

FLOW CHART FOR WATER

FLOW RATE Q (l/min) FOR WATER

kV	ΔP bar																										
	0.1	0.2	0.4	0.6	0.8	1	1.5	2	3	4	5	6	8	10	12	15	18	20	25	30	40	50	75	100	150	200	250
1	0.3	0.44	0.6	0.77	0.9	1	1.2	1.4	1.7	2	2.2	2.4	2.8	3.1	3.4	3.8	4.2	4.4	5	5.5	6.3	7	8.6	10	12.2	14	16
1.2	0.4	0.53	0.76	0.9	1	1.2	1.5	1.7	2	2.4	2.6	3	3.4	3.8	4.1	4.6	5	5.3	6	6.5	7.6	8.5	10.5	12	14.7	17	19
1.5	0.5	0.67	0.95	1.1	1.3	1.5	1.8	2.1	2.6	3	3.3	3.6	4.2	4.7	5.2	5.8	6.3	6.7	7.5	8.2	9.5	10.6	13	15	18.7	21	24
2	0.6	0.9	1.2	1.5	1.8	2	2.5	2.8	3.5	4	4.4	5	5.6	6.3	7	7.7	8.5	9	10	11	12.6	14	17.3	20	24.5	28	32
3	0.9	1.35	1.9	2.3	2.7	3	3.7	4.2	5.2	6	6.7	7.3	8.5	9.5	10	11.6	12.7	13.4	15	16.4	19	21	26	30	36.7	42.5	48
4	1.2	1.8	2.5	3.1	3.6	4	4.9	5.6	7	8	9	9.8	11.3	12.6	13.8	15.5	17	18	20	22	25.7	28	34.5	40	49	56.5	63
5	1.6	2.2	3.1	3.9	4.5	5	6.1	7	8.6	10	11	12.5	14.2	15.8	17.3	19.3	21	22.4	25	27.4	31.6	35.4	43.5	50	61.3	70	79
6	1.9	2.7	3.8	4.6	5.3	6	7.3	8.5	10.4	12	13.4	14.7	17	19	20.8	23.2	25.4	27	30	33	38	42.4	52	60	73.5	85	95
8	2.5	3.6	5	6.2	7.1	8	9.8	11.3	13.8	16	18	19.6	22.6	25	27.7	31	34	36	40	43.8	50	56	70	80	98	113	126
10	3.1	4.5	6.3	7.7	9	10	12.2	14	17.3	20	22.3	24.5	28.3	31	34.6	38.7	42	45	50	55	63	70	86	100	122	141	158
12	3.7	5.3	7.6	9.3	10.7	12	14.7	17	21	24	26.8	29.4	34	38	41.5	46.5	51	54	60	65.6	76	85	104	120	147	171	190
14	4.3	6.2	8.8	10.8	12.5	14	17.1	20	24	28	31	34	39	44	48.5	54	59	63	70	76.6	88	99	121	140	171	198	221
16	5	7	10	12.4	14.3	16	19.6	22.6	27.7	32	36	39	45	50	55.5	62	68	71.5	80	87.5	101	113	138	160	196	226	253
18	5.6	8	11.4	14	16	18	22	25.4	31.2	36	40	44	51	57	62.5	70	76.5	81	90	98	114	127	156	180	220	254	284
20	6.2	9	12.6	15.5	18	20	24.5	28.3	35	40	44.6	49	56	63	70	77.5	85	90	100	109	126	141	173	200	245	283	316
25	7.8	11	15.8	20	22.4	25	30	35.4	43.4	50	56	61	65	79	86.5	97	106	112	125	137	158	177	216	250	306	354	395
30	9.3	13.4	19	23.2	27	30	37	42.5	52	60	67	73.5	85	95	104	116	127	134	150	164	190	212	260	300	367	425	475
35	11	15.6	22.5	27	31	35	43	50	60	70	78	85.7	99	110	121	135	148	156	175	192	222	248	303	350	429	495	554
40	12.4	17.8	25	31	36	40	49	56.5	69	80	90	98	113	126	138	155	170	179	200	219	257	283	346	400	490	565	632
45	14	20	28	35	40	45	55	64	78	90	100	110	127	142	156	174	191	201	225	246	285	318	390	450	552	637	712
50	15.5	22	31.6	39	45	50	61	70	86	100	112	125	142	158	173	193	212	224	250	274	316	354	433	500	613	707	790
60	18.6	27	38	46.5	54	60	73.5	85	104	120	134	147	170	190	208	232	254	268	300	328	380	424	520	600	735	850	950
70	21.7	31	44.3	54	63	70	86	99	121	140	156	171	198	221	242	270	297	313	350	384	443	495	606	700	857	990	110
80	25	35.7	50	62	71.5	80	98	113	138	160	179	196	226	253	277	310	340	358	400	438	505	566	693	800	980	1130	1265
90	28	40	57	70	80	90	110	127	156	180	200	220	254	285	312	348	381	402	450	493	570	637	780	900	1100	1270	1425
100	31.6	45	63	77	90	100	122	141	173	200	225	245	283	316	346	387	424	447	500	547	632	707	866	1000	1220	1410	1580

Specifications are subject to change without notice

FLOW FACTOR

Flow Factor is specified in various units as under :

- kv = 1 is a flow of 1 litre of water in 1 minute through a valve, when the pressure drop ΔP across the valve is 1 kg/cm²
- Cv = 1 is a flow of 1 US Gallon of water in 1 minute through a valve, when the pressure drop ΔP across the valve is 1 psi
- kv = 1 is a flow of 1 cubic meter (m³) of water in 1 hour through a valve, when the pressure drop ΔP across the valve is 1 kg/cm²
- Q = 1 is a flow of 1 imperial Gallon of water in 1 minute through a valve, when the pressure drop ΔP across the valve is 1 psi
- f = 1 is a flow of 1 Nominal liter of air in 1 minute through a valve, when the pressure drop ΔP across the valve is 1 bar, and inlet pressure 6 bar

Relation between the various flow factors is as under :

ORIFICE	kv	KV	Cv	PORT CONNECTION
0.8	0.3	0.018	0.021	1/8" or 1/4"
1	0.5	0.03	0.035	1/8" or 1/4"
1.2	0.7	0.042	0.049	1/8" or 1/4"
1.6	1.4	0.084	0.098	1/8" or 1/4"
1.8	1.8	0.108	0.126	1/8" or 1/4"
2.2	2.5	0.15	0.175	1/8" or 1/4"
2.5	3.5	0.21	0.245	1/8" or 1/4"
3	4	0.24	0.28	1/8" or 1/4"
3.5	5	0.3	0.35	1/4"
4	7	0.42	0.49	1/4"
5	10	0.6	0.7	1/4"
6	12	0.72	0.84	1/4"
7	18	1.08	1.26	1/4", 3/8", 1/2"
8	20	1.2	1.4	1/4", 3/8", 1/2"
9	22	1.32	1.54	1/4", 3/8", 1/2"
10	38	2.28	2.66	3/8", 1/2"
12	50	3.6	4.2	1/2"
16	75	4.5	5.25	1/2"
20	110	6.6	7.7	3/4"
22	175	10.5	12.25	1"
25	185	11.1	12.95	3/8", 1"
32	375	22.5	26.25	1 1/4", 1 1/2"
40	410	24.6	28.7	1 1/2"
50	660	39.6	46.2	2"
65	850			2 1/2"
80	2000			3"

These are Suggested flow factors of ROTEX Solenoid Valves, Refer details for exact Flow factor of a particular model.

CONVERSION

CONVERT	TO	MULTIPLY BY
FLOW FACTOR		
Cv	kv	14.3
Kv	kv	16.67
Qn	kv	0.0145
kv	Cv	0.07
f	Cv	1.206
Qn	Cv	0.001
kv	Kv	0.06
Cv	Qn	981.5
kv	Qn	68.65
Cv	f	0.829

FLOW		
Liter/min.	UK gallon/min.	0.22
Liter/min.	US gallon/min.	0.26
Liter/min.	m ³ /hr.	0.06
Nm ³ / hr	Cfm	0.6
ℓ / min	Cfm	0.035

PRESSURE		
kg/cm ²	Mpa	0.1
kg/cm ²	mm of Hg	760
kg/cm ²	Mm of WATER	10000
kg/cm ²	PSI	14.3
kg/cm ²	atm	1
kg/cm ²	bar	1

SELECTION GUIDE : ORIFICE

ROTEX Solenoid Valves are modular in construction facilitating the user to select valves for various Application from wide range and different construction of solenoids independently

SELECTION OF BASIC VALVE TYPE:

Depending on the application of valve in system select e.g a 2/2 Valve for ON/ OFF application, 3/2 valve for a single acting actuator, mixing, diverting, Universal applications, 5/2 Valve for double acting actuator, cylinder etc.

VALVE SIZE & PORT CONNECTION :

The basic size of the valve is based on the kv (flow factor) of the valve

The kv Value is calculated through basic application information

(A) FLOW REQUIRED

- i) Flow data
- ii) Calculate flow from time in which a specific volume is to be delivered

(B) INLET PRESSURE-PO

- C) Outlet Pressure- P_1 In most of the cases the outlet pressure is not known, the same can be arrived at from back pressure from equipment or based on the load on the equipment under operation
- D) ΔP -Pressure drop across the valve (P_0-P_1)
- E) Operating temperature of media
- F) Specific gravity of media

The flow factor (kv) can be calculated using following methods for AIR, LIQUIDS, GASES.

1) FOR AIR

Refer into the kv chart No. 1 (Page 412) for AIR. Select the inlet pressure and differential pressure. The result from chart yields flow in Nm^3/hr . For a value of flow factor $kv=1$, calculate the flow factor for the specific application.

$$kv = \frac{Q \text{ (Application specific)}}{Q \text{ (for } kv=1)}$$

Select the valve orifice size having calculated kv or nearest higher kv

EXAMPLE-1

TO FIND AN ORIFICE OF A VALVE

REQUIREMENT: To fill a volume of 100 liters, the inlet air pressure P_0 is 7 bar. The Volume to be filled in 20 seconds from 0-5 bar. P_1 is 5 bar

First calculate m^3/hr at 5 bar

$$\frac{100}{20} \times \frac{60 \times 60}{1000} = 18m^3/hr.$$