

Data sheet

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



Regulating system KVR and NRD is used to maintain a constant and sufficiently high condenser and receiver pressure in refrigeration and air conditioning plant with air-cooled condensers.

KVR can also be used together with receiver pressure regulator, type KVD.

## 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 gauge connection
- Available with flare and ODF solder connections
- 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**, R1270*, 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** *KVR 12 - KVR 22 and NRD only **NRD only
Adjustment range	5 – 17.5 bar Factory setting = 10 bar
Maximum working pressure	KVR: PS/MWP = 28 bar NRD: PS/MWP = 49 bar
Maximum test pressure	KVR: Pe = 31 bar NRD: Pe = 81 bar
Medium temperature range	KVR: -45 – 130 °C, NRD: -50 – 155 °C
P-band	KVR 12 – 22 = 6.2 bar KVR 28 – 35 = 5 bar
Minimum opening pressure differential for NRD	Start opening: $\Delta p = 1.4$ bar

KVR 12 - KVR 22 is evaluated for R290, R454A, R454C, R455A, R600, R600a, R1234ze(E), R1270 by ignition source assessment in accordance with standard EN13463-1.

NRD is evaluated for R32, R1270, R290, R452B, R454A, R454B, R454C, R455A, R600, R600a, R1233zd(E), R1234ze(E), R1234yf by ignition source assessment in accordance with standard EN13463-1.

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**

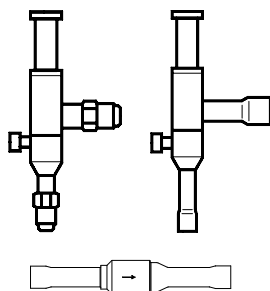
Type	Rated liquid capacity <sup>1)</sup> (Evaporator capacity) [kW]				Rated hot gas <sup>1)</sup> (Evaporator capacity) [kW]				Flare connect. <sup>2)</sup>		Code no.	Solder Connect.		Code no.
	R22	R134a	R404A/ R507	R407C	R22	R134a	R404A/ R507	R407C	[in]	[mm]		[in]	[mm]	
KVR 12	50.4	47.3	36.6	54.4	13.2	11.6	12.0	14.3	1/2	12	034L0091	1/2	–	034L0093
	50.4	47.3	36.6	54.4	13.2	11.6	12.0	14.3	–	–	–	–	12	034L0096
KVR 15	50.4	47.3	36.6	54.4	13.2	11.6	12.0	14.3	5/8	16	034L0092	5/8	16	034L0097
KVR 22	50.4	47.3	36.6	54.4	13.2	11.6	12.0	14.3	–	–	–	7/8	22	034L0094
KVR 28	129	121	93.7	139.3	34.9	30.6	34.9	37.7	–	–	–	1 1/8	–	034L0095
	129	121	93.7	139.3	34.9	30.6	34.9	37.7	–	–	–	–	28	034L0099
KVR 35	129	121	93.7	139.3	34.9	30.6	34.9	37.7	–	–	–	1 3/8	35	034L0100
NRD	–	–	–	–	–	–	–	–	–	–	–	1/2	–	020B1132
	–	–	–	–	–	–	–	–	–	–	–	–	12	020B1136

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.

- <sup>1)</sup> Rated capacity is based on:
- evaporating temperature  $t_e = -10$  °C
  - condensing temperature  $t_c = 30$  °C
  - pressure drop across the valve  
 $\Delta p = 0.2$  bar for liquid capacity  
 $\Delta p = 0.4$  bar for hot gas capacity
  - offset = 3 bar

To select the product for other conditions or refrigerants, use Danfoss Coolselector\*2.

- <sup>2)</sup> KVR are delivered without flare nuts. Separate flare nuts can be delivered:
- 1/2 in / 12 mm, code no. 011L1103
  - 5/8 in / 16 mm, code no. 011L1167


**REACH requirements**

All Danfoss products fulfill the requirements in REACH. One of the obligations in REACH is to inform customers about presence of Candidate list substances if any, we hereby inform you about one substance on the candidate list:

an O-ring used in this product contains Diisopentylphthalat (CAS no: 605-50-5) in a concentration above 0.1% w/w.

Liquid capacity

Max. regulator capacity  $Q_e$  <sup>1)</sup>

Type	Condensing temperature $t_c$	Liquid capacity in [kW] (Evaporator capacity)				
		Offset 1.5 bar				
	[°C]	0.1	0.2	0.4	0.8	1.6
<b>R22</b>						
KVR 12 KVR 15 KVR 22	10	23.7	33.5	47.4	67.0	94.8
	20	21.8	30.8	43.6	61.7	87.3
	30	19.8	28.1	39.7	56.2	79.4
	40	17.8	25.2	35.6	50.4	71.3
	50	15.7	22.2	31.4	44.4	62.9
KVR 28 KVR 35	10	60.5	85.6	121.1	171.2	242.3
	20	55.7	78.8	111.4	157.6	223.0
	30	50.7	71.7	101.4	143.4	202.9
	40	45.9	64.3	91.0	128.7	182.1
	50	40.1	58.8	80.3	113.6	160.7
<b>R134a</b>						
KVR 12 KVR 15 KVR 22	10	22.8	32.3	45.6	64.6	91.3
	20	20.8	29.4	41.6	58.8	83.2
	30	18.7	26.5	37.4	53.0	74.9
	40	16.6	23.5	33.2	47.0	66.5
	50	14.5	20.5	29.0	41.0	58.0
KVR 28 KVR 35	10	58.3	82.4	117.0	165.0	233.0
	20	53.1	75.1	106.0	150.0	213.0
	30	47.8	67.6	95.7	135.0	191.0
	40	42.5	60.0	84.9	120.0	170.0
	50	37.0	52.3	74.0	105.0	148.0

Liquid capacity in [kW] (Evaporator capacity)					
Offset 3 bar					
Pressure drop across valve $\Delta p$ [bar]					
0.1	0.2	0.4	0.8	1.6	
<b>R22</b>					
42.5	60.2	85.1	120.4	170.5	
39.2	55.4	78.4	110.9	157.0	
35.6	50.4	71.3	100.9	142.9	
32.0	45.3	64.0	90.6	128.3	
28.2	39.9	56.4	79.9	113.1	
108.9	154.0	217.8	308.2	436.2	
100.2	141.8	200.6	283.8	401.7	
91.2	129.0	182.5	258.2	365.5	
81.9	115.8	163.9	231.8	328.2	
72.2	102.1	144.4	204.4	289.3	
<b>R134a</b>					
40.7	57.5	81.4	115.0	163.0	
37.1	52.5	74.2	105.0	149.0	
33.4	47.3	66.9	94.7	134.0	
29.7	42.0	59.4	84.1	119.0	
25.9	36.6	51.8	73.3	104.0	
104.0	147.0	208.0	295.0	418.0	
94.9	134.0	190.0	269.0	361.0	
85.5	121.0	171.0	242.0	343.0	
76.0	108.0	152.0	215.0	305.0	
66.3	93.7	133.0	188.0	266.0	

<sup>1)</sup> The capacities are based on:  
 - Evaporating temperature  $t_e = -10$  °C  
 - For other evaporating temperatures see table below

Correction factors for evaporating temperature  $t_e$

$t_e$	-40	-30	-20	-10	0	10
[°C]						
<b>R22</b>	1.09	1.05	1.02	1.0	0.98	0.96
<b>R134a</b>	1.14	1.09	1.04	1.0	0.96	0.93

Plant capacity x correction factor = table capacity

Liquid capacity (continued)

Max. regulator capacity  $Q_e$  <sup>1)</sup>

Type	Condensing temperature $t_c$	Liquid capacity in [kW] (Evaporator capacity)				
		Offset 1.5 bar				
	[°C]	0.1	0.2	0.4	0.8	1.6
<b>R404A / R507</b>						
KVR 12 KVR 15 KVR 22	10	18.4	25.9	36.8	52.0	73.5
	20	16.4	23.2	32.9	46.5	65.7
	30	14.5	20.5	29.0	41.0	58.0
	40	12.9	17.6	25.0	35.4	50.1
	50	10.5	14.9	21.0	29.7	42.1
KVR 28 KVR 35	10	46.9	66.3	93.8	132.3	188.0
	20	42.0	59.3	83.9	118.7	168.0
	30	37.0	52.3	73.9	104.6	148.1
	40	31.9	45.2	63.8	90.3	128.1
	50	26.9	37.9	53.7	75.9	107.0
<b>R407C</b>						
KVR 12 KVR 15 KVR 22	10	25.6	36.2	51.2	72.6	102.3
	20	23.5	33.2	47.1	66.6	94.3
	30	21.4	30.3	42.9	60.7	85.7
	40	19.4	27.5	38.8	55.0	77.7
	50	17.3	24.4	34.5	48.8	69.2
KVR 28 KVR 35	10	65.3	92.4	130.7	184.9	261.7
	20	60.1	85.1	120.3	170.2	240.8
	30	54.5	77.4	109.5	154.9	219.1
	40	50.0	70.1	99.2	140.3	198.5
	50	44.1	62.5	88.3	124.9	176.8

Liquid capacity in [kW] (Evaporator capacity)					
Offset 3 bar					
Pressure drop across valve $\Delta p$ [bar]					
0.1	0.2	0.4	0.8	1.6	
<b>R404A / R507</b>					
32.9	46.4	65.6	92.9	131.3	
29.4	41.6	58.8	83.2	117.6	
25.9	36.6	51.8	73.3	103.7	
22.4	31.6	44.7	63.3	89.7	
18.8	26.6	37.6	53.2	75.4	
84.0	118.7	168.0	237.3	337.1	
75.2	106.1	150.2	213.2	301.4	
66.3	93.7	132.3	188.0	265.7	
57.2	81.0	114.5	161.7	228.9	
48.1	68.0	96.2	136.5	193.2	
<b>R407C</b>					
45.9	65.0	91.9	130.0	184.1	
42.3	59.8	84.7	119.8	169.6	
38.4	54.4	77.0	109.0	154.3	
34.9	49.4	69.8	98.8	139.8	
31.0	43.9	62.0	87.9	124.4	
117.6	166.3	235.2	332.9	471.1	
108.2	153.1	216.6	306.5	433.8	
98.5	139.3	197.1	278.9	394.7	
89.3	126.2	178.7	252.7	357.7	
79.4	112.3	158.8	224.8	318.2	

<sup>1)</sup> The capacities are based on:  
 - Evaporating temperature  $t_e = -10$  °C  
 - For other evaporating temperatures see table below

Correction factors for evaporating temperature  $t_e$

$t_e$	-40	-30	-20	-10	0	10
[°C]						
R404A / R507	1.18	1.11	1.05	1.0	0.95	0.92
R407C	1.12	1.08	1.04	1.0	0.97	0.93

Plant capacity x correction factor = table capacity

Hot gas capacity

Max. regulator capacity  $Q_e$  1)

Type	Condensing temperature $t_c$	Hot gas capacity in [kW] (Evaporator capacity)				
		Offset 1.5 bar				
	[°C]	0.1	0.2	0.4	0.8	1.6
<b>R22</b>						
KVR 12 KVR 15 KVR 22	10	3.3	4.6	6.4	8.8	11.8
	20	3.5	5.0	6.9	9.6	13.0
	30	3.7	5.3	7.4	10.3	14.4
	40	3.9	5.5	7.8	10.9	15.0
KVR 28 KVR 35	10	8.5	11.9	16.6	22.8	30.3
	20	9.1	12.8	17.9	24.8	33.5
	30	9.7	13.6	19.1	26.6	36.3
	40	10.2	14.3	20.1	28.1	38.7
KVR 12 KVR 15 KVR 22	10	2.9	4.0	5.6	7.6	9.7
	20	3.1	4.3	6.0	8.2	10.8
	30	3.2	4.5	6.3	8.8	11.7
	40	3.4	4.7	6.6	9.2	12.5
KVR 28 KVR 35	10	7.5	10.5	14.5	19.6	25.0
	20	7.9	11.1	15.5	21.2	27.8
	30	8.4	11.8	16.4	22.6	30.2
	40	8.7	12.2	17.1	23.7	32.1
KVR 12 KVR 15 KVR 22	10	3.4	4.8	6.8	9.5	13.0
	20	3.4	4.8	6.8	9.5	13.0
	30	3.4	4.8	6.8	9.5	13.0
	40	3.4	4.8	6.8	9.5	13.0
KVR 28 KVR 35	10	8.9	12.5	17.6	24.5	33.5
	20	8.9	12.5	17.6	24.5	33.5
	30	8.9	12.5	17.6	24.5	33.5
	40	8.9	12.5	17.6	24.5	33.5

Hot gas capacity in [kW] (Evaporator capacity)				
Offset 3 bar				
Pressure drop across valve $\Delta p$ [bar]				
0.1	0.2	0.4	0.8	1.6
<b>R22</b>				
6.0	8.4	11.8	16.3	22.2
6.3	8.9	12.5	17.4	23.9
6.6	9.4	13.2	18.4	25.4
6.9	9.8	13.7	19.3	26.7
7.1	10.1	14.2	20.0	27.7
15.8	22.2	31.1	43.2	58.7
16.7	23.5	33.1	46.1	63.1
17.6	24.8	34.9	48.7	67.2
18.3	25.9	36.4	51.0	70.6
18.9	26.6	37.5	52.6	73.2
<b>R134a</b>				
5.4	7.6	10.7	14.7	19.6
5.6	7.9	11.1	15.4	20.8
5.8	8.2	11.6	16.1	21.9
6.0	8.5	11.9	16.6	22.8
6.1	8.6	12.1	16.9	23.3
14.4	20.2	28.2	38.8	51.8
15.0	21.0	29.5	40.8	55.0
15.5	21.8	30.6	42.5	57.9
15.9	22.4	31.5	43.9	60.3
16.1	22.7	32.0	44.7	61.7

1) The capacities are based on:  
 - Evaporating temperature  $t_e = -10$  °C  
 - For other evaporating temperatures see table below

Correction factors for evaporating temperature  $t_e$

$t_e$	-40	-30	-20	-10	0	10
[°C]						
R22	1.09	1.05	1.02	1.0	0.98	0.96
R134a	1.14	1.09	1.04	1.0	0.96	0.93

Plant capacity x correction factor = table capacity

Hot gas capacity  
(continued)

Max. regulator capacity  $Q_e$  <sup>1)</sup>

Type	Condensing temperature $t_c$ [°C]	Hot gas capacity in [kW] (Evaporator capacity)				
		Offset 1.5 bar				
		Pressure drop across valve $\Delta p$ [bar]				
		0.1	0.2	0.4	0.8	1.6
<b>R404A / R507</b>						
KVR 12 KVR 15 KVR 22	10	3.2	4.5	6.3	8.6	11.7
	20	3.4	4.7	6.6	9.2	12.4
	30	3.5	4.9	6.8	9.5	13.0
	40	3.5	4.9	6.8	9.6	13.1
	50	3.5	4.9	6.8	9.6	13.1
KVR 28 KVR 35	10	8.3	11.7	16.2	22.3	30.0
	20	8.7	12.2	17.1	23.7	32.2
	30	8.9	12.5	17.6	24.4	33.5
	40	9.0	12.6	17.8	24.8	33.0
	50	9.0	12.6	17.8	24.8	33.5
<b>R407C</b>						
KVR 12 KVR 15 KVR 22	10	3.6	5.0	6.9	9.5	12.8
	20	3.8	5.4	7.5	10.4	14.0
	30	4.0	5.8	8.0	11.1	15.5
	40	4.2	6.0	8.5	11.9	16.4
	50	4.5	6.3	8.9	12.4	17.3
KVR 28 KVR 35	10	9.2	12.9	17.9	24.7	32.7
	20	9.8	13.8	19.3	26.8	36.2
	30	10.5	14.7	20.6	28.7	39.2
	40	11.1	15.6	21.9	30.6	42.2
	50	11.6	16.4	23.0	32.1	44.4

Hot gas capacity in [kW] (Evaporator capacity)				
Offset 3 bar				
Pressure drop across valve $\Delta p$ [bar]				
0.1	0.2	0.4	0.8	1.6
<b>R404A / R507</b>				
5.8	8.1	11.3	15.8	21.6
6.1	8.4	11.8	16.5	22.7
6.1	8.5	12.0	16.8	23.2
6.1	8.6	12.1	16.9	23.2
6.1	8.6	12.1	16.9	23.2
15.8	22.2	31.1	43.2	58.7
16.7	23.5	33.1	46.1	63.1
17.6	24.8	34.9	48.7	67.2
18.3	25.9	36.4	51.0	70.6
18.9	26.6	37.5	52.6	73.2
<b>R407C</b>				
6.5	9.1	12.7	17.6	24.0
6.8	9.6	13.5	18.8	25.8
7.1	10.2	14.3	19.9	27.4
7.5	10.7	14.9	21.0	29.1
7.8	11.1	15.6	22.0	30.5
17.1	24.0	33.6	46.7	63.4
18.0	25.4	35.7	49.8	68.1
19.0	26.8	37.7	52.6	72.6
19.9	28.2	39.7	55.6	77.0
20.8	29.3	41.3	57.9	80.5

<sup>1)</sup> The capacities are based on:  
 - Evaporating temperature  $t_e = -10$  °C  
 - For other evaporating temperatures see table below

Correction factors for evaporating temperature  $t_e$

$t_e$ [°C]	-40	-30	-20	-10	0	10
R404A / R507	1.18	1.11	1.05	1.0	0.95	0.92
R407C	1.12	1.08	1.04	1.0	0.97	0.93

Plant 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  $Q_e$  (plant capacity)
- Evaporating temperature  $t_e$  in [°C]
- Condensing temperature  $t_c$  in [°C]
- Connection type: flare or solder
- Connection size in [in]

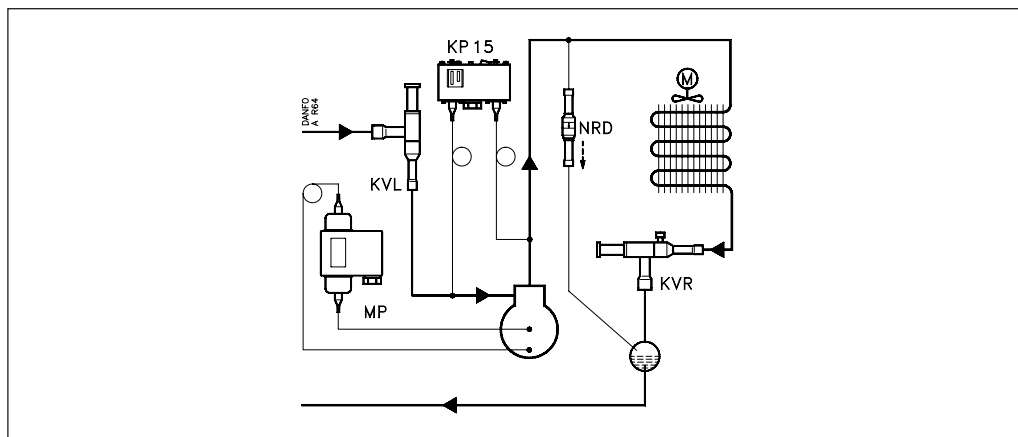
**Valve selection**

**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.

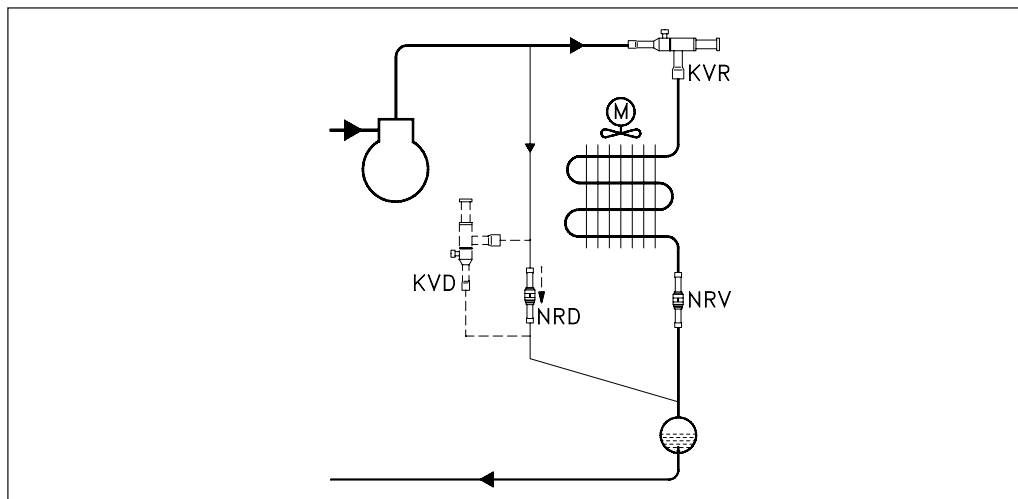
KVR in a liquid capacity application

- Refrigerant: R22 example
- Evaporator capacity:  $Q_e = 100$  kW (plant capacity)
- Evaporating temperature:  $t_e = -40$  °C
- Condensing temperature:  $t_c = 30$  °C
- Connection type: Solder
- Connection size:  $\frac{5}{8}$  in

**Application example**  
Liquid capacity application



**Application example**  
Liquid 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  $-40\text{ }^\circ\text{C}$ , R22 corresponds to a factor of 1.09.

**Correction factors**

$t_e$ [ $^\circ\text{C}$ ]	-40	-30	-20	-10	0	10
R22	1.09	1.05	1.02	1.0	0.98	0.96
R134a	1.14	1.09	1.04	1.0	0.96	0.93
R404A, R507	1.18	1.11	1.05	1.0	0.95	0.92
R407C	1.12	1.08	1.04	1.0	0.97	0.93

Plant capacity x correction factor = table capacity

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**Step 2**

Corrected evaporator capacity is

$$Q_e = 100 \times 1.09 = 109.0 \text{ kW}$$


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**Step 3**

Now select the appropriate capacity table and choose the line for a condensing temperature  $t_c = 30\text{ }^\circ\text{C}$ .

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 142.9 kW at 1.6 bar pressure drop across the valve.

Based on the required connection size of  $\frac{5}{8}$  in. ODF, the KVR 15 is the proper selection for this example.

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**Step 4**

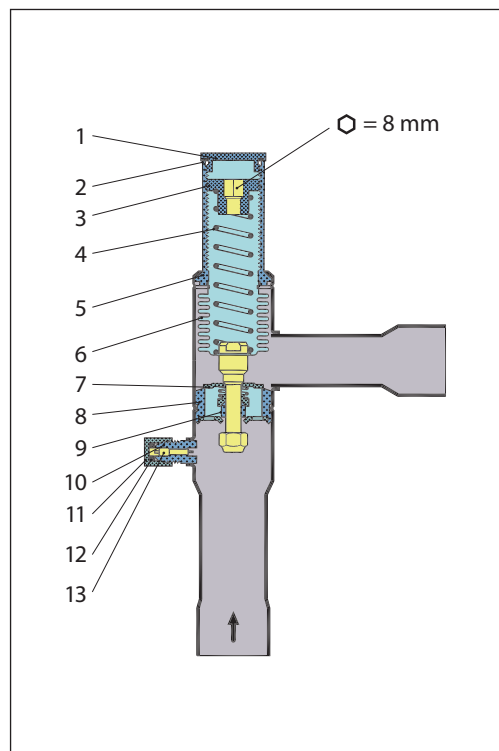
KVR 15,  $\frac{5}{8}$  in. solder connection:  
code no. **034L0097** (see ordering list)



Design / Function

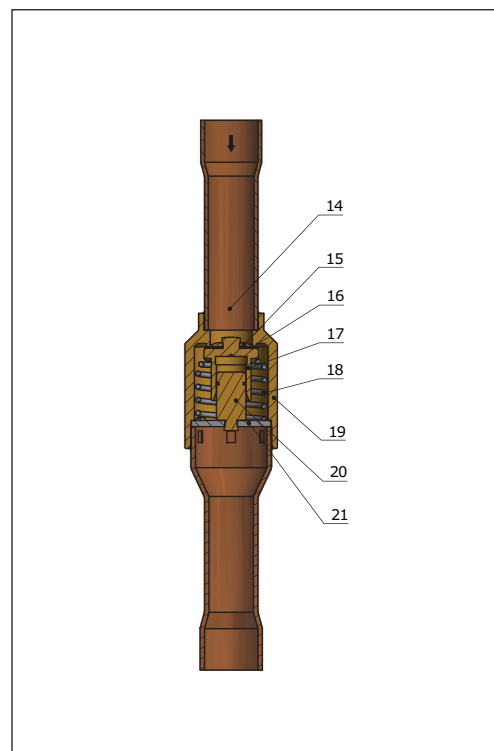
1. Seal cap
2. Gasket
3. Setting screw
4. Main spring
5. Valve body
6. Equalizing bellows
7. Valve plate
8. Valve seat
9. Damping device
10. Pressure gauge connection
11. Cap
12. Gasket
13. Insert
14. Copper tube
15. Washer
16. Teflon disk
17. Piston
18. Spring
19. Valve body
20. Guide
21. Stop face

KVR



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 regulation is dependent only on the inlet pressure. Pressure variations on the outlet side of the regulator do not affect the degree of opening, since type KVR has an equalizing bellows (6). The effective area of this bellows corresponds to that of the valve seat.

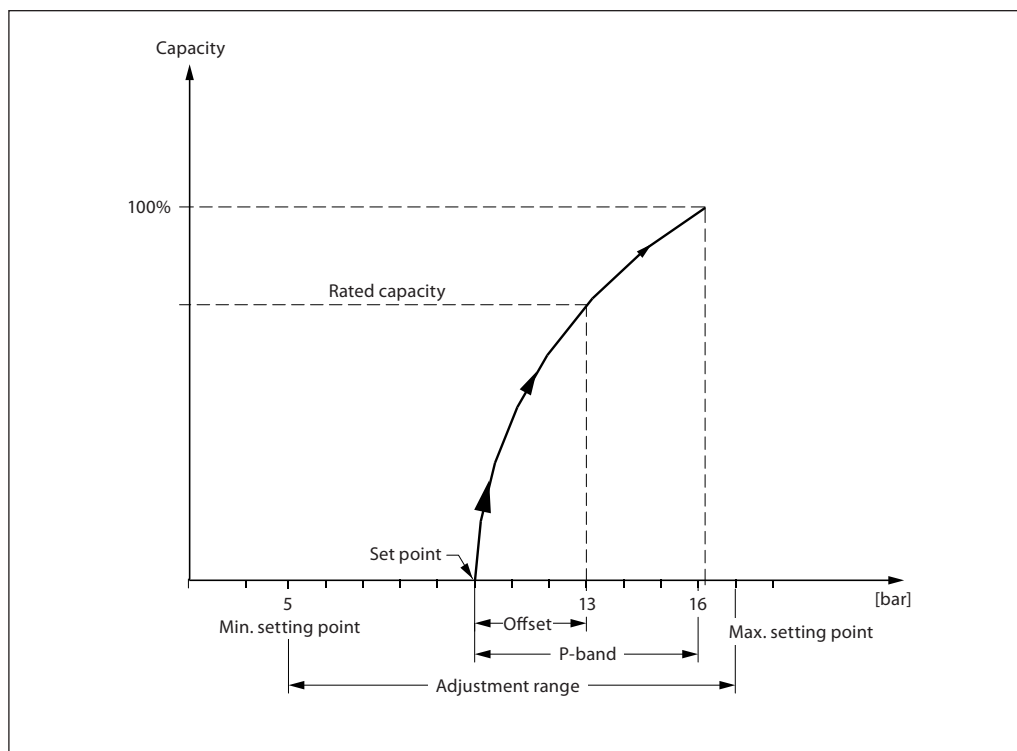
NRD



In addition, the regulator is equipped with an effective damping device (9) to safe-guard against pulsations which can normally occur in refrigeration plant. The damping device contributes to ensuring a long working life for the regulator without impairing regulation accuracy. Differential valve type NRD begins to open when the pressure drop in the valve is 1.4 bar.

**P-band and Offset**

**Principle diagram**



**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 10 bar and the valve P-band is 6.2, the valve will give maximum capacity when the inlet pressure reaches 16.2 bar.

**Offset**

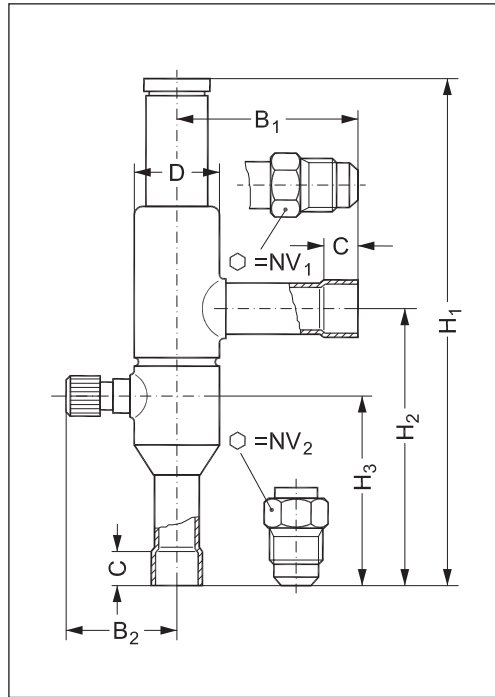
The offset is defined as the amount of pressure required to move the valve plate from closed position (set point) to the necessary opening degree for the actual load. The offset is always a part of the P-band.

**Example with R22**

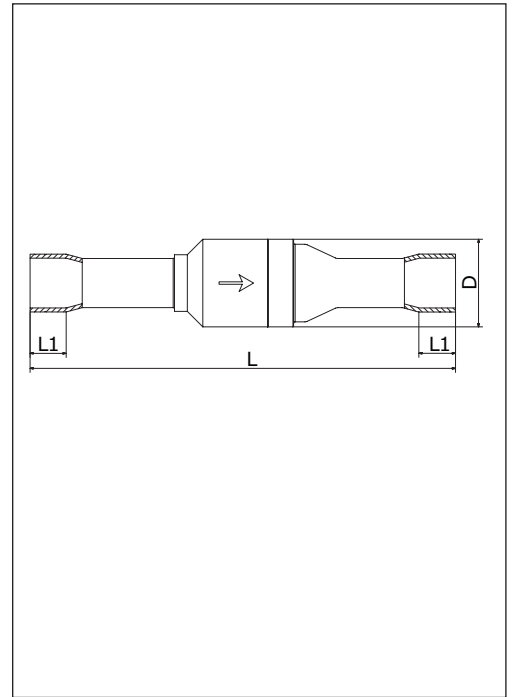
A working temperature of 36 °C ~ 13 bar is required, and the temperature must not drop below 27 °C ~ 10 bar (set point). The offset will then be 3 bar.

Dimensions and weights

KVR



NRD



KVR, NRD

Type	Connection				NV <sub>1</sub>	NV <sub>2</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	L	L <sub>1</sub>	B <sub>1</sub>	B <sub>2</sub>	C Solder	øD	Net weight
	Flare		Solder ODF													
	[in]	[mm]	[in]	[mm]												
KVR 12	1/2	12	1/2	12	19	19	179	99	66	-	-	64	41	10	30	0.4
KVR 15	5/8	16	5/8	16	24	24	179	99	66	-	-	64	41	12	30	0.4
KVR 22	-	-	7/8	22	-	-	179	99	66	-	-	64	41	17	30	0.4
KVR 28	-	-	1 1/8	28	-	-	259	151	103	-	-	105	48	20	43	1.0
KVR 35	-	-	1 3/8	35	-	-	259	151	103	-	-	105	48	25	43	1.0
NRD	-	-	1/2	12	-	-	-	-	-	131	10	-	-	-	22	0.1

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