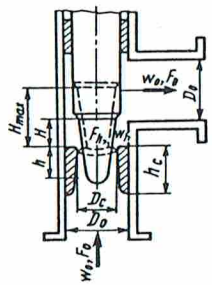
Regulating valves at any Re
($D_0 = 50$ mm)

Diagram
9-20



1. Angular single-seat valve within $1.7 < h/D_h < 30$:

$$\zeta = \frac{\Delta p}{\rho w_h^2/2} = \frac{A_1}{\mathrm{Re}_h} + \zeta_{1qu}$$

where

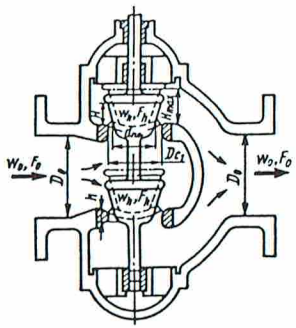
$$A_1 = 4.1\,\frac{h}{D_h} + 23 \qquad \zeta_{1qu} = \left(1 - \frac{F_h}{F_0}\right)^2 + 0.18$$

$$\zeta_0 = \frac{\Delta p}{\rho w_0^2/2} = \zeta\left(\frac{F_0}{F_h}\right)^2 = \frac{A_1}{\mathrm{Re}_h}\left(\frac{F_0}{F_h}\right)^2 + \zeta_{01qu}$$

where $\zeta_{01qu} = \zeta_{1qu}\left(\frac{F_0}{F_h}\right)^2$ see the curve $\zeta_{01qu} = f\left(\frac{F_h}{F_0}\right)$

at complete opening of the valve $h/D_h < 1.7$:

$$\zeta = \frac{30}{\mathrm{Re}_h} + \zeta_{1qu} \qquad \zeta_0 = \frac{30}{\mathrm{Re}_h}\left(\frac{F_0}{F_h}\right)^2 + \zeta_{01qu}$$



2. Double-seat valve within $4.0 < h/D_h < 60$:

$$\zeta = \frac{\Delta p}{\rho w_h^2/2} = \frac{A_2}{\mathrm{Re}_h} + \zeta_{2qu}$$

where

$$A_2 = 0.5\,\frac{h}{D_h} + 27 \qquad \zeta_{2qu} = \left(1 - \frac{F_h}{F_0}\right)^2 + 4.7\left(\frac{F_h}{F_0}\right)^2$$

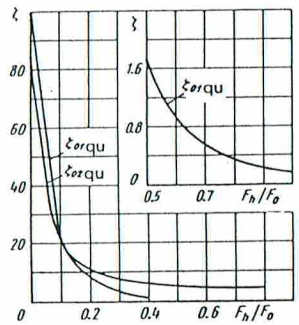
$$\zeta_0 = \frac{\Delta p}{\rho w_0^2/2} = \zeta\left(\frac{F_0}{F_h}\right)^2 = \frac{A_2}{\mathrm{Re}_h}\left(\frac{F_0}{F_h}\right)^2 + \zeta_{02qu}$$

where $\zeta_{02qu} = \zeta_{2qu}\left(\frac{F_0}{F_h}\right)^2$ see the curve $\zeta_{02qu} = f\left(\frac{F_h}{F_0}\right)$

at complete opening of the valve $h/D_h < 4.0$:

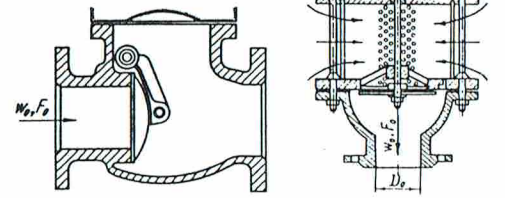
$$\zeta = \frac{30}{\mathrm{Re}_h} + \zeta_{2qu} \qquad \zeta_0 = \frac{30}{\mathrm{Re}_h}\left(\frac{F_0}{F_h}\right)^2 + \zeta_{02qu}$$

F/F_0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\zeta_{01\,qu}$	99.0	20.5	7.50	3.40	1.72	0.95	0.55	0.34	0.24	0.18
$\zeta_{02\,qu}$	86.0	21.0	10.5	7.20	5.70	5.20	4.90	4.75	4.70	4.70



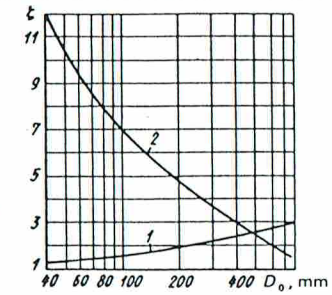
Check valve and suction valve with screen
[17]

Diagram
9-21



1. Check valve

2. Suction valve with a screen



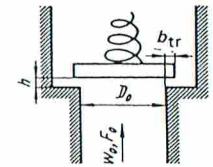
$$\zeta = \frac{\Delta p}{\rho w_0^2/2} = f(D_0)$$

Values of ζ

Valve	D_0, mm 40	70	100	200	300	500	750
1. Check valve	1.3	1.4	1.5	1.9	2.1	2.5	2.9
2. Suction valve	12	8.5	7.0	4.7	3.7	2.5	1.6

Disk valve without bottom guides [28, 35]

Diagram 9-22



$$\zeta = \frac{\Delta p}{\rho w_0^2/2} = \alpha_0 + \beta_0$$

where $\alpha_0 = 0.55 + 4[(b_{tr}/D_0) - 0.1]$, see graph a; $\beta_0 = 0.155/(h/D_0)^2$, see graph b. The formula is valid within

$$0.1 < \frac{h}{D_0} < 0.25 \qquad 0.1 < \frac{b_{tr}}{D_0} < 0.25$$

b_{tr}/D_0	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.25
α_0	0.55	0.63	0.71	0.79	0.87	0.95	1.03	1.11	1.15

h/D_0	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.25
β_0	15.5	10.8	7.90	6.05	4.78	3.87	3.20	2.69	2.48