Flow Rate and Valve Sizing

In order to design valves for a process system correctly, the valve size is determined by the required flow rate. The K_V-value serves as a calculation basis for the different process conditions.
This value is stated in the following table with regard to nominal diameter and standards.

K_V-value

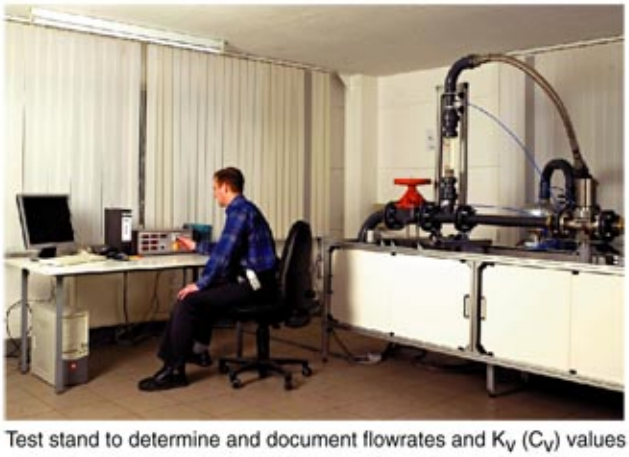
The K_V-value is a parameter defining the flow rate of valves. It describes the amount of water from 5° to 30°C which flows through the valve at a pressure loss of 1 bar. The K_{VS}-value describes the K_V-value when the valve is 100% open.

For water 5-30°C applies:

$$K_V = \frac{Q}{\sqrt{\Delta p}}$$

General Liquid Flow Formula:

$$K_V = Q \sqrt{\frac{\rho}{1000\ \Delta p}}$$



Test stand to determine and document flowrates and K_V (C_V) values

Conversion:
For the correct K_V to C_V conversion calculation, use only the stated units formulas below.
The K_V-value must be converted from (cubic meter / hour) by utilizing the following conversion factors.
In the US the flow rate of water is measured with the C_V-value in US-gallons per minute (gpm) with a pressure drop of Δp 1 PSI.

Conversion of K_V to C_V
$C_V = 1{,}17 \times K_V$

Conversion of C_V to K_V
$K_V = 0{,}86 \times C_V$

Explanations:

K_V	m^3/h	flow rate parameter
Q	m^3/h	volume flow rate
ρ	kg/m^3	specific gravity
p_1	bar	pressure before the valve
p_2	bar	pressure after the valve
Δp	bar	pressure drop through the valve $\Delta p = p_1 - p_2$

K_{VS}-Value (m^3/h)

			Nominal diameter			Valve type
			Iso 1127	**DIN 11850**	**ASME-BPE**	
DN	NPS	MA	Code 40	Code 41-43	Code 45	
4	-	8	-	-	-	190/207 290/297
6	-	8	-	-	-	
8	1/4"	8	2,4	-	0,7	
10	3/8"	8	-	2,3	1,4	
15	1/2"	8	-	-	2,0	
8	1/4"	10	2,7	-	-	188/195/307 289/295/397
10	3/8"	10	3,9	2,5	1,4	
15	1/2"	10	5,3	4,7	2,2	
20	3/4	10	-	5,5	4,6	
15	1/2"	25	10,5	9,5	2,2	385/402/407/495 985/995/997
20	3/4"	25	13,0	11,5	6,8	
25	1"	25	15,5	14,2	12,0	
32	1 1/4"	40	43,0	-	-	
40	1 1/2"	40	50,0	43,0	40,0	
50	2"	50	64,0	52,0	48,0	
65	2 1/2"	80	95,0	89,0	85,0	
80	3"	80	127,0	123,0	110,0	
100	4"	100	205	192,0	185,0	

The K_{VS}-Values in the table refer to the specification with two-way valves with EPDM diaphragm (Depending on the specification variations are possible).