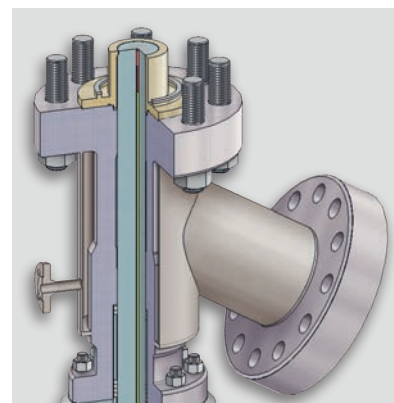


Soft Seal (Below): Valves with a soft-seal arrangement have the advantage of providing very good sealing performance (up to class VI) for competitive cost, due to smaller actuation requirements. In addition, this seal type can provide long valve-seat service life with low maintenance requirements. Seats are fully customised and replaceable. A wide variety of sealing ring materials is available to suit particular customer requirements.



Left: A cutaway view of a Type 28 metal-to-metal sealing ram/piston valve, with weld-on nozzle/insert containing the seat (yellow), contoured to match the internal bore of a pipeline

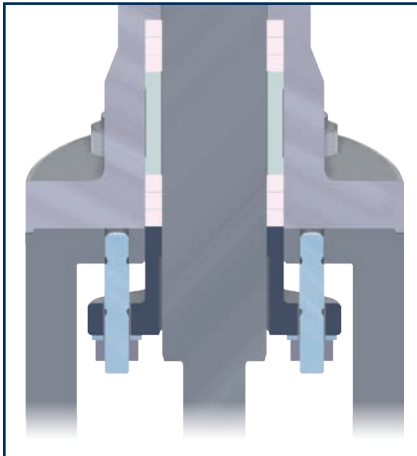
Below: SchuF ram/piston valves can also incorporate temperature sensors (with or without additional PAT sensors) as required (see page 8 for further PAT info)



Ram/Piston Flush-Mounted Drain Valves- Features, Options

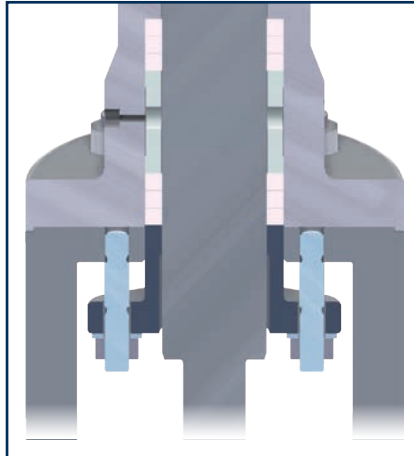
Seal to Atmosphere

The seal-to-atmosphere options listed for disc valves on page 8 also apply to ram/piston valves, except for bellows-sealed types. In addition, ram/piston valves can be supplied with further custom options, below, designed to match process requirements where ram/piston valves already provide the best solution.



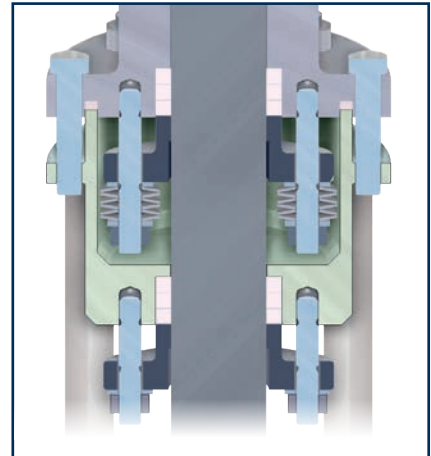
Extended Packing

A lantern (spacer) ring will create an extended-length packing arrangement which reduces dead-space and increases ram/piston travel stability



Extended Packing & Leak Detection

As left, but with an additional sniffer/sampling port behind the external sealing ring set to help identify leaks in the upper/inner set



Double-Stuffing-Box

Two entirely separate layers of isolation can be provided, with the internal separately-tightened stuffing box utilising live-loaded packing

Below: An example of a pneumatically-actuated Type-28KS ram/piston valve. A cast yoke provides rigid support and an integral T-Piece allows installation into pipelines without introducing dead-space issues



Below: SchuF has a proven track record in providing valves to exacting Fire-Safe standards. This is an example of a Fire Blanket being utilized to protect the valve actuator and its ability to close in the event of fire



Above: A Type 28KS ram/piston valve with custom replaceable seat, featuring a manual bevel-gear actuator



Ram/Piston Valves- Standard Dimension Sheets

All dimensions in mm

Ram/Piston Type 28 Valve, Pneumatic Actuator (PKD - double-acting, air supply 4-6 bar/60-90psi)

ASME 150 / PN16

| Rating and Variable Valve Size → ↓ | a | | b | | ≈ H | Stroke | Ø PKD | Ø D |
|--|----------|------|----------|------|--------|--------|-------|-----|
| | ASME 150 | PN16 | ASME 150 | PN16 | | | | |
| 1"/DN25 | 59 | 61 | 149 | 151 | 580+x | 76+x | 160 | 200 |
| 1½"/ DN40 | 88 | 86 | 194 | 192 | 730+x | 122+x | 160 | 200 |
| 2"/ DN50 | 89 | 88 | 209 | 208 | 745+x | 122+x | 160 | 200 |
| 3"/DN80 | 99 | 95 | 244 | 240 | 830+x | 159+x | 200 | 230 |
| 4"/DN100 | 99 | 95 | 269 | 265 | 870+x | 174+x | 250 | 280 |
| 6"/DN150 | 125 | 122 | 325 | 322 | 1070+x | 254+x | 320 | 355 |

ASME 300 / PN25

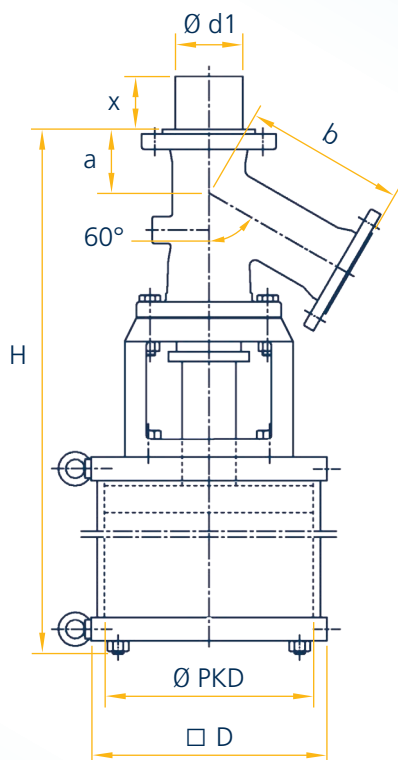
| Rating and Variable Valve Size → ↓ | a | | b | | ≈ H | Stroke | Ø PKD | Ø D |
|--|----------|------|----------|------|--------|--------|-------|-----|
| | ASME 300 | PN25 | ASME 300 | PN25 | | | | |
| 1"/DN25 | 63 | 63 | 153 | 153 | 590+x | 80+x | 160 | 200 |
| 1½"/ DN40 | 91 | 88 | 197 | 194 | 740+x | 125+x | 160 | 200 |
| 2"/ DN50 | 92 | 90 | 212 | 210 | 755+x | 125+x | 160 | 200 |
| 3"/DN80 | 103 | 99 | 248 | 244 | 840+x | 163+x | 200 | 230 |
| 4"/DN100 | 107 | 99 | 277 | 269 | 880+x | 182+x | 250 | 280 |
| 6"/DN150 | 137 | 128 | 337 | 328 | 1100+x | 266+x | 400 | 445 |

ASME 600 / PN40

| Rating and Variable Valve Size → ↓ | a | | b | | ≈ H | Stroke | Ø PKD | Ø D |
|--|----------|------|----------|------|--------|--------|-------|-----|
| | ASME 600 | PN40 | ASME 600 | PN40 | | | | |
| 1"/DN25 | 63 | 63 | 159 | 153 | 590+x | 80+x | 160 | 200 |
| 1½"/ DN40 | 92 | 88 | 205 | 194 | 740+x | 126+x | 160 | 200 |
| 2"/ DN50 | 95 | 90 | 222 | 210 | 760+x | 128+x | 200 | 230 |
| 3"/DN80 | 107 | 99 | 258 | 244 | 850+x | 167+x | 320 | 355 |
| 4"/DN100 | 113 | 99 | 290 | 269 | 895+x | 188+x | 320 | 445 |
| 6"/DN150 | 148 | 128 | 354 | 328 | 1120+x | 277+x | 500 | 560 |

ASME 900 / PN63

| Rating and Variable Valve Size → ↓ | a | | b | | ≈ H | Stroke | Ø PKD | Ø D |
|--|----------|------|----------|------|--------|--------|-------|-----|
| | ASME 900 | PN63 | ASME 900 | PN63 | | | | |
| 1"/DN25 | 73 | 69 | 170 | 159 | 610+x | 90+x | 160 | 200 |
| 1½"/ DN40 | 102 | 96 | 214 | 202 | 760+x | 136+x | 200 | 230 |
| 2"/ DN50 | 108 | 96 | 235 | 216 | 785+x | 141+x | 200 | 230 |
| 3"/DN80 | 113 | 103 | 265 | 248 | 860+x | 173+x | 320 | 355 |
| 4"/DN100 | 119 | 105 | 296 | 275 | 910+x | 194+x | 400 | 445 |
| 6"/DN150 | 156 | 136 | 362 | 336 | 1140+x | 285+x | 550 | 610 |



Ram/Piston Valves- Standard Dimension Sheets

All dimensions in mm

Ram/Piston Type 28 Valve, Manual [NF] Bevel Gear [KU] or Electric [EM] Actuator

ASME 150 / PN16

| Rating and Valve Size → ↓ | a | | b | | ≈H | ≈H1 | c | Ø D |
|------------------------------------|-------------|------|-------------|------|--------|---------|-----|-----|
| | ASME 150 | PN16 | ASME 150 | PN16 | | | | |
| 1"/DN25 | 59 | 61 | 149 | 151 | 675+x | 505+2x | 500 | 225 |
| 1½"/ DN40 | 88 | 86 | 194 | 192 | 775+x | 560+2x | 500 | 225 |
| 2"/ DN50 | 89 | 88 | 209 | 208 | 900+x | 825+2x | 500 | 280 |
| 3"/DN80 | 99 | 95 | 244 | 240 | 1020+x | 995+2x | 515 | 360 |
| 4"/DN100 | 99 | 95 | 269 | 265 | 1040+x | 1030+2x | 515 | 360 |
| 6"/DN150 | 125 | 122 | 325 | 322 | 1170+x | 1255+2x | 540 | 560 |

ASME 300 / PN25

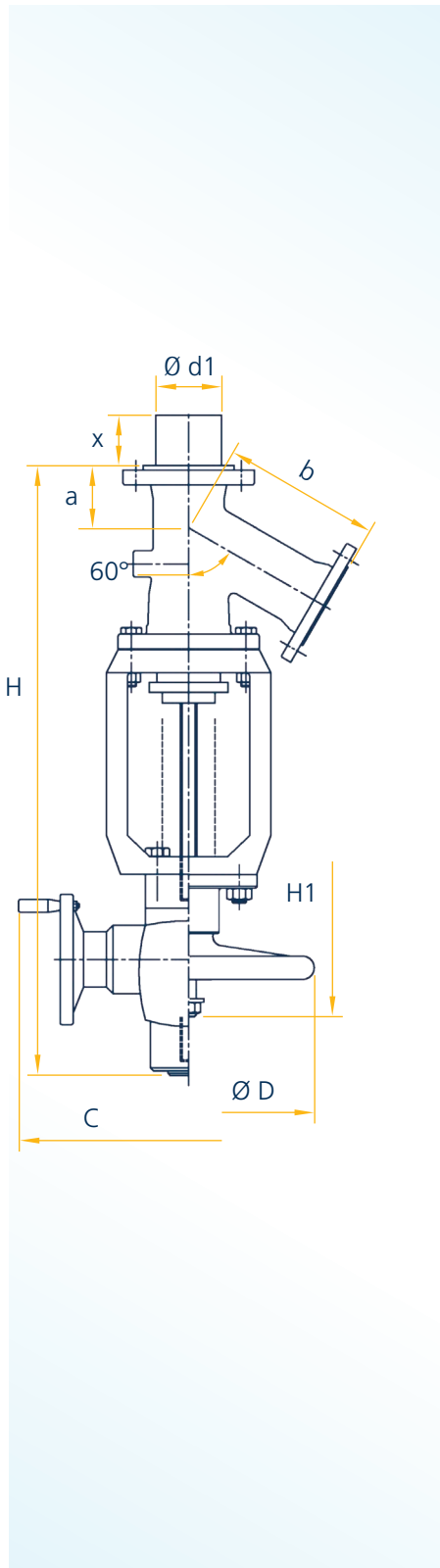
| Rating and Valve Size → ↓ | a | | b | | ≈H | ≈H1 | c | Ø D |
|------------------------------------|-------------|------|--------------|------|--------|---------|-----|-----|
| | ASME 300 | PN25 | ASME 3050 | PN25 | | | | |
| 1"/DN25 | 63 | 63 | 153 | 153 | 680+x | 510+2x | 500 | 225 |
| 1½"/ DN40 | 91 | 88 | 197 | 194 | 780+x | 665+2x | 500 | 225 |
| 2"/ DN50 | 92 | 90 | 212 | 210 | 910+x | 835+2x | 500 | 280 |
| 3"/DN80 | 103 | 99 | 248 | 244 | 1030+x | 1000+2x | 515 | 360 |
| 4"/DN100 | 107 | 99 | 277 | 269 | 1050+x | 1050+2x | 540 | 360 |
| 6"/DN150 | 137 | 128 | 337 | 328 | 1240+x | 1280+2x | 710 | 560 |

ASME 600 / PN40

| Rating and Valve Size → ↓ | a | | b | | ≈H | ≈H1 | c | Ø D |
|------------------------------------|-------------|------|-------------|------|--------|---------|-----|-----|
| | ASME 600 | PN40 | ASME 600 | PN40 | | | | |
| 1"/DN25 | 63 | 63 | 159 | 153 | 680+x | 510+2x | 500 | 225 |
| 1½"/ DN40 | 92 | 88 | 205 | 194 | 785+x | 670+2x | 500 | 225 |
| 2"/ DN50 | 95 | 90 | 222 | 210 | 910+x | 840+2x | 515 | 280 |
| 3"/DN80 | 107 | 99 | 258 | 244 | 1030+x | 1015+2x | 540 | 360 |
| 4"/DN100 | 113 | 99 | 290 | 269 | 1100+x | 1065+2x | 710 | 560 |
| 6"/DN150 | 148 | 128 | 354 | 328 | 1250+x | 1330+2x | 720 | 800 |

ASME 900 / PN63

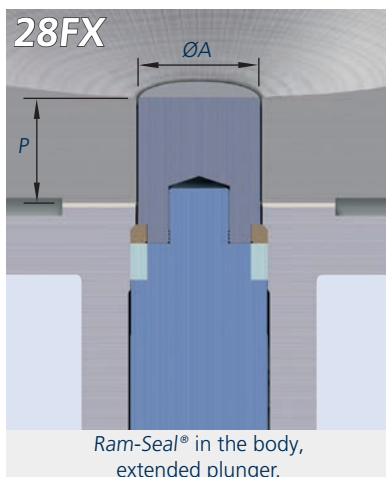
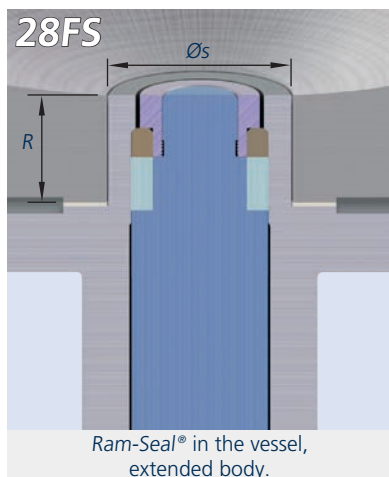
| Rating and Valve Size → ↓ | a | | b | | ≈H | ≈H1 | c | Ø D |
|------------------------------------|-------------|------|-------------|------|--------|---------|-----|-----|
| | ASME 900 | PN63 | ASME 900 | PN63 | | | | |
| 1"/DN25 | 73 | 69 | 170 | 159 | 700+x | 530+2x | 500 | 225 |
| 1½"/ DN40 | 102 | 96 | 214 | 202 | 805+x | 690+2x | 515 | 225 |
| 2"/ DN50 | 108 | 96 | 235 | 216 | 920+x | 865+2x | 515 | 280 |
| 3"/DN80 | 113 | 103 | 265 | 248 | 1090+x | 1030+2x | 710 | 360 |
| 4"/DN100 | 119 | 105 | 296 | 275 | 1120+x | 1080+2x | 710 | 560 |
| 6"/DN150 | 156 | 136 | 362 | 336 | 1270+x | - | 720 | - |



SchuF Fetterolf Ram/Piston Valves: Ram-Seal®

SchuF's sister company, Fetterolf Corporation, are inventors of **Ram-Seal®** and **Rod-Seal®** valves, both of which utilise patented principles to provide zero leakage and clog-free flow when open

Ram-Seal® valves feature a fully-integrated seat. Full valve sealing forces only compress the sealing ring when the ram/piston is in the fully closed position: Full vessel outlet bore flow is provided.



The **Ram-Seal®** drain valve is a free-flowing, full-opening valve design that offers bubble-tight Class VI sealing characteristics that ensure positive shut-off to process.

In laboratory tests Ram-Seal valves have exceeded all Class requirements and delivered positive shut-off over several hours of testing.

The design ensures: clog-free performance, flow in either direction, high Cv, no leaks, extended seal life, and diverse Low emissions.

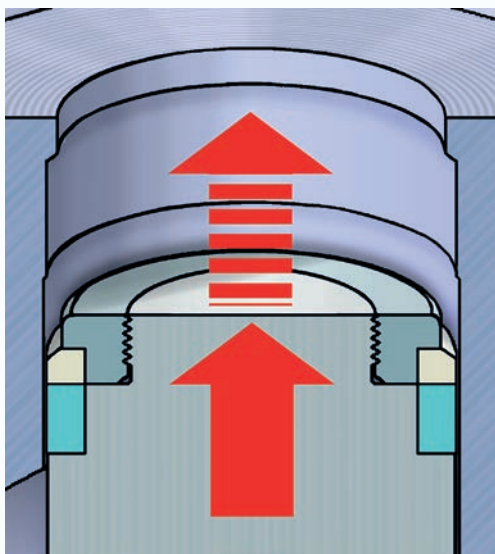
Replaceable **M-Seal®** sealing rings provide metal-to-metal sealing standards for extreme conditions

The Fetterolf Ram-Seal® advantage

Stroking

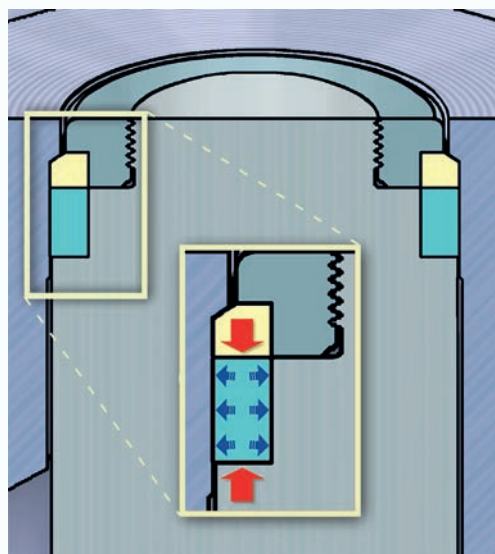
The ram/piston strokes upwards as the valve closes: the sealing ring (in blue, right) is not in contact with the body wall as it travels, ensuring minimised wear during stroking.

This ensures long seal life and reduced maintenance costs. The same minimised-wear performance applies as the valve strokes open.



Closure

When the ram/piston reaches the point of closure, the compression ring (in yellow, right) meets the body face. Actuator forces continue pushing the piston upwards, so the sealing ring is then squeezed outwards to provide the required high-quality seal against the internal body wall until the valve is opened once more.



SchuF Fetterolf Ram/Piston Valves: Ram-Seal®

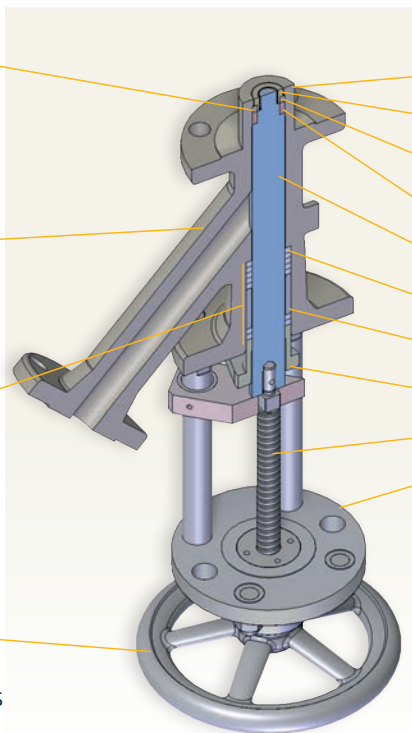
Type 28FS/FX Ram-Seal® Valve - Standard Materials of Construction

Compression Ring exerts force on Seal ring only in closed position

316 Stainless Steel Body, other materials as requested

Selection of Seal-to-atmosphere arrangements available

Manual actuator with non-rising handwheel. Full range of other actuation options available



| Item | Description | Material | Qty. |
|------|--------------------|--------------------------|------|
| 1 | Body | Type 316 Stainless Steel | 1 |
| 2 | Plunger Head Nut | Type 316 Stainless Steel | 1 |
| 3 | Compression Ring | Type 316 Stainless Steel | 1 |
| 4 | Seal Ring | TFE (Standard) | 1 |
| 5 | Ram/Plunger | Type 316 Stainless Steel | 1 |
| 6 | Packing Ring | TFE/Kevlar (Standard) | 6 |
| 7 | Spacer | Type 316 Stainless Steel | 1 |
| 8 | Stuffing-Box Gland | Type 304 Stainless Steel | 1 |
| 9 | Stem | Type 416 Stainless Steel | 1 |
| 10 | Actuator | Zinc-coated Carbon Steel | 1 |

Standard Ram-Seal® Valve Flange Sizes:

| Valve Size, Imperial↓ | ASME 150 | | ASME 300 | |
|-----------------------|------------------|---------------|------------------|---------------|
| | Top/Inlet Flange | Branch Flange | Top/Inlet Flange | Branch Flange |
| 1" | 1", 1½", 2", 2½" | 1" | 1" | 1" |
| 1½" | 1½", 2", 2½", 3" | 1½" | 1½" | 1½" |
| 2" | 2", 2½", 3" | 2" | 2" | 2" |
| 3" | 3", 4" | 3" | 3" | 3" |
| 4" | 4" | 4" | 4" | 4" |
| 6" | 6" | 6" | 6" | 6" |
| 8" | 8" | 8" | 8" | 8" |
| 10" | 10" | 10" | 10" | 10" |

| Valve Size, Metric↓ | PN16 | | PN40 | |
|---------------------|------------------------|---------------|------------------|---------------|
| | Top/Inlet Flange | Branch Flange | Top/Inlet Flange | Branch Flange |
| DN25 | DN25, DN40, DN50, DN65 | DN25 | DN25 | DN25 |
| DN40 | DN40, DN50, DN65, DN80 | DN40 | DN40 | DN40 |
| DN50 | DN50, DN65, DN80 | DN50 | DN50 | DN50 |
| DN80 | DN80, DN100 | DN80 | DN80 | DN80 |
| DN100 | DN100 | DN100 | DN100 | DN100 |
| DN150 | DN150 | DN150 | DN150 | DN150 |
| DN200 | DN200 | DN200 | DN200 | DN200 |
| DN250 | DN250 | DN250 | DN250 | DN250 |



Left: Ram-Seal® Valve with pneumatic linear actuator

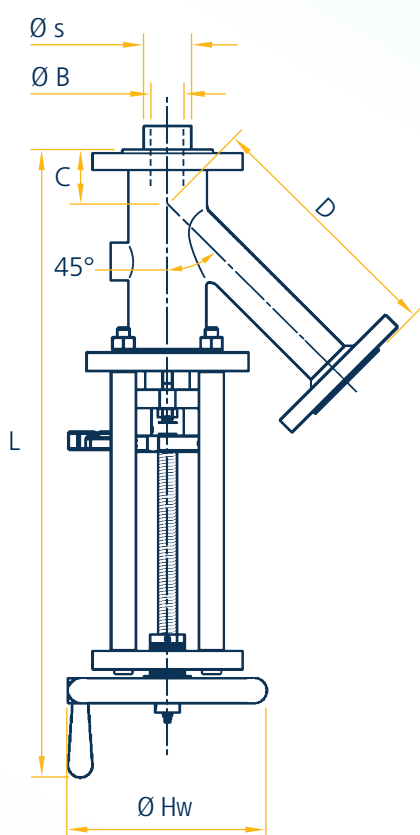


Right: Ram-Seal® Valve with an electric motor

SchuF Fetterolf Ram/Piston Valves: Ram-Seal®

All dimensions in mm

Type 28FS/FX Ram-Seal® Valve Valve Standard Dimensions (Type NA non-rising handwheel)



ASME 150 / PN16

| Rating and Valve Size ↓ | Ø B (Port) | C | D | L | ØHw | Ø s (min.) |
|-------------------------------|---------------|-----|-----|------|-----|---------------|
| 1"/DN25 | 24 | 57 | 209 | 518 | 160 | 33.4 |
| 1½"/DN40 | 30 | 65 | 262 | 597 | 225 | 40.7 |
| 2"/DN50 | 43 | 65 | 293 | 641 | 225 | 61.4 |
| 3"/DN80 | 65 | 79 | 334 | 743 | 225 | 89 |
| 4"/DN100 | 81 | 79 | 393 | 870 | 360 | 101.6 |
| 6"/DN150 | 130 | 87 | 471 | 1181 | 500 | 166.5 |
| 8"/DN200 | 181 | 104 | 528 | 1213 | 500 | 213 |
| 10"/DN250 | 235 | 177 | 723 | 1657 | 813 | 265 |

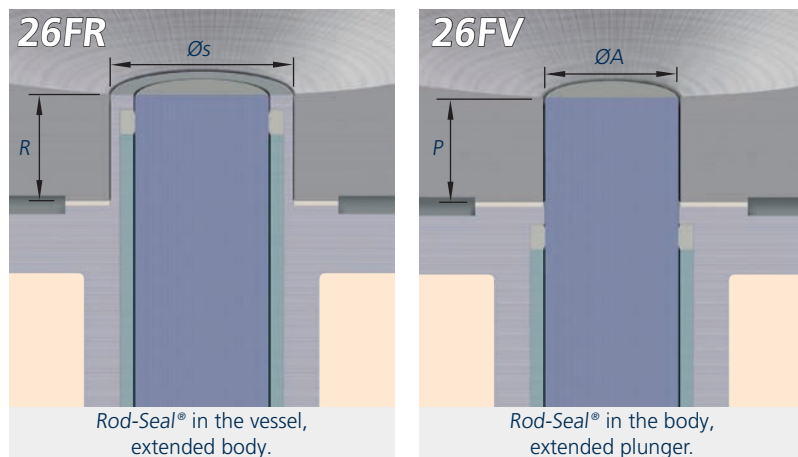
ASME 300 / PN25

| Rating and Valve Size ↓ | Ø B (Port) | C | D | L | ØHw | Ø s (min.) |
|-------------------------------|---------------|----|-----|-----|-----|---------------|
| 1"/DN25 | 24 | 57 | 209 | 521 | 160 | 35.7 |
| 1½"/DN40 | 30 | 65 | 262 | 600 | 225 | 44.1 |
| 2"/DN50 | 43 | 65 | 293 | 648 | 225 | 66.7 |
| 3"/DN80 | 65 | 79 | 334 | 749 | 225 | 94 |
| 4"/DN100 | 81 | 79 | 393 | 876 | 360 | 117 |

SchuF Fetterolf Ram/Piston Valves: Rod-Seal®

Rod-Seal® valves with their seatless design with automatic rodding on every stroke remove any areas where media can stick or accumulate

Rod-Seal® valves also feature a fully-integrated seat. 'Super Closure' provides extra-tight shut-off to both process and atmosphere at full closure. Full vessel outlet bore flow also provided.



The **Rod-Seal®** valve is designed and built to eliminate typical problems of conventional valves.

The seatless sealing principle plus "Super Closure" thrust-loading provides the basis for the Rod-Seal difference.

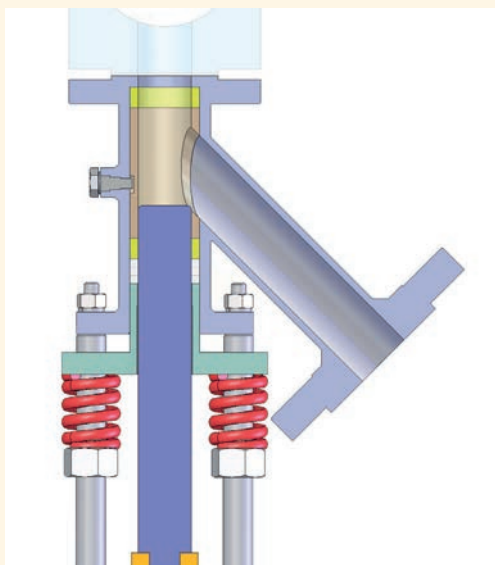
The valve has been proven in sampling, purging, or draining highly viscous media, polymers, abrasive slurries, and powders.

Rod-Seal® valves offer free-flow with no obstruction from stem within product stream, as well as a low pressure-drop, high-Cv 45° discharge pattern (60 or 90° branch angles are alternative options)

The Fetterolf Rod-Seal®, featuring 'Super-Closure'

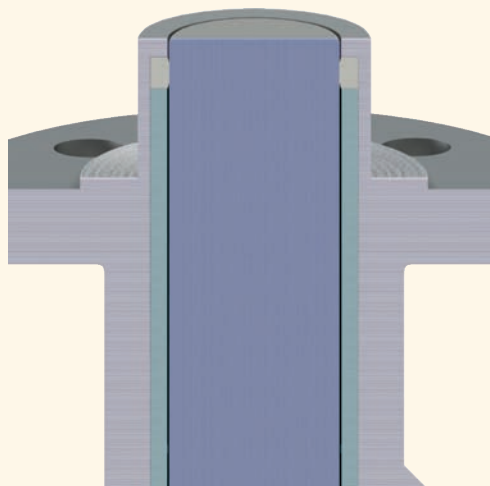
Stroking

The sealing rings (in yellow, below) are not highly compressed while the ram/piston is stroking, ensuring reduced wear. The springs (red) maintain a minimum sealing force on the stuffing box (green) and packing rings (white). Note the location of the plunger drive bushing (orange), at the bottom of the image, while the valve is stroked open.



Closure

When the ram/piston reaches the point of closure, the plunger drive bushing (in orange, below) meets the stuffing box gland face, and provides **Super Closure**, a broad-band seal between the sealing rings (yellow) and surrounding body faces. There is also enhanced seal-to-atmosphere capability through the packing rings at this point.



SchuF Fetterolf Ram/Piston Valves: Rod-Seal®

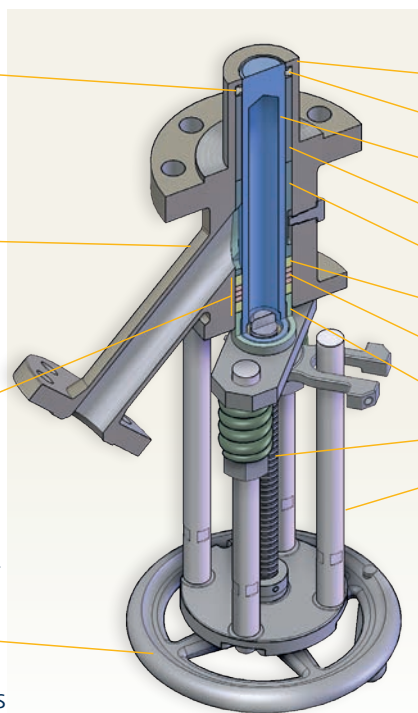
Type 26FR/FV Rod-Seal® Valve - Standard Materials of Construction

Maximum Sealing Force on Seal ring applied only in closed position

316 Stainless Steel Body, other materials as requested

Selection of Seal-to-atmosphere arrangements available

Manual actuator with non-rising handwheel. Full range of other actuation options available



| Item | Description | Material | Qty. |
|------|----------------------|--------------------------|------|
| 1 | Body | Type 316 Stainless Steel | 1 |
| 2 | Sealing Ring | TFM/Glass | 1 |
| 3 | Ram/Plunger | Type 316 Stainless Steel | 1 |
| 4 | Guide Ring Extension | Type 316 Stainless Steel | 1 |
| 5 | Guide Ring | Type 316 Stainless Steel | 1 |
| 6 | Seal Ring | TFM | 2 |
| 7 | Packing Ring | TFE/Kevlar (Standard) | 3 |
| 8 | Stuffing-Box Gland | Type 304 Stainless Steel | 1 |
| 9 | Stem | Type 416 Stainless Steel | 1 |
| 10 | Actuator | Zinc-coated Carbon Steel | 1 |

Standard Rod-Seal® Valve Flange Sizes:

| Valve Size, Imperial↓ | ASME 150 | | ASME 300 | |
|-----------------------|------------------|---------------|------------------|---------------|
| | Top/Inlet Flange | Branch Flange | Top/Inlet Flange | Branch Flange |
| 1" | 1", 1½", 2", 2½" | 1" | 1" | 1" |
| 1½" | 1½", 2", 2½", 3" | 1½" | 1½" | 1½" |
| 2" | 2", 2½", 3" | 2" | 2" | 2" |
| 3" | 3", 4" | 3" | 3" | 3" |
| 4" | 4" | 4" | 4" | 4" |
| 6" | 6" | 6" | 6" | 6" |
| 8" | 8" | 8" | 8" | 8" |
| 10" | 10" | 10" | 10" | 10" |

| Valve Size, Metric↓ | PN16 | | PN40 | |
|---------------------|------------------------|---------------|------------------|---------------|
| | Top/Inlet Flange | Branch Flange | Top/Inlet Flange | Branch Flange |
| DN25 | DN25, DN40, DN50, DN65 | DN25 | DN25 | DN25 |
| DN40 | DN40, DN50, DN65, DN80 | DN40 | DN40 | DN40 |
| DN50 | DN50, DN65, DN80 | DN50 | DN50 | DN50 |
| DN80 | DN80, DN100 | DN80 | DN80 | DN80 |
| DN100 | DN100 | DN100 | DN100 | DN100 |
| DN150 | DN150 | DN150 | DN150 | DN150 |
| DN200 | DN200 | DN200 | DN200 | DN200 |
| DN250 | DN250 | DN250 | DN250 | DN250 |

Left: Rod-Seal® Valve with electric actuator

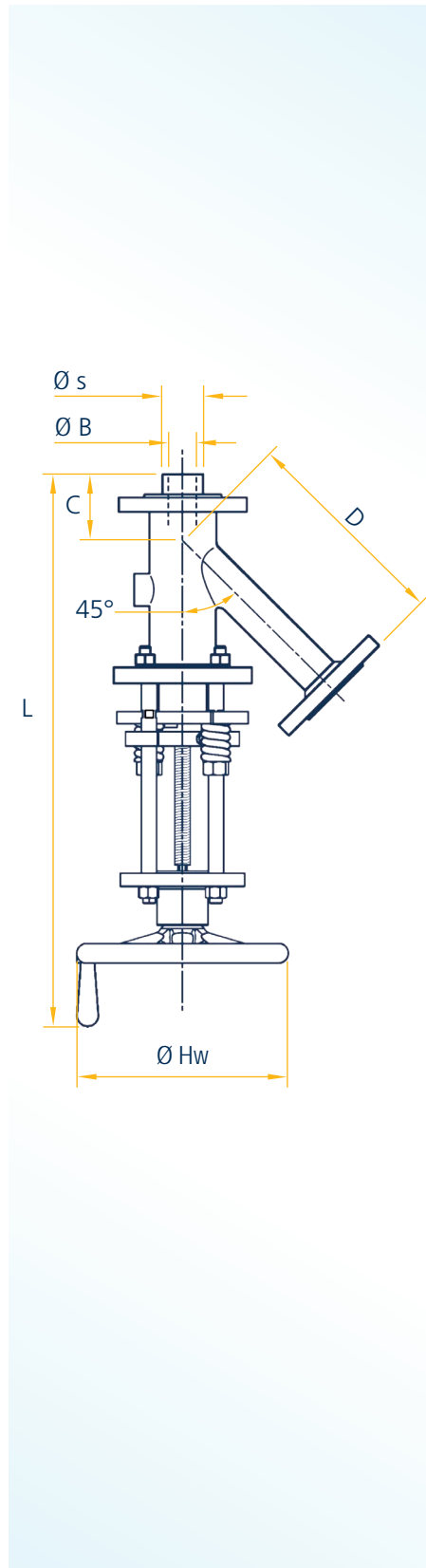


Right: Rod-Seal® Valve with linear pneumatic actuator



SchuF Fetterolf Ram/Piston Valves: Rod-Seal®

Type 26FR/FV Rod-Seal® Valve Standard Dimensions (Type NA non-rising handwheel)



ASME 150 / PN16

| Rating and Variable Valve Size → ↓ | Ø B (Port) | C | D | L | ØHw | Ø s (min.) |
|------------------------------------|------------|-----|-----|------|-----|------------|
| 1"/DN25 | 27 | 57 | 209 | 594 | 160 | 47 |
| 1½"/DN40 | 42 | 65 | 262 | 639 | 225 | 64 |
| 2"/DN50 | 52 | 65 | 293 | 728 | 225 | 78 |
| 3"/DN80 | 82 | 79 | 390 | 949 | 225 | 109 |
| 4"/DN100 | 102 | 98 | 479 | 1005 | 360 | 134 |
| 6"/DN150 | 152 | 117 | 537 | 1277 | 210 | 185 |
| 8"/DN200 | 202 | 124 | 542 | 1392 | 210 | 237 |
| 10"/DN250 | 252 | 118 | 601 | 1769 | 400 | 289 |
| 12"/DN300 | 302 | 165 | 798 | 2014 | 400 | 340 |

ASME 300 / PN25

| Rating and Variable Valve Size → ↓ | Ø B (Port) | C | D | L | ØHw | Ø s (min.) |
|------------------------------------|------------|-----|-----|------|-----|------------|
| 1"/DN25 | 27 | 57 | 209 | 594 | 160 | 48 |
| 1½"/DN40 | 42 | 65 | 262 | 634 | 225 | 65 |
| 2"/DN50 | 52 | 65 | 293 | 733 | 225 | 80 |
| 3"/DN80 | 82 | 79 | 334 | 934 | 225 | 112 |
| 4"/DN100 | 102 | 98 | 393 | 1005 | 360 | 137 |
| 6"/DN150 | 152 | 117 | 471 | 1295 | 210 | 190 |
| 8"/DN200 | 202 | 124 | 528 | 1587 | 400 | 245 |
| 10"/DN250 | 252 | 118 | 723 | 1759 | 400 | 300 |
| 12"/DN300 | 302 | 165 | 723 | 2014 | 400 | 355 |

Injection Valves

Steam injection valves are primarily used in the chemical, pharmaceutical and petrochemical industries. They are used to inject steam or any gas into a reactor or vessel..

There are two common applications:

1. Direct and quick pre-heating of media and/or vessels.
2. Steam stripping and sanitisation to remove monomers or impurities in polymerisation processes. The choice of a ram/piston or disc injection valve design is process- and media-driven:
 - A solid ram/piston design is suitable for full bore, high flow-rate applications with vibrations.
 - Disc-style injection valves are more suitable where space is limited, the required flow rate is low or where low or zero emissions to atmosphere are important.

Key Features

- Piston- or Disc-Valve design
- Metal-to-metal sealing
- Replaceable seat and injection head
- Customised arrangement of holes for any required gas or vapour injection
- Non-clogging

Direct Steam Injection

Most batch polymer processes begin as endothermic reactions and require heat to get started. This can be accomplished by heating the vessel either through a jacket or by inner coils. An alternative method gaining more and more acceptance is that of direct steam injection.

Here, steam is injected at the bottom of the reactor using SchuF's patented steam injection valve, the Type 27SE.

A piston-rising valve, it features a variable number of holes arranged in a stepped linear manner along the piston. A positioner allows control of the flow of steam into the reactor. The different distribution angles of the injection holes ensure an even steam distribution throughout reactor, ensuring maximum thermal efficiency with minimal dilution effect. This valve can also be used for the stripping or desoderizing of the batch at the end of reaction. Here, steam is injected and allowed to bubble up through the batch removing or stripping away the free monomers, as well as residues and impurities.

SchuF Ram/Piston Injection Valve with pneumatic linear actuator and hollow piston, which can feature up to 2000 holes for high flow rates



Operation

The valve is typically installed at the bottom of a vessel. Steam is injected into the inlet, flows through the hollow injection stem and exits through up to 2000 dispersion holes. Constant steam pressure ensures that there is no back-flow and keeps the dispersion holes free of sediment build-up. The valve operates according to a linear step control curve characteristic. This allows a pre-determined number of hole rings to be exposed as required by the process.

Right: Type 27SE Ram/Piston-Type Steam Injection Valve with air-motor actuator



Below: Type 27SE Disc-Type Steam Injection Valve. Note the angled steam dispersal holes visible in the open disc.



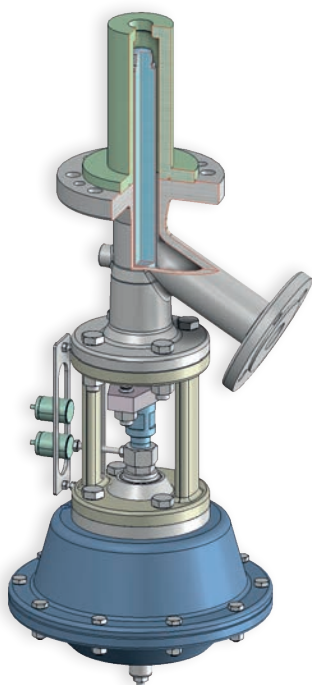
Benefits

- Time-saving vessel pre-heating
- Evenly distributed steam pattern
- Step-linear flow rate control
- Optimised steam usage
- Avoids steam-hammer effects

Short-Stroke Ram/Piston Valves

Short-stroke Stopper/Killer Ram/Piston Valves

These short-stroke ram/piston valves, known as stopper/killer valves, operate in PVC plants and can stop an out-of-control (exothermic) process by injecting killing solution directly into the system.



SchuF Short-stroke Stopper/Killer Ram/Piston Valve with spring-returned pneumatic actuator, here (left) shown in the open position



Operation

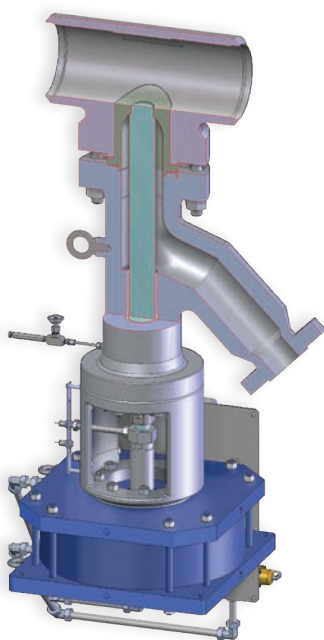
For immediate abortion of exothermic reactions, a short-stroke ram valve, backed by a 30 bar N₂ tank system, is used to inject a chemical 'stopper'. The valve injects the stopper deep into the vessel contents as it is important that the stopper does not only percolate up the sides of the vessel- which can happen if the incorrect valve is used. Available in 'Airfail to close with bypass' or 'Airfail to open' options, these valves may remain inactive for long periods of time so reliability and dependability are crucial.

Key Features

- Short, fast stroke
- Optional Soft or Metal-to-metal sealing
- Replaceable seat and ram/piston
- Optional actuator air-fail position

Short-stroke Water Flush valves

These short-stroke ram/piston valves are used to intermittently inject water into a process line to prevent product build-up in the line.



SchuF PTA Water Flush Valve with pneumatic linear actuator and T-Piece pipeline connection, shown in the closed position.



Operation

In slurry applications such as PTA, product can crystallise or build up as it moves along the slurry transfer lines. Such build-up needs to be removed to prevent it causing a restriction in the flow or even a clogging of the line. Short-stroke Water Flush valves are designed to give a quick, controlled injection of flush water into the slurry transfer line to remove any build up in the line or in the downstream valves and fittings.

Key Features

- Contoured ram and seat
- Controlled flow
- Suitable for HP flushing
- Compact design

Spray Rinse Valves

The Fetterolf Spray rinse valve Type 27SR was developed to wash residue from large tank or reactor walls without having to open or enter a vessel.

The Fetterolf Spray rinse valve Type 27SR was developed to wash residue from large tank or reactor walls without having to open or enter a vessel. This feature has two key benefits:

- Enhanced safety of personnel for applications with toxic fluids
- Reduction of required cleaning time in batch processes.

Spray rinse valves are frequently found in the Plastics & Polymer (especially PVC), Fine Chemicals and Pharmaceutical industries. It ensures a **unique two-stage** efficient spray pattern, while maintaining a simple, rugged design, utilizing the famous SchuF metal-to-metal shut-off, first developed in the 1920's.

Application

Spray rinse valves can be used to clean vessels after each batch operation. Water, steam, solvents and anti-sticking agents can be injected and are sprayed in a distinct and efficient pattern into the vessel. This leads to longer uninterrupted reactor production cycles and the most cost efficient use of cleaning agents. They are also used in vessel rinsing applications with toxic media in order to ensure personnel safety

Operation

In operation, the spray tube assembly is moved out of the valve body to initiate the spray and retracts back into the valve body after the washing cycle. In the closed position the valve disc is flush with the end of the valve body and the spray head is tightly sealed off from the process – and remains clog-free.

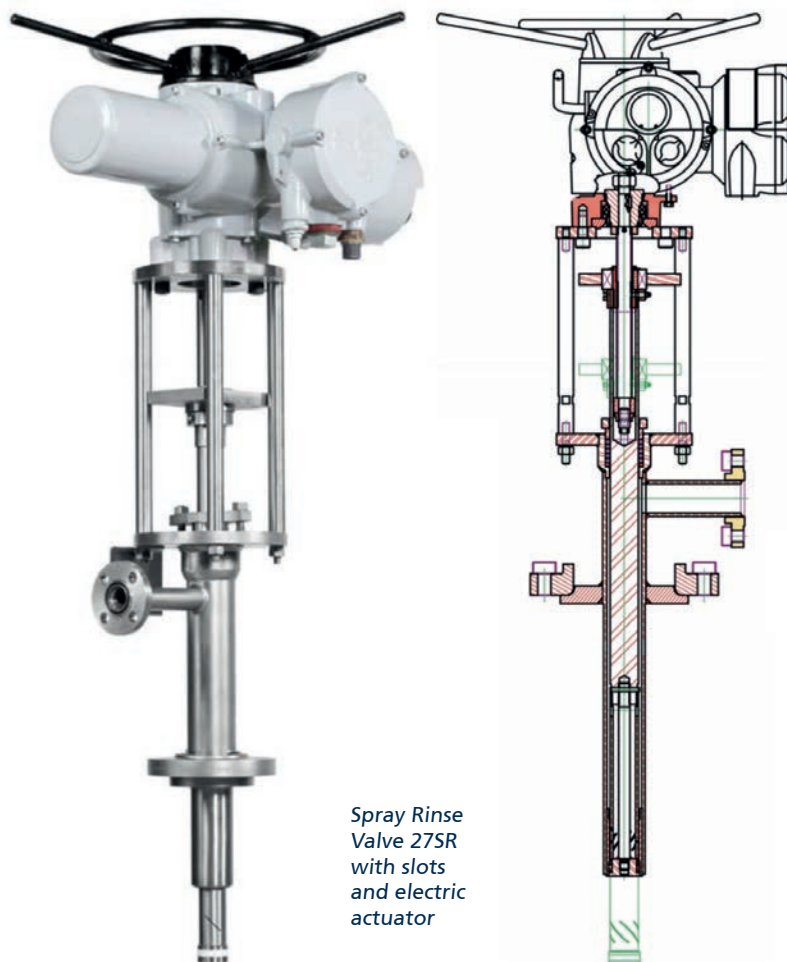
As the valve opens, water is initially concentrated at the vessel bottom, gushing between the spray head and the seat.

Only after the residue at the bottom of the reactor has been dislodged are the spray slots allowed to emerge.

These ensure a 360° spray pattern as it fans out to spray sideways and, increasingly, backwards.

To ensure full pressure and concentrated flow the straight down direction is now closed off. At the end of the stroke the distribution of spray apertures ensures a 360° spray pattern, directed principally at the top of the vessel as required by, for example, the PVC industry.

As the valve closes a continuing flow of water prevents clogging until the positive metal-to-metal shut-off guarantees leak-free, bubble-tight shutoff.

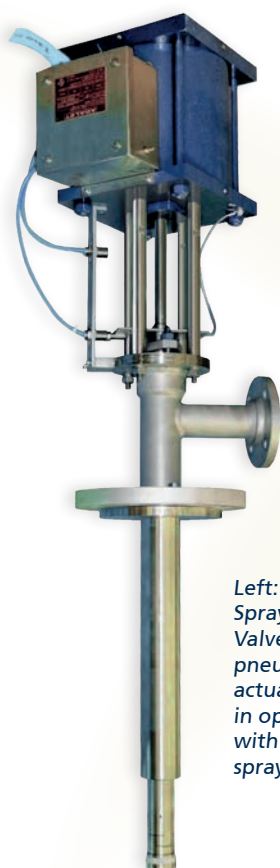


Spray Rinse Valves

The Fetterolf Spray rinse valve *Type 27SR* was developed to wash residue from large tank or reactor walls without having to open or enter a vessel.

Key Features

- Standard sizes 3/4" up to 2" (DN 50) and ASME 900#
- Positive metal-to-metal shut-off
- Customised spray pattern, pressure & volume
- Zero leakage to atmosphere and process– dual Ram-Seal design
- Exchangeable seat and spray head
- No clogging guaranteed due to pre-designed "leakage" path
- Rotating or linear spray head
- Electric or pneumatic actuation
- Optional position switches
- Easily retrofitted to existing reactors

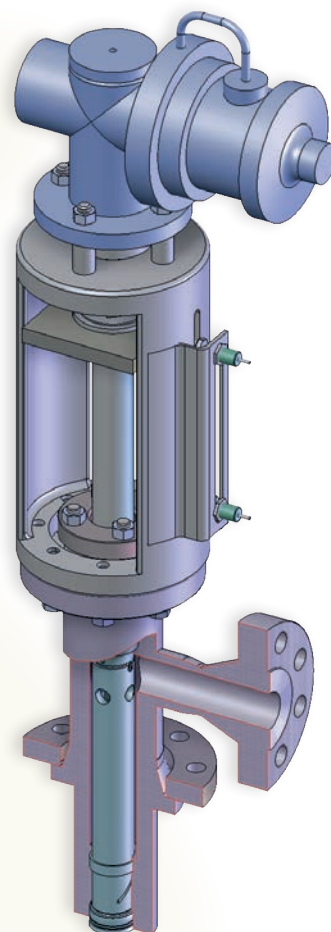


Left: Type 27SR Spray Rinse Valve with pneumatic actuator, shown in open position with extended spray head

Below: Close-up view of a spray head with custom spray slot design



Right: Type 27SR Spray Rinse Valve with air-motor actuator, here shown in closed position.



Benefits

- Increased batch process productivity and Reduced maintenance
- Protection against toxic emissions
- Optimised water & solvent consumption
- Directing the use of water, steam, solvents and anti-sticking agents

SchuF Sampling Valve Range

SchuF offers a large range of sampling valve solutions. Standard Model 32 sampling valves are available from stock for fast deliveries and custom-built solutions are also available. SchuF Sampling Valves are designed to simplify the extraction of samples from or the injection into tanks, reactors or pipelines and allow for long, trouble-free service. They are non-clogging and dead-space free.

The SchuF Model 32 Series is available in standard sizes from stock for fast delivery:

Model 32FR "ROD SEAL®":

The "ROD SEAL®" design embodies the self-cleaning, seatless valve principle. Only SchuF Fetterolf offers the feature of "Super-Closure", utilizing spring-loaded components. Ideal for extended plungers for crust-breaking- see page 31.

Model 32PG (Metal Seal):

This robust, metal seated sampling valve is ideal for high temperature applications and can be manufactured in certified, FIRE-SAFE versions. Immediate flow is achieved as soon as the crank handle is turned. The 32PG is also ideal for injecting media into piping or vessels, since there are no soft sealing rings exposed to the flow. - see page 28.

Model 32FG "RAM SEAL®":

The patented "RAM SEAL®" design features replaceable seal rings for ease of maintenance. The combination of a metal compression ring and a soft PTFE seal ring allows the delivery of incredibly low leakage rates in a variety of services (gas and liquid) over long periods of time- see page 32.

Model 32PT

The 32PT is a metal-seated, disc-type sampling valve, The disc opens into the process medium- see page 29.



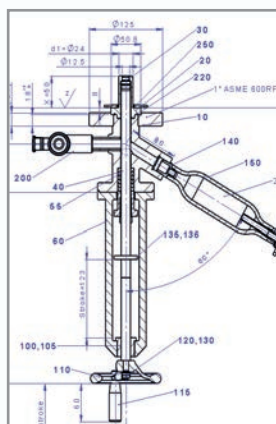
Key Features

- All Model 32 valves are rated to ASME 600.
- Crank handle manual operators are easy to use.
- The outlet branch is at 60 degrees.
- All valves have Leakage Class VI shut-off (100% tested).
- Cast yokes and bodies are of a robust design.

Materials of Construction:

All wetted parts and bodies can be manufactured in a variety of materials, including:

- 316 stainless steel (standard)
- Titanium
- Nickel Alloys
- Alloy 20
- Monel
- Others available as per customer specifications.



Actuation:

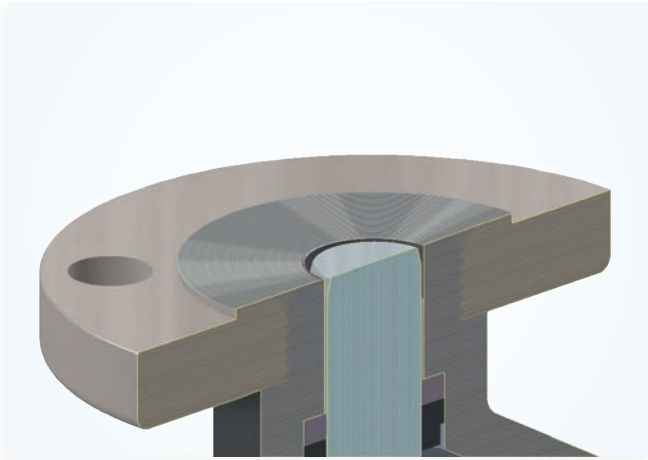
- Manual (Crank Handle, Handwheel or Bevel Gears)
- Deadman's Handle
- Pneumatic
- Others available

Options:

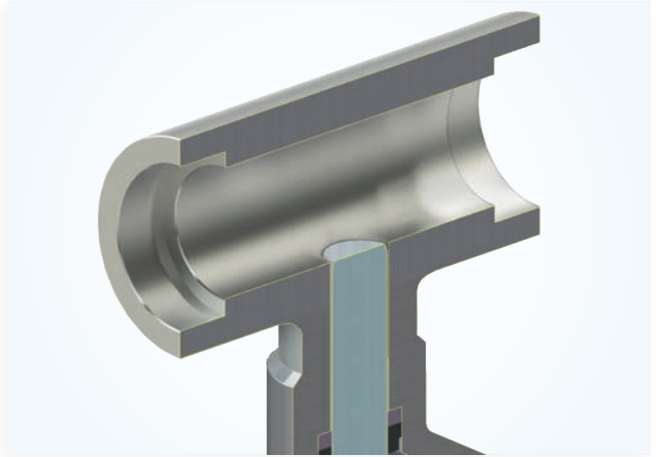
- See page 9 for further info on Sample Bottles, Integral Heating Jackets, Flushing Ports, Extended Rams/Pistons and Bodies, and Alternative Inlet Connections such as T-Pieces, Half-Couplings, etc.

Type 32 Connection Options

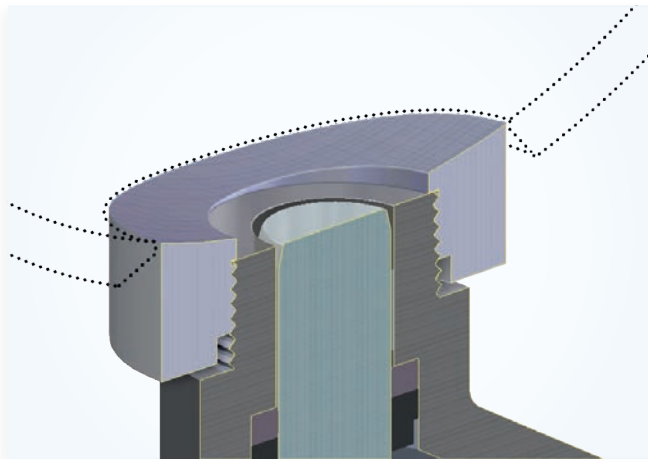
Extended Rams/Pistons and Extended Bodies plus alternative valve connections



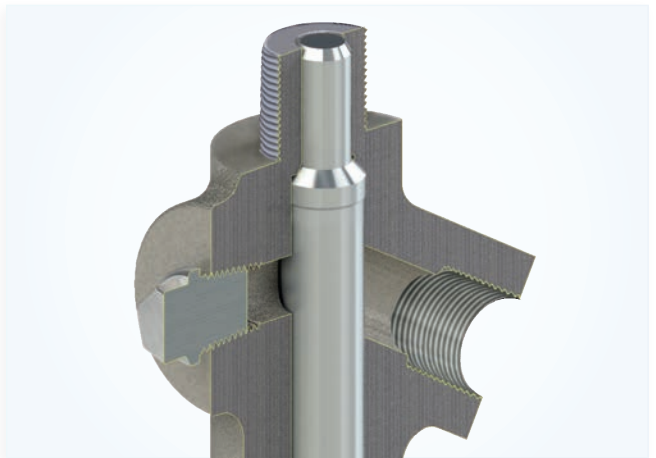
Flanged Connection



T-Piece



Contoured Half-Coupling



Additional Purge Connection

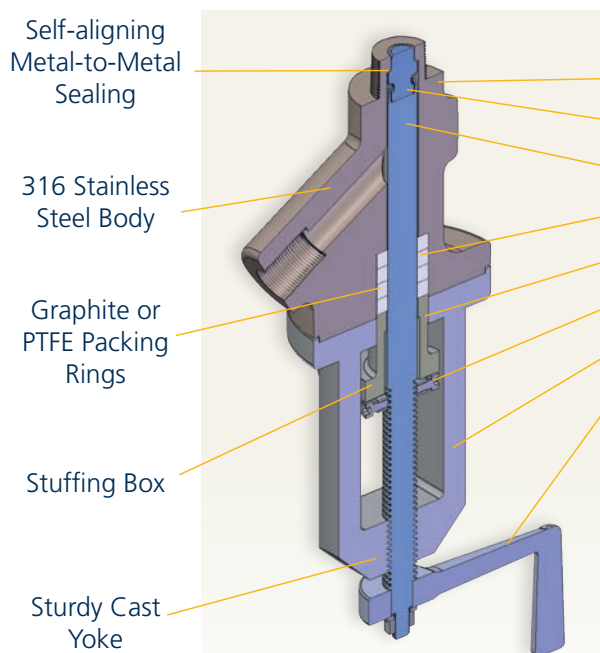


Left: Type 32PG

Model 32PG Standard Dimensions

Model 32PG Valve with Metal-Seated Ram/Piston

Super-low Class VI shut-off leakage rate, low-maintenance, full flow



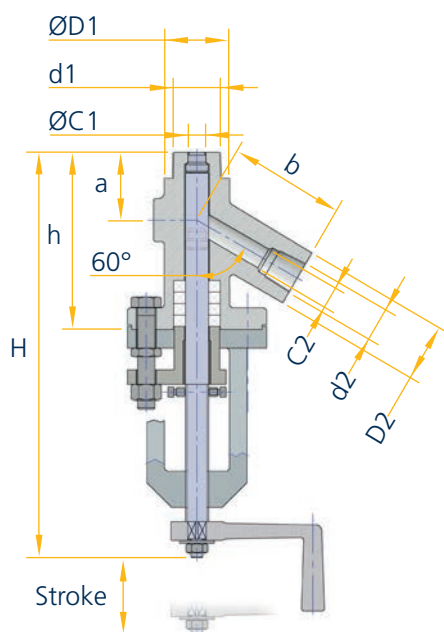
| Item | Description | Material | Qty. |
|------|--------------------|----------------------|------|
| 1 | Body | ASTM GR.CF-8M/1.4408 | 1 |
| 2 | Ram/Piston | SS316/1.4401 | 1 |
| 3 | Spindle | SS416/1.44005 | 1 |
| 4 | Packing Ring | PTFE/Graphite | 4 |
| 5 | Stuffing-Box Gland | ASTM GR.CF-8M/1.4408 | 1 |
| 6 | Indicator | SS303/1.4305 | 1 |
| 7 | Yoke | SS303/1.4305 | 1 |
| 8 | Crank Handle | ASTM GR.CF-8/1.4308 | 1 |

- Max. Temperature: PTFE Packing Rings 260°C, Graphite Packing Rings 550°C.
- Pressure rating: Valves rated to ASME 600.



Certification according to API 607:2010 & ISO 10497: 2010

Model 32PG Standard Dimensions

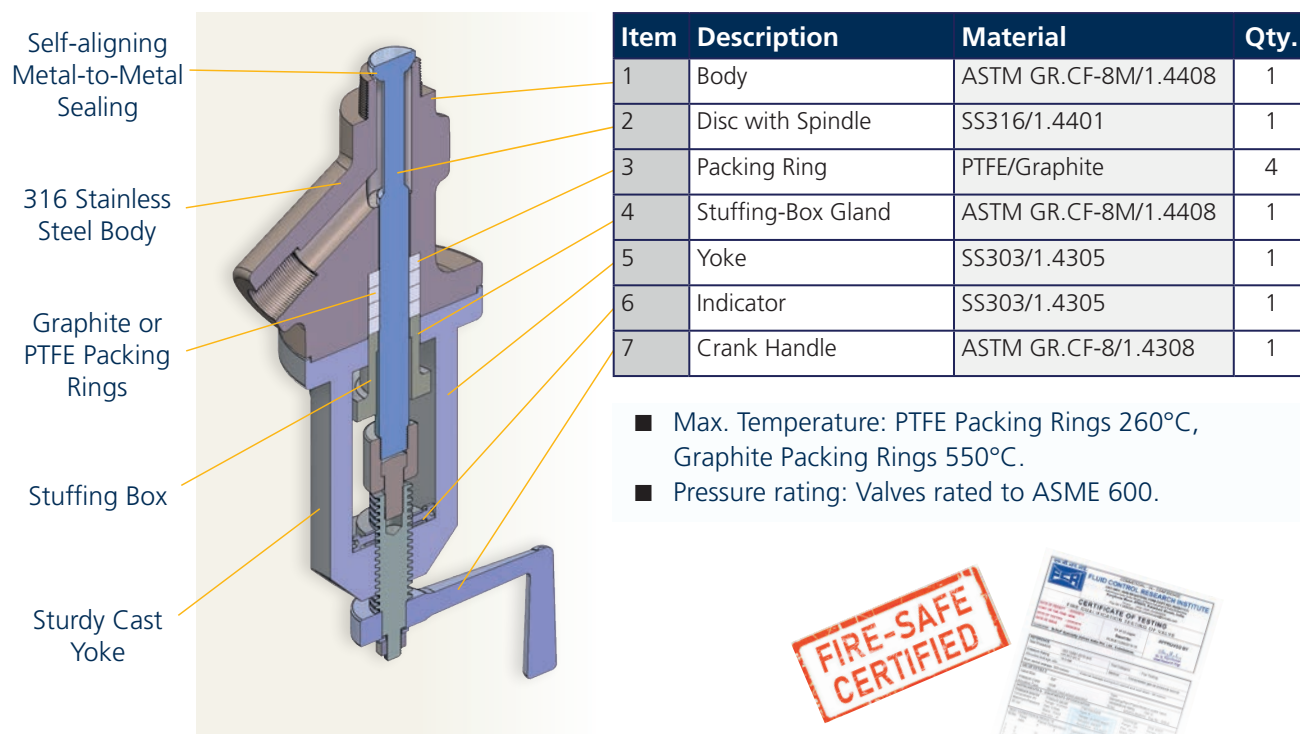


| Size → | ½" | ¾" | ¾" | 1" | 1" | 1½" |
|------------|------|------|------|------|------|-----|
| ↓ Variable | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØD1 | 45 | 45 | 45 | 45 | 45 | 60 |
| ØD2 | 40 | 40 | 40 | 40 | 40 | 45 |
| d1 [NPT] | ½" | ¾" | ¾" | 1" | 1" | 1½" |
| d2 [NPT] | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØC1 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 25 |
| ØC2 | 15 | 15 | 15 | 15 | 15 | 25 |
| a | 47 | 47 | 47 | 47 | 47 | 47 |
| b | 80 | 80 | 80 | 80 | 80 | 90 |
| h | 123 | 123 | 123 | 123 | 123 | 140 |
| H | 295 | 295 | 295 | 295 | 295 | 310 |
| Stroke | 55 | 55 | 55 | 55 | 55 | 55 |

Model 32PT Standard Dimensions

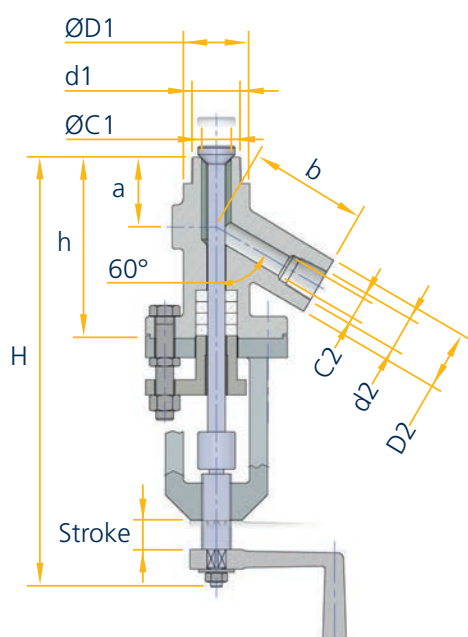
Model 32PT Metal-Seated Disc

The 32PT is a metal-seated, disc-type sampling valve. When the valve is opened, the disc rises into the vessel or pipe. By doing so, it breaks any crust that can impede the flow of a sample. The 32PT opens to full flow very quickly thanks to its short stroke.



Certification according to API 607:2010 & ISO 10497: 2010

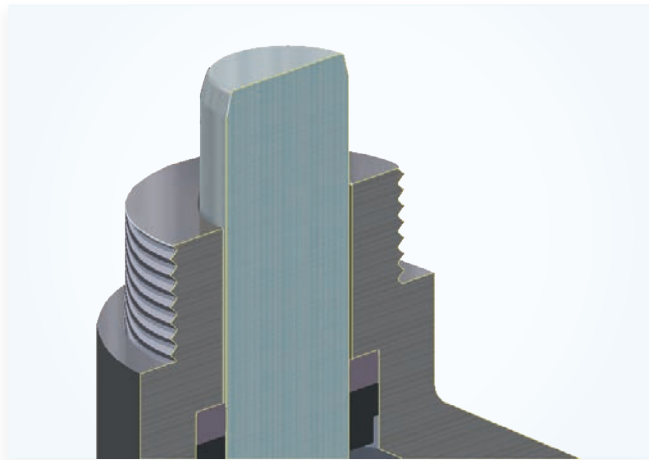
Model 32PT Standard Dimensions



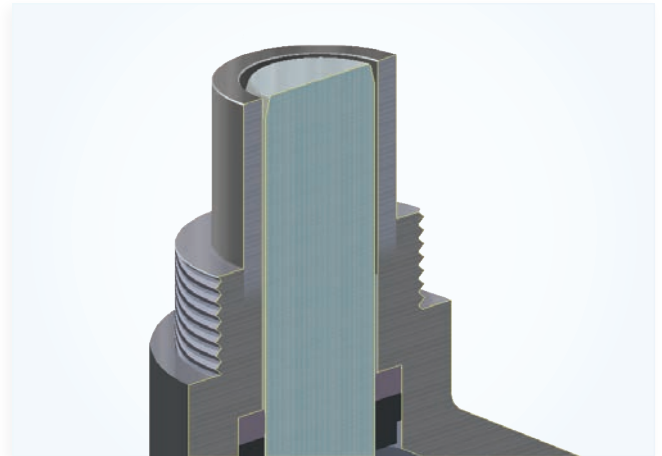
| Size → | ½" | ¾" | ¾" | 1" | 1" | 1½" |
|------------|------|------|------|------|------|------|
| ↓ Variable | x ½" | x ½" | x ¾" | x ½" | x ¾" | x 1" |
| ØD1 | 45 | 45 | 45 | 45 | 45 | 60 |
| ØD2 | 40 | 40 | 40 | 40 | 40 | 45 |
| d1 [NPT] | ½" | ¾" | ¾" | 1" | 1" | 1½" |
| d2 [NPT] | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØC1 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 25 |
| ØC2 | 15 | 15 | 15 | 15 | 15 | 25 |
| a | 47 | 47 | 47 | 47 | 47 | 47 |
| b | 80 | 80 | 80 | 80 | 80 | 90 |
| h | 123 | 123 | 123 | 123 | 123 | 140 |
| H | 295 | 295 | 295 | 295 | 295 | 310 |
| Stroke | 55 | 55 | 55 | 55 | 55 | 55 |

Type 32 Ram/Piston and Seat Options

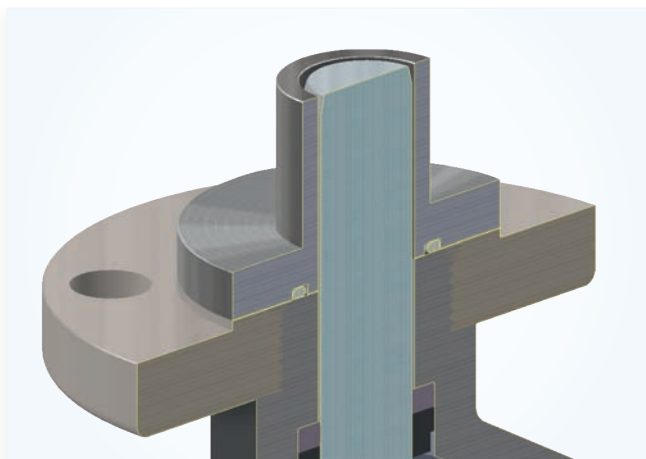
Extended Ram/Piston and Extended Bodies plus alternative valve connections



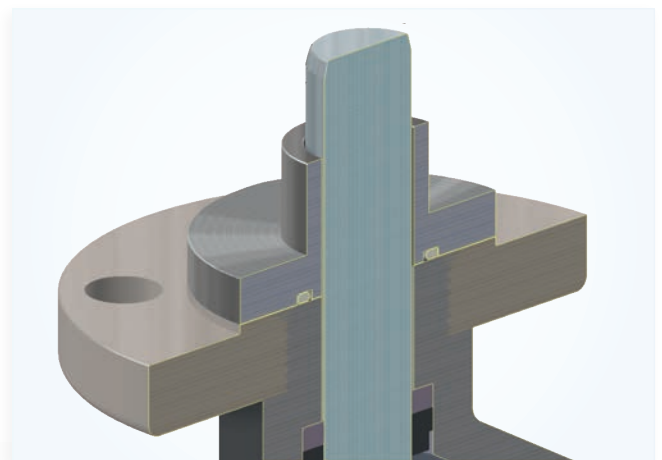
Ram/Piston Extension



Fixed Seat



Extended Body/Seat



Extended Body/Seat with extra Ram/Piston Extension

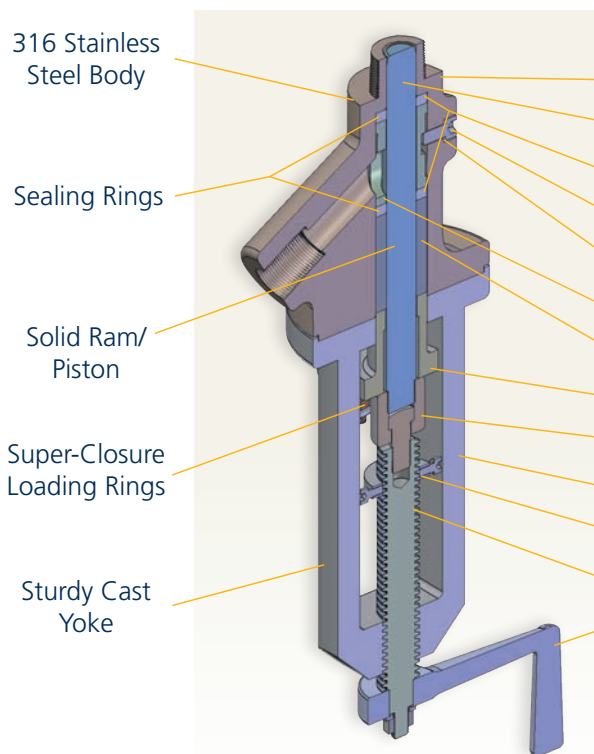


Left: Type 32FR

Model 32FR Standard Dimensions

Model 32FR 'Rod Seal'®

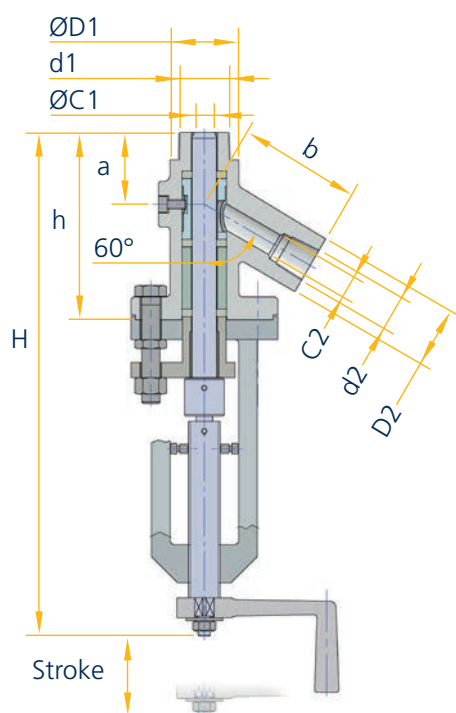
Self-cleaning and seatless, the model 32FR features 'Super Closure' using spring-loaded components, which allows high-level sealing while maximising maintenance intervals



| Item | Description | Material | Qty. |
|------|-----------------------|----------------------|------|
| 1 | Body | ASTM GR.CF-8M/1.4408 | 1 |
| 2 | Ram/Piston | SS316/1.4401 | 1 |
| 3 | Sealing Ring | PTFE/GLASS 25% | 2 |
| 4 | Socket-Head Cap Screw | A2-70 | 1 |
| 5 | Gasket | Fluoroloy K | 1 |
| 6 | Pressure Sleeve | SS316/1.4401 | 1 |
| 7 | Guide Bush | SS316/1.4401 | 1 |
| 8 | Stuffing-Box Gland | ASTM GR.CF-8M/1.4408 | 1 |
| 9 | Connecting Nut | SS416/1.44005 | 1 |
| 10 | Yoke | SS303/1.4305 | 1 |
| 11 | Indicator | SS303/1.4305 | 1 |
| 12 | Spindle | SS416/1.44005 | 1 |
| 13 | Crank Handle | ASTM GR.CF-8/1.4308 | 1 |

- Max. Temperature: PTFE Sealing Rings 200°C, Blue Guard Sealing Rings 370°C.
- Pressure rating: Valves rated to ASME 600.

Model 32FR Standard Dimensions

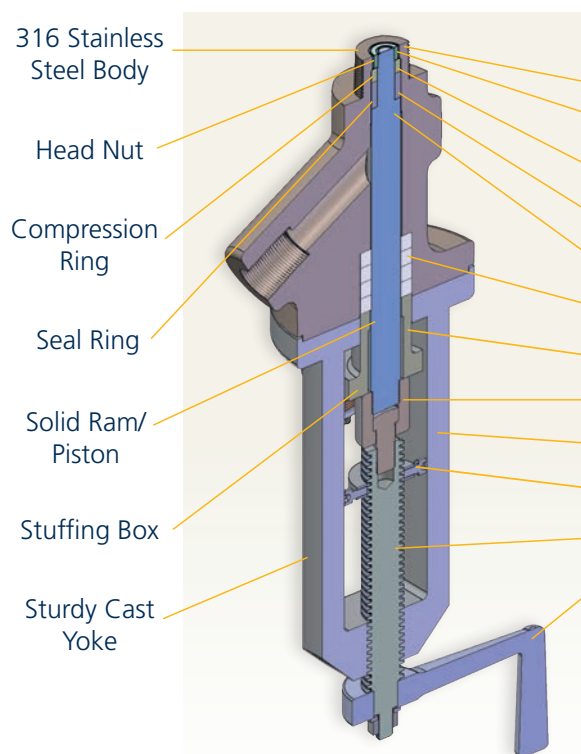


| Size → | ½" x ½" | ¾" x ½" | ¾" x ¾" | 1" x ½" | 1" x ¾" | 1½" x 1" |
|------------|---------|---------|---------|---------|---------|----------|
| ↓ Variable | | | | | | |
| ØD1 | 45 | 45 | 45 | 45 | 45 | 60 |
| ØD2 | 40 | 40 | 40 | 40 | 40 | 45 |
| d1 [NPT] | ½" | ¾" | ¾" | 1" | 1" | 1½" |
| d2 [NPT] | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØC1 | 13 | 16 | 16 | 16 | 16 | 25 |
| ØC2 | 15 | 15 | 15 | 15 | 15 | 25 |
| a | 47 | 47 | 47 | 47 | 47 | 47 |
| b | 80 | 80 | 80 | 80 | 80 | 90 |
| h | 123 | 123 | 123 | 123 | 123 | 140 |
| H | 345 | 345 | 345 | 345 | 345 | 360 |
| Stroke | 60 | 60 | 60 | 60 | 60 | 65 |

Model 32FG Standard Dimensions

Model 32FG 'Ram Seal'®

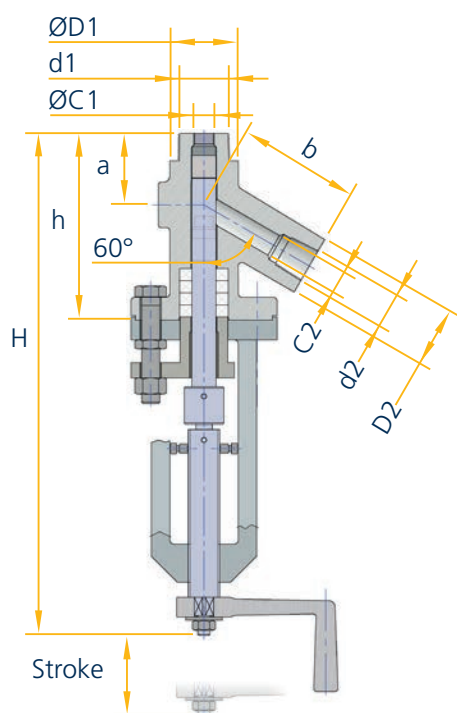
The patented "RAM SEAL®" design features replaceable seal rings for ease of maintenance. The combination of a metal compression ring and a soft PTFE seal ring allows the valve to deliver incredibly low leakage rates in a variety of services (gas and liquid) over a long period of time



| Item | Description | Material | Qty. |
|------|---------------------|----------------------|------|
| 1 | Body | ASTM GR.CF-8M/1.4408 | 1 |
| 2 | Ram/Piston Head Nut | SS316/1.4401 | 1 |
| 3 | Compression Ring | PTFE/GLASS 25% | 2 |
| 4 | Sealing Ring | A2-70 | 1 |
| 5 | Ram/Piston | SS316/1.4401 | 1 |
| 6 | Packing Ring | SS316/1.4401 | 1 |
| 7 | Stuffing-Box Gland | ASTM GR.CF-8M/1.4408 | 1 |
| 8 | Connecting Nut | SS416/1.44005 | 1 |
| 9 | Yoke | SS303/1.4305 | 1 |
| 10 | Indicator | SS303/1.4305 | 1 |
| 11 | Spindle | SS416/1.44005 | 1 |
| 12 | Crank Handle | ASTM GR.CF-8/1.4308 | 2 |

- Max. Temperature: PTFE Sealing Ring 260°C
- Pressure rating: Valves rated to ASME 600.

Model 32FG Standard Dimensions

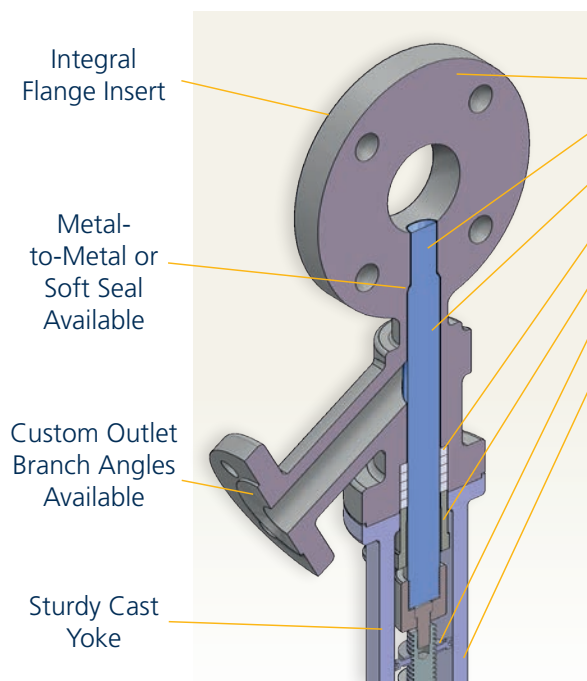


| Size → | ½" | ¾" | ¾" | 1" | 1" | 1½" |
|------------|-----|-----|-----|-----|-----|-----|
| ↓ Variable | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØD1 | 45 | 45 | 45 | 45 | 45 | 60 |
| ØD2 | 40 | 40 | 40 | 40 | 40 | 45 |
| d1 [NPT] | ½" | ¾" | ¾" | 1" | 1" | 1½" |
| d2 [NPT] | ½" | ½" | ¾" | ½" | ¾" | 1" |
| ØC1 | 13 | 16 | 16 | 16 | 16 | 25 |
| ØC2 | 15 | 15 | 15 | 15 | 15 | 25 |
| a | 47 | 47 | 47 | 47 | 47 | 47 |
| b | 80 | 80 | 80 | 80 | 80 | 90 |
| h | 123 | 123 | 123 | 123 | 123 | 140 |
| H | 345 | 345 | 345 | 345 | 345 | 360 |
| Stroke | 60 | 60 | 60 | 60 | 60 | 65 |

Model 31PF Standard Dimensions

Model 31PF 'Integral Flange'

These valves are built with an integral metal flange welded to the valve body. The complete assembly is installed in the product line (can be bolted, clamped or welded). The valve seals flush with the inner diameter (ID) of the insert which has the same ID as the product line, guaranteeing a dead-space-free arrangement.

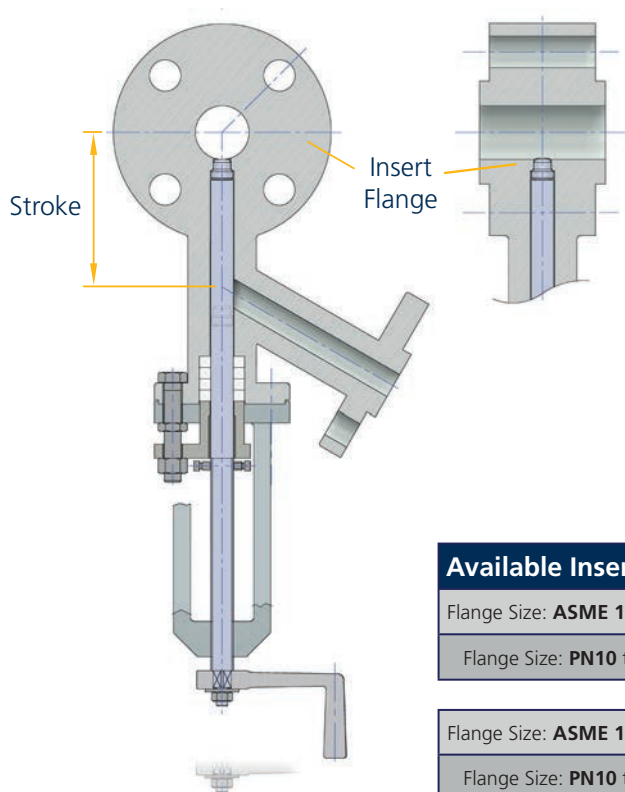


| Item | Description | Material | Qty. |
|------|----------------------|----------------------|------|
| 1 | Body/Integral Flange | ASTM GR.CF-8M/1.4408 | 1 |
| 2 | Disc | SS316/1.4401 | 1 |
| 3 | Spindle | SS416/1.44005 | 1 |
| 4 | Packing Ring | PTFE/Graphite | 4 |
| 5 | Stuffing-Box Gland | ASTM GR.CF-8M/1.4408 | 1 |
| 6 | Indicator | SS303/1.4305 | 1 |
| 7 | Yoke | SS303/1.4305 | 1 |
| 8 | Crank Handle | ASTM GR.CF-8/1.4308 | 1 |

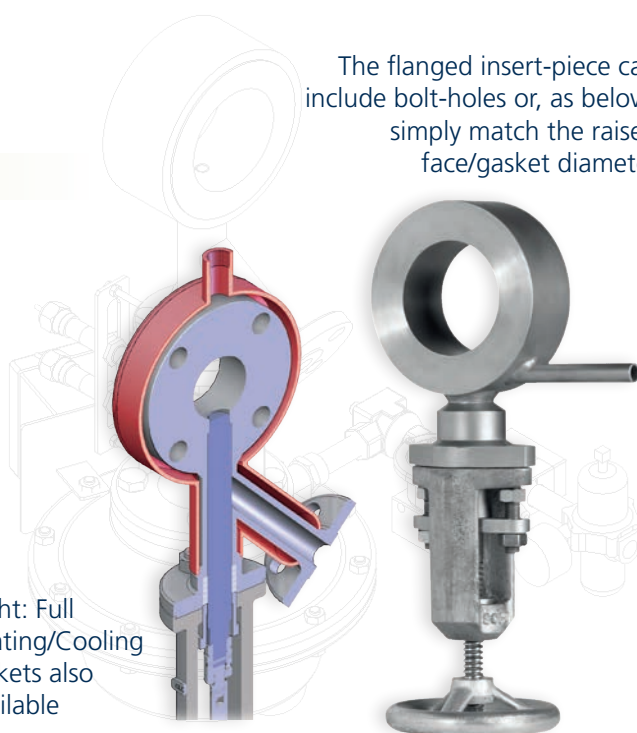
- Max. Temperature: PTFE Packing Rings 260°C, Graphite Packing Rings 550°C.
- Pressure rating: Valves rated to ASME 600.

The flanged insert-piece can include bolt-holes or, as below, simply match the raised face/gasket diameter

Model 31PF Standard Dimensions



Right: Full heating/Cooling Jackets also available



Available Insert Flange Sizes:

| | | | | | | | | |
|-------------------------------------|------|------|------|------|------|------|------|------|
| Flange Size: ASME 150 to 600 | ½" | ¾" | 1" | 1¼" | 1½" | 2" | 2½" | 3" |
| Flange Size: PN10 to PN63 | DN10 | DN15 | DN20 | DN25 | DN32 | DN40 | DN50 | DN65 |

| | | | | | | | |
|-------------------------------------|------|-------|-------|-------|-------|-------|-------|
| Flange Size: ASME 150 to 600 | 3½" | 4" | 5" | 6" | 8" | 10" | 12" |
| Flange Size: PN10 to PN63 | DN80 | DN100 | DN125 | DN150 | DN200 | DN250 | DN300 |

Models 30P and 30T - Custom Innovation

All Model 30 valves are custom-built assemblies. Options include a wide variety of metallurgies, actuators, pressure ratings from full vacuum to ASME 2500/PN 400, hardened sealing surfaces and replaceable seats.

Model 30P 'Core Pipe Assembly'

Model 30P valves (see examples, right) are also known as core pipe assemblies. They allow the user to take a sample under high temperature and pressure.

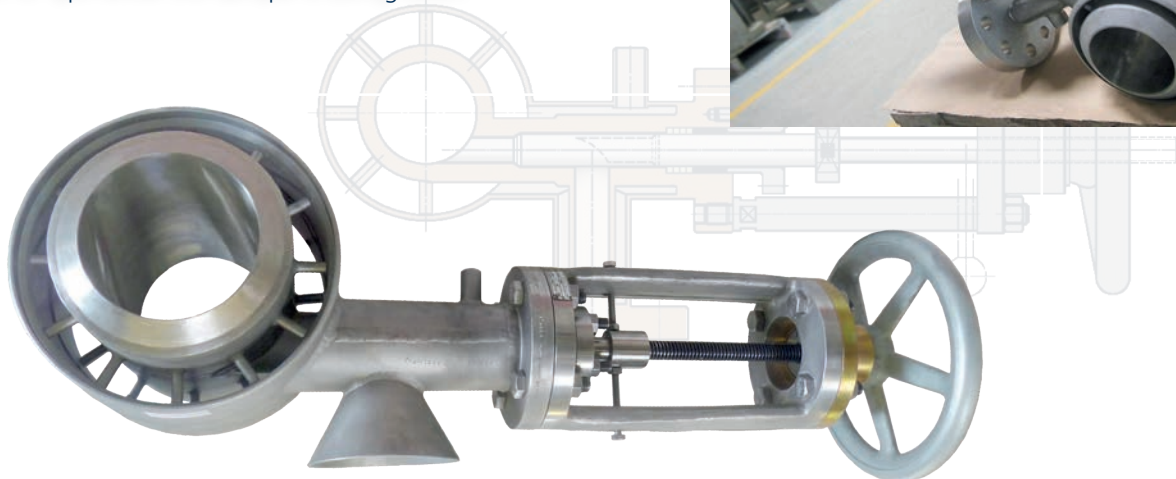
The valve is welded to a spool-piece which is a short piece of the process pipe. The valve assembly is welded directly into the process piping. In polymer applications, the 30P is usually fully jacketed.

The spool piece connections can be provided with alternative connections. The 30P can also be used to drain a line in a shut-down situation, to flush or purge it, or as an injection valve.



Model 30T - Tangential Sampling With Contoured Ram/Piston

Another SchuF innovation, the 30T, allows the valve to be installed horizontally. This enables the gravity-driven sample drop to be carried out without the operator having to activate the valve while located under the pipe – a potentially dangerous situation should hot polymer splash or spill while the sample is being taken.

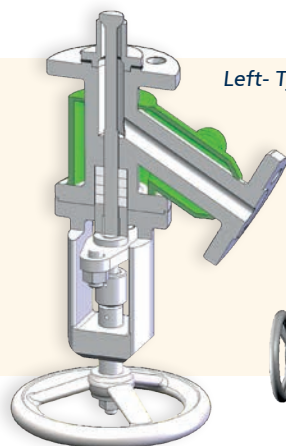


Sample Valve Custom Options

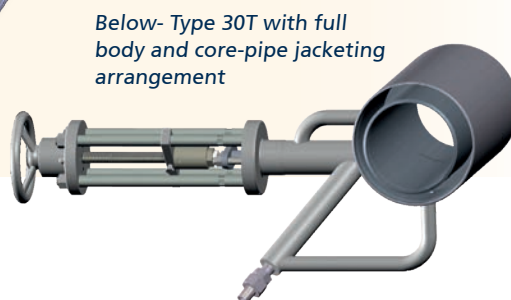
SchuF sample valves can be supplied with a number of different options and arrangements to suit any customer system or process requirements. All wetted parts and bodies can be manufactured in a variety of materials, including 316 stainless steel (standard), Titanium, Nickel Alloys, Alloy 20, Monel, with others available. Schuf will also fabricate to your specifications- please contact Schuf with any inquiries.

Jacketing

All SchuF sampling valves can be jacketed. Jackets are welded in place and can cover the entire valve body fully, preventing cold spots when the jacket is for heating purposes or maximising cooling when used for heat extraction.



Left- Type 32PT with jacketed body



Below- Type 30T with full body and core-pipe jacketing arrangement

Sample Containers, Fixed-Volume Sampling

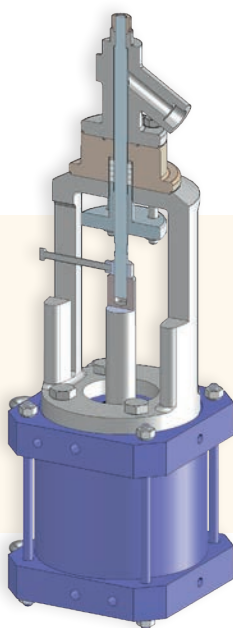
All SchuF sampling valves can be supplied with sample bottles of any size and type required- e.g. glass, or high-temperature metal containers. The bottle connection can allow venting as required. In this example, right, we see an isolated fixed-volume cooling or heating chamber which allows depressurised discharging into a container

Right: Type 32PG with vented PTFE coupling and glass bottle



Pneumatic Piston Actuator

Actuation of sample valves can be delivered with double-acting or spring-returned pneumatic actuators. More complex systems utilising control and instrumentation accessories are further possible options.



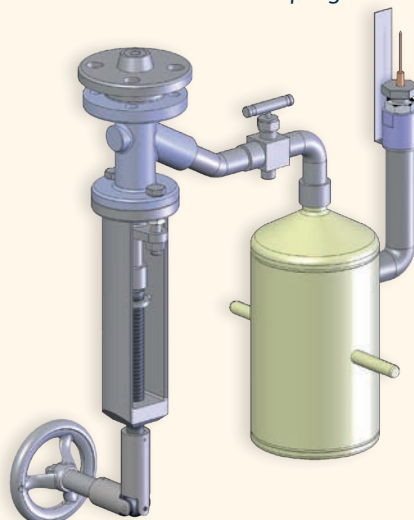
Left: Type 32PG valve with double-acting pneumatic actuator

Sample Valve Custom Options

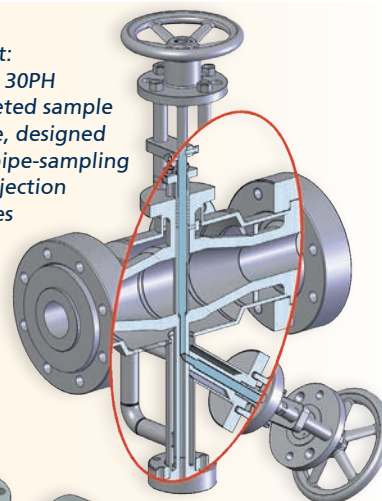
Sampling Systems

SchuF offer complete sampling systems which can include specific combinations of customised features in a single self-contained assembly. Such systems can offer increased safety, accuracy, speed and efficiency, particularly in challenging conditions.

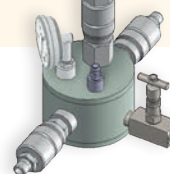
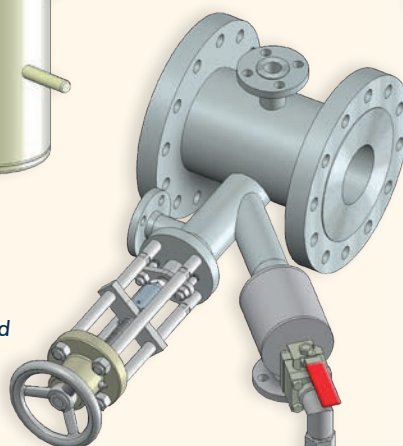
Below: Type 32PG sampling valve with isolation valve, detachable stainless steel container and mechanical float device/indicator for accurate and safe fixed-volume sampling



Right: Type 30PH jacketed sample valve, designed for pipe-sampling or injection duties



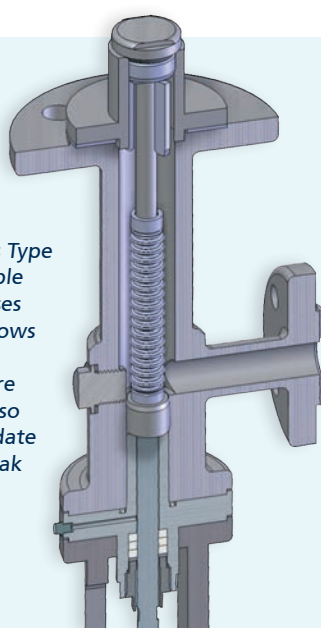
Right: Type 30TH jacketed sample valve for fixed-volume pipe-sampling



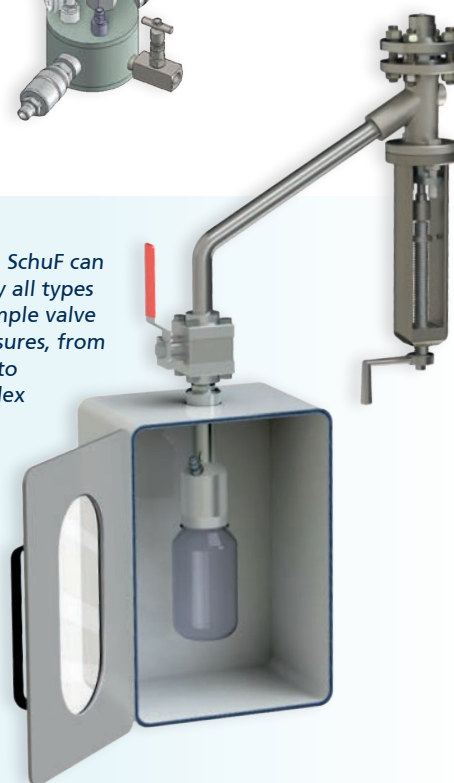
Enclosures and Lethal Service

SchuF can supply sampling systems and enclosures for critical applications and lethal service. The type 32PH sample valve has a metal bellows seal to atmosphere with an emergency stuffing-box which prevents leakage through the gland should the bellows break. A further option available is Leak Detection inside the gland.

Right: This Type 32PH sample valve utilises metal bellows sealing to atmosphere and can also accommodate internal leak detection



Right: SchuF can supply all types of sample valve enclosures, from basic to complex

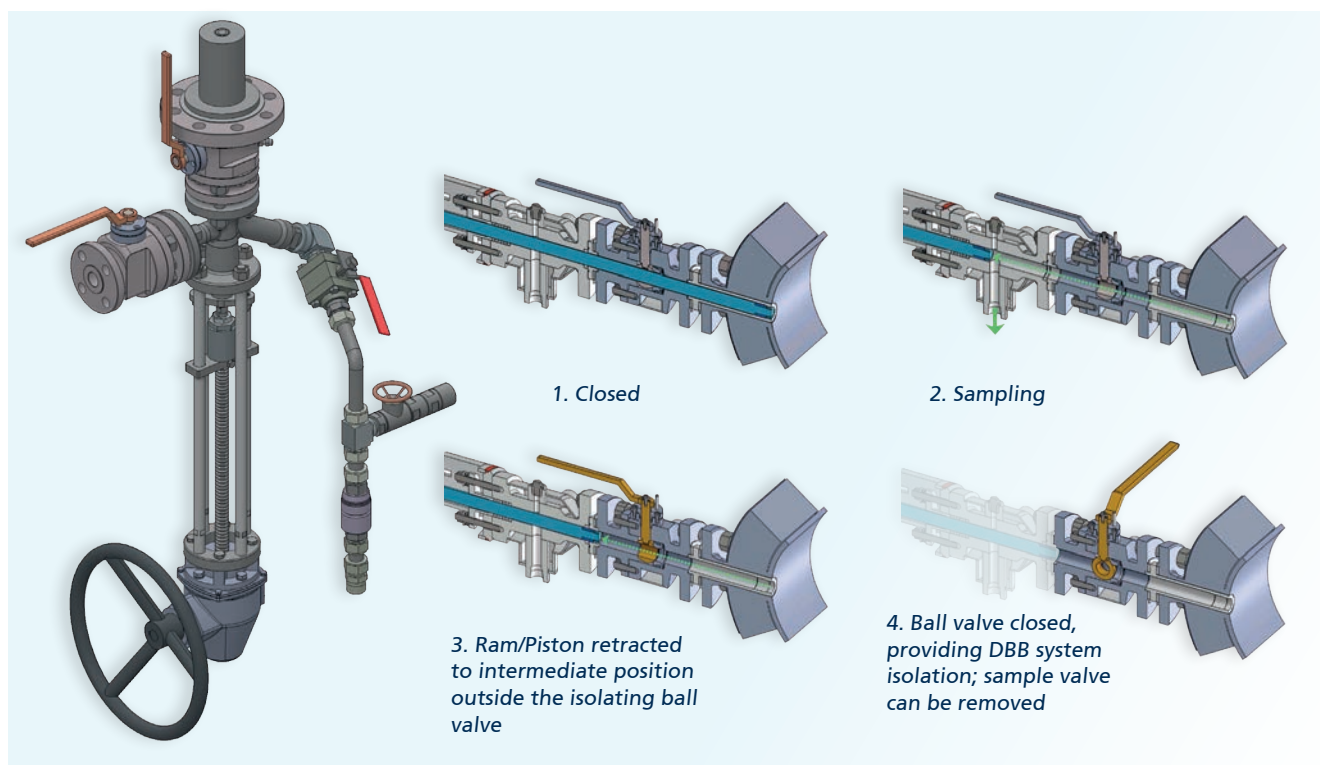
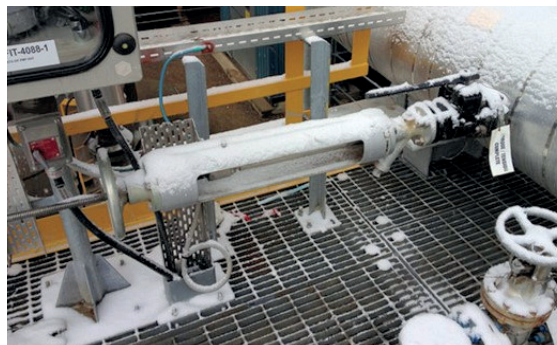


Sample Valve Custom Options

Added Innovation

This is an example of an already specialised Type 32FS sampling valve gaining additional functionality through innovative design. This valve is entirely removable without having to shut down the whole process unit- while the valve itself remains closed and self-contained.

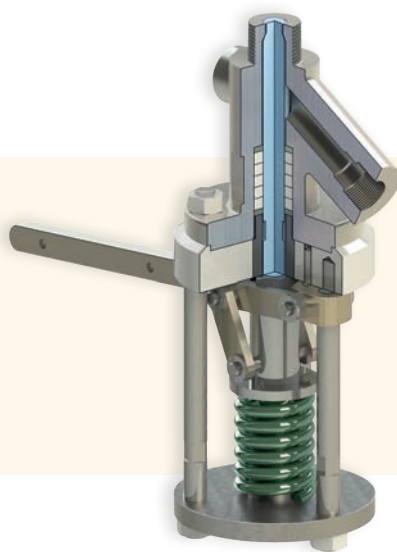
The ram/piston strokes through the ball valve during normal sampling activities. When necessary, the ram/piston is retracted to an intermediate position and the dedicated ball valve is closed to isolate the system, allowing valve removal.



Deadman's Handle

Manual actuation can be via a standard handwheel, crank-handle or dead-man's handle.

A dead-man's handle provides a spring-returned lever action which ensures very fast and automatic closure upon release.



Left: Type 32PG sample valve featuring a dead-man's handle manual actuator

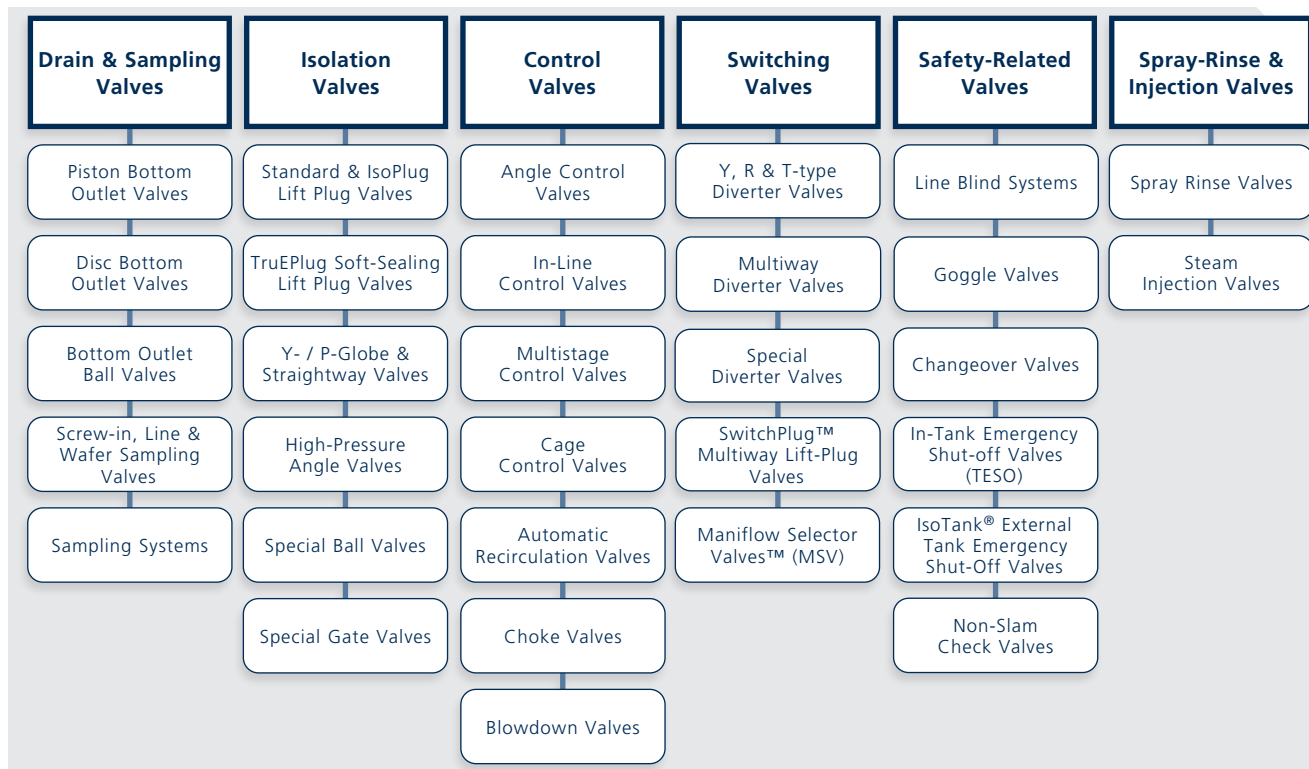
SchuF Valve Enquiry Sheet

| SchuF | | CUSTOMER APPLICATION DATA | | | | | | | | | | |
|--------------------|--------------|---------------------------|-------|-----|------|-------------------|----------------------|--|-------------------|--------------------------|-------|--|
| | | sales@schuf.com | | | | | www.schuf.com | | | Date: | | |
| Customer | | | | | | | Purchase Order No | | | | | |
| Customer Enq. Ref. | | | | | | | Item Number | | | | | |
| Quote Reference | | | | | | | Quantity | | | | | |
| Project Title | | | | | | | Customer Tag | | | | | |
| 1 | PROCESS DATA | Fluid | | | | Critical Pressure | | | Shut-off Pressure | | | |
| | | | Units | Min | Norm | Max | Other | | | | | |
| 2 | | Inlet State | | | | | | | | | | |
| 3 | | Flow Rate Mass | | | | | | | | | | |
| 4 | | Flow Rate Volume | | | | | | | | | | |
| 5 | | Inlet Pressure | | | | | | | | | | |
| 6 | | Outlet Pressure | | | | | | | | | | |
| 7 | | Inlet Temperature | | | | | | | | | | |
| 8 | | Molecular Mass | | | | | | | | | | |
| 9 | | Specific Heat Ratio | | | | | | | | | | |
| 10 | | Compressibility | | | | | | | | | | |
| 11 | | Specific Gravity | | | | | | | | | | |
| 12 | | Vapour Pressure | | | | | | | | | | |
| 13 | | Viscosity | | | | | | | | | | |
| 14 | SPL @ 1m | | | | | | | | | | | |
| 15 | PIPE | Inlet Pipe Size / Sch | | | | 43 | ACTUATOR | Actuator Type | | | | |
| 16 | | Outlet Pipe Size / Sch | | | | 44 | | Actuator Model / Stroke | / | | | |
| 17 | | Insulation | | | | 45 | | Size / Spring | / | | | |
| 18 | | Design Pressure | | | | 46 | | Fail Action | | | | |
| 19 | | Design Temp Min/Max. | | | | 47 | | System Air / Set Press. | / | | | |
| 20 | BODY | Valve Type | | | | 48 | Actuator Orientation | | | | | |
| 21 | | Size / Class | | | | 49 | Handwheel | | | | | |
| 22 | | Body Type | | | | 50 | Volume Tank | | | | | |
| 23 | | Body Material | | | | 51 | Tubing | | | | | |
| 24 | | End Connections | | | | 52 | Fittings | | | | | |
| 25 | | End Finish | | | | 53 | Stroking Time | | | | | |
| 26 | | Body F/F Dims | | | | 54 | Positioner Model | | | | | |
| 27 | BONNET | Bonnet Type | | | | 55 | Comms Protocol | | | | | |
| 28 | | Bonnet Material | | | | 56 | Control Signal | | | | | |
| 29 | | Bonnet Bolting | | | | 57 | Switch Type | | | | | |
| 30 | | Gasket Material | | | | 58 | Filter Regulator | | | | | |
| 31 | | Gland Packing | | | | 59 | Boosters | | | | | |
| 32 | | Bellows Material | | | | 60 | Solenoid | | | | | |
| 33 | TRIM | Trim Size / Type | | | | 61 | Lockup Valves | | | | | |
| 34 | | Cv / Characteristic | | | | 62 | Relief Valve | | | | | |
| 35 | | Balancing | | | | 63 | Other Accessories | | | | | |
| 36 | | Flow Direction | | | | 64 | Other Accessories | | | | | |
| 37 | | Plug/Seat/Cage Matl. | | | | 65 | TEST | Design and Testing: Seat Leakage, Hydrostatic, Functional Test | | | | |
| 38 | | Seating Type | | | | 66 | | | | | | |
| 39 | Seat Leakage | | | | 67 | | | | | | | |
| 40 | CERT | PED | | | | 68 | MISC | Paint Finish | Standard | <input type="checkbox"/> | | |
| 41 | | NACE | | | | 69 | | Mat. Cert Body / Bonnet | / | | | |
| 42 | | ATEX | | | | 70 | | Drawing Outl / GA / Hkp | No / No / No | <input type="checkbox"/> | | |
| 71 | NOTES | | | | | | | | Rev. | Date | Desc. | |
| 72 | | | | | | | | | | | | |
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Product Portfolio Overview

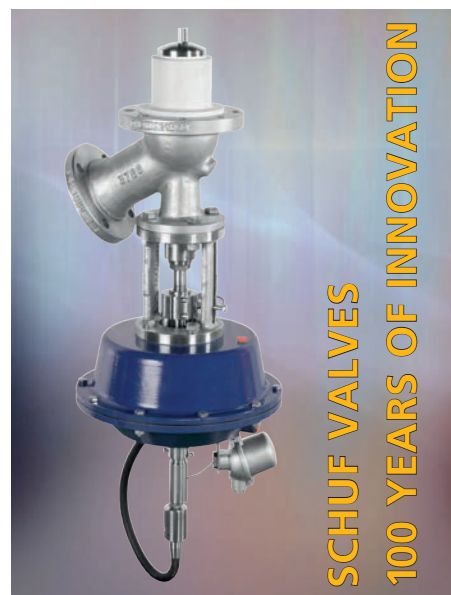
The SchuF Group has delivered over one million valves during its 100-year history, to a wide variety of industries in over 50 countries worldwide. With headquarters near Frankfurt in Germany, the company has additional design and manufacturing centres in Italy, India, Ireland, UK and the

USA. SchuF has sales and agent offices servicing almost every country in the world. SchuF manufacture valve products that control, isolate, divert, and sample liquids, gases, powders, and slurries. Our product range of engineered, customised valves includes:

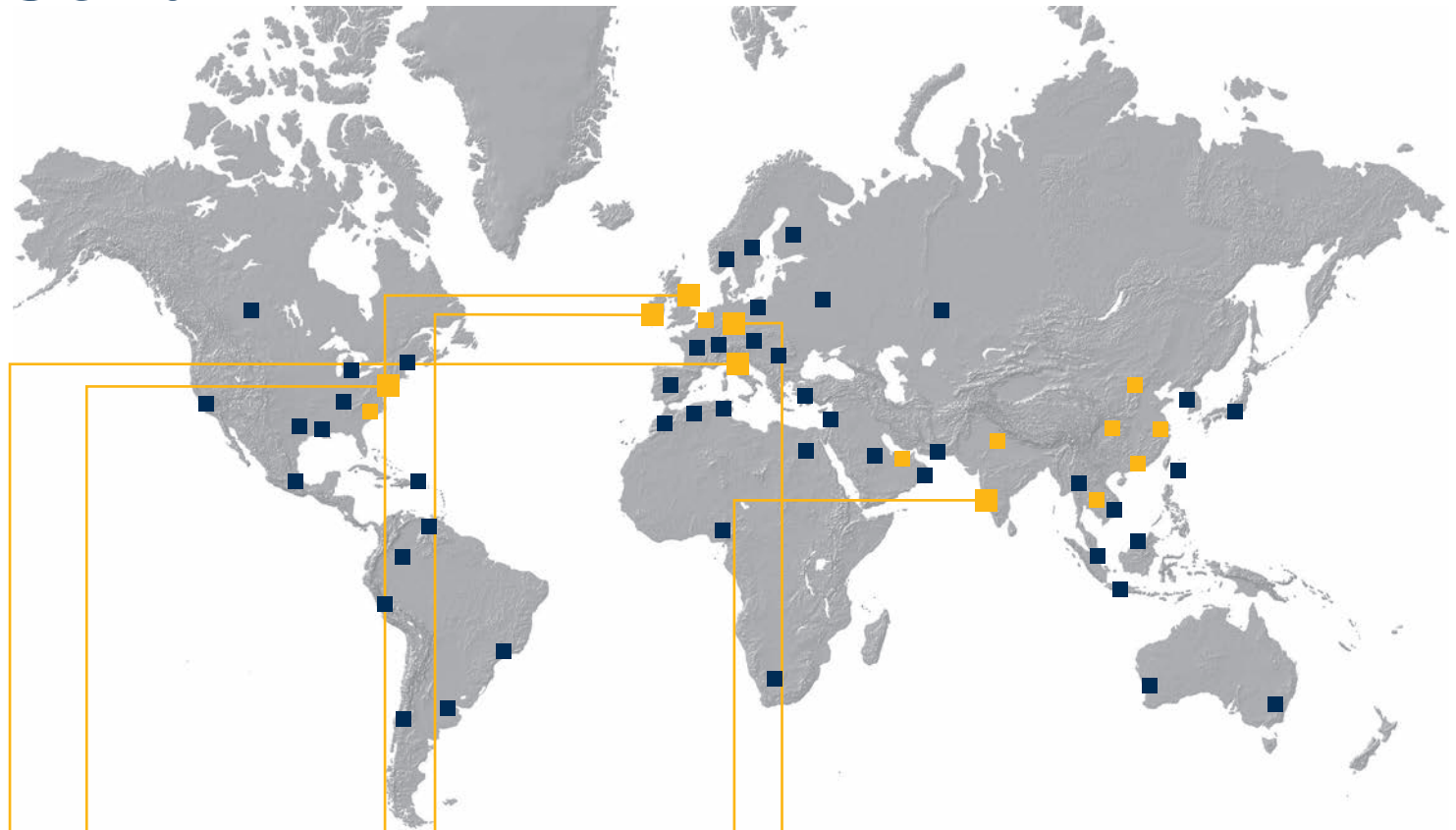


Key Client List:

- | | | |
|------------------|---------------------|------------------|
| ■ ADNOC | ■ Glaxo Smith Kline | ■ Reliance |
| ■ AkzoNobel | ■ INEOS | ■ Roche |
| ■ AstraZeneca | ■ Invista | ■ SABIC |
| ■ BASF | ■ Jiangsu Hengli | ■ Saipem |
| ■ Bayer | ■ Lanxess | ■ Salavat |
| ■ BP | ■ LG Chemical | ■ Samsung |
| ■ Chevron | ■ Linde | ■ Sanofi Aventis |
| ■ Clariant | ■ Lotte Chemical | ■ SASA |
| ■ DOW Chemical | ■ Lukoil | ■ Shell |
| ■ Du Pont | ■ Lurgi | ■ Shin Etsu |
| ■ Eastman | ■ Merck | ■ Sinopec |
| ■ Evonik | ■ Novartis | ■ Sulzer |
| ■ Exxon Chemical | ■ Oerlikon | ■ Temex |
| ■ FCFC | ■ Oxy Vinyls | ■ Tuntex |
| ■ Far Eastern | ■ Pemex | ■ Uhde |
| ■ Foster Wheeler | ■ Petrobras | ■ Vinnolit |
| ■ GE | ■ Pfizer | |



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