

Flansch-Feder-Sicherheitsventile (Vollhub)

Flanged Full Lift Safety Valves spring loaded

4

| Inhalt | Contents | Type | Seite/Page |
|---|--|--------------------------------|------------|
| Vollhub-Feder-Sicherheitsventil bis PN 40 für Dämpfe, Gase und Flüssigkeiten | <i>Full Lift Safety Valve up to PN 40 spring loaded, for steam, gases and liquids</i> | 441, 442 DN 20-200 DIN | 4/10-14 |
| Vollhub-Feder-Sicherheitsventil #150-#300 für Dämpfe, Gase und Flüssigkeiten | <i>Full Lift Safety Valve up to #150-#300 spring loaded, for steam, gases and liquids</i> | 441, 442 1"-4" ANSI | 4/15-17 |
| Vollhub-Feder-Sicherheitsventil PN 25 (#150-#300) für Dämpfe, Gase und Flüssigkeiten | <i>Full Lift Safety Valve PN 25 (#150-#300) spring loaded, for steam, gases and liquids</i> | 441, 442 DN 200-400 XXL | 4/20-23 |
| Vollhub-Feder-Sicherheitsventil PN 63-160 für Dämpfe, Gase und Flüssigkeiten | <i>Full Lift Safety Valve PN 63-160 spring loaded, for steam, gases and liquids</i> | 455, 456 DN 25-100 | 4/40-43 |
| Vollhub-Feder-Sicherheitsventil PN 63-400 (#300-#2500) für Dämpfe, Gase und Flüssigkeiten | <i>Full Lift Safety Valve PN 63-400 (#300-#2500) spring loaded, for steam, gases and liquids</i> | 457, 458 DN 25-150 1"-6" | 4/50-56 |

Type
441, 442
DN 20 - 200
DIN

Vollhub-Feder-Sicherheitsventil bis PN 40
Full Lift Safety Valve up to PN 40 spring loaded
für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

Zusatzausrüstungen

- Edelstahl-Faltenbalg
- Elastomer-Faltenbalg
- Teller mit Weichdichtung
- Lösbare Hubhilfe
- Teller/Sitz gepanzert
- Heizmantel
- Entwässerungsbohrung
- Detailinformationen und weitere Zusatzausrüstungen siehe Teil 13

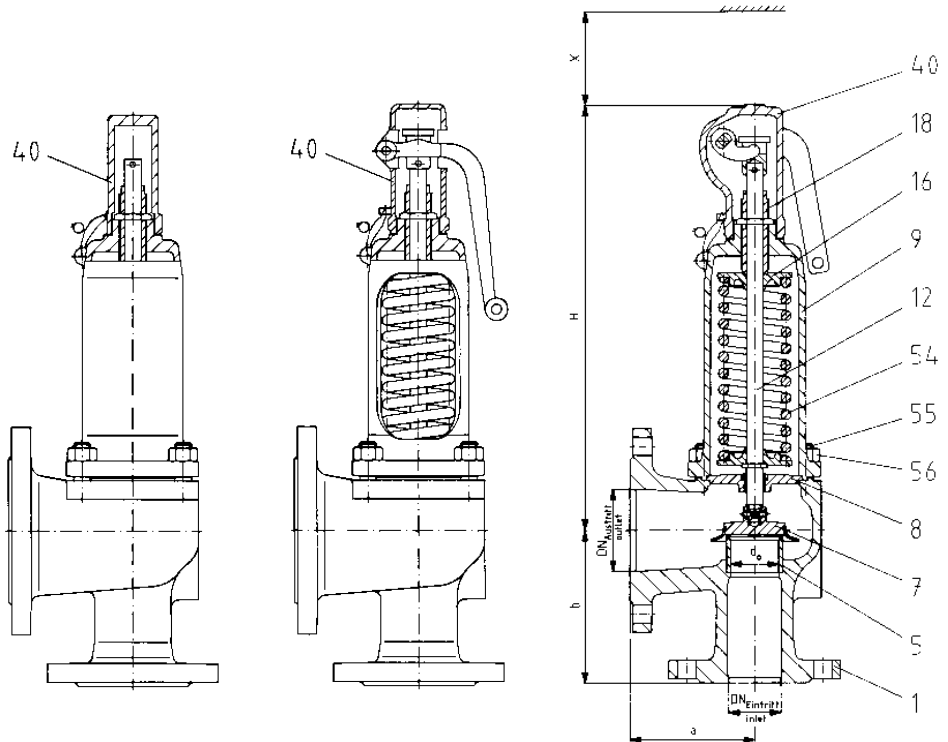
Accessories

- Stainless steel bellows
- Elastomer bellows
- Disc with soft seal
- Detachable lifting aid
- Disc / Seat stellited
- Heating jacket
- Drain hole

For detailed information and additional accessories refer to section 13

Zulassungen / Approvals

| | Dämpfe/Gase D/G Steam/Gases S/G | | Flüssigkeiten F Liquids L | | | | | |
|---|------------------------------------|-------------|--------------------------------|------------------|--------------------------------|------------------|--------------------------------|--|
| | 576 | | 576 | | 576 | | 576 | |
| TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/Coefficient of discharge α_d Öffnungscharakteristik/Opening characteristic | 576 0,7 Vollhub/Full lift | | 576 0,45 Normal/Standard | | 576 0,45 Normal/Standard | | 576 0,45 Normal/Standard | |
| ASME/NB (außer/excl. DN 20) Nr./No. Ausflussziffer/Coefficient of discharge K | 37044 0,699 | | 37055 0,521 | | 37055 0,521 | | 37055 0,521 | |
| Weitere / Others siehe Seite/refer to page 2/40-41 | DGR/PED Kanada | BV KISCO | CBPVI LROS | DIN GOST RINA | DNV TMBEF | GL Tschechien | ISPESL UDT | |



Type 441
mit gasdichter Kappe H2
with gastight cap H2

Type 442
offene Federhaube mit
Anlüftung H3,
Teller anlüftbar
open bonnet
lifting device H3,
disc liftable

Type 441
geschlossene Federhaube mit
Anlüftung H4, gasdicht,
Teller anlüftbar
closed bonnet
lifting device H4, gastight,
disc liftable

| Gehäusewerkstoff Body material | | | DN | | Flanschanschlüsse 1) Flange connections 1) nach/acc. to DIN PN | | Temperatureinsatzbereich °C 2) Temperature range °F 2) Federhaube | | | | Type | |
|-----------------------------------|---------------|------------|------|-----|--|----------|--|-----------|-----------|-----------|---------|-------|
| DIN EN | | ASME | von | bis | Eintritt | Austritt | DIN EN | | ASME | | geschl. | offen |
| Werkstoffbezeichnung | Werkstoff-Nr. | | from | to | Inlet | Outlet | from | to | from | to | closed | open |
| GG-25 | 0.6025 | - | 25 | 150 | 16 | 16 | -10/+14 | +300/+572 | - | - | 4411 | 4421 |
| GGG-40.3 | 0.7043 | SA 395 | 25 | 100 | 40 | 16 | -60/-76 | +350/+662 | -10/+14 | +350/+662 | 4415 | 4425 |
| | | | 200 | 150 | 16 | 16 | | | | | | |
| | | | 200 | 150 | 25 | 10 | | | | | | |
| GP 240 GH | 1.0619 | SA 216 WCB | 20 | 150 | 40 | 16 | -85/-121 | +450/+842 | -29/-20 | +427/+800 | 4412 | 4422 |
| | | | 200 | 150 | 25 | 16 | | | | | | |
| GX5CrNiMo19-11-2 | 1.4408 | SA 351CF8M | 25 | 150 | 40 | 16 | -270/-454 | +400/+752 | -268/-450 | +300/+572 | 4414 | - |

1) Anschlussmaße nach ANSI B16.5 150 lbs. möglich.

2) Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

1) Dimensions acc. to ANSI B16.5 150 lbs. possible.

2) Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

| Gehäusewerkstoff / Body material | | | | Nennweite / Nominal Diameter | | | | | | | | | | | | |
|----------------------------------|-----------------------|-------------------------------|----------------------|------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| DIN EN | | Werkstoff-Nr. Material No. | ASME | DN | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 | 200 | |
| Federhaube / Bonnet | geschlossen closed | GG-25 | 0.6025 | - | 4411 | .437* | .438* | .439* | .440* | .441* | .442* | .443* | .444* | .445* | .446* | - |
| | | GGG-40.3 | 0.7043 | SA 395 | 4415 | - | .738* | .739* | .740* | .741* | .742* | .743* | .744* | .745* | .746* | .747* |
| | | GP 240 GH | 1.0619 | SA 216 WCB | 4412 | .450* | .451* | .452* | .453* | .454* | .455* | .456* | .457* | .458* | .459* | .461* |
| | | GX5 CrNiMo 19-11-2 | 1.4408 ¹⁾ | SA 351CF8M | 4414 | - | .464* | .465* | .466* | .467* | .468* | .469* | .470* | .471* | .472* | - |
| | offen open | GG-25 | 0.6025 | - | 4421 | .4375 | .4385 | .4395 | .4405 | .4415 | .4425 | .4435 | .4445 | .4455 | .4465 | - |
| | | GGG-40.3 | 0.7043 | SA 395 | 4425 | - | .7385 | .7395 | .7405 | .7415 | .7425 | .7435 | .7445 | - | - | .7475 |
| | | GP 240 GH | 1.0619 | SA 216 WCB | 4422 | .4505 | .4515 | .4525 | .4535 | .4545 | .4555 | .4565 | .4575 | .4585 | .4595 | .4615 |
| | | | | | | | | | | | | | | | | |

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

- 2 = Kappe H 2
- 3 = Anlüftung H 3 (offen)
- 4 = Anlüftung H 4 (gasdicht)

- 1) H3 ist bei diesem Werkstoff nicht lieferbar.
- 2) Artikelnummer auf Anfrage.

Bei Bestellung bitte Artikelnummer, Ansprechdruck und Anschlüsse entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatz-ausrüstung (siehe Teil 13) angeben.

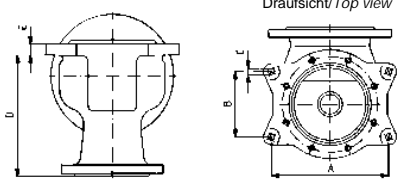
* Please add number for the required cap or lifting device:

- 2 = Cap H 2
- 3 = Lifting device H 3 (open)
- 4 = Lifting device H 4 (gastight)

- 1) H3 is not available in this material.
- 2) Article number on request.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

| Nennweite, Ventilgröße | | Nominal Diameter, Valve size | | DN | - | 20 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 | 200 | | | |
|---|------------------|---------------------------------------|------------------|-------------------|-----------------|--|-----|-----|-----|------|------|------|------|------|------|-------|-------|------|-------------------|----|
| Nennweite, Austritt | | Nominal Diameter, Outlet | | DN | - | 32 | 40 | 40 | 50 | 65 | 80 | 100 | 125 | 150 | 200 | 250 | 300 | | | |
| Druckstufe Eintritt | GG | Pressure rating Inlet | CI | PN | - | 16 | - | 16 | | | | | | | | - | | | | |
| | GGG | | NCI | PN | - | - | - | 40 | | | | | | | | 16 | 16 | 25 | | |
| | GS, GX | | CS, SS | PN | - | - | - | 40 | | | | | | | | - | - | 25 | | |
| Druckstufe Austritt | GG | Pressure rating Outlet | CI | PN | - | 16 | - | 16 | | | | | | | | - | | | | |
| | GGG | | NCI | PN | - | - | - | 16 | | | | | | | | 10 | | | | |
| | GS | | CS | PN | - | - | - | 16 | | | | | | | | - | | | | |
| Max. Ansprechdruck | GG | Max. Set pressure | CI | p | bar/bar g | 16 | - | 16 | | | | | | | | - | | | | |
| | GGG | | NCI | p | bar/bar g | - | - | 40 | | | | | | | | 32 | 40 | 16 | 16 | 20 |
| | GS | | CS | p | bar/bar g | - | - | 40 | | | | | | | | 32 | 40 | 28 | 17 | 20 |
| | GX ¹⁾ | | SS ¹⁾ | p | bar/bar g | - | - | 40 | | | | 33 | 28 | 13,6 | 15 | 15 | 7 | - | | |
| Engster Strömungsquerschnitt | | Flow area | | A ₀ | mm ² | 254 | 254 | 416 | 661 | 1075 | 1662 | 2827 | 4301 | 6648 | 7543 | 12272 | 21382 | | | |
| Engster Strömungsdurchmesser | | Flow diameter | | d ₀ | mm | 18 | 18 | 23 | 29 | 37 | 46 | 60 | 74 | 92 | 98 | 125 | 165 | | | |
| Schenkellänge | | Centre to face dim. | | a | mm | 95 | 95 | 100 | 110 | 115 | 120 | 140 | 160 | 180 | 200 | 225 | 300 | | | |
| | | | | b | mm | 85 | 85 | 105 | 115 | 140 | 150 | 170 | 195 | 220 | 250 | 285 | 290 | | | |
| Bauhöhe | H2 | GG GGG GS | H2 | CI | H | mm | - | 217 | 232 | 315 | 356 | 403 | 481 | 558 | 615 | 615 | 728 | 1090 | | |
| | H3 | | H3 | NCI | H | mm | 215 | 218 | 233 | 325 | 366 | 413 | 526 | 603 | 660 | 660 | 735 | 1090 | | |
| | H4 | | H4 | CS | H | mm | - | 219 | 234 | 331 | 372 | 419 | 529 | 606 | 663 | 663 | 735 | 1090 | | |
| | H2 | GX | H2 | SS | H | mm | - | - | 232 | 315 | 356 | 403 | 481 | 558 | 615 | 615 | 728 | - | | |
| | H4 | | H4 | SS | H | mm | - | - | 234 | 322 | 363 | 410 | 529 | 606 | 663 | 663 | 735 | - | | |
| mit Faltenbalg zus. | | | | with bellows add. | H | mm | - | 33 | 39 | 42 | 38 | 46 | 70 | 59 | 56 | 56 | 58 | - | | |
| Deckenfreiheit | | Height clearance | | x | mm | 150 | 150 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 450 | 450 | 700 | | | |
| Gewicht | | Weight | | - | kg | 9 | 9 | 9 | 12 | 16 | 22 | 32 | 56 | 75 | 85 | 131 | 285 | | | |
| Spannpratzen (Nur auf Anforderung gebohrt) | | Brackets (Drilled only on request) | | A | mm |  | | | | | | | | | | 277 | 277 | 320 | 490 | |
| | | | | B | mm | | | | | | | | | | | 160 | 160 | 185 | 150 ²⁾ | |
| | | | | C | mm | | | | | | | | | | | ∅18 | ∅18 | ∅18 | ∅18 | |
| | | | | D | mm | | | | | | | | | | | 293 | 318 | 392 | 489 ³⁾ | |
| | | | | E | mm | | | | | | | | | | | 21 | 21 | 28 | 25 ⁴⁾ | |

1) Höhere Ansprechdrücke durch Einsatz von Sonderfedern möglich. / Higher set pressures are possible by fitting special springs.

3) GGG/NCI: 290 mm

4) GGG/NCI: 16 mm

2) GS/CS: 100 mm

Werkstoffe / Materials

| Pos. Item | Bauteile | Parts | 4411/4421 | 4415/4425 | 4412/4422 | 4414 | |
|--------------|--------------------------|---------------------------|---|-----------------|------------------|---|--------|
| | | | GG CI | GGG NCI | GS CS | Korrosionsfest, kaltzäh corrosion resistant, cryogenic | |
| 1 | Gehäuse | Body | GG-25 0.6025 | GGG-40.3 0.7043 | GP 240 GH 1.0619 | GX5 Cr Ni Mo 19-11-2 1.4408 | |
| 5 | Sitz | Seat | X2 Cr Ni Mo 17-12-2 | | | | 1.4404 |
| 7 | Teller | Disc | X 39 Cr Mo 17-1 1.4122 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| 8 | Führungsscheibe | Guide | X 14 Cr Mo S 17/C35/GGG-40 1.4104/1.0501/0.7040 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| | mit Buchse | with bush | X 14 Cr Mo S 17 tenifer 1.4104 tenifer | | | | |
| 9 | Federhaube | Bonnet | GGG-40 (GGG-40.3/GP 240 GH) 0.7040 (0.7043/1.0619) | | | GX5 Cr Ni Mo 19-11-2 1.4408 | |
| | | | | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| | | | | | | X 6 Cr Ni Mo Ti 17-12-2 1.4571 | |
| 12 | Spindel | Spindle | X 20 Cr 13 1.4021 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| 16 | Federteller | Spring plate | 11 S Mn Pb 30/X 2 Cr Ni Mo 17-12-2 1.0718/1.4404 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| 18 | Druckschraube mit Buchse | Adjusting screw with bush | X 2 Cr Ni Mo 17-12-2/X 14 Cr Mo S 17 1.4404/1.4104 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| | | | PTFE | | | PTFE | PTFE |
| 54 | Feder | Spring | Federstahldraht C/Spring steel wire C 54 Si Cr 6/51 Cr V 4/X 10 Cr Ni 18 8 1.1200/1.7102/1.8159/1.4310 | | | X 10 Cr Ni 18 8 1.4310 | |
| | | | t > 200 °C 54 Cr Si 6/51 Cr V 4/X 10 Cr Ni 18 8 1.7102/1.8159/1.4310 | | | | |
| 40 | Kappe H 2 | Cap H 2 | 11 S Mn Pb 30/GGG40.3 1.0718/0.7043 | | | X 2 Cr Ni Mo 17-12-2 1.4404 | |
| | Anlüftung H 3 | Lifting device H 3 | GGG-40 0.7040 | | | | |
| | Anlüftung H 4 | Lifting device H 4 | GGG-40 0.7040 | | | GX5 Cr Ni Mo 19-11-2 1.4408 | |
| 55/ 56 | Stiftschraube Mutter | Bolt nut | t < 400 °C Ck 35/C 35 1.1181/1.0501 | | | A 4-70/A 4 1.4401/1.4401 | |
| | | | t > 400 °C | | | A 4-70/A 4 1.4401/1.4401 | |

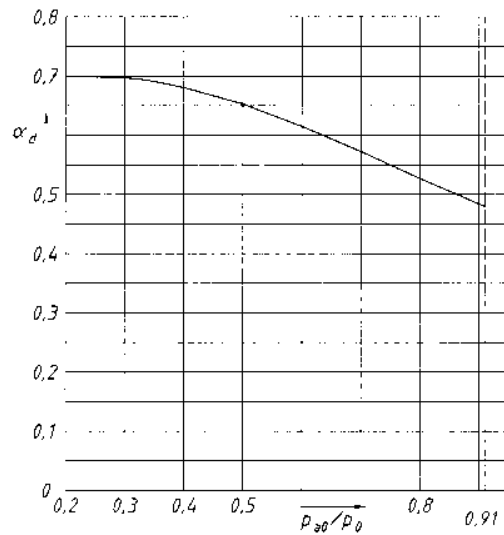
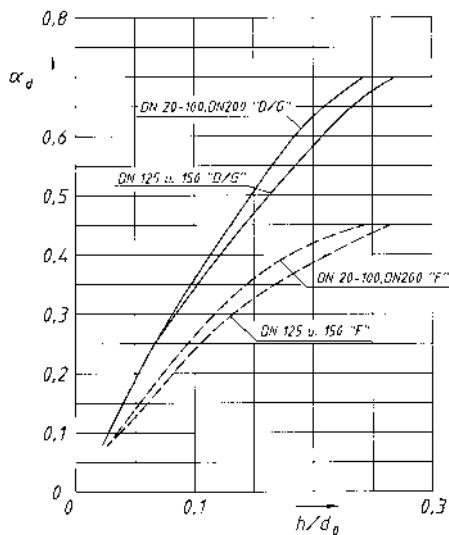
Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1

$$\alpha_d = f(h/d_o)$$

Diagramm 2

$$\alpha_d = f(p_{a0}/p_o)$$



h = Hub (mm)
 d_o = engster Strömungsdurchmesser (mm)
 p_{a0} = Gegendruck, bar (abs.)
 p_o = Ansprechdruck, bar (abs.)

h = Lift (mm)
 d_o = Flow diameter (mm)
 p_{a0} = Back pressure, bar (abs.)
 p_o = Set pressure, bar (abs.)

Type 441, 442 DN 20-200 DIN

| Leistungstabelle | | Discharge Capacities | |
|--|----------------------------|---|---------|
| Berechnungen aus VALVESTAR® 6.2.50 | | Calculations from VALVESTAR® 6.2.50 | |
| Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421 | | Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421 | |
| p | Ansprechüberdruck | Set pressure | bar g |
| I | Sattdampf | Saturated steam | kg/h |
| II | Luft bei 0°C und 1013 mbar | Air at 0°C and 1013 mbar | m³/h |
| III | Wasser bei 20°C | Water at 20°C | 10³kg/h |

| DN | 20 | | | 25 | | | 32 | | | 40 | | | 50 | | | 65 | | |
|---------------------|------|------|------|------|------|------|------|-------|------|-------|-------|------|-------|-------|------|-------|-------|------|
| d ₀ (mm) | 18 | | | 23 | | | 29 | | | 37 | | | 46 | | | 60 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 0,2 | 85 | 99 | 3,19 | 139 | 161 | 5,21 | 222 | 257 | 8,28 | 361 | 418 | 13,5 | 558 | 646 | 20,8 | 949 | 1099 | 35,4 |
| 0,5 | 134 | 157 | 4,51 | 219 | 257 | 7,37 | 348 | 409 | 11,7 | 566 | 665 | 19,1 | 875 | 1028 | 29,5 | 1489 | 1749 | 50,1 |
| 1 | 198 | 237 | 6,11 | 324 | 386 | 9,97 | 515 | 614 | 15,9 | 839 | 999 | 25,8 | 1296 | 1545 | 39,9 | 2205 | 2628 | 67,9 |
| 2 | 317 | 383 | 8,64 | 517 | 625 | 14,1 | 822 | 993 | 22,4 | 1339 | 1617 | 36,5 | 2069 | 2499 | 56,4 | 3520 | 4251 | 96,0 |
| 3 | 427 | 522 | 10,6 | 697 | 852 | 17,3 | 1108 | 1354 | 27,5 | 1804 | 2204 | 44,7 | 2788 | 3406 | 69,1 | 4744 | 5795 | 118 |
| 4 | 533 | 655 | 12,2 | 870 | 1069 | 19,9 | 1382 | 1700 | 31,7 | 2250 | 2768 | 51,6 | 3478 | 4278 | 79,8 | 5918 | 7278 | 136 |
| 5 | 638 | 788 | 13,7 | 1041 | 1287 | 22,3 | 1656 | 2047 | 35,5 | 2695 | 3331 | 57,7 | 4165 | 5149 | 89,2 | 7087 | 8761 | 152 |
| 6 | 743 | 922 | 15,0 | 1213 | 1505 | 24,4 | 1928 | 2393 | 38,8 | 3138 | 3895 | 63,2 | 4850 | 6021 | 97,7 | 8252 | 10243 | 166 |
| 7 | 845 | 1055 | 16,2 | 1380 | 1723 | 26,4 | 2193 | 2739 | 42,0 | 3570 | 4459 | 68,3 | 5518 | 6892 | 106 | 9388 | 11726 | 180 |
| 8 | 949 | 1189 | 17,3 | 1550 | 1941 | 28,2 | 2464 | 3086 | 44,8 | 4010 | 5023 | 73,0 | 6198 | 7763 | 113 | 10545 | 13208 | 192 |
| 9 | 1053 | 1322 | 18,3 | 1719 | 2159 | 29,9 | 2733 | 3432 | 47,6 | 4450 | 5587 | 77,4 | 6878 | 8635 | 120 | 11701 | 14691 | 204 |
| 10 | 1157 | 1456 | 19,3 | 1889 | 2377 | 31,5 | 3003 | 3778 | 50,1 | 4889 | 6150 | 81,6 | 7556 | 9506 | 126 | 12856 | 16173 | 215 |
| 12 | 1365 | 1722 | 21,2 | 2228 | 2812 | 34,6 | 3542 | 4471 | 54,9 | 5766 | 7278 | 89,4 | 8913 | 11249 | 138 | 15163 | 19138 | 235 |
| 14 | 1568 | 1989 | 22,9 | 2560 | 3248 | 37,3 | 4070 | 5164 | 59,3 | 6625 | 8405 | 96,6 | 10241 | 12992 | 149 | 17423 | 22104 | 254 |
| 16 | 1775 | 2256 | 24,4 | 2898 | 3684 | 39,9 | 4608 | 5856 | 63,4 | 7501 | 9533 | 103 | 11594 | 14735 | 160 | 19725 | 25069 | 271 |
| 18 | 1983 | 2523 | 25,9 | 3237 | 4119 | 42,3 | 5147 | 6549 | 67,3 | 8378 | 10661 | 110 | 12949 | 16478 | 169 | 22030 | 28034 | 288 |
| 20 | 2191 | 2790 | 27,3 | 3577 | 4555 | 44,6 | 5686 | 7242 | 70,9 | 9256 | 11788 | 115 | 14306 | 18220 | 178 | 24339 | 30999 | 304 |
| 22 | 2392 | 3057 | 28,7 | 3906 | 4991 | 46,8 | 6209 | 7934 | 74,4 | 10107 | 12916 | 121 | 15623 | 19963 | 187 | 26579 | 33964 | 318 |
| 24 | 2600 | 3324 | 29,9 | 4246 | 5427 | 48,9 | 6750 | 8627 | 77,7 | 10987 | 14043 | 126 | 16982 | 21706 | 195 | 28892 | 36929 | 333 |
| 26 | 2809 | 3590 | 31,1 | 4586 | 5862 | 50,9 | 7291 | 9320 | 80,9 | 11869 | 15171 | 132 | 18345 | 23449 | 203 | 31211 | 39894 | 346 |
| 28 | 3018 | 3857 | 32,3 | 4928 | 6298 | 52,8 | 7835 | 10012 | 83,9 | 12753 | 16298 | 137 | 19712 | 25192 | 211 | 33537 | 42859 | 359 |
| 30 | 3228 | 4124 | 33,5 | 5271 | 6734 | 54,6 | 8379 | 10705 | 86,8 | 13640 | 17426 | 141 | 21083 | 26935 | 219 | 35869 | 45824 | 372 |
| 32 | 3439 | 4391 | 34,6 | 5615 | 7169 | 56,4 | 8926 | 11398 | 89,7 | 14530 | 18554 | 146 | 22459 | 28677 | 226 | 38210 | 48790 | 384 |
| 34 | | 4658 | 35,6 | | 7605 | 58,2 | | 12090 | 92,5 | | 19681 | 151 | | 30420 | 233 | | 51755 | 396 |
| 36 | | 4925 | 36,7 | | 8041 | 59,8 | | 12783 | 95,1 | | 20809 | 155 | | 32163 | 239 | | 54720 | 407 |
| 38 | | 5192 | 37,7 | | 8476 | 61,5 | | 13476 | 97,7 | | 21936 | 159 | | 33906 | 246 | | 57685 | 418 |
| 40 | | 5459 | 38,6 | | 8912 | 63,1 | | 14169 | 100 | | 23064 | 163 | | 35649 | 252 | | 60650 | 429 |

| DN | 80 | | | 100 | | | 125 | | | 150 | | | 200 | | | | | |
|---------------------|-------|-------|------|-------|--------|------|-------|--------|------|--------|--------|------|--------|--------|------|--|--|--|
| d ₀ (mm) | 74 | | | 92 | | | 98 | | | 125 | | | 165 | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | | | |
| 0,2 | 1444 | 1672 | 53,9 | 2232 | 2584 | 83,3 | 2532 | 2932 | 94,6 | 4120 | 4770 | 154 | 7178 | 8311 | 268 | | | |
| 0,5 | 2265 | 2661 | 76,3 | 3502 | 4113 | 118 | 3973 | 4667 | 134 | 6464 | 7593 | 218 | 11263 | 13230 | 379 | | | |
| 1 | 3355 | 3998 | 103 | 5185 | 6179 | 160 | 5883 | 7011 | 181 | 9572 | 11407 | 295 | 16678 | 19876 | 513 | | | |
| 2 | 5355 | 6467 | 146 | 8277 | 9995 | 226 | 9392 | 11341 | 256 | 15280 | 18452 | 417 | 26623 | 32150 | 726 | | | |
| 3 | 7216 | 8816 | 179 | 11153 | 13626 | 276 | 12655 | 15461 | 314 | 20589 | 25154 | 510 | 35873 | 43828 | 889 | | | |
| 4 | 9002 | 11071 | 206 | 13913 | 17111 | 319 | 15787 | 19416 | 362 | 25685 | 31589 | 589 | 44753 | 55040 | 1027 | | | |
| 5 | 10780 | 13326 | 231 | 16662 | 20597 | 357 | 18906 | 23371 | 405 | 30758 | 38023 | 659 | 53593 | 66252 | 1148 | | | |
| 6 | 12552 | 15581 | 253 | 19401 | 24083 | 391 | 22014 | 27326 | 444 | 35815 | 44458 | 722 | 62404 | 77463 | 1257 | | | |
| 7 | 14281 | 17836 | 273 | 22073 | 27568 | 422 | 25046 | 31281 | 479 | 40748 | 50893 | 779 | 71000 | 88675 | 1358 | | | |
| 8 | 16041 | 20091 | 292 | 24794 | 31054 | 451 | 28133 | 35237 | 512 | 45770 | 57327 | 833 | 79750 | 99887 | 1452 | | | |
| 9 | 17799 | 22346 | 310 | 27510 | 34540 | 479 | 31216 | 39192 | 543 | 50786 | 63762 | 884 | 88489 | 111099 | 1540 | | | |
| 10 | 19555 | 24601 | 326 | 30225 | 38025 | 505 | 34296 | 43147 | 573 | 55797 | 70197 | 932 | 97221 | 122311 | 1623 | | | |
| 12 | 23065 | 29112 | 358 | 35650 | 44997 | 553 | 40452 | 51057 | 627 | 65812 | 83066 | 1021 | 114671 | 144734 | 1778 | | | |
| 14 | 26502 | 33622 | 386 | 40962 | 51968 | 597 | 46479 | 58967 | 678 | 75619 | 95936 | 1102 | 131758 | 167158 | 1921 | | | |
| 16 | 30004 | 38132 | 413 | 46376 | 58939 | 638 | 52622 | 66878 | 724 | 85612 | 108805 | 1178 | 149170 | 189582 | 2053 | | | |
| 18 | 33510 | 42642 | 438 | 51795 | 65910 | 677 | 58772 | 74788 | 768 | 95617 | 121674 | 1250 | 166603 | 212005 | 2178 | | | |
| 20 | 37023 | 47153 | 462 | 57224 | 72882 | 714 | 64932 | 82698 | 810 | 105639 | 134544 | 1317 | 184066 | 234429 | 2296 | | | |
| 22 | 40430 | 51663 | 484 | 62491 | 79853 | 748 | 70907 | 90608 | 849 | 115361 | 147413 | 1382 | 201005 | 256853 | 2408 | | | |
| 24 | 43948 | 56173 | 506 | 67928 | 86824 | 782 | 77078 | 98519 | 887 | 125399 | 160282 | 1443 | 218496 | 279276 | 2515 | | | |
| 26 | 47475 | 60684 | 526 | 73380 | 93796 | 814 | | 106429 | 923 | | 173152 | 1502 | | | | | | |
| 28 | 51013 | 65194 | 546 | 78848 | 100767 | 844 | | 114339 | 958 | | 186021 | 1559 | | | | | | |
| 30 | 54561 | 69704 | 565 | 84333 | 107738 | 874 | | 122249 | 992 | | 198891 | 1614 | | | | | | |
| 32 | 58121 | 74214 | 584 | 89835 | 114710 | 903 | | 130160 | 1024 | | 211760 | 1666 | | | | | | |
| 34 | | 78725 | 602 | | 121681 | 931 | | 138070 | 1056 | | 224629 | 1718 | | | | | | |
| 36 | | 83235 | 619 | | 128652 | 957 | | 145980 | 1086 | | 237499 | 1768 | | | | | | |
| 38 | | 87745 | 636 | | 135623 | 984 | | 153890 | 1116 | | 250368 | 1816 | | | | | | |
| 40 | | 92255 | 653 | | 142595 | 1009 | | 161801 | 1145 | | 263238 | 1863 | | | | | | |

Type 441, 442 DN 25-200 DIN

| Leistungstabelle | | Discharge Capacities | |
|---|---|---|-------------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | Calculations from VALVESTAR® 6.2.50 | |
| Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet. | | Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure. | |
| p | Ansprechüberdruck | Set pressure | psig |
| I | Sattdampf, Abblasen gegen Atmosphärengedruck (14,7 psi) | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi) | lb/h |
| II | Luft bei 60°F, Abblasen gegen Atmosphärengedruck (14,7 psi) | Air at 60°F, valve discharging to atmospheric pressure (14,7 psi) | SCFM |
| III | Wasser bei 70°F | Water at 70°F | U.S. gallons per minute |

| DN | 25 | | | 32 | | | 40 | | | 50 | | | 65 | | | 80 | | |
|---------------------|-------|------|------|-------|------|------|-------|-------|-----|-------|-------|------|-------|-------|------|--------|-------|------|
| d _o (mm) | 23 | | | 29 | | | 37 | | | 46 | | | 60 | | | 74 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 15 | 754 | 268 | 54,1 | 1198 | 427 | 86,0 | 1950 | 695 | 140 | 3015 | 1074 | 216 | 5129 | 1827 | 368 | 7802 | 2779 | 560 |
| 20 | 870 | 310 | 61,1 | 1383 | 493 | 97,2 | 2250 | 802 | 158 | 3478 | 1239 | 245 | 5918 | 2108 | 416 | 9002 | 3207 | 633 |
| 40 | 1356 | 483 | 84,6 | 2156 | 768 | 134 | 3510 | 1251 | 219 | 5426 | 1933 | 338 | 9231 | 3289 | 576 | 14041 | 5002 | 875 |
| 60 | 1866 | 665 | 104 | 2967 | 1057 | 165 | 4830 | 1721 | 268 | 7466 | 2660 | 414 | 12702 | 4525 | 705 | 19321 | 6882 | 1072 |
| 80 | 2376 | 847 | 120 | 3778 | 1346 | 190 | 6150 | 2191 | 310 | 9506 | 3386 | 478 | 16173 | 5762 | 814 | 24600 | 8763 | 1238 |
| 100 | 2886 | 1028 | 134 | 4589 | 1635 | 213 | 7470 | 2662 | 346 | 11546 | 4113 | 535 | 19643 | 6998 | 910 | 29880 | 10643 | 1384 |
| 120 | 3397 | 1210 | 146 | 5400 | 1924 | 233 | 8790 | 3132 | 379 | 13586 | 4840 | 586 | 23114 | 8235 | 997 | 35159 | 12524 | 1516 |
| 140 | 3907 | 1392 | 158 | 6211 | 2213 | 252 | 10110 | 3602 | 410 | 15626 | 5566 | 633 | 26585 | 9471 | 1077 | 40439 | 14405 | 1638 |
| 160 | 4417 | 1573 | 169 | 7021 | 2502 | 269 | 11430 | 4072 | 438 | 17666 | 6293 | 677 | 30056 | 10708 | 1151 | 45718 | 16285 | 1751 |
| 180 | 4927 | 1755 | 179 | 7832 | 2791 | 285 | 12749 | 4543 | 464 | 19706 | 7020 | 718 | 33527 | 11944 | 1221 | 50998 | 18166 | 1857 |
| 200 | 5437 | 1937 | 189 | 8643 | 3079 | 301 | 14069 | 5013 | 490 | 21746 | 7747 | 756 | 36998 | 13181 | 1287 | 56277 | 20046 | 1957 |
| 220 | 5947 | 2118 | 198 | 9454 | 3368 | 315 | 15389 | 5483 | 513 | 23786 | 8473 | 793 | 40468 | 14417 | 1350 | 61557 | 21927 | 2053 |
| 240 | 6457 | 2300 | 207 | 10265 | 3657 | 329 | 16709 | 5954 | 536 | 25826 | 9200 | 829 | 43939 | 15654 | 1410 | 66836 | 23807 | 2144 |
| 260 | 6967 | 2482 | 216 | 11076 | 3946 | 343 | 18029 | 6424 | 558 | 27867 | 9927 | 862 | 47410 | 16890 | 1467 | 72116 | 25688 | 2232 |
| 280 | 7477 | 2663 | 224 | 11886 | 4235 | 356 | 19349 | 6894 | 579 | 29907 | 10654 | 895 | 50881 | 18127 | 1523 | 77395 | 27569 | 2316 |
| 300 | 7987 | 2845 | 232 | 12697 | 4524 | 368 | 20669 | 7364 | 600 | 31947 | 11380 | 926 | 54352 | 19363 | 1576 | 82675 | 29449 | 2397 |
| 350 | 9262 | 3299 | 250 | 14724 | 5246 | 398 | 23968 | 8540 | 648 | 37047 | 13197 | 1001 | 63029 | 22455 | 1703 | 95874 | 34151 | 2590 |
| 400 | 10537 | 3753 | 267 | 16751 | 5968 | 425 | 27268 | 9716 | 692 | 42147 | 15014 | 1070 | 71706 | 25546 | 1820 | 109072 | 38852 | 2768 |
| 450 | 11812 | 4208 | 284 | 18778 | 6690 | 451 | 30568 | 10892 | 734 | 47247 | 16831 | 1135 | 80383 | 28637 | 1931 | 122271 | 43554 | 2936 |
| 500 | | 4662 | 299 | | 7413 | 475 | | 12067 | 774 | | 18648 | 1196 | | 31728 | 2035 | | 48255 | 3095 |
| 550 | | 5116 | 314 | | 8135 | 499 | | 13243 | 812 | | 20464 | 1254 | | | | | | |

| DN | 100 | | | 125 | | | 150 | | | 200 | | | | | | | | |
|---------------------|--------|-------|------|--------|-------|------|--------|-------|------|--------|--------|-------|--|--|--|--|--|--|
| d _o (mm) | 92 | | | 98 | | | 125 | | | 165 | | | | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | | | | | | |
| 15 | 12059 | 4296 | 865 | 13683 | 4874 | 982 | 22262 | 7930 | 1598 | 38789 | 13818 | 2784 | | | | | | |
| 20 | 13914 | 4956 | 978 | 15788 | 5624 | 1110 | 25686 | 9150 | 1806 | 44755 | 15943 | 3147 | | | | | | |
| 40 | 21703 | 7731 | 1353 | 24626 | 8773 | 1535 | 40065 | 14272 | 2498 | 69810 | 24868 | 4353 | | | | | | |
| 60 | 29863 | 10638 | 1657 | 33886 | 12071 | 1881 | 55129 | 19638 | 3059 | 96058 | 34218 | 5331 | | | | | | |
| 80 | 38024 | 13545 | 1914 | 43145 | 15370 | 2171 | 70194 | 25004 | 3533 | 122306 | 43568 | 6155 | | | | | | |
| 100 | 46184 | 16452 | 2140 | 52404 | 18668 | 2428 | 85258 | 30370 | 3950 | 148554 | 52918 | 6882 | | | | | | |
| 120 | 54344 | 19359 | 2344 | 61664 | 21967 | 2659 | 100322 | 35736 | 4327 | 174802 | 62268 | 7539 | | | | | | |
| 140 | 62505 | 22266 | 2532 | 70923 | 25265 | 2873 | 115387 | 41102 | 4673 | 201050 | 71618 | 8143 | | | | | | |
| 160 | 70665 | 25173 | 2706 | 80183 | 28564 | 3071 | 130451 | 46468 | 4996 | 227298 | 80969 | 8705 | | | | | | |
| 180 | 78825 | 28080 | 2871 | 89442 | 31862 | 3257 | 145515 | 51835 | 5299 | 253546 | 90319 | 9233 | | | | | | |
| 200 | 86985 | 30987 | 3026 | 98701 | 35161 | 3433 | 160580 | 57201 | 5586 | 279794 | 99669 | 9732 | | | | | | |
| 220 | 95146 | 33894 | 3173 | 107961 | 38459 | 3601 | 175644 | 62567 | 5858 | 306042 | 109019 | 10208 | | | | | | |
| 240 | 103306 | 36800 | 3315 | 117220 | 41758 | 3761 | 190708 | 67933 | 6119 | 332290 | 118369 | 10661 | | | | | | |
| 260 | 111466 | 39707 | 3450 | 126479 | 45056 | 3915 | 205773 | 73299 | 6369 | 358538 | 127719 | 11097 | | | | | | |
| 280 | 119627 | 42614 | 3580 | 135739 | 48355 | 4062 | 220837 | 78665 | 6609 | 384786 | 137070 | 11516 | | | | | | |
| 300 | 127787 | 45521 | 3706 | 144998 | 51653 | 4205 | | | | 411034 | 146420 | 11920 | | | | | | |
| 350 | 148188 | 52788 | 4003 | | | | | | | | 169795 | 12875 | | | | | | |
| 400 | | | | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | | | | |
| 500 | | | | | | | | | | | | | | | | | | |
| 550 | | | | | | | | | | | | | | | | | | |

Vollhub-Feder-Sicherheitsventil #150-300

Full Lift Safety Valve #150-300 spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

Type
441, 442
1"–4"
ANSI

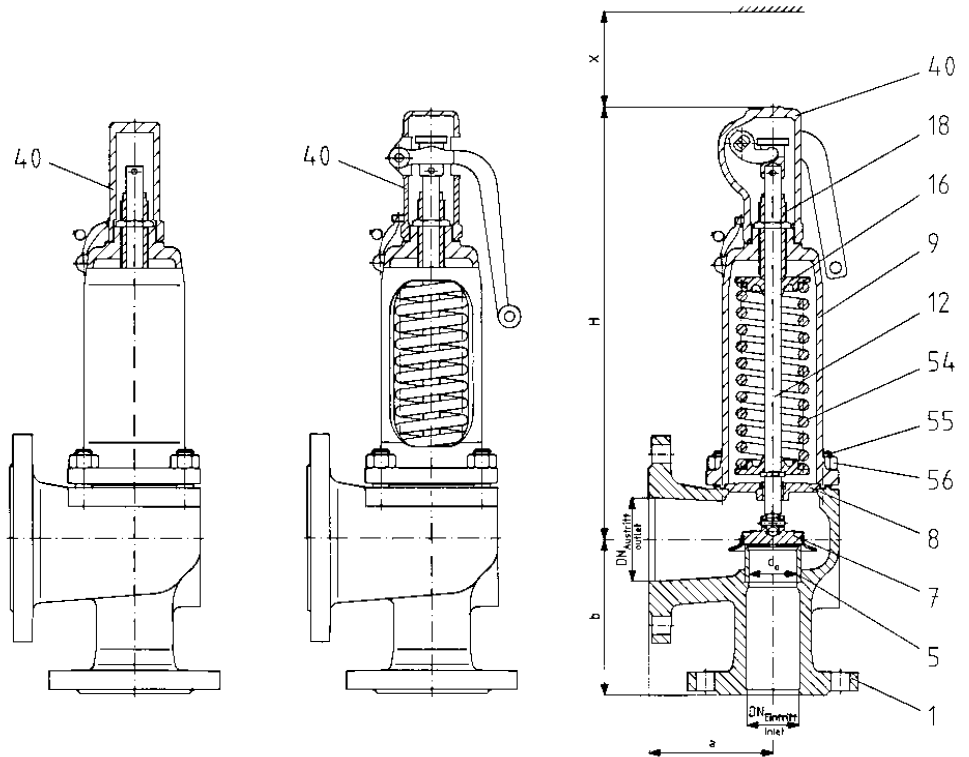
Zusatzrüstungen

- Edelstahl-Faltenbalg
- Elastomer-Faltenbalg
- Teller mit Weichdichtung
- Lösbare Hubhilfe
- Teller/Sitz gepanzert
- Heizmantel
- Entwässerungsbohrung
- Detailinformationen und weitere Zusatzrüstungen siehe Teil 13**

Accessories

- Stainless steel bellows
- Elastomer bellows
- Disc with soft seal
- Detachable lifting aid
- Disc / Seat stellite
- Heating jacket
- Drain hole

For detailed information and additional accessories refer to section 13



Type 441
mit gasdichter Kappe H2
with gastight cap H2

Type 442
offene Federhaube mit
Anlüftung H 3,
Teller anlüftbar
open bonnet
lifting device H 3,
disc liftable

Type 441
geschlossene Federhaube mit
Anlüftung H 4, gasdicht,
Teller anlüftbar
closed bonnet
lifting device H 4, gastight,
disc liftable

Zulassungen / Approvals

| | Dämpfe/Gase D/G Steam/Gases S/G | Flüssigkeiten F Liquids L |
|---|--|--------------------------------|
| TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/Coefficient of discharge α_d Öffnungscharakteristik/Opening characteristic | 576 0,7 Vollhub/Full lift | 576 0,45 Normal/Standard |
| ASME/NB Nr./No. Ausflussziffer/Coefficient of discharge K | 37044 0,699 | 37055 0,521 |
| Weitere / Others siehe Seite/refer to page 2/40-41 | AOTC, Det Norske Veritas, Bureau Veritas, ISPESL, Germ. Lloyd, GOST, Lloyd's Reg., TÜV Wien, UDT | |

| Gehäusewerkstoff Body material | | | DN | Flanschanschlüsse Flange connections | | Temperatureinsatzbereich °C 1) Temperature range °F 1) | | | | Type Federhaube Bonnet | | |
|--|-------------------------------|------------|-------------|---|--------------------------|---|-------------|-----------|-------------|------------------------------|-------------------|---------------|
| DIN EN | | ASME | von from | bis to | Eintritt Inlet | Austritt Outlet | DIN EN | | ASME | | geschl. closed | offen open |
| Werkstoffbezeichnung Material Designation | Werkstoff-Nr. Material No. | | | | nach/acc. to ANSI B 16.5 | | von from | bis to | von from | bis to | | |
| GP 240 GH | 1.0619 | SA 216 WCB | 1" | 4" | #150-#300 | #150 | -85/-121 | +450/+842 | -29/-20 | +427/+800 | 4412 | 4422 |
| GX5CrNiMo19-11-2 | 1.4408 | SA 351CF8M | 1" | 4" | #150-#300 | #150 | -270/-454 | +400/+752 | -268/-450 | +300/+572 | 4414 | - |

1) Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

1) Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

| Gehäusewerkstoff / Body material | | | | Ventilgröße / Valve Size | | | | | | | |
|----------------------------------|-----------------------|-------------------------------|----------------------|--------------------------|-------|-----------|---------------|-------|-------|-------|-------|
| DIN EN | | Werkstoff-Nr. Material No. | ASME | | 1 x 2 | 1 1/2 x 2 | 1 1/2 x 2 1/2 | 2 x 3 | 3 x 4 | 4 x 6 | |
| Federhaube / Bonnet | geschlossen closed | GP 240 GH | 1.0619 | SA 216 WCB | 4412 | .481* | .482* | .483* | .484* | .486* | .487* |
| | | GX5 CrNiMo 19-11-2 | 1.4408 ¹⁾ | SA 351CF8M | 4414 | .791* | - | .793* | .794* | .796* | .797* |
| | offen open | GP 240 GH | 1.0619 | SA 216 WCB | 4422 | .4815 | .4825 | .4835 | .4845 | .4865 | .4875 |

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

* Please add number for the required cap or lifting device:

- 2 = Kappe H 2
- 3 = Anlüftung H 3 (offen)
- 4 = Anlüftung H 4 (gasdicht)

- 2 = Cap H 2
- 3 = Lifting device H 3 (open)
- 4 = Lifting device H 4 (gastight)

1) H3 ist bei diesem Werkstoff nicht lieferbar.

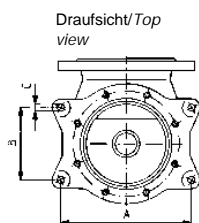
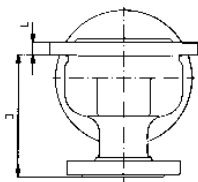
1) H3 is not available in this material.

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

| Ventilgröße | | Valve size | - | - | 1 x 2 | 1 1/2 x 2 | 1 1/2 x 2 1/2 | 2 x 3 | 3 x 4 | 4 x 6 | | | | | |
|---|---------------------|---------------------------------------|-------------------|----|------------------------|-----------|---------------|--------|--------|----------|----------|---------|--|--|--|
| Druckstufe Eintritt | | Pressure rating Inlet | - | - | # 150 bzw./resp. # 300 | | | | | | | | | | |
| Druckstufe Austritt | | Pressure rating outlet | - | - | # 150 | | | | | | | | | | |
| Max. Ansprechdruck | GS | Max. Set Pressure | CS | p | psi g | 740 | 740 | 740 | 740 | 570 | 490 | | | | |
| | GX | | SS | p | psi g | 570 | - | 570 | 410 | 300 | 330 | | | | |
| Max. Ansprechdruck | GS | Max. Set Pressure | CS | p | bar/bar g | 50 | 50 | 50 | 50 | 40 | 34 | | | | |
| | GX | | SS | p | bar/bar g | 40 | - | 40 | 28 | 20 | 22 | | | | |
| Schenkellänge | | Centre to face dim. | | a | inch | 4 1/2 | 4 3/4 | 4 3/4 | 4 7/8 | 6 1/2 | 9 | | | | |
| | | | | b | inch | 4 1/8 | 4 7/8 | 4 7/8 | 5 3/8 | 6 1/8 | 7 1/8 | | | | |
| | | | | a | mm | 114 | 121 | 121 | 124 | 165 | 229 | | | | |
| | | | | b | mm | 105 | 124 | 124 | 137 | 156 | 181 | | | | |
| Bauhöhe | H 2 | Height | H 2 | H | inch | 9 1/8 | 12 3/8 | 14 | 15 7/8 | 18 15/16 | 24 1/4 | | | | |
| | H 3 GS | | H 3 CS | H | inch | 9 3/16 | 12 3/4 | 14 3/8 | 16 1/4 | 20 11/16 | 26 | | | | |
| | H 4 | | H 4 | H | inch | 9 3/16 | 13 | 14 5/8 | 16 1/2 | 20 13/16 | 26 1/16 | | | | |
| | H 2 | | H 2 | SS | H | inch | 9 1/8 | - | 14 | 15 7/8 | 18 15/16 | 24 1/4 | | | |
| | H 4 | | | | H | inch | 9 3/16 | - | 14 5/8 | 16 3/16 | 20 13/16 | 26 1/16 | | | |
| | mit Faltenbalg zus. | | with bellows add. | | H | inch | 1 1/2 | 1 5/8 | 1 1/2 | 1 11/16 | 2 3/16 | 2 3/16 | | | |
| Deckenfreiheit | H 2 | Height clearance | H 2 | H | mm | 232 | 315 | 356 | 403 | 481 | 615 | | | | |
| | H 3 GS | | H 3 CS | H | mm | 233 | 325 | 366 | 413 | 526 | 660 | | | | |
| | H 4 | | H 4 | H | mm | 234 | 331 | 372 | 419 | 529 | 663 | | | | |
| | H 2 | | H 2 | SS | H | mm | 232 | - | 356 | 403 | 481 | 615 | | | |
| | H 4 | | | | H | mm | 234 | - | 363 | 410 | 529 | 663 | | | |
| | mit Faltenbalg zus. | | with bellows add. | | H | mm | 39 | 42 | 38 | 46 | 56 | 58 | | | |
| Gewicht | | Weight | - | kg | 10 | 13 | 16 | 22 | 33 | 75 | | | | | |
| Spannpratzen (Nur auf Anforderung gebohrt) | | Brackets (Drilled only on request) | | A | inch | | | | | | 11 | | | | |
| | | | | B | inch | | | | | | 6 1/4 | | | | |
| | | | | C | inch | | | | | | Ø 3/4 | | | | |
| | | | | D | inch | | | | | | 9 7/8 | | | | |
| | | | | E | inch | | | | | | 1 | | | | |
| | | | | A | mm | | | | | | 280 | | | | |
| | | | | B | mm | | | | | | 160 | | | | |
| | | | | C | mm | | | | | | Ø 18 | | | | |
| | | | | D | mm | | | | | | 250 | | | | |
| | | | | E | mm | | | | | | 25 | | | | |



Type 441, 442 1"-4" ANSI

| Leistungstabelle | | | | Discharge Capacities | | | |
|--|----------------------------|--|--|---|--|--|----------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | Calculations from VALVESTAR® 6.2.50 | | | |
| Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | | Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | |
| p | Ansprechüberdruck | | | Set pressure | | | bar g |
| I | Sattdampf | | | Saturated steam | | | kg/h |
| II | Luft bei 0°C und 1013 mbar | | | Air at 0°C and 1013 mbar | | | m ³ /h |
| III | Wasser bei 20°C | | | Water at 20°C | | | 10 ³ kg/h |

| DN | 1 x 2 | | | 1 1/2 x 2 | | | 1 1/2 x 2 1/2 | | | 2 x 3 | | | 3 x 4 | | | 4 x 6 | | |
|---------------------|-------|------|------|-----------|-------|------|---------------|-------|------|-------|-------|------|-------|-------|------|-------|--------|------|
| d ₀ (mm) | 23 | | | 29 | | | 37 | | | 46 | | | 60 | | | 92 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 0,2 | 139 | 161 | 5,21 | 222 | 257 | 8,28 | 361 | 418 | 13,5 | 558 | 646 | 20,8 | 949 | 1099 | 35,4 | 2232 | 2584 | 83,3 |
| 0,5 | 219 | 257 | 7,37 | 348 | 409 | 11,7 | 566 | 665 | 19,1 | 875 | 1028 | 29,5 | 1489 | 1749 | 50,1 | 3502 | 4113 | 118 |
| 1 | 324 | 386 | 9,97 | 515 | 614 | 15,9 | 839 | 999 | 25,8 | 1296 | 1545 | 39,9 | 2205 | 2628 | 67,9 | 5185 | 6179 | 160 |
| 2 | 517 | 625 | 14,1 | 822 | 993 | 22,4 | 1339 | 1617 | 36,5 | 2069 | 2499 | 56,4 | 3520 | 4251 | 96,0 | 8277 | 9995 | 226 |
| 3 | 697 | 852 | 17,3 | 1108 | 1354 | 27,5 | 1804 | 2204 | 44,7 | 2788 | 3406 | 69,1 | 4744 | 5795 | 118 | 11153 | 13626 | 276 |
| 4 | 870 | 1069 | 19,9 | 1382 | 1700 | 31,7 | 2250 | 2768 | 51,6 | 3478 | 4278 | 79,8 | 5918 | 7278 | 136 | 13913 | 17111 | 319 |
| 5 | 1041 | 1287 | 22,3 | 1656 | 2047 | 35,5 | 2695 | 3331 | 57,7 | 4165 | 5149 | 89,2 | 7087 | 8761 | 152 | 16662 | 20597 | 357 |
| 6 | 1213 | 1505 | 24,4 | 1928 | 2393 | 38,8 | 3138 | 3895 | 63,2 | 4850 | 6021 | 97,7 | 8252 | 10243 | 166 | 19401 | 24083 | 391 |
| 7 | 1380 | 1723 | 26,4 | 2193 | 2739 | 42,0 | 3570 | 4459 | 68,3 | 5518 | 6892 | 106 | 9388 | 11726 | 180 | 22073 | 27568 | 422 |
| 8 | 1550 | 1941 | 28,2 | 2464 | 3086 | 44,8 | 4010 | 5023 | 73,0 | 6198 | 7763 | 113 | 10545 | 13208 | 192 | 24794 | 31054 | 451 |
| 9 | 1719 | 2159 | 29,9 | 2733 | 3432 | 47,6 | 4450 | 5587 | 77,4 | 6878 | 8635 | 120 | 11701 | 14691 | 204 | 27510 | 34540 | 479 |
| 10 | 1889 | 2377 | 31,5 | 3003 | 3778 | 50,1 | 4889 | 6150 | 81,6 | 7556 | 9506 | 126 | 12856 | 16173 | 215 | 30225 | 38025 | 505 |
| 12 | 2228 | 2812 | 34,6 | 3542 | 4471 | 54,9 | 5766 | 7278 | 89,4 | 8913 | 11249 | 138 | 15163 | 19138 | 235 | 35650 | 44997 | 553 |
| 14 | 2560 | 3248 | 37,3 | 4070 | 5164 | 59,3 | 6625 | 8405 | 96,6 | 10241 | 12992 | 149 | 17423 | 22104 | 254 | 40962 | 51968 | 597 |
| 16 | 2898 | 3684 | 39,9 | 4608 | 5856 | 63,4 | 7501 | 9533 | 103 | 11594 | 14735 | 160 | 19725 | 25069 | 271 | 46376 | 58939 | 638 |
| 18 | 3237 | 4119 | 42,3 | 5147 | 6549 | 67,3 | 8378 | 10661 | 110 | 12949 | 16478 | 169 | 22030 | 28034 | 288 | 51795 | 65910 | 677 |
| 20 | 3577 | 4555 | 44,6 | 5686 | 7242 | 70,9 | 9256 | 11788 | 115 | 14306 | 18220 | 178 | 24339 | 30999 | 304 | 57224 | 72882 | 714 |
| 22 | 3906 | 4991 | 46,8 | 6209 | 7934 | 74,4 | 10107 | 12916 | 121 | 15623 | 19963 | 187 | 26579 | 33964 | 318 | 62491 | 79853 | 748 |
| 24 | 4246 | 5427 | 48,9 | 6750 | 8627 | 77,7 | 10987 | 14043 | 126 | 16982 | 21706 | 195 | 28892 | 36929 | 333 | 67928 | 86824 | 782 |
| 26 | 4586 | 5862 | 50,9 | 7291 | 9320 | 80,9 | 11869 | 15171 | 132 | 18345 | 23449 | 203 | 31211 | 39894 | 346 | 73380 | 93796 | 814 |
| 28 | 4928 | 6298 | 52,8 | 7835 | 10012 | 83,9 | 12753 | 16298 | 137 | 19712 | 25192 | 211 | 33537 | 42859 | 359 | 78848 | 100767 | 844 |
| 30 | 5271 | 6734 | 54,6 | 8379 | 10705 | 86,8 | 13640 | 17426 | 141 | 21083 | 26935 | 219 | 35869 | 45824 | 372 | 84333 | 107738 | 874 |
| 32 | 5615 | 7169 | 56,4 | 8926 | 11398 | 89,7 | 14530 | 18554 | 146 | 22459 | 28677 | 226 | 38210 | 48790 | 384 | 89835 | 114710 | 903 |
| 34 | | 7605 | 58,2 | | 12090 | 92,5 | | 19681 | 151 | | 30420 | 233 | | 51755 | 396 | | 121681 | 931 |
| 36 | | 8041 | 59,8 | | 12783 | 95,1 | | 20809 | 155 | | 32163 | 239 | | 54720 | 407 | | 128652 | 957 |
| 38 | | 8476 | 61,5 | | 13476 | 97,7 | | 21936 | 159 | | 33906 | 246 | | 57685 | 418 | | 135623 | 984 |
| 40 | | 8912 | 63,1 | | 14169 | 100 | | 23064 | 163 | | 35649 | 252 | | 60650 | 429 | | 142595 | 1009 |

| Leistungstabelle | | | | Discharge Capacities | | | |
|---|---|--|--|---|--|--|-------------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | Calculations from VALVESTAR® 6.2.50 | | | |
| Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet. | | | | Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure. | | | |
| p | Ansprechüberdruck | | | Set pressure | | | psig |
| I | Sattdampf, Abblasen gegen Atmosphärengedruck (14,7 psi) | | | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi) | | | lb/h |
| II | Luft bei 60°F, Abblasen gegen Atmosphärengedruck (14,7 psi) | | | Air at 60°F, valve discharging to atmospheric pressure (14,7 psi) | | | SCFM |
| III | Wasser bei 70°F | | | Water at 70°F | | | U.S. gallons per minute |

| DN | 1 x 2 | | | 1 1/2 x 2 | | | 1 1/2 x 2 1/2 | | | 2 x 3 | | | 3 x 4 | | | 4 x 6 | | |
|---------------------|-------|------|------|-----------|-------|------|---------------|-------|-----|-------|-------|------|-------|-------|------|--------|-------|------|
| d ₀ (mm) | 23 | | | 29 | | | 37 | | | 46 | | | 60 | | | 92 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 15 | 754 | 268 | 54,1 | 1198 | 427 | 86,0 | 1950 | 695 | 140 | 3015 | 1074 | 216 | 5129 | 1827 | 368 | 12059 | 4296 | 865 |
| 20 | 870 | 310 | 61,1 | 1383 | 493 | 97,2 | 2250 | 802 | 158 | 3478 | 1239 | 245 | 5918 | 2108 | 416 | 13914 | 4956 | 978 |
| 40 | 1356 | 483 | 84,6 | 2156 | 768 | 134 | 3510 | 1251 | 219 | 5426 | 1933 | 338 | 9231 | 3289 | 576 | 21703 | 7731 | 1353 |
| 60 | 1866 | 665 | 104 | 2967 | 1057 | 165 | 4830 | 1721 | 268 | 7466 | 2660 | 414 | 12702 | 4525 | 705 | 29863 | 10638 | 1657 |
| 80 | 2376 | 847 | 120 | 3778 | 1346 | 190 | 6150 | 2191 | 310 | 9506 | 3386 | 478 | 16173 | 5762 | 814 | 38024 | 13545 | 1914 |
| 100 | 2886 | 1028 | 134 | 4589 | 1635 | 213 | 7470 | 2662 | 346 | 11546 | 4113 | 535 | 19643 | 6998 | 910 | 46184 | 16452 | 2140 |
| 120 | 3397 | 1210 | 146 | 5400 | 1924 | 233 | 8790 | 3132 | 379 | 13586 | 4840 | 586 | 23114 | 8235 | 997 | 54344 | 19359 | 2344 |
| 140 | 3907 | 1392 | 158 | 6211 | 2213 | 252 | 10110 | 3602 | 410 | 15626 | 5566 | 633 | 26585 | 9471 | 1077 | 62505 | 22266 | 2532 |
| 160 | 4417 | 1573 | 169 | 7021 | 2502 | 269 | 11430 | 4072 | 438 | 17666 | 6293 | 677 | 30056 | 10708 | 1151 | 70665 | 25173 | 2706 |
| 180 | 4927 | 1755 | 179 | 7832 | 2791 | 285 | 12749 | 4543 | 464 | 19706 | 7020 | 718 | 33527 | 11944 | 1221 | 78825 | 28080 | 2871 |
| 200 | 5437 | 1937 | 189 | 8643 | 3079 | 301 | 14069 | 5013 | 490 | 21746 | 7747 | 756 | 36998 | 13181 | 1287 | 86985 | 30987 | 3026 |
| 220 | 5947 | 2118 | 198 | 9454 | 3368 | 315 | 15389 | 5483 | 513 | 23786 | 8473 | 793 | 40468 | 14417 | 1350 | 95146 | 33894 | 3173 |
| 240 | 6457 | 2300 | 207 | 10265 | 3657 | 329 | 16709 | 5954 | 536 | 25826 | 9200 | 829 | 43939 | 15654 | 1410 | 103306 | 36800 | 3315 |
| 260 | 6967 | 2482 | 216 | 11076 | 3946 | 343 | 18029 | 6424 | 558 | 27867 | 9927 | 862 | 47410 | 16890 | 1467 | 111466 | 39707 | 3450 |
| 280 | 7477 | 2663 | 224 | 11886 | 4235 | 356 | 19349 | 6894 | 579 | 29907 | 10654 | 895 | 50881 | 18127 | 1523 | 119627 | 42614 | 3580 |
| 300 | 7987 | 2845 | 232 | 12697 | 4524 | 368 | 20669 | 7364 | 600 | 31947 | 11380 | 926 | 54352 | 19363 | 1576 | 127787 | 45521 | 3706 |
| 350 | 9262 | 3299 | 250 | 14724 | 5246 | 398 | 23968 | 8540 | 648 | 37047 | 13197 | 1001 | 63029 | 22455 | 1703 | 148188 | 52788 | 4003 |
| 400 | 10537 | 3753 | 267 | 16751 | 5968 | 425 | 27268 | 9716 | 692 | 42147 | 15014 | 1070 | 71706 | 25546 | 1820 | | | |
| 450 | 11812 | 4208 | 284 | 18778 | 6690 | 451 | 30568 | 10892 | 734 | 47247 | 16831 | 1135 | 80383 | 28637 | 1931 | | | |
| 500 | | 4662 | 299 | | 7413 | 475 | | 12067 | 774 | | 18648 | 1196 | | 31728 | 2035 | | | |
| 550 | | 5116 | 314 | | 8135 | 499 | | 13243 | 812 | | 20464 | 1254 | | | | | | |
| 600 | | 5570 | 328 | | 8857 | 521 | | 14419 | 848 | | 22281 | 1310 | | | | | | |
| 650 | | 6025 | 341 | | 9579 | 542 | | 15595 | 882 | | 24098 | 1364 | | | | | | |
| 700 | | 6479 | 354 | | 10302 | 563 | | 16770 | 916 | | 25915 | 1415 | | | | | | |

Type
441, 442
DN 200 - 400
XXL

Vollhub-Feder-Sicherheitsventil bis PN 25 (#150 - 300)

Full Lift Safety Valve up to PN 25 (#150 - 300) spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

4

Zusatzrüstungen

Edelstahl-Faltenbalg
Hochtemperatur-Ausrüstung
Anschweißende am Eintritt

Detailinformationen und weitere
Zusatzrüstungen siehe Teil 13

Accessories

Stainless steel bellows
High temperature equipment
Butt weld inlet

For detailed information and additional
accessories refer to section 13

Zulassungen / Approvals

| | Dämpfe/Gase D/G Steam/Gases S/G | | | | Flüssigkeiten F Liquids L | | | |
|--|---|--|---------------|------------------|------------------------------|---|---------------|--|
| | TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/Coefficient of discharge αd Öffnungscharakteristik/Opening characteristic | 576 DN 200 : 0,75/DN 250-400 : 0,7 Vollhub/Full lift | | | | 576 DN 200 : 0,56/DN 250-400 : 0,52 Normal/Standard | | |
| ASME/NB Nr./No. Ausflussziffer/Coefficient of discharge K | 37044 0,699 | | | | 37055 0,521 | | | |
| Weitere / Others siehe Seite/refer to page 2/40-41 | DGR/PED Kanada | BV KISCO | CBPVI LROS | DIN GOST RINA | DNV TMBEF | GL Tschechien | ISPESL UDT | |

| Gehäusewerkstoff Body material | | | DN | | Flanschanschlüsse nach Flange connections acc. to | | | | Temperatureinsatzbereich °C ¹⁾ Temperature range °F ¹⁾ | | | | Type Federhaube Bonnet | | | |
|--|-------------------------------|--------------|------|-----|--|------------------|-----------------|------------------|---|-----------|-------------|------------|------------------------------|-----------|------|------|
| DIN EN | | ASME | von | bis | DIN PN | | ANSI B 16.5 | | DIN EN | | ASME | | geschl. | open | | |
| Werkstoffbezeichnung Material Designation | Werkstoff-Nr. Material No. | | from | to | Eintr. Inlet | Austr. Outlet | Eintr. Inlet | Austr. Outlet | von from | bis to | von from | bis to | closed | open | | |
| C 22.8/P 265 GH ²⁾ | 1.0460/1.0425 | Carbon steel | 200 | 400 | 8" | 16" | 25 | 16 | #150-300 | #150 | -85/-121 | +450/+842 | -29/-20 | +450/+842 | 4412 | 4422 |
| X6 CrNiMoTi 17-12-2 | 1.4571 | SA 316 Ti | 200 | 400 | 8" | 16" | 25 | 16 | #150-300 | #150 | -196/-321 | +550/+1022 | -184/-300 | +300/+572 | 4414 | - |

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

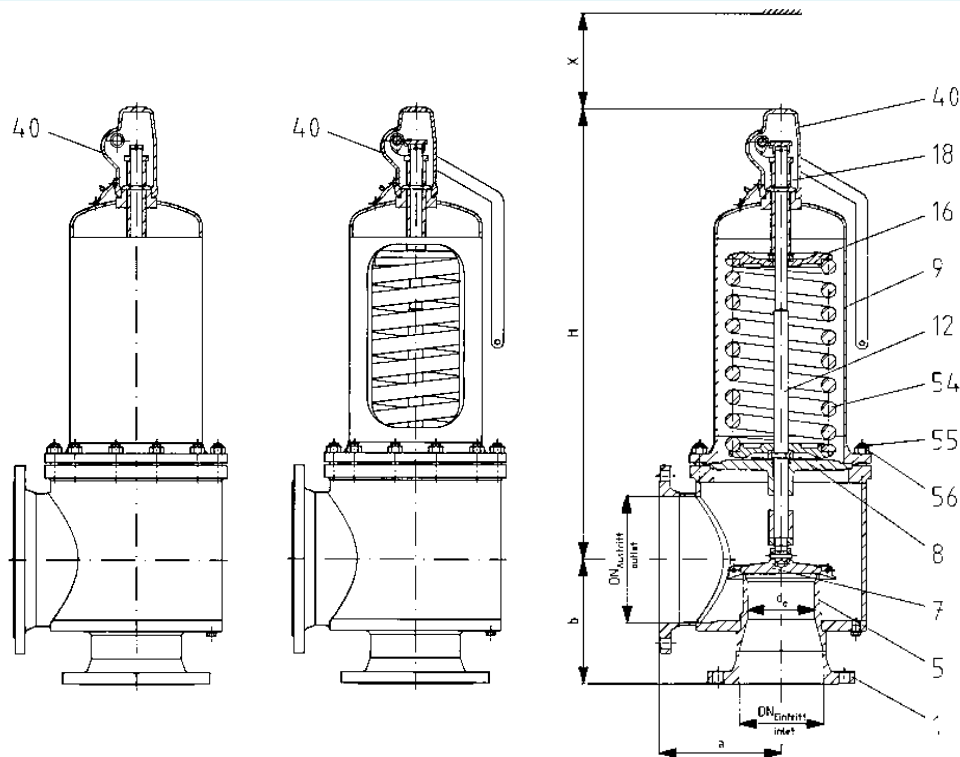
²⁾ Eintrittsflansch und Sitz in Edelstahlausführung auf Anfrage möglich.

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

²⁾ Inlet flange and seat also in stainless steel design available.

Änderungen behalten wir uns vor.

Modifications reserved.



Type 441
mit gasdichter Kappe H 2
with gastight cap H 2

Type 442
offene Federhaube mit
Anlüftung H 3,
Teller anlüftbar
open bonnet
lifting device H 3,
disc liftable

Type 441
geschlossene Federhaube mit
Anlüftung H 4, gasdicht,
Teller anlüftbar
closed bonnet
lifting device H 4, gastight,
disc liftable

Artikelnummern / Article Numbers

| Gehäusewerkstoff / Body material | | | | Nennweite / Nominal Diameter | | | | | | | | | | | |
|----------------------------------|-----------------------|----------------------|---------------|------------------------------|-------------------------------|-------|-------|-------|-------|-----|-----|--|--|--|--|
| | | | | DIN EN | Werkstoff-Nr. Material No. | ASME | | 200 | 250 | 300 | 400 | | | | |
| | | | | | 8" | 10" | 12" | 16" | | | | | | | |
| Federhaube / Bonnet | geschlossen closed | C 22.8/P 265 GH | 1.0460/1.0425 | Carbon steel | 4412 | .475* | .476* | .477* | .478* | | | | | | |
| | | X 6 CrNiMoTi 17-12-2 | 1.4571 | SA 316 Ti | 4414 | .479* | .480* | .490* | .491* | | | | | | |
| offen open | | C 22.8/P 265 GH | 1.0460/1.0425 | Carbon steel | 4422 | .4755 | .4765 | .4775 | .4785 | | | | | | |
| | | | | | | | | | | | | | | | |

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

* Please add number for the required cap or lifting device:

2 = Kappe H2
4 = Anlüftung H4 (gasdicht)

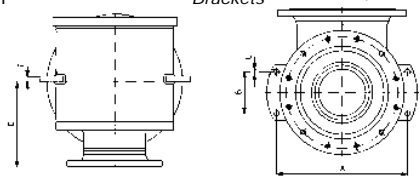
2 = Cap H2
4 = Lifting device H4 (gastight)

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

4

Abmessungen, Druckbereiche, Gewichte Dimensions, Pressure Ranges, Weights

| | | | | | | | | | |
|---|----------------------------------|------------------------------|------------------------|----------------|-----------------|------------------|-------|-------------------|-------------------|
| Nennweite, Ventilgröße | | Nominal Diameter, Valve size | | DN | - | 200 | 250 | 300 | 400 |
| Nennweite, Austritt | | Nominal Diameter, Outlet | | DN | - | 300 | 350 | 400 | 500 |
| Druckstufe Eintritt | | Pressure rating Inlet | | PN | - | 25 | | 16 | |
| Druckstufe Austritt | | Pressure rating Outlet | | PN | - | 10 ²⁾ | | | |
| Nennweite, Ventilgröße | | Nominal Diameter, Valve size | | DN | - | 8" | 10" | 12" | 16" |
| Nennweite, Austritt | | Nominal Diameter, Outlet | | DN | - | 12" | 14" | 16" | 20" |
| Druckstufe Eintritt | | Pressure rating Inlet | | PN | - | #150-300 | | | |
| Druckstufe Austritt | | Pressure rating Outlet | | PN | - | #150 | | | |
| Max. Ansprechdruck | Stahl Edelstahl ¹⁾ | Max. Set pressure | CS SS ¹⁾ | p | bar/bar g | 25 | 18,5 | 12 | 6 |
| | | | | p | bar/bar g | 11 | 5 | 4 | 3 |
| Engster Strömungsquerschnitt | | Flow area | | A _o | mm ² | 21382 | 31416 | 43374 | 68349 |
| Engster Strömungsdurchmesser | | Flow diameter | | d _o | mm | 165 | 200 | 235 | 295 |
| Schenkellänge | Stahl, Edelstahl | Centre to face dim. | CS, SS | a | mm | 300 | 325 | 394 ²⁾ | 477 ²⁾ |
| | Stahl, Edelstahl | | CS, SS | b | mm | 305 | 340 | 330 ³⁾ | 400 |
| Bauhöhe | H2 Stahl, Edelstahl | Height | H2 CS, SS | H | mm | 1105 | 1115 | 1240 | 1490 |
| | H3 Stahl | | H3 CS | H | mm | 1105 | 1115 | 1240 | 1490 |
| | H4 Stahl, Edelstahl | | H4 CS, SS | H | mm | 1105 | 1115 | 1240 | 1490 |
| Deckenfreiheit | | Height clearance | | x | mm | 700 | 700 | 850 | 1200 |
| Gewicht | | Weight | | - | kg | 285 | 335 | 384 | 588 |
| Spannpratzen  | | Brackets | | A | mm | 470 | 514 | 640 | 800 |
| | | | | B | mm | 150 | 150 | 180 | 220 |
| | | | | C | mm | Ø 18 | Ø 18 | Ø 24 | Ø 28 |
| | | | | D | mm | 305 | 340 | 330 | 400 |
| | | | | E | mm | 20 | 20 | 20 | 20 |

- 1) Höhere Ansprechdrücke durch Einsatz von Sonderfedern möglich.
Higher set pressures are possible by fitting special springs.
- 2) Für Druckstufe Austritt höher als PN 10 abweichende Schenkellänge.
For pressure rating outlet higher than PN 10 centre to face dimension will change.
- 3) Für Druckstufe Eintritt bei Anschluss #300 abweichende Schenkellänge.
For pressure rating inlet connection #300 centre to face dimension will change.

Werkstoffe / Materials

| Pos. Item | Bauteile | Parts | 4412/4422 | | 4414 | |
|-----------|----------------------------|---------------------------|--|-------------------------|---------------------------------------|----------------------|
| | | | Stahl Steel | | Korrosionsfest corrosion resistant | Kaltzäh cryogenic |
| 1 | Gehäuse | Body | C 22.8/ P 265 GH St 35.8 | 1.0460/1.0425 1.0305 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| 5 | Sitz | Seat | DN 200-250: St 35.8 gepanzert/stellited | 1.0305 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| | | | DN 300-400: C 22.8 gepanzert/stellited | 1.0460 | | |
| 7 | Teller | Disc | DN 200-250: X 39 Cr Mo 17-1/X 6 Cr Ni Mo Ti 17-12-2 | 1.4122/1.4571 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| | | | DN 300-400: X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 | | |
| 8 | Führungsscheibe mit Buchse | Guide with bush | DN 200-250: S235JRG2 | 1.0038 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| | | | X14 Cr Mo S 17 tenifer | 1.4104 tenifer | | |
| | | | DN 300-400: X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 | | |
| 9 | Federhaube | Bonnet | PTFE | PTFE | PTFE | PTFE |
| 9 | Federhaube | Bonnet | GGG-40.3 | 0.7043 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| 12 | Spindel | Spindle | DN 200-250: X 20 Cr 13 | 1.4021 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| | | | DN 300-400: X 2 Cr Ni Mo 17-12-2 | 1.4404 | | |
| 16 | Federteller | Spring plate | S355J2G3 | 1.0570 | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| 18 | Druckschraube mit Buchse | Adjusting screw with bush | X 2 Cr Ni Mo 17-12-2 | 1.4404 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| | | | PTFE | PTFE | | |
| 54 | Feder | Spring | 54 Si Cr 6/51 Cr V 4 | 1.7102/1.8159 | X 10 Cr Ni 18-8 | 1.4310 |
| 40 | Kappe H 2 | Cap H 2 | GGG-40 | 0.7040 | GX5 Cr Ni Mo 19-11-2 | 1.4408 |
| | Anlüftung H 3 | Lifting device H 3 | | | | |
| | Anlüftung H 4 | Lifting device H 4 | | | | |
| 55/ 56 | Stiftschraube Mutter | Bolt nut | t < 400 °C Ck 35/C 35 | 1.1181/1.0501 | A 4-70/A 4 | 1.4401/1.4401 |
| | | | t > 400 °C A 4-70/A 4 | 1.4401/1.4401 | | |

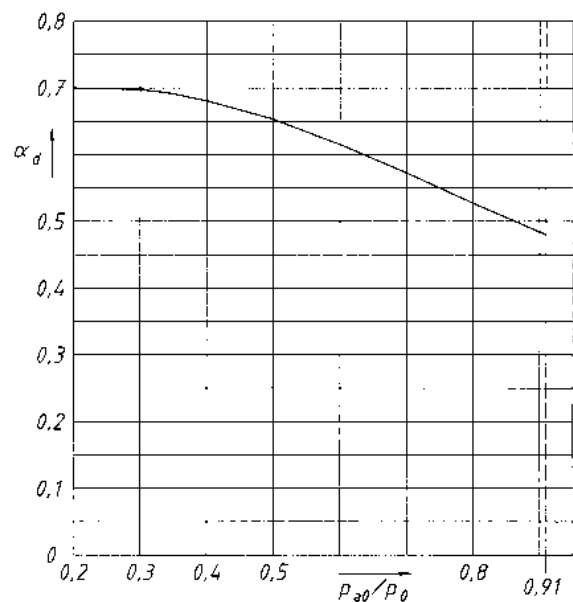
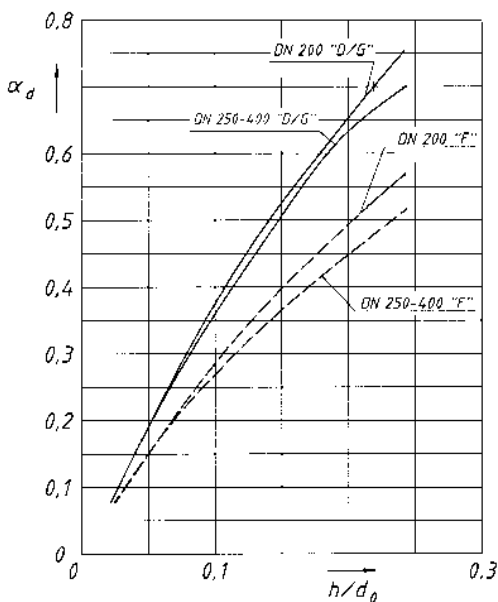
Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1

$$\alpha_d = f(h/d_0)$$

Diagramm 2

$$\alpha_d = f(p_{a0}/p_0)$$



h = Hub (mm)
 d_0 = engster Strömungsdurchmesser (mm)
 p_{a0} = Gegendruck, bar (abs.)
 p_0 = Ansprechdruck, bar (abs.)

h = Lift (mm)
 d_0 = Flow diameter (mm)
 p_{a0} = Back pressure, bar (abs.)
 p_0 = Set pressure, bar (abs.)

Type 441, 442 DN 200-400 XXL

| Leistungstabelle | | | | Discharge Capacities | | | |
|--|----------------------------|--|--|---|--|--|----------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | Calculations from VALVESTAR® 6.2.50 | | | |
| Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | | Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | |
| p | Ansprechüberdruck | | | Set pressure | | | bar g |
| I | Sattdampf | | | Saturated steam | | | kg/h |
| II | Luft bei 0°C und 1013 mbar | | | Air at 0°C and 1013 mbar | | | m ³ /h |
| III | Wasser bei 20°C | | | Water at 20°C | | | 10 ³ kg/h |

| DN | 200 | | | 250 | | | 300 | | | 400 | | | | | | | | |
|-----|---------------------|--------|------|--------|--------|------|--------|--------|------|--------|--------|------|---|----|-----|---|----|-----|
| | d _o (mm) | | | 200 | | | 235 | | | 295 | | | | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 0,2 | 7178 | 8311 | 334 | 10547 | 12211 | 455 | 14561 | 16859 | 628 | 22946 | 26567 | 990 | | | | | | |
| 0,5 | 11263 | 13230 | 472 | 16548 | 19438 | 644 | 22847 | 26837 | 889 | 36002 | 42290 | 1400 | | | | | | |
| 1 | 16678 | 19876 | 639 | 24504 | 29202 | 871 | 33830 | 40317 | 1203 | 53311 | 63532 | 1896 | | | | | | |
| 2 | 26623 | 32150 | 903 | 39116 | 47236 | 1232 | 54004 | 65216 | 1702 | 85101 | 102769 | 2681 | | | | | | |
| 3 | 38436 | 46959 | 1106 | 52707 | 64394 | 1509 | 72768 | 88904 | 2084 | 114670 | 140097 | 3284 | | | | | | |
| 4 | 47950 | 58971 | 1278 | 65753 | 80867 | 1743 | 90781 | 111646 | 2406 | 143055 | 175935 | 3792 | | | | | | |
| 5 | 57421 | 70984 | 1428 | 78741 | 97339 | 1949 | 108712 | 134389 | 2690 | 171311 | 211774 | 4240 | | | | | | |
| 6 | 66861 | 82997 | 1565 | 91686 | 113812 | 2135 | 126584 | 157132 | 2947 | | | | | | | | | |
| 7 | 76071 | 95009 | 1690 | 104316 | 130285 | 2306 | 144021 | 179875 | 3183 | | | | | | | | | |
| 8 | 85447 | 107022 | 1807 | 117172 | 146758 | 2465 | 161770 | 202618 | 3403 | | | | | | | | | |
| 9 | 94810 | 119035 | 1916 | 130012 | 163231 | 2614 | 179497 | 225360 | 3610 | | | | | | | | | |
| 10 | 104165 | 131047 | 2020 | 142840 | 179704 | 2756 | | | | | | | | | | | | |
| 12 | 122862 | 155073 | 2213 | 168480 | 212649 | 3019 | | | | | | | | | | | | |
| 14 | 141169 | 179098 | 2390 | | | | | | | | | | | | | | | |
| 16 | 159825 | 203123 | 2555 | | | | | | | | | | | | | | | |
| 18 | 178504 | 227149 | 2710 | | | | | | | | | | | | | | | |
| 20 | 197213 | 251174 | 2857 | | | | | | | | | | | | | | | |
| 22 | 215363 | 275199 | 2996 | | | | | | | | | | | | | | | |
| 24 | 234103 | 299224 | 3129 | | | | | | | | | | | | | | | |

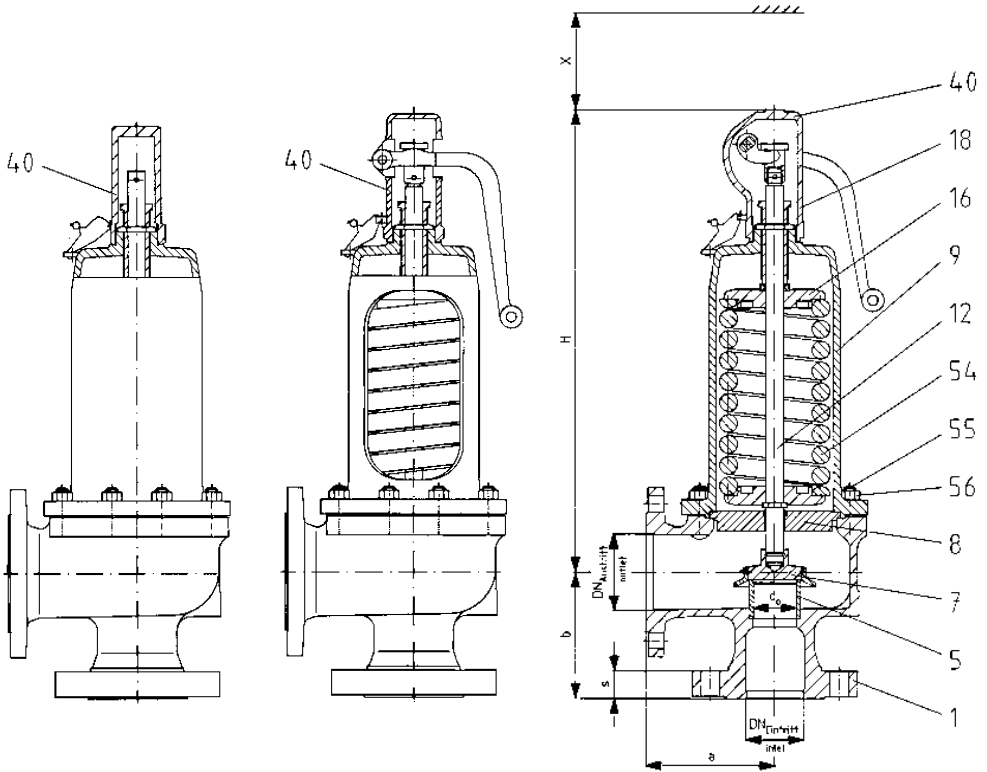
| Leistungstabelle | | | | Discharge Capacities | | | |
|---|---|--|--|---|--|--|-------------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | Calculations from VALVESTAR® 6.2.50 | | | |
| Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet. | | | | Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure. | | | |
| p | Ansprechüberdruck | | | Set pressure | | | psig |
| I | Sattdampf, Abblasen gegen Atmosphärengedruck (14,7 psi) | | | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi) | | | lb/h |
| II | Luft bei 60°F, Abblasen gegen Atmosphärengedruck (14,7 psi) | | | Air at 60°F, valve discharging to atmospheric pressure (14,7 psi) | | | SCFM |
| III | Wasser bei 70°F | | | Water at 70°F | | | U.S. gallons per minute |

| DN | 200 | | | 250 | | | 300 | | | 400 | | | | | | | | |
|---------------------|--------|--------|-------|--------|--------|-------|--------|--------|-------|--------|--------|-------|---|----|-----|---|----|-----|
| | 8" | | | 10" | | | 12" | | | 16" | | | | | | | | |
| d _o (mm) | 165 | | | 200 | | | 235 | | | 295 | | | | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 15 | 38789 | 13818 | 2784 | 56990 | 20301 | 4090 | 78682 | 28028 | 5647 | 123990 | 44168 | 8899 | | | | | | |
| 20 | 44755 | 15943 | 3147 | 65755 | 23423 | 4623 | 90783 | 32339 | 6383 | 143058 | 50961 | 10059 | | | | | | |
| 40 | 69810 | 24868 | 4353 | 102567 | 36537 | 6395 | 141606 | 50443 | 8829 | 223147 | 79490 | 13913 | | | | | | |
| 60 | 96058 | 34218 | 5331 | 141131 | 50274 | 7832 | 194850 | 69409 | 10813 | 307049 | 109378 | 17040 | | | | | | |
| 80 | 122306 | 43568 | 6155 | 179696 | 64012 | 9044 | 248093 | 88376 | 12486 | 390951 | 139266 | 19676 | | | | | | |
| 100 | 148554 | 52918 | 6882 | 218261 | 77749 | 10111 | 301336 | 107342 | 13960 | | | | | | | | | |
| 120 | 174802 | 62268 | 7539 | 256825 | 91487 | 11076 | 354580 | 126308 | 15292 | | | | | | | | | |
| 140 | 201050 | 71618 | 8143 | 295390 | 105225 | 11964 | 407823 | 145275 | 16517 | | | | | | | | | |
| 160 | 227298 | 80969 | 8705 | 333955 | 118962 | 12790 | 461066 | 164241 | 17658 | | | | | | | | | |
| 180 | 253546 | 90319 | 9233 | 372519 | 132700 | 13566 | | | | | | | | | | | | |
| 200 | 279794 | 99669 | 9732 | 411084 | 146437 | 14299 | | | | | | | | | | | | |
| 220 | 306042 | 109019 | 10208 | 449649 | 160175 | 14997 | | | | | | | | | | | | |
| 240 | 332290 | 118369 | 10661 | 488213 | 173913 | 15664 | | | | | | | | | | | | |
| 260 | 358538 | 127719 | 11097 | 526778 | 187650 | 16304 | | | | | | | | | | | | |
| 280 | 384786 | 137070 | 11516 | | | | | | | | | | | | | | | |
| 300 | 411034 | 146420 | 11920 | | | | | | | | | | | | | | | |
| 350 | | 169795 | 12875 | | | | | | | | | | | | | | | |
| 400 | | | | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | | | | |
| 500 | | | | | | | | | | | | | | | | | | |
| 550 | | | | | | | | | | | | | | | | | | |

Type
455, 456

Vollhub-Feder-Sicherheitsventil PN 63-160 Full Lift Safety Valve PN 63-160 spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids



Type 456
mit gasdichter Kappe H 2
with gastight cap H 2

Type 455
offene Federhaube mit
Anlüftung H 3, Teller anlüftbar
open bonnet
lifting device H 3
disc liftable

Type 456
geschlossene Federhaube mit
Anlüftung H 4 gasdicht, Teller anlüftbar
closed bonnet
lifting device H 4 gastight
disc liftable

Zusatzrüstungen

Edelstahl-Faltenbalg
Teller mit Weichdichtung
Heizmantel
Entwässerungsbohrung
Detailinformationen und weitere
Zusatzrüstungen siehe Teil 13

Accessories

Stainless steel bellows
Disc with soft seal
Heating jacket
Drain hole

For detailed information and additional
accessories refer to section 13

Zulassungen / Approvals

| | Dämpfe/Gase D/G Steam/Gases S/G | | Flüssigkeiten F Liquids L | |
|---|--|---|------------------------------|--|
| | TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/Coefficient of discharge αd Öffnungscharakteristik/Opening characteristic | 934 DN 25, 50, 100: 0,8 / DN 80: 0,75 Vollhub/Full lift | | 934 DN 25: 0,6 / DN 50: 0,54 / DN 80: 0,5 / DN 100: 0,56 Normal/Standard |
| ASME/NB Nr./No. Ausflussziffer/Coefficient of discharge K | 1", 2", 4" 37066 0,798 | 3" 37088 0,754 | 1", 2", 4" 37077 0,572 | 3" 37099 0,479 |
| Weitere / Others siehe Seite/refer to page 2/40-41 | GOST, ISPEL, UDT | | | |

| Gehäusewerkstoff Body material | | | DN von bis from to | Flanschanschlüsse nach Flange connections acc. to | | Temperatureinsatzbereich °C ¹⁾ Temperature range °F ¹⁾ Federhaube | | | | Type | |
|--|---------------------------------------|-------------|--------------------------|--|--|--|----------------------------|------------------------------|----------------------------|-------------------|---------------|
| DIN EN Werkstoffbezeichnung Material Designation | ASME Werkstoff-Nr. Material No. | | | DIN PN Eintr. Austr. Inlet Outlet | ANSI B 16.5 Eintr. Austr. Inlet Outlet | DIN EN von bis from to | ASME von bis from to | DIN EN von bis from to | ASME von bis from to | geschl. closed | offen open |
| GP 240 GH | 1.0619 | SA 216 WCB | 25/1" 100/4" | 63-160 40 | #300-600 #150 | -85/-121 | +400/+752 | -29/-20 | +427/+800 | 4562 | 4552 |
| GX5CrNiMoNb19-11-2 | 1.4581 | SA 351CF10M | 25/1" 100/4" | 63-160 40 | #300-600 #150 | -85/-121 | +400/+752 | -184/-300 | +300/+572 | 4564 | - |

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Artikelnummern / Article Numbers

| Gehäusewerkstoff / Body material | | | | Nennweite / Nominal Diameter | | | | | | | | | | |
|----------------------------------|-----------------------|----------------------|----------------------|------------------------------|-------------------------------|-------|-------|-------|-------|-----|--|--|--|--|
| | | | | DIN EN | Werkstoff-Nr. Material No. | ASME | 25 | 50 | 80 | 100 | | | | |
| Federhaube / Bonnet | geschlossen closed | GP 240 GH | 1.0619 | SA 216 WCB | 4562 | .601* | .602* | .603* | .604* | | | | | |
| | | GX5 CrNiMoNb 19-11-2 | 1.4581 ¹⁾ | SA 351CF10M | 4564 | .605* | .606* | .607* | .608* | | | | | |
| | offen open | GP 240 GH | 1.0619 | SA 216 WCB | 4552 | .6015 | .6025 | .6035 | .6045 | | | | | |
| | | | | | | | | | | | | | | |

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

* Please add number for the required cap or lifting device:

- 2 = Kappe H 2
- 3 = Anlüftung H 3 (offen)
- 4 = Anlüftung H 4 (gasdicht)

- 2 = Cap H 2
- 3 = Lifting device H 3 (open)
- 4 = Lifting device H 4 (gastight)

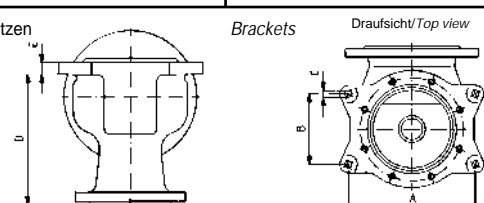
1) H3 ist bei diesem Werkstoff nicht lieferbar.

1) H3 is not available in this material.

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

| | | | | | | | | | | | |
|---|----|------------------------------|---------------------------|---------------------|-----------------|----------|------|------|------|-----|-----|
| Nennweite, Ventilgröße | | Nominal Diameter, Valve size | | DN | - | 25 | 50 | 80 | 100 | | |
| | | | | | | 1" | 2" | 3" | 4" | | |
| Nennweite, Austritt | | Nominal Diameter, Outlet | | DN | - | 50 | 80 | 100 | 150 | | |
| | | | | | | 2" | 3" | 4" | 6" | | |
| Druckstufe Eintritt | | Pressure rating Inlet | | | | 63-160 | | | | | |
| | | PN | | | | #300-600 | | | | | |
| Druckstufe Eintritt | | Pressure rating Inlet | | | | 40 | | | | | |
| Sonderausführung | | Special Version | | | | #150 | | | | | |
| Druckstufe Austritt | | Pressure rating Outlet | | PN | - | 40-63 | | 40 | | | |
| | | | | | | #150-300 | | #150 | | | |
| Druckstufe Austritt | | Pressure rating Outlet | | PN | - | - | - | 63 | | | |
| Sonderausführung | | Special Version | | | | #300 | | | | | |
| Ansprechdruck | GS | Set pressure | CS | p | bar/bar g | 100 | 100 | 77 | 77 | | |
| 2) | GX | 2) | SS | p | bar/bar g | 100 | 65 | 51,5 | 49 | | |
| Engster Strömungsquerschnitt | | Flow area | | A ₀ | mm ² | 314 | 1257 | 2827 | 4301 | | |
| Engster Strömungsdurchmesser | | Flow diameter | | d ₀ | mm | 20 | 40 | 60 | 74 | | |
| Schenkellänge | | PN 40 | Centre to face dim. | PN 40 | a | mm | 120 | 145 | 180 | 235 | |
| bei Austrittsflansch | | PN 63 | for outlet flange | PN 63 | a | mm | 120 | 145 | 205 | 265 | |
| Schenkellänge | | Eintritt | Centre to face dim. Inlet | b | mm | 122 | 155 | 165 | 205 | | |
| Maß zur Bestimmung der Schraubenlänge | | Used to find bolt length | | s | mm | 28 | 38 | 38 | 45 | | |
| Bauhöhe | | H 2 | Height | H 2 | H | mm | 355 | 481 | 594 | 791 | |
| | | H 3 GS | | H 3 CS | H | mm | 365 | 526 | 639 | 791 | |
| | | H 4 | | H 4 | H | mm | 371 | 529 | 642 | 791 | |
| | | H 2 GX | | H 2 SS | H | mm | 355 | 481 | 594 | 791 | |
| | | H 4 | | H 4 | H | mm | 363 | 529 | 642 | 791 | |
| | | mit Faltenbalg zus. | | with bellows add. | H | mm | 35 | 80 | 98 | 91 | |
| Deckenfreiheit | | Height clearance | | x | mm | 250 | 300 | 350 | 400 | | |
| Gewicht ohne Faltenbalg | | Weight without bellows | | - | kg | 18 | 43 | 85 | 154 | | |
| mit Faltenbalg | | with bellows | | - | kg | 20 | 46 | 102 | 185 | | |
| Spannpratzen | | Brackets | | Draufsicht/Top view | | A | mm | 140 | 184 | 278 | 364 |
|  | | | | B | mm | - | 110 | 160 | 210 | | |
| | | | | C | mm | Ø14 | Ø14 | Ø18 | Ø18 | | |
| | | | | D | mm | 149 | 194 | 225 | 288 | | |
| | | | | E | mm | 18 | 18 | 27 | 32 | | |

2) Höhere Ansprechdrücke auf Anfrage möglich. / On request higher set pressures are possible.

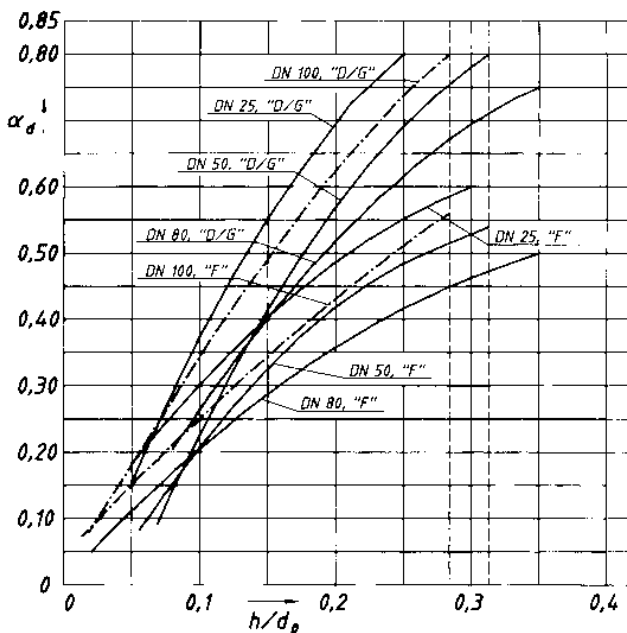
Werkstoffe / Materials

| Pos. Item | Bauteile | Parts | 4552/4562 | | 4564 | |
|--------------|-------------------------------|------------------------------|--------------------------------------|----------------------|---------------------------------------|----------------|
| | | | GS | CS | Korrosionsfest corrosion resistant | |
| 1 | Gehäuse | Body | GP 240 GH | 1.0619 | GX5 Cr Ni Mo Nb 19-11-2 | 1.4581 |
| 5 | Sitz | Seat | X 2 Cr Ni Mo 17-12-2 | | | 1.4404 |
| 7 | Teller | Disc | X 39 Cr Mo 17-1 | 1.4122 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| 8 | Führungsscheibe mit Buchse | Guide with bush | C35/GGG-40 | 1.0501/0.7040 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| | | | X 14 Cr Mo S 17 tenifer | 1.4104 tenifer | | |
| 9 | Federhaube | Bonnet | geschl./closed: GGG 40.3 (GP 240 GH) | 0.7043 (1.0619) | GX5 Cr Ni Mo 19-11-2 | 1.4408 |
| | | | offen/open: GGG 40 (GP 240 GH) | 0.7040 (1.0619) | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| | | | | | X 6 Cr Ni Mo Ti 17-12-2 | 1.4571 |
| 12 | Spindel | Spindle | X 2 Cr Ni Mo 17-12-2 tenifer | | | 1.4404 tenifer |
| 16 | Federteller | Spring plate | 11 S Mn Pb 30/X 2 Cr Ni Mo 17-12-2 | 1.0718/1.4404 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| 18 | Druckschraube mit Buchse | Adjusting screw with bush | X 14 Cr Mo S 17 | 1.4104 | X 2 Cr Ni Mo 17-12-2 tenifer | 1.4404 tenifer |
| | | | PTFE | PTFE | | |
| 54 | Feder | Spring | 54 Cr Si 6/51 Cr V 4/X 10 Cr Ni 18-8 | 1.7102/1.8159/1.4310 | X 10 Cr Ni 18-8 | 1.4310 |
| 40 | Kappe H 2 | Cap H 2 | 11 S Mn Pb 30/GGG 40.3 | 1.0718/0.7043 | X 2 Cr Ni Mo 17-12-2 | 1.4404 |
| | Anlüftung H 3 | Lifting device H 3 | GGG-40 | 0.7040 | | |
| | Anlüftung H 4 | Lifting device H 4 | GGG-40 | 0.7040 | | |
| 55/ 56 | Stiftschraube und Mutter | Bolt and nut | A 4-70/A 4 | | | 1.4401/1.4401 |

Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1

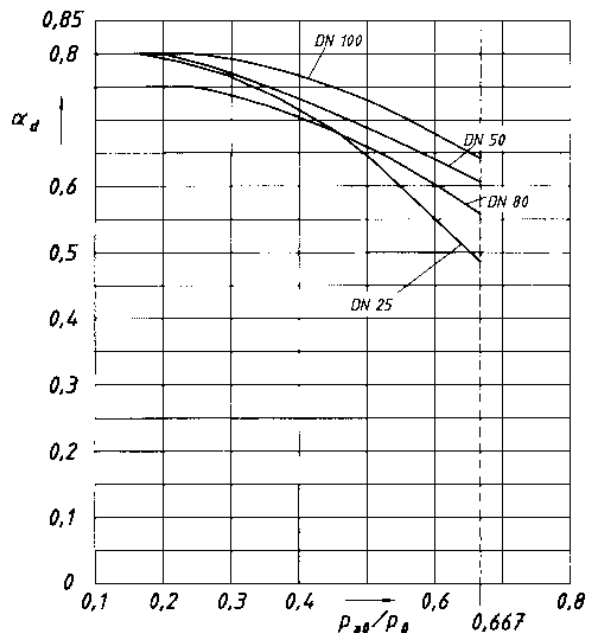
$$\alpha_d = f(h/d_0)$$



h = Hub (mm)
 d_0 = engster Strömungsdurchmesser (mm)
 p_{a0} = Gegendruck, absolut (bar)
 p_0 = Ansprechdruck, absolut (bar)

Diagramm 2

$$\alpha_d = f(p_{a0}/p_0)$$



h = Lift (mm)
 d_0 = Flow diameter (mm)
 p_{a0} = Back pressure abs. (bar)
 p_0 = Set pressure abs. (bar)

Type 455, 456

| Leistungstabelle | | | | | | | | | | Discharge Capacities | | | | | | | | | |
|--|----------------------------|-------|------|-------|-------|------|-------|--------|-----|---|--------|------|----------------------|--|--|--|--|--|--|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | | | | | | | Calculations from VALVESTAR® 6.2.50 | | | | | | | | | |
| Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | | | | | | | | Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | | | | | | | |
| p | Ansprechüberdruck | | | | | | | | | Set pressure | | | bar g | | | | | | |
| I | Sattdampf | | | | | | | | | Saturated steam | | | kg/h | | | | | | |
| II | Luft bei 0°C und 1013 mbar | | | | | | | | | Air at 0°C and 1013 mbar | | | m ³ /h | | | | | | |
| III | Wasser bei 20°C | | | | | | | | | Water at 20°C | | | 10 ³ kg/h | | | | | | |
| DN | 25 | | | 50 | | | 80 | | | 100 | | | | | | | | | |
| d ₀ (mm) | 20 | | | 40 | | | 60 | | | 74 | | | | | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | | | | | | | |
| 2,5 | 501 | 610 | 15,9 | 2031 | 2471 | 57,2 | 4391 | 5343 | 119 | 7131 | 8676 | 203 | | | | | | | |
| 5 | 900 | 1112 | 22,5 | 3600 | 4450 | 80,9 | 7593 | 9386 | 169 | 12320 | 15229 | 287 | | | | | | | |
| 10 | 1632 | 2054 | 31,8 | 6530 | 8215 | 114 | 13774 | 17329 | 238 | 22348 | 28116 | 406 | | | | | | | |
| 15 | 2359 | 2995 | 38,9 | 9434 | 11980 | 140 | 19900 | 25271 | 292 | 32288 | 41002 | 498 | | | | | | | |
| 20 | 3091 | 3936 | 45,0 | 12363 | 15745 | 162 | 26078 | 33213 | 337 | 42312 | 53889 | 575 | | | | | | | |
| 25 | 3816 | 4878 | 50,3 | 15264 | 19511 | 181 | 32197 | 41155 | 377 | 52241 | 66775 | 642 | | | | | | | |
| 30 | 4555 | 5819 | 55,1 | 18219 | 23276 | 198 | 38431 | 49098 | 413 | 62356 | 79662 | 704 | | | | | | | |
| 35 | 5285 | 6760 | 59,5 | 21140 | 27041 | 214 | 44591 | 57040 | 446 | 72350 | 92548 | 760 | | | | | | | |
| 40 | 6035 | 7702 | 63,6 | 24138 | 30806 | 229 | 50917 | 64982 | 477 | 82614 | 105435 | 813 | | | | | | | |
| 45 | 6792 | 8643 | 67,5 | 27167 | 34572 | 243 | 57306 | 72924 | 506 | 92981 | 118321 | 862 | | | | | | | |
| 50 | 7557 | 9584 | 71,1 | 30230 | 38337 | 256 | 63765 | 80867 | 533 | 103461 | 131208 | 909 | | | | | | | |
| 55 | 8308 | 10525 | 74,6 | 33233 | 42102 | 268 | 70101 | 88809 | 559 | 113740 | 144094 | 953 | | | | | | | |
| 60 | 9090 | 11467 | 77,9 | 36360 | 45867 | 280 | 76697 | 96751 | 584 | 124442 | 156980 | 995 | | | | | | | |
| 65 | 9882 | 12408 | 81,1 | 39528 | 49632 | 292 | 83379 | 104693 | 608 | 135284 | 169867 | 1036 | | | | | | | |
| 70 | 10685 | 13349 | 84,1 | 42739 | 53398 | 303 | 90153 | 112636 | 631 | 146276 | 182753 | 1075 | | | | | | | |
| 75 | 11467 | 14291 | 87,1 | 45866 | 57163 | 313 | | 120578 | 653 | 156977 | 195640 | 1113 | | | | | | | |
| 80 | 12291 | 15232 | 89,9 | 49165 | 60928 | 324 | | 128520 | 675 | | 208526 | 1149 | | | | | | | |
| 85 | 13129 | 16173 | 92,7 | 52517 | 64693 | 334 | | 136462 | 695 | | 221413 | 1185 | | | | | | | |
| 90 | 13981 | 17115 | 95,4 | 55925 | 68459 | 343 | | 144405 | 715 | | 234299 | 1219 | | | | | | | |
| 95 | 14849 | 18056 | 98,0 | 59395 | 72224 | 353 | | 152347 | 735 | | 247186 | 1252 | | | | | | | |
| 100 | 15687 | 18997 | 101 | 62749 | 75989 | 362 | | 160289 | 754 | | 260072 | 1285 | | | | | | | |

| Leistungstabelle | | | | | | | | | | Discharge Capacities | | | | | | | | |
|---|---|-------|------|--------|-------|------|--------|-------|------|---|--------|------|-------------------------|----|-----|---|----|-----|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | | | | | | | Calculations from VALVESTAR® 6.2.50 | | | | | | | | |
| Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet. | | | | | | | | | | Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure. | | | | | | | | |
| p | Ansprechüberdruck | | | | | | | | | Set pressure | | | psig | | | | | |
| I | Sattdampf, Abblasen gegen Atmosphärendruck (14,7 psi) | | | | | | | | | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi) | | | lb/h | | | | | |
| II | Luft bei 60°F, Abblasen gegen Atmosphärendruck (14,7 psi) | | | | | | | | | Air at 60°F, valve discharging to atmospheric pressure (14,7 psi) | | | SCFM | | | | | |
| III | Wasser bei 70°F | | | | | | | | | Water at 70°F | | | U.S. gallons per minute | | | | | |
| DN | 25 | | | 50 | | | 80 | | | 100 | | | | | | | | |
| | 1 x 2 | | | 2 x 3 | | | 3 x 4 | | | 4 x 6 | | | | | | | | |
| d ₀ (mm) | 20 | | | 40 | | | 60 | | | 74 | | | | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 40 | 1171 | 417 | 70,2 | 4684 | 1669 | 281 | 9957 | 3547 | 529 | 16030 | 5710 | 961 | | | | | | |
| 60 | 1611 | 574 | 86,0 | 6445 | 2296 | 344 | 13701 | 4881 | 648 | 22057 | 7857 | 1177 | | | | | | |
| 80 | 2051 | 731 | 99,3 | 8206 | 2923 | 397 | 17445 | 6215 | 748 | 28085 | 10004 | 1359 | | | | | | |
| 100 | 2492 | 888 | 111 | 9967 | 3551 | 444 | 21189 | 7549 | 837 | 34112 | 12151 | 1520 | | | | | | |
| 120 | 2932 | 1045 | 122 | 11728 | 4178 | 486 | 24933 | 8883 | 917 | 40139 | 14298 | 1665 | | | | | | |
| 140 | 3372 | 1201 | 131 | 13489 | 4806 | 525 | 28677 | 10216 | 990 | 46166 | 16445 | 1798 | | | | | | |
| 160 | 3813 | 1358 | 140 | 15250 | 5433 | 562 | 32421 | 11550 | 1058 | 52194 | 18592 | 1922 | | | | | | |
| 180 | 4253 | 1515 | 149 | 17011 | 6060 | 596 | 36165 | 12884 | 1123 | 58221 | 20738 | 2039 | | | | | | |
| 200 | 4693 | 1672 | 157 | 18772 | 6688 | 628 | 39909 | 14218 | 1183 | 64248 | 22885 | 2149 | | | | | | |
| 220 | 5133 | 1829 | 165 | 20533 | 7315 | 659 | 43653 | 15552 | 1241 | 70275 | 25032 | 2254 | | | | | | |
| 240 | 5574 | 1986 | 172 | 22294 | 7943 | 688 | 47397 | 16885 | 1296 | 76303 | 27179 | 2354 | | | | | | |
| 260 | 6014 | 2142 | 179 | 24055 | 8570 | 716 | 51140 | 18219 | 1349 | 82330 | 29326 | 2450 | | | | | | |
| 280 | 6454 | 2299 | 186 | 25817 | 9197 | 743 | 54884 | 19553 | 1400 | 88357 | 31473 | 2543 | | | | | | |
| 300 | 6894 | 2456 | 192 | 27578 | 9825 | 769 | 58628 | 20887 | 1449 | 94384 | 33620 | 2632 | | | | | | |
| 350 | 7995 | 2848 | 208 | 31980 | 11393 | 831 | 67988 | 24221 | 1565 | 109452 | 38987 | 2843 | | | | | | |
| 400 | 9096 | 3240 | 222 | 36383 | 12962 | 888 | 77348 | 27556 | 1673 | 124520 | 44355 | 3039 | | | | | | |
| 450 | 10196 | 3633 | 236 | 40786 | 14530 | 942 | 86708 | 30890 | 1775 | 139589 | 49722 | 3224 | | | | | | |
| 500 | 11297 | 4025 | 248 | 45188 | 16099 | 993 | 96067 | 34225 | 1871 | 154657 | 55089 | 3398 | | | | | | |
| 550 | 12398 | 4417 | 260 | 49591 | 17667 | 1041 | 105427 | 37559 | 1962 | 169725 | 60457 | 3564 | | | | | | |
| 600 | 13498 | 4809 | 272 | 53994 | 19236 | 1088 | 114787 | 40894 | 2050 | 184793 | 65824 | 3722 | | | | | | |
| 650 | 14599 | 5201 | 283 | 58396 | 20804 | 1132 | 124147 | 44228 | 2133 | 199861 | 71191 | 3874 | | | | | | |
| 700 | 15700 | 5593 | 294 | 62799 | 22373 | 1175 | 133507 | 47563 | 2214 | 214929 | 76559 | 4021 | | | | | | |
| 750 | 16800 | 5985 | 304 | 67202 | 23941 | 1216 | 142866 | 50897 | 2291 | 229997 | 81926 | 4162 | | | | | | |
| 800 | 17901 | 6377 | 314 | 71604 | 25510 | 1256 | 152226 | 54232 | 2367 | 245065 | 87293 | 4298 | | | | | | |
| 850 | 19002 | 6770 | 324 | 76007 | 27078 | 1295 | 161586 | 57567 | 2439 | 260133 | 92661 | 4430 | | | | | | |
| 900 | 20102 | 7162 | 333 | 80410 | 28647 | 1332 | 170946 | 60901 | 2510 | 275202 | 98028 | 4559 | | | | | | |
| 950 | 21203 | 7554 | 342 | 84812 | 30215 | 1369 | 180306 | 64236 | 2579 | 290270 | 103395 | 4684 | | | | | | |
| 1000 | 22304 | 7946 | 351 | 89215 | 31784 | 1404 | 189665 | 67570 | 2646 | 305338 | 108763 | 4806 | | | | | | |
| 1100 | 24505 | 8730 | 368 | 98020 | 34921 | 1473 | | 74239 | 2775 | | 119497 | 5040 | | | | | | |
| 1200 | 26706 | 9514 | 385 | 106825 | 38058 | 1538 | | 80908 | 2899 | | | | | | | | | |
| 1300 | 28908 | 10299 | 400 | 115631 | 41195 | 1601 | | | | | | | | | | | | |
| 1400 | 31065 | 11083 | 415 | 124260 | 44332 | 1662 | | | | | | | | | | | | |
| 1500 | | 11867 | 430 | | 47468 | 1720 | | | | | | | | | | | | |

Type
457, 458

Vollhub-Feder-Sicherheitsventil PN 63-400 (#300-#2500) Full Lift Safety Valve PN 63-400 (#300-#2500) spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

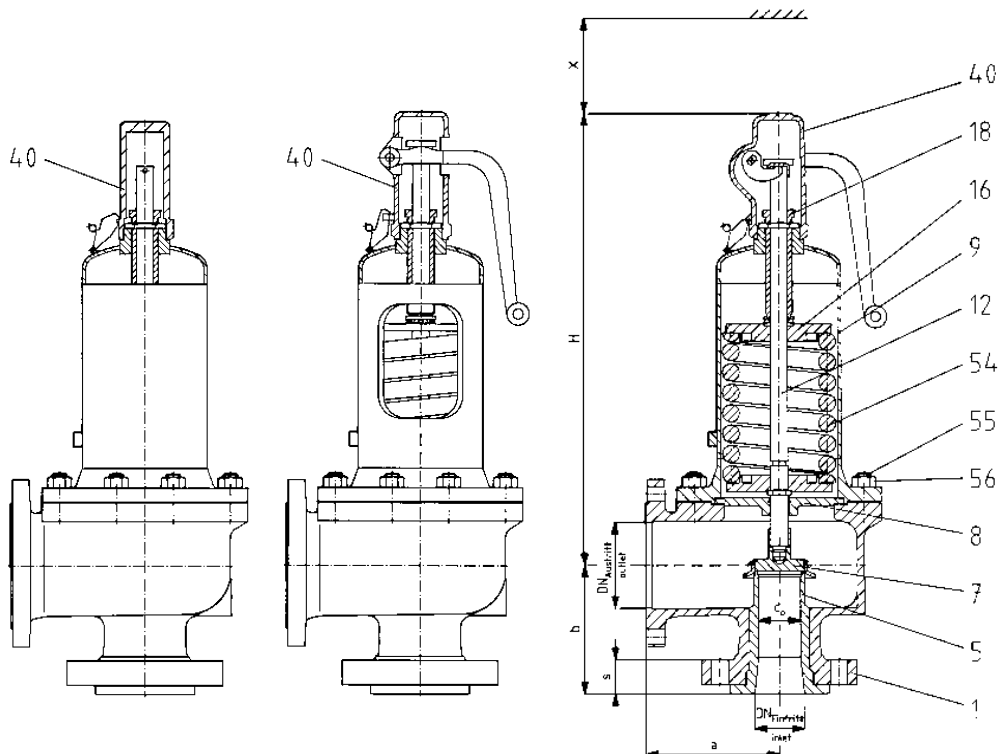
Zusatzrüstungen

- Edelstahl-Faltenbalg
- Hochtemperatur-Ausrüstung
- Teller mit Weichdichtung
- Heizmantel
- Anschweißende am Eintritt
- Entwässerungsbohrung
- Detailinformationen und weitere Zusatzrüstungen siehe Teil 13

Accessories

- Stainless steel bellows
- High temperature equipment
- Disc with soft seal
- Heating jacket
- Butt weld inlet
- Drain hole

For detailed information and additional accessories refer to section 13



Type 458
mit gasdichter Kappe H 2
with gastight cap H 2

Type 457
offene Federhaube mit
Anlüftung H 3, Teller anlüftbar
open bonnet
lifting device H 3
disc liftable

Type 458
geschlossene Federhaube mit
Anlüftung H 4 gasdicht, Teller anlüftbar
closed bonnet
lifting device H 4 gastight
disc liftable

Zulassungen / Approvals

| | Dämpfe/Gase D/G Steam/Gases S/G | | Flüssigkeiten F Liquids L | |
|---|------------------------------------|--|------------------------------|--|
| | 934 | | 934 | |
| TÜV (AD-A2, TRD 421) Listennr./Approval number | 934 | | 934 | |
| Ausflussziffer/Coefficient of discharge α_d | 934 | | 934 | |
| Öffnungscharakteristik/Opening characteristic | Vollhub/Full lift | | Normal/Standard | |
| ASME/NB Nr./No. | 37066 | | 37077 | |
| Ausflussziffer/Coefficient of discharge K | 0,798 | | 0,479 | |
| Weitere/Others siehe Seite/refer to page 2/40-41 | GOST, ISPESL, UDT | | | |

| Gehäusewerkstoff Body material | DN | Flanschanschlüsse nach Flange connections acc. to | | | | Temperatureinsatzbereich °C ¹⁾ Temperature range °F ¹⁾ Federhaube | | | | Type Bonnet | |
|--|--------------------|--|------------------|-----------------|------------------|--|------------|-------------|------------|-------------------|------|
| | | DIN PN | | ANSI B 16,5 | | DIN EN | | ASME | | | |
| Werkstoffbezeichnung Material Designation | von bis from to | Eintr. Inlet | Austr. Outlet | Eintr. Inlet | Austr. Outlet | von from | bis to | von from | bis to | geschl. closed | open |
| GP 240 GH | 25/1" 150/6" | | | | | -85/-121 | +450/+842 | -20/-29 | +427/+800 | 4582 | 4572 |
| G 17 CrMo 5-5 | 25/1" 100/6" | | | | | -85/-121 | +550/+1022 | -20/-29 | +538/+1000 | 4587 | 4577 |
| GX5 CrNiMoNb 19-11-2 | 25/1" 100/6" | 63-400 | 40-160 | #300-2500 | #150-300 | -85/-121 | +550/+1022 | -184/-300 | +300/+572 | 4584 | - |
| GX5 CrNiMo 19-11-2 | 25/1" 150/6" | | | | | -270/-454 | +400/+752 | -268/-450 | +300/+572 | 4584 | |

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

| Gehäusewerkstoff / Body material | | | | Nennweite / Nominal Diameter | | | | | | | | | | | | |
|----------------------------------|-----------------------|-------------------------------|----------------------|------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | | DN | | 25 | | 50 | | 80 | | 100 | | | | 150 |
| DIN EN | | Werkstoff-Nr. Material No. | ASME | | 1" | | 2" | | 3" | | 4" | | | | 6" | |
| | | | | d _o | 15 | 20 | 30 | 40 | 50 | 60 | 50 | 60 | 74 | 88 | 110 | |
| Federhaube/Bonnet | geschlossen closed | GP 240 GH | 1.0619 | SA 216 WCB | 4582 | .610* | .611* | .612* | .613* | .614* | .615* | .616* | .617* | .618* | .619* | 460* |
| | | G 17 CrMo 5-5 | 1.7357 | SA 217 WC6 | 4587 | .630* | .631* | .632* | .633* | .634* | .635* | .636* | .637* | .638* | .639* | - |
| | | GX 5 CrNiMoNb 19-11-2 | 1.4581 ¹⁾ | SA 351CF10M | 4584 | .620* | .621* | .622* | .623* | .624* | .625* | .626* | .627* | .628* | .629* | - |
| | | GX 5 CrNiMo 19-11-2 | 1.4408 ¹⁾ | SA 351CF8M | 4584 | - | - | - | - | - | - | - | - | - | - | 473* |
| | offen open | GP 240 GH | 1.0619 | SA 216 WCB | 4572 | .6105 | .6115 | .6125 | .6135 | .6145 | .6155 | .6165 | .6175 | .6185 | .6195 | 4605 |
| | | G 17 CrMo 5-5 | 1.7357 | SA 217 WC6 | 4577 | .6305 | .6315 | .6325 | .6335 | .6345 | .6355 | .6365 | .6375 | .6385 | .6395 | - |

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

- 2 = Kappe H2
- 3 = Anlüftung H3 (offen)
- 4 = Anlüftung H4 (gasdicht)

1) H3 ist bei diesem Werkstoff nicht lieferbar.

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

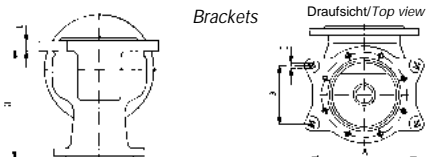
* Please add number for the required cap or lifting device:

- 2 = Cap H2
- 3 = Lifting device H3 (open)
- 4 = Lifting device H4 (gastight)

1) H3 is not available in this material.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

| Nennweite, Ventilgröße | | Nominal Diameter, Valve size | | DN | - | 25 | 50 | 80 | 100 | | | | 150 | | | |
|---|---------------------|---|---------------------|----------------|-----------------|----------------|-----|----------------|------|------|------|----------|------|------|------|------|
| Nennweite, Ventilgröße (ASME) | | Nominal Diameter, Valve size | | DN | - | 1" | 2" | 3" | 4" | | | | 6" | | | |
| Druckstufe Eintritt | | Pressure rating Inlet PN | | - | | 63-250 | | 63-160 | | | | 40 | | | | |
| Druckstufe Eintritt (ASME) | | Pressure rating Inlet PN | | - | | #300-1500 | | #300-600 | | | | #150 | | | | |
| Druckstufe Eintritt Sonderausführung | | Pressure rating Inlet Special Version | | PN | - | 40 und/and 400 | | 40 und/and 250 | | | | 63 | | | | |
| Druckstufe Eintritt Sonderausführung (ASME) | | Pressure rating Inlet Special Version | | PN | - | #2500 | - | #900, 1500 | | | | #300-600 | | | | |
| Nennweite, Austritt | | Nominal Diameter, Outlet | | DN | - | 50 | 80 | 100 | 150 | | | | 250 | | | |
| Nennweite, Austritt (ASME) | | Nominal Diameter, Outlet | | DN | - | 2" | 3" | 4" | 6" | | | | 10" | | | |
| Druckstufe Austritt | | Pressure rating Outlet | | PN | - | 40-63 | | 40 | | | | 16 | | | | |
| Druckstufe Austritt (ASME) | | Pressure rating Outlet | | PN | - | #150-300 | | #150 | | | | #150 | | | | |
| Druckstufe Austritt Sonderausführung | | Pressure rating Outlet Special Version | | PN | - | 160 | - | 63 | | | | 40 | | | | |
| Druckstufe Austritt Sonderausführung (ASME) | | Pressure rating Outlet Special Version | | PN | - | #600 | - | #300 | | | | - | | | | |
| Ansprechdruck GS 2) GX | CS SS | Set pressure | p | bar/barg | 300 | 180 | 210 | 114,5 | 160 | 77 | 160 | 160 | 77 | 53 | 40 | |
| | | | p | bar/barg | 250 | 146 | 130 | 65 | 104 | 51,5 | 71 | 55 | 49 | 32 | 10 | |
| Engster Strömungsquerschnitt | | Flow area | | A ₀ | mm ² | 177 | 314 | 707 | 1257 | 1964 | 2827 | 1964 | 2827 | 4301 | 6082 | 9503 |
| Engster Strömungsdurchmesser | | Flow diameter | | d ₀ | mm | 15 | 20 | 30 | 40 | 50 | 60 | 50 | 60 | 74 | 88 | 110 |
| Schenkellänge bei Austrittsflansch | PN 40 | Centre to face dim. for outlet flange | PN 40 | a | mm | 120 | 145 | 180 | 235 | | | | 225 | | | |
| | PN 63 | | PN 63 | a | mm | 120 | 145 | 205 | 265 | | | | - | | | |
| | PN 160 | | PN 160 | a | mm | 130 | - | - | - | | | | - | | | |
| Schenkellänge | Eintritt | Centre to face dim. Inlet | b | mm | 135 | 170 | 190 | 225 | | | | 300 | | | | |
| Maß zur Bestimmung der Schraubenlänge bei Eintrittsflansch | PN 40-160 | Used to find bolt length for inlet flange | PN 40-160 | s | mm | 41 | 53 | 53 | 60 | | | | 43 | | | |
| | PN 250 | | PN 250 | s | mm | 41 | 53 | 60 | 68 | | | | - | | | |
| | PN 400 | | PN 400 | s | mm | 50 | - | - | - | | | | - | | | |
| Bauhöhe | H2 | Height | H2 | H | mm | 355 | 481 | 594 | 791 | | | | 728 | | | |
| | H3 GS | | H3 CS | H | mm | 365 | 526 | 639 | 791 | | | | 735 | | | |
| | H4 | | H4 | H | mm | 371 | 529 | 642 | 791 | | | | 735 | | | |
| | H2 GX | | H2 SS | H | mm | 355 | 481 | 594 | 791 | | | | 728 | | | |
| | H4 | H4 | H | mm | 363 | 529 | 642 | 791 | | | | 735 | | | | |
| | mit Faltenbalg zus. | | with bellows add. | H | mm | 35 | 80 | 98 | 91 | | | | 58 | | | |
| Deckenfreiheit | | Height clearance | | x | mm | 200 | 300 | 350 | 400 | | | | 450 | | | |
| Gewicht ohne Faltenbalg mit Faltenbalg | | Weight without bellows | | - | kg | 20 | 45 | 88 | 157 | | | | 131 | | | |
| | | with bellows | | - | kg | 22 | 48 | 108 | 188 | | | | 162 | | | |
| Spannpratzen  | Brackets | | Draufsicht/Top view | | A | mm | 140 | 184 | 278 | 364 | | | | 320 | | |
| | | | | | B | mm | - | 110 | 160 | 210 | | | | 185 | | |
| | | | | | C | mm | Ø14 | Ø14 | Ø18 | Ø18 | | | | Ø18 | | |
| | | | | | D | mm | 162 | 209 | 240 | 303 | | | | 392 | | |
| | | | | | E | mm | 18 | 18 | 27 | 32 | | | | 28 | | |

2) Höhere Ansprechdrücke auf Anfrage möglich. / On request higher set pressures are possible.

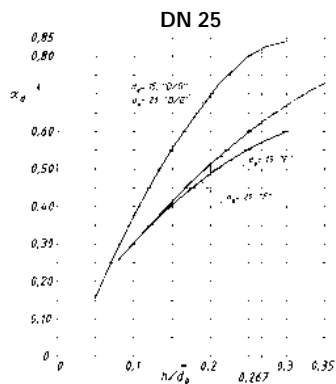
Werkstoffe / Materials

| Pos. Item | Bauteile | Parts | 4572/4582 | | 4577/4587 | | 4584 | | | |
|-----------|----------------------------|---------------------------|--|-----------------|------------------------|-----------------|---------------------------------------|---|----------------------|--------|
| | | | GS | CS | GS-CrMo | Chrome Moly St. | Korrosionsfest corrosion resistant | Korrosions- und Kältefest corrosion- /cryogenic resistant DN 150 only | | |
| 1 | Gehäuse | Body | GP 240 GH | 1.0619 | G 17 Cr Mo 5-5 | 1.7357 | GX5 Cr Ni MoNb 19-11-2 | 1.4581 | GX5 Cr Ni Mo 19-11-2 | 1.4408 |
| 5 | Sitzbuchse | Nozzle | X 2 Cr Ni Mo 17-12-2 gepanzert/stellited | | | | 1.4404 gepanzert/stellited | | | |
| 7 | Teller | Disc | X 39 Cr Mo 17-1/X 2 Cr Ni Mo 17-12-2 | 1.4122/1.4404 | X 2 Cr Ni Mo 17-12-2 | 1.4404 | gepanzert/stellited | | | |
| 8 | Führungsscheibe mit Buchse | Guide with bush | C35/GGG-40 | 1.0501/0.7040 | X 2 Cr Ni Mo 17-12-2 | 1.4404 | gepanzert/stellited | | | |
| 9 | Federhaube | Bonnet | geschl./closed: GGG 40.3 (GP 240 GH) | 0.7043 (1.0619) | GX5 Cr Ni Mo 19-11-2 | 1.4408 | gepanzert/stellited | | | |
| | | | offen/open: GGG 40 (GP 240 GH) | 0.7040 (1.0619) | X2 Cr Ni Mo 17-12-2 | 1.4404 | gepanzert/stellited | | | |
| | | | | | X6 Cr Ni Mo Ti 17-12-2 | 1.4571 | | | | |
| 12 | Spindel | Spindle | X 2 Cr Ni Mo 17-12-2 tenifer | | | | 1.4404 tenifer | | | |
| 16 | Federteller | Spring plate | 11 S Mn Pb 30/X 2 Cr Ni Mo 17-12-2 | | | | 1.0718/1.4404 | | | |
| 18 | Druckschraube mit Buchse | Adjusting screw with bush | X 14 Cr Mo S 17 | | | | 1.4104 | | | |
| | | | PTFE | | | | PTFE | | | |
| 54 | Feder | Spring | 54 Cr Si 6/51 Cr V 4/X 10 Cr Ni 18-8 | | | | 1.7102/1.8159/1.4310 | | | |
| 40 | Kappe H 2 | Cap H 2 | 11 S Mn Pb 30/GGG40.3 | | | | 1.0718/0.7043 | | | |
| | Anlüftung H 3 | Lifting device H 3 | GGG-40 | | | | 0.7040 | | | |
| | Anlüftung H 4 | Lifting device H 4 | GGG-40 | | | | 0.7040 | | | |
| 55/ 56 | Stiftschraube und Mutter | Bolt and nut | t < 400 °C | | | | A 4-70/A 4 | | | |
| | | | t > 400 °C | | | | 21 Cr Mo V 57/24 Cr Mo 5 | | | |

Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1

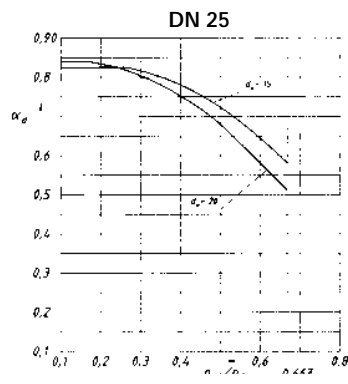
$$\alpha_d = f(h/d_0)$$



h = Hub (mm)
 d_0 = engster Strömungsdurchmesser (mm)
 p_{a0} = Gegendruck, absolut (bar)
 p_0 = Ansprechdruck, absolut (bar)

Diagramm 2

$$\alpha_d = f(p_{a0}/p_0)$$

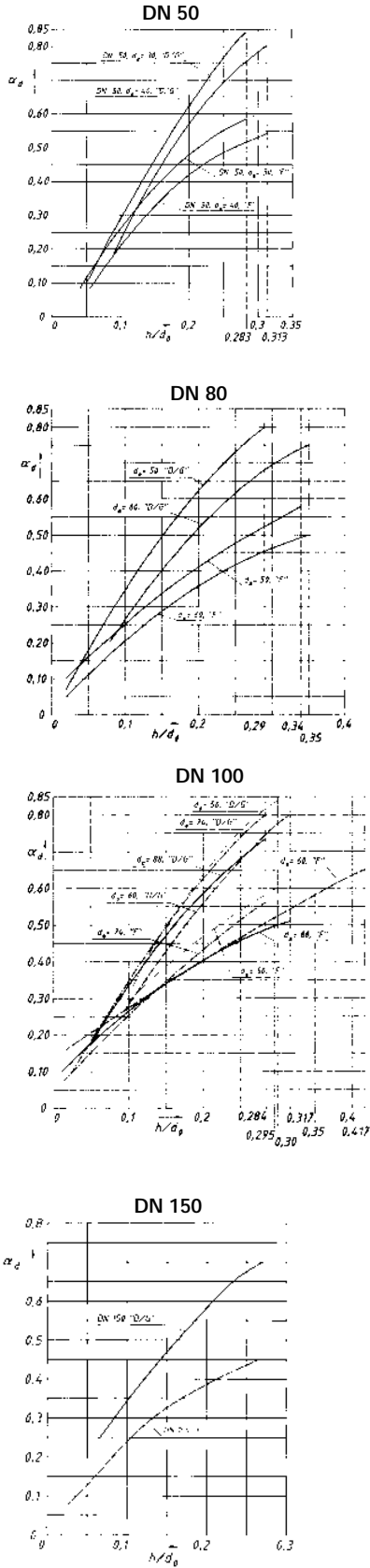


h = Lift (mm)
 d_0 = Flow diameter (mm)
 p_{a0} = Back pressure abs. (bar)
 p_0 = Set pressure abs. (bar)

Zuerkante Ausflussziffer α_D / Coefficient of Discharge α_D

Diagramm 1

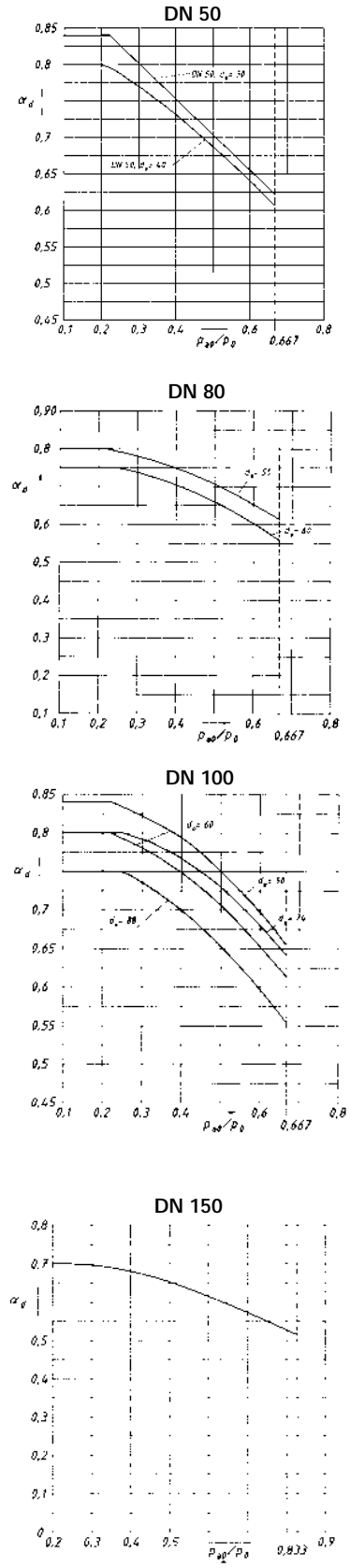
$$\alpha_D = f(h/d_0)$$



h = Hub (mm)
 d_0 = engster Strömungsdurchmesser (mm)
 p_{a0} = Gegendruck, absolut (bar)
 p_0 = Ansprechdruck, absolut (bar)

Diagramm 2

$$\alpha_D = f(p_{a0}/p_0)$$



h = Lift (mm)
 d_0 = Flow diameter (mm)
 p_{a0} = Back pressure abs. (bar)
 p_0 = Set pressure abs. (bar)

Type 457, 458

| Leistungstabelle | | | | Discharge Capacities | | | |
|--|----------------------------|--|--|---|--|--|----------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | | | Calculations from VALVESTAR® 6.2.50 | | | |
| Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | | Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421 | | | |
| p | Ansprechüberdruck | | | Set pressure | | | bar g |
| I | Satttdampf | | | Saturated steam | | | kg/h |
| II | Luft bei 0°C und 1013 mbar | | | Air at 0°C and 1013 mbar | | | m ³ /h |
| III | Wasser bei 20°C | | | Water at 20°C | | | 10 ³ kg/h |

| DN | 25 | | | | | | 50 | | | | | | 80 | | | | | |
|---------------------|-------|-------|------|-------|-------|------|-------|-------|------|-------|--------|------|--------|--------|------|--------|--------|-----|
| | 1" | | | | | | 2" | | | | | | 3" | | | | | |
| d ₀ (mm) | 15 | | | 20 | | | 30 | | | 40 | | | 50 | | | 60 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 2,5 | 300 | 366 | 9,39 | 527 | 642 | 15,9 | 1187 | 1444 | 34,0 | 2031 | 2471 | 57,2 | 3420 | 4162 | 94,4 | 4391 | 5343 | 119 |
| 5 | 525 | 649 | 13,3 | 945 | 1168 | 22,5 | 2126 | 2628 | 48,1 | 3600 | 4450 | 80,9 | 5835 | 7214 | 134 | 7593 | 9386 | 169 |
| 10 | 953 | 1199 | 18,8 | 1714 | 2156 | 31,8 | 3857 | 4852 | 68,0 | 6530 | 8215 | 114 | 10585 | 13317 | 189 | 13774 | 17329 | 238 |
| 15 | 1376 | 1748 | 23,0 | 2476 | 3145 | 38,9 | 5572 | 7076 | 83,2 | 9434 | 11980 | 140 | 15294 | 19421 | 231 | 19900 | 25271 | 292 |
| 20 | 1804 | 2297 | 26,6 | 3245 | 4133 | 45,0 | 7302 | 9300 | 96,1 | 12363 | 15745 | 162 | 20041 | 25525 | 267 | 26078 | 33213 | 337 |
| 25 | 2227 | 2847 | 29,7 | 4007 | 5122 | 50,3 | 9015 | 11523 | 107 | 15264 | 19511 | 181 | 24744 | 31629 | 299 | 32197 | 41155 | 377 |
| 30 | 2658 | 3396 | 32,5 | 4783 | 6110 | 55,1 | 10761 | 13747 | 118 | 18219 | 23276 | 198 | 29535 | 37732 | 327 | 38431 | 49098 | 413 |
| 35 | 3084 | 3945 | 35,1 | 5549 | 7098 | 59,5 | 12486 | 15971 | 127 | 21140 | 27041 | 214 | 34269 | 43836 | 353 | 44591 | 57040 | 446 |
| 40 | 3522 | 4495 | 37,6 | 6336 | 8087 | 63,6 | 14257 | 18195 | 136 | 24138 | 30806 | 229 | 39131 | 49940 | 378 | 50917 | 64982 | 477 |
| 45 | 3964 | 5044 | 39,8 | 7131 | 9075 | 67,5 | 16046 | 20419 | 144 | 27167 | 34572 | 243 | 44041 | 56044 | 401 | 57306 | 72924 | 506 |
| 50 | 4410 | 5593 | 42,0 | 7935 | 10063 | 71,1 | 17854 | 22643 | 152 | 30230 | 38337 | 256 | 49005 | 62147 | 422 | 63765 | 80867 | 533 |
| 55 | 4849 | 6143 | 44,0 | 8724 | 11052 | 74,6 | 19628 | 24866 | 159 | 33233 | 42102 | 268 | 53874 | 68251 | 443 | 70101 | 88809 | 559 |
| 60 | 5305 | 6692 | 46,0 | 9545 | 12040 | 77,9 | 21475 | 27090 | 166 | 36360 | 45867 | 280 | 58943 | 74355 | 462 | 76697 | 96751 | 584 |
| 65 | 5767 | 7241 | 47,9 | 10376 | 13029 | 81,1 | 23346 | 29314 | 173 | 39528 | 49632 | 292 | 64078 | 80459 | 481 | 83379 | 104693 | 608 |
| 70 | 6236 | 7791 | 49,7 | 11219 | 14017 | 84,1 | 25243 | 31538 | 180 | 42739 | 53398 | 303 | 69285 | 86563 | 500 | 90153 | 112636 | 631 |
| 75 | 6692 | 8340 | 51,4 | 12040 | 15005 | 87,1 | 27090 | 33762 | 186 | 45866 | 57163 | 313 | 74353 | 92666 | 517 | 96749 | 120578 | 653 |
| 80 | 7173 | 8889 | 53,1 | 12906 | 15994 | 89,9 | 29038 | 35986 | 192 | 49165 | 60928 | 324 | 79701 | 98770 | 534 | 103707 | 128520 | 675 |
| 85 | 7662 | 9439 | 54,8 | 13786 | 16982 | 92,7 | 31018 | 38209 | 198 | 52517 | 64693 | 334 | 85134 | 104874 | 550 | 110777 | 136462 | 695 |
| 90 | 8159 | 9988 | 56,3 | 14680 | 17970 | 95,4 | 33031 | 40433 | 204 | 55925 | 68459 | 343 | 90660 | 110978 | 566 | 117968 | 144405 | 715 |
| 95 | 8666 | 10537 | 57,9 | 15591 | 18959 | 98,0 | 35080 | 42657 | 209 | 59395 | 72224 | 353 | 96285 | 117081 | 582 | 125287 | 152347 | 735 |
| 100 | 9155 | 11087 | 59,4 | 16472 | 19947 | 101 | 37061 | 44881 | 215 | 62749 | 75989 | 362 | 101723 | 123185 | 597 | 132362 | 160289 | 754 |
| 110 | 10216 | 12185 | 62,3 | 18380 | 21924 | 105 | 41355 | 49329 | 225 | 70019 | 83519 | 380 | 113507 | 135393 | 626 | | | |
| 120 | 11325 | 13284 | 65,1 | 20376 | 23901 | 110 | 45846 | 53776 | 235 | 91050 | 91050 | 397 | 125833 | 147600 | 654 | | | |
| 130 | 12493 | 14383 | 67,7 | 22477 | 25877 | 115 | 50574 | 58224 | 245 | | 98580 | 413 | 138810 | 159808 | 681 | | | |
| 140 | 13772 | 15481 | 70,3 | 24779 | 27854 | 119 | 55753 | 62672 | 254 | | 106111 | 428 | 153026 | 172015 | 706 | | | |
| 150 | 15104 | 16580 | 72,7 | 27176 | 29831 | 123 | 61146 | 67119 | 263 | | 113641 | 443 | 167828 | 184223 | 731 | | | |
| 160 | 16602 | 17679 | 75,1 | 29871 | 31808 | 127 | 67209 | 71567 | 272 | | 121172 | 458 | | 196430 | 755 | | | |
| 170 | 18224 | 18777 | 77,4 | 32788 | 33784 | 131 | 73772 | 76015 | 280 | | | | | | | | | |
| 180 | 20169 | 19876 | 79,7 | 36288 | 35761 | 135 | 81648 | 80462 | 288 | | | | | | | | | |
| 200 | | 22073 | 84,0 | | 39714 | 142 | | 89378 | 309 | | | | | | | | | |
| 250 | | 27567 | 93,9 | | 49574 | 159 | | | | | | | | | | | | |
| 300 | | 33060 | 103 | | | | | | | | | | | | | | | |

| DN | 100 | | | | | | | | | 150 | | | | | | | | |
|---------------------|--------|--------|------|--------|--------|------|--------|--------|------|--------|--------|------|--------|--------|------|---|----|-----|
| | 4" | | | | | | | | | 6" | | | | | | | | |
| d ₀ (mm) | 50 | | | 60 | | | 74 | | | 88 | | | 110 | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 2,5 | 3379 | 4112 | 99,4 | 4629 | 5632 | 129 | 7131 | 8676 | 203 | 9318 | 11338 | 251 | 13762 | 16745 | 361 | | | |
| 5 | 5906 | 7300 | 141 | 8099 | 10012 | 182 | 12320 | 15229 | 287 | 16333 | 20191 | 355 | 23819 | 29445 | 510 | | | |
| 10 | 10713 | 13478 | 199 | 14692 | 18484 | 258 | 22348 | 28116 | 406 | 29629 | 37276 | 503 | 43209 | 54360 | 721 | | | |
| 15 | 15478 | 19655 | 243 | 21227 | 26956 | 315 | 32288 | 41002 | 498 | 42807 | 54360 | 616 | 62428 | 79275 | 884 | | | |
| 20 | 20283 | 25832 | 281 | 27816 | 35427 | 364 | 42312 | 53889 | 575 | 56096 | 71445 | 711 | 81807 | 104191 | 1020 | | | |
| 25 | 25042 | 32010 | 314 | 34344 | 43899 | 407 | 52241 | 66775 | 642 | 69260 | 88530 | 795 | 101004 | 129106 | 1141 | | | |
| 30 | 29891 | 38187 | 344 | 40993 | 52371 | 446 | 62356 | 79662 | 704 | 82670 | 105614 | 871 | 120561 | 154021 | 1250 | | | |
| 35 | 34682 | 44364 | 372 | 47564 | 60842 | 482 | 72350 | 92548 | 760 | 95921 | 122699 | 941 | 139885 | 178936 | 1350 | | | |
| 40 | 39602 | 50542 | 397 | 54311 | 69314 | 515 | 82614 | 105435 | 813 | 109528 | 139784 | 1005 | 159728 | 203851 | 1443 | | | |
| 45 | 44572 | 56719 | 422 | 61127 | 77786 | 546 | 92981 | 118321 | 862 | 123272 | 156868 | 1066 | | | | | | |
| 50 | 49595 | 62896 | 444 | 68016 | 86258 | 576 | 103461 | 131208 | 909 | | 173953 | 1124 | | | | | | |
| 55 | 54523 | 69074 | 466 | 74774 | 94729 | 604 | 113740 | 144094 | 953 | | 191038 | 1179 | | | | | | |
| 60 | 59653 | 75251 | 487 | 81810 | 103201 | 631 | 124442 | 156980 | 995 | | 208122 | 1231 | | | | | | |
| 65 | 64850 | 81428 | 507 | 88938 | 111673 | 657 | 135284 | 169867 | 1036 | | | | | | | | | |
| 70 | 70119 | 87605 | 526 | 96164 | 120145 | 681 | 146276 | 182753 | 1075 | | | | | | | | | |
| 75 | 75249 | 93783 | 544 | 103199 | 128616 | 705 | 156977 | 195640 | 1113 | | | | | | | | | |
| 80 | 80661 | 99960 | 562 | 110621 | 137088 | 729 | | 208526 | 1149 | | | | | | | | | |
| 85 | 86160 | 106137 | 579 | 118162 | 145560 | 751 | | 221413 | 1185 | | | | | | | | | |
| 90 | 91753 | 112315 | 596 | 125832 | 154032 | 773 | | 234299 | 1219 | | | | | | | | | |
| 95 | 97445 | 118492 | 613 | 133639 | 162503 | 794 | | 247186 | 1252 | | | | | | | | | |
| 100 | 102948 | 124669 | 628 | 141186 | 170975 | 814 | | 260072 | 1285 | | | | | | | | | |
| 110 | 114874 | 137024 | 659 | 157542 | 187919 | 854 | | | | | | | | | | | | |
| 120 | 127349 | 149379 | 688 | 174650 | 204862 | 892 | | | | | | | | | | | | |
| 130 | 140483 | 161733 | 717 | 192662 | 221806 | 929 | | | | | | | | | | | | |
| 140 | 154869 | 174088 | 744 | | 238749 | 964 | | | | | | | | | | | | |
| 150 | 169850 | 186442 | 770 | | 255693 | 998 | | | | | | | | | | | | |
| 160 | | 198797 | 795 | | 272636 | 1030 | | | | | | | | | | | | |
| 170 | | 211152 | 819 | | | | | | | | | | | | | | | |
| 180 | | 223506 | 843 | | | | | | | | | | | | | | | |

Type 457, 458

| Leistungstabelle | | Discharge Capacities | |
|---|---|---|-------------------------|
| Berechnungen aus VALVESTAR® 6.2.50 | | Calculations from VALVESTAR® 6.2.50 | |
| Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet. | | Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure. | |
| p | Ansprechüberdruck | Set pressure | psig |
| I | Sattdampf, Abblasen gegen Atmosphärengedruck (14,7 psi) | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi) | lb/h |
| II | Luft bei 60°F, Abblasen gegen Atmosphärengedruck (14,7 psi) | Air at 60°F, valve discharging to atmospheric pressure (14,7 psi) | SCFM |
| III | Wasser bei 70°F | Water at 70°F | U.S. gallons per minute |

| DN | 25 | | | | | | 50 | | | | | | 80 | | | | | |
|---------------------|-------|-------|------|-------|-------|------|--------|-------|------|--------|-------|------|--------|-------|------|--------|-------|------|
| | 1" | | | | | | 2" | | | | | | 3" | | | | | |
| d _G (mm) | 15 | | | 20 | | | 30 | | | 40 | | | 50 | | | 60 | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 40 | 659 | 235 | 39,5 | 1171 | 417 | 70,2 | 2635 | 939 | 158 | 4684 | 1669 | 281 | 7318 | 2607 | 439 | 9957 | 3547 | 529 |
| 60 | 906 | 323 | 48,4 | 1611 | 574 | 86,0 | 3625 | 1292 | 194 | 6445 | 2296 | 344 | 10070 | 3587 | 537 | 13701 | 4881 | 648 |
| 80 | 1154 | 411 | 55,9 | 2051 | 731 | 99,3 | 4616 | 1645 | 223 | 8206 | 2923 | 397 | 12822 | 4567 | 620 | 17445 | 6215 | 748 |
| 100 | 1402 | 499 | 62,5 | 2492 | 888 | 111 | 5606 | 1998 | 250 | 9967 | 3551 | 444 | 15573 | 5547 | 694 | 21189 | 7549 | 837 |
| 120 | 1649 | 588 | 68,4 | 2932 | 1045 | 122 | 6597 | 2351 | 274 | 11728 | 4178 | 486 | 18325 | 6527 | 760 | 24933 | 8883 | 917 |
| 140 | 1897 | 676 | 73,9 | 3372 | 1201 | 131 | 7588 | 2704 | 296 | 13489 | 4806 | 525 | 21077 | 7507 | 821 | 28677 | 10216 | 990 |
| 160 | 2145 | 764 | 79,0 | 3813 | 1358 | 140 | 8578 | 3057 | 316 | 15250 | 5433 | 562 | 23828 | 8487 | 877 | 32421 | 11550 | 1058 |
| 180 | 2392 | 852 | 83,8 | 4253 | 1515 | 149 | 9569 | 3410 | 335 | 17011 | 6060 | 596 | 26580 | 9467 | 931 | 36165 | 12884 | 1123 |
| 200 | 2640 | 941 | 88,3 | 4693 | 1672 | 157 | 10559 | 3763 | 353 | 18772 | 6688 | 628 | 29332 | 10447 | 981 | 39909 | 14218 | 1183 |
| 220 | 2887 | 1029 | 92,6 | 5133 | 1829 | 165 | 11550 | 4116 | 371 | 20533 | 7315 | 659 | 32083 | 11427 | 1029 | 43653 | 15552 | 1241 |
| 240 | 3135 | 1117 | 96,8 | 5574 | 1986 | 172 | 12541 | 4469 | 387 | 22294 | 7943 | 688 | 34835 | 12407 | 1075 | 47397 | 16885 | 1296 |
| 260 | 3383 | 1205 | 101 | 6014 | 2142 | 179 | 13531 | 4822 | 403 | 24055 | 8570 | 716 | 37587 | 13387 | 1119 | 51140 | 18219 | 1349 |
| 280 | 3630 | 1294 | 105 | 6454 | 2299 | 186 | 14522 | 5175 | 418 | 25817 | 9197 | 743 | 40338 | 14367 | 1161 | 54884 | 19553 | 1400 |
| 300 | 3878 | 1382 | 108 | 6894 | 2456 | 192 | 15512 | 5528 | 433 | 27578 | 9825 | 769 | 43090 | 15347 | 1202 | 58628 | 20887 | 1449 |
| 350 | 4497 | 1603 | 117 | 7995 | 2848 | 208 | 17989 | 6410 | 467 | 31980 | 11393 | 831 | 49969 | 17798 | 1298 | 67988 | 24221 | 1565 |
| 400 | 5116 | 1823 | 125 | 9096 | 3240 | 222 | 20465 | 7293 | 500 | 36383 | 12962 | 888 | 56848 | 20248 | 1387 | 77348 | 27556 | 1673 |
| 450 | 5735 | 2044 | 133 | 10196 | 3633 | 236 | 22942 | 8175 | 530 | 40786 | 14530 | 942 | 63727 | 22698 | 1472 | 86708 | 30890 | 1775 |
| 500 | 6355 | 2264 | 140 | 11297 | 4025 | 248 | 25418 | 9058 | 559 | 45188 | 16099 | 993 | 70607 | 25148 | 1551 | 96067 | 34225 | 1871 |
| 550 | 6974 | 2485 | 146 | 12398 | 4417 | 260 | 27895 | 9940 | 586 | 49591 | 17667 | 1041 | 77486 | 27598 | 1627 | 105427 | 37559 | 1962 |
| 600 | 7593 | 2706 | 153 | 13498 | 4809 | 272 | 30371 | 10823 | 612 | 53994 | 19236 | 1088 | 84365 | 30048 | 1699 | 114787 | 40894 | 2050 |
| 650 | 8212 | 2926 | 159 | 14599 | 5201 | 283 | 32848 | 11705 | 637 | 58396 | 20804 | 1132 | 91244 | 32499 | 1769 | 124147 | 44228 | 2133 |
| 700 | 8831 | 3147 | 165 | 15700 | 5593 | 294 | 35324 | 12588 | 661 | 62799 | 22373 | 1175 | 98123 | 34949 | 1835 | 133507 | 47563 | 2214 |
| 750 | 9450 | 3367 | 171 | 16800 | 5985 | 304 | 37801 | 13470 | 684 | 67202 | 23941 | 1216 | 105002 | 37399 | 1900 | 142866 | 50897 | 2291 |
| 800 | 10069 | 3588 | 177 | 17901 | 6377 | 314 | 40277 | 14352 | 707 | 71604 | 25510 | 1256 | 111882 | 39849 | 1962 | 152226 | 54232 | 2367 |
| 850 | 10688 | 3809 | 182 | 19002 | 6770 | 324 | 42754 | 15235 | 728 | 76007 | 27078 | 1295 | 118761 | 42299 | 2022 | 161586 | 57567 | 2439 |
| 900 | 11308 | 4029 | 187 | 20102 | 7162 | 333 | 45230 | 16117 | 750 | 80410 | 28647 | 1332 | 125640 | 44749 | 2081 | 170946 | 60901 | 2510 |
| 950 | 11927 | 4250 | 193 | 21203 | 7554 | 342 | 47707 | 17000 | 770 | 84812 | 30215 | 1369 | 132519 | 47199 | 2138 | 180306 | 64236 | 2579 |
| 1000 | 12546 | 4471 | 198 | 22304 | 7946 | 351 | 50183 | 17882 | 790 | 89215 | 31784 | 1404 | 139398 | 49650 | 2194 | 189665 | 67570 | 2646 |
| 1100 | 13784 | 4912 | 207 | 24505 | 8730 | 368 | 55136 | 19647 | 829 | 98020 | 34921 | 1473 | 153156 | 54550 | 2301 | | 74239 | 2775 |
| 1200 | 15022 | 5353 | 216 | 26706 | 9514 | 385 | 60089 | 21412 | 866 | 106825 | 38058 | 1538 | 166915 | 59450 | 2403 | | 80908 | 2899 |
| 1300 | 16261 | 5794 | 225 | 28908 | 10299 | 400 | 65042 | 23177 | 901 | 115631 | 41195 | 1601 | 180673 | 64351 | 2501 | | | |
| 1400 | 17474 | 6236 | 234 | 31065 | 11083 | 415 | 69896 | 24942 | 935 | 124260 | 44332 | 1662 | 194157 | 69251 | 2596 | | | |
| 1500 | 18827 | 6677 | 242 | 33470 | 11867 | 430 | 75307 | 26707 | 968 | 133879 | 47468 | 1720 | 209186 | 74151 | 2687 | | | |
| 1600 | 20204 | 7118 | 250 | 35919 | 12651 | 444 | 80817 | 28472 | 999 | | 50605 | 1776 | 224491 | 79052 | 2775 | | | |
| 1700 | 21610 | 7559 | 258 | 38417 | 13436 | 458 | 86438 | 30237 | 1030 | | | | 240106 | 83952 | 2860 | | | |
| 1800 | 23046 | 8000 | 265 | 40971 | 14220 | 471 | 92185 | 32002 | 1060 | | | | 256070 | 88852 | 2943 | | | |
| 1900 | 24518 | 8442 | 272 | 43588 | 15004 | 484 | 98074 | 33767 | 1089 | | | | 272427 | 93753 | 3024 | | | |
| 2000 | 26031 | 8883 | 279 | 46277 | 15788 | 497 | 104124 | 35532 | 1117 | | | | 289233 | 98653 | 3102 | | | |
| 2500 | | 11089 | 312 | | 19710 | 555 | | 44357 | 1249 | | | | | | | | | |
| 3000 | | 13295 | 342 | | | | | 53181 | 1369 | | | | | | | | | |
| 3500 | | 15502 | 370 | | | | | 62006 | 1478 | | | | | | | | | |
| 4000 | | 17708 | 395 | | | | | | | | | | | | | | | |
| 4500 | | 19914 | 419 | | | | | | | | | | | | | | | |

| DN | 100 | | | | | | | | | | | | 150 | | | | | |
|---------------------|--------|--------|------|--------|--------|------|--------|--------|------|--------|--------|------|--------|--------|------|---|----|-----|
| | 4" | | | | | | | | | | | | 6" | | | | | |
| d ₀ (mm) | 50 | | | 60 | | | 74 | | | 88 | | | 110 | | | | | |
| p | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 40 | 7318 | 2607 | 439 | 10538 | 3754 | 632 | 16030 | 5710 | 961 | 21419 | 7630 | 1138 | 33468 | 11922 | 1778 | | | |
| 60 | 10070 | 3587 | 537 | 14501 | 5166 | 774 | 22057 | 7857 | 1177 | 29473 | 10499 | 1394 | 46051 | 16404 | 2178 | | | |
| 80 | 12822 | 4567 | 620 | 18463 | 6578 | 894 | 28085 | 10004 | 1359 | 37527 | 13367 | 1610 | 58635 | 20887 | 2515 | | | |
| 100 | 15573 | 5547 | 694 | 22426 | 7989 | 999 | 34112 | 12151 | 1520 | 45580 | 16236 | 1800 | 71219 | 25369 | 2812 | | | |
| 120 | 18325 | 6527 | 760 | 26388 | 9401 | 1095 | 40139 | 14298 | 1665 | 53634 | 19105 | 1971 | 83803 | 29852 | 3080 | | | |
| 140 | 21077 | 7507 | 821 | 30350 | 10813 | 1182 | 46166 | 16445 | 1798 | 61687 | 21974 | 2129 | 96386 | 34334 | 3327 | | | |
| 160 | 23828 | 8487 | 877 | 34313 | 12224 | 1264 | 52194 | 18592 | 1922 | 69741 | 24842 | 2276 | 108970 | 38817 | 3557 | | | |
| 180 | 26580 | 9467 | 931 | 38275 | 13636 | 1341 | 58221 | 20738 | 2039 | 77794 | 27711 | 2414 | 121554 | 43300 | 3773 | | | |
| 200 | 29332 | 10447 | 981 | 42238 | 15048 | 1413 | 64248 | 22885 | 2149 | 85848 | 30580 | 2545 | 134138 | 47782 | 3977 | | | |
| 220 | 32083 | 11427 | 1029 | 46200 | 16459 | 1482 | 70275 | 25032 | 2254 | 93902 | 33449 | 2669 | 146721 | 52265 | 4171 | | | |
| 240 | 34835 | 12407 | 1075 | 50162 | 17871 | 1548 | 76303 | 27179 | 2354 | 101955 | 36317 | 2788 | 159305 | 56747 | 4356 | | | |
| 260 | 37587 | 13387 | 1119 | 54125 | 19282 | 1611 | 82330 | 29326 | 2450 | 110009 | 39186 | 2902 | 171889 | 61230 | 4534 | | | |
| 280 | 40338 | 14367 | 1161 | 58087 | 20694 | 1672 | 88357 | 31473 | 2543 | 118062 | 42055 | 3011 | 184472 | 65712 | 4705 | | | |
| 300 | 43090 | 15347 | 1202 | 62050 | 22106 | 1731 | 94384 | 33620 | 2632 | 126116 | 44924 | 3117 | 197056 | 70195 | 4871 | | | |
| 350 | 49669 | 17798 | 1298 | 71956 | 25635 | 1869 | 109452 | 38987 | 2843 | 146250 | 52096 | 3367 | 228515 | 81401 | 5261 | | | |
| 400 | 56848 | 20248 | 1387 | 81862 | 29164 | 1998 | 124520 | 44355 | 3039 | 166384 | 59267 | 3599 | 259975 | 92607 | 5624 | | | |
| 450 | 63727 | 22698 | 1472 | 91768 | 32693 | 2120 | 139589 | 49722 | 3224 | 186518 | 66439 | 3818 | 291434 | 103814 | 5965 | | | |
| 500 | 70607 | 25148 | 1551 | 101673 | 36222 | 2234 | 154657 | 55089 | 3398 | 206652 | 73611 | 4024 | 322893 | 115020 | 6288 | | | |
| 550 | 77486 | 27598 | 1627 | 111579 | 39751 | 2343 | 169725 | 60457 | 3564 | 226786 | 80783 | 4221 | 354353 | 126226 | 6595 | | | |
| 600 | 84365 | 30048 | 1699 | 121485 | 43280 | 2448 | 184793 | 65824 | 3722 | 246920 | 87955 | 4408 | | | | | | |
| 650 | 91244 | 32499 | 1769 | 131391 | 46809 | 2547 | 199861 | 71191 | 3874 | 267054 | 95127 | 4588 | | | | | | |
| 700 | 98123 | 34949 | 1835 | 141297 | 50339 | 2644 | 214929 | 76559 | 4021 | 287188 | 102299 | 4761 | | | | | | |
| 750 | 105002 | 37399 | 1900 | 151203 | 53868 | 2736 | 229997 | 81926 | 4162 | | | | | | | | | |
| 800 | 111882 | 39849 | 1962 | 161109 | 57397 | 2826 | 245065 | 87293 | 4298 | | | | | | | | | |
| 850 | 118761 | 42299 | 2022 | 171015 | 60926 | 2913 | 260133 | 92661 | 4430 | | | | | | | | | |
| 900 | 125640 | 44749 | 2081 | 180921 | 64455 | 2998 | 275202 | 98028 | 4559 | | | | | | | | | |
| 950 | 132519 | 47199 | 2138 | 190827 | 67984 | 3080 | 290270 | 103395 | 4684 | | | | | | | | | |
| 1000 | 139398 | 49650 | 2194 | 200733 | 71513 | 3160 | 305338 | 108763 | 4806 | | | | | | | | | |
| 1100 | 153156 | 54550 | 2301 | 220545 | 78571 | 3314 | | 119497 | 5040 | | | | | | | | | |
| 1200 | 166915 | 59450 | 2403 | 240357 | 85630 | 3461 | | | | | | | | | | | | |
| 1300 | 180673 | 64351 | 2501 | 260169 | 92688 | 3603 | | | | | | | | | | | | |
| 1400 | 194157 | 69251 | 2596 | 279586 | 99746 | 3739 | | | | | | | | | | | | |
| 1500 | 209186 | 74151 | 2687 | 301227 | 106804 | 3870 | | | | | | | | | | | | |
| 1600 | 224491 | 79052 | 2775 | 323267 | 113862 | 3997 | | | | | | | | | | | | |
| 1700 | 240106 | 83952 | 2860 | 345753 | 120921 | 4120 | | | | | | | | | | | | |
| 1800 | 256070 | 88852 | 2943 | 368740 | 127979 | 4239 | | | | | | | | | | | | |
| 1900 | 272427 | 93753 | 3024 | | 135037 | 4355 | | | | | | | | | | | | |
| 2000 | 289233 | 98653 | 3102 | | 142095 | 4469 | | | | | | | | | | | | |
| 2500 | | 123154 | 3469 | | | | | | | | | | | | | | | |
| 3000 | | 147656 | 3800 | | | | | | | | | | | | | | | |
| 3500 | | | | | | | | | | | | | | | | | | |
| 4000 | | | | | | | | | | | | | | | | | | |
| 4500 | | | | | | | | | | | | | | | | | | |