

Type 441

Flanged Safety Relief Valves

CATALOG

LESER

The-Safety-Valve.com

General Information

LESER India – Safety Relief Valves

The safety valve Type 441 represents

- ✓ High capacity related to the safety valve size
- ✓ High adaptability
- ✓ Excellent price / performance ratio

General design features

- Are designed to meet all industrial applications.
- Lifting aid mechanism to ensure valve performance within the specified limits.
- Spring loaded valve as a standard for pressures as low as 0.10 barg.
- Open rapidly within overpressure of 5% to 10% to the full lift and blowdown of -5% to -10%
- Are one of the best selling spring loaded safety relief valves in India.
- Are developed in a close cooperation with plant engineers and service specialists.
- Serve for protection of processes and equipments.

Approvals

Are approved by all important approval organisations in India which ensures wide applicability e.g.:

- IBR 1950
- CCoE

Furthermore, all LESER India Type 441 safety relief valves are designed and produced in order to meet the requirements of following regulations (directives, codes, rules and standards).

ASME section VIII Division 1, ASME PTC 25, ASME-Code Sec. II, ASME B 16.34 and ASME B16.5, API Std. 520, 521, 526, API Std. 527, API RP 576

Applications

Are the ultimate solution for all industrial applications for steam, gas and liquid.

Typical applications are:

- Protection of chemical processes and equipment
- Fertiliser
- Steel
- Compressors
- Pharma
- Boilers
- Oil & Gas
- Process Industries
- Pumps

General Information

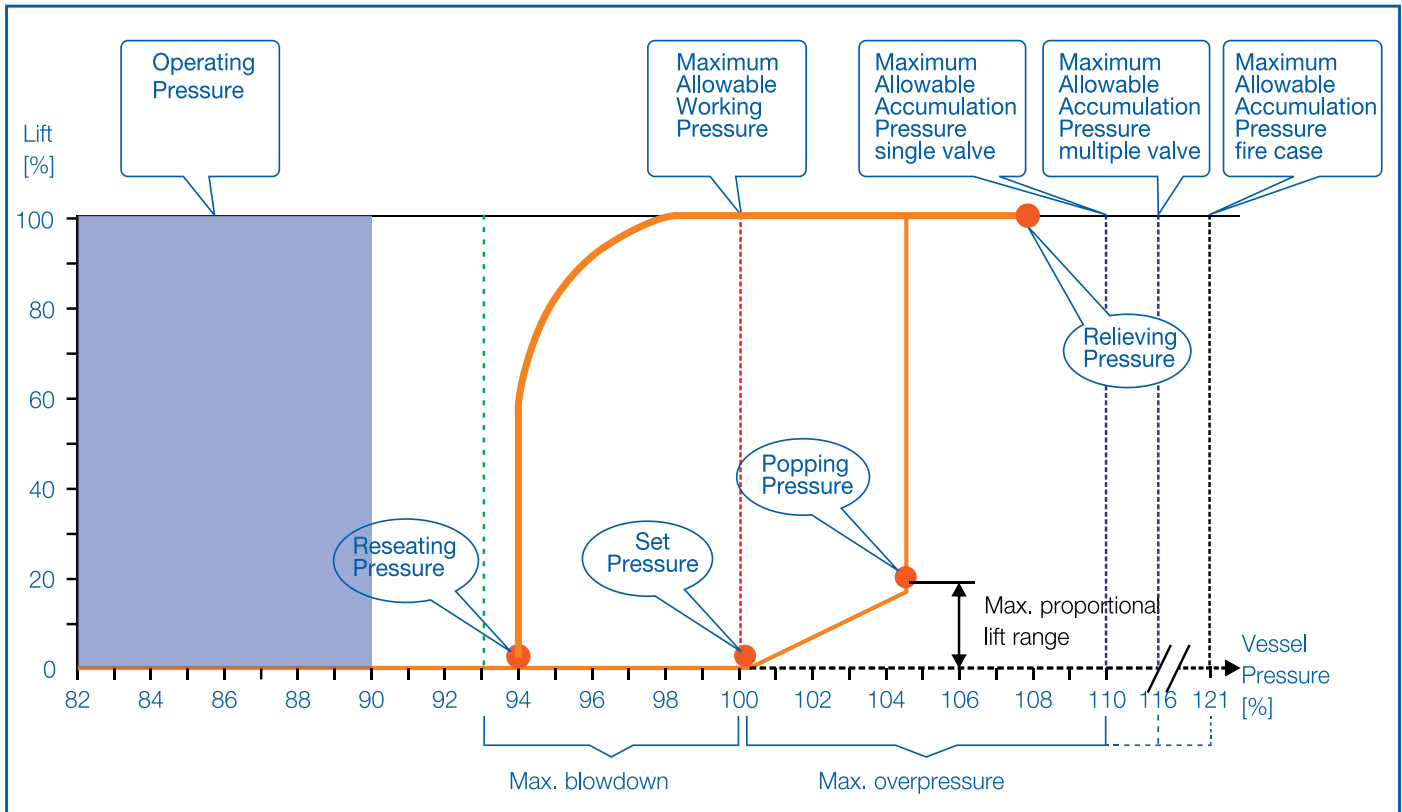
Product Features

Offer a large variety of types, materials and options to suit any application:

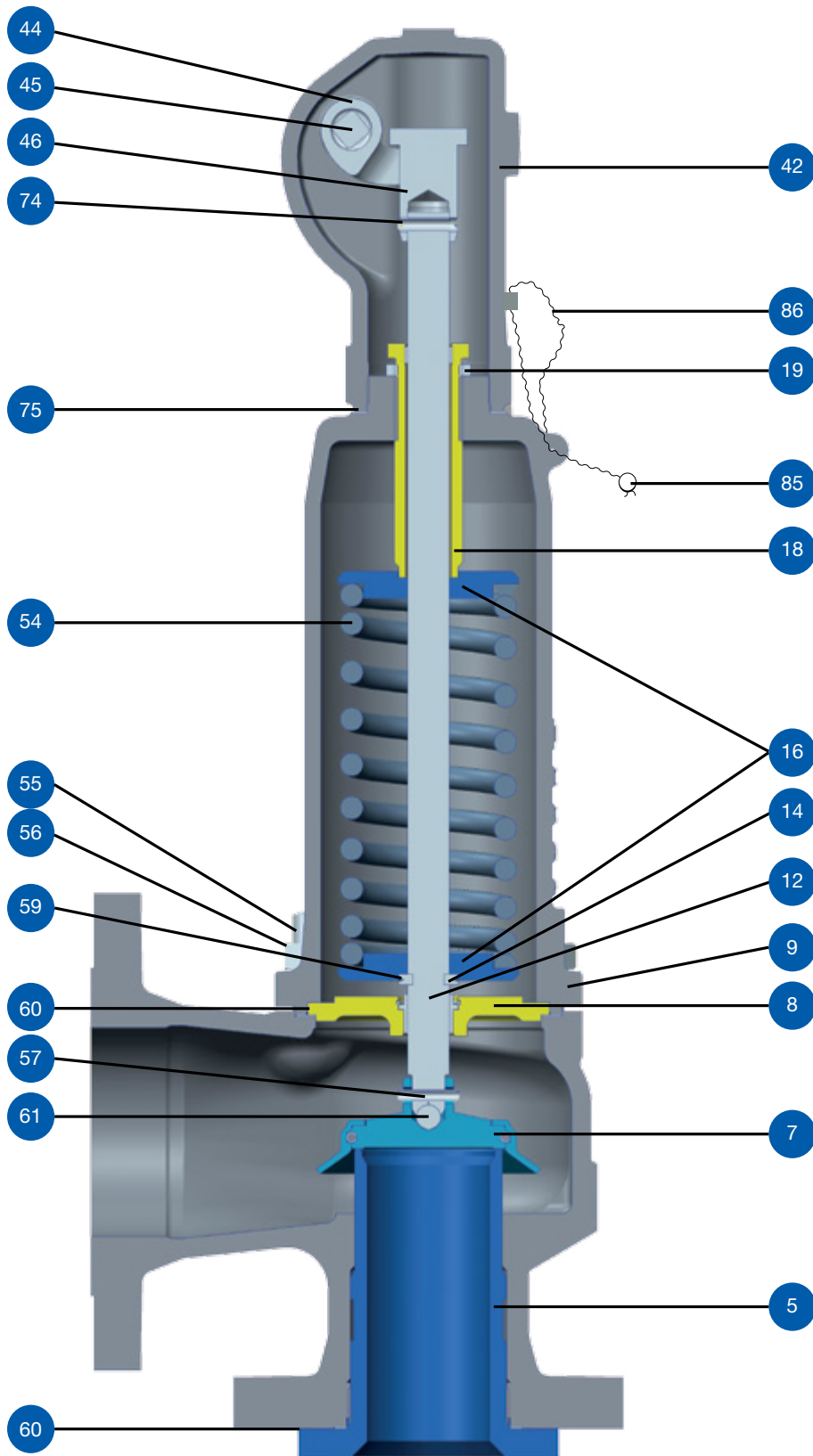
- From DN 25 to DN 200 – 1" to 8" inlet
- Inlet pressure ratings class 150 to class 2500 to fit all required design pressures
- Orifice sizes from D/E to T cover all capacity requirements
- Large variety of body materials; e.g. WCB, CF8M, WC6...

- Set pressures from 0.1 to 160 bar / 1.5 to 2320 psig make this product group suitable for all industrial processes
- Operating temperatures from -270 to 550 °C / -454 to 1022 °F cover a wide range of applications
- One-piece spindle reduces friction which is leading to high operation accuracy
- Self-draining body design, avoids residues and reduces corrosion
- One design and spring (single trim) for steam, gas and liquid applications reduces the number of spare parts and ensure an easier maintenance

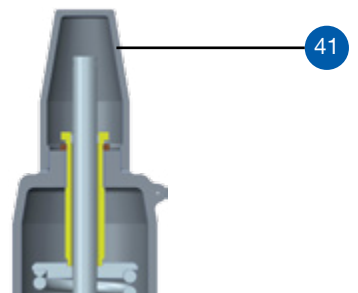
Typical characteristic of safety valve for compressible fluids according to ASME Sec. VIII Div. 1/API 520



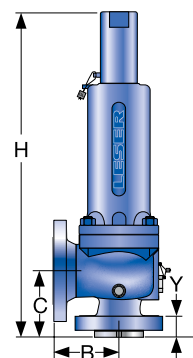
Type 441 SP Series



Closed Cap, H2



| | Item | Part Name |
|---------------|-------------------|-------------------|
| Closed cap H2 | 1 | Body |
| | 5 | Nozzle |
| | 7 | Disc Assembly |
| | 8 | Guide |
| | 9 | Bonnet |
| | 12 | Spindle |
| | 14 | Split Ring |
| | 16 | Spring Plate |
| | 18 | Adjusting Screw |
| | 19 | Lock Nut |
| | 41 | Cap H2 |
| | 54 | Spring |
| | 55 | Stud |
| | 56 | Hex. Nut |
| | 57 | Roll Pin |
| | 59 | Securing Ring |
| | 60 | Gasket |
| | Lifting Device H4 | 61 |
| 75 | | Spacer |
| 85 | | Lead Seal |
| 86 | | Seal Wire |
| 42 | | Lifting Device H4 |
| 43 | | Lever |
| 44 | | Lifting Fork |
| 45 | | Lever Shaft |
| 46 | | Spindle Cap |
| 74 | | Pin |
| 80 | Gland | |
| 82 | Hex. Nut | |



Type 441 SP Series Materials

| Type | Item | Component | Standard Application | Corrosive Application | High Temp. Application | Low Temp/ Cryogenic. Application | Highly Corrosive Application | Highly Corrosive Application |
|------------------|-----------|-----------------------------|-------------------------------|---------------------------------|-------------------------|----------------------------------|------------------------------|------------------------------|
| CLOSED CAP, H 2 | 1 | Body | A 216 Gr. WCB | A 351 CF 8/8M | A 217 Gr. WC6 | A 352 Gr. LCB | A 351 Gr. CF 8/8M | A 351 CF 8/8M |
| | 5 | Nozzle | A351 Gr. CF8M | A351 Gr. CF8M | A351 Gr. CF8M | A351 Gr. CF8M | Hastelloy-C | PTFE |
| | 7 | Disc Assembly | SS 316 | SS 316 | SS 316 | SS 316 | Hastelloy-C | PTFE |
| | 8 | Spindle Guide/ Guide Insert | A 216 Gr. WCB SS 316 | A 351 CF 8/8M SS 316 | A 216 Gr. WCB SS 316 | A 351 Gr. CF 8M SS 316 | A 351 Gr. CF 8/8M SS 316 | A 351 CF 8/8M SS 316 |
| | 9 | Bonnet | A 216 Gr. WCB | A 351 CF 8/8M | A 217 Gr. WC6 | A 352 Gr. LCB | A 351 Gr. CF 8/8M | A 351 CF 8/8M |
| | 12 | Spindle | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 14 | Split Ring | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 16 | Spring Plate | CS ZN. Plated | SS 316 | CS ZN. Plated | SS 316 | SS 316 | SS 316 |
| | 18 | Adjusting Screw | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 19 | Lock Nut | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 42 | Cap (41) | A 216 Gr. WCB | A 351 CF 8/8M | A 216 Gr. WCB | A 351 Gr. CF 8M | A 351 Gr. CF 8/8M | A 351 CF 8/8M |
| | 54 | Spring | CS ZN. Plated/ Alloy Steel | Stainless Steel/ Alloy Steel | Alloy Steel | Stainless Steel | Stainless Steel | Stainless Steel |
| | 55 | Stud | A 193 Gr. B7 | A 193 Gr. B8M | A 193 Gr. B7 | A 193 Gr. B8M | A 193 Gr. B8M | A 193 Gr. B8M |
| | 56 | Hex. Nut | A 194 Gr. 2H | A 194 Gr. 8M | A 194 Gr. 2H | A 194 Gr. 8M | A 194 Gr. 8M | A 194 Gr. 8M |
| | 57 | Roll Pin | SS | SS | SS | SS | SS | SS |
| | 59 | Securing Ring | SS | SS | SS | SS | SS | SS |
| | 60 | Gasket | Non Asbestos | Non Asbestos | Non Asbestos | Non Asbestos | Non Asbestos/ PTFE | PTFE |
| | 61 | Ball | SS | SS | SS | SS | SS | SS |
| | 75 | Spacer | Non Asbestos | Non Asbestos | Non Asbestos | Non Asbestos | Non Asbestos/ PTFE | PTFE |
| | 85 | Lead Seal | Lead | Lead | Lead | Lead | Lead | Lead |
| 86 | Seal Wire | SS | SS | SS | SS | SS | SS | |
| PACKED LEVER, H4 | 43 | Lever | CS | SS 316 | CS | CS | SS 316 | SS 316 |
| | 44 | Lifting Fork | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 45 | Lever Shaft | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 46 | Spindle Cap | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 | SS 316 |
| | 74 | Pin | SS | SS | SS | SS | SS | SS |
| | 80 | Gland | CS | SS 316 | CS | SS 316 | SS 316 | SS 316 |
| | 82 | Hex. Nut | CS | SS | CS | SS | SS | SS |

NOTE

Material of construction will vary according to the service conditions and customer requirement. Other special materials, for example, Monel, Alloy -20, CF 3, CF 3M and accessories such as Balanced Bellows, Cooling Spacer test Gag, Heating Jacket, Drain Plug, Soft Seat (O-Ring) Disc etc. can be provided on request.

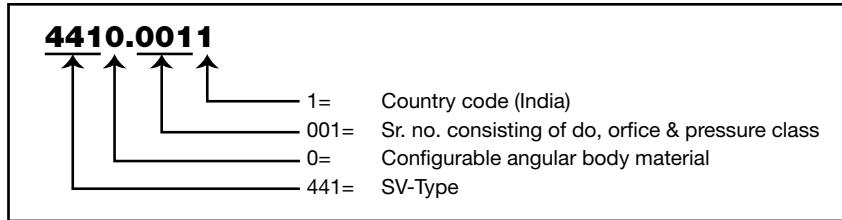
Type 441 SP Series

Article numbers

System for configuration

| | Valve Type | Country Code | Body Material | do/Orifice | Size Inlet | Pressure Rating Inlet | Size Outlet | Pressure Rating Outlet | Lifting Device | Bonnet Open / Closed |
|------------------------------|------------|--------------|---------------|------------|------------|-----------------------|-------------|------------------------|----------------|----------------------|
| Article No. | X | X | | X | | X | | | | |
| Configuration by option code | | | X | | X | X | X | X | X | X |

Example:



| Orifice (area) | Type | | Nominal pressure class | | | |
|--------------------|------|---|------------------------|------------|----------|------------|
| | | | 150 | 300L | 300 | 600 |
| D (0.11 sq.in) | 4410 | . | 0011* | | 0031* | 0041* |
| | | | 1" x 2" | | 1" x 2" | 1" x 2" |
| E (0.196 sq.in) | 4410 | . | 0091 | | 0111 | 0121 |
| | | | 1" x 2" | | 1" x 2" | 1" x 2" |
| F (0.307sq. In) | 4410 | . | 0171 | 0181 | | 0201 |
| | | | 11/2" x 2" | 11/2" x 2" | | 11/2" x 2" |
| G (0.503 sq.in) | 4410 | . | 0251* | 0261* | | 0281* |
| | | | 11/2" x 3" | 11/2" x 3" | | 11/2" x 3" |
| H (0.785 sq.in) | 4410 | . | 0331 | 0341 | 0351 | 0361 |
| | | | 11/2" x 3" | 11/2" x 3" | 2" x 3" | 2" x 3" |
| J (1.287 sq.in) | 4410 | . | 0401 | 0411 | 0421 | 0431 |
| | | | 2" x 3" | 2" x 3" | 3" x 4" | 3" x 4" |
| K (1.838 sq.in) | 4410 | . | 0471 | | 0491 | 0501 |
| | | | 3" x 4" | | 3" x 4" | 3" x 4" |
| L (2.853 sq.in) | 4410 | . | 0541 | 0551 | 0561* | 0571* |
| | | | 3" x 4" | 3" x 4" | 4" x 6" | 4" x 6" |
| M (3.60 sq.in) | 4410 | . | 0611 | | 0631 | 0641 |
| | | | 4" x 6" | | 4" x 6" | 4" x 6" |
| N (4.34 sq.in) | 4410 | . | 0671 | | 0691 | 0701 |
| | | | 4" x 6" | | 4" x 6" | 4" x 6" |
| P (6.38 sq.in) | 4410 | . | 0731 | 0741 | | 0761 |
| | | | 4" x 6" | 4" x 6" | | 4" x 6" |
| Q (11.05 sq.in) | 4410 | . | 0791 | | 0811 | 0821 |
| | | | 6" x 8" | | 6" x 8" | 6" x 8" |
| R (16.0 sq.in) | 4410 | . | 0841 | | 0861 | 0871 |
| | | | 6" x 10" | | 6" x 10" | 6" x 10" |
| T (26.0 sq.in) | 4410 | . | 0891 | | 0911 | 0921 |
| | | | 8" x 10" | | 8" x 10" | 8" x 10" |
| T (26.0 sq.in) | 4410 | . | 0941 | | 0961 | 0971 |
| | | | 8" x 12" | | 8" x 12" | 8" x 12" |

NOTE

* Marked article nos. are applicable for non-IBR valves only.
 The standard sizes are shown in above table, other special sizes may be provided on request.

Type 441 SP Series Overall Dimensions

| Inlet Size inches | Outlet Size inches | Max. Set Pr. Bar g | Orifice Details | | | | Weight Approx. kgs. | Height 'H' Approx. | | Center to face dim | | 'Y' mm |
|----------------------|--------------------------|-----------------------|-----------------|-----------------|----------------|----------------|---------------------------|-------------------------|---------------------------|---------------------|-----------------|-----------|
| | | | Letter | Area Sq. in. | Area Sq. mm | Dia, "d" mm | | Closed Cap, H2 mm | Packed Lever, H4 mm | Outlet "B" mm | Inlet "C" mm | |
| 1 | 2 | 40.0 | D | 0.110 | 71.0 | 9.50 | 11.0 | 340 | 350 | 114 | 105 | 11.0 |
| 1 | 2 | 40.0 | E | 0.196 | 126.5 | 12.70 | 11.0 | 340 | 350 | 114 | 105 | 11.0 |
| 1½ | 2 | 40.0 | F | 0.307 | 198.1 | 15.88 | 13.0 | 360 | 370 | 121 | 124 | 11.0 |
| 1½ | 3 | 40.0 | G | 0.503 | 324.5 | 20.33 | 18.0 | 440 | 470 | 124 | 130 | 11.0 |
| 1½ | 3 | 19.7 | H | 0.785 | 506.5 | 25.40 | 18.0 | 440 | 470 | 124 | 130 | 11.0 |
| 2 | 3 | 40.0 | H | 0.785 | 506.5 | 25.40 | 21.0 | 450 | 480 | 124 | 137 | 11.0 |
| 2 | 3 | 19.7 | J | 1.287 | 830.3 | 32.51 | 22.0 | 490 | 520 | 124 | 137 | 11.0 |
| 3 | 4 | 40.0 | J | 1.287 | 830.3 | 32.51 | 28.0 | 510 | 540 | 162 | 156 | 13.0 |
| 3 | 4 | 40.0 | K | 1.838 | 1185.8 | 38.86 | 35.0 | 550 | 580 | 162 | 156 | 13.0 |
| 3 | 4 | 19.7 | L | 2.853 | 1840.6 | 48.41 | 48.0 | 640 | 700 | 165 | 156 | 15.0 |
| 4 | 6 | 40.0 | L | 2.853 | 1840.6 | 48.41 | 55.0 | 670 | 730 | 184 | 178 | 15.0 |
| 4 | 6 | 40.0 | M | 3.600 | 2322.6 | 54.38 | 55.0 | 670 | 730 | 184 | 178 | 15.0 |
| 4 | 6 | 40.0 | N | 4.340 | 2800.0 | 59.70 | 70.0 | 770 | 830 | 210 | 197 | 17.0 |
| 4 | 6 | 40.0 | P | 6.380 | 4116.1 | 72.40 | 97.0 | 800 | 860 | 229 | 181 | 18.0 |
| 6 | 8 | 28.0 | Q | 11.050 | 7129.0 | 95.30 | 132.0 | 860 | 920 | 241 | 240 | 19.0 |
| 6 | 10 | 24.0 | R | 16.000 | 10322.6 | 114.60 | 164.0 | 990 | 990 | 267 | 240 | 20.0 |
| 8 | 12 | 25.0 | T | 26.000 | 16774 | 141.72 | 335.0 | 1350 | 1350 | 279 | 276 | 26.0 |

NOTE

Flange ratings and center to face dimensions are according to API RP 526 as applicable for Full Nozzle Safety Valves of inlet size 1" (25mm) and above.

Discharge Capacities

Calculation of mass flow acc. to IBR 1950
(Saturated Steam capacity in kg/h)

| Flow dia mm | Set Pressure, bar _g | | | | | | | | | | | | | |
|----------------|--------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|-------|
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 28 | 32 |
| 18 | 195 | 291 | 485 | 678 | 872 | 1065 | 1259 | 1452 | 1646 | 1839 | 2033 | 2420 | 2807 | 3194 |
| 23 | 318 | 476 | 792 | 1108 | 1424 | 1739 | 2055 | 2371 | 2687 | 3003 | 3319 | 2951 | 4582 | 5214 |
| 29 | 505 | 757 | 1259 | 1761 | 2263 | 2765 | 3268 | 3770 | 4272 | 4774 | 5276 | 6281 | 7285 | 8289 |
| 37 | 823 | 1232 | 2049 | 2867 | 3684 | 4501 | 5319 | 6136 | 6954 | 7771 | 8589 | 10224 | 11859 | 13494 |
| 46 | 1272 | 1904 | 3167 | 4431 | 5694 | 6958 | 8221 | 9485 | 10748 | 12012 | 13275 | 15803 | 18330 | 20857 |
| 60 | 2164 | 3239 | 5388 | 7538 | 9688 | 11837 | 13987 | 16137 | 18286 | 20436 | 22586 | 26885 | 31185 | 35484 |
| 74 | 3291 | 4926 | 8196 | 11466 | 14736 | 18006 | 21276 | 24546 | 27816 | 31086 | 34356 | 42895 | 47435 | 53975 |
| 92 | 5087 | 7614 | 12668 | 17723 | 22777 | 27831 | 32885 | 37939 | 42993 | 48048 | 53102 | 63210 | 73319 | 83427 |
| 98 | 5772 | 8640 | 14375 | 20110 | 25844 | 31579 | 37314 | 43049 | 48784 | 54519 | 60254 | 71724 | 83194 | |
| 125 | 9391 | 14056 | 23386 | 32717 | 42047 | 51377 | 60708 | 70038 | 79368 | 88699 | 98029 | 116690 | | |
| 165 | 16363 | 24491 | 40749 | 57006 | 73263 | 89520 | 10577 | 122034 | 138291 | 154548 | 170806 | | | |

NOTE

Capacities shown here are indicative. For detailed calculations, please provide the complete process data.

Type 441 SP Series Discharge Capacities

Calculation of mass flow acc. to ASME Sec. VIII Div. 1/ API 526

■ Saturated Steam capacity in lb/h

□ Air capacity at 15°C in scfm

□ Water capacity in U.S.gpm

| Orifice Letter | Medium | Set Pressure, psig | | | | | | | | | | | | | | | |
|----------------|--------|--------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 15 | 30 | 50 | 75 | 100 | 125 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 575 |
| D | Steam | 172 | 263 | 385 | 537 | 589 | 841 | 993 | 1296 | 1600 | 1904 | 2208 | 2511 | 2815 | 3119 | 3423 | 3575 |
| | Air | 65 | 94 | 137 | 192 | 246 | 300 | 354 | 463 | 571 | 680 | 788 | 897 | 1005 | 1114 | 1222 | 1276 |
| | Water | 11 | 15 | 19 | 24 | 27 | 30 | 33 | 38 | 43 | 47 | 51 | 54 | 58 | 61 | 64 | 65 |
| E | Steam | 307 | 469 | 686 | 957 | 1227 | 1498 | 1769 | 2310 | 2851 | 3392 | 3934 | 4475 | 5016 | 5558 | 6099 | 6370 |
| | Air | 115 | 168 | 245 | 342 | 438 | 535 | 632 | 825 | 1018 | 1211 | 1405 | 1598 | 1791 | 1985 | 2178 | 2274 |
| | Water | 19 | 27 | 34 | 42 | 48 | 54 | 59 | 69 | 77 | 84 | 91 | 97 | 103 | 108 | 114 | 116 |
| F | Steam | 481 | 735 | 1074 | 1498 | 1922 | 2346 | 2770 | 2618 | 4466 | 5314 | 6161 | 7009 | 7857 | 8705 | 9553 | 9977 |
| | Air | 180 | 263 | 384 | 535 | 686 | 838 | 989 | 1292 | 1595 | 1897 | 2200 | 2503 | 2806 | 3108 | 3411 | 3563 |
| | Water | 29 | 42 | 54 | 66 | 76 | 85 | 93 | 107 | 120 | 132 | 142 | 152 | 161 | 170 | 178 | 182 |
| G | Steam | 788 | 1205 | 1760 | 2455 | 3150 | 3844 | 4539 | 5928 | 7317 | 8706 | 10095 | 11484 | 12873 | 14263 | 15652 | 16346 |
| | Air | 295 | 430 | 629 | 877 | 1125 | 1373 | 1621 | 2117 | 2613 | 3109 | 3605 | 4101 | 4597 | 5093 | 5589 | 5837 |
| | Water | 48 | 68 | 88 | 108 | 124 | 139 | 152 | 176 | 197 | 215 | 233 | 249 | 264 | 278 | 292 | 298 |
| H | Steam | 1230 | 1880 | 2747 | 3831 | 4915 | 5999 | 7083 | 9251 | 11419 | 13587 | 15755 | 17923 | 20091 | 22259 | 24427 | 25511 |
| | Air | 460 | 671 | 981 | 1368 | 1755 | 2142 | 2529 | 3303 | 4078 | 4852 | 5626 | 6400 | 7174 | 7948 | 8722 | 9109 |
| | Water | 75 | 106 | 137 | 168 | 194 | 217 | 238 | 275 | 307 | 336 | 363 | 388 | 412 | 434 | 455 | 466 |
| J | Steam | 2016 | 3083 | 4504 | 6281 | 8059 | 9836 | 11613 | 15167 | 18721 | 22276 | 25830 | 29384 | 32939 | 36493 | 40047 | 41824 |
| | Air | 754 | 1101 | 1608 | 2243 | 2878 | 3512 | 4147 | 5416 | 6685 | 7954 | 9223 | 10493 | 11762 | 13031 | 14300 | 14935 |
| | Water | 123 | 174 | 225 | 276 | 318 | 356 | 390 | 450 | 503 | 551 | 595 | 637 | 675 | 712 | 746 | 763 |
| K | Steam | 2879 | 4402 | 6433 | 8971 | 11509 | 14047 | 16585 | 21661 | 26737 | 31813 | 36889 | 41965 | 47041 | 52116 | 57192 | 59730 |
| | Air | 1077 | 1572 | 2297 | 3203 | 4110 | 5016 | 5922 | 7735 | 9547 | 11360 | 13172 | 14985 | 16797 | 18610 | 20422 | 21329 |
| | Water | 176 | 249 | 321 | 394 | 455 | 508 | 557 | 643 | 719 | 787 | 850 | 909 | 964 | 1016 | 1066 | 1090 |
| L | Steam | 4470 | 6833 | 9985 | 13925 | 17864 | 21804 | 25743 | 33622 | 41501 | 49380 | 57260 | 65139 | 73018 | 80897 | 88776 | 92715 |
| | Air | 1672 | 2440 | 3565 | 4972 | 6379 | 7786 | 9192 | 12006 | 14819 | 17633 | 20446 | 23260 | 26073 | 28887 | 31700 | 33107 |
| | Water | 273 | 386 | 499 | 611 | 706 | 789 | 864 | 998 | 1116 | 1222 | 1320 | 1411 | 1497 | 1578 | 1655 | 1692 |
| M | Steam | 5640 | 8622 | 12599 | 17570 | 22541 | 27512 | 32483 | 42426 | 52368 | 62310 | 72252 | 82194 | 92136 | 102078 | 112020 | 116991 |
| | Air | 2109 | 3079 | 4499 | 6274 | 8049 | 9826 | 11599 | 15149 | 18700 | 22250 | 25800 | 29350 | 32900 | 36450 | 40000 | 41775 |
| | Water | 345 | 488 | 630 | 771 | 890 | 995 | 1090 | 1259 | 1408 | 1542 | 1666 | 1781 | 1889 | 1991 | 2088 | 2135 |
| N | Steam | 6799 | 10395 | 15189 | 21182 | 27175 | 33168 | 39161 | 51146 | 63132 | 75118 | 87104 | 99089 | 111075 | 123061 | 135046 | 141039 |
| | Air | 2543 | 3712 | 5424 | 7564 | 9704 | 11844 | 13984 | 18263 | 22543 | 26823 | 31103 | 35383 | 39663 | 43943 | 48223 | 50363 |
| | Water | 416 | 588 | 759 | 930 | 1073 | 1200 | 1315 | 1518 | 1697 | 1859 | 2008 | 2147 | 2277 | 2400 | 2517 | 2574 |
| P | Steam | 9995 | 15281 | 22329 | 31139 | 39948 | 48758 | 57568 | 75187 | 92807 | 110427 | 128046 | 145666 | 163285 | 180905 | 198524 | 207334 |
| | Air | 3738 | 5457 | 7973 | 11119 | 14265 | 17411 | 20556 | 26848 | 33140 | 39431 | 45723 | 52015 | 58306 | 64598 | 70890 | 74035 |
| | Water | 611 | 864 | 1116 | 1366 | 1578 | 1764 | 1932 | 2231 | 2495 | 2733 | 2952 | 3156 | 3347 | 3528 | 3700 | 3784 |
| Q | Steam | 17311 | 26466 | 38673 | 53931 | 69190 | 84448 | 99706 | 130223 | 160740 | 191256 | 221773 | | | | | |
| | Air | 6475 | 9451 | 13809 | 19258 | 24706 | 30155 | 35603 | 46500 | 57397 | 68294 | 79191 | | | | | |
| | Water | 1058 | 1497 | 1932 | 2367 | 2733 | 3055 | 3347 | 3865 | 4321 | 4733 | 5113 | | | | | |
| R | Steam | 25066 | 38322 | 55997 | 78090 | 100184 | 122277 | 144371 | 188558 | 232745 | 276932 | 321119 | | | | | |
| | Air | 9375 | 13684 | 19996 | 27885 | 35774 | 43663 | 51552 | 67331 | 83109 | 98888 | 114666 | | | | | |
| | Water | 1533 | 2167 | 2798 | 3427 | 3957 | 4424 | 4846 | 5596 | 6256 | 6854 | 7403 | | | | | |
| T | Steam | 40732 | 62274 | 90995 | 126897 | 162799 | 198701 | 234603 | 306407 | 378211 | 450014 | | | | | | |
| | Air | 15234 | 22237 | 32493 | 45313 | 58133 | 70953 | 83773 | 109412 | 135042 | 160692 | | | | | | |
| | Water | 2490 | 3522 | 4547 | 5569 | 6430 | 7189 | 7875 | 9093 | 10167 | 11137 | | | | | | |

NOTE

Capacities shown here are indicative. For detailed calculations, please provide the complete process data.

Type 441 HP Series Materials

| Type | Item | Component | Standard Application | Corrosive Application | High Temp. Application |
|------------------------------------------------------------------------|-----------|--------------------------------|-------------------------------|-----------------------------|-------------------------|
| C L O S E D C A P , H 2 | 1 | Body | A 216 Gr. WCB | A 351 Gr. CF 8/8M | A 217 Gr. WC6 |
| | 5 | Nozzle | SS 316 Stellite | SS 316 Stellite | SS 316 Stellite |
| | 7 | Disc Assembly | SS 316 Stellite | SS 316 Stellite | SS 316 Stellite |
| | 8 | Spindle Guide/ Guide Insert | A 216 Gr. WCB SS 316 | A 351 Gr. CF 8/8M SS 316 | A 216 Gr. WCB SS 316 |
| | 9 | Bonnet | A 216 Gr. WCB | A 351 Gr. CF 8/8M | A 217 Gr. WC6 |
| | 12 | Spindle | SS 316 | SS 316 | SS 316 |
| | 14 | Split Ring | SS 316 | SS 316 | SS 316 |
| | 16 | Spring Plate | CS ZN Plated | SS 316 | CS ZN Plated |
| | 18 | Adjusting Screw | SS 316 | SS 316 | SS 316 |
| | 19 | Lock Nut | SS 316 | SS 316 | SS 316 |
| | 42 | Cap (41) | A 216 Gr. WCB | A 351 Gr. CF 8/8M | A 216 Gr. WCB |
| | 54 | Spring | CS ZN. Plated/ Alloy Steel | Alloy Steel | Alloy Steel |
| | 55 | Stud | A 193 Gr. B7 | A 193 Gr. B8M | A 193 Gr. B7 |
| | 56 | Hex. Nut | A 194 Gr. 2H | A 194 Gr. 8M | A 194 Gr. 2H |
| | 57 | Roll Pin | SS | SS | SS |
| | 59 | Securing Ring | SS | SS | SS |
| | 60 | Gasket | Non Asbestos | Non Asbestos | Non Asbestos |
| | 61 | Ball | SS | SS | SS |
| | 69 | Axial Thrust Ball Bearing | Steel | Steel | Steel |
| | 75 | Spacer | Non Asbestos | Non Asbestos | Non Asbestos |
| 85 | Lead Seal | Lead | Lead | Lead | |
| 86 | Seal Wire | SS | SS | SS | |
| P A C K E D L E V E R , H 4 | 43 | Lever | CS | SS 316 | CS |
| | 44 | Lifting Fork | SS 316 | SS 316 | SS 316 |
| | 45 | Lever Shaft | SS 316 | SS 316 | SS 316 |
| | 46 | Spindle Cap | SS 316 | SS 316 | SS 316 |
| | 74 | Pin | SS | SS | SS |
| | 80 | Gland | CS | SS 316 | CS |
| | 82 | Hex. Nut | CS | SS | CS |

NOTE

Material of construction will vary according to the service conditions and customer requirement. Other special materials, for example, Monel, Alloy-20, CF 3, CF 3M and accessories such as Cooling Spacer, Test Gag, Heating Jacket, Drain Plug Soft Seat (O-Ring) Disc etc. can be provided on request.

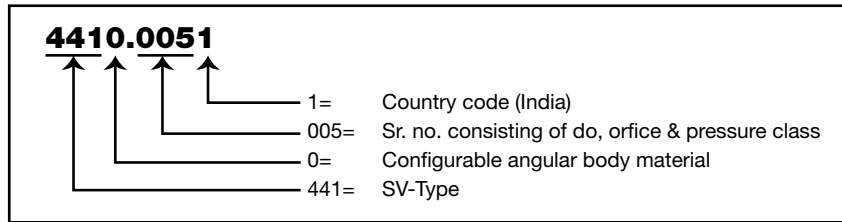
Type 441 HP Series

Article numbers

System for configuration

| | Valve Type | Country Code | Body Material | do/Orifice | Size Inlet | Pressure Rating Inlet | Size Outlet | Pressure Rating Outlet | Lifting Device | Bonnet Open / Closed |
|------------------------------|------------|--------------|---------------|------------|------------|-----------------------|-------------|------------------------|----------------|----------------------|
| Article No. | X | X | | X | | X | | | | |
| Configuration by option code | | | X | | X | X | X | X | X | X |

Example:



| Orifice (Area) | Type | | Nominal pressure class | | | |
|--------------------|------|---|------------------------|-------|-------|-------|
| | | | 600 | 900 | 1500 | 2500 |
| D (0.11 sq.in) | 4410 | . | 0051* | 0061* | 0071* | 0081* |
| E (0.196 sq.in) | 4410 | . | 0131 | 0141 | 0151 | 0161 |
| F (0.307sq. In) | 4410 | . | 0211 | 0221 | 0231 | 0241 |
| G (0.503 sq.in) | 4410 | . | 0291 | 0301 | 0311 | 0321 |
| H (0.785 sq.in) | 4410 | . | 0371 | 0381 | 0391 | |
| J (1.287 sq.in) | 4410 | . | 0441 | 0451 | 0461 | |
| K (1.838 sq.in) | 4410 | . | 0511 | 0521 | 0531 | |
| L (2.853 sq.in) | 4410 | . | 0581* | 0591 | 0601 | |
| M (3.60 sq.in) | 4410 | . | 0651 | | | |
| N (4.34 sq.in) | 4410 | . | 0711* | | | |
| P (6.38 sq.in) | 4410 | . | 0771 | | | |

NOTE

* Marked article nos. are not to be used for IBR certified valves
The standard sizes are shown in above table, other special sizes may be provided on request.

Type 441 HP Series Overall Dimensions

| Inlet | Outlet | | | | Height "H" Approx. | | Center to face | | |
|---------|---------|--------------------|-------------|---------------------|--------------------|---------------------|----------------|--------------|--------|
| Size mm | Size mm | Max. Set Pr. Bar g | Flow dia mm | Weight Approx. kgs. | Closed Cap, H2 mm | Packed Lever, H4 mm | Outlet "B" mm | Inlet "C" mm | "Y" mm |
| 25 | 50 | 143 | 18 | 15.0 | 450 | 475 | 100 | 135 | 13.0 |
| | | 160 | 15 | | | | | | |
| 40 | 50 | 143 | 18 | 18.0 | 435 | 460 | 152 | 124 | 13.0 |
| | | 160 | 15 | | | | | | |
| 40 | 80 | 78 | 29 | 25.0 | 510 | 535 | 120 | 145 | 14.0 |
| | | 130 | 23 | | | | | | |
| 50 | 80 | 73 | 37 | 35.0 | 565 | 590 | 120 | 170 | 16.0 |
| | | 120 | 29 | | | | | | |
| 80 | 100 | 48 | 46 | 50.0 | 670 | 720 | 155 | 180 | 16.0 |
| | | 90 | 37 | | | | | | |
| 100 | 150 | 36* | 74* | 105.0 | 835 | 885 | 190 | 215 | 17.0 |
| | | 55 | 60 | | | | | | |
| | | 86 | 46 | | | | | | |

NOTE

Special sizes & connections or different center to face dimensions etc. can also be provided on request.

Inlet flange rating shall be from ANSI 600# to ANSI 2500# & the corresponding outlet flange rating shall be ANSI 150# to ANSI 300# as per customer requirement.

*The applicable sizes are for only steam service when set pressure is above 32.0 bar g.

Discharge Capacities

Calculation of mass flow acc. to IBR 1950
(Saturated Steam capacity in kg/h)

| Flow dia mm | Set Pressure, bar _g | | | | | | | | | | | | | |
|-------------|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 32.1 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 55 | 60 | 65 | 70 |
| 18 | 3203 | 3387 | 3581 | 3774 | 3967 | 4161 | 4354 | 4548 | 4741 | 4935 | 5419 | 5902 | 6386 | 6870 |
| 23 | 5230 | 5530 | 5846 | 6162 | 6478 | 6794 | 7110 | 7425 | 7741 | 8057 | 8847 | 9637 | 10426 | 11216 |
| 29 | 8315 | 8792 | 9294 | 9796 | 10298 | 10800 | 11303 | 11805 | 12307 | 12809 | 14065 | 15320 | 16576 | 17831 |
| 37 | 13535 | 14311 | 15129 | 15946 | 16764 | 17581 | 18399 | 19216 | 20034 | 20851 | 22895 | 24939 | 26982 | 29026 |
| 46 | 20920 | 22120 | 23384 | 24647 | 25911 | 27175 | 28438 | 29702 | 30965 | 32229 | 35388 | 3846 | 41705 | 44864 |
| 60 | 35592 | 37634 | 39783 | 41933 | 44083 | 46233 | 48382 | 50532 | 52682 | 54831 | 60206 | | | |
| 74 | 54139 | 57245 | 60515 | | | | | | | | | | | |

NOTE

Capacities shown here are indicative. For detailed calculations, please provide the complete process data.

Type 441 HP Series Discharge Capacities

Calculation of mass flow acc. to ASME Sec. VIII Div. 1/ API 526

■ Saturated Steam capacity in lb/h

□ Air capacity at 15°C in scfm

□ Water capacity in U.S.gpm

| Orifice Letter | Medium | Set Pressure, psig | | | | | | | | | | | |
|----------------|--------|--------------------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|
| | | 575 | 600 | 625 | 675 | 700 | 750 | 775 | 800 | 850 | 900 | 950 | 1000 |
| D | Steam | 3575 | 3727 | 3879 | 4182 | 4334 | 4638 | 4790 | 4942 | 5246 | 5549 | 5853 | 6157 |
| | Air | 1276 | 1331 | 1385 | 1493 | 1548 | 1656 | 1710 | 1765 | 1873 | 1982 | 2090 | 2199 |
| | Water | 65 | 67 | 68 | 71 | 72 | 75 | 76 | 77 | 79 | 82 | 84 | 86 |
| E | Steam | 6370 | 6640 | 6911 | 7452 | 7723 | 8264 | 8535 | 8805 | 9347 | 9888 | 10429 | 10970 |
| | Air | 2274 | 2371 | 2468 | 2661 | 2758 | 2951 | 3048 | 3144 | 3338 | 3531 | 3724 | 3917 |
| | Water | 116 | 119 | 121 | 126 | 128 | 133 | 135 | 137 | 141 | 145 | 149 | 153 |
| F | Steam | 9977 | 10401 | 10825 | 11672 | 12096 | 12944 | 13368 | 13792 | 14640 | 15488 | 16336 | 17183 |
| | Air | 3563 | 3714 | 3865 | 4168 | 4319 | 462 | 4774 | 4925 | 5228 | 5530 | 5833 | 6136 |
| | Water | 182 | 186 | 190 | 197 | 201 | 208 | 211 | 215 | 221 | 228 | 234 | 240 |
| G | Steam | 16346 | 17041 | 17735 | 19125 | 19819 | 21208 | 21903 | 22597 | 23986 | 25376 | 26765 | 28154 |
| | Air | 5837 | 6085 | 6333 | 6829 | 7077 | 7573 | 7821 | 8069 | 8565 | 9061 | 9557 | 10053 |
| | Water | 298 | 305 | 311 | 323 | 329 | 341 | 346 | 352 | 363 | 373 | 383 | 393 |
| H | Steam | 25511 | 26595 | 27678 | 29846 | 30930 | 33098 | 34182 | 35266 | 37434 | 39602 | 41770 | 43938 |
| | Air | 9109 | 9496 | 9884 | 10658 | 11045 | 11819 | 12206 | 12593 | 13367 | 14141 | 14915 | 15689 |
| | Water | 466 | 476 | 485 | 504 | 514 | 532 | 540 | 549 | 566 | 582 | 598 | 614 |
| J | Steam | 41824 | 43601 | 45379 | 48933 | 50710 | 54264 | 56041 | 57819 | 61373 | 64927 | 68482 | 72036 |
| | Air | 14935 | 15569 | 16204 | 17473 | 18108 | 19377 | 20011 | 20646 | 21915 | 23184 | 24454 | 25723 |
| | Water | 763 | 780 | 796 | 827 | 842 | 872 | 886 | 900 | 928 | 955 | 981 | 1007 |
| K | Steam | 59730 | 62268 | 64806 | 69882 | | | | | | | | |
| | Air | 21329 | 22235 | 23141 | 24954 | | | | | | | | |
| | Water | 1090 | 1113 | 1136 | 1181 | | | | | | | | |
| L | Steam | 92715 | 96655 | 100595 | 108474 | 112413 | 120292 | 124232 | | | | | |
| | Air | 33107 | 34514 | 35921 | 38734 | 40141 | 42954 | 44361 | | | | | |
| | Water | 1692 | 1728 | 1764 | 1833 | 1867 | 1932 | 1964 | | | | | |
| M | Steam | 116991 | 121962 | 126933 | 136875 | 141846 | 151788 | 156759 | | | | | |
| | Air | 41775 | 43551 | 45326 | 48876 | 50651 | 54201 | 55976 | | | | | |
| | Water | 2135 | 2181 | 2226 | 2313 | 2356 | 2438 | 2479 | | | | | |
| N | Steam | 141039 | 147032 | 153025 | 165011 | 171004 | 182989 | 188982 | | | | | |
| | Air | 50363 | 52503 | 54643 | 58922 | 61062 | 65342 | 67482 | | | | | |
| | Water | 2574 | 2629 | 2683 | 2789 | 2840 | 2939 | 2988 | | | | | |

NOTE

Capacities shown here are indicative. For detailed calculations, please provide the complete process data.

Type 441

Pressure Temperature Ratings

| Body material: WCB | | | | | | | | |
|--------------------|-------------------|------|-------------------------|------|-------|-----------------------------|-------|-------|
| Orifice | Temperature range | 150 | 300L | 300 | 600 | 900 | 1500 | 2500 |
| D | -29 to 38 °C | 19.7 | Use 1D2 300# x 150# | 51.0 | 102.1 | Use 11/2 D2 1500# x 300# | 255.5 | 413.8 |
| | 39 to 232 °C | 12.8 | | 42.4 | 85.2 | | 212.4 | 354.1 |
| | 233 to 427 °C | 5.5 | | 28.3 | 56.9 | | 142.1 | 236.6 |
| E | -29 to 38 °C | 19.7 | Use 1E2 300# x 150# | 51.0 | 102.1 | Use 11/2 E2 1500# x 300# | 255.5 | 413.8 |
| | 39 to 232 °C | 12.8 | | 42.4 | 85.2 | | 212.4 | 354.1 |
| | 233 to 427 °C | 5.5 | | 28.3 | 56.9 | | 142.1 | 236.6 |
| F | -29 to 38 °C | 19.7 | 19.7 | 51.0 | 102.1 | Use 11/2 F3 1500# x 300# | 255.5 | 344.8 |
| | 39 to 232 °C | 12.8 | 19.7 | 42.4 | 85.2 | | 212.4 | 344.8 |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | | 142.1 | 236.6 |
| G | -29 to 38 °C | 19.7 | 19.7 | 51.0 | 102.1 | 153.1 | 255.5 | 255.5 |
| | 39 to 232 °C | 12.8 | 19.7 | 42.4 | 85.2 | 127.2 | 212.4 | 255.5 |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | 85.2 | 142.1 | 236.6 |
| H | -29 to 38 °C | 19.7 | 19.7 | 51.0 | 102.1 | 153.1 | 189.7 | |
| | 39 to 232 °C | 12.8 | 19.7 | 42.4 | 85.2 | 127.2 | 189.7 | |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | 85.2 | 142.1 | |
| J | -29 to 38 °C | 19.7 | 19.7 | 51.0 | 102.1 | 153.1 | 186.2 | |
| | 39 to 232 °C | 12.8 | 19.7 | 42.4 | 85.2 | 127.2 | 186.2 | |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | 85.2 | 142.1 | |
| K | -29 to 38 °C | 19.7 | Use 3K4 300# x 150# | 51.0 | 102.1 | 153.1 | 153.1 | |
| | 39 to 232 °C | 12.8 | | 42.4 | 85.2 | 127.2 | 153.1 | |
| | 233 to 427 °C | 5.5 | | 28.3 | 56.9 | 85.2 | 142.1 | |
| L | -29 to 38 °C | 19.7 | 19.7 | 51.0 | 69.0 | 103.4 | | |
| | 39 to 232 °C | 12.8 | 19.7 | 42.4 | 69.0 | 103.4 | | |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | 85.2 | 103.4 | |
| M | -29 to 38 °C | 19.7 | Use 4M6 300# x 150# | 51.0 | 75.9 | | | |
| | 39 to 232 °C | 12.8 | | 42.4 | 75.9 | | | |
| | 233 to 427 °C | 5.5 | | 28.3 | 56.9 | 75.9 | | |
| N | -29 to 38 °C | 19.7 | Use 4N6 300# x 150# | 51.0 | 69.0 | | | |
| | 39 to 232 °C | 12.8 | | 42.4 | 69.0 | | | |
| | 233 to 427 °C | 5.5 | | 28.3 | 56.9 | 69.0 | | |
| P | -29 to 38 °C | 19.7 | 19.7 | 36.2 | 69.0 | | | |
| | 39 to 232 °C | 12.8 | 19.7 | 36.2 | 69.0 | | | |
| | 233 to 427 °C | 5.5 | 19.7 | 28.3 | 56.9 | 69.0 | | |
| Q | -29 to 38 °C | 11.4 | Use 6Q8 300# x 150# | 20.7 | 41.4 | | | |
| | 39 to 232 °C | 11.4 | | 20.7 | 41.4 | | | |
| | 233 to 427 °C | 5.5 | | 20.7 | 41.4 | | | |
| R | -29 to 38 °C | 6.9 | 6.9 | 15.9 | 20.7 | | | |
| | 39 to 232 °C | 6.9 | 6.9 | 15.9 | 20.7 | | | |
| | 233 to 427 °C | 5.5 | 6.9 | 15.9 | 20.7 | | | |
| T | -29 to 38 °C | 4.5 | Use 8T10 300# x 150# | 20.7 | | | | |
| | 39 to 232 °C | 4.5 | | 20.7 | | | | |
| | 233 to 427 °C | 4.5 | | 20.7 | | | | |

NOTE

The above table shows pressure vs. temperature relationship for WCB material only. For other materials, please check for the limits. Pressure unit is in bar.

Type 441 Accessories

1. Safety Valves with Stainless Steel Bellows

There are two reasons for the use of stainless steel bellows:

- a) Bellows reliably seal the bonnet to the outlet chamber, protecting the guides, moving parts and the spring against failure through action of the fluid, such as dirt, corrosion, impurities or temperature.
- b) Stainless steel bellows compensate for the effects of back pressure. They are so designed that the effective area of the bellows is equivalent to that of the seating area.

Stainless steel bellows must be used when variable back pressure exceeds 15% of set pressure. It can be used for back pressure up to a maximum of 35% of the set pressure. The stainless steel balanced bellows' inherent stiffness affects set and function performance. The min. set pressure is also dependent on the nominal dia. (DN) chosen. Depending on the set pressure, either single or double-walled stainless steel bellows (standard) are used. A shield may also have to be installed if the unit is subjected to a particularly high level of stress, such as abrasive fluids, flow effects, etc.

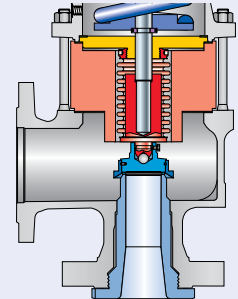
A 1/4" BSP/NPT control thread is fitted into the bonnet to monitor the efficiency of the bellows. A discharge pipe can be attached to the 1/4" threaded drain, in the event that provisions have to be made for a safe discharge of fluids in special cases e.g. aggressive or toxic fluids.

The design height of the safety valve is altered if the stainless steel bellows are installed.

Material & Limits of Application

| | |
|--------------------|--------------------------------|
| Bellow material | : SS 316 L / Inconel / Hast. C |
| Temperature limits | : Up to 450 °C |
| Set pressure | : 3.0 bar minimum |
| Back pressure | : Max. 35% of set pressure |

FF4: Stainless steel bellows



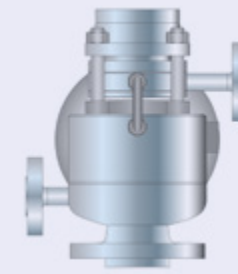
2. Safety Valves with Heating Jacket

Safety valve can be fitted with a heating jacket for special applications. Areas of application are systems to be protected from media, which are viscous, sticky or have tendency to crystallize out of solution.

In case of flanged safety valves without stainless steel bellows, only the bodies are fitted with a heating jacket. The heating connections for these safety valves shall be 1/2" NPT female or 1/2" ANSI 150 # RF.

Safety valves with stainless steel bellows: For safety valves with stainless steel bellows, the bonnet spacer required to house the bellows is fitted with an additional heating jacket. Both heating jackets are joined by a threaded pipe bend.

Heating jacket
FL8: Couplings 1/2" NPT
H31, H32: Flanges DN 15, DN 25



3. Safety Valves with Cooling Spacer

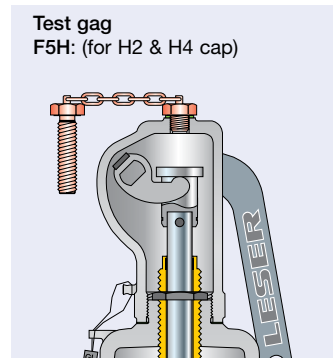
To protect the sliding parts and the spring against inadmissible influence of temperature an additional equipment will be necessary for all flanged spring loaded valves if the fluid temperature is 400 °C and higher.

If the temperature is higher than 450 °C stainless steel bellows should be provided as far as they are not fitted already by reason of the back pressure ratio.

Type 441 Accessories

4. Safety Valves with Test Gag

In order to allow the adjustment of each Safety Valve in a plant provided with several Safety Valves or to carry out a pressure test above the allowable operating pressure a test gag is required. The test gag is fitted in the lever cover and exerts force on top of the spindle. After testing the test gag shall be removed.

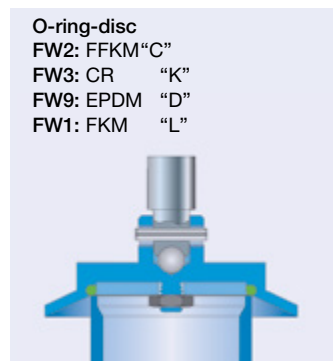


5. O-Ring-Disc Design

With increased demands on the tightness of a safety valve, the valve seat can be provided with a soft seal disc replacing the standard disc. In such cases, the temperature limits and medium resistance for the use of the particular elastomer must be considered.

The range of applications for the soft seal O-ring disc are as follows:

- Demand of higher tightness (2.6×10^{-8} lmbars⁻¹)
- Not so sensitive towards contaminating fluids
- Provides a tightness even if the valve seat is slightly damaged
- Lasting tightness even after repeated operation
- Can be used under vacuum conditions



¹⁾ actual tightness depends on valve type and pressure, specified values on request

| Code | Material | Code letter | Temp. min. | Temp. max. | Applications ²⁾ |
|-----------|---------------------|-------------|------------|------------|-------------------------------------------------------------------------------------------------------------------------|
| CR | Neoprene | K | -40 °C | 100 °C | Paraffin oil, silicone oil and grease, water and water based solvents, refrigerants, ozone |
| EPDM | Ethylene/ Propylene | D | -45 °C | 150 °C | Hot water and superheated steam up to 150 °C, several organic and inorganic acids, silicone oil and grease |
| FPM (FKM) | Viton | L | -20 °C | 180 °C | For high temperature service (no superheated steam), mineral oil and grease, vegetable and animal grease and oil, ozone |
| FFKM | Kalrez | C | 0 °C | 250 °C | Nearly all chemicals |

NOTE

²⁾ For every case, the pressure, temperature and service must be checked.

Other products



Type 526

Flanged safety relief valves with "UV" stamp, Designed as per API 526, Now available from LESER India.



Type 237

For all smaller capacity applications of steam, gases and liquids.



Type 549

Safety valve for gas, liquid or steam. Also for thermal relief application. Available in screwed and flanged connection for all utility applications.



Type 459*

Safety valve for gas, liquid or steam. Also for thermal relief application. Available in screwed and flanged connection for all utility applications. Can be supplied with "UV" stamp.

*Under development

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Assembly of safety valves

Type 441
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