MAKING MODERN LIVING POSSIBLE

Technical brochure

Check valve
type NRV and NRVH

Hydrocarbons

www.danfoss.com/hydrocarbons

Introduction

NRV and NRVH can be used in liquid, suction and hot gas lines in refrigeration and air conditioning plant with flammable refrigerants (HC).

NRV and NRVH can also be supplied with oversize connections providing flexibility in the use of check valves.

Features

- The valve ensures only correct flow direction
- Straightway versions
- Prevents back-condensation from warm to cold evaporator
- Built-in damping piston that makes the valves suitable for installation in lines where pulsation can occur, e.g. in the discharge line from the compressor.
- NRVH is supplied with spring to $\Delta p = 0.3$ bar. Used in refrigeration plant with compressors connected in parallel.
- Oversize connections provide flexibility in use.

- Max. working pressure PS = 46 bar
- Max. test pressure P' = 60 bar
- Temperature of the medium – 50 → 140°C

Dimensioning and selection

When dimensioning and selecting check valves to be mounted into the compressor discharge line, it is important to be aware of the following: The differential pressure across the check valve must always be higher than the given minimum pressure drop at which the valve is completely open. This also applies to lowest capacities for compressors with capacity regulation.

In refrigeration plant with compressors connected in parallel, it is advantageous to use NRVH equipped with a stronger spring than NRV. With check valve, type NRVH, resonance problems can be avoided at partial load in the refrigeration plant. The differential pressure across NRVH at partial load must not be lower than minimum pressure drop for NRVH with completely open valve.

Flammable / toxic refrigerants

R 290, R 600, R 600a and R 1270

Terms of delivery

It should be noted that special terms of delivery apply to Danfoss controls for HC and corresponding flammable refrigerants: Please refer to Danfoss literature RZ0ZM (agreement on the application of HC refrigerants). All inquiries for NRV/NRVH for HC will be dealt with as „inquiries for special versions".

Delivery agreements on components can only be entered into within the EU or EFTA, and the export and re-export of plants or sections of plants containing Danfoss components are also limited to the EU and EFTA.

Product technology

The use of Danfoss NRV/NRVH for R 290, R 600, R 600a and R 1270 in refrigeration plants is subject to explosion protection regulations for danger zone 2 (only rare or short term threat).
The Danfoss controls are, therefore, developed for this above-mentioned requirement.

NRV/NRVH complies with the requirements for explosive atmospheres
(94/9/EC) ac. ATEX zone 2.

NRV/NRVH complies with the requirements in the Pressure Equipment Directive (97/23/EC) (PED) fluid group I (flammable/toxic media).

NRV/NRVH is marked with a label that indicates fire hazard (B.3.2 / ISO 3864).

Only Danfoss valves and controls released for use with flammable hydrocarbons must be used with these substances. The actual medium must be stated in the product data sheet and / or on the product.

Only original Danfoss spare parts approved for use with flammable hydrocarbons must be used.

Technical safety requirements

The refrigeration system must be located within the EU or EFTA and comply with the existing EU legislation, such as the Pressure Equipment Directive (PED) (97/23/EC), the directive concerning potential explosive atmospheres (ATEX) (94/9/EC), EN 378 and other relevant EU legislation.

The refrigeration system must always comply with any local directive, legislation and any other regulation applying in the area of installation.

Installation and maintenance

Only authorized persons, who are certified in installing and maintaining refrigeration plants containing flammable hydrocarbons, may do the installation and maintenance.

All requirements from local authorities, regarding use of hydrocarbons in refrigeration systems, must be fulfilled.

The refrigeration system must be designed in such a way that no abnormal impact (e.g. abnormal vibration, liquid hammer, or pressure pulsations) can create risk for damage of the refrigeration system during operation.

Only original Danfoss spare parts approved for use with flammable hydrocarbons may be used.

The Danfoss products are classified according to the ATEX directive. Danfoss takes no responsibility for the classification of the refrigeration system.

Ordering

Type	Version		Connection in		Connection mm		Pressure drop across valve Δp [1] bar	k_v-value [2] m^3/h
			Size	Code no.	Size	Code no.		
NRV 6s	Straight-way	Solder ODF × ODF	1/4	020-6xxx	6	020-6xxx	0.07	0.56
NRV 10s			3/8	020-6xxx	10	020-6xxx	0.07	1.43
NRVH 10s			3/8	020-6xxx	10	020-6xxx	0.3	
NRV 12s			1/2	020-6xxx	12	020-6xxx	0.05	2.05
NRVH 12s			1/2	020-6xxx	12	020-6xxx	0.3	
NRV 16s			5/8	020-6xxx	16	020-6xxx	0.05	3.6
NRVH 16s			5/8	020-6xxx	16	020-6xxx	0.3	
NRV 19s			3/4	020-6xxx	19	020-6xxx	0.05	5.5
NRVH 19s			3/4	020-6xxx	19	020-6xxx	0.3	

[1]) Δp = the minimum pressure at which the valve is completely open.
The NRVH with a stronger spring is used in the discharge line from compressors connected in parallel.

[2]) The k_v value is the flow of water in m^3/h at a pressure drop across valve of 1 bar, ρ = 1000 kg/m^3.

Capacity

Liquid capacity in kW

Type	Liquid capacity in kW at pressure drop across valve Δp bar			
	NRV			NRV / NRVH
	0.05	0.07 [1])	0.14	0.3 [2])

R 600

NRV/NRVH 6		9.6	13.6	19.9
NRV/NRVH 10		24.6	29.3	50.8
NRV/NRVH 12	29.7	35.2	49.7	72.8
NRV/NRVH 16	52.3	61.8	87.8	128.0
NRV/NRVH 19	72.6	85.9	122.0	178.0

R 600a / R 290

NRV/NRVH 6		8.5	12.1	17.6
NRV/NRVH 10		21.7	30.8	45.0
NRV/NRVH 12	26.3	31.2	44.1	64.5
NRV/NRVH 16	46.3	54.8	77.3	113.4
NRV/NRVH 19	64.4	76.2	107.8	157.7

R 1270

NRV/NRVH 6		8.8	12.5	18.3
NRV/NRVH 10		22.5	31.8	46.6
NRV/NRVH 12	28.2	32.3	45.6	66.8
NRV/NRVH 16	47.9	56.7	80.3	118.0
NRV/NRVH 19	66.8	78.8	112.0	163.0

[1]) Rated capacities
[2]) Capacity for NRVH

Suction vapour capacity in kW

Type	Pressure drop across valve Δp bar	Suction vapour capacity kW at evaporating temperature t_o °C		
		−30	−10 [1])	+5

R 600

NRV 6	0.07	0.34	0.57	0.80
NRV 10	0.07	0.87	1.46	2.04
NRV 12	0.05	1.06	1.77	2.49
NRV 16	0.05	1.86	3.11	4.38
NRV 19	0.05	2.59	4.34	6.09

R 600a

NRV 6	0.07	0.39	0.66	0.90
NRV 10	0.07	1.02	1.67	2.31
NRV 12	0.05	1.24	2.01	2.79
NRV 16	0.05	2.16	3.54	4.90
NRV 19	0.05	3.01	4.92	6.81

R 290

NRV 6	0.07	0.71	1.09	1.45
NRV 10	0.07	1.82	2.79	3.71
NRV 12	0.05	2.21	3.38	4.49
NRV 16	0.05	3.87	5.93	7.88
NRV 19	0.05	5.39	8.25	10.94

R 1270

NRV 6	0.07	0.81	1.22	1.60
NRV 10	0.07	2.08	3.12	4.07
NRV 12	0.05	2.51	3.78	4.94
NRV 16	0.05	4.42	6.63	8.68
NRV 19	0.05	6.15	9.22	12.10

[1]) Rated capacities

The suction vapour capacities are based on liquid temperature tl = 25°C ahead of the evaporator.
The table values refer to the evaporator capacity.
The capacities are based on dry, saturated vapour ahead of the valve.
Under operating conditions with superheated vapour ahead of the valve, the capacities are reduced by 4% for every 10 K superheat.

The liquid capacities are based on:
liquid temperature tl = + 25°C
evaporating temperature te = -10°C.

Correction factors

When selecting the evaporator capacity is to be multiplied by a correction factor depending on the liquid temperature tl ahead of the valve/the evaporator. The corrected capacity can then be found from the table.

Correction factors for liquid temperature tl

t_l °C	–10	0	10	15	20	25	30	35	40	45	50
R 290	0.77	0.82	0.88	0.92	0.96	1	1-05	1.10	1.16	1.23	1.31
R 600	0.79	0.84	0.90	0.93	0.96	1	1.04	1.09	1.13	1.19	1.25
R 600a	0.78	0.83	0.89	0.92	0.96	1	1.04	1.09	1.15	1.21	1.28
R 1270	0.78	0.83	0.89	0.92	0.96	1	1.04	1.09	1.15	1.21	1.29

Capacity

Hot gas capacity in kW

Type	Hot gas capacity kW [1] at pressure drop across valve Δp bar			
	0.05	0.07 [2]	0.14	0.3 [3]

R 600

NRV/NRVH 6		0.99	1.40	2.05
NRV/NRVH 10		24.6	29.3	50.8
NRV/NRVH 12	3.05	3.61	5.10	7.48
NRV/NRVH 16	5.36	6.34	9.00	13.2
NRV/NRVH 19	7.46	8.86	12.50	18.30

R 600a

NRV 6		1.13	1.59	2.34
NRV 10		2.88	4.08	5.97
NRV 12	3.50	4.13	5.85	8.5
NRV 16	6.14	7.26	10.30	15.10
NRV 19	8.53	10.10	14.30	20.90

R 290

NRV/NRVH 6		1.71	2.42	3.55
NRV/NRVH 10		4.17	5.90	8.63
NRV/NRVH 12	5.06	5.98	8.46	12.40
NRV/NRVH 16	8.88	10.50	14.90	21.80
NRV/NRVH 19	12.30	14.60	20.70	30.20

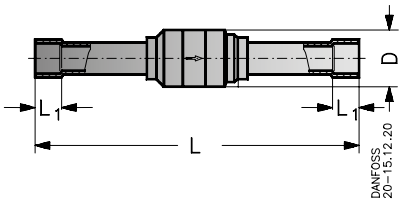
R 1270

NRV 6		1.79	2.53	3.71
NRV 10		4.56	6.47	9.48
NRV 12	5.55	6.56	9.28	13.60
NRV 16	9.74	11.50	16.30	23.90
NRV 19	13.50	16.00	22.60	33.20

[1] The hot gas capacities are based on condensing temp. t_c = +25°C, subcooling = 4 K, evaporating temp. = –10°C and hot gas temp. t_h = +60° C ahead of valve.
[2] Rated capacities
[3] Capacity for NRVH

An increase of the hot gas temperature of 10 K will reduce the valve capacity approx. 2% and vice versa.

Dimensions and weights



Connection	Type	Size in.	Size mm.	L mm.	L_1 mm.	Ø D mm.	Weight kg.
Solder straight-way	NRV 6s	1/4	6	92	7	18	0.1
	NRV/NRVH 10s	3/8	10	109	9	20	0.2
	NRV/NRVH 12s	1/2	12	131	10	22	0.2
	NRV/NRVH 16s	5/8	16	138	12	28	0.3
	NRV/NRVH 19s [1]	7/8	22	165	17	34	0.4

[1] Oversize connections