

# Series 240 and 250

## Pneumatic Control Valves with AC-1 or AC-2 Trim



### Application

Optimized trims for low-noise pressure letdown of liquids with differential pressures up to 40 bar

**Nominal size** DN 50 to 300 · NPS 2 to 12  
**Nominal pressure** PN 16 to 160 · Class 150 to 900  
**Temperature range** -10 to +220 °C · 14 to 428 °F



The optimized **AC-1** trim has the following special features:

- Raised seat
- Parabolic plug with integrated guide in the seat

One to four attenuation plates are integrated into the seat of the **AC-2** trim upstream of the parabolic plug and the plug guide. The differential pressure must not exceed 40 bar (580 psi).

### Versions

**Standard version** for SAMSON valves according to Table 2 and Table 3

- **AC-1** · Optimized trim for valves in DN 50 to 300 or NPS 2 to 12
- **AC-2** · Optimized trim with one to four attenuation plates for valve sizes DN 80 to 250 or NPS 3 to 10

### Further versions

- **Balanced valve plug** with PTFE seal · Possible for DN 200/NPS 8 and larger and with a seat bore of minimum 125 mm (Type 3251) or minimum 150 mm (Type 3241)
- **Balanced valve plug** with graphite seal · On request

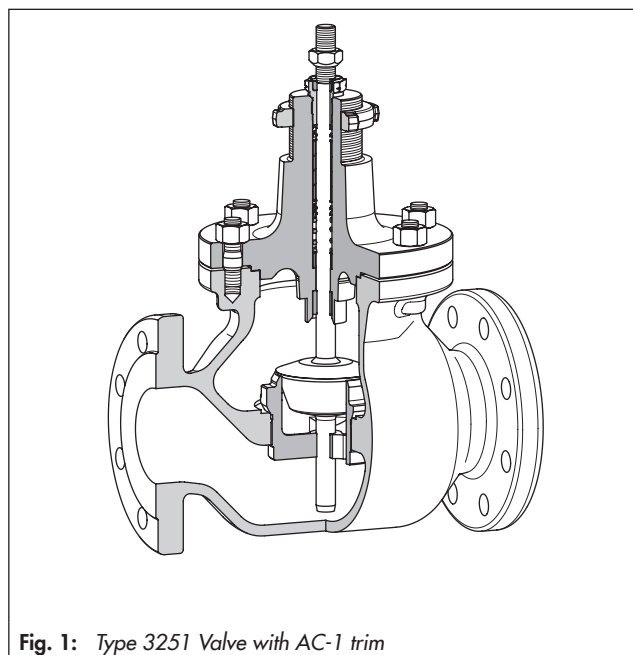


Fig. 1: Type 3251 Valve with AC-1 trim

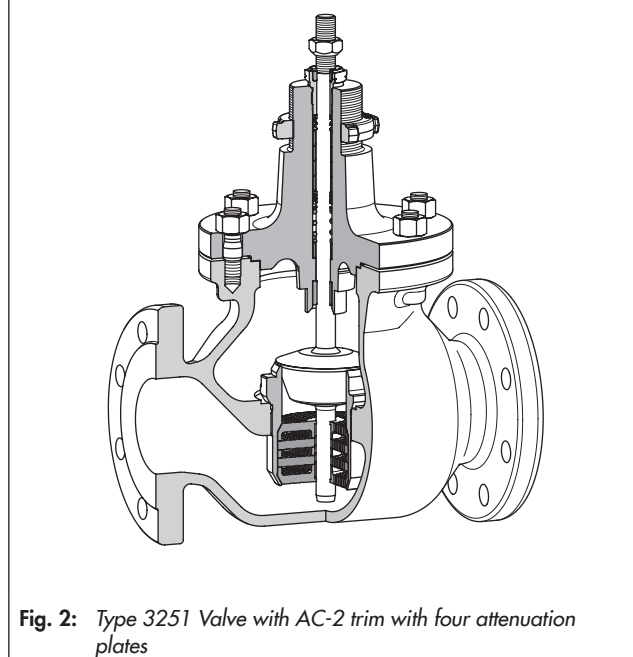


Fig. 2: Type 3251 Valve with AC-2 trim with four attenuation plates

## Principle of operation

The medium flows in the flow-to-open direction through the valve. The valve plug determines the cross-sectional area of flow. The  $K_V$  coefficient is adapted over the plug and, if necessary, using a combination of attenuation plates upstream of the seat.

To avoid vibrations, the plug is double guided by a guide bushing at the top and a second guide in the seat.

### AC-1

Compared to standard valve trims, these trims considerably reduce the sound pressure level for differential pressure ratios between  $X_F = 0.25$  and  $X_F = 0.75$  by shifting the point of incipient cavitation.

Depending on the valve load, the sound pressure level is reduced to varying degrees.

### AC-2

Optionally one to four attenuation plates can be integrated into the seat on the upstream side. In this way, the point of incipient cavitation is shifted at large valve loads to higher differential pressure ratios  $X_F$ .

For small valve loads, the onset of cavitation is shifted by higher  $X_{FZ}$  values of the parabolic plug to higher differential pressure ratios.

Compared to standard valve trims, these trims considerably reduce the sound pressure level for differential pressure ratios between  $X_F = 0.25$  and  $X_F = 0.9$  by shifting the point of incipient cavitation.

The differential pressure ratio  $X_F$  is defined as follows:

$$X_F = \frac{\Delta p}{p_1 - p_v}$$

with  $\Delta p$  being the differential pressure across the valve,  $p_1$  being the upstream pressure, and  $p_v$  representing the vapor pressure of the medium.

The reduction of the sound pressure level  $\Delta L_{pa}$  compared to a standard valve trim is exemplified in Fig. 5 and Fig. 6. The diagrams illustrate four different valve loads.

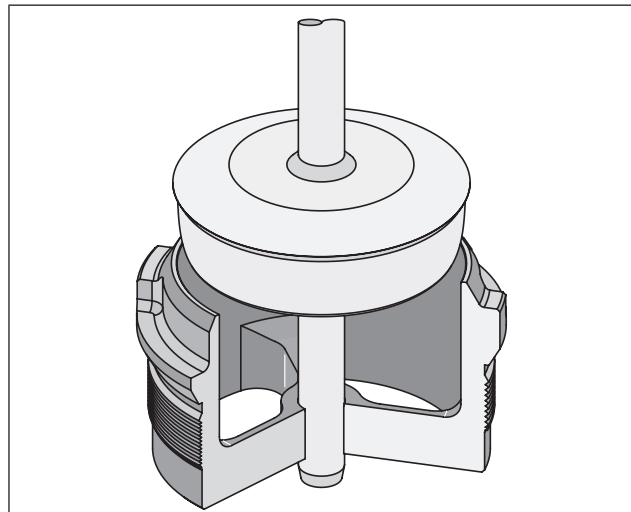


Fig. 3: Sectional drawing of AC-1 trim

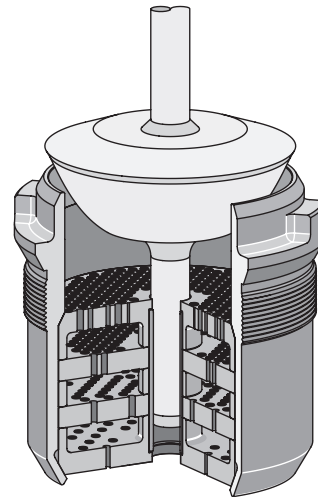


Fig. 4: Sectional drawing of AC-2 trim with four attenuation plates

Table 1: Technical data for AC-1 and AC-2 trims

|  | AC-1  | AC-2  |
|--|---|---|
| Nominal size   | DN 50 to 300 · NPS 2 to 12  | DN 80 to 250 · NPS 3 to 10  |
| Nominal pressure   | PN 16 to 160 · Class 150 to 900                                   |   |
| Temperature range  | -10 to +220 °C · 14 to 428 °F                                     |   |
| $\Delta p_{max}$<br>Max. permissible differential pressure | Operation without cavitation: < 40 bar · < 580 psi                |   |
|  | Operation with cavitation: < 25 bar · < 360 psi                   |   |
| Medium   | Liquid applications only  |   |
| Flow direction   | Flow-to-open (FTO) only   |   |
| Closure member   | Double-guided parabolic plug                                      | Double-guided parabolic plug with attenuation plates integrated into the seat |
| Seat/plug seal<br>Leakage class (IEC 60534)                | Metal seal, class IV<br>IV-S1 with SB ≥ 100 · IV-S2 with SB < 100 |   |
| $K_V/C_V$ coefficient                                      | See Table 2   | See Table 3   |
| Characteristic   | Equal percentage  | Mod. equal percentage   |
| Rangeability   | 50:1  | See Table 3   |
| Seat bore  | See Table 2   | See Table 3   |
| Travel   | See Table 2   | See Table 3   |
| Seat/plug material   | 1.4404 Stellite hard facing/1.4006 Stellite hard facing/1.4301    |   |

### Reduction of the sound pressure level

The diagrams illustrate the reduction of the sound pressure level  $\Delta L_{pa}$  when using the AC Trims as opposed to a standard trim.  $\Delta L_{pa}$  values of other AC Trims available on request.

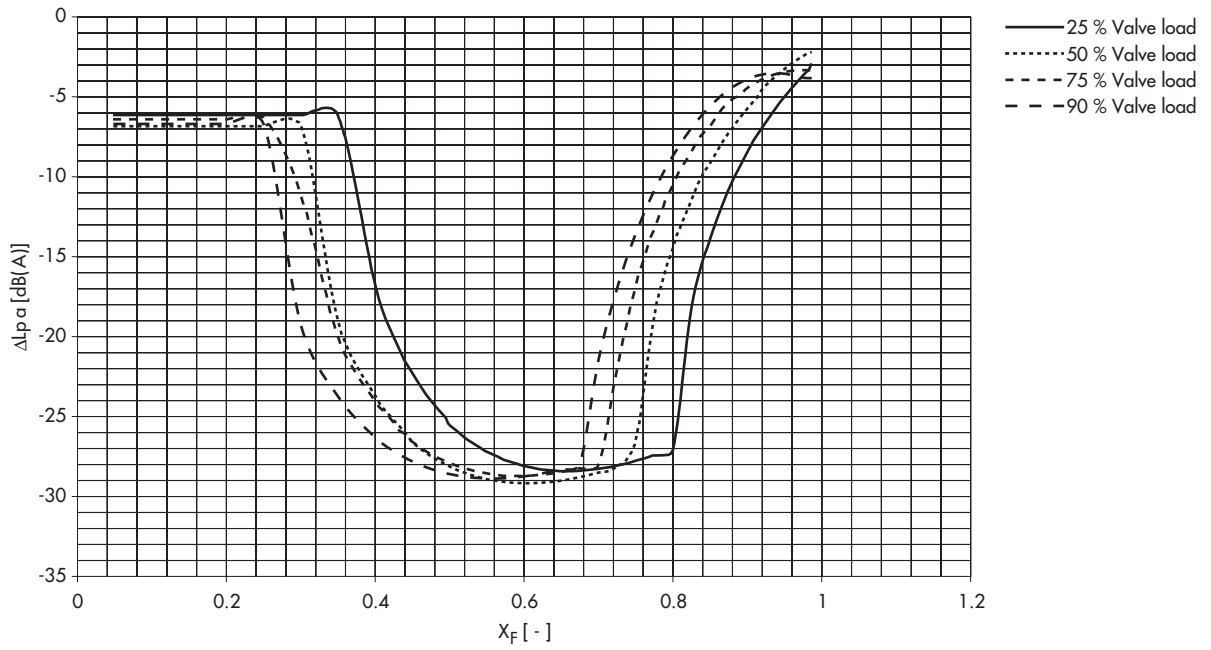


Fig. 5: Nominal size DN 80 (NPS 3)

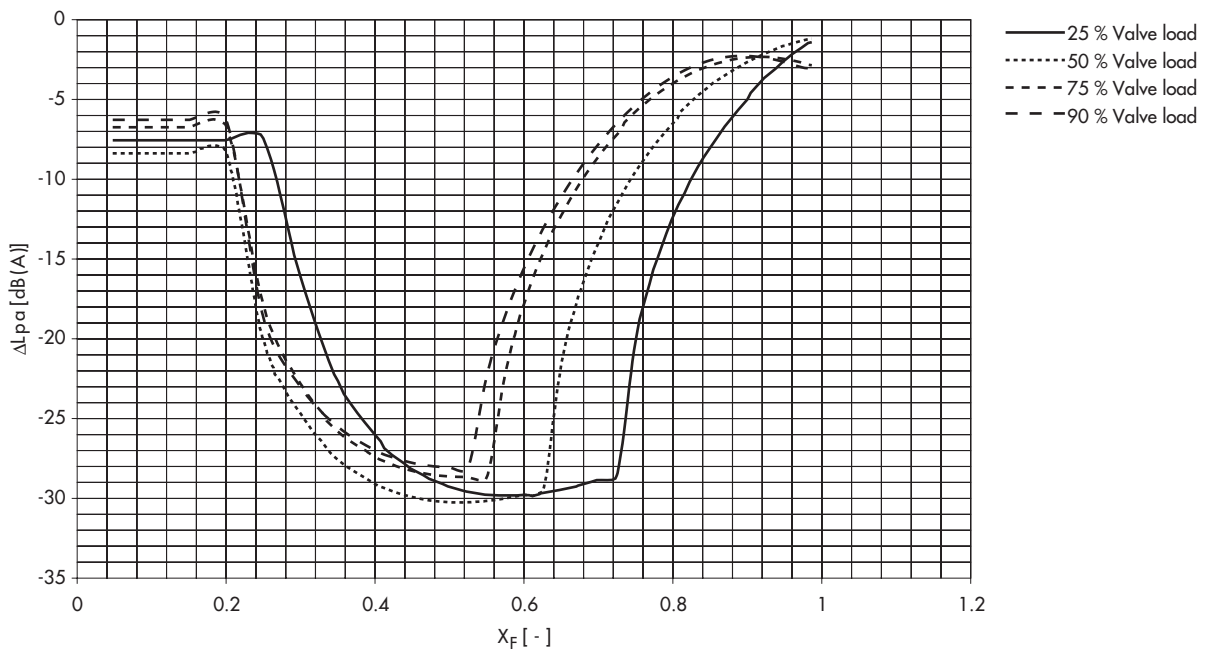


Fig. 6: Nominal size DN 150 (NPS 6)

**Table 2: AC-1 trim · Nominal sizes with associated  $K_V$  and  $C_V$  coefficients**

The specified travels must be achieved including an overtravel of 10 %. The use of a mechanical travel stop is required for fail-close actuators.

| Nominal size    | SB [mm] | Travel [mm] | $K_V$ | $C_V$  | Type ... Valve   | $X_{Fz}$ value<br>(valve load in %)                      |
|-----------------|---------|-------------|-------|--|--|--|
| DN 50<br>NPS 2  | 38      | 15          | 22    | 26   | 3241   | 0.43 (90 %)<br>0.46 (75 %)<br>0.52 (50 %)<br>0.61 (25 %) |
|                 | 48      | 15          | 35    | 40   | 3241   | 0.34 (90 %)<br>0.38 (75 %)                               |
|                 | 50      | 30          |       |  | 3251/3256  | 0.45 (50 %)<br>0.54 (25 %)                               |
| DN 80<br>NPS 3  | 38      | 15          | 22    | 26   | 3241   | 0.43 (90 %)<br>0.46 (75 %)<br>0.52 (50 %)<br>0.61 (25 %) |
|                 | 48      | 15          | 35    | 40   | 3241   | 0.34 (90 %)<br>0.38 (75 %)                               |
|                 | 50      | 30          |       |  | 3251/3256  | 0.45 (50 %)<br>0.54 (25 %)                               |
|                 | 63      | 15          | 50    | 60   | 3241   | 0.31 (90 %)<br>0.35 (75 %)                               |
|                 |         | 30          |       |  | 3251/3256  | 0.44 (50 %)<br>0.56 (25 %)                               |
|                 | 80      | 30          | 60    | 70   | 3251<br>3256   | 0.38 (90 %)<br>0.42 (75 %)<br>0.49 (50 %)<br>0.60 (25 %) |
| 70              |         |             | 80    | 0.35 (90 %)<br>0.38 (75 %)<br>0.47 (50 %)<br>0.58 (25 %) |  |  |
| DN 100<br>NPS 4 | 48      | 15          | 38    | 45   | 3241   | 0.33 (90 %)<br>0.36 (75 %)                               |
|                 | 50      | 30          |       |  | 3251/3256  | 0.43 (50 %)<br>0.53 (25 %)                               |
|                 | 63      | 30          | 55    | 65   | 3241   | 0.29 (90 %)<br>0.33 (75 %)                               |
|                 |         |             |       |  | 3251/3256  | 0.42 (50 %)<br>0.54 (25 %)                               |
|                 | 80      | 30          | 75    | 90   | 3241   | 0.33 (90 %)<br>0.37 (75 %)                               |
|                 |         |             |       |  | 3251/3256  | 0.45 (50 %)<br>0.57 (25 %)                               |
| 100             | 30      | 75          | 90    | 3251/3256  | 0.42 (90 %)<br>0.46 (75 %)<br>0.53 (50 %)<br>0.63 (25 %) |  |
|                 |         | 100         | 120   | 3241   | 0.37 (90 %)  |  |
| 3251/3256       |         |             |       |  | 0.40 (75 %)<br>0.48 (50 %)<br>0.59 (25 %)                |  |
|                 |         |             |       |  |  |  |
| DN 150<br>NPS 6 | 80      | 30          | 95    | 110  | 3241   | 0.27 (90 %)<br>0.32 (75 %)                               |
|                 |         |             |       |  | 3251/3256  | 0.41 (50 %)<br>0.53 (25 %)                               |
|                 | 100     | 30          | 145   | 170  | 3241/3251/3256   | 0.28 (90 %)<br>0.32 (75 %)<br>0.41 (50 %)<br>0.54 (25 %) |
|                 |         |             |       |  | 3241   | 0.25 (90 %)<br>0.29 (75 %)                               |
|                 | 125     | 30          | 205   | 240  | 3251/3256  | 0.38 (50 %)<br>0.50 (25 %)                               |
| 60              |         |             |       |  |  |  |

| Nominal size     | SB [mm] | Travel [mm] | K <sub>v</sub> | C <sub>v</sub>   | Type ... Valve         | X <sub>Fz</sub> value<br>(valve load in %)               |
|------------------|---------|-------------|----------------|--|------------------------|--|
| DN 150<br>NPS 6  | 150     | 60          | 205            | 240  | 3251<br>3256           | 0.34 (90 %)<br>0.37 (75 %)<br>0.45 (50 %)<br>0.57 (25 %) |
|                  |         |             | 250            | 290  |                        | 0.28 (90 %)<br>0.33 (75 %)<br>0.41 (50 %)<br>0.54 (25 %) |
| DN 200<br>NPS 8  | 100     | 30          | 155            | 180  | 3241<br>3251<br>3256   | 0.27 (90 %)<br>0.31 (75 %)<br>0.40 (50 %)<br>0.53 (25 %) |
|                  | 125     | 60          | 230            | 270  |                        | 0.22 (90 %)<br>0.26 (75 %)<br>0.36 (50 %)<br>0.49 (25 %) |
|                  | 150     | 60          | 305            | 360  |                        | 0.24 (90 %)<br>0.28 (75 %)<br>0.37 (50 %)<br>0.51 (25 %) |
|                  | 200     | 60          | 360            | 420  |                        | 0.33 (90 %)<br>0.37 (75 %)<br>0.45 (50 %)<br>0.57 (25 %) |
| 480              |         |             | 560            | 0.26 (90 %)<br>0.31 (75 %)<br>0.40 (50 %)<br>0.52 (25 %) |                        |  |
| DN 250<br>NPS 10 | 100     | 30          | 155            | 180  | 3241<br>3251<br>(3254) | 0.27 (90 %)<br>0.31 (75 %)<br>0.40 (50 %)<br>0.53 (25 %) |
|                  | 125     | 60          | 230            | 270  |                        | 0.22 (90 %)<br>0.26 (75 %)<br>0.36 (50 %)<br>0.49 (25 %) |
|                  | 150     | 60          | 305            | 360  |                        | 0.24 (90 %)<br>0.28 (75 %)<br>0.37 (50 %)<br>0.51 (25 %) |
|                  | 200     | 60          | 360            | 420  |                        | 0.33 (90 %)<br>0.37 (75 %)<br>0.45 (50 %)<br>0.57 (25 %) |
| 480              |         |             | 560            | 0.26 (90 %)<br>0.31 (75 %)<br>0.40 (50 %)<br>0.52 (25 %) |                        |  |
| DN 300<br>NPS 12 | 125     | 60          | 230            | 270  | 3241<br>3251<br>(3254) | 0.22 (90 %)<br>0.26 (75 %)<br>0.36 (50 %)<br>0.49 (25 %) |
|                  | 150     | 60          | 305            | 360  |                        | 0.24 (90 %)<br>0.28 (75 %)<br>0.37 (50 %)<br>0.51 (25 %) |
|                  | 200     | 60          | 480            | 560  |                        | 0.26 (90 %)<br>0.31 (75 %)<br>0.40 (50 %)<br>0.52 (25 %) |
|                  | 250     | 120         | 1000           | 1150   |                        | 0.20 (90 %)<br>0.24 (75 %)<br>0.33 (50 %)<br>0.48 (25 %) |

**Table 3: AC-2 trim · Nominal sizes with associated  $K_V$  and  $C_V$  coefficients**

The specified travels must be achieved including an overtravel of 10 %. The use of a mechanical travel stop is required for fail-close actuators.

| Nominal size     | SB [mm] | Travel [mm] | $K_V$ | $C_V$ | Type ...<br>Valve | Attenuation plates |            | Rangeability |        |
|------------------|---------|-------------|-------|-------|-------------------|--------------------|------------|--------------|--------|
|                  |         |             |       |       |                   | Qty.               | Borehole Ø |              |        |
| DN 80<br>NPS 3   | 80      | 30          | 16    | 20    | 3251              | 4                  | 3          | > 10:1       |        |
|                  |         |             | 22    | 25    |                   |                    |            |              |        |
|                  |         |             | 25    | 30    |                   |                    |            |              |        |
|                  |         |             | 30    | 35    |                   |                    |            |              |        |
|                  |         |             | 35    | 40    |                   | 3                  |            | > 15:1       |        |
|                  |         |             | 38    | 45    |                   | 2                  |            |              |        |
|                  |         |             | 43    | 50    |                   | 1                  |            |              | > 20:1 |
|                  |         |             | 50    | 60    |                   |                    |            |              | > 25:1 |
| DN 100<br>NPS 4  | 100     | 30          | 35    | 40    | 3251              | 4                  | 3          | > 20:1       |        |
|                  |         |             | 38    | 45    |                   |                    |            | > 15:1       |        |
|                  |         |             | 43    | 50    |                   |                    |            | > 10:1       |        |
|                  |         |             | 45    | 55    |                   |                    |            | > 15:1       |        |
|                  |         |             | 50    | 60    |                   | 3                  |            |              |        |
|                  |         |             | 55    | 65    |                   | 2                  |            |              |        |
|                  |         |             | 60    | 70    |                   | 1                  |            |              | > 20:1 |
|                  |         |             | 63    | 75    |                   |                    |            | > 30:1       |        |
| 72               | 85      | > 20:1      |       |       |                   |                    |            |              |        |
| DN 150<br>NPS 6  | 150     | 60          | 85    | 100   | 3251              | 4                  | 5          | > 15:1       |        |
|                  |         |             | 95    | 110   |                   |                    |            | > 20:1       |        |
|                  |         |             | 100   | 120   |                   |                    |            | > 15:1       |        |
|                  |         |             | 110   | 130   |                   |                    |            |              |        |
|                  |         |             | 120   | 140   |                   |                    |            |              |        |
|                  |         |             | 130   | 150   |                   | 3                  |            |              |        |
|                  |         |             | 135   | 160   |                   | 2                  |            | > 20:1       |        |
|                  |         |             | 145   | 170   |                   |                    |            |              |        |
|                  |         |             | 155   | 180   |                   | 1                  |            | > 25:1       |        |
|                  |         |             | 160   | 190   |                   |                    |            | > 20:1       |        |
| 180              | 210     |             |       |       |                   |                    |            |              |        |
| DN 200<br>NPS 8  | 200     | 60          | 135   | 160   | 3241<br>3251      | 4                  | 5          | > 15:1       |        |
|                  |         |             | 145   | 170   |                   |                    |            | > 10:1       |        |
|                  |         |             | 155   | 180   |                   |                    |            | > 15:1       |        |
|                  |         |             | 160   | 190   |                   |                    |            |              |        |
|                  |         |             | 170   | 200   |                   |                    |            |              |        |
|                  |         |             | 180   | 210   |                   | 3                  |            |              |        |
|                  |         |             | 190   | 220   |                   |                    |            | 2            |        |
|                  |         |             | 205   | 240   |                   | 1                  |            |              | 20:1   |
|                  |         |             | 220   | 255   |                   |                    |            | > 20:1       |        |
|                  |         |             | 250   | 290   |                   | > 20:1             |            |              |        |
|                  |         |             | 260   | 305   |                   | > 25:1             |            |              |        |
|                  |         |             | 280   | 325   |                   |                    |            |              |        |
|                  |         |             | 320   | 375   |                   |                    |            |              |        |
| DN 250<br>NPS 10 | 200     | 60          | 135   | 160   | 3241              | 4                  | 5          | > 15:1       |        |
|                  |         |             | 145   | 170   |                   |                    |            | > 10:1       |        |
|                  |         |             | 155   | 180   |                   |                    |            | > 15:1       |        |
|                  |         |             | 160   | 190   |                   |                    |            |              |        |
|                  |         |             | 170   | 200   |                   |                    |            |              |        |
|                  |         |             | 180   | 210   |                   | 3                  |            |              |        |
|                  |         |             | 190   | 220   |                   |                    |            | 5            |        |
|                  |         |             | 205   | 240   |                   | 2                  |            |              | 20:1   |
|                  |         |             | 220   | 255   |                   |                    |            | 1            | > 20:1 |
|                  |         |             | 250   | 290   |                   | > 20:1             |            |              |        |
|                  |         |             | 260   | 305   |                   | > 25:1             |            |              |        |
|                  |         |             | 280   | 325   |                   |                    |            |              |        |
|                  |         |             | 320   | 375   |                   |                    |            |              |        |

**Order specifications:**

AC-1 trim with  $K_V/C_V$  according to Table 2

or

AC-2 trim with  $K_V/C_V$  according to Table 3

Material

For tag number ...

In order/quotation ...

Operating pressure in bar (a), bar (g) or psi (a), psi (g)  
(with minimum, normal and maximum flow rate)

Flow rate kg/h or m<sup>3</sup>/h  
in operating state with minimum, normal,  
and maximum flow rate

Process medium Density in kg/m<sup>3</sup>  
Temperature in °C/°F  
Vapor pressure in bar

Nominal size DN ... or NPS ...

Nominal pressure PN ... or Class ...

Material According to Table 1

Specifications subject to change without notice



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2014-08-28 · English