Valve factor for water,steam and air

kv81

Manual prepared for Burkert.

bürkert

kv 81

GEBRAUCHSANWEISUNG
INSTRUCTION
INSTRUKTION

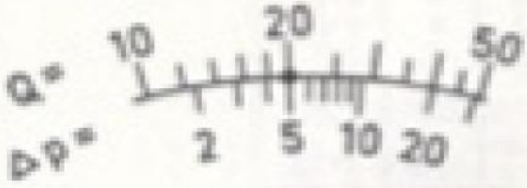

Fig. 1a

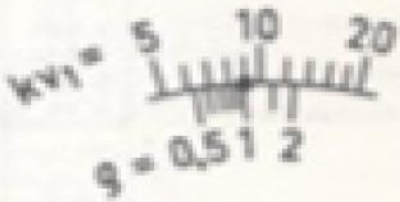

Fig. 1b

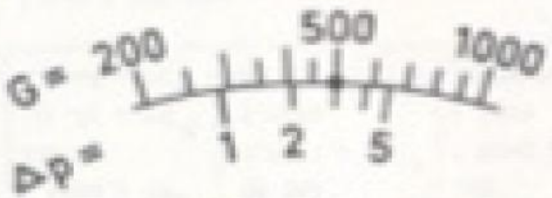

Fig. 2a

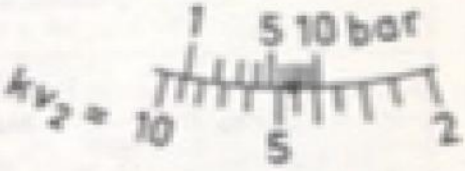

Fig. 2b

Fig. 3a

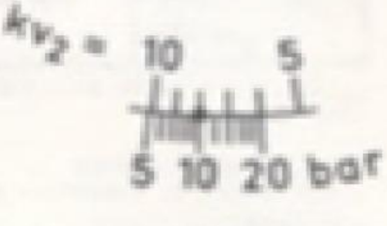

Fig. 3b

Pa	bar	kp/cm² at	torr (mm Hg)	lbf/in² (psi)
1	10×10^{-6}	10.197×10^{-6}	7.5006×10^{-3}	0.14504×10^{-3}
100×10^{3}	1	1.0197	750.06	14.504
98.066×10^{3}	0.98066	1	753.56	14.223
9.8066×10^{6}	98.066	100	73.556×10^{3}	1.4223×10^{3}
133.32	1.3332×10^{-3}	1.3595×10^{-3}	1	19.337×10^{-3}
101.32×10^{-3}	1.0132	1.0332	760	14.696
6.8948×10^{3}	68.948×10^{-3}	70.307×10^{-3}	51.715	1

1 bar = 100 kPa

1 bar = 10.2 m vp

$\Delta p < 0.5\ P_1$	$\Delta p > 0.5\ P_1$		V_0	t°C
P_2+1	P_1+1	$\frac{P_1+1}{2}$	V_2	
1.0	2	1.0	1.73	99.1
1.5	3	1.5	1.18	110.8
2.0	4	2.0	0.90	119.6
2.5	5	2.5	0.73	126.8
3.0	6	3.0	0.62	132.9
3.5	7	3.5	0.53	138.2
4.0	8	4.0	0.47	142.9
4.5	9	4.5	0.42	147.2
5.0	10	5.0	0.38	151.1
6.0	12	6.0	0.32	158.1
7.0	14	7.0	0.28	164.1
8.0	16	8.0	0.25	170.0
9.0	18	9.0	0.22	174.5
10.0	20	10.0	0.20	179.0

P_1, P_2 = bar V_0, V_2 = m³/kg

ENGLISH

INSTRUCTIONS FOR USE OF BÜRKERT VALVE RECKONER

Every valve has a resistance to fluid flow. The actual flowrate obtained is a function of the fluid pressure, the internal cross-sectional flow area and its shape as well as the viscosity of the fluid.
With liquids the kv value in m^3/h determines the flow. This is measured with water between 5^o and 30^oC and with a pressure drop (Δp) of 1 bar across the valve, i.e. between inlet and outlet.
For gases the QNn value is used (Nl/min, air at 20^oC), when the pressure at the valve inlet is 6 bar and the pressure drop is 1 bar.
Use of the valve reckoner is based on the relevant kv value in m^3/h. Other units and dimensions must be converted.

Other flowrate values and their conversion

Great Britain	Cv (Imp.gall./min)	= 0.97 kv (m^3/h) or
	f (SCFM, ft^3/min)	= 50 kv (m^3/h)
America	Cv (USG/min)	= 1.165 kv (m^3/h)

If the kv value is quoted in litres per minute (l/min) it must be divided by 16.7 in order to obtain the appropriate dimensions of m^3/h. Similarly, the QNn value (l/min) must be divided by 1078.

Conversion examples

QNn	= 6300 l/min	kv (m^3/h) = 6300:1078 = 5.8
kv (l/min)	= 96.9	kv (m^3/h) = 96.9:16.7 = 5.8
Cv (Imp.Gall./min)	= 6.3	kv (m^3/h) = 6.3:0.97 = 6.5
f (SCFM, cft/min)	= 70	kv (m^3/h) = 70:50 = 1.4
Cv (USG/min)	= 3	kv (m^3/h) = 3:1.165 = 2.6

Either obtain the flow factor from the relevant data sheet and then calculate the flowrate, or determine the necessary kv-value on the basis of the flowrate required and seek a suitable size an type of valve from the information in the catalogue.

DESCRIPTION OF THE RECKONER

Fixed part: The outer scale denotes flowrate Q in m^3/h for liquids and in kg/h for steam. On the lower blue scale kv1 (for liquids) kv figures from 0.1 to 1000 m^3/h are given. The red and pink scale kv2 below contains the flow factors in m^3/h from 1 to 100 for steam.
In the centre of the reckoner there are two calculation examples for liquids (blue) and steam (pink for non-critical, red for critical flows).
Moveable part: The upper part of the moveable disc contains on the outside the scale for the pressure drop across the valve Δp (bar) for liquids. Δp is also valid for steam at non-critical flowrates corresponding to p1x for critical flowrates.
On the inner part of the lower half is the scale p2 for non-critical steam flows and on the outer part the scale p1 for critical steam flows.
Formulae: Lower left hand section, pink: for non-critical flow. Centre: for liquids. Lower right hand section, red: for critical flow.

GENERAL INSTRUCTIONS

Having determined the type and orifice size of your valve with the aid of the Bürkert valve reckoner, it is helpful to order the item in question according to the code detailed in the relevant data sheet; alternatively please provide the following information:

* Voltage and frequency
* Circuit function (e.g. normally closed or code letter from data sheet)
* Type of fluid medium (water, steam etc., as accurate a description as possible)
* Fluid and ambient temperatures
* Special features such as manual override, explosion-proof version, position indicator, low concussion version etc.

If you are unable to determine the type and orifice size of the item required with the help of the valve reckoner please also provide the following data:

* Upstream pressure (p1)
* Downstream pressure (p2) or pressure differential (Δp)
* Flowrate required

SOME TIPS FOR TROUBLE-FREE VALVE OPERATION

Design the system such that with liquids a velocity of approximately 2 m/s is not exceeded.

Please note the viscosity information in the data sheets if viscous fluids are involved.

In cases of media containing foreign bodies always ensure that a Bürkert strainer Type 0007 is installed upstream of the valve.

With servo-assisted valves avoid oversizing and please bear in mind that a pressure differential of at least the minimum figure quoted in the relevant data sheet exists between valve inlet and outlet to ensure full opening (or proper switching).

The Formulae are set out on the front.
In the centre of the reckoner are two calculation examples for liquids and steam.
The red upper example for "non-critical", the lower for "critical" flow.

Example 1 (Liquids)

To find: the kv-value
Given: $Q = 20\ m^3/h$ (flowrate)
$\Delta p = 5$ bar (pressure drop across valve)
$\rho = 1\ kg/dm^3$ (density)
Set: $\Delta p = 5$ bar (on moveable part opposite Q = 20 on fixed scale) (Fig. 1a)
Read: kv value on the blue scale kv2 opposite = 1 on the moveable scale.(Fig. 1b)
Result: kv value = 9.0 (m^3/h)
Remarks: If the density is greater than or less than 1 then the kv value is altered accordingly:

In the example shown, for a density of 0.5 the kv value changes to 6.3. Important. In practice this means that for fluids with a density of less than 1.0 a smaller orifice size than that calculated from the details in the data sheet can be specified, and that conversely with a density greater than 1.0 a valve having a larger orifice size will be required (assuming identical pressure conditions).

Example 2 (non-critical steam)

To find: the kv-value
Given: $p_1 = 10$ bar (upstream pressure)
$\Delta p = 3$ bar (pressure drop across valve)
$p_2 = 7$ bar (downstream pressure)
$G = 500$ kg/h (flowrate)
Set: $\Delta p = 3$ bar (on moveable scale) opposite G = 500 on fixed scale.(Fig. 2a)
Read: kv value on pink kv2-scale opposite $p_2 = 7$ bar (moveable scale) (Fig. 2b)
Result: kv value = 4.5 (m^3/h)
Remarks: The value obtained is valid for saturated steam; for superheated steam the kv value must be corrected as follows:

Example: kv value = 4.5 (from example above)
Superheating 200°C
Set: 0°C on the moveable scale opposite 4.5 on the pink kv2 scale.
Read: kv value 5.6 on the pink kv2 scale opposite 200°C on the moveable scale.
Result: corrected kv value = 5.6 (m^3/h)

Example 3 (non-critical steam)

To find: kv value
Given: $p_1 = 10$ bar (upstream pressure)
$G = 1000$ kg/h (flowrate)
Set: $p_{1x} = 10$ bar (upper part of moveable scale) opposite G = 1000 (on fixed scale)(Fig. 3a)
Read: kv value on the red kv2 scale opposite $p_1 = 10$ bar (lower moveable scale)
Result: kv value = 8.0 (m^3/h) (Fig. 3b)