ENGINEERING TOMORROW

Data sheet

Condensing pressure regulator, type KVR
Differential pressure valve, type NRD

The condensing pressure regulator, type KVR can be mounted in either the gas or liquid side of the condenser in refrigeration and air conditioning systems.
They are used to maintain a constant and sufficiently high condensing pressure with systems using air-cooled condensers.

They can also be used with valve types NRD or KVD to assure that adequate pressure is maintained on the receiver.

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
- ¼ in. Schrader valve for pressure gauge connection
- Available with flare or ODF solder connections
- Can be used as a relief valve from high pressure to suction side
- KVR 12 - KVR 22 and NRD: May be used in the following EX range: Category 3 (Zone 2)

Approvals

UL LISTED, file SA7200
EAC

Technical data

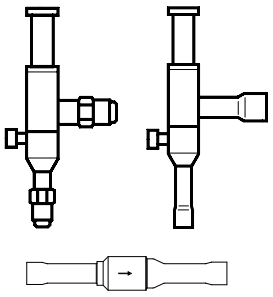
Refrigerants	R22, R32**, R134a, R290*, R404A, R407A, R407C, R407F, R407H, R410A**, R448A, R449A, R449B, R450A, R452A, R452B**, R454A*, R454B**, R454C*, R455A*, R507, R513A, R515B, R516A, R600*, R600a*, R1233zd(E)**, R1234ze(E)*, R1234yf*, R1270* KVR 12 – KVR 22 only; see more details in the note below the table **NRD only
	HCFC and non-flammable HFC: KVR 28 – KVR 35
Regulation range	Pe = 73.00 – 254.00 psig
	Factory setting = 145 psig
Maximum working pressure	KVR: PS/MWP = 406 psig
	NRD: PS/MWP = 667 psig
Maximum test pressure	KVR: Pe = 450 psig
	NRD: Pe = 870 psig
Medium temperature range	KVR: -49 – 266 °F
P band (full valve stroke)	KVR 12 – KVR 22: 90 psi
	KVR 28 – KVR 35: 72.5 psi
Opening differential pressure for NRD	Start opening: Δp= 20 psi
	Fully open: Δp = 43 psi

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

This product (KVR 12 - KVR 22) is evaluated 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. NRD is evaluated for R32, R290, R452B, R454A, R454B, R454C R455A, R600, R600a, R1233zd(E), R1234ze(E), R1234yf, R1270 by ignition source assessment in accordance with standard EN ISO80079-36.

For complete list of approved refrigerants, visit http://store.danfoss.com/ and search for individual code numbers, where refrigerants are listed as part of technical data.

Ordering



KVR 12, KVR 15, KVR 22, KVR 28, KVR 35, NRD

Type	Rated liquid capacity [1] (Evaporator capacity) [TR]				Rated hot gas [1] (Evaporator capacity) [TR]				Flare connection [2] [in.]	Code no.	Solder connection [in.]	Code no.
	R22	R134a	R404A/ R507	R407C	R22	R134a	R404A/ R507	R407C				
KVR 12	12.7	11.8	8.2	13.8	4.13	3.03	3.27	4.50	$^1/_2$	**034L0091**	$^1/_2$	**034L0093**
KVR 15	12.7	11.8	8.2	13.8	4.13	3.03	3.27	4.50	$^5/_8$	**034L0092**	$^5/_8$	**034L0097**
KVR 22	12.7	11.8	8.2	13.8	4.13	3.03	3.27	4.50	–	–	$^7/_8$	**034L0094**
KVR 28	32.6	30.2	20.9	35.5	10.93	8.04	8.66	11.91	–	–	1 $^1/_8$	**034L0095**
KVR 35	32.6	30.2	20.9	35.5	10.93	8.04	8.66	11.91	–	–	1 $^3/_8$	**034L0100**
NRD	–	–	–	–	–	–	–	–	–	–	$^1/_2$	**020-1132**

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.

[1]) Rated capacity is based on:
- evaporating temperature t_e = 40 °F
- condensing temperature t_c = 110 °F
- pressure drop across the valve
  Δp = 3 psi for liquid capacity
  Δp = 6 psi for hot gas capacity

[2]) KVR are delivered without flare nuts. Separate flare nuts can be delivered:
- $^1/_2$ in. code no. **011L1103**
- $^5/_8$ in. code no. **011L1167**

Liquid capacity

Max. regulator capacity Q_e [1])

Type	Condensing temperature t_c	Liquid capacity [TR] (Evaporator capacity) Offset 45 psi Pressure drop Δp [psi]					Hot gas capacity [TR] (Evaporator capacity) Offset 45 psi Pressure drop Δp [psi]				
	[°F]	1.5	3	6	10	25	1.5	3	6	10	25
						R22					**R22**
KVR 12 KVR 15 KVR 22	50	13.1	17.6	25.2	32.9	52.6	1.81	2.47	3.52	4.51	6.86
	70	11.9	16.0	23.0	30.0	48.0	1.92	2.62	3.75	4.83	7.44
	90	10.6	14.4	20.8	27.0	43.2	2.04	2.76	3.96	5.12	7.94
	110	9.2	12.7	18.4	23.9	38.2	2.13	2.89	4.13	5.36	8.34
	130	7.8	11.0	16.0	20.7	33.1	2.20	2.98	4.27	5.54	8.64
KVR 28 KVR 35	50	33.5	45.0	64.4	84.2	134.6	4.77	6.50	9.31	11.95	18.15
	70	30.4	41.1	58.9	76.8	122.8	5.11	6.93	9.92	12.79	19.66
	90	27.1	37.0	53.2	69.2	110.6	5.42	7.34	10.48	13.54	20.98
	110	23.6	32.6	47.2	61.3	97.8	5.67	7.65	10.93	14.16	22.06
	130	20.0	28.0	40.9	53.0	84.6	5.79	7.83	11.23	14.60	22.85
						R134a					**R134a**
KVR 12 KVR 15 KVR 22	50	12.0	16.9	24.0	31.0	49.1	1.40	1.97	2.75	3.50	5.15
	70	11.9	16.0	23.0	30.0	48.0	1.92	2.62	3.75	4.83	7.44
	90	9.6	13.6	19.2	24.8	39.3	1.50	2.12	2.97	3.80	5.75
	110	8.4	11.8	16.7	21.6	34.2	1.53	2.15	3.03	3.87	5.92
	130	7.1	10.0	14.2	18.3	29.0	1.52	2.14	3.01	3.86	5.95
KVR 28 KVR 35	50	30.7	43.4	61.3	79.2	126.0	3.72	5.24	7.31	9.26	13.60
	70	27.6	39.1	55.3	71.4	113.0	3.87	5.44	7.63	9.71	14.49
	90	24.5	34.7	49.1	63.4	100.0	3.99	5.62	7.89	10.07	15.22
	110	21.4	30.2	42.8	55.3	87.5	4.06	5.71	8.04	10.28	15.69
	130	18.1	25.6	36.3	46.9	74.2	4.03	5.68	8.00	10.25	15.77

[1]) The capacities are based on:
- Evaporating temperature t_e= 40 °F.
- For other evaporating temperatures see table below

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

Correction factors for evaporating temperature t_e

t_e [°F]	-40	-30	-20	-10	0	10
R22	1.12	1.09	1.05	1.03	1.0	0.98
R134a	1.22	1.16	1.10	1.04	1.0	0.96

System capacity x correction factor = table capacity.

Liquid capacity

Max. regulator capacity Q_e [1])

Type	Condensing temperature t_c	Liquid capacity [TR] (Evaporator capacity) Offset 45 psi Pressure drop Δp [psi]					Hot gas capacity [TR] (Evaporator capacity) Offset 45 psi Pressure drop Δp [psi]				
	[°F]	1.5	3	6	10	25	1.5	3	6	10	25
						R404A/R507					**R404A/R507**
KVR 12 KVR 15 KVR 22	50	9.2	12.4	17.6	23.0	37.0	1.63	2.09	2.99	3.84	5.87
	70	8.1	10.9	15.7	20.4	32.7	1.60	2.17	3.10	4.00	6.17
	90	7.0	9.6	13.8	17.9	28.7	1.65	2.25	3.21	4.15	6.45
	110	5.9	8.2	11.8	15.4	24.5	1.68	2.28	3.27	4.24	6.60
	130	4.8	6.8	10.0	13.0	20.6	1.69	2.31	3.34	4.34	6.78
KVR 28 KVR 35	50	23.6	31.7	45.2	59.0	94.5	4.06	5.52	7.89	10.15	15.48
	70	20.8	27.9	40.1	52.2	83.6	4.24	5.74	8.20	10.58	16.32
	90	17.9	24.5	35.2	45.9	73.4	4.41	5.96	8.50	10.99	17.06
	110	15.1	20.9	30.3	39.3	62.7	4.88	6.06	8.66	11.22	17.49
	130	12.3	17.4	25.7	33.1	52.7	4.49	6.12	8.82	11.45	17.92
						R407C					**R407C**
KVR 12 KVR 15 KVR 22	50	4.2	19.0	27.2	35.5	56.8	1.96	2.67	3.80	4.87	7.41
	70	12.9	17.3	24.8	32.4	51.8	2.07	2.83	4.05	5.22	8.04
	90	11.5	15.6	22.5	29.2	46.7	2.20	2.98	4.28	5.53	8.58
	110	10.0	13.8	20.1	26.1	41.6	2.32	3.15	4.50	5.84	9.09
	130	8.6	12.1	17.6	22.8	36.4	2.42	3.28	4.70	6.09	9.50
KVR 28 KVR 35	50	36.2	48.6	69.6	90.9	145.4	5.15	7.02	10.06	12.91	19.60
	70	32.8	44.4	63.6	82.9	132.6	5.52	7.48	10.71	13.81	21.23
	90	29.3	40.0	57.5	74.7	119.5	5.85	7.93	11.32	16.62	22.66
	110	25.7	35.5	51.5	66.8	106.6	6.18	8.34	11.91	15.43	24.05
	130	22.0	30.8	45.0	58.3	93.1	6.37	8.61	12.35	16.06	25.14

[1]) The capacities are based on:
Evaporating temperature t_e = 40 °F.
For other evaporating temperatures see table below.

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

Correction factors (evaporating temperature)

t_e [°F]	-40	-20	0	20	40	50
R404A / R507	1.32	1.22	1.14	1.06	1.0	0.95
R407C	1.20	1.15	1.09	1.04	1.0	0.96

System capacity x correction factor = table capacity.

Sizing

For optimum performance, it is important to select a KVR valve according to system conditions and application.

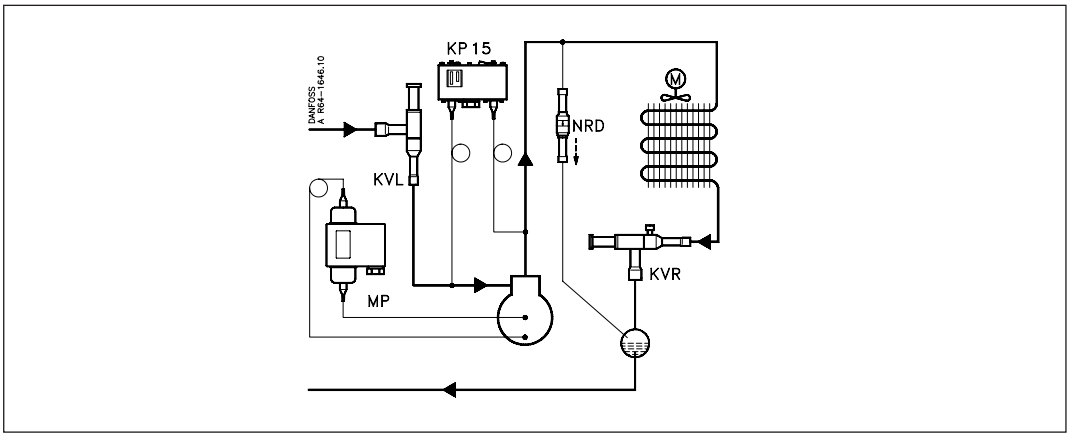
- The following data must be used when sizing
- a KVR valve:
- Refrigerant: HCFC, HFC and HC: KVR 12 – KVR 22, HCFC and non-flammable HFC: KVR 28 – KVR 35
- Evaporator capacity Q_e in [TR]
- Evaporating temperature t_e in [°F]
- Condensing temperature t_c in [°F]
- Connection type: flare or solder
- Connection size in [in.]

Valve selection

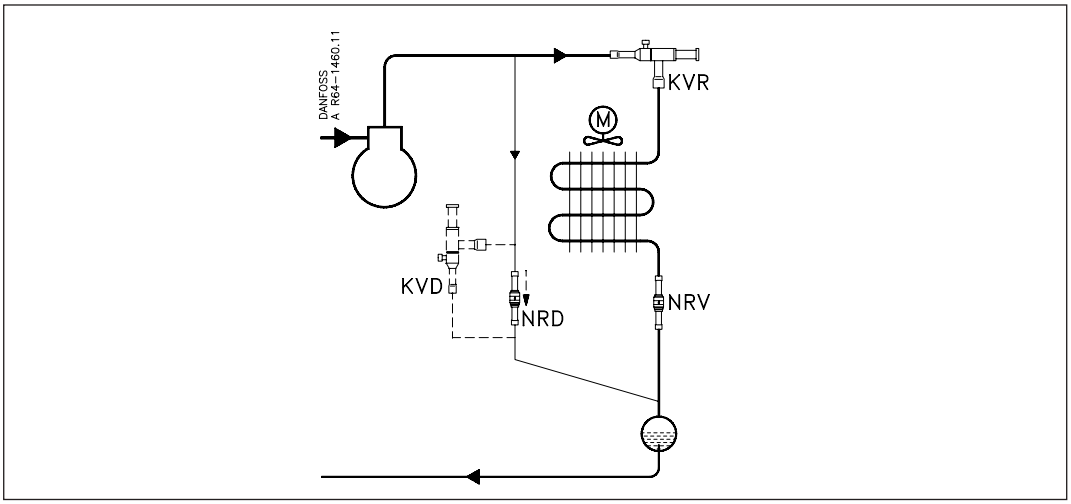
Example
When selecting the appropriate valve it may be necessary to convert the actual evaporator capacity using a correction factors. This is required when your system conditions are different than the table conditions.
The selection is also dependant on the acceptable pressure drop across the valve.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

KVR in a liquid capacity application
- Refrigerant: R22 example
- Evaporator capacity: Q_e= 28.7 TR
- Evaporating temperature: t_e= -40 °F ~ 21 psig
- Condensing temperature: t_c= 90 °F ~ 170 psig
- Connection type: Solder
- Connection size: 5/8 in.

Application example
Liquid capacity application



Application example
Hot gas capacity application



Valve selection (continued)

Step 1
Determine the correction factor for evaporating temperature t_e.

From the correction factors table an evaporating temperature of -40 °F, R22 corresponds to a factor of 1.12.

Correction factors

t_e [°F]	-40	-30	-20	-10	0	10
R22	1.12	1.09	1.05	1.03	1.0	0.98
R134a	1.22	1.16	1.10	1.04	1.0	0.96
R404A, R507	1.32	1.22	1.14	1.06	1.0	0.95
R407C	1.20	1.15	1.09	1.04	1.0	0.96

Plant capacity x correction factor = table capacity

Step 2
Corrected evaporator capacity is
Q_e = 28.7 x 1.12 = 32.14 TR

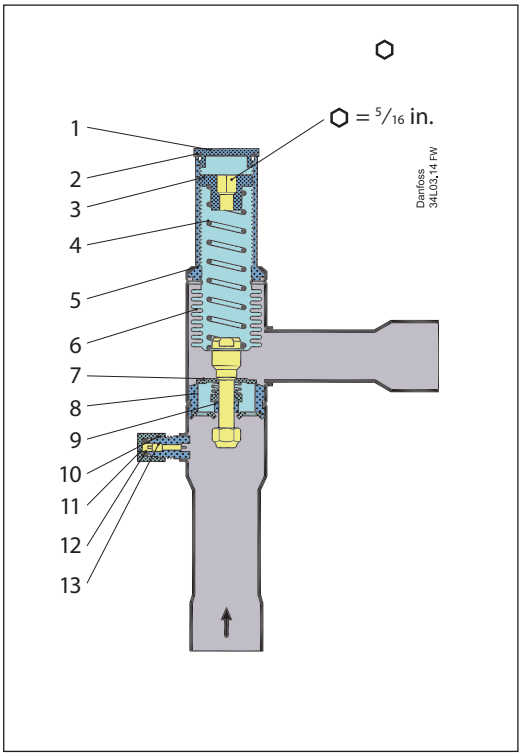
Step 3
Now select the appropriate capacity table and choose the line for a condensing temperature t_c= 90 °F.
Using the corrected evaporator capacity, select a valve that provides an equivalent or greater capacity at an acceptable pressure drop.

KVR 12, KVR 15, KVR 22 delivers 38.2 TR at a 25 psi pressure drop across the valve. Based on the required connection size of $^5/_8$ in. ODF, the KVR 15 is the proper selection for this example.

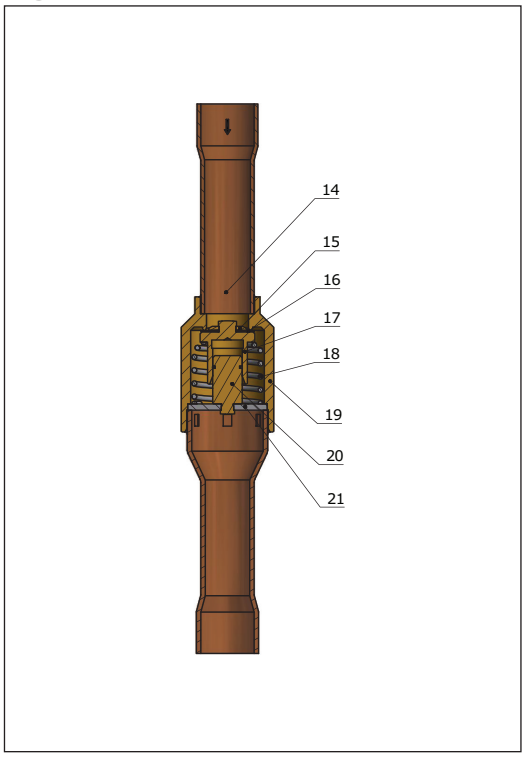
Step 4
KVR 15, $^5/_8$ in. solder connection:
code no. **034L0097**

Design / Function

KVR



NRD



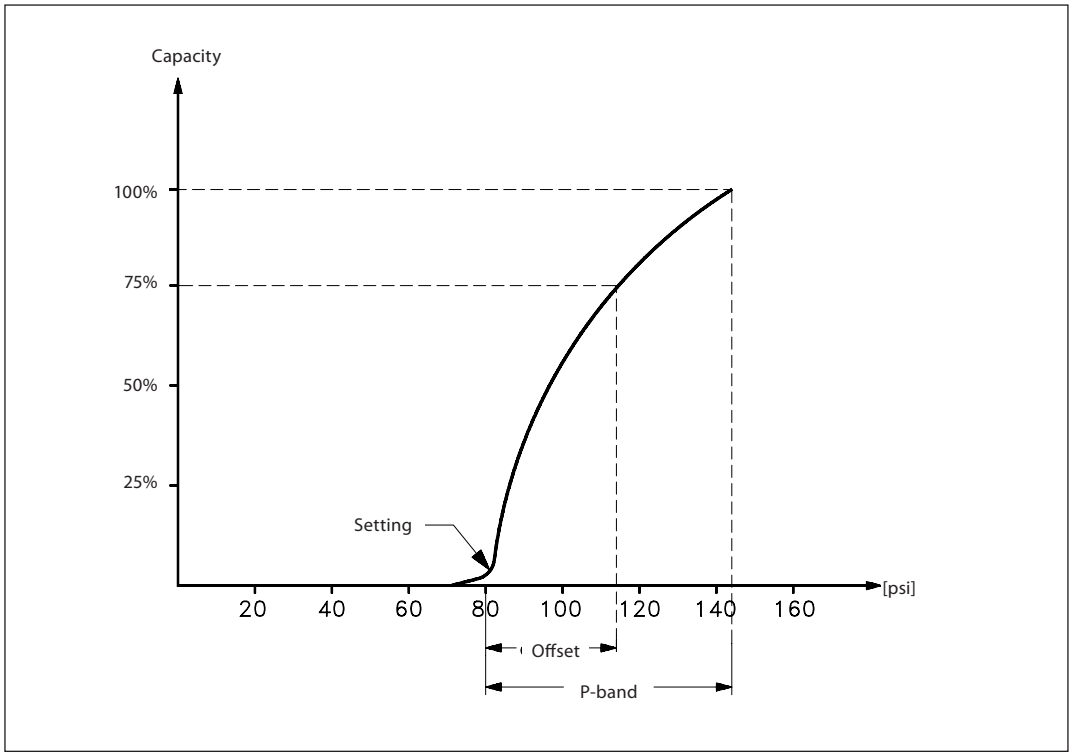
1. Seal cap
2. Gasket
3. Setting screw
4. Main spring
5. Valve body
6. Equalizing bellows
7. Valve plate
8. Valve seat
9. Damping device
10. Pressure gauge connection
11. Cap
12. Gasket
13. Insert
14. Piston
15. Valve plate
16. Piston guide
17. Valve body
18. Spring

The condensing pressure regulator, type KVR opens upon a rise in pressure on the inlet side, i.e. when the pressure in the condenser reaches the set value. KVR regulates on the 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 has an effective area corresponding to that of the valve seat neutralizing any changes to the setting.

The valve 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.
Differential valve type NRD begins to open when the pressure drop in the valve is 20 psig.

P-band and Offset

Principle diagram



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

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

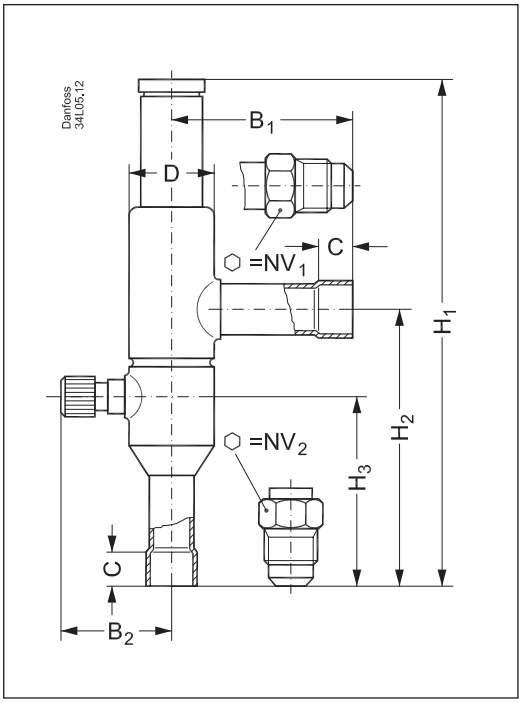
Example
If the valve is set to open at 120 psig and the valve P-band is 90 psi, the valve will give maximum capacity when the inlet pressure reaches 210 psig.

Offset
The offset is defined as the permissible pressure variation in condenser 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.

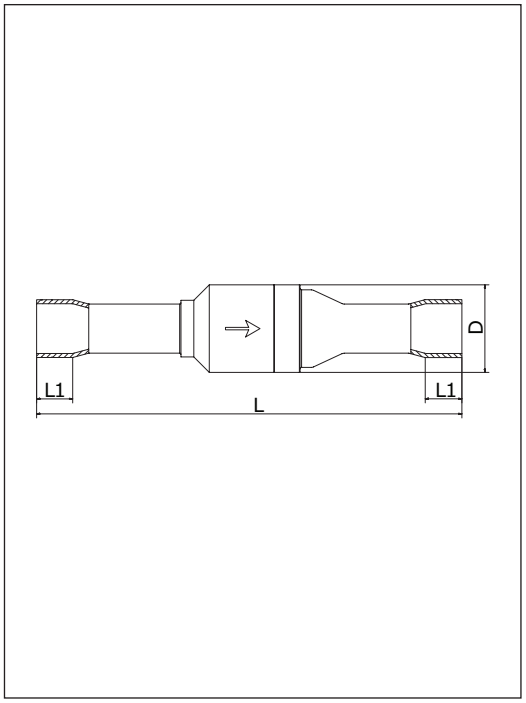
Example with R22
A working temperature of 110 °F ~ 230 psig is required, and the temperature must not drop below 100 °C ~ 200 psig (set point).
The offset will then be 30 psi.

Dimensions and weights

KVR



NRD



Type	Connection		NV_1	NV_2	H_1	H_2	H_3	L	L_1	B_1	B_2	C Solder	øD	Net weight [kg]
	Flare	Solder ODF												
KVR 12	1/2	1/2	0.748	0.748	7.045	3.898	2.598	–	–	2.520	1.614	0.394	1.181	0.88
KVR 15	5/8	5/8	0.945	0.945	7.045	3.898	2.598	–	–	2.520	1.614	0.472	1.181	0.88
KVR 22	–	7/8	–	–	7.045	3.898	2.598	–	–	2.520	1.614	0.669	1.181	0.88
KVR 28	–	1 1/8	–	–	10.197	5.945	4.055	–	–	4.134	1.890	0.787	1.693	2.20
KVR 35	–	1 3/8	–	–	10.197	5.945	4.055	–	–	4.134	1.890	0.984	1.693	2.20
NRD	–	1/2	–	–	–	–	–	5.157	0.394	–	–	–	0.866	0.1

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