

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

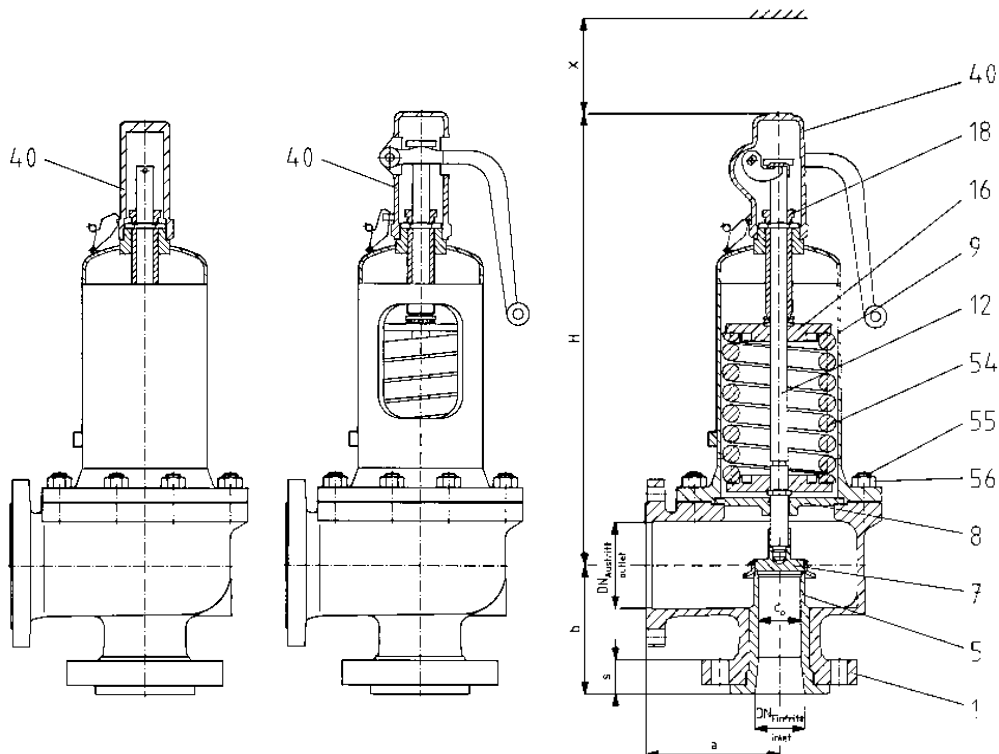
## Zusatzrüstungen

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

| Gehäusewerkstoff<br>Body material            | DN                            | Flanschanschlüsse nach<br>Flange connections acc. to |           |                 |                  | Temperatureinsatzbereich °C 1)<br>Temperature range °F 1)Federhaube |           |             |            | Type              |            |           |           |      |
|--|-------------------------------|--|-----------|-----------------|------------------|---|-----------|-------------|------------|-------------------|------------|-----------|-----------|------|
|  |                               | DIN PN   |           | ANSI B 16,5     |                  | DIN EN  |           | ASME        |            | Bonnet            |            |           |           |      |
| Werkstoffbezeichnung<br>Material Designation | Werkstoff-Nr.<br>Material No. | von<br>from  | bis<br>to | Eintr.<br>Inlet | Austr.<br>Outlet | von<br>from   | bis<br>to | von<br>from | bis<br>to  | geschl.<br>closed | open       |           |           |      |
| GP 240 GH                                    | 1.0619                        | SA-216 WCB   | 25/1"     | 150/6"          |                  |   |           | -85/-121    | +450/+842  | -20/-29           | +427/+800  | 4582      | 4572      |      |
| G 17 CrMo 5-5                                | 1.7357                        | SA-217 WC6   | 25/1"     | 100/6"          |                  |   |           | -85/-121    | +550/+1022 | -20/-29           | +538/+1000 | 4587      | 4577      |      |
| GX5 CrNiMoNb 19-11-2                         | 1.4581                        | SA-351CF10M  | 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                           | 1.4408                        | SA-351CF8M   | 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   |      |
|                                  |                       |                               |                      | 1"                           |                | 2"   |       | 3"    |       | 4"    |       |       |       | 6"    |       |       |      |
| DIN EN                           |                       | Werkstoff-Nr.<br>Material No. | ASME                 |                              | d <sub>o</sub> | 15   | 20    | 30    | 40    | 50    | 60    | 50    | 60    | 74    | 88    | 110   |      |
| Federhaube/Bonnet                | geschlossen<br>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 <sup>1)</sup> | SA 351CF10M                  |                | 4584 | .620* | .621* | .622* | .623* | .624* | .625* | .626* | .627* | .628* | .629* | -    |
|                                  |                       | GX 5 CrNiMo 19-11-2           | 1.4408 <sup>1)</sup> | SA 351CF8M                   |                | 4584 | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | 473* |
|                                  | offen<br>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.

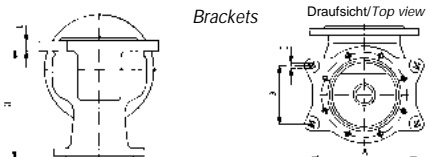
\* Please add number for the required cap or lifting device:

- 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<br>2) GX   | Set pressure CS<br>2) SS               | 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 <sub>0</sub>    | mm <sup>2</sup> | 177            | 314 | 707        | 1257     | 1964           | 2827 | 1964     | 2827 | 4301 | 6082 | 9503 |
| Engster Strömungsdurchmesser  | Flow diameter                          |   | d <sub>0</sub>    | mm              | 15             | 20  | 30         | 40       | 50             | 60   | 50       | 60   | 74   | 88   | 110  |
| Schenkellänge<br>bei Austrittsflansch   | PN 40                                  | Centre to face dim.                             | PN 40             | a               | mm             | 120 | 145        | 180      | 235            |      |          |      | 225  |      |      |
|   | PN 63                                  | for outlet flange                               | 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<br>der Schraubenlänge<br>bei Eintrittsflansch                                    | PN 40-160                              | Used to find<br>bolt length<br>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<br>mit Faltenbalg   | Weight without bellows<br>with bellows |   | -                 | kg              | 20             | 45  | 88         | 157      |                |      |          | 131  |      |      |      |
|   |  |   | -                 | kg              | 22             | 48  | 108        | 188      |                |      |          | 162  |      |      |      |
| Spannpratzen<br> | Brackets                               |   |                   | 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.

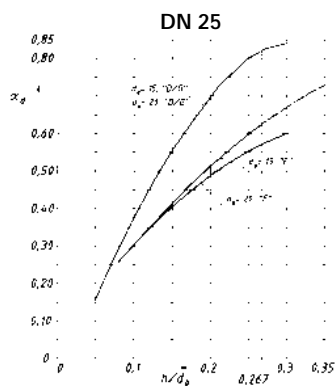
## Werkstoffe / Materials

| Pos. Item | Bauteile                      | Parts                        | 4572/4582   | 4577/4587                            | 4584  |   |                            |
|-----------|-------------------------------|------------------------------|---|--------------------------------------|---|---|----------------------------|
|           |                               |                              | GS<br>CS  | GS-CrMo<br>Chrome Moly St.           | Korrosionsfest<br>corrosion resistant       | Korrosions- und Kältefest<br>corrosion- /cryogenic resistant<br>DN 150 only |                            |
| 1         | Gehäuse                       | Body                         | GP 240 GH<br>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<br>gepanzert/stellited | 1.4122/1.4404<br>gepanzert/stellited | X 2 Cr Ni Mo 17-12-2<br>gepanzert/stellited | 1.4404<br>gepanzert/stellited   |                            |
| 8         | Führungsscheibe<br>mit Buchse | Guide<br>with bush           | C35/GGG-40<br>X 14 Cr Mo S 17 tenifer                       | 1.0501/0.7040<br>1.4104 tenifer      | X 2 Cr Ni Mo 17-12-2                        | 1.4404  |                            |
| 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)                      | X2 Cr Ni Mo 17-12-2                         | 1.4404  |                            |
|           |                               |                              |   |                                      | 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                               | X 2 Cr Ni Mo 17-12-2  | 1.4404                     |
| 18        | Druckschraube<br>mit Buchse   | Adjusting screw<br>with bush | X 14 Cr Mo S 17   |                                      | 1.4104                                      | X2 Cr Ni Mo 17-12-2 tenifer   | 1.4404 tenifer             |
|           |                               |                              | PTFE  |                                      | PTFE  | 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/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/<br>56 | Stiftschraube<br>und Mutter   | Bolt and<br>nut              | t < 400 °C  |                                      | A 4-70/A 4                                  |   | 1.4401/1.4401              |
|           |                               |                              | t > 400 °C  |                                      | 21 Cr Mo V 57/24 Cr Mo 5                    |   | 1.7709/1.7258              |

### Zuerkannte Ausflussziffer $\alpha_d$ / Coefficient of Discharge $\alpha_d$

Diagramm 1

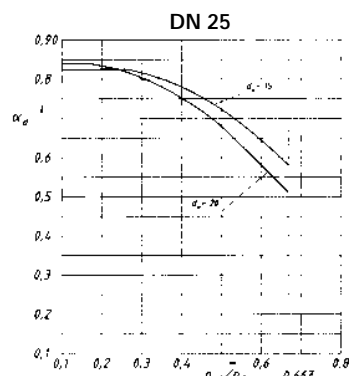
$$\alpha_d = f(h/d_0)$$



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

Diagramm 2

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

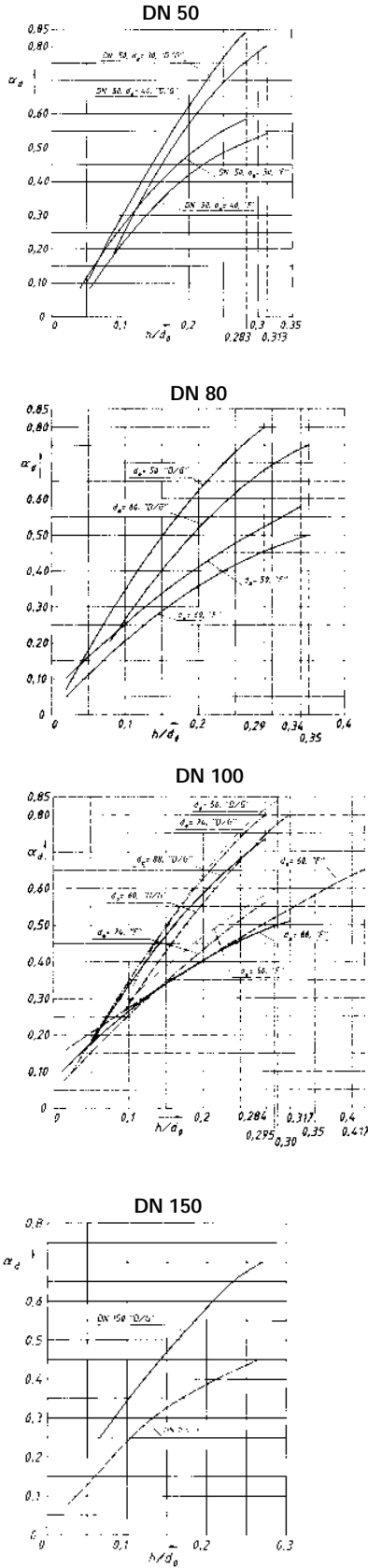


$h$  = Lift (mm)  
 $d_0$  = Flow diameter (mm)  
 $p_{a0}$  = Back pressure abs. (bar)  
 $p_0$  = Set pressure abs. (bar)

# Zuerkante Ausflussziffer $\alpha_d$ / Coefficient of Discharge $\alpha_d$

Diagramm 1

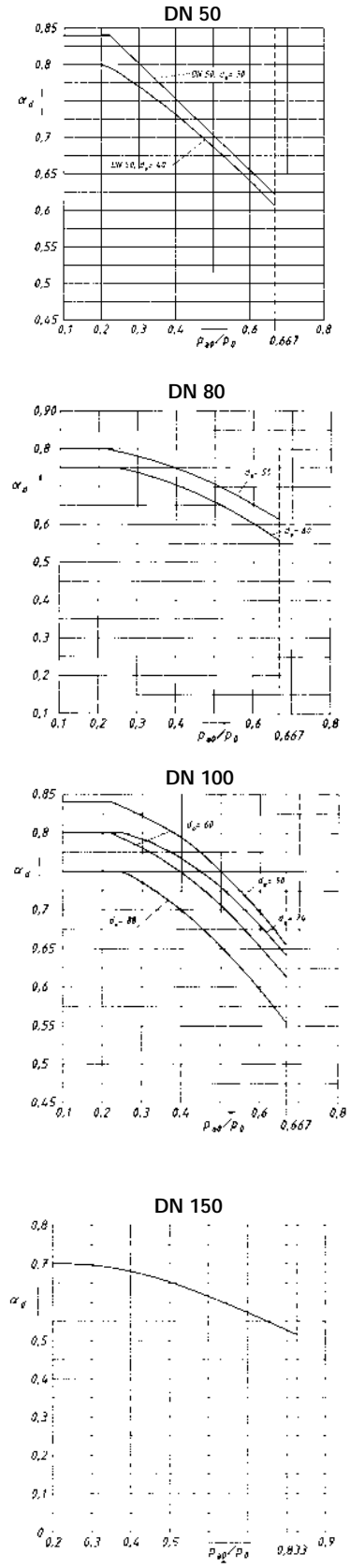
$$\alpha_d = f(h/d_0)$$



$h$  = 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  | Sattdampf                  |  |  | Saturated steam   |  |  | kg/h                 |
| II   | Luft bei 0°C und 1013 mbar |  |  | Air at 0°C and 1013 mbar  |  |  | m <sup>3</sup> /h    |
| III  | Wasser bei 20°C            |  |  | Water at 20°C   |  |  | 10 <sup>3</sup> kg/h |

| DN                  | 25    |       |      |       |       |      | 50    |       |      |       |        |      | 80     |        |      |        |        |     |
|---------------------|-------|-------|------|-------|-------|------|-------|-------|------|-------|--------|------|--------|--------|------|--------|--------|-----|
|                     | 1"    |       |      |       |       |      | 2"    |       |      |       |        |      | 3"     |        |      |        |        |     |
| d <sub>0</sub> (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 <sub>0</sub> (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 Atmosphärengegendruck (14,7 psi)     | Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)   | lb/h                    |
| II  | Luft bei 60°F, Abblasen gegen Atmosphärengegendruck (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 <sub>G</sub> (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 <sub>0</sub> (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                 | 49969  | 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                |        |        |      |        |        |      |        |        |      |        |        |      |        |        |      |   |    |     |