



HANDBOOK
SOLENOID VALVES

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 **Castel**[®]
Italian technology

CHAPTER 2

HIGH-TEMPERATURE NORMALLY-CLOSED SOLENOID VALVES

FOR REFRIGERATION PLANTS THAT USE HFC OR HFO REFRIGERANTS



APPLICATION

The solenoid valves illustrated in this chapter have been developed by Castel for all those commercial, civil and industrial air conditioning refrigeration applications that **require higher temperature operation**. They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a , R404A , R407C , R410A , R507)
- HFO and HFO/HFC mixtures (R1234ze , R448A , R449A , R450A , and R452A)

belonging to Group 2, as defined in Article 13, chapter 1, Point (b) of Directive 2014/68/EU, with reference to EC Regulation No. 1272/2008.

Furthermore, the same solenoid valves, up to DN 25, that is models; 1078N/9, 1098N/9, 1079N/11, and 1099N/11, can also be installed on systems using the following refrigeration fluids:

- HFC (R32)
- HFO (R1234yf)
- HC (R290 , R600 , R600a)

belonging to Group 1, as defined in Article 13, chapter 1, Point (a) of Directive 2014/68/EU, with reference to EC Regulation No. 1272/2008 (see chapter 5 for more information on the use of HC refrigerant fluids).

For specific applications with refrigerant fluids not listed above, please contact Castel Technical Department.

CAUTION! The solenoid valves in this chapter cannot be installed on systems that use HCFC (R22) refrigerants or other refrigerants blended with mineral oils or alkylbenzene oils.

OPERATION

The valves listed in this chapter are normally closed valves (NC). This means that when the coil is not energised, the

plunger closes the fluid flow. When the coil is energised, the plunger opens the valve seat connecting the inlet to the outlet.

All the above indicated valves are sold in the version without coil (with the S suffix), and in the version with series 9300, type HF2 - "FAST LOCK" coils (A6 suffix with coil 9300/RA6-220/230 VAC).

The valves series 1020N and 1028N are direct acting valves. Their operation depends only on the magnetic field produced by the current flow into the coil. Opening/closing of main valve seat, the only seat, is directly controlled by the mobile plunger.

These valves can work with zero pressure differential.

The valves series 1064N ; 1068N ; 1070N ; 1078N (excluded /11 , /13 , and /M42) ; 1079N (excluded /13 , /M42 , and /17) ; 1090N ; 1098N (excluded /9) ; 1099N (excluded /11) are pilot-operated diaphragm solenoid valves. Their operation depends not only on the magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the diaphragm and keep it lifted off the main opening
- close the diaphragm and ensure the tightness on the main opening

Opening/closing of main valve seat is controlled by the diaphragm while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

The valve series 1034N ; 1038N ; 1040N ; 1048N ; 1049N ; 1050N ; 1058N ; 1059N ; 1078N (/11 , /13 , and /M42);

1079N (/13 , /M42 , and /17); 1098N/9 ; 1099N/11 are pilot-operated piston valves. Their operation depends not only on the magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the piston and keep it lifted off the main opening
- close the piston and ensure the tightness on the main opening

Opening/closing of main valve seat is controlled by the piston, while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

CONSTRUCTION

The main parts of the solenoid valves described in this chapter are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Austenitic stainless steel EN 10088-2 – 1.4303 for enclosure where the plunger moves
- Ferritic stainless steel EN 10088-3 – 1.4105 for the plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

INSTALLATION

All the valves in this chapter can be installed on the three main branches of a plant (hot gas line, liquid line, and suction line), while respecting the limits of use indicated in TABLES 5 and 6 and the capacities indicated in TABLE 8. Castel recommends using piston pilot-operated solenoid valves for applications with the hot gas supply line in particularly harsh (temperature/pressure) operating conditions.

TABLES 5 and 6 show the following functional characteristics of a solenoid valve:

- Connection dimensions
- PS: maximum allowable pressure of the refrigerant
- TS: maximum / minimum allowable temperature of the refrigerant

- TA: maximum / minimum allowable ambient temperature
- Kv: discharge factor
- minOPD : minimum opening pressure differential. This is the minimum pressure differential between inlet and outlet at which a pilot-operated solenoid valve can open and stay opened or close and maintain the seal.
- MOPD: maximum Opening Pressure Differential according to AHRI STANDARD 760 : 2014. This is the maximum pressure differential between inlet and outlet at which a solenoid valve can open.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. In fact, valves with P.T.F.E. gaskets, and particularly piston valves, are sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body. All the valves can be mounted in any position so long as the coil does not point downwards. The brazing of valves with solder connections should be carried out with care, using a low melting point filler material. It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

Before connecting a valve to the electrical system, be sure that the line voltage and frequency correspond to the values marked on the coil.

TRACEABILITY

Direct action valves in series 1020N and 1028N are identified by laser marking on the valve enclosure of the mobile plunger. This marking includes the following data: valve code, refrigerants, PS, TS, and production lot.

The pilot-operated diaphragm and piston valves, series 1034N, 1038N, 1040N, 1048N, 1049N, 1050N, 1058N, 1059N, 1064N, 1068N, 1070N, 1078N, 1079N, 1090N, 1098N, and 1099N are identified by a plastic label fit on the valve enclosure of the mobile plunger (under the coil when indicated). This label includes the following data: valve code, refrigerants, PS, TS, and production lot.

TABLE 5: General characteristics of NC valves (high temperature) with SAE Flare connections

Operating Principles	Catalogue Number	SAE Flare Connections	Seat size nominal \varnothing [mm]	Kv Factor [m ³ /h]	Opening Pressure Differential [bar]				PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast	
					min OPD	MOPD				min.	max.	min. (2)	max.		
						coil series									
						9100 9110 9300 (AC)	9160 (AC)	9120 9320 (AC)							9120 9320 (DC)
Direct Acting	1020N/2# (1)	1/4"	2,5	0,175	0	21	28	35	21	45	- 40	+130	- 40	+50	Art. 4.3
	1020N/3# (1)	3/8"	3	0,23											
Diaphragm Pilot Operated	1064N/3# (1)	3/8"	6,5	0,80	0,05	21	28	35	18	45	- 40	+120	- 40	+50	Art. 4.3
	1064N/4# (1)	1/2"							13						
	1070N/4# (1)	1/2"	2,20												
	1070N/5# (1)	5/8"		2,61											
	1090N/5# (1)	5/8"	3,80												
	1090N/6# (1)	3/4"		16,5					4,80						
Piston Pilot Operated	1034N/3# (1)	3/8"	6,5	1	0,05	21	28	35	18	45	- 40	+120	- 40	+50	Art. 4.3
	1034N/4# (1)	1/2"							13						
	1040N/4# (1)	1/2"	2,40												
	1040N/5# (1)	5/8"		3,00											
	1050N/5# (1)	5/8"	3,80												
	1050N/6# (1)	3/4"		16,5					4,80						

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(1) NB: No use with R22, mineral and alchylbenzene oils

(2) Check TA_{min} of the chosen coil

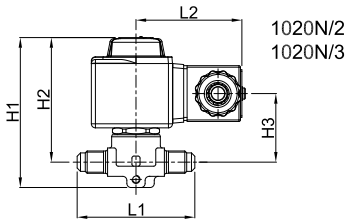
TABLE 6: General characteristics of NC valves (high temperature) with ODS connections

Operating Principles	Catalogue Number	Connections ODS		Seat size nominal Ø [mm]	Kv Factor [m³/h]	Opening Pressure Differential [bar]				PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast	
		Ø [in.]	Ø [mm]			min OPD	MOPD				min.	max.	min. (2)	max.		
							coil series									
							9100 9110 9300 (AC)	9160 (AC)	9120 9320 (AC)							9120 9320 (DC)
Direct Acting	1028N/2 # (1)	1/4"	–	2,2	0,15	0	21	28	35	21	45	– 40	+130	– 40	+50	Art. 4.3
	1028N/2.E (1)	1/4"	–	3	0,23											
	1028N/3# (1)	3/8"	–													
	1028N/M10# (1)	–	10													
Diaphragm Pilot Operated	1068N/3# (1)	3/8"	–	6,5	0,80	0,05	21	28	35	18	45	– 40	+120	– 40	+50	Art. 4.3
	1068N/M10# (1)	–	10													
	1068N/M12# (1)	–	12													
	1068N/4# (1)	1/2"	–													
	1078N/M12# (1)	–	12	12,5	2,20											
	1078N/4# (1)	1/2"	–													
	1078N/5# (1)	5/8"	16	16,5	2,61											
	1079N/7# (1)	7/8"	22													
	1098N/5# (1)	5/8"	16													
	1098N/6# (1)	3/4"	–	25,5	10											
	1098N/7# (1)	7/8"	22													
	1099N/9# (1)	1.1/8"	–													
	1078N/9# (1)	1.1/8"	–	10	13											
	1079N/11# (1)	1.3/8"	35													
Piston Pilot Operated	1038N/3# (1)	3/8"	–	6,5	1,00	0,05	21	28	35	18	45	– 40	+120	– 40	+50	Art. 4.3
	1038N/M10# (1)	–	10													
	1038N/M12# (1)	–	12													
	1038N/4# (1)	1/2"	–													
	1048N/M12# (1)	–	12	12,5	2,40											
	1048N/4# (1)	1/2"	–													
	1048N/5# (1)	5/8"	16													
	1049N/7# (1)	7/8"	22													
	1058N/5# (1)	5/8"	16	16,5	3,80											
	1058N/6# (1)	3/4"	–													
	1058N/7# (1)	7/8"	22													
	1059N/9# (1)	1.1/8"	–	25	10											
	1098N/9# (1)	1.1/8"	–													
	1099N/11# (1)	1.3/8"	35													
	1078N/11# (1)	1.3/8"	35	27	16											
	1079N/13# (1)	1.5/8"	–													
	1079N/M42# (1)	–	42													
	1078N/13# (1)	1.5/8"	–	34	25											
1078N/M42# (1)	–	42														
1079N/17# (1)	2.1/8"	54														

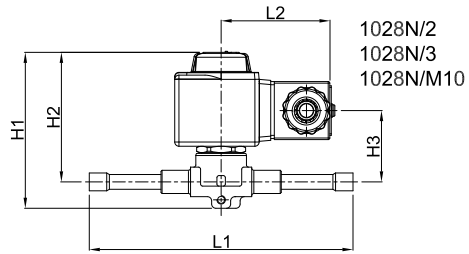
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(1) NB: No use with R22, mineral and alchylbenzene oils

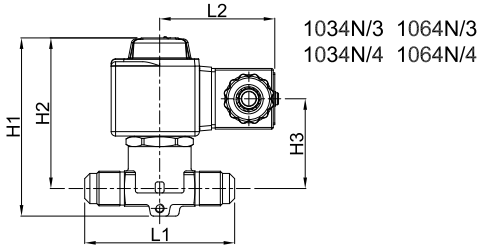
 (2) Check TA_{min} of the chosen coil



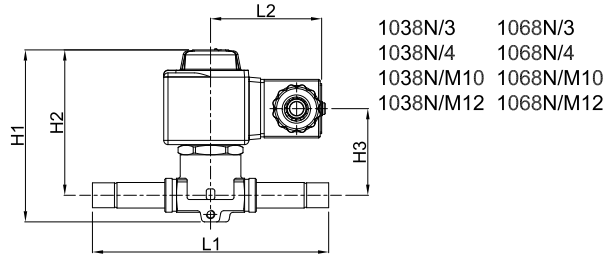
1020N/2
1020N/3



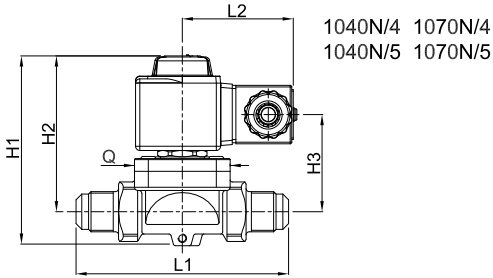
1028N/2
1028N/3
1028N/M10



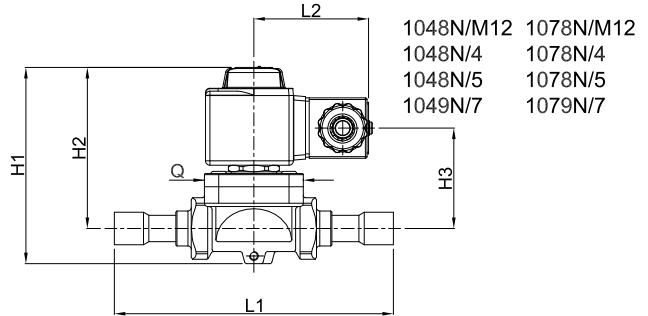
1034N/3 1064N/3
1034N/4 1064N/4



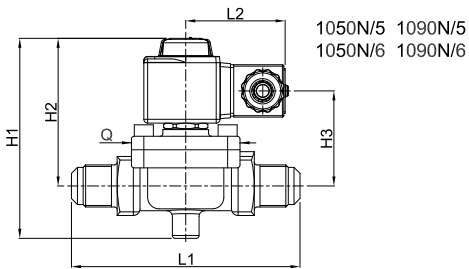
1038N/3 1068N/3
1038N/4 1068N/4
1038N/M10 1068N/M10
1038N/M12 1068N/M12



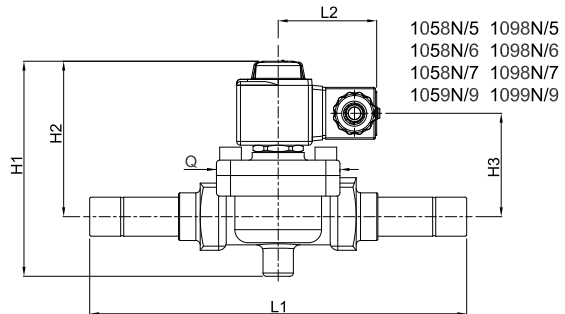
1040N/4 1070N/4
1040N/5 1070N/5



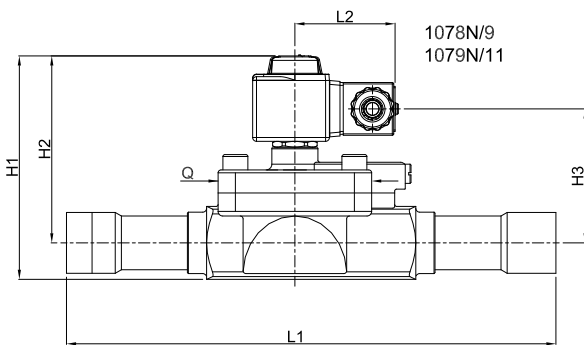
1048N/M12 1078N/M12
1048N/4 1078N/4
1048N/5 1078N/5
1049N/7 1079N/7



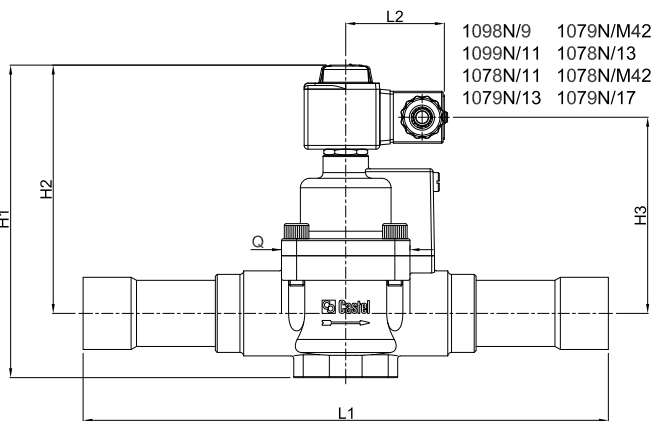
1050N/5 1090N/5
1050N/6 1090N/6



1058N/5 1098N/5
1058N/6 1098N/6
1058N/7 1098N/7
1059N/9 1099N/9



1078N/9
1079N/11



1098N/9 1079N/M42
1099N/11 1078N/13
1078N/11 1078N/M42
1079N/13 1079N/17

TABLE 7: Dimensions and weights of NC valves (high temperature) with 9300 coils (1)

Operating Principles	Catalogue Number	Dimensions [mm]						Weight [g]	
		H ₁	H ₂	H ₃	L ₁	L ₂	Q		
Direct Acting	1020N/2#	75	62,5	34	58	52	-	340	
	1020N/3#				65			355	
	1028N/2#				125			350	
	1028N/2#.E				125			350	
	1028N/3#				125			365	
	1028N/M10#				125			365	
Diaphragm Pilot Operated	1064N/3#	82	69,5	40	68	52	-	400	
	1064N/4#				72			415	
	1068N/3#				111			400	
	1068N/M10#				111			395	
	1068N/M12#				127			420	
	1068N/4#				127			420	
	1070N/4#	91	75	47	100		45	-	710
	1070N/5#				106				755
	1078N/M12#				127				690
	1078N/4#				127				680
	1078N/5#				175				775
	1079N/7#				190				765
	1090N/5#	106	78	50	120		57	-	1035
	1090N/6#				124				1365
	1098N/5#				175				995
	1098N/6#				175				1185
	1098N/7#				180				1170
	1099N/9#				216				1225
	1078N/9#	115	96	72	250		80	-	2565
	1079N/11#				292				2620
Piston Pilot Operated	1034N/3#	92,5	80	50,5	68	52	-	440	
	1034N/4#				72			457	
	1038N/3#				111			440	
	1038N/M10#				111			435	
	1038N/M12#				127			462	
	1038N/4#				127			462	
	1040N/4#	100,5	84,5	56,5	100		45	-	781
	1040N/5#				106				831
	1048N/M12#				127				759
	1048N/4#				127				748
	1048N/5#				175				853
	1049N/7#				190				842
	1050N/5#	121	93	65	120		57	-	1157
	1050N/6#				124				1487
	1058N/5#				175				1117
	1058N/6#				175				1307
	1058N/7#				180				1292
	1059N/9#				216				1347
	1098N/9#	157	127	99	235		60	-	2050
	1099N/11#				277				2130
	1078N/11#	175	141	113	278		68	-	2710
	1079N/13#								2750
	1079N/M42#								
	1078N/13#	190	153	125	280		88	-	3810
1078N/M42#	3810								
1079N/17#	3880								

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(1) : With coil 9320 the dimension L₂ is equal to 65 mm and the weights must be increased of 500 g.

Connectors are not included in the boxes and have to be ordered separately

TABLE 8: Refrigerant flow capacity of NC valves (high temperature) [kW]

Operating Principles	Catalogue Number	Liquid line											
		R134a	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020N/2#	2,98	4,40	2,08	3,02	3,00	2,01	2,20	2,63	2,74	2,75	2,78	2,12
	1020N/3#	3,91	5,78	2,74	3,96	3,95	2,65	2,89	3,46	3,60	3,62	3,66	2,79
	1028N/2#	2,55	3,77	1,79	2,58	2,58	1,73	1,89	2,26	2,35	2,36	2,39	1,82
	1028N/2#.E	3,91	5,78	2,74	3,96	3,95	2,65	2,89	3,46	3,60	3,62	3,66	2,79
	1028N/3#												
	1028N/M10#												
1028N/M12#													
Diaphragm Pilot Operated	1064N/3#	13,6	20,1	9,5	13,8	13,7	9,2	10,1	12,0	12,5	12,6	12,7	9,7
	1064N/4#												
	1068N/3#												
	1068N/M10#												
	1068N/M12#												
	1068N/4#												
	1070N/4#	37,4	55,3	26,2	37,9	37,8	25,3	27,7	33,1	34,4	34,6	35,0	26,7
	1070N/5#	44,4	65,6	31,1	45,0	44,8	30,0	32,8	39,3	40,8	41,0	41,5	31,7
	1078N/M12#	37,4	55,3	26,2	37,9	37,8	25,3	27,7	33,1	34,4	34,6	35,0	26,7
	1078N/4#												
	1078N/5#	44,4	65,6	31,1	45,0	44,8	30,0	32,8	39,3	40,8	41,0	41,5	31,7
	1079N/7#	64,6	95,5	45,2	65,5	65,2	43,7	47,8	57,2	59,5	59,7	60,5	46,1
	1090N/5#												
	1090N/6#												
	1098N/5#												
	1098N/6#												
	1098N/7#												
	1099N/9#	96,9	143,2	67,8	98,2	97,9	65,6	71,7	85,7	89,2	89,6	90,7	69,1
1078N/9#	170,0	251,3	119,0	172,3	171,7	115,0	125,8	150,4	156,5	157,2	159,1	121,3	
1079N/11#													
Piston Pilot Operated	1034N/3#	17,0	25,1	11,9	17,2	17,2	11,5	12,6	15,0	15,7	15,7	15,9	12,1
	1034N/4#												
	1038N/3#												
	1038N/M10#												
	1038N/M12#												
	1038N/4#												
	1040N/4#	40,8	60,3	28,6	41,4	41,2	27,6	30,2	36,1	37,6	37,7	38,2	29,1
	1040N/5#	51,0	75,4	35,7	51,7	51,5	34,5	37,7	45,1	47,0	47,2	47,7	36,4
	1048N/M12#	40,8	60,3	28,6	41,4	41,2	27,6	30,2	36,1	37,6	37,7	38,2	29,1
	1048N/4#												
	1048N/5#	51,0	75,4	35,7	51,7	51,5	34,5	37,7	45,1	47,0	47,2	47,7	36,4
	1049N/7#												
	1050N/5#	64,6	95,5	45,2	65,5	65,2	43,7	47,8	57,2	59,5	59,7	60,5	46,1
	1050N/6#	81,6	120,6	57,1	82,7	82,4	55,2	60,4	72,2	75,1	75,5	76,4	58,2
	1058N/5#	64,6	95,5	45,2	65,5	65,2	43,7	47,8	57,2	59,5	59,7	60,5	46,1
	1058N/6#	81,6	120,6	57,1	82,7	82,4	55,2	60,4	72,2	75,1	75,5	76,4	58,2
	1058N/7#	96,9	143,2	67,8	98,2	97,9	65,6	71,7	85,7	89,2	89,6	90,7	69,1
	1059N/9#												
	1098N/9#	170,0	251,3	119,0	172,3	171,7	115,0	125,8	150,4	156,5	157,2	159,1	121,3
	1099N/11#												
	1078N/11#	272,0	-	190,4	275,7	274,7	184,0	-	240,6	250,4	251,5	254,6	194,1
1079N/13#													
1079N/M42#													
1078N/13#	425,0	-	297,5	430,8	429,3	287,5	-	376,0	391,3	393,0	397,8	303,3	
1078N/M42#													
1079N/17#													

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Continued

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)	Temperature leaving evaporator	50 °F	(9,9 °C)
Liquid temperature	100 °F	(37,8 °C)	Evaporator superheating	10 °R	(5,5 °K)
Subcooling	10 °R	(5,5 °K)	Suction line temperature	65 °F	(18,3 °C)
Evaporating temperature	40 °F	(4,4 °C)	Suction superheating	15 °R	(8,4 °K)
			Discharge temperature	160 °F	(71,1 °C)

TABLE 8: Refrigerant flow capacity of NC valves (high temperature) [kW]

Operating Principles	Catalogue Number	Suction line											
		R134a	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020N/2#	-	-	-	-	-	-	-	-	-	-	-	-
	1020N/3#												
	1028N/2#												
	1028N/2#.E												
	1028N/3#												
	1028N/M10#												
Diaphragm Pilot Operated	1064N/3#	1,46	3,40	1,76	1,82	2,64	1,78	1,18	1,14	1,92	1,76	1,27	1,69
	1064N/4#												
	1068N/3#												
	1068N/M10#												
	1068N/M12#												
	1068N/4#												
	1070N/4#	4,00	9,35	4,84	4,99	7,26	4,91	3,23	3,12	5,28	4,84	3,50	4,64
	1070N/5#	4,75	11,09	5,74	5,92	8,61	5,82	3,84	3,71	6,26	5,74	4,15	5,51
	1078N/M12#	4,00	9,35	4,84	4,99	7,26	4,91	3,23	3,12	5,28	4,84	3,50	4,64
	1078N/4#												
	1078N/5#	4,75	11,09	5,74	5,92	8,61	5,82	3,84	3,71	6,26	5,74	4,15	5,51
	1079N/7#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0
	1090N/5#												
	1090N/6#												
	1090N/6#												
	1098N/5#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0
	1098N/6#	8,7	20,4	10,6	10,9	15,8	10,7	7,1	6,8	11,5	10,6	7,6	10,1
	1098N/5#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0
1098N/6#	8,7	20,4	10,6	10,9	15,8	10,7	7,1	6,8	11,5	10,6	7,6	10,1	
1098N/7#	10,4	24,2	12,5	12,9	18,8	12,7	8,4	8,1	13,7	12,5	9,1	12,0	
1099N/9#													
1078N/9#	18,2	42,5	22,0	22,7	33,0	22,3	14,7	14,2	24,0	22,0	15,9	21,1	
1079N/11#	1,82	4,25	2,20	2,27	3,30	2,23	1,47	1,42	2,40	2,20	1,59	2,11	
1034N/3#													
1034N/4#													
1038N/3#													
1038N/M10#													
1038N/M12#													
1038N/4#													
1040N/4#	4,37	10,20	5,28	5,45	7,92	5,35	3,53	3,41	5,76	5,28	3,82	5,06	
1040N/5#	5,46	12,75	6,60	6,81	9,90	6,69	4,41	4,26	7,20	6,60	4,77	6,33	
1048N/M12#	4,37	10,20	5,28	5,45	7,92	5,35	3,53	3,41	5,76	5,28	3,82	5,06	
1048N/4#													
1048N/5#	5,46	12,75	6,60	6,81	9,90	6,69	4,41	4,26	7,20	6,60	4,77	6,33	
1049N/7#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0	
1050N/5#													
1050N/6#													
1050N/6#													
1058N/5#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0	
1058N/6#	8,7	20,4	10,6	10,9	15,8	10,7	7,1	6,8	11,5	10,6	7,6	10,1	
1058N/5#	6,9	16,2	8,4	8,6	12,5	8,5	5,6	5,4	9,1	8,4	6,0	8,0	
1058N/6#	8,7	20,4	10,6	10,9	15,8	10,7	7,1	6,8	11,5	10,6	7,6	10,1	
1058N/7#	10,4	24,2	12,5	12,9	18,8	12,7	8,4	8,1	13,7	12,5	9,1	12,0	
1059N/9#													
1098N/9#	18,2	42,5	22,0	22,7	33,0	22,3	14,7	14,2	24,0	22,0	15,9	21,1	
1099N/11#	29,1	-	35,2	36,3	52,8	35,7	-	22,7	38,4	35,2	25,4	33,8	
1078N/11#													
1079N/13#													
1079N/M42#													
1078N/13#	45,5	-	55,0	56,8	82,5	55,8	-	35,5	60,0	55,0	39,8	52,8	
1078N/M42#													
1078N/13#													
1079N/17#													

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Continued

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)	Temperature leaving evaporator	50 °F	(9,9 °C)
Liquid temperature	100 °F	(37,8 °C)	Evaporator superheating	10 °R	(5,5 °K)
Subcooling	10 °R	(5,5 °K)	Suction line temperature	65 °F	(18,3 °C)
Evaporating temperature	40 °F	(4,4 °C)	Suction superheating	15 °R	(8,4 °K)
			Discharge temperature	160 °F	(71,1 °C)

TABLE 8: Refrigerant flow capacity of NC valves (high temperature) [kW]

Operating Principles	Catalogue Number	Hot Gas line											
		R134a	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020N/2#	1,49	3,18	1,68	2,08	2,38	1,67	1,16	1,20	2,07	1,89	1,34	1,75
	1020N/3#	1,96	4,18	2,21	2,74	3,13	2,19	1,53	1,58	2,71	2,48	1,76	2,30
	1028N/2#	1,28	2,72	1,44	1,79	2,04	1,43	1,00	1,03	1,77	1,62	1,15	1,50
	1028N/2#.E	1,96	4,18	2,21	2,74	3,13	2,19	1,53	1,58	2,71	2,48	1,76	2,30
	1028N/3#												
	1028N/M10#												
1028N/M12#													
Diaphragm Pilot Operated	1064N/3#	6,8	14,5	7,7	9,5	10,9	7,6	5,3	5,5	9,4	8,6	6,1	8,0
	1064N/4#												
	1068N/3#												
	1068N/M10#												
	1068N/M12#												
	1068N/4#												
	1070N/4#	18,7	40,0	21,1	26,2	29,9	21,0	14,6	15,1	26,0	23,7	16,8	22,0
	1070N/5#	22,2	47,4	25,1	31,1	35,5	24,9	17,3	17,9	30,8	28,1	20,0	26,0
	1078N/M12#	18,7	40,0	21,1	26,2	29,9	21,0	14,6	15,1	26,0	23,7	16,8	22,0
	1078N/4#												
	1078N/5#	22,2	47,4	25,1	31,1	35,5	24,9	17,3	17,9	30,8	28,1	20,0	26,0
	1079N/7#	32,3	69,0	36,5	45,2	51,7	36,3	25,2	26,0	44,8	41,0	29,1	37,9
	1090N/5#	40,8	87,2	46,1	57,1	65,3	45,8	31,9	32,9	56,6	51,7	36,7	47,9
	1090N/6#	32,3	69,0	36,5	45,2	51,7	36,3	25,2	26,0	44,8	41,0	29,1	37,9
	1098N/5#	40,8	87,2	46,1	57,1	65,3	45,8	31,9	32,9	56,6	51,7	36,7	47,9
	1098N/6#	48,5	103,5	54,7	67,8	77,5	54,4	37,8	39,0	67,3	61,4	43,6	56,9
	1098N/7#	85,0	181,6	96,0	119,0	136,0	95,4	66,4	68,5	118,0	107,8	76,5	99,8
	1099N/9#												
1078N/9#	85,0	181,6	96,0	119,0	136,0	95,4	66,4	68,5	118,0	107,8	76,5	99,8	
1079N/11#	8,5	18,2	9,6	11,9	13,6	9,5	6,6	6,9	11,8	10,8	7,7	10,0	
1034N/3#													
1034N/4#													
1038N/3#													
1038N/M10#													
1038N/M12#													
1038N/4#													
1040N/4#	20,4	43,6	23,0	28,6	32,6	22,9	15,9	16,4	28,3	25,9	18,4	24,0	
1040N/5#	25,5	54,5	28,8	35,7	40,8	28,6	19,9	20,6	35,4	32,3	23,0	29,9	
1048N/M12#	20,4	43,6	23,0	28,6	32,6	22,9	15,9	16,4	28,3	25,9	18,4	24,0	
1048N/4#													
1048N/5#	25,5	54,5	28,8	35,7	40,8	28,6	19,9	20,6	35,4	32,3	23,0	29,9	
1049N/7#	32,3	69,0	36,5	45,2	51,7	36,3	25,2	26,0	44,8	41,0	29,1	37,9	
1050N/5#	40,8	87,2	46,1	57,1	65,3	45,8	31,9	32,9	56,6	51,7	36,7	47,9	
1050N/6#	32,3	69,0	36,5	45,2	51,7	36,3	25,2	26,0	44,8	41,0	29,1	37,9	
1058N/5#	40,8	87,2	46,1	57,1	65,3	45,8	31,9	32,9	56,6	51,7	36,7	47,9	
1058N/6#	48,5	103,5	54,7	67,8	77,5	54,4	37,8	39,0	67,3	61,4	43,6	56,9	
1058N/7#	85,0	181,6	96,0	119,0	136,0	95,4	66,4	68,5	118,0	107,8	76,5	99,8	
1059N/9#													
1098N/9#	85,0	181,6	96,0	119,0	136,0	95,4	66,4	68,5	118,0	107,8	76,5	99,8	
1099N/11#	136,0	-	153,6	190,4	217,6	152,6	-	109,6	188,8	172,5	122,4	159,7	
1078N/11#													
1079N/13#													
1079N/M42#													
1078N/13#	212,5	-	240,0	297,5	340,0	238,5	-	171,3	295,0	269,5	191,3	249,5	
1078N/M42#													
1079N/17#													

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Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)	Temperature leaving evaporator	50 °F	(9,9 °C)
Liquid temperature	100 °F	(37,8 °C)	Evaporator superheating	10 °R	(5,5 °K)
Subcooling	10 °R	(5,5 °K)	Suction line temperature	65 °F	(18,3 °C)
Evaporating temperature	40 °F	(4,4 °C)	Suction superheating	15 °R	(8,4 °K)
			Discharge temperature	160 °F	(71,1 °C)

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