

## Data Sheet

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

Maintains a constant and sufficiently high condenser and receiver pressure



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.

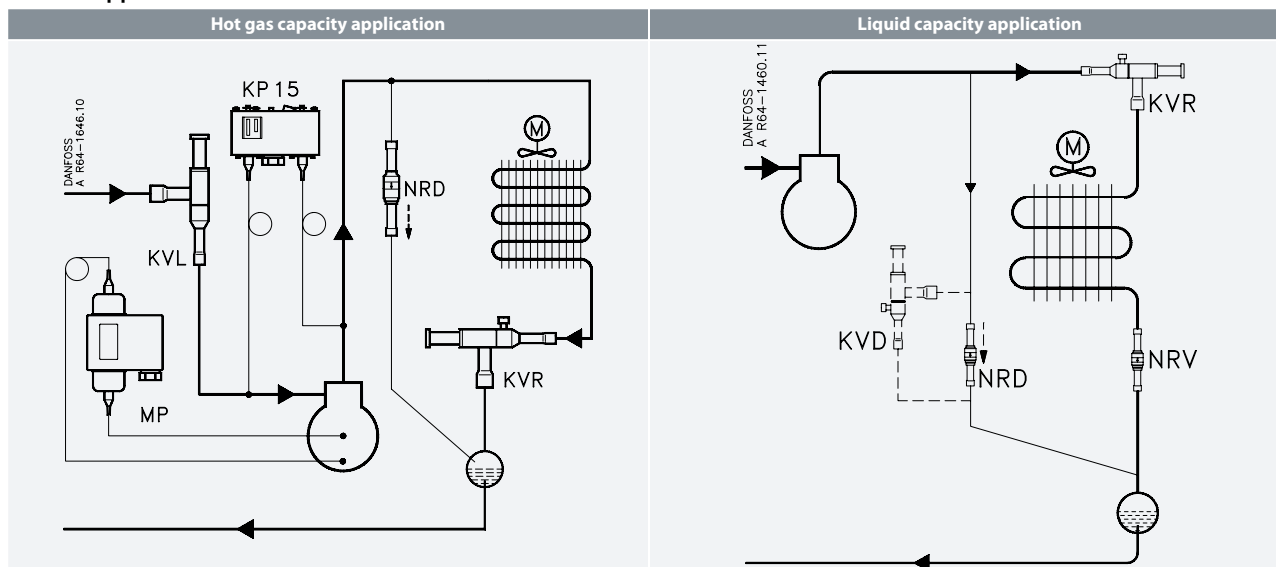
**Features:**

- 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)

## Applications

### Application

Table 1: Application



## Product specification

### Technical data

Table 2: 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<br>**NRD only |
| Adjustment range                              | 5 – 17.5 bar<br>Factory setting = 10 bar                                                                                                                                                                                                                                                                                   |
| Maximum working pressure                      | KVR: PS/MWP = 28 bar<br>NRD: PS/MWP = 49 bar                                                                                                                                                                                                                                                                               |
| Maximum test pressure                         | KVR: Pe = 31 bar<br>NRD: Pe = 81 bar                                                                                                                                                                                                                                                                                       |
| Medium temperature range                      | KVR: -45 – 130 °C,<br>NRD: -50 – 155 °C                                                                                                                                                                                                                                                                                    |
| P-band                                        | KVR 12 – 22 = 6.2 bar<br>KVR 28 – 35 = 5 bar                                                                                                                                                                                                                                                                               |
| Minimum opening pressure differential for NRD | Start opening: $\Delta p = 1.4$ bar                                                                                                                                                                                                                                                                                        |

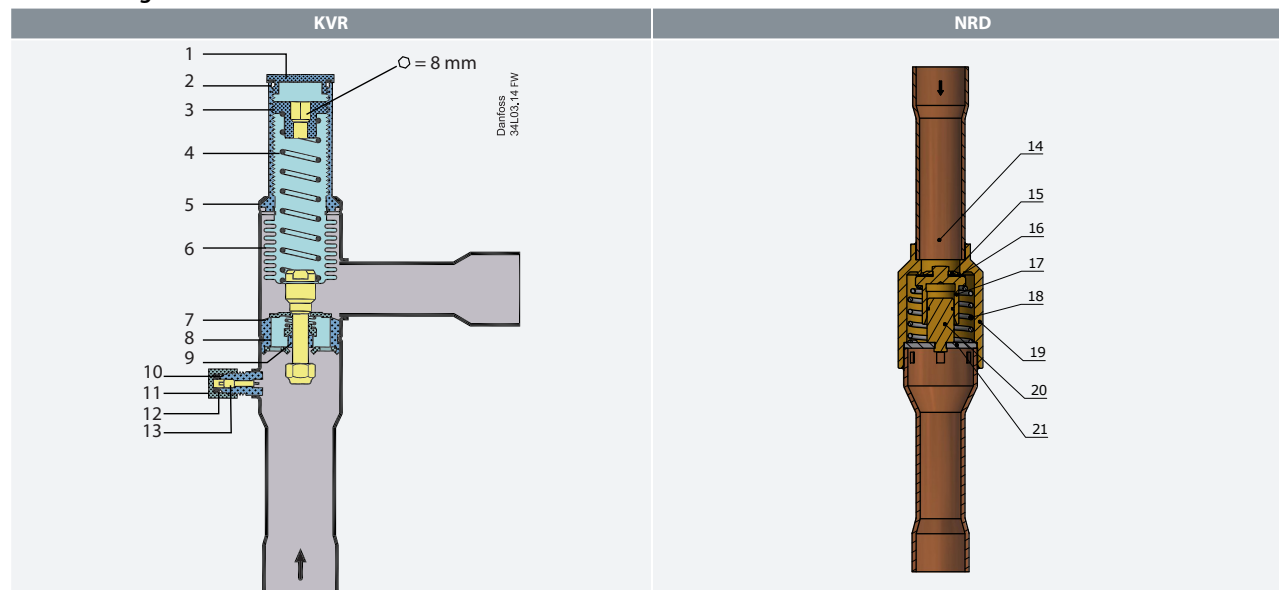
This product (KVR 12 – KVR 22) is evaluated for R290, R454A, R454C, R455A, R600, R600a, R1234ze(E), R1234yf, R1270 by ignition source assessment in accordance with standard EN ISO80079-36. Flare connections are only approved for A1 and A2L refrigerants.

NRD is evaluated for R32, R1270, 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.

## Design and materials

Table 3: Design / Function



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

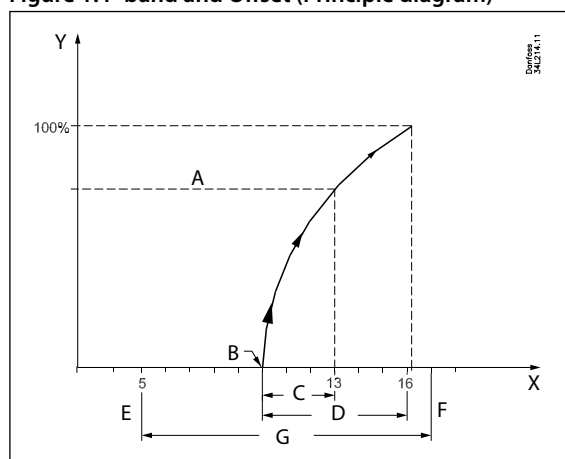
Condensing pressure regulator, type KVR opens upon a rise in pressure on the inlet side, i.e. when the pressure in the condenser reaches the set value. KVR regulation is dependent only on the inlet pressure. Pressure variations on the outlet side of the regulator do not affect the degree of opening,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

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.

Figure 1: P-band and Offset (Principle diagram)



|   |                    |
|---|--------------------|
| A | Rated capacity     |
| B | Set point          |
| C | Offset             |
| D | P-band             |
| E | Min. setting point |
| F | Max. setting point |
| G | Adjustment range   |
| X | capacity           |
| Y | bar                |

### 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.

## 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: 5/8 in

## 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.

| $t_e$ / [ $^{\circ}\text{C}$ ] | -40  | -30  | -20  | -10 | 0    | 10   |
|--------------------------------|------|------|------|-----|------|------|
| R22                            | 1.09 | 1.05 | 1.02 | 1   | 0.98 | 0.96 |
| R134a                          | 1.14 | 1.09 | 1.04 | 1   | 0.96 | 0.93 |
| R404A, R507                    | 1.18 | 1.11 | 1.05 | 1   | 0.95 | 0.92 |
| R407C                          | 1.12 | 1.08 | 1.04 | 1   | 0.97 | 0.93 |

Plant capacity x correction factor = table capacity

## Step 2

Corrected evaporator capacity is  $Q_e = 100 \times 1.09 = 109.0\text{ kW}$

## 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.

## Step 4

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

## Valve selection based on capacity calculation

As for extended capacity calculations and valve selection based on capacities and refrigerants, please refer to Coolselector®2. Rated and extended capacities are calculated with the Coolselector®2 calculation engine to ARI standards with the ASEREP equations based on laboratory measurements of selected valves.

## Dimensions

Table 4: Dimensions

| KVR |  |  |  |  |  |  |  |  |  | NRD |  |  |  |  |  |  |
|-----|--|--|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|
|     |  |  |  |  |  |  |  |  |  |     |  |  |  |  |  |  |

| Type   | Connection |      |            |      | NV1 | NV2 | H1  | H2 | H3 | L | L1 | B1 | B2 | 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        |

## Condensing pressure regulator, type KVR and differential pressure valve, type NRD

| Type   | Connection |      |            |      | NV1 | NV2 | H1  | H2  | H3  | L   | L1 | B1  | B2 | C Sol-der | øD | Net weight |
|--------|------------|------|------------|------|-----|-----|-----|-----|-----|-----|----|-----|----|-----------|----|------------|
|        | Flare      |      | Solder ODF |      |     |     |     |     |     |     |    |     |    |           |    |            |
|        | [in]       | [mm] | [in]       | [mm] |     |     |     |     |     |     |    |     |    |           |    |            |
| KVR 28 | –          | –    | 1 1/8      | 28   | –   | –   | 259 | 151 | 103 | –   | –  | 105 | 48 | 20        | 43 | 1          |
| KVR 35 | –          | –    | 1 3/8      | 35   | –   | –   | 259 | 151 | 103 | –   | –  | 105 | 48 | 25        | 43 | 1          |
| NRD    | –          | –    | 1/2        | 12   | –   | –   | –   | –   | –   | 131 | 10 | –   | –  | –         | 22 | 0.1        |

## Ordering

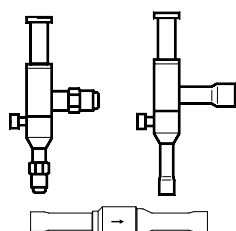


Table 5: KVR 12, KVR 15, KVR 22, KVR 28, KVR 35, NRD

| 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         | 14.3  | 1/2                           | 12   | 034L0091 | 1/2             | –    | 034L0093 |
|        | 50.4                                                            | 47.3  | 36.6       | 54.4  | 13.2                                                    | 11.6  | 12         | 14.3  | –                             | –    | –        | –               | 12   | 034L0096 |
| KVR 15 | 50.4                                                            | 47.3  | 36.6       | 54.4  | 13.2                                                    | 11.6  | 12         | 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         | 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 |

<sup>(1)</sup> To select the product for other conditions or refrigerants, use Danfoss Coolselector<sup>®</sup>2.

Rated capacity is based on:

- evaporating temperature  $t_e = -10\text{ °C}$
- condensing temperature  $t_c = 30\text{ °C}$
- pressure drop across the valve
  - $\Delta p = 0.2\text{ bar}$  for liquid capacity
  - $\Delta p = 0.4\text{ bar}$  for hot gas capacity
- offset = 3 bar

<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

## Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at [danfoss.com](https://danfoss.com) or contact your local Danfoss representative if you have any questions.

**Table 6: Certificates, declarations, and approvals**

| File name                           | Document type             | Document topic | Approvals Authority |
|-------------------------------------|---------------------------|----------------|---------------------|
| Danfoss 034L9625.AB                 | Manufacturers Declaration | PED/RoHS       | Danfoss             |
| Danfoss 034R9541.AA                 | Manufacturers Declaration | China RoHS     | Danfoss             |
| EAC RU Д-ДК.Б/108.В.00191_18        | EAC Declaration           | EAC            | EAC                 |
| LLC CDC EURO-TYSK UA.089.D.00188-17 | UA Declaration            | TYSK           | TYSK                |
| UL SA7200                           | UL Certificate            | UL             | UL                  |

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