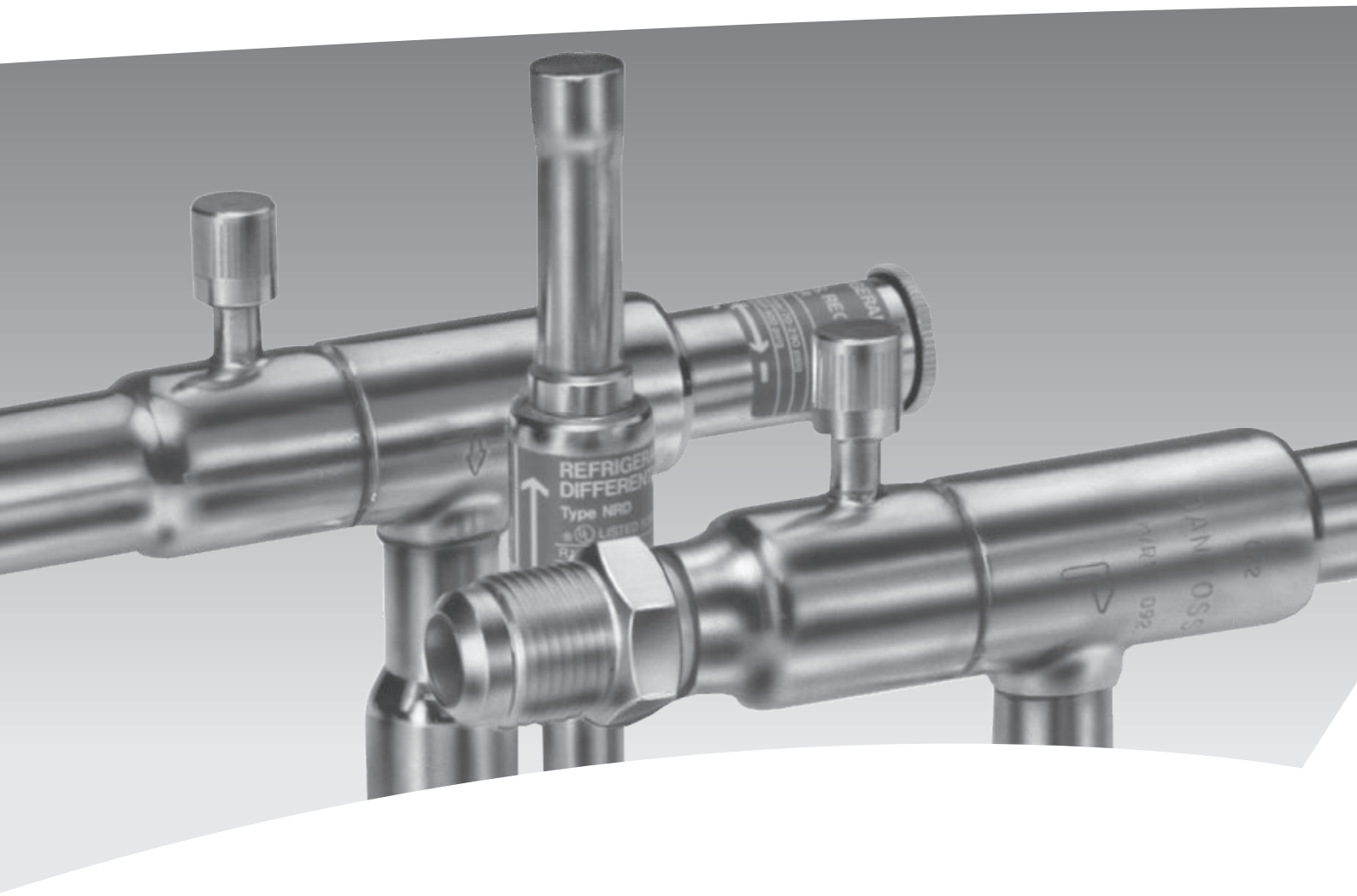


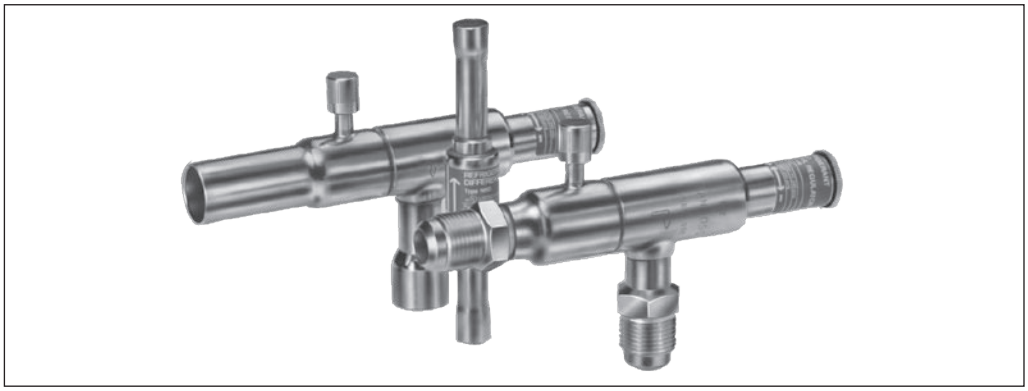
Condensing pressure regulator,
type KVR and NRD

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

Technical leaflet **Condensing pressure regulator, type KVR and NRD**

Introduction



Regulator 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
- ¼ in. Schrader valve for pressure gauge connection
- 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

Adjustment range
5 → 17.5 bar
Factory setting = 10 bar

Maximum working pressure
KVR: PS/MWP = 28 bar
NRD: PS/MWP = 46 bar

Maximum test pressure
KVR: p' = 31 bar
NRD: p' = 60 bar

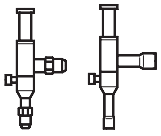
Maximum temperature of medium:
KVR / NRD: 130°C

Minimum temperatur of medium:
–45°C

P band
KVR 12 → 22 = 6.2 bar
KVR 28 → 35 = 5 bar
The rated capacity is given at offset = 3 bar

Opening differential pressure for NRD
Start opening: Δp = 1.4 bar
Fully open: Δp = 3 bar

Ordering

	Type	Rated liquid capacity [1] (Evaporator capacity) kW				Rated hot gas [1] (Evaporator capacity) kW				Flare connection [2]		Code no.	Solder Connection		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**
														12	**034L0096**
	KVR 15									5/8	16	**034L0092**	5/8	16	**034L0097**
	KVR 22												7/8	22	**034L0094**
	KVR 28	129	121	93.7	139.3	34.9	30.6	34.9	37.7				1 1/8		**034L0095**
														28	**034L0099**
	KVR 35												1 3/8	35	**034L0100**
	NRD												1/2		**020-1132**
														12	**020-1136**

[1] Rated capacity is based on:
- evaporating temperature t_e = –10°C
- condensing temperature t_c = +30°C
- pressure drop across the valve
  Δp = 0.2 bar for liquid capacity
  Δp = 0.4 bar for hot gas capacity
- offset = 3 bar

[2] 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**

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.

Liquid capacty

Max. regulator capacity Q_e [1])

Type	Condensing temperature t_c °C	**Liquid capacity** in kW (Evaporator capacity) Offset 1.5 bar Pressure drop across valve Δp bar 0.1	0.2	0.4	0.8	1.6	**Liquid capacity** in kW (Evaporator capacity) Offset 3 bar Pressure drop across valve Δp bar 0.1	0.2	0.4	0.8	1.6
					R22						**R22**
KVR 12 KVR 15 KVR 22	10	23.7	33.5	47.4	67.0	94.8	42.5	60.2	85.1	120.4	170.5
	20	21.8	30.8	43.6	61.7	87.3	39.2	55.4	78.4	110.9	157.0
	30	19.8	28.1	39.7	56.2	79.4	35.6	50.4	71.3	100.9	142.9
	40	17.8	25.2	35.6	50.4	71.3	32.0	45.3	64.0	90.6	128.3
	50	15.7	22.2	31.4	44.4	62.9	28.2	39.9	56.4	79.9	113.1
KVR 28 KVR 35	10	60.5	85.6	121.1	171.2	242.3	108.9	154.0	217.8	308.2	436.2
	20	55.7	78.8	111.4	157.6	223.0	100.2	141.8	200.6	283.8	401.7
	30	50.7	71.7	101.4	143.4	202.9	91.2	129.0	182.5	258.2	365.5
	40	45.9	64.3	91.0	128.7	182.1	81.9	115.8	163.9	231.8	328.2
	50	40.1	58.8	80.3	113.6	160.7	72.2	102.1	144.4	204.4	289.3
					R134a						**R134a**
KVR 12 KVR 15 KVR 22	10	22.8	32.3	45.6	64.6	91.3	40.7	57.5	81.4	115.0	163.0
	20	20.8	29.4	41.6	58.8	83.2	37.1	52.5	74.2	105.0	149.0
	30	18.7	26.5	37.4	53.0	74.9	33.4	47.3	66.9	94.7	134.0
	40	16.6	23.5	33.2	47.0	66.5	29.7	42.0	59.4	84.1	119.0
	50	14.5	20.5	29.0	41.0	58.0	25.9	36.6	51.8	73.3	104.0
KVR 28 KVR 35	10	58.3	82.4	117.0	165.0	233.0	104.0	147.0	208.0	295.0	418.0
	20	53.1	75.1	106.0	150.0	213.0	94.9	134.0	190.0	269.0	361.0
	30	47.8	67.6	95.7	135.0	191.0	85.5	121.0	171.0	242.0	343.0
	40	42.5	60.0	84.9	120.0	170.0	76.0	108.0	152.0	215.0	305.0
	50	37.0	52.3	74.0	105.0	148.0	66.3	93.7	133.0	188.0	266.0
					R404A / R507						**R404A / R507**
KVR 12 KVR 15 KVR 22	10	18.4	25.9	36.8	52.0	73.5	32.9	46.4	65.6	92.9	131.3
	20	16.4	23.2	32.9	46.5	65.7	29.4	41.6	58.8	83.2	117.6
	30	14.5	20.5	29.0	41.0	58.0	25.9	36.6	51.8	73.3	103.7
	40	12.9	17.6	25.0	35.4	50.1	22.4	31.6	44.7	63.3	89.7
	50	10.5	14.9	21.0	29.7	42.1	18.8	26.6	37.6	53.2	75.4
KVR 28 KVR 35	10	46.9	66.3	93.8	132.3	188.0	84.0	118.7	168.0	237.3	337.1
	20	42.0	59.3	83.9	118.7	168.0	75.2	106.1	150.2	213.2	301.4
	30	37.0	52.3	73.9	104.6	148.1	66.3	93.7	132.3	188.0	265.7
	40	31.9	45.2	63.8	90.3	128.1	57.2	81.0	114.5	161.7	228.9
	50	26.9	37.9	53.7	75.9	107.0	48.1	68.0	96.2	136.5	193.2
					R407C						**R407C**
KVR 12 KVR 15 KVR 22	10	25.6	36.2	51.2	72.6	102.3	45.9	65.0	91.9	130.0	184.1
	20	23.5	33.2	47.1	66.6	94.3	42.3	59.8	84.7	119.8	169.6
	30	21.4	30.3	42.9	60.7	85.7	38.4	54.4	77.0	109.0	154.3
	40	19.4	27.5	38.8	55.0	77.7	34.9	49.4	69.8	98.8	139.8
	50	17.3	24.4	34.5	48.8	69.2	31.0	43.9	62.0	87.9	124.4
KVR 28 KVR 35	10	65.3	92.4	130.7	184.9	261.7	117.6	166.3	235.2	332.9	471.1
	20	60.1	85.1	120.3	170.2	240.8	108.2	153.1	216.6	306.5	433.8
	30	54.5	77.4	109.5	154.9	219.1	98.5	139.3	197.1	278.9	394.7
	40	50.0	70.1	99.2	140.3	198.5	89.3	126.2	178.7	252.7	357.7
	50	44.1	62.5	88.3	124.9	176.8	79.4	112.3	158.8	224.8	318.2

[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 °C	–40	–30	–20	**–10**	0	+10
R22	0.92	0.95	0.98	**1.0**	1.02	1.04
R134a	0.88	0.92	0.96	**1.0**	1.04	1.08
R404A/R507	0.85	0.90	0.95	**1.0**	1.05	1.09
R407C	0.89	0.93	0.96	**1.0**	1.03	1.07

Plant capacity × correction factor = table capacity

Hot gas capacty

Max. regulator capacity Q_e [2)]

Type	Condensing temperature t_c °C	**Hot gas capacity** in kW (Evaporator capacity) Offset 1.5 bar Pressure drop across valve Δp bar 0.1	0.2	0.4	0.8	1.6	**Hot gas capacity** in kW (Evaporator capacity) Offset 3 bar Pressure drop across valve Δp bar 0.1	0.2	0.4	0.8	1.6
						R22					**R22**
KVR 12	10	3.3	4.6	6.4	8.8	11.8	6.0	8.4	11.8	16.3	22.2
KVR 15	20	3.5	5.0	6.9	9.6	13.0	6.3	8.9	12.5	17.4	23.9
KVR 22	30	3.7	5.3	7.4	10.3	14.4	6.6	9.4	13.2	18.4	25.4
	40	3.9	5.5	7.8	10.9	15.0	6.9	9.8	13.7	19.3	26.7
	50	4.1	5.7	8.1	11.3	15.7	7.1	10.1	14.2	20.0	27.7
KVR 28	10	8.5	11.9	16.6	22.8	30.3	15.8	22.2	31.1	43.2	58.7
KVR 35	20	9.1	12.8	17.9	24.8	33.5	16.7	23.5	33.1	46.1	63.1
	30	9.7	13.6	19.1	26.6	36.3	17.6	24.8	34.9	48.7	67.2
	40	10.2	14.3	20.1	28.1	38.7	18.3	25.9	36.4	51.0	70.6
	50	10.5	14.9	20.9	29.2	40.4	18.9	26.6	37.5	52.6	73.2
						R134a					**R134a**
KVR 12	10	2.9	4.0	5.6	7.6	9.7	5.4	7.6	10.7	14.7	19.6
KVR 15	20	3.1	4.3	6.0	8.2	10.8	5.6	7.9	11.1	15.4	20.8
KVR 22	30	3.2	4.5	6.3	8.8	11.7	5.8	8.2	11.6	16.1	21.9
	40	3.4	4.7	6.6	9.2	12.5	6.0	8.5	11.9	16.6	22.8
	50	3.4	4.8	6.8	9.5	13.0	6.1	8.6	12.1	16.9	23.3
KVR 28	10	7.5	10.5	14.5	19.6	25.0	14.4	20.2	28.2	38.8	51.8
KVR 35	20	7.9	11.1	15.5	21.2	27.8	15.0	21.0	29.5	40.8	55.0
	30	8.4	11.8	16.4	22.6	30.2	15.5	21.8	30.6	42.5	57.9
	40	8.7	12.2	17.1	23.7	32.1	15.9	22.4	31.5	43.9	60.3
	50	8.9	12.5	17.6	24.5	33.5	16.1	22.7	32.0	44.7	61.7
						R404A / R507					**R404A / R507**
KVR 12	10	3.2	4.5	6.3	8.6	11.7	5.8	8.1	11.3	15.8	21.6
KVR 15	20	3.4	4.7	6.6	9.2	12.4	6.1	8.4	11.8	16.5	22.7
KVR 22	30	3.5	4.9	6.8	9.5	13.0	6.1	8.5	12.0	16.8	23.2
	40	3.5	4.9	6.8	9.6	13.1	6.1	8.6	12.1	16.9	23.2
	50	3.5	4.9	6.8	9.6	13.1	6.1	8.6	12.1	16.9	23.2
KVR 28	10	8.3	11.7	16.2	22.3	30.0	15.8	22.2	31.1	43.2	58.7
KVR 35	20	8.7	12.2	17.1	23.7	32.2	16.7	23.5	33.1	46.1	63.1
	30	8.9	12.5	17.6	24.4	33.5	17.6	24.8	34.9	48.7	67.2
	40	9.0	12.6	17.8	24.8	33.0	18.3	25.9	36.4	51.0	70.6
	50	9.0	12.6	17.8	24.8	33.5	18.9	26.6	37.5	52.6	73.2
						R407C					**R407C**
KVR 12	10	3.6	5.0	6.9	9.5	12.8	6.5	9.1	12.7	17.6	24.0
KVR 15	20	3.8	5.4	7.5	10.4	14.0	6.8	9.6	13.5	18.8	25.8
KVR 22	30	4.0	5.8	8.0	11.1	15.5	7.1	10.2	14.3	19.9	27.4
	40	4.2	6.0	8.5	11.9	16.4	7.5	10.7	14.9	21.0	29.1
	50	4.5	6.3	8.9	12.4	17.3	7.8	11.1	15.6	22.0	30.5
KVR 28	10	9.2	12.9	17.9	24.7	32.7	17.1	24.0	33.6	46.7	63.4
KVR 35	20	9.8	13.8	19.3	26.8	36.2	18.0	25.4	35.7	49.8	68.1
	30	10.5	14.7	20.6	28.7	39.2	19.0	26.8	37.7	52.6	72.6
	40	11.1	15.6	21.9	30.6	42.2	19.9	28.2	39.7	55.6	77.0
	50	11.6	16.4	23.0	32.1	44.4	20.8	29.3	41.3	57.9	80.5

[2)] 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
R22	0.92	0.95	0.98	**1.0**	1.02	1.04
R134a	0.88	0.92	0.96	**1.0**	1.04	1.08
R404A/R507	0.85	0.90	0.95	**1.0**	1.05	1.09
R407C	0.89	0.93	0.96	**1.0**	1.03	1.07

Plant capacity × 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: CFC, HCFC or HFC
- 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 inches

Valve selection

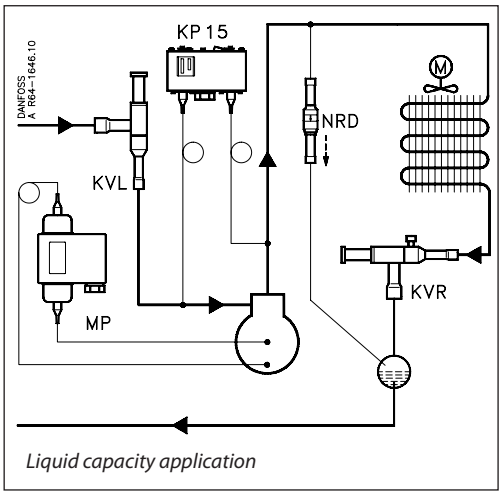
Example

When selecting the appropiate 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.

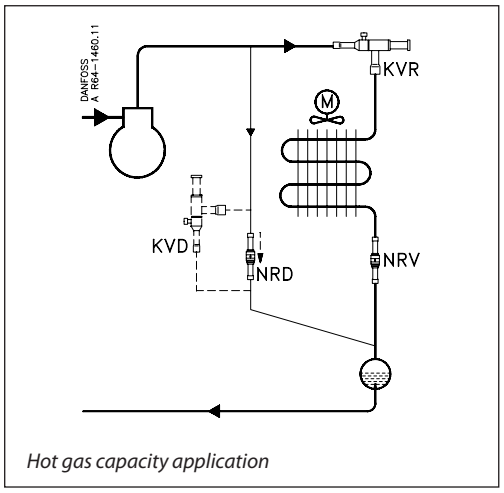
KVR in a liquid capacity application

- Refrigerant: R22
- 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: 5/8 in.

Application example



Liquid capacity application



Hot gas capacity application

Step 1

Determine the correction factor for evaporating temperature t_e.

From the correction factors table an evaporating temperature of –40°C, R22 corresponds to a factor of 0.92.

Correction factors for evaporating temperature t_e

t_e °C	–40	–30	–20	–10	0	+10
R22	0.92	0.95	0.98	1.0	1.02	1.04
R134a	0.88	0.92	0.96	1.0	1.04	1.08
R404A / R507	0.85	0.90	0.95	1.0	1.05	1.09
R407C	0.89	0.93	0.96	1.0	1.03	1.07

Plant capacity × correction factor = table capacity

Step 2

Corrected evaporator capacity is
$Q_e = 100 \times 0.92 = 92$ kW

Step 3

Now select the appropriate capacity table and choose the line for a condensing temperature t_c = 30°C.
Using the corrected evaporator capacity, select a valve that provides an equivalent or greater capacity at an acceptable pressure drop.

KVR 12/15/22 delivers 100.9 kW at a 0.8 bar 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.

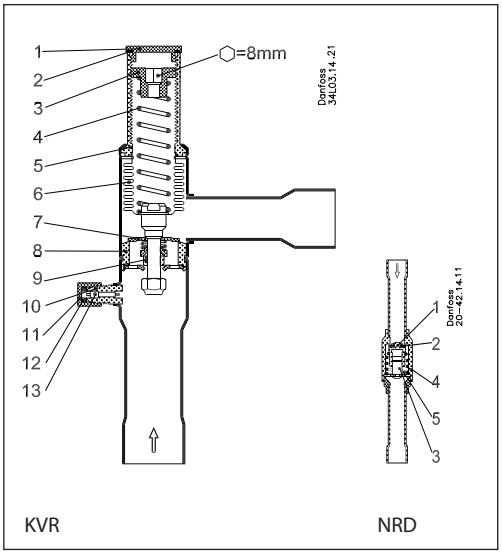
Step 4

KVR 15, 5/8 in. solder connection:
code no. 034L0097 (see ordering list)

Design and function

KVR
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

NRD
1. Piston
2. Valve plate
3. Piston guide
4. Valve body
5. Spring

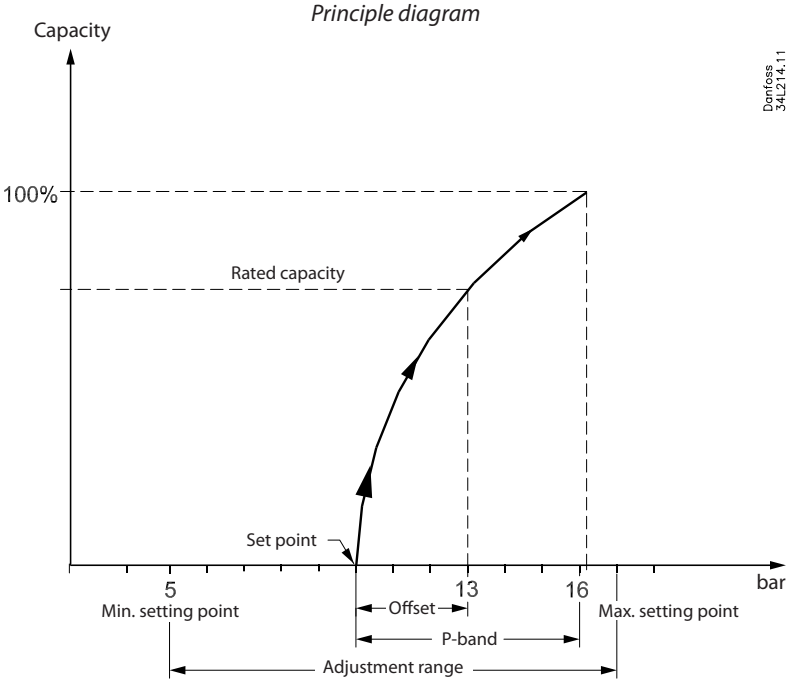


Regulator type KVR opens upon a rise in pressure on the inlet side, i.e. when the pressure in the condenser reaches the set value. KVR regulation is dependent only on the inlet pressure. Pressure variations on the outlet side of the regulator do not affect the degree of opening, since type KVR has an equalizing bellows (6). The effective area of this bellows corresponds to that of the valve seat.
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, and is fully open when the pressure drop is 3 bar.

P band and offset

Principle diagram



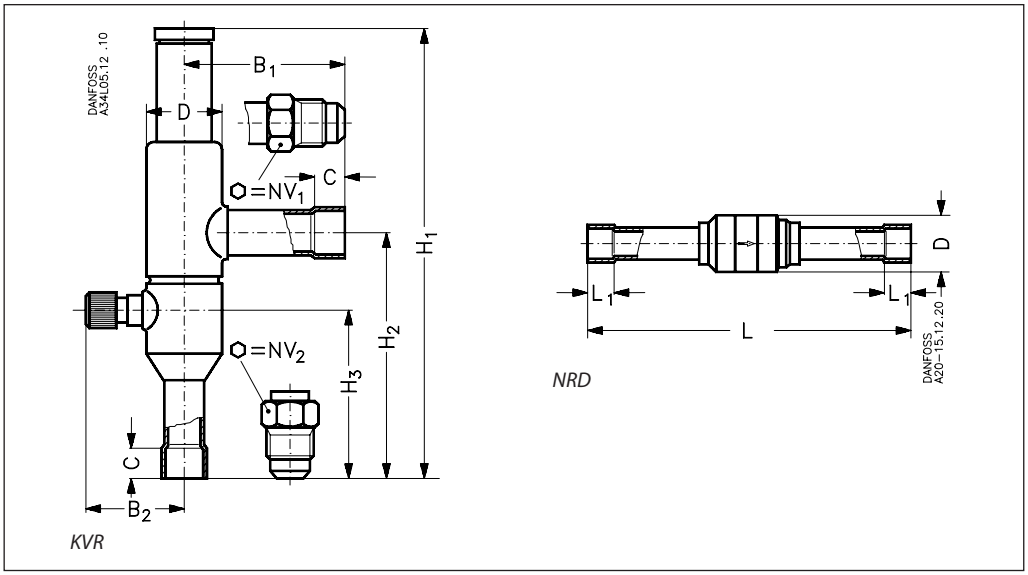
Proportional band
The proportional band or P-band is defined as the amount of pressure required to move the valve plate from closed (set point) to fully open position.

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 weight



Type	Connection				NV_1	NV_2	H_1	H_2	H_3	L	L_1	B_1	B_2	C Solder	∅ D	Weight
	Flare		Solder ODF													
	in.	mm	in.	mm			mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
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										131	10				22	0.1