



HANDBOOK  
**SOLENOID VALVES**

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Ed. 2017

 **Castel**<sup>®</sup>  
Italian technology

# CHAPTER 7 ■

## NORMALLY-CLOSED SOLENOID VALVES

### CERTIFIED BY UNDERWRITERS LABORATORIES INC.

#### FOR REFRIGERATION PLANTS THAT USE HCFC, HFC OR HFO REFRIGERANTS



#### APPLICATION

The solenoid valves illustrated in this chapter are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants that use the following refrigerant fluids:

- HCFC (R22)
- 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.

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

#### 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 valves are exclusively sold in the model without coil (S suffix).

These valves must be coupled with the coils in series 9105, 9115, 9116, 9125, 9185, and 9186.

The valves series 1020UL and 1028UL 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 1064UL, 1068UL, 1070UL, 1078UL (excluded /11, /13, and /M42), 1079UL (excluded /13, /M42, and /17), 1090UL, 1098UL (excluded /9) and 1099UL (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 1034UL, 1038UL, 1040UL, 1048UL, 1049UL, 1050UL, 1058UL, 1059UL, 1078UL (/11, /13, and /M42), 1079UL (/13, /M42, and /17), 1098/9UL, and 1099/11UL are pilot-operated piston 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 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 that make up the solenoid valves presented 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.
- Chloroprene rubber (CR) for the 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 22 and 23 and the capacities indicated in TABLE 25. TABLES 22 and 23 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.

## APPROVALS

The solenoid valves series: 1020UL, 1028UL, 1034UL, 1038UL, 1040UL, 1048UL, 1049UL, 1050UL, 1058UL, 1059UL, 1064UL, 1068UL, 1070UL, 1078UL, 1079UL, 1090UL, 1098UL, and 1099UL have been approved by the American certification body Underwriters Laboratories Inc. The valves are certified **UL-CSA Listed** for the USA and Canada with file MH50005, in compliance with American standard UL 429 and Canadian standard C22.2 No. 139-13.

**N.B.: The UL Listed certification is valid only if the above-listed valves are coupled with the coils in series 9115, 9116, 9185, or 9186 illustrated in Chapter 11. If the same valves are coupled with coils in series 9105 and 9125, again illustrated in Chapter 11, a “UL Listed” certified valve is not obtained; rather, you obtain a “UL Recognized” certified valve.**

The coils in series 9105, 9115, 9116, 9125, 9185, and 9186 with voltages of 120 VAC, 208 VAC, 220/230 VAC, 240 VAC comply with the Low Voltage Directive, 2006/95/EC and the Electromagnetic Compatibility Directive (EMC) 2004/108/EC.

## TRACEABILITY

Direct action valves in series 1020 UL and 1028UL 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.

Pilot-operated diaphragm and piston valves in series 1034UL, 1038UL, 1040UL, 1048UL, 1049UL, 1050UL, 1058UL, 1059UL, 1064UL, 1068UL, 1070UL, 1078UL, 1079UL, 1090UL, 1098UL and 1099UL are identified by marking on the yellow locking ring-nut for the coil. The marking on the ring-nut includes the following data: valve code, PS, and production lot.

**TABLE 22: General characteristics of NC valves with SAE Flare connections, UL Listed approved**

Operating Principles	Catalogue Number	SAE Flare Connections	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	
					min OPD	MOPD			min.	max.	min.	max.		
						coil series								
						9105 9115 9116 (AC)	9125 9185 9186 (AC)							9125 9185 9186 (DC)
Direct Acting	1020UL/2S	1/4"	2,5	0,175	0	21	35	19	45	-35	+110 (2)	-20	+50	Art. 4.3
	1020UL/3S	3/8"	3	0,23										
Diaphragm Pilot Operated	1064UL/3S	3/8"	6,5	0,80	0,05	21	35	18	45	-35	+105 (1)	-20	+50	Art. 4.3
	1064UL/4S	1/2"												
	1070UL/4S	1/2"	12,5	2,20				18	41,5					
	1070UL/5S	5/8"												
	1090UL/5S	5/8"	4,80											
	1090UL/6S	3/4"												
Piston Pilot Operated	1034UL/3S	3/8"	6,5	1,00	0,05	21	35	19	45	-35	+110 (2)	-20	+50	Art. 4.3
	1034UL/4S	1/2"												
	1040UL/4S	1/2"	12,5	2,40				18	41,5					
	1040UL/5S	5/8"												
	1050UL/5S	5/8"	4,80											
	1050UL/6S	3/4"												

(1) Temperature peaks of 120 °C are allowed during defrosting

(2) Temperature peaks of 130 °C are allowed during defrosting

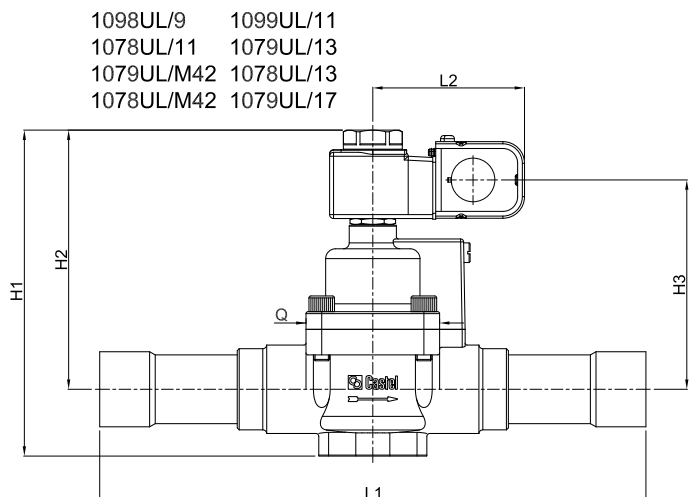
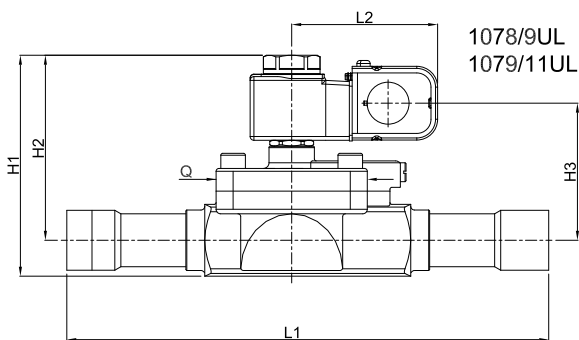
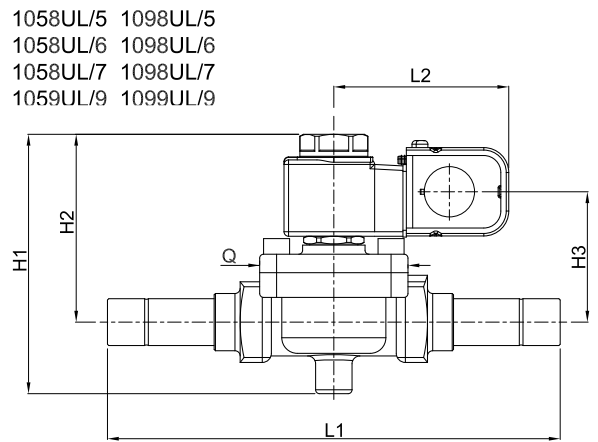
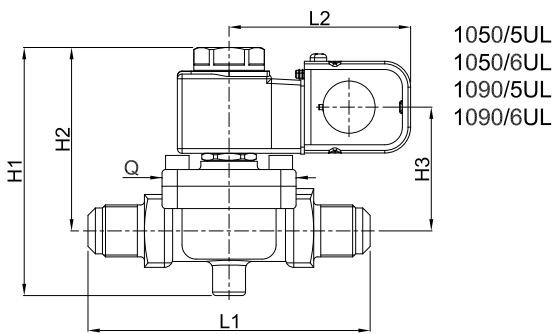
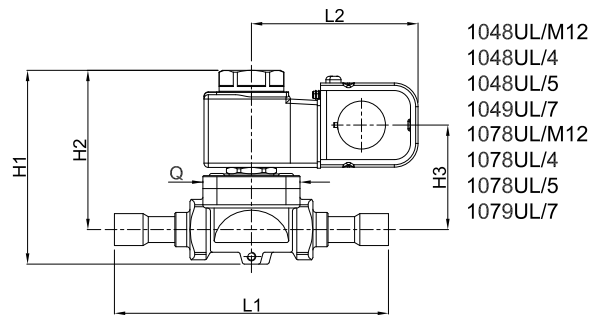
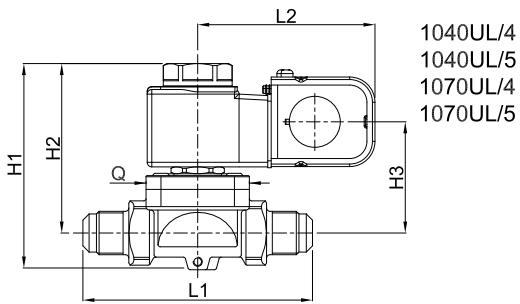
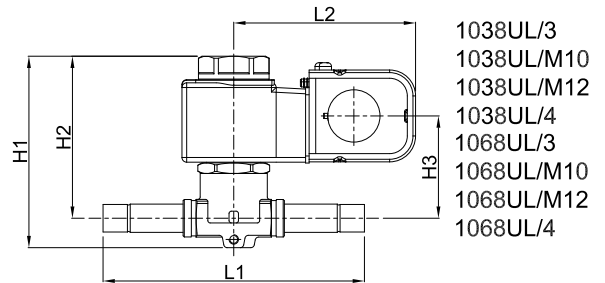
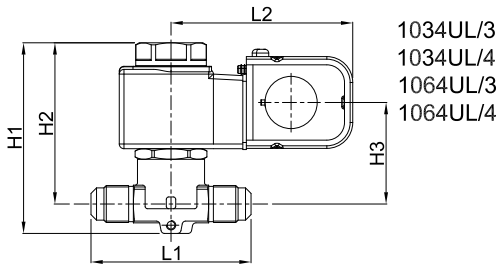
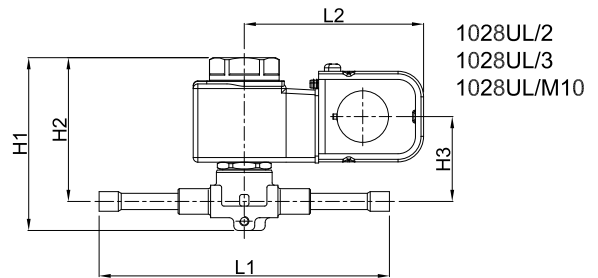
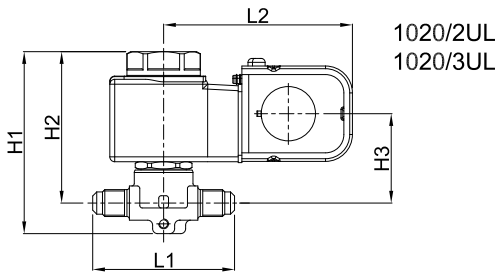
**TABLE 23: General characteristics of NC valves with ODS connections, UL Listed approved**

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.	max.				
							coil series										
							9105 9115 9116 (AC)	9125 9185 9186 (AC)							9125 9185 9186 (DC)		
Direct Acting	1028UL/2S	1/4"	–	2,2	0,15	0	21	35	19	45	– 35	+110 (2)	–20	+50	Art. 4.3		
	1028UL/2S.E	1/4"	–	3	0,23												
	1028UL/3S	3/8"	–														
	1028UL/M10S	–	10														
Diaphragm Pilot Operated	1068UL/3S	3/8"	–	6,5	0,80	0,05	21	35	19	45	– 35	+105 (1)	–20	+50	Art. 4.3		
	1068UL/M10S	–	10														
	1068UL/M12S	–	12														
	1068UL/4S	1/2"	–														
	1078UL/M12S	–	12	2,20													
	1078UL/4S	1/2"	–	12,5	2,61												
	1078UL/5S	5/8"	16														
	1079UL/7S	7/8"	22														
	1098UL/5S	5/8"	16	16,5	3,80				13	34,5							
	1098UL/6S	3/4"	–													4,80	
	1098UL/7S	7/8"	22														
1099UL/9S	1.1/8"	–	5,70														
Piston Pilot Operated	1038UL/3S	3/8"	–	6,5	1,00	0,05	21	35	19	45	– 35	+110 (2)	–20	+50	Art. 4.3		
	1038UL/M10S	–	10														
	1038UL/M12S	–	12														
	1038UL/4S	1/2"	–														
	1048UL/M12S	–	12	12,5	2,40				0,07	18						41,5	
	1048UL/4S	1/2"	–														
	1048UL/5S	5/8"	16														3,00
	1049UL/7S	7/8"	22														
	1058UL/5S	5/8"	16	16,5	3,80				13	41,5							
	1058UL/6S	3/4"	–													4,80	
	1058UL/7S	7/8"	22														
	1059UL/9S	1.1/8"	–													5,70	
	1098UL/9S	1.1/8"	–	25	10				0,1	18						34,5	
	1099UL/11S	1.3/8"	35	27	16												
	1078UL/11S	1.3/8"	35														
	1079UL/13S	1.5/8"	–														
	1079UL/M42S	–	42	34	25				0,15	18						30	
	1078UL/13S	1.5/8"	–														
1078UL/M42S	–	42															
1079UL/17S	2.1/8"	54													I		

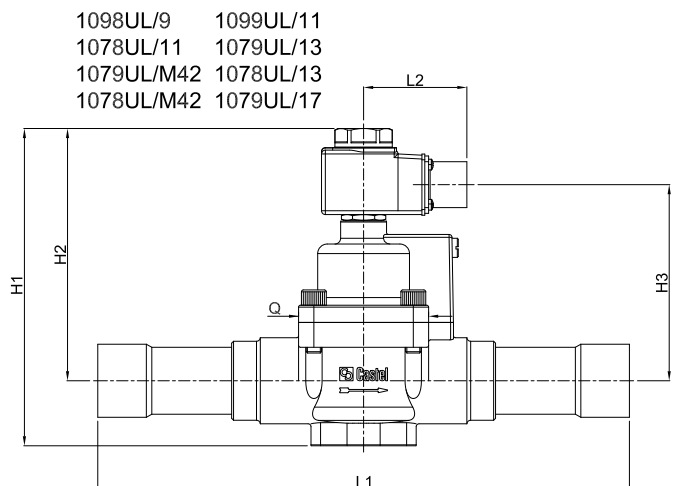
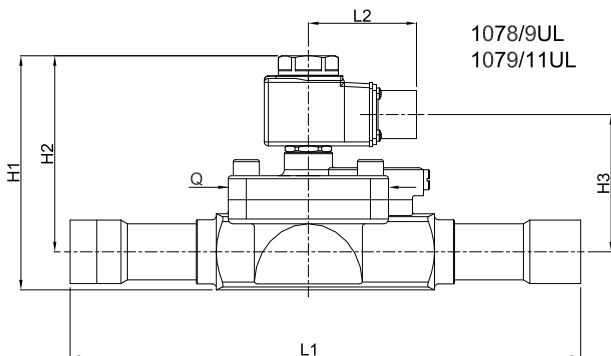
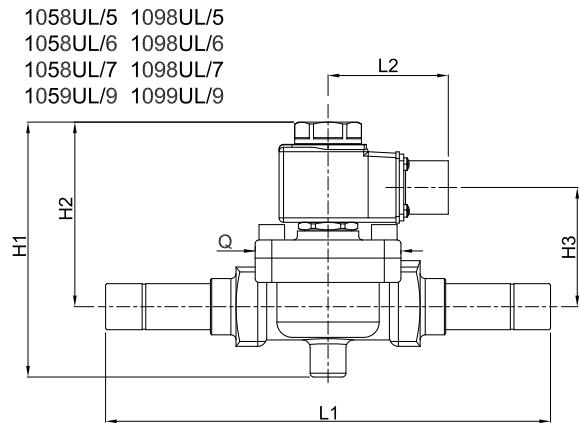
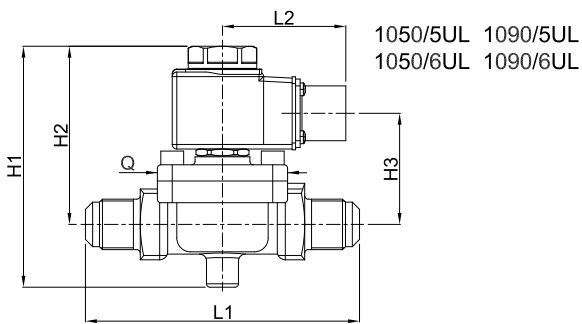
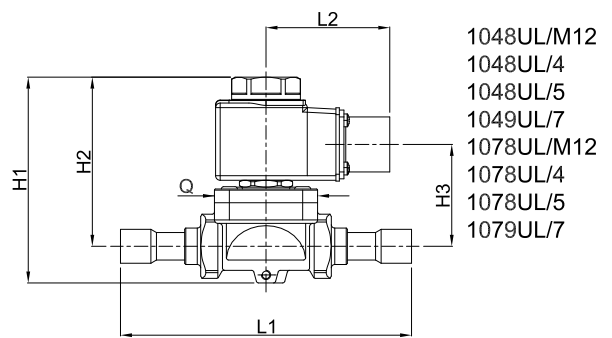
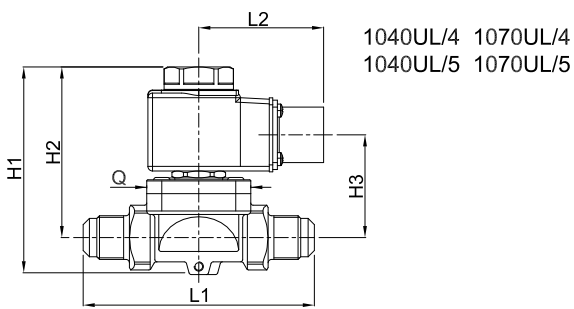
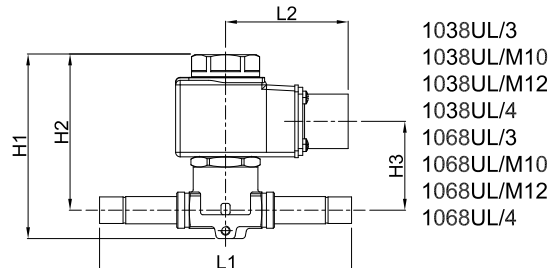
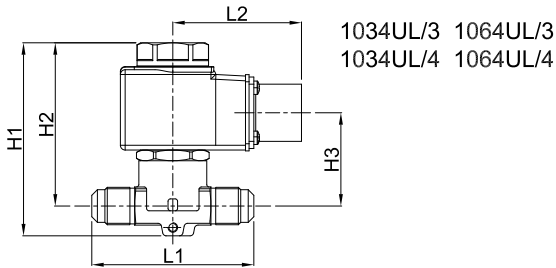
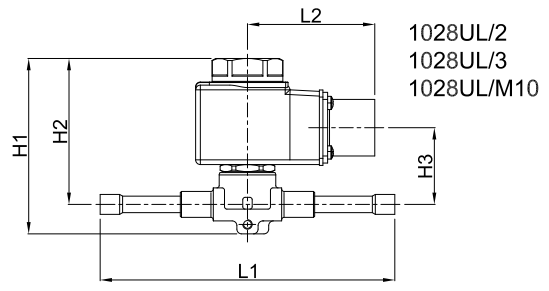
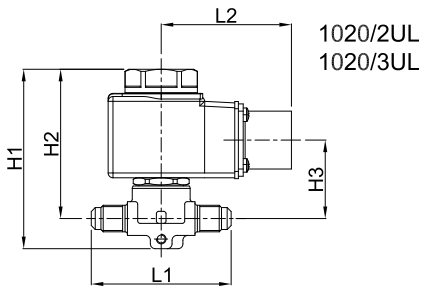
(1) Temperature peaks of 120 °C are allowed during defrosting

(2) Temperature peaks of 130 °C are allowed during defrosting

# JUNCTION BOX CONNECTION



# CONDUIT HUB CONNECTION



**TABLE 24: Dimensions and weights of NC valves with 9105 coils (1), UL Listed approved**

Operating Principles	Catalogue Number	Dimensions [mm]						Weight [g]	
		H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	L <sub>1</sub>	L <sub>2</sub>	Q		
Direct Acting	1020UL/2S	75	62,5	34	58	52	-	340	
	1020UL/3S				65			355	
	1028UL/2S				125			350	
	1028UL/2S.E				125			350	
	1028UL/3S				125			365	
	1028UL/M10S				125			365	
Diaphragm Pilot Operated	1064UL/3S	82	69,5	40	68	52	-	400	
	1064UL/4S				72			415	
	1068UL/3S				111			400	
	1068UL/M10S				111			395	
	1068UL/M12S				127			420	
	1068UL/4S				127			420	
	1070UL/4S	91	75	47	100		45	45	710
	1070UL/5S				106				755
	1078UL/M12S				127				690
	1078UL/4S				127				680
	1078UL/5S				175				775
	1079UL/7S				190				765
	1090UL/5S	106	78	50	120		57	57	1035
	1090UL/6S				124				1365
	1098UL/5S				175				995
	1098UL/6S				175				1185
	1098UL/7S				180				1170
	1099UL/9S				216				1225
Piston Pilot Operated	1034UL/3S	92,5	80	50,5	68	52	-	440	
	1034UL/4S				72			457	
	1038UL/3S				111			440	
	1038UL/M10S				111			435	
	1038UL/M12S				127			462	
	1038UL/4S				127			462	
	1040UL/4S	100,5	84,5	56,5	100		45	45	781
	1040UL/5S				106				831
	1048UL/M12S				127				759
	1048UL/4S				127				748
	1048UL/5S				175				853
	1049UL/7S				190				842
	1050UL/5S	121	93	65	120		57	57	1157
	1050UL/6S				124				1487
	1058UL/5S				175				1117
	1058UL/6S				175				1307
	1058UL/7S				180				1292
	1059UL/9S				216				1347
	1098UL/9S	157	127	99	235		60	60	2050
	1099UL/11S				277				2130
	1078UL/11S	175	141	113	278		68	68	2710
	1079UL/13S								2750
	1079UL/M42S								2750
	1078UL/13S	190	153	125	280		88	88	3810
1078UL/M42S	3810								
1079UL/17S	3880								

With coil 9125 the dimension L<sub>2</sub> is equal to 65 mm and the weights must be increased of 500 g.

With coil 9115 the dimension L<sub>2</sub> is equal to 77 mm and the weights must be increased of 310 g.

With coil 9116 the dimension L<sub>2</sub> is equal to 54 mm and the weights must be increased of 240 g.

With coil 9185 the dimension L<sub>2</sub> is equal to 90 mm and the weights must be increased of 590 g.

With coil 9186 the dimension L<sub>2</sub> is equal to 67 mm and the weights must be increased of 472 g.

Connectors are not included in the boxes and have to be ordered separately for coils 9015 and 9125.



**TABLE 25: Refrigerant flow capacity of NC valves [kW], UL Listed approved**

Operating Principles	Catalogue Number	Liquid line										
		R134a	R22	R404A	R407C	R410A	R507	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020UL/2S	2,98	3,20	2,08	3,02	3,00	2,01	2,63	2,74	2,75	2,78	2,12
	1020UL/3S	3,91	4,21	2,74	3,96	3,95	2,65	3,46	3,60	3,62	3,66	2,79
	1028UL/2S	2,55	2,75	1,79	2,58	2,58	1,73	2,26	2,35	2,36	2,39	1,82
	1028UL/2S.E	3,91	4,21	2,74	3,96	3,95	2,65	3,46	3,60	3,62	3,66	2,79
	1028UL/3S											
1028UL/M10S												
Diaphragm Pilot Operated	1064UL/3S	13,6	14,6	9,5	13,8	13,7	9,2	12,0	12,5	12,6	12,7	9,7
	1064UL/4S											
	1068UL/3S											
	1068UL/M10S											
	1068UL/M12S											
	1068UL/4S											
	1070UL/4S	37,4	40,3	26,2	37,9	37,8	25,3	33,1	34,4	34,6	35,0	26,7
	1070UL/5S	44,4	47,8	31,1	45,0	44,8	30,0	39,3	40,8	41,0	41,5	31,7
	1078UL/M12S	37,4	40,3	26,2	37,9	37,8	25,3	33,1	34,4	34,6	35,0	26,7
	1078UL/4S											
	1078UL/5S	44,4	47,8	31,1	45,0	44,8	30,0	39,3	40,8	41,0	41,5	31,7
	1079UL/7S	64,6	69,5	45,2	65,5	65,2	43,7	57,2	59,5	59,7	60,5	46,1
	1090UL/5S	81,6	87,8	57,1	82,7	82,4	55,2	72,2	75,1	75,5	76,4	58,2
	1090UL/6S	64,6	69,5	45,2	65,5	65,2	43,7	57,2	59,5	59,7	60,5	46,1
	1098UL/5S	81,6	87,8	57,1	82,7	82,4	55,2	72,2	75,1	75,5	76,4	58,2
1098UL/6S	96,9	104,3	67,8	98,2	97,9	65,6	85,7	89,2	89,6	90,7	69,1	
1098UL/7S												
1099UL/9S												
Piston Pilot Operated	1034UL/3S	17,0	18,3	11,9	17,2	17,2	11,5	15,0	15,7	15,7	15,9	12,1
	1034UL/4S											
	1038UL/3S											
	1038UL/M10S											
	1038UL/M12S											
	1038UL/4S											
	1040UL/4S	40,8	43,9	28,6	41,4	41,2	27,6	36,1	37,6	37,7	38,2	29,1
	1040UL/5S	51,0	54,9	35,7	51,7	51,5	34,5	45,1	47,0	47,2	47,7	36,4
	1048UL/M12S	40,8	43,9	28,6	41,4	41,2	27,6	36,1	37,6	37,7	38,2	29,1
	1048UL/4S											
	1048UL/5S	51,0	54,9	35,7	51,7	51,5	34,5	45,1	47,0	47,2	47,7	36,4
	1049UL/7S	64,6	69,5	45,2	65,5	65,2	43,7	57,2	59,5	59,7	60,5	46,1
	1050UL/5S	81,6	87,8	57,1	82,7	82,4	55,2	72,2	75,1	75,5	76,4	58,2
	1050UL/6S	64,6	69,5	45,2	65,5	65,2	43,7	57,2	59,5	59,7	60,5	46,1
	1058UL/5S	81,6	87,8	57,1	82,7	82,4	55,2	72,2	75,1	75,5	76,4	58,2
	1058UL/6S	96,9	104,3	67,8	98,2	97,9	65,6	85,7	89,2	89,6	90,7	69,1
	1058UL/7S											
	1059UL/9S											
	1098UL/9S	170,0	183,0	119,0	172,3	171,7	115,0	150,4	156,5	157,2	159,1	121,3
	1099UL/11S											
1078UL/11S	272,0	292,8	190,4	275,7	274,7	184,0	240,6	250,4	251,5	254,6	194,1	
1079UL/13S												
1079UL/M42S												
1078UL/13S	425,0	457,5	297,5	430,8	429,3	287,5	376,0	391,3	393,0	397,8	303,3	
1078UL/M42S												
1079UL/17S												

Standard rating conditions according to AHRI Standard 760-2007

Continued

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 25: Refrigerant flow capacity of NC valves [kW], UL Listed approved**

Operating Principles	Catalogue Number	Suction line										
		R134a	R22	R404A	R407C	R410A	R507	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020UL/2S	-	-	-	-	-	-	-	-	-	-	-
	1020UL/3S											
	1028UL/2S											
	1028UL/2S.E											
	1028UL/3S											
	1028UL/M10S											
Diaphragm Pilot Operated	1064UL/3S	1,46	2,04	1,76	1,82	2,64	1,78	1,14	1,92	1,76	1,27	1,69
	1064UL/4S											
	1068UL/3S											
	1068UL/M10S											
	1068UL/M12S											
	1068UL/4S											
	1070UL/4S	4,00	5,61	4,84	4,99	7,26	4,91	3,12	5,28	4,84	3,50	4,64
	1070UL/5S	4,75	6,66	5,74	5,92	8,61	5,82	3,71	6,26	5,74	4,15	5,51
	1078UL/M12S	4,00	5,61	4,84	4,99	7,26	4,91	3,12	5,28	4,84	3,50	4,64
	1078UL/4S											
	1078UL/5S	4,75	6,66	5,74	5,92	8,61	5,82	3,71	6,26	5,74	4,15	5,51
	1079UL/7S	6,9	9,7	8,4	8,6	12,5	8,5	5,4	9,1	8,4	6,0	8,0
	1090UL/5S	8,7	12,2	10,6	10,9	15,8	10,7	6,8	11,5	10,6	7,6	10,1
	1090UL/6S	6,9	9,7	8,4	8,6	12,5	8,5	5,4	9,1	8,4	6,0	8,0
	1098UL/5S	8,7	12,2	10,6	10,9	15,8	10,7	6,8	11,5	10,6	7,6	10,1
	1098UL/6S	10,4	14,5	12,5	12,9	18,8	12,7	8,1	13,7	12,5	9,1	12,0
	1098UL/7S	10,4	14,5	12,5	12,9	18,8	12,7	8,1	13,7	12,5	9,1	12,0
1099UL/9S												
Piston Pilot Operated	1034UL/3S	1,82	2,55	2,20	2,27	3,30	2,23	1,42	2,40	2,20	1,59	2,11
	1034UL/4S											
	1038UL/3S											
	1038UL/M10S											
	1038UL/M12S											
	1038UL/4S											
	1040UL/4S	4,37	6,12	5,28	5,45	7,92	5,35	3,41	5,76	5,28	3,82	5,06
	1040UL/5S	5,46	7,65	6,60	6,81	9,90	6,69	4,26	7,20	6,60	4,77	6,33
	1048UL/M12S	4,37	6,12	5,28	5,45	7,92	5,35	3,41	5,76	5,28	3,82	5,06
	1048UL/4S											
	1048UL/5S	5,46	7,65	6,60	6,81	9,90	6,69	4,26	7,20	6,60	4,77	6,33
	1049UL/7S	6,9	9,7	8,4	8,6	12,5	8,5	5,4	9,1	8,4	6,0	8,0
	1050UL/5S	8,7	12,2	10,6	10,9	15,8	10,7	6,8	11,5	10,6	7,6	10,1
	1050UL/6S	6,9	9,7	8,4	8,6	12,5	8,5	5,4	9,1	8,4	6,0	8,0
	1058UL/5S	8,7	12,2	10,6	10,9	15,8	10,7	6,8	11,5	10,6	7,6	10,1
	1058UL/6S	10,4	14,5	12,5	12,9	18,8	12,7	8,1	13,7	12,5	9,1	12,0
	1058UL/7S	10,4	14,5	12,5	12,9	18,8	12,7	8,1	13,7	12,5	9,1	12,0
	1059UL/9S											
	1098UL/9S	18,2	25,5	22,0	22,7	33,0	22,3	14,2	24,0	22,0	15,9	21,1
	1099UL/11S	29,1	40,8	35,2	36,3	52,8	35,7	22,7	38,4	35,2	25,4	33,8
1078UL/11S												
1079UL/13S												
1079UL/M42S												
1078UL/13S	45,5	63,8	55,0	56,8	82,5	55,8	35,5	60,0	55,0	39,8	52,8	
1078UL/M42S												
1079UL/17S												

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature  
Liquid temperature  
Subcooling  
Evaporating temperature

110 °F (43,3 °C)  
100 °F (37,8 °C)  
10 °R (5,5 °K)  
40 °F (4,4 °C)

Temperature leaving evaporator  
Evaporator superheating  
Suction line temperature  
Suction superheating  
Discharge temperature

50 °F (9,9 °C)  
10 °R (5,5 °K)  
65 °F (18,3 °C)  
15 °R (8,4 °K)  
160 °F (71,1 °C)

Continued

**TABLE 25: Refrigerant flow capacity of NC valves [kW], UL Listed approved**

Operating Principles	Catalogue Number	Hot Gas line										
		R134a	R22	R404A	R407C	R410A	R507	R1234ze	R448A	R449A	R450A	R452A
Direct Acting	1020UL/2S	1,96	3,18	2,08	2,38	1,67	1,16	2,07	1,89	1,34	1,75	1,75
	1020UL/3S	2,58	4,18	2,74	3,13	2,19	1,53	2,71	2,48	1,76	2,30	2,30
	1028UL/2S	1,68	2,72	1,79	2,04	1,43	1,00	1,77	1,62	1,15	1,50	1,50
	1028UL/2S.E	2,58	4,18	2,74	3,13	2,19	1,53	2,71	2,48	1,76	2,30	2,30
	1028UL/3S											
	1028UL/M10S											
1028UL/M10S												
Diaphragm Pilot Operated	1064UL/3S	6,8	9,0	7,7	9,5	10,9	7,6	5,5	9,4	8,6	6,1	8,0
	1064UL/4S											
	1068UL/3S											
	1068UL/M10S											
	1068UL/M12S											
	1068UL/4S											
	1070UL/4S	18,7	24,6	21,1	26,2	29,9	21,0	15,1	26,0	23,7	16,8	22,0
	1070UL/5S	22,2	29,2	25,1	31,1	35,5	24,9	17,9	30,8	28,1	20,0	26,0
	1078UL/M12S	18,7	24,6	21,1	26,2	29,9	21,0	15,1	26,0	23,7	16,8	22,0
	1078UL/4S											
	1078UL/5S	22,2	29,2	25,1	31,1	35,5	24,9	17,9	30,8	28,1	20,0	26,0
	1079UL/7S	32,3	42,6	36,5	45,2	51,7	36,3	26,0	44,8	41,0	29,1	37,9
	1090UL/5S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1090UL/6S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1098UL/5S	32,3	42,6	36,5	45,2	51,7	36,3	26,0	44,8	41,0	29,1	37,9
	1098UL/6S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1098UL/7S	48,5	63,8	54,7	67,8	77,5	54,4	39,0	67,3	61,4	43,6	56,9
	1099UL/9S											
Piston Pilot Operated	1034UL/3S	8,5	11,2	9,6	11,9	13,6	9,5	6,9	11,8	10,8	7,7	10,0
	1034UL/4S											
	1038UL/3S											
	1038UL/M10S											
	1038UL/M12S											
	1038UL/4S											
	1040UL/4S	20,4	26,9	23,0	28,6	32,6	22,9	16,4	28,3	25,9	18,4	24,0
	1040UL/5S	25,5	33,6	28,8	35,7	40,8	28,6	20,6	35,4	32,3	23,0	29,9
	1048UL/M12S	20,4	26,9	23,0	28,6	32,6	22,9	16,4	28,3	25,9	18,4	24,0
	1048UL/4S											
	1048UL/5S	25,5	33,6	28,8	35,7	40,8	28,6	20,6	35,4	32,3	23,0	29,9
	1049UL/7S	32,3	42,6	36,5	45,2	51,7	36,3	26,0	44,8	41,0	29,1	37,9
	1050UL/5S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1050UL/6S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1058UL/5S	32,3	42,6	36,5	45,2	51,7	36,3	26,0	44,8	41,0	29,1	37,9
	1058UL/6S	40,8	53,8	46,1	57,1	65,3	45,8	32,9	56,6	51,7	36,7	47,9
	1058UL/7S	48,5	63,8	54,7	67,8	77,5	54,4	39,0	67,3	61,4	43,6	56,9
	1059UL/9S											
	1098UL/9S	85,0	112,0	96,0	119,0	136,0	95,4	68,5	118,0	107,8	76,5	99,8
	1099UL/11S											
	1078UL/11S	136,0	179,2	153,6	190,4	217,6	152,6	109,6	188,8	172,5	122,4	159,7
1079UL/13S												
1079UL/M42S												
1078UL/13S	212,5	280,0	240,0	297,5	340,0	238,5	171,3	295,0	269,5	191,3	249,5	
1078UL/M42S												
1079UL/17S												

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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ed. 001-VS-ENG

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