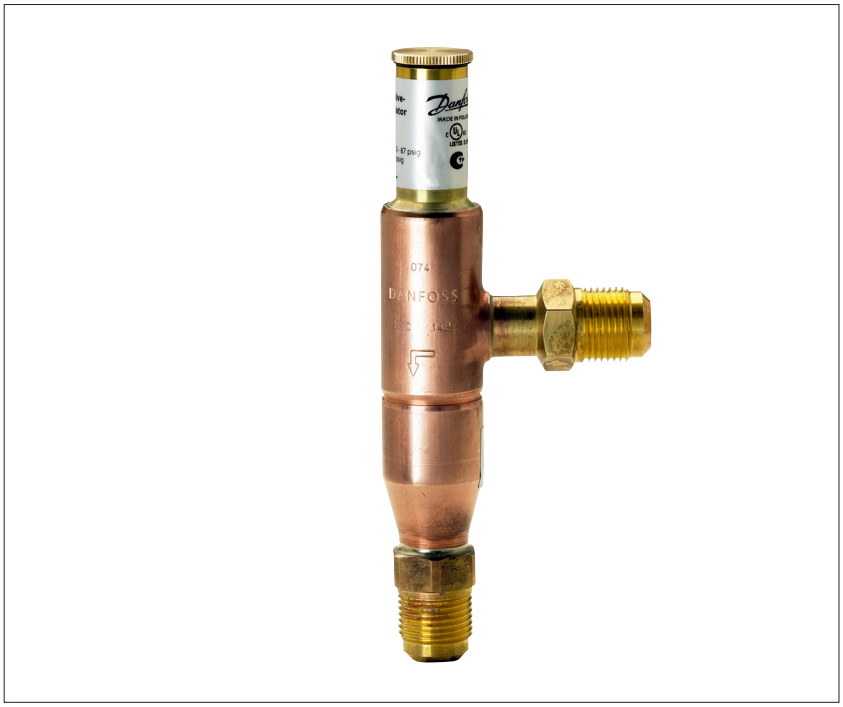
ENGINEERING TOMORROW

Data sheet

Hot gas bypass regulator
Type KVC



KVC hot gas bypass regulator are used to adapt compressor capacity to actual evaporator load by supplying a replacement capacity in form of hot / cool gas.

It is installed in a bypass line between the high and low pressure sides of the refrigeration system and is designed for direct gas injection into the suction line.

Features

- Accurate, adjustable pressure regulation
- Wide capacity and operating range
- Pulsation damping design
- Stainless steel bellows
- Compact angle design for easy installation
- "Hermetic" brazed construction
- Available with flare or ODF solder connections
- May be used in the following EX range: Category 3 (Zone 2)

Approvals

UL LISTED, file SA7200
EAC

Technical data

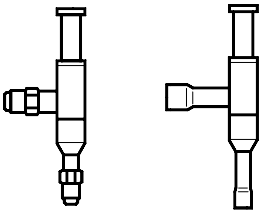
Metric conversions:
1 psi = 0.07 bar
⅝ (t_1 °F - 32) = t_2 °C
1 TR = 3.5 kW

Refrigerants	R22, R134a, R290, R404A, R407A, R407C, R407F, R407H, R448A, R449A, R449B, R450A, R452A, R454A, R454C, R455A, R507A, R513A, R515B, R516A, R600, R600a, R1234ze(E), R1234yf, R1270
Regulating range	Pe = 3.00 – 87.00 psig
	Factory setting = 29 psig
Maximum working pressure	MWP = 406 psig
Maximum test pressure	Pe = 450 psig
Medium temperature range	-49 – 266 °F
Maximum P-band	29 psi

This product is approved for R290, R454A, R454C, R455A, R600, R600a, R1234ze(E), R1234yf, R1270 by ignition source assessment in accordance with standard EN ISO80079-36. Flare connections are only approved for A1 and A2L refrigerants.

For complete list of approved refrigerants, visit **www.products.danfoss.com** and search for individual code numbers, where refrigerants are listed as part of technical data.

Ordering



Type	Rated capacity [1] [TR]				Flare connection [2]	Code no.	Solder connection	Code no.
	R22	R134a	R404A/R507	R407C	[in]		[in]	
KVC 12	2.14	1.36	2.02	2.31	½	**034L0141**	½	**034L0143**
KVC 15	4.17	2.65	3.93	4.50	⅝	**034L0142**	⅝	**034L0147**
KVC 22	5.35	3.41	5.04	5.78	–	–	⅞	**034L0144**

[1]) Rated capacity is based on:
Suction gas temperature t_s = 14 °F
Condensing temperature t_l = 77 °F
Offset Δp = 10 psi

[2]) KVC are delivered without flare nuts. Separate flare nuts can be supplied:
½ in code no **011L1103**
⅝ 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.

If the temperature in the discharge gas line is too high according to the compressor specifications, it is recommanded to install a liquid injection valve in a bypass from the liquid line to the suction line.

Replacement capacity

Maximum regulator capacity Q_e [1])

R22

Type	Offset Δp	Regulator capacity Q_e [1]) [TR] suction gas temperature t_s after pressure / temperature reduction [°F]						
	[psi]	-50	-40	-25	-10	10	30	50
KVC 12	1.5	–	0.68	0.70	0.71	0.73	0.75	0.77
	2.0	–	0.93	0.95	0.97	1.00	1.03	1.05
	3.0	–	1.33	1.36	1.39	1.43	1.47	1.51
	5.0	–	1.75	1.79	1.83	1.88	1.93	1.98
	7.5	–	1.93	1.97	2.01	2.07	2.12	2.18
	10.0	–	2.00	2.04	2.08	2.14	2.20	2.26
	15.0	–	2.19	2.24	2.28	2.35	2.41	2.48
	20.0	–	2.62	2.67	2.72	2.80	2.87	2.94
KVC 15	1.5	–	1.01	1.03	1.06	1.09	1.12	1.15
	2.0	–	1.20	1.23	1.25	1.29	1.32	1.35
	3.0	–	1.73	1.77	1.80	1.85	1.90	1.95
	5.0	–	2.64	2.69	2.75	2.83	2.90	2.98
	7.5	–	3.39	3.46	3.54	3.63	3.73	3.83
	10.0	–	3.90	3.98	4.06	4.17	4.28	4.39
	15.0	–	4.76	4.66	4.75	4.88	5.01	5.14
	20.0	–	5.05	5.16	5.27	5.42	5.57	5.72
KVC 22	1.5	–	1.09	1.12	1.14	1.17	1.21	1.24
	2.0	–	1.38	1.41	1.44	1.48	1.52	1.56
	3.0	–	1.89	1.93	1.97	2.02	2.07	2.12
	5.0	–	2.88	2.94	3.00	3.08	3.16	3.24
	7.5	–	4.02	4.11	4.19	4.31	4.43	4.54
	10.0	–	4.98	5.09	5.20	5.35	5.50	5.64
	15.0	–	6.35	6.49	6.63	6.82	7.01	7.20
	20.0	–	7.10	7.25	7.40	7.60	7.79	7.99

[1]) The capacities are based on: Condensing temperature t_l = 77 °F

Metric conversions:
1 psi = 0.07 bar
$\frac{5}{9}(t_1$ °F - 32) = t_2 °C
1 TR = 3.5 kW
1 in = 25.4 mm

Correction factors for condensing temperature t_l. When liquid temperature t_l is other than 77 °F, adjust the table capacities by multiplying them by the appropriate correction factor found in the following table.

Correction factors for condensing temperature t_l

t_l [°F]	50	59	68	77	86	95	104	113	122
R22	0.9	0.93	0.96	1.00	1.05	1.1	1.13	1.18	1.24

System capacity × correction factor = table capacity

Replacement capacity (continued)

Maximum regulator capacity Q_e [1])

R134a

Type	Offset Δp	Regulator capacity Q_e [1]) [TR] suction gas temperature t_s after pressure / temperature reduction [°F]						
	[psi]	-50	-40	-25	-10	10	30	50
KVC 12	1.5	–	–	0.41	0.43	0.46	0.48	0.50
	2.0	–	–	0.58	0.60	0.62	0.66	0.70
	3.0	–	–	0.83	0.86	0.91	0.95	1.00
	5.0	–	–	1.09	1.14	1.20	1.25	1.31
	7.5	–	–	1.20	1.25	1.31	1.37	1.44
	10.0	–	–	1.25	1.30	1.36	1.42	1.49
	15.0	–	–	1.36	1.42	1.49	1.56	1.63
	20.0	–	–	1.62	1.69	1.78	1.86	1.94
KVC 15	1.5	–	–	0.62	0.65	0.68	0.72	0.76
	2.0	–	–	0.74	0.78	0.82	0.86	0.90
	3.0	–	–	1.08	1.13	1.18	1.24	1.28
	5.0	–	–	1.64	1.72	1.79	1.87	1.96
	7.5	–	–	2.12	2.21	2.30	2.41	2.51
	10.0	–	–	2.45	2.54	2.65	2.77	2.88
	15.0	–	–	2.87	2.96	3.11	3.25	3.40
	20.0	–	–	3.13	3.26	3.44	3.61	3.79
KVC 22	1.5	–	–	0.67	0.70	0.73	0.78	0.82
	2.0	–	–	0.86	0.90	0.94	0.97	1.02
	3.0	–	–	1.18	1.22	1.28	1.33	1.39
	5.0	–	–	1.80	1.86	1.96	2.04	2.12
	7.5	–	–	2.52	2.62	2.74	2.87	2.99
	10.0	–	–	3.13	3.25	3.41	3.55	3.71
	15.0	–	–	4.00	4.15	4.34	4.54	4.74
	20.0	–	–	4.43	4.61	4.82	5.05	5.28

[1]) The capacities are based on: Condensing temperature t_l = 77 °F

Metric conversions:
1 psi = 0.07 bar
$\frac{5}{9}(t_1$ °F - 32) = t_2 °C
1 TR = 3.5 kW
1 in = 25.4 mm

Correction factors for condensing temperature t_l. When liquid temperature t_l is other than 77 °F, adjust the table capacities by multiplying them by the appropriate correction factor found in the following table.

Correction factors for condensing temperature t_l

t_l [°F]	50	59	68	77	86	95	104	113	122
R134a	0.88	0.92	0.96	1.00	1.05	1.1	1.16	1.23	1.31

System capacity × correction factor = table capacity

Replacement capacity (continued)

Maximum regulator capacity Q_e [1])

R404A/R507

Type	Offset Δp	Regulator capacity Q_e [1]) [TR] suction gas temperature t_s after pressure / temperature reduction [°F]						
	[psi]	-50	-40	-25	-10	10	30	50
KVC 12	1.5	0.57	0.58	0.62	0.64	0.67	0.70	0.74
	2.0	0.79	0.81	0.85	0.88	0.92	0.97	1.01
	3.0	1.16	1.19	1.23	1.28	1.34	1.40	1.46
	5.0	1.54	1.58	1.64	1.69	1.77	1.85	1.93
	7.5	1.68	1.73	1.79	1.86	1.96	2.05	2.13
	10.0	1.74	1.78	1.85	1.93	2.02	2.11	2.21
	15.0	1.89	1.94	2.01	2.10	2.20	2.31	2.41
	20.0	2.27	2.33	2.42	2.51	2.62	2.74	2.85
KVC 15	1.5	0.86	0.89	0.92	0.96	1.01	1.06	1.10
	2.0	1.05	1.07	1.11	1.16	1.21	1.27	1.32
	3.0	1.51	1.55	1.61	1.66	1.74	1.82	1.90
	5.0	2.29	2.34	2.44	2.53	2.65	2.77	2.89
	7.5	2.94	3.01	3.14	3.26	3.42	3.58	3.74
	10.0	3.38	3.47	3.61	3.75	3.93	4.11	4.30
	15.0	3.95	4.06	4.22	4.39	4.61	4.82	5.04
	20.0	4.36	4.48	4.66	4.85	5.09	5.34	5.58
KVC 22	1.5	0.92	0.96	0.99	1.02	1.08	1.12	1.18
	2.0	1.19	1.22	1.27	1.31	1.38	1.44	1.51
	3.0	1.71	1.75	1.83	1.89	1.98	2.08	2.17
	5.0	2.63	2.71	2.81	2.92	3.06	3.20	3.34
	7.5	3.58	3.67	3.82	3.96	4.17	4.35	4.54
	10.0	4.33	4.46	4.63	4.81	5.04	5.28	5.51
	15.0	5.49	5.64	5.86	6.08	6.39	6.69	6.99
	20.0	6.31	6.49	6.74	7.01	7.35	7.70	8.04

[1]) The capacities are based on: Condensing temperature t_l = 77 °F

Metric conversions:
1 psi = 0.07 bar
$\frac{5}{9}(t_1$ °F - 32) = t_2 °C
1 TR = 3.5 kW
1 in = 25.4 mm

Correction factors for condensing temperature t_l. When liquid temperature t_l is other than 77 °F, adjust the table capacities by multiplying them by the appropriate correction factor found in the following table.

Correction factors for condensing temperature t_l

t_l [°F]	50	59	68	77	86	95	104	113	122
R404A/R507	0.84	0.89	0.94	1.00	1.07	1.06	1.26	1.4	1.57

System capacity × correction factor = table capacity

Replacement capacity (continued)

Maximum regulator capacity Q_e [1])

R407C

Type	Offset Δp	Regulator capacity Q_e [1]) [TR] suction gas temperature t_s after pressure / temperature reduction [°F]						
	[psi]	-50	-40	-25	-10	10	30	50
KVC 12	1.5	–	0.73	0.76	0.77	0.79	0.81	0.83
	2.0	–	1.00	1.03	1.05	1.08	1.11	1.13
	3.0	–	1.44	1.47	1.50	1.54	1.59	1.63
	5.0	–	1.89	1.93	1.98	2.03	2.08	2.14
	7.5	–	2.08	2.13	2.17	2.24	2.29	2.35
	10.0	–	2.16	2.20	2.25	2.31	2.38	2.44
	15.0	–	2.37	2.42	2.46	2.54	2.60	2.68
	20.0	–	2.83	2.88	2.94	3.02	3.10	3.18
KVC 15	1.5	–	1.09	1.11	1.14	1.18	1.21	1.24
	2.0	–	1.30	1.33	1.35	1.39	1.43	1.46
	3.0	–	1.87	1.91	1.94	2.00	2.05	2.11
	5.0	–	2.85	2.91	2.97	3.06	3.13	3.22
	7.5	–	3.66	3.74	3.82	3.92	4.03	4.14
	10.0	–	4.21	4.30	4.38	4.50	4.62	4.74
	15.0	–	4.92	5.03	5.13	5.27	5.41	5.55
	20.0	–	5.45	5.57	5.69	5.85	6.02	6.18
KVC 22	1.5	–	1.18	1.21	1.23	1.26	1.31	1.34
	2.0	–	1.49	1.52	1.56	1.60	1.64	1.68
	3.0	–	2.04	2.08	2.13	2.18	2.24	2.29
	5.0	–	3.11	3.18	3.24	3.33	3.41	3.50
	7.5	–	4.34	4.44	4.53	4.65	4.78	4.90
	10.0	–	5.38	5.50	5.62	5.78	5.94	6.09
	15.0	–	6.86	7.01	7.16	7.37	7.57	7.78
	20.0	–	7.67	7.83	7.99	8.21	8.41	8.63

[1]) The capacities are based on: Condensing temperature t_l = 77 °F

Metric conversions:
1 psi = 0.07 bar
$\frac{5}{9}(t_1$ °F - 32) = t_2 °C
1 TR = 3.5 kW
1 in = 25.4 mm

Correction factors for condensing temperature t_l. When liquid temperature t_l is other than 77 °F, adjust the table capacities by multiplying them by the appropriate correction factor found in the following table.

Correction factors for condensing temperature t_l

t_l [°F]	50	59	68	77	86	95	104	113	122
R407C	0.88	0.91	0.95	1.00	1.05	1.11	1.18	1.26	1.35

System capacity × correction factor = table capacity

Sizing

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

- Refrigerant: HCFC, HFC and HC
- Suction temperature at maximum compressor / evaporator load ts in [°F] / [psig]
- Minimum suction temperature ts in [°F] / [psig]
- Compressor capacity in [TR]
- Evaporating load in [TR]
- Condensing temperature t_l in [°F]
- Connection type: flare or solder
- Connection size [in]

Metric conversions:
1 psi = 0.07 bar
⅝ (t_1 °F - 32) = t_2 °C
1 TR = 3.5 kW
1 in = 25.4 mm

Valve selection Example

Note:
When selecting the appropriate valve, it may be necessary to convert the actual capacity using a correction factor for condensing temperature.
This is due to differences between the table rated conditions and the design conditions.
The following example illustrates how this is done.

Conditions:

- Refrigerant type: R134a
- Suction temperature at maximum compressor / evaporator load t_s: 0 °F ~ 7 psi.
- Minimum suction temperature t_s: 10 °F ~ 12 psi.
- Compressor capacity at 10 °F: 4.4 TR
- Evaporating load at 10 °F: 2.85 TR
- Condensing temperature t_l: 95 °F
- Connection type: solder
- Connection size: ⅝ in

Step 1:
Determine the correction factor for the condensing temperature t_l.

From the correction factors table (see below) a condensing temperature of 95 °F, R134a corresponds to a factor of 1.1.

Correction factors for condensing temperature t_l

t_l [°F]	50	59	68	77	86	95	104	113	122
R 134a	0.88	0.92	0.96	1.00	1.05	1.1	1.16	1.23	1.31
R22	0.9	0.93	0.96	1.00	1.05	1.1	1.13	1.18	1.24
R404A/R507	0.84	0.89	0.94	1.00	1.07	1.16	1.26	1.4	1.57
R407C	0.88	0.91	0.95	1.00	1.05	1.11	1.18	1.26	1.35

Step 2:
The required replacement capacity is defined as the (compressor capacity – the evaporator load) divided by the correction factor is equal:
(4.4-2.85) / 1.1 = 1,41 TR

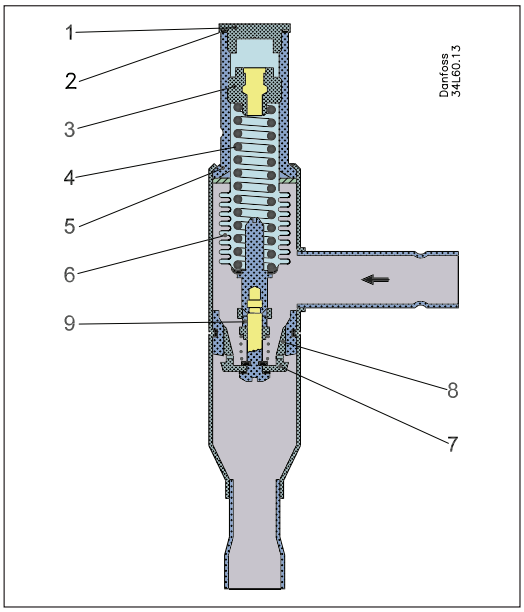
Step 3:
Now select the appropriate capacity table and choose the column for minimum suction temperature t_s = 10 °F.
Using the corrected replacement capacity, select a valve that provides an equivalent or greater capacity than required.
From the correction factors table (see below) a condensing temperature of
95 °F, R134a corresponds to a factor of 1.1.

KVC 15 delivers 1.79 TR at an offset of 5 psi.
Based on the required connection size of ⅝ in ODF, the KVC 15 is the proper selection for this example.

Step 4:
KVC 15, ⅝ in ODF
Code no **034L0147**.

Design / Function

KVC



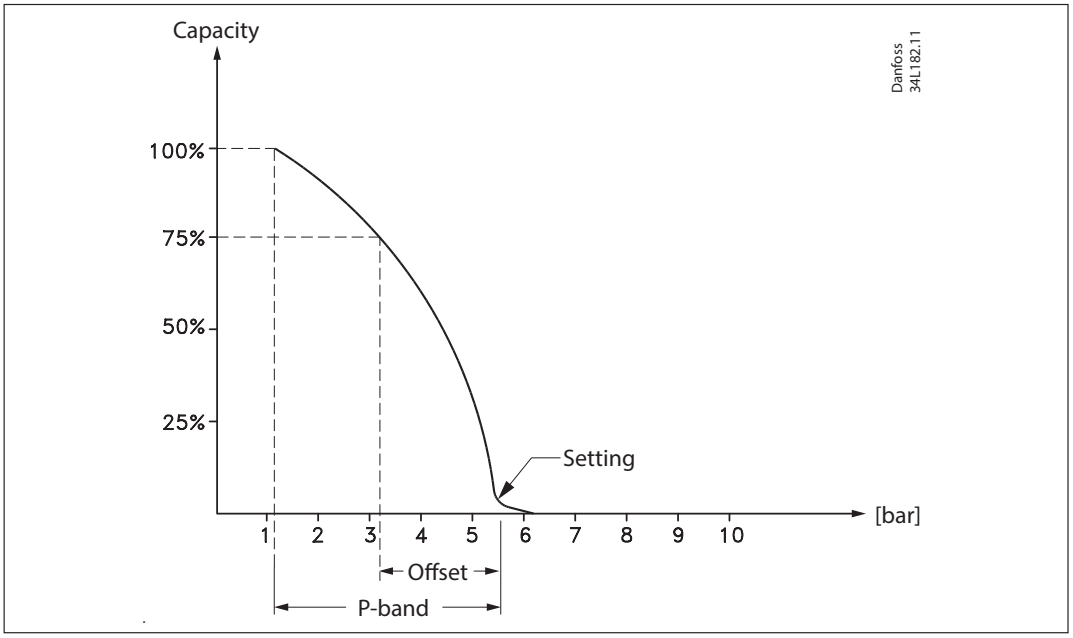
1. Protective cap
2. Gasket
3. Setting screw
4. Main spring
5. Valve body
6. Equalization bellows
7. Valve plate
8. Valve seat
9. Damping device

Hot gas bypass regulator type KVC opens on a fall in pressure on the outlet side, i.e. when the pressure in the evaporator reaches the set value.

Type KVC regulates on outlet pressure (suction pressure) only. Pressure variations on the inlet side of the regulator do not affect the degree of opening as the valve is equipped with equalization bellows (6). The bellows has 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



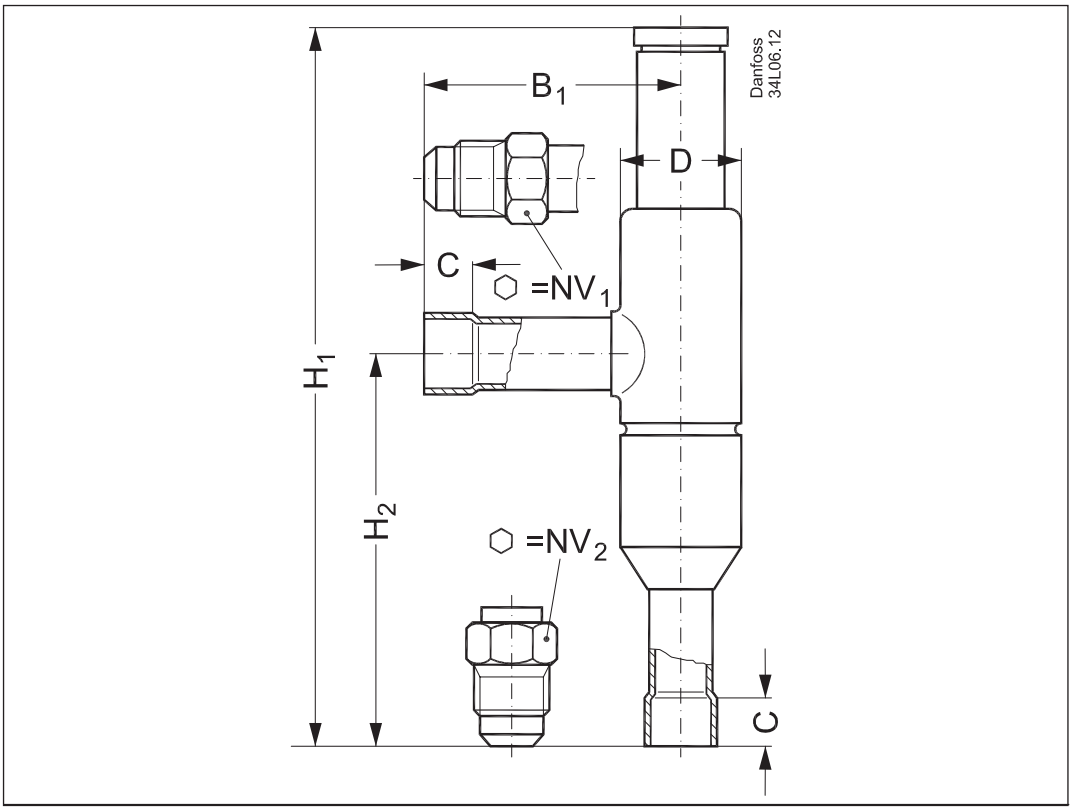
Proportional band:
The proportional band or P-band is defined as the amount of pressure required to move the valve plate from closed to full open position.
If the setting is 80 psig and the p-band is 29 psi, the pressure at which the valve gives maximum capacity will be 51 psig.

Offset:
The offset is defined as the permissible pressure variation in suction line 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 R 404A:
A suction temperature ahead of the compressor of 25 °F ~ 61 psig is required, and the temperature must not drop below 14 °F ~ 48 psig.
The offset will then be 13 psi.

Dimensions and weights

KVC



Type	Connection		NV_1	NV_2	H_1	H_2	B_1	C solder	øD	Net weight
	Flare	Solder ODF								
	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lbs]
KVC 12	½	½	¾	15/16	7.047	3.898	2.520	0.394	1.181	0.88
KVC 15	⅝	⅝	15/16	15/16	7.047	3.898	2.520	0.472	1.181	0.88
KVC 22	–	7/8	–	–	7.047	3.898	2.520	0.669	1.181	0.88

Metric conversions
1 in = 25.4 mm
1 lb = 0.454 kg