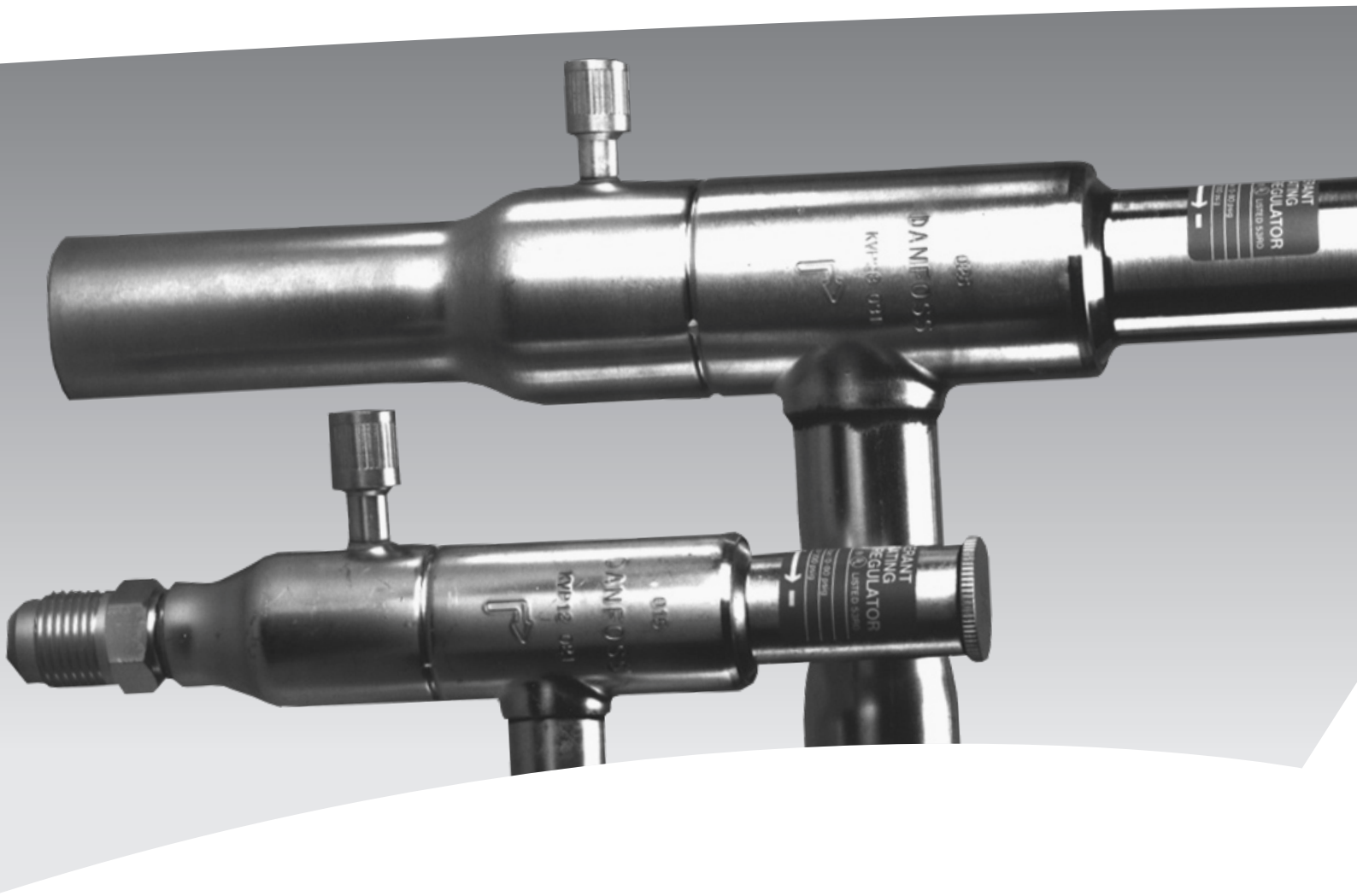
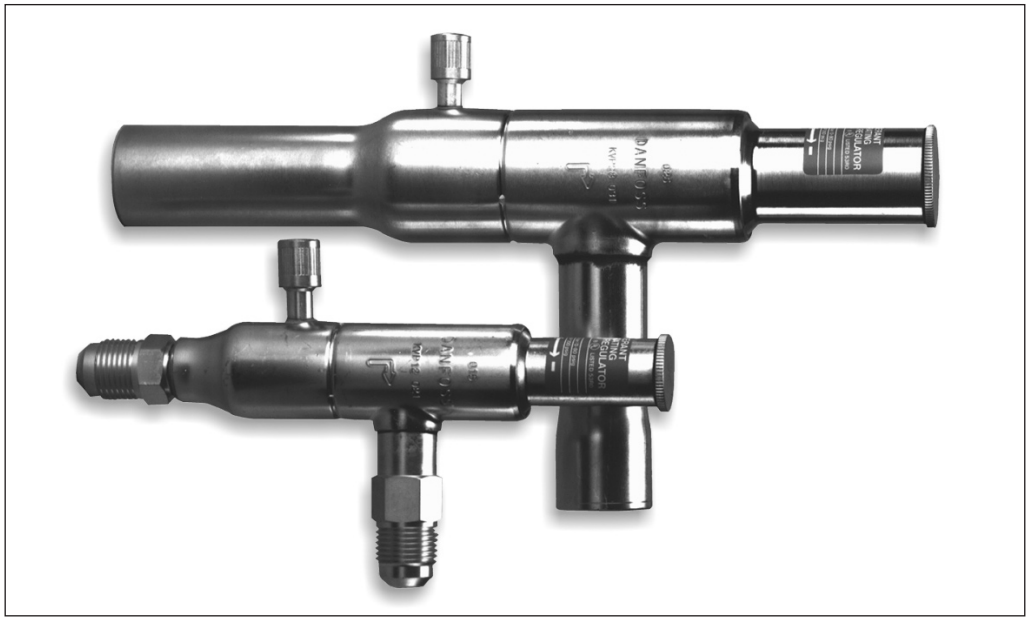


Evaporating pressure regulator, type KVP

REFRIGERATION AND AIR CONDITIONING

Technical leaflet

Introduction



The KVP is mounted in the suction line after the evaporator. It is used to:

1. Maintain a constant evaporating pressure and thereby a constant surface temperature on the evaporator. The regulation is modulating. By throttling in the suction line, the amount of refrigerant gas is matched to the evaporator load.
2. Protect against too low an evaporating pressure (e.g. as protection against freezing in a water chiller). The regulator closes when the pressure in the evaporator falls below the set value.
3. The KVP are also used to differentiate the evaporating pressures in two or more evaporators in systems with one compressor.

Features

- Accurate, adjustable pressure regulation
- Wide capacity and operating range
- Pulsation damping design
- Stainless steel bellows
- Compact angle design for easy installation in any position
- "Hermetic" brazed construction
- $^1/_4$ in. Schrader valve for pressure testing
- Available with flare and ODF solder connections
- For use with CFC, HCFC and HFC refrigerants

Approvals

c UL us listed, file SA7200

Technical data

Refrigerants
CFC, HCFC, HFC

Regulating range
0 → 5.5 bar
Factory setting = 2 bar

Maximum working pressure
PS = 18 bar

Maximum test pressure
KVP 12 → 22: p' = 28 bar
KVP 28 → 35: p' = 25.6 bar

Maximum temperatur of medium: 130°C

Minimum temperatur of medium: –45°C

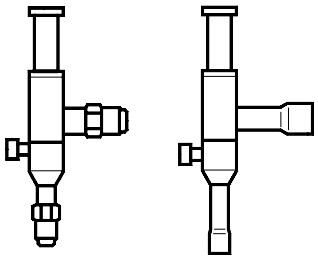
Maximum P band
KVP 12 → 22 = 1.7 bar
KVP 28 → 35 = 2.8 bar

k_v-value [1] *with offset 0.6 bar*
KVP 12 → 22 = 1.7 m^3/h
KVP 28 → 35 = 2.8 m^3/h

k_v-value [1] *with maximum P- bånd*
KVP 12 → 22 = 2.5 m^3/h
KVP 28 → 35 = 8.0 m^3/h

[1] The k_v value is the flow of water in m^3/h at a pressure drop across valve of 1 bar, ρ = 1000 kg/m^3.

Ordering



Type	Rated capacity [1] kW				Flare connection [2]		Code no.	Solder connection		Code no.
	R 22	R 134a	R 404A / R 507	R 407C	in.	mm		in.	mm	
KVP 12	4.0	2.8	3.6	3.7	1/2	12	**034L0021**	1/2		**034L0023**
									12	**034L0028**
KVP 15	4.0	2.8	3.6	3.7	5/8	16	**034L0022**	5/8	16	**034L0029**
KVP 22	4.0	2.8	3.6	3.7				7/8	22	**034L0025**
KVP 28	8.6	6.1	7.7	7.9				1 1/8		**034L0026**
									28	**034L0031**
KVP 35	8.6	6.1	7.7	7.9				1 3/8	35	**034L0032**

1) Rated capacity is the capacity of the regulator at evaporating temperature t_e = –10°C, condensing temperature t_c = +25°C, pressure drop in regulator Δp = 0.2 bar, offset = 0.6 bar.

*2) KVP supplied without flare nuts. Separate flare nuts can be supplied: 1/2 in./12 mm, **code no. 011L1103**, 5/8 in./16 mm, **code no. 011L1167**.*

The connection dimensions chosen must not be too small, since gas velocities in excess of 40 m/s at the inlet of the regulator can give flow noise.

Capacity

Regulator capacity Q_e [1])kW with offset = 0.6 bar

Type	Pressure drop in regulator Δp bar	Evaporating temperature t_e °C							
		–30	–25	–20	–15	–10	–5	0	5
									R 22
KVP 12	0.1	1.9	2.1	2.3	2.6	2.9	3.2	3.5	3.8
KVP 15	0.2	2.5	2.9	3.2	3.6	4.0	4.4	4.9	5.3
KVP 22	0.3	3.0	3.4	3.8	4.3	4.8	5.3	5.9	6.5
	0.4	3.3	3.8	4.3	4.9	5.5	6.1	6.7	7.4
	0.5	3.4	4.1	4.7	5.3	6.0	6.7	7.4	8.2
	0.6	3.6	4.2	5.0	5.7	6.4	7.2	8.0	8.8
KVP 28	0.1	4.0	4.5	5.0	5.6	6.2	6.8	7.5	8.2
KVP 35	0.2	5.4	6.2	6.9	7.7	8.6	9.5	10.4	11.4
	0.3	6.3	7.3	8.2	9.3	10.3	11.5	12.6	13.9
	0.4	7.0	8.1	9.2	10.4	11.7	13.0	14.4	15.8
	0.5	7.4	8.7	10.0	11.4	12.8	14.3	15.9	17.5
	0.6	7.6	9.1	10.6	12.2	13.8	15.4	17.1	18.9

Regulator capacity Q_e [1])kW with offset = 0.6 bar

Type	Pressure drop in regulator Δp bar	Evaporating temperature t_e °C							
		–15	–10	–5	0	5	10	15	20
									R 134a
KVP 12	0.1	1.8	2.1	2.3	2.6	2.9	3.2	3.6	3.9
KVP 15	0.2	2.5	2.8	3.2	3.6	4.0	4.5	5.0	5.5
KVP 22	0.3	2.9	3.4	3.8	4.3	4.9	5.4	6.0	6.6
	0.4	3.2	3.7	4.3	4.9	5.5	6.1	6.8	7.6
	0.5	3.4	4.0	4.6	5.3	6.0	6.8	7.5	8.3
	0.6	3.5	4.2	4.9	5.7	6.4	7.3	8.1	9.0
KVP 28	0.1	3.9	4.5	5.0	5.6	6.2	6.9	7.6	8.4
KVP 35	0.2	5.3	6.1	6.9	7.8	8.7	9.6	10.6	11.7
	0.3	6.3	7.2	8.2	9.3	10.4	11.6	12.9	14.2
	0.4	6.9	8.0	9.2	10.5	11.8	13.2	14.6	16.2
	0.5	7.3	8.6	10.0	11.4	12.9	14.5	16.1	17.9
	0.6	7.5	9.0	10.5	12.1	13.8	15.6	17.4	19.3

[1]) The capacities are based on Liquid temperature ahead of expansion valve t_l = +25°C Regulator offset = 0.6 bar. Dry saturated gas ahead of regulator.

Correction factors for liquid temperature t_l

t_l °C	15	20	25	30	35	40
R 22	0.93	0.96	1.0	1.04	1.08	1.13
R 134a	0.92	0.96	1.0	1.05	1.10	1.16

Correction factors for offset

Offset bar	0.2	0.4	0.6	0.8	1.0	1.2	1.4
KVP 12 KVP 15 KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	
KVP 28 KVP 35		1.4	1.0	0.77	0.67	0.59	0.53

Capacity
(continued)

Regulator capacity Q_e [1]) kW with offset = 0.6 bar

Type	Pressure drop in regulator Δp bar	Evaporating temperature t_e °C							
		–35	–30	–25	–20	–15	–10	–5	0
									R 404A / R 507
KVP 12	0.1	1.4	1.6	1.8	2.1	2.3	2.6	2.8	3.2
KVP 15	0.2	1.9	2.2	2.5	2.8	3.2	3.6	4.0	4.4
KVP 22	0.3	2.2	2.5	3.0	3.5	3.9	4.4	4.8	5.4
	0.4	2.4	2.9	3.3	3.9	4.3	4.9	5.5	6.2
	0.5	2.5	3.1	3.6	4.2	4.8	5.5	6.1	6.8
	0.6	2.6	3.2	3.9	4.4	5.1	5.8	6.5	7.4
KVP 28	0.1	2.9	3.4	3.9	4.4	5.0	5.5	6.0	6.8
KVP 35	0.2	4.0	4.7	5.4	6.2	6.8	7.7	8.4	9.6
	0.3	4.7	5.5	6.4	7.3	8.2	9.2	10.3	11.6
	0.4	5.1	6.1	7.2	8.2	9.3	10.5	11.7	13.2
	0.5	5.5	6.6	7.7	9.0	10.2	11.4	12.9	14.5
	0.6	5.7	6.9	8.2	9.6	10.9	12.4	13.8	15.7

Regulator capacity Q_e [1]) kW with offset = 0.6 bar

Type	Pressure drop in regulator Δp bar	Evaporating temperature t_e °C							
		–30	–25	–20	–15	–10	–5	0	5
									R 407C
KVP 12	0.1	1.6	1.8	2.0	2.3	2.7	3.0	3.3	3.6
KVP 15	0.2	2.2	2.5	2.8	3.2	3.7	4.1	4.6	5.1
KVP 22	0.3	2.6	3.0	3.4	3.9	4.4	4.9	5.5	6.2
	0.4	2.8	3.3	3.8	4.4	5.1	5.7	6.3	7.1
	0.5	2.9	3.6	4.2	4.8	5.5	6.2	7.0	7.9
	0.6	3.1	3.7	4.5	5.1	5.9	6.7	7.5	8.4
KVP 28	0.1	3.4	3.9	4.5	5.0	5.7	6.3	7.1	7.9
KVP 35	0.2	4.6	5.4	6.1	6.9	7.9	8.8	9.8	10.9
	0.3	5.4	6.4	7.3	8.4	9.5	10.7	11.8	13.3
	0.4	6.0	7.0	8.2	9.4	10.8	12.1	13.5	15.2
	0.5	6.4	7.6	8.9	10.3	11.8	13.3	14.9	16.8
	0.6	6.5	7.9	9.4	11.0	12.7	14.3	16.1	18.1

[1]) The capacities are based on Liquid temperature ahead of expansion valve t_l = +25°C
Regulator offset = 0.6 bar.
Dry saturated gas ahead of regulator.

Correction factors for temperature t_l

t_l °C	15	20	25	30	35	40
R 404A/ R 507	0.89	0.94	1.0	1.07	1.16	1.26
R 407C	0.91	0.95	1.0	1.05	1.11	1.18

Correction factors for offset

Offset bar	0.2	0.4	0.6	0.8	1.0	1.2	1.4
KVP 12 KVP 15 KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	
KVP 28 KVP 35		1.4	1.0	0.77	0.67	0.59	0.53

Sizing

For optimum performance, it is important to select a KVP valve according to system conditions and application.
The following data must be used when sizing a KVP valve:

- Refrigerant - CFC, HCFC or HFC
- Evaporator capacity Q_e in kW
- Evaporating temperature (required temperature) t_e in °C
- Minimum evaporating temperature t_e in °C
- Liquid temperature ahead of expansion valve t_l in °C
- Connection type flare or solder
- Connection size in inches

Valve selection

Example

When selecting the appropiate valve it may be necessary to convert the actual evaporator capacity using a correction factor. This is required when your system conditions are different than the table conditions.
The selection is also dependant on the acceptable pressure drop across the valve.
The following example illustrates how this is done.

Refrigerant: R134a
Evaporator capacity: Q_e = 4.2 kW
Evaporating temperature: t_e = 5°C ~ 2.5 bar
Minimum evaporating temperature: 1.4°C ~ 2.1 bar
Liquid temperature ahead of expansion valve: t_l = 30°C
Connection type: Solder
Connection size: $^5/_8$ in.

Step 1

Determine the correction factor for liquid temperature t_l ahead of expansion valve.

From the correction factors table (see below) a liquid temperature of 30°C, R134a corresponds to a factor of 1.05.

Correction factors for liquid temperature t_l

t_l°C	10	15	20	25	30	35	40	45	50
R 134a	0.88	0.92	0.96	1.0	1.05	1.10	1.16	1.23	1.31
R 22	0.90	0.93	0.96	1.0	1.05	1.10	1.13	1.18	1.24
R 404A / R 507	0.84	0.89	0.94	1.0	1.07	1.16	1.26	1.40	1.57
R 407C	0.88	0.91	0.95	1.0	1.05	1.11	1.18	1.26	1.35

Step 2

Determine the correction factor for the valve offset.
The offset is defined as the difference between the design evaporating pressure and the minimum evaporating pressure.
From the offset correction factor table, an offset of 0.4 bar (2.5 – 2.1) coresonds to a factor of 1.4.

Correction factors for offset

Offset bar	0.2	0.4	0.6	0.8	1.0	1.2	1.4
KVP 12 KVP 15 KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	
KVP 28 KVP 35		1.4	1.0	0.77	0.67	0.59	0.53

Step 3

Corrected evaporator capacity is
$Q_e = 1.05 \times 1.4 \times 4.2 = 6.2$ kW

Step 4

Now select the appropriate capacity table (R134a) and choose the column for an evaporating temperature of t_e = 5°C.

Using the corrected evaporator capacity, select a valve that provides an equivalent or greater capacity at an acceptable pressure drop.
KVP 12/15/22 delivers 6.4 kW at a 0.6 bar pressure drop across the valve.

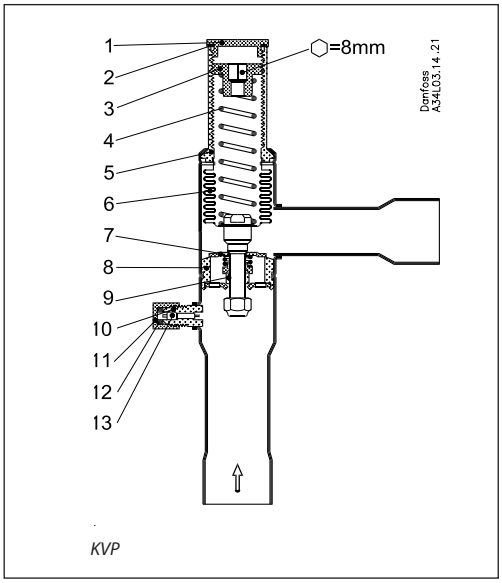
KVP 28/35 delivers 6.2 kW at a 0.1 bar pressure drop across the valve.

Based on the required connection size of $^5/_8$ in., the KVP 15 is the proper selection for this example.

Step 5

KVP 15, $^5/_8$ in. solder connection:
code no. 034L0029, see Ordering table.

Design
Function

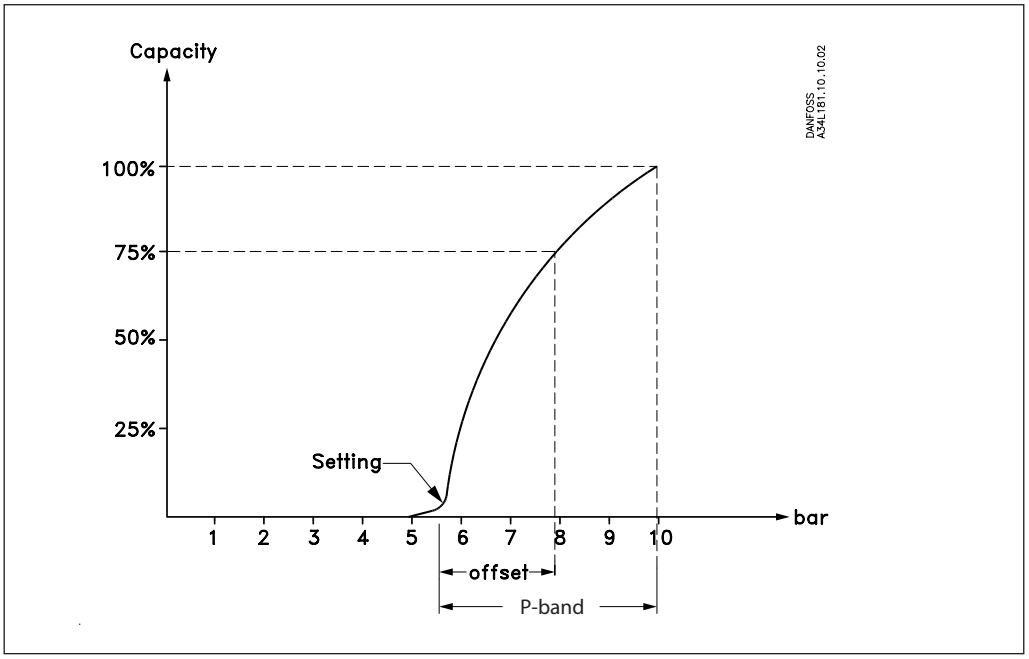


KVP

1. Protective cap
2. Gasket
3. Setting screw
4. Main spring
5. Valve body
6. Equalization bellows
7. Valve plate
8. Valve seat
9. Damping device
10. Pressure gauge connection
11. Cap
12. Gasket
13. Insert

Evaporator pressure regulator type KVP opens on a rise in pressure on the inlet side, i.e. when the pressure in the evaporator exceeds the set value. Type KVP regulates on inlet pressure only. Pressure variations on the outlet side of the regulator do not affect the degree of opening as the valve is equipped with equalization bellows (6).
The bellows have an effective area corresponding to that of the valve seat neutralizing any affect to the setting.
The regulator is also equipped with a damping device (9) providing protection against pulsations which can normally arise in a refrigeration system.
The damping device helps to ensure long life for the regulator without impairing regulation accuracy.

P-band and Offset



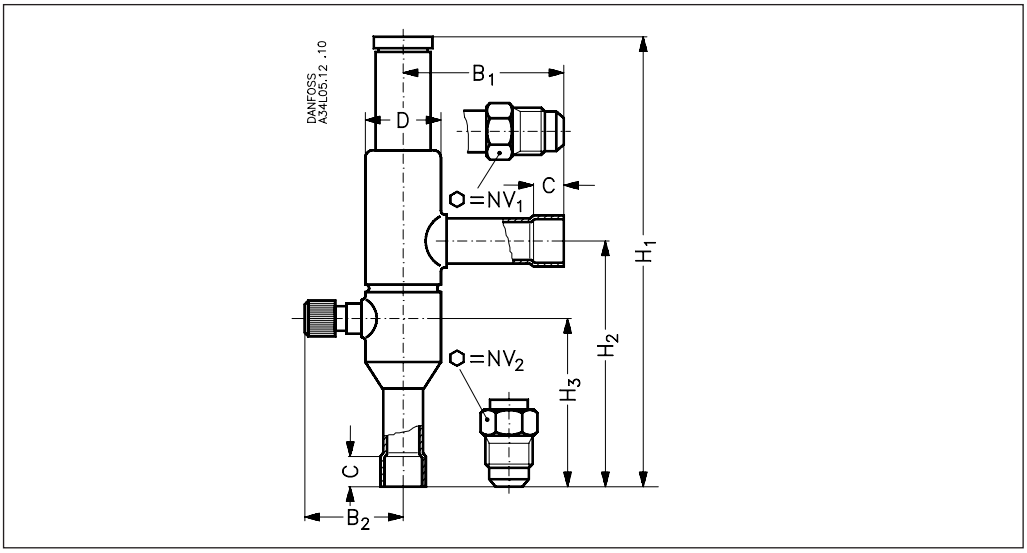
Proportional band
The proportional band or P-band is defined as the amount of pressure required to move the valve plate from closed to full open position.

Example: If the valve is set to open at 4 bar and the valve p-band is 1.7, the valve will give maximum capacity when the inlet pressure reaches 5.7 bar.

Offset
The offset is defined as the permissible pressure variation in evaporator pressure (temperature). It is calculated as the difference between the required working pressure and the minimum allowable pressure.
The offset is always a part of the P-band.

Example with R22:
A working temperature of 5°C ~ 4.9 bar is required, and the temperature must not drop below 0.5°C ~ 4.1 bar.
The offset will then be 0.8 bar.
When selecting a valve, be sure to correct the evaporator capacity based on the required offset.

Dimensions and weights



Type	Connection				NV_1	NV_2	H_1	H_2	H_3	B_1	B_2	C	Ø D	Weight
	Flare		Solder ODF											
	in.	mm	in.	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
KVP 12	1/2	12	1/2	12	19	19	179	99	66	64	41	10	30	0.4
KVP 15	5/8	16	5/8	16	24	24	179	99	66	64	41	12	30	0.4
KVP 22			7/8	22	24	24	179	99	66	64	41	17	30	0.4
KVP 28			1 1/8	28	24	24	259	151	103	105	48	20	43	1.0
KVP 35			1 3/8	35			259	151	103	105	48	25	43	1.0