Engineering Data

Correction Factor for High-Viscous Fluids

The determination of a correction factor K_V is not required for viscosities less than 100 Seybolt Universal seconds or less than $10 \cdot 10^{-6} m^2/s$. In these cases is $K_V = 1.0$. The correction factor K_V can either be obtained from the graph or calculated as prescribed.

Verwendete Formelzeichen / Used Symbols

Formel-zeichen *Symbols*	*Designation*	SI-Einheiten *SI-Units*	*Pound/Inch Units*
A	*Effective discharge area according to orifice letter for calculations in accordance with ASME/API 520, see page 20/63*	–	sq in
A_o	*Actual discharge area for calculations in accordance with AD-Merkblatt A2, see page 20/22*	mm^2	–
K_V	*Correction factor for high-viscous fluids*	–	–
q_V, Q	*Volume flow to be discharged*	m^3/h	gal/min
Re	*Reynolds number*	–	–
U	*Viscosity*	–	Saybolt Universal seconds
ν	*Viscosity*	m^2/s	–

The flow area of the safety valve for discharging viscous liquids is to be calculated in two steps. First step, is to calculate the valve size assuming the fluid as water. Second step: Calculate the Reynolds Number (see formula). Then calculate using the given formulae. Therefore take into account the former calculated flow area A_O resp. A (refer to step 1) and the given viscosity (Figure on page 20/41 refer to DIN IEC 534 part 2-1, edition 6.84).

The already mentioned calculated A_O resp. A is to be divided by the correction factor K_V and results the enlarged new flow area A_O resp. A.

Calculation of the Reynolds Number for pipe friction (US units):

$$Re = 12700 \cdot \frac{Q}{U \cdot \sqrt{A}}$$

Calculation of the correction factor K_V:

$34 \leq Re \leq 200$

$$K_V = -0{,}6413 + 0{,}2669 \cdot \ln(Re)$$

$200 < Re \leq 60000$

$$K_V = -0{,}5735 + 0{,}4343 \cdot \ln(Re) - 0{,}04093 \cdot \ln^2(Re) + 0{,}001308 \cdot \ln^3(Re)$$

$Re > 60000$

$$K_V = 1$$