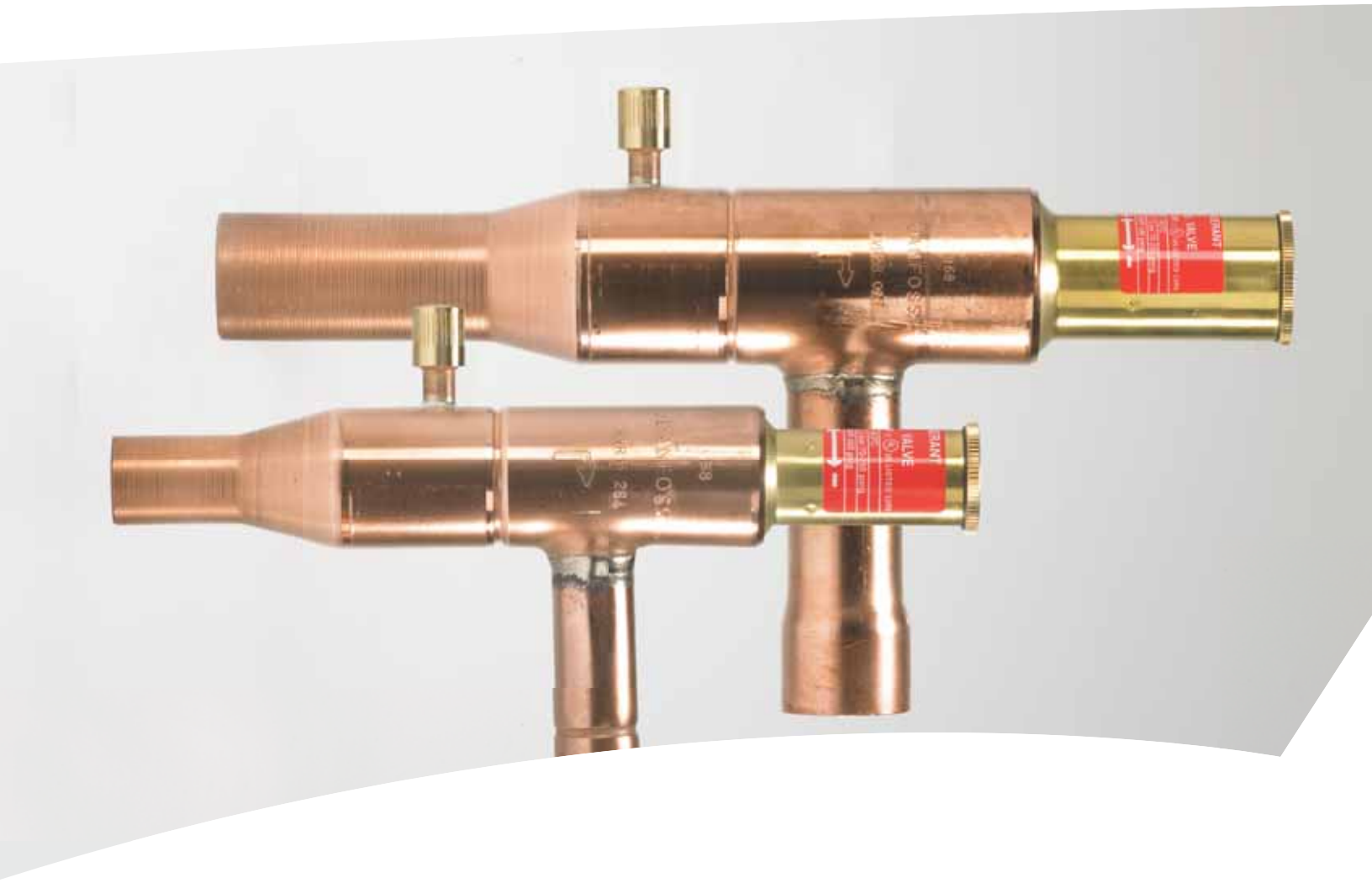
MAKING MODERN LIVING POSSIBLE



Evaporating pressure regulator
KVP

Technical brochure

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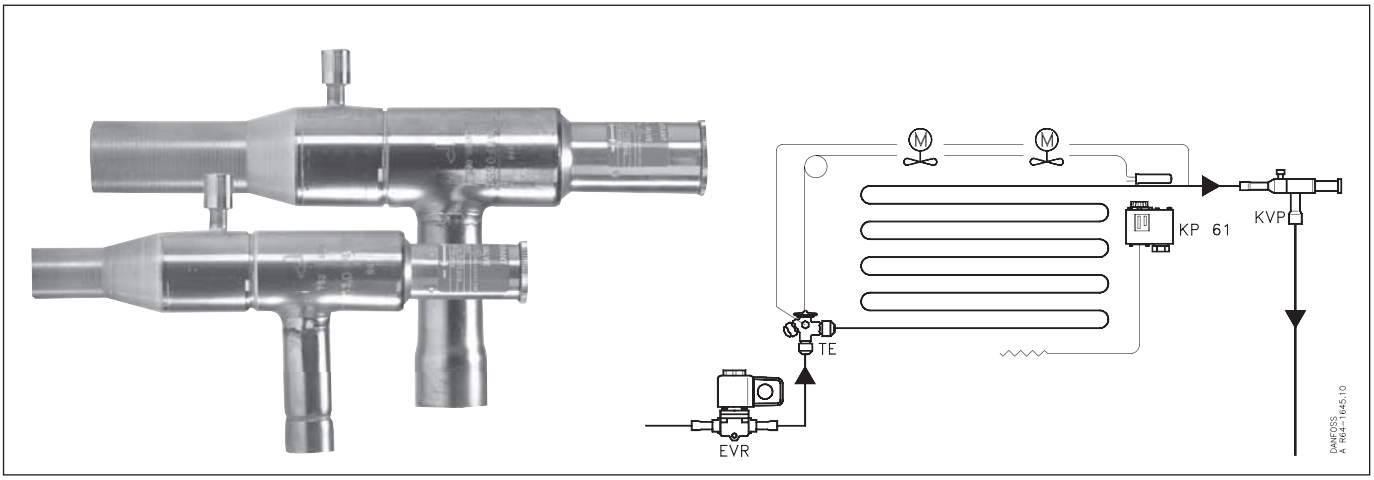


Introduction

KVP evaporator pressure regulators are mounted in the suction line of refrigeration and air conditioning systems.
They are used to maintain a constant pressure corresponding to a constant temperature on the evaporator.

They also protect against too low an evaporating pressure by throttling down when pressure falls below the set value.
They 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

Regulation range
0 to 80 psig
Factory setting = 29 psig

Maximum working pressure
PS (MWP) = 261 psig

Maximum test pressure
p' = PS x 1.1 = 287 psig

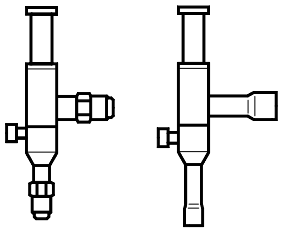
Maximum temperature of medium: 266°F

Minimum temperature of medium: –49°F

P band (full valve stroke)
KVP 12 to 22 = 26 psi
KVP 28 to 35 = 40 psi

Metric conversions
1 psi = 0.07 bar
$^5/_9$ (t_1°F – 32) = t_2°C

Ordering



Type	Rated capacity [1] tons				Flare connection [2]	Code no.	Solder connection	Code no.
	R 22	R 134a	R 404A / R 507	R 407C	in.		in. ODF	
KVP 12	1.3	0.9	1.2	1.2	1/2	**034L0021**	1/2	**034L0023**
KVP 15	1.3	0.9	1.2	1.2	5/8	**034L0022**	5/8	**034L0029**
KVP 22	1.3	0.9	1.2	1.2			7/8	**034L0025**
KVP 28	2.8	1.9	2.4	2.6			1 1/8	**034L0026**
KVP 35	2.8	1.9	2.4	2.6			1 3/8	**034L0032**

1) Rated capacity is based on:
Evaporating temperature t_e = 40°F
Condensing temperature t_c = 100°F
Pressure drop across regulator Δp = 2 psi
Offset (design evaporating pressure minus minimum allowable evaporator pressure) = 9 psi.

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

Note: The connection dimensions chosen must not be too small, as gas velocities in excess of 130 ft/s at the inlet of the regulator can result in flow noise.

Capacity

Maximum regulator capacity Q_e 1)

Type	Pressure drop across regulator Δp psi	Capacity Q_e in tons at evaporating temperature t_e °F									
		–20	–10	0	10	20	30	40	50	60	70
											R 22
KVP 12	2	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.5	1.7
KVP 15	4	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.2	2.4
KVP 22	6	1.0	1.2	1.3	1.5	1.7	1.9	2.2	2.4	2.6	2.9
	10	1.1	1.4	1.6	1.9	2.1	2.4	2.7	3.0	3.3	3.6
	20	1.1	1.4	1.8	2.2	2.6	3.0	3.5	3.9	4.4	4.9
KVP 28	2	1.4	1.6	1.8	2.0	2.3	2.5	2.8	3.1	3.4	3.7
KVP 35	4	1.9	2.2	2.5	2.8	3.1	3.5	3.9	4.3	4.7	5.2
	6	2.1	2.5	2.9	3.3	3.8	4.2	4.7	5.2	5.7	6.3
	10	2.4	2.9	3.5	4.0	4.6	5.2	5.8	6.5	7.2	7.9
	20	2.4	3.0	3.8	4.7	5.6	6.6	7.5	8.5	9.6	10.6

Maximum regulator capacity Q_e 1)

Type	Pressure drop across regulator Δp psi	Capacity Q_e in tons at evaporating temperature t_e °F						
		–15	–10	–5	0	5	10	15
								R 134a
KVP 12	2	0.6	0.7	0.8	0.9	1.0	1.1	1.2
KVP 15	4	0.8	0.9	1.0	1.2	1.3	1.5	1.7
KVP 22	6	0.9	1.0	1.2	1.4	1.6	1.8	2.0
	10	1.0	1.2	1.5	1.7	2.0	2.2	2.5
	20	1.0	1.3	1.6	2.0	2.4	2.8	3.3
KVP 28	2	1.3	1.5	1.7	1.9	2.1	2.4	2.6
KVP 35	4	1.7	2.0	2.3	2.6	2.9	3.3	3.6
	6	2.0	2.3	2.7	3.1	3.5	3.9	4.4
	10	2.2	2.7	3.2	3.7	4.3	4.9	5.5
	20	2.2	2.8	3.5	4.4	5.2	6.1	7.1

1) The capacities are based on:
Liquid temperature ahead of expansion valve t_l = 100°F
Regulator offset Δp = 9 psi

Metric conversions

1 psi = 0.07 bar
5/9 (t_1°F – 32) = t_2°C
1 ton = 3.5 kW
1 in. = 25.4 mm

Capacity
(continued)

Maximum regulator capacity Q_e[1])

Type	Pressure drop across regulator Δp psi	Capacity Q_e in tons at evaporating temperature t_e °F										
		–20	–20	–10	0	10	20	30	40	50	60	70
R 404A and R 507												
KVP 12	2	0.5	0.5	0.6	0.7	0.8	0.9	1.1	1.2	1.3	1.4	1.5
KVP 15	4	0.6	0.7	0.8	0.9	1.1	1.3	1.4	1.6	1.8	1.9	2.2
KVP 22	6	0.7	0.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.4	2.6
	10	0.8	1.0	1.2	1.3	1.6	1.9	2.0	2.4	2.8	3.0	3.4
	20	0.8	1.0	1.3	1.6	1.9	2.3	2.7	3.2	3.6	4.1	4.5
KVP 28	2	1.0	1.1	1.3	1.5	1.8	2.0	2.2	2.4	2.8	3.0	3.4
KVP 35	4	1.3	1.5	1.8	2.0	2.4	2.7	3.1	3.4	3.9	4.3	4.8
	6	1.5	1.8	2.1	2.4	2.9	3.2	3.7	4.1	4.7	5.1	5.7
	10	1.7	2.1	2.5	2.9	3.5	4.1	4.6	5.2	5.9	6.5	7.2
	20	1.7	2.1	2.7	3.4	4.3	5.2	5.9	6.8	7.8	8.8	9.8

Maximum regulator capacity Q_e[1])

Type	Pressure drop across regulator Δp psi	Capacity Q_e in tons at evaporating temperature t_e °F									
		–20	–10	0	10	20	30	40	50	60	70
R 407C											
KVP 12	2	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.7
KVP 15	4	0.7	0.9	0.9	1.1	1.2	1.4	1.7	1.9	2.1	2.3
KVP 22	6	0.8	1.0	1.1	1.3	1.5	1.7	2.0	2.3	2.5	2.8
	10	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.1	3.5
	20	0.9	1.1	1.5	1.9	2.3	2.7	3.2	3.7	4.2	4.8
KVP 28	2	1.1	1.3	1.5	1.7	2.0	2.3	2.6	2.9	3.2	3.6
KVP 35	4	1.5	1.8	2.1	2.4	2.7	3.2	3.6	4.0	4.5	5.0
	6	1.7	2.1	2.5	2.8	3.3	3.8	4.3	4.9	5.4	6.1
	10	1.9	2.4	3.0	3.4	4.0	4.7	5.3	6.1	6.8	7.7
	20	1.9	2.5	3.2	4.0	4.9	5.9	6.9	8.0	9.1	10.3

[1]) The capacities are based on:
Liquid temperature ahead of expansion valve t_l = 100°F
Regulator offset Δp = 9 psi

Correction factors for liquid temperature t_l

t_l°C	50	60	70	80	90	100	110	120
R 22	0.82	0.85	0.88	0.92	0.96	1.0	1.05	1.10
R 134a	0.79	0.82	0.86	0.90	0.95	1.0	1.06	1.13
R 404A / R 507	0.71	0.75	0.80	0.85	0.92	1.0	1.10	1.24
R 407C	0.78	0.81	0.85	0.89	0.94	1.0	1.07	1.15

Correction factors for offset

Offset psi	3	6	9	12	15	18	21
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

Metric conversions

1 psi = 0.07 bar
$^5/_9$ (t_1°F – 32) = t_2°C
1 ton = 3.5 kW

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 tons
- Evaporating temperature (required temperature) t_e in °F
- Minimum evaporating temperature t_e in °F
- Liquid temperature ahead of expansion valve t_l in °F
- 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 = 1.5 tons
Evaporating temperature: t_e = 40°F ~ 36 psig
Minimum evaporating temperature: 35°F ~ 30.5 psig
Liquid temperature ahead of expansion valve: t_l = 80°F
Connection type: Solder
Connection size: 5/8 in.

Step 1

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

From the correction factors table (see below) a liquid temperature of 80°F, R134a corresponds to a factor of 0.90.

Correction factors for liquid temperature t_l

t_l°C	50	60	70	80	90	100	110	120
R 22	0.82	0.85	0.88	0.92	0.96	1.0	1.05	1.10
R 134a	0.79	0.82	0.86	0.90	0.95	1.0	1.06	1.13
R 404A / R 507	0.71	0.75	0.80	0.85	0.92	1.0	1.10	1.24
R 407C	0.78	0.81	0.85	0.89	0.94	1.0	1.07	1.15

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 5.5 psi (36 – 30.5) corresonds to a factor of 1.4.

Correction factors for offset

Offset psi	3	6	9	12	15	18	21
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
$Q_e = 0.90 \times 1.4 \times 1.5 = 1.89$ tons

Step 4

Now select the appropriate capacity table and choose the column for an evaporating temperature of t_e=40°F.

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 2.0 tons at a 20 psi pressure drop across the valve.

KVP 28/35 delivers 1.9 tons at a 2 psi 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.

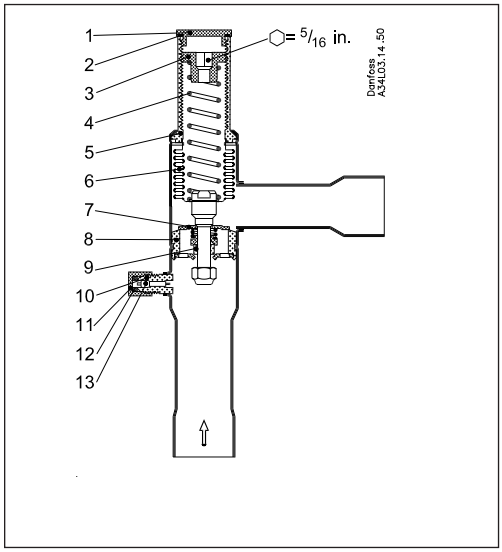
Step 5

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

Metric conversions

1 psi = 0.07 bar
$^5/_9$ (t_1°F – 32) = t_2°C
1 ton = 3.5 kW
1 in. = 25.4 mm

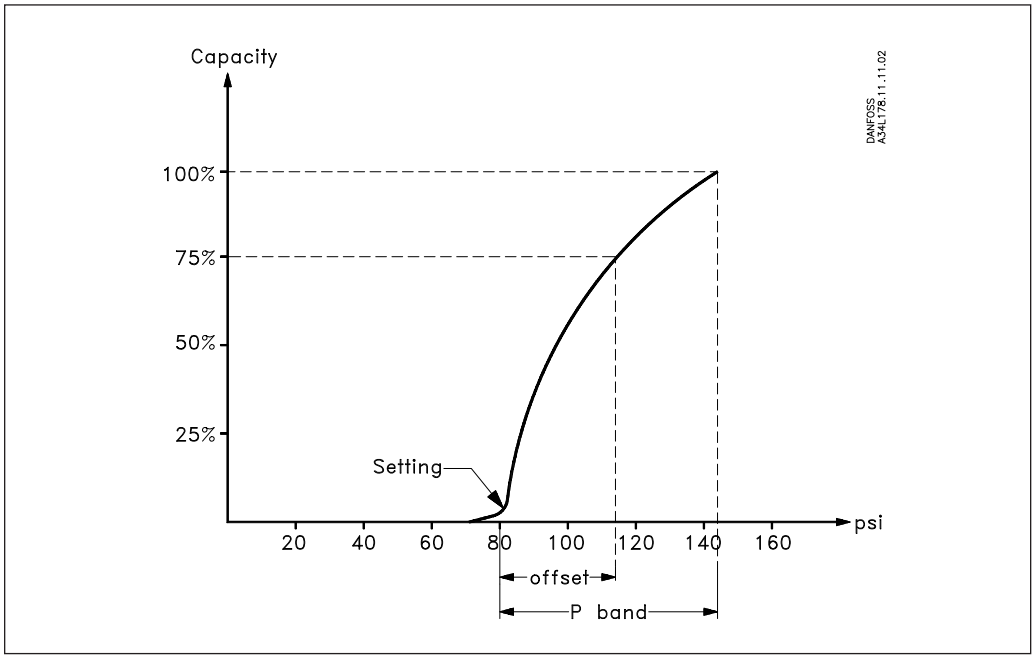
Design and Function



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 58 psig and the valve p-band is 25 psi, the valve will give maximum capacity when the inlet pressure reaches 83 psig.

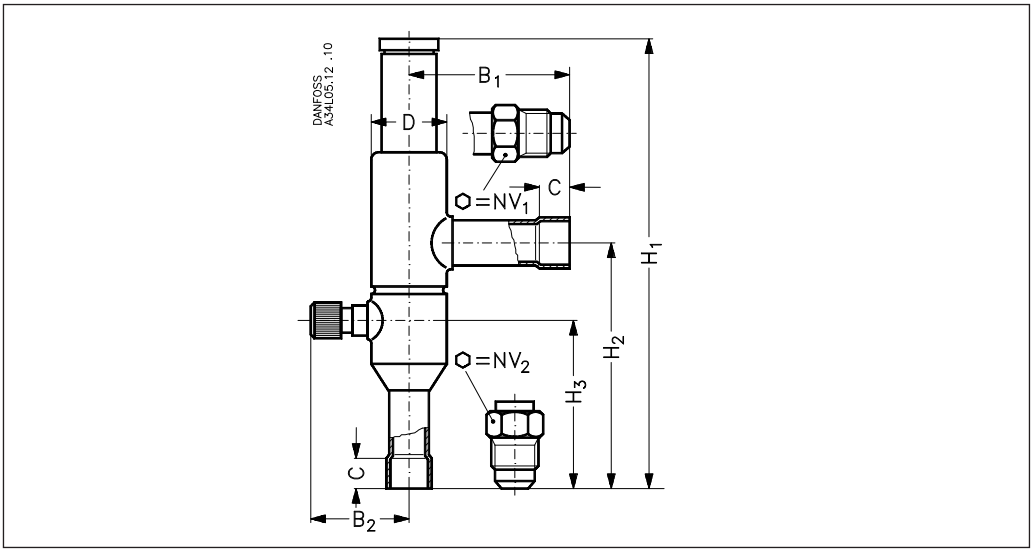
Offset
The offset is defined as the permissible pressure variation in evaporator pressure (temperature). It is calculated as the difference between the required working pressure and the minimum allowable pressure.
The offset is always a part of the P-band.

Example with R22:
A working temperature of 40°F ~ 70 psig is required, and the temperature must not drop below 33°F ~ 60 psig.
The offset will then be 10 psi.
When selecting a valve, be sure to correct the evaporator capacity based on the required offset.

Metric conversions

1 psi = 0.07 bar
$^5/_9$ (t_1°F – 32) = t_2°C

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.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	lbs
KVP 12	1/2	1/2	0.748	0.748	7.047	3.898	2.598	2.520	1.614	0.394	1.181	0.9
KVP 15	5/8	5/8	0.945	0.945	7.047	3.898	2.598	2.520	1.614	0.472	1.181	0.9
KVP 22		7/8	0.945	0.945	7.047	3.898	2.598	2.520	1.614	0.669	1.181	0.9
KVP 28		1 1/8	0.945	0.945	10.197	5.945	4.055	4.134	1.890	0.787	1.693	2.0
KVP 35		1 3/8			10.197	5.945	4.055	4.134	1.890	0.984	1.693	2.0

Metric conversions

1 in. = 25.4 mm
1 lb = 0.454 kg