Perdas de carga singulares
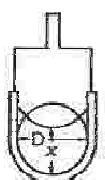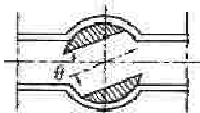
Perdas de carga singulares em válvulas instaladas em condutas circulares

$$h_s = k \frac{v^2}{2g}$$
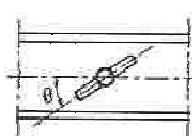
a) válvulas de adufa

X/D	K	X/D	K	X/D	K	X/D	K
0.181	41.22	0.25	22.68	0.417	6.33	0.583	1.55
0.194	35.36	0.333	11.89	0.458	4.57	0.667	0.77
0.208	31.35	0.375	8.63	0.5	3.27	1.00	

b) válvulas cilíndricas

θº	K	θº	K	θº	K	θº	K
0		20	1.56	40	17.3	60	206
5	0.05	25	3.1	45	31.2	65	486
10	0.29	30	5.47	50	52.6	82	∞
15	0.75	35	9.68	55	106.0		

c) válvulas de borboleta

θº	K	θº	K	θº	K	θº	K
0		20	1.54	40	10.8	60	118
5	0.24	25	2.51	45	18.7	65	256
10	0.52	30	3.91	50	32.6	70	750
15	0.9	35	6.22	55	58.8	90	∞

Singularidade	K
Válvula de esfera (aberta 100%)	10.0
Válvula corrediça	
Aberta 100%	0.16
Aberta 75%	1.15
Aberta 50%	5.6
Aberta 25%	24.0
Válvula de diafragma	
Aberta 100%	2.3
Aberta 75%	2.6
Aberta 25%	21.0

Singularidade	K
Cotovelo standard a 90º	0.9
Cotovelo standard a 45	0.26
Tê standard	1.8

Perdas de carga em junções de caudal ($A_1 = A_3$)

$$h_s = k \frac{v_3^2}{2g}$$
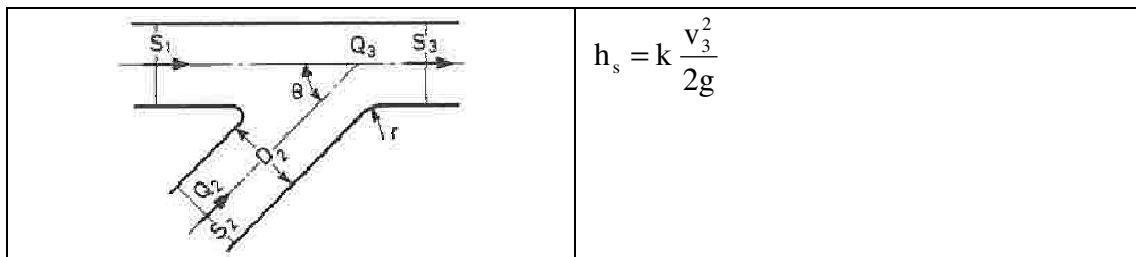
θ = 45º	Q2/Q3					
A2/A3	**0.1**	**0.2**	**0.3**	**0.4**	**0.6**	**1**
0.122	0.1	-0.15	-0.5	0.9	-3.2	-9.7
0.34	0.1	0.07	0	-0.14	-0.66	-2.9
1.0	0.14	0.17	0.19	0.16	0.06	-0.58
θ = 60º	**Q2/Q3**					
A2/A3	**0.1**	**0.2**	**0.3**	**0.4**	**0.6**	**1**
0.122	0.1	0.04	-0.1	-0.44	-1.45	-6.14
0.34	0.15	0.2	0.19	0.11	-0.25	-1.65
1.0	0.13	0.19	0.23	0.23	0.14	-0.3
θ = 90º	**Q2/Q3**					
A2/A3	**0.1**	**0.2**	**0.3**	**0.4**	**0.6**	**1**
0.122	-	-	-	-	-	-
0.34	-	-	-	-	-	-
1.0	0.12	0.23	0.29	0.32	0.36	0.35

Perdas de carga em estreitamentos bruscos
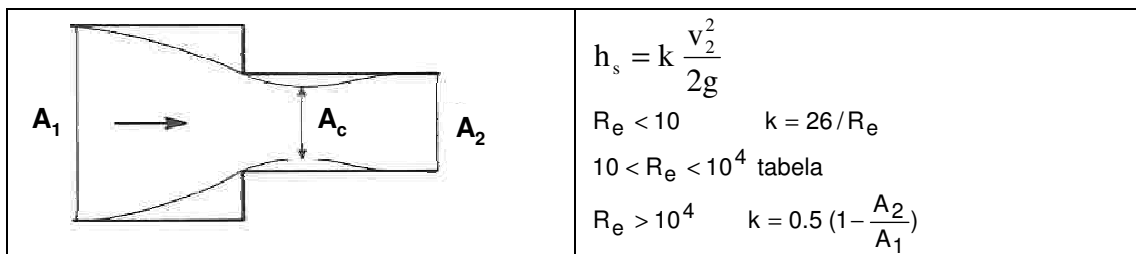
$$h_s = k \frac{v_2^2}{2g}$$

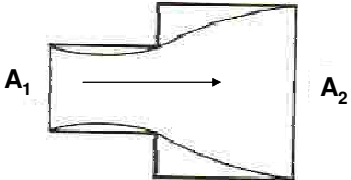$R_e < 10 \qquad k = 26/R_e$

$10 < R_e < 10^4$ tabela

$R_e > 10^4 \qquad k = 0.5 \left(1 - \frac{A_2}{A_1}\right)$

Valores de k

A2/A1	Re					
	30	2×10^2	5×10^2	2×10^3	5×10^3	$> 10^4$
0.1	2.4	1.04	0.82	0.5	0.75	0.45
0.2	2.3	0.95	0.7	0.4	0.6	0.4
0.3	2.15	0.85	0.6	0.3	0.55	0.35
0.4	2.00	0.78	0.5	0.25	0.5	0.3
0.5	1.8	0.65	0.42	0.2	0.42	0.25
0.6	1.7	0.56	0.35	0.15	0.35	0.25

Perdas de carga em alargamentos bruscos

$$h_s = \frac{v_1^2}{2g}$$

$R_e < 10 \qquad k = 26/R_e$

$10 < R_e < 3500 \qquad \text{tabela}$

$R_e > 3500 \qquad k = (1 - \frac{A_1}{A_2})^2$

Valores de k

A_1/A_2	Re				
	30	2×10^2	5×10^2	2×10^3	3.5×10^3
0.1	2.4	1.65	1.7	1.6	0.81
0.2	2.2	1.3	1.3	1.25	0.64
0.3	2.0	1.1	1.1	0.95	0.5
0.4	1.8	1.0	0.85	0.8	0.36
0.5	1.65	0.75	0.65	0.65	0.25
0.6	1.55	0.6	0.4	0.5	0.16