External leakage

All the products illustrated in this Handbook are submitted, one by one, to tightness tests besides to functional tests. Allowable external leakage, measurable during the test, agrees to the definition given in Par. 9.4 of EN 12284 : 2003 Standard:
"During the test, no bubbles shall form over a period of at least one minute when the specimen is immersed in water with low surface tension…"

Pressure containment

All the products illustrated in this Handbook, if submitted to hydrostatic test, guarantee a pressure strength at least equal to 1,43 x PS in compliance with the Directive 97/23/EC.
All the products illustrated in this Handbook, if submitted to burst test, guarantee a pressure strength at least equal to 3 x PS according to EN 378-2 : 2008 Standard.

Weights

The weights of the items listed in this Handbook include packaging.

Guarantee

All Castel products are covered by a 12 – month's warranty. This warranty covers all products or parts thereof that turn out to be defective within the warranty period. In this case, at his own expenses, the customer shall return the defective item with a detailed description of the claimed defects. The warranty doesn't apply if the defect of Castel products are due to mistakes either by customer or by third parties such wrong installations, use contrary to Castel indications, tampering. In case of defects of its own products, Castel will only replace the defective goods and will not refund damages of any kind.
The technical data shown on this catalogue are indicative. Castel reserves the right to modify the same at any time without any previous notice.

NORMALLY CLOSED SOLENOID VALVES FOR REFRIGERATING SYSTEMS

APPLICATIONS

The solenoid valves, shown in this chapter, are classified "Pressure accessories" in the sense of the Pressure Equipment Directive 94/23/EC, Article 1, Section 2.1.4 and are subject of Article 3, Section 1.3 of the same Directive.
They are designed for installation on commercial refrigerating systems and on civil and industrial conditioning plants, which use the following refrigerant fluids: R22 , R134a , R404A , R407C , R410A , R507
proper to the Group II (as defined in Article 9, Section 2.2 of Directive 97/23/EC and referred to in Directive 67/548/EEC). For specific applications with refrigerant fluids not listed above, always proper to the Group II, please contact Castel Technical Department.

OPERATION

The valves series 1020 ; 1028 ; 1034 ; 1038 ; 1040 ; 1048 ; 1049 ; 1050 ; 1058 ; 1059 , 1064 ; 1068 ; 1070 ; 1078 ; 1079 ; 1090 ; 1098 ; 1099 are normally closed valves.
NC = when the coil is de-energised the plunger stops the fluid flow, when the coil is electrically energised the plunger opens the valve seat connecting the inlet to the outlet.
The NC valves are supplied either without coil (S type) or with coil (A6 type with coil HM2–220/230 VAC and A7 type with coil HM2–240 VAC).

The valves series 1020 and 1028 are **direct acting valves**. The 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 and the valves can open with zero pressure differential.

The valves series 1064 ; 1068 ; 1070 ; 1078 (excluded /11 , /13 , /M42) ; 1079 (excluded /13 , /M42 , /17) ; 1090 ; 1098 (excluded /9) ; 1099 (excluded /11) are **diaphragm pilot operated valves**.
The operation depends not only on the magnetic field produced by the current flow into the coil but it's also necessary a minimum inlet pressure to move the diaphragm and to keep it lift off the main seat. Opening/closing of main seat is controlled by the diaphragm while opening/closing of pilot seat is controlled by the mobile plunger. These valves cannot work with zero pressure differential.

The valves series 1034 ; 1038 ; 1040 ; 1048 ; 1049 ; 1050 ; 1058 ; 1059 ; 1078 (/11 , /13 , /M42) ; 1079 (/13 , /M42 , /17) ; 1098/9 ; 1099/11 are **piston pilot operated valves**.
The operation depends not only on the magnetic field produced by the current flow into the coil but it's also necessary a minimum inlet pressure to move the piston and to keep it lift off the main seat. Opening/closing of main seat is controlled by the piston while opening/closing of pilot seat is controlled by the mobile plunger. These valves cannot work with zero pressure differential.

CONSTRUCTION

The main parts of the valves are made 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 plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover
- Chloroprene rubber (CR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

INSTALLATION

The valves can be installed in all sections of a refrigerating system, in compliance with the limits and capacities indicated in TABLE 4. Castel recommends using piston valves in those applications with hard operating conditions (temperature/pressure), for example in hot gas line.
TABLES 1 and 2 show the following functional characteristics of a solenoid valve:

- Connections
- PS : maximum allowable pressure
- TS : maximum / minimum allowable temperature
- Kv : discharge factor
- minOPD : minimum Opening Pressure Differential. That is the minimum pressure differential between inlet and outlet at which a solenoid valve, pilot operated, can open and stay opened.
- MOPD : maximum Opening Pressure Differential according to ARI STANDARD 760 : 2001. That is the maximum pressure differential between inlet and outlet at which a solenoid valve, pilot operated, 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 body of the valve. All the valves can be mounted in whatever position except with the coil pointing 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's 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.

TABLE 1: General Characteristics of NC valves (normally closed) with SAE Flare connections

Operating Principles	Catalogue Number	SAE Flare Connections	Seat size nominal Ø [mm]	Kv Factor [m^3/h]	Opening Pressure Differential [bar]					TS [°C]		PS [bar]	Risk Category according to PED
					min OPD	MOPD				min.	max.		
						Coil type							
						HM2 CM2 (AC)	HM4 (AC)	HM3 (AC)	HM3 (DC)				
Direct Acting	1020/2		2,5	0,175	0	21	28	35	21	-35	+110 (2)	45	Art. 3.3
	1020/3	3/8"	3	0,23									
Diaphragm Pilot Operated	1064/3	3/8"	6,5	0,80	0,05	21	28	35	18	-35	+105 (1)	45	Art. 3.3
	1064/4	1/2"											
	1070/4	1/2"	12,5	2,20					13				
	1070/5	5/8"		2,61									
	1090/5	5/8"	16,5	3,80					10				
	1090/6	3/4"		4,80									
Piston Pilot Operated	1034/3	3/8"	6,5	1,00	0,05	21	28	35	18	-35	+110 (2)	45	Art. 3.3
	1034/4	1/2"											
	1040/4	1/2"	12,5	2,40	0,07				18				
	1040/5	5/8"		3,00									
	1050/5	5/8"	16,5	3,80					16				
	1050/6	3/4"		4,80									

(1) Temperature peaks of 120 °C are allowed during defrosting
(2) Temperature peaks of 130 °C are allowed during defrosting

TABLE 2: General Characteristics of NC valves (normally closed) with ODS connections

Operating Principles	Catalogue Number	Connections ODS		Seat size nominal Ø [mm]	Kv Factor [m³/h]	Opening Pressure Differential [bar]					TS [°C]		PS [bar]	Risk Category according to PED
		Ø [in.]	Ø [mm]			min OPD	MOPD Coil type HM2 CM2 (AC)	HM4 (AC)	HM3 (AC)	HM3 (DC)	min.	max.		
Direct Acting	1028/2	1/4"	–	2,2	0,15	0	21	28	35	21	-35	+110 (2)	45	Art. 3.3
	1028/2E	1/4"	–	3	0,23									
	1028/3	3/8"	–											
	1028/M10	–	10											
Diaphragm Pilot Operated	1068/3	3/8"	–	6,5	0,80	0,05	21	28	35	18	-35	+105 (1)	45	Art. 3.3
	1068/M10	–	10											
	1068/M12	–	12											
	1068/4	1/2"	–											
	1078/M12	–	12	12,5	2,20					13				
	1078/4	1/2"	–											
	1078/5	5/8"	16		2,61									
	1079/7	7/8"	22											
	1098/5	5/8"	16	16,5	3,80					10				
	1098/6	3/4"	–		4,80									
	1098/7	7/8"	22		5,70									
	1099/9	1.1/8"	–											
	1078/9	1.1/8"	–	25,5	10					13				
	1079/11	1.3/8"	35											
Piston Pilot Operated	1038/3	3/8"	–	6,5	1,00	0,05	21	28	35	18	-35	+110 (2)	45	Art. 3.3
	1038/M10	–	10											
	1038/M12	–	12											
	1038/4	1/2"	–											
	1048/M12	–	12	12,5	2,40	0,07				18				
	1048/4	1/2"	–											
	1048/5	5/8"	16		3,00									
	1049/7	7/8"	22											
	1058/5	5/8"	16	16,5	3,80					16				
	1058/6	3/4"	–		4,80									
	1058/7	7/8"	22		5,70									
	1059/9	1.1/8"	–											
	1098/9	1.1/8"	–	25	10	0,1				18				
	1099/11	1.3/8"	35											
	1078/11	1.3/8"	35	27	16									
	1079/13	1.5/8"	–											
	1079/M42	–	42											
	1078/13	1.5/8"	–	34	25	0,15								1
	1078/M42	–	42											
	1079/17	2.1/8"	54											

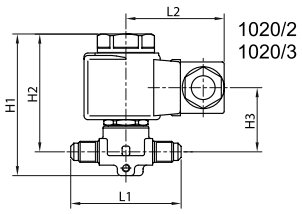
(1) Temperature peaks of 120 °C are allowed during defrosting
(2) Temperature peaks of 130 °C are allowed during defrosting

TABLE 3: Dimensions and Weights of NC valves with 9100 coils (1)

Operating Principles	Catalogue Number	Dimensions [mm]						Weight [g]
		H_1	H_2	H_3	L_1	L_2	Q	
Direct Acting	1020/2	75	62,5	34	58	50	–	340
	1020/3				65			355
	1028/2				125			350
	1028/2E				125			350
	1028/3				125			365
	1028/M10				125			365
Diaphragm Pilot Operated	1064/3	82	69,5	40	68	50	–	400
	1064/4				72			415
	1068/3				111			400
	1068/M10				111			395
	1068/M12				127			420
	1068/4				127			420
	1070/4	91	75	47	100		45	710
	1070/5				106			755
	1078/M12				127			690
	1078/4				127			680
	1078/5				175			775
	1079/7				190			765
	1090/5	106	78	50	120		57	1035
	1090/6				124			1365
	1098/5				175			995
	1098/6				175			1185
	1098/7				180			1170
	1099/9				216			1225
	1078/9	115	96	72	250		80	2565
	1079/11				292			2620
Piston Pilot Operated	1034/3	92,5	80	50,5	68	50	–	440
	1034/4				72			457
	1038/3				111			440
	1038/M10				111			435
	1038/M12				127			462
	1038/4				127			462
	1040/4	100,5	84,5	56,5	100		45	781
	1040/5				106			831
	1048/M12				127			759
	1048/4				127			748
	1048/5				175			853
	1049/7				190			842
	1050/5	121	93	65	120		57	1157
	1050/6				124			1487
	1058/5				175			1117
	1058/6				175			1307
	1058/7				180			1292
	1059/9				216			1347
	1098/9	157	127	99	235		60	2050
	1099/11				277			2130
	1078/11	175	141	113	278		68	2710
	1079/13							2750
	1079/M42							2750
	1078/13	190	153	125	280		88	3810
	1078/M42							3810
	1079/17							3880

(1) : With coil 9120 the dimension L_2 is equal to 64 mm and theweights must be increased of 305 g.

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



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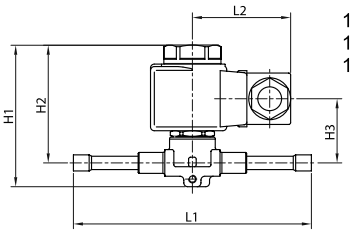
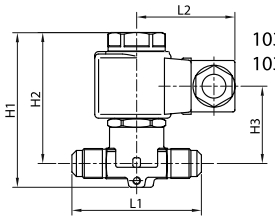
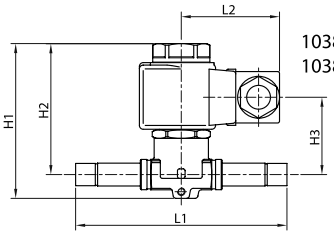
1020/3



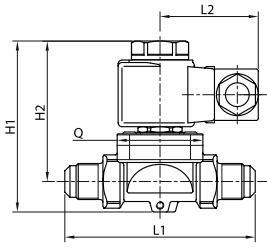
1028/2
1028/3
1028/M10



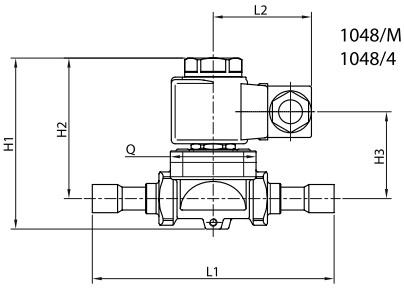
1034/3 1064/3
1034/4 1064/4



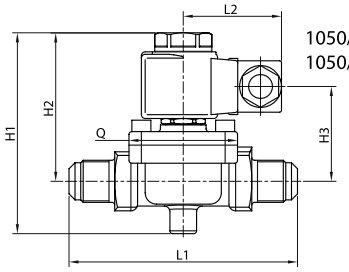
1038/3 1068/3 1038/M10 1068/M10
1038/4 1068/4 1038/M12 1068/M12



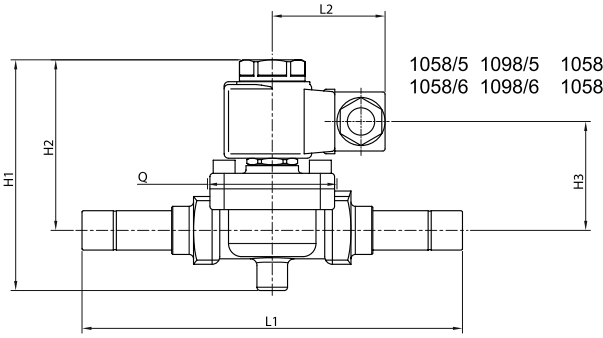
1040/4 1070/4
1040/5 1070/5



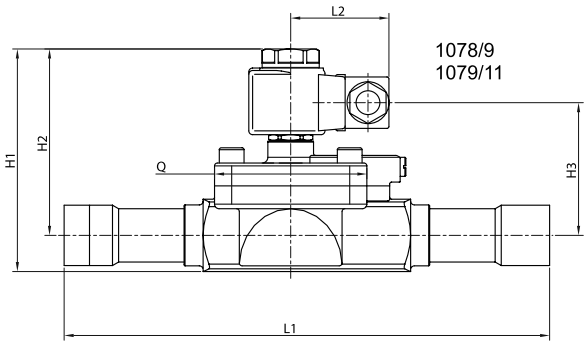
1048/M12 1078/M12 1048/5 1078/5
1048/4 1078/4 1049/7 1079/7



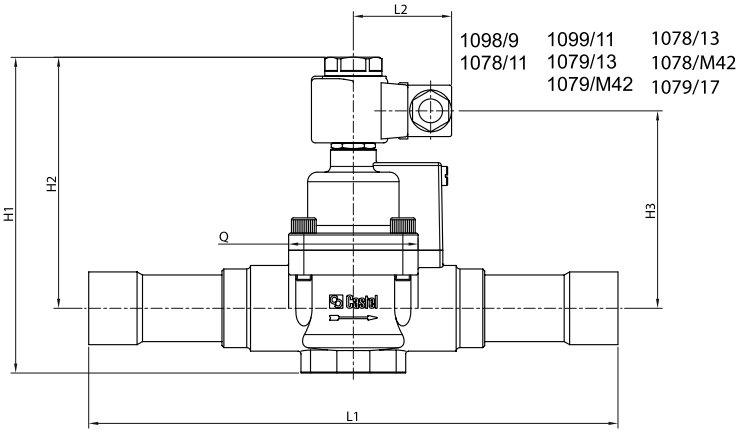
1050/5 1090/5
1050/6 1090/6



1058/5 1098/5 1058/7 1098/7
1058/6 1098/6 1058/9 1098/9



1078/9
1079/11



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

TABLE 4: Refrigerant Flow Capacity of NC valves [kW]

Operating Principles	Catalogue Number	Liquid line						Suction line						Hot Gas line					
		R134a	R22	R404A	R407C	R410A	R507	R134a	R22	R404A	R407C	R410A	R507	R134a	R22	R404A	R407C	R410A	R507
Direct Acting	1020/2	2,98	3,20	2,08	3,02	3,00	2,01	–	–	–	–	–	–	1,49	1,89	1,68	2,03	2,38	1,67
	1020/3	3,91	4,21	2,74	3,96	3,95	2,65							1,96	2,48	2,21	2,67	3,13	2,19
	1028/2	2,55	2,75	1,79	2,58	2,58	1,73							1,28	1,62	1,44	1,74	2,04	1,43
	1028/2E	3,91	4,21	2,74	3,96	3,95	2,65							1,96	2,48	2,21	2,67	3,13	2,19
	1028/3																		
	1028/M10																		
Diaphragm Pilot Operated	1064/3	13,6	14,6	9,5	13,8	13,7	9,2	1,51	2,04	1,78	1,82	2,40	1,78	6,8	8,6	7,7	9,3	10,9	7,6
	1064/4																		
	1068/3																		
	1068/M10																		
	1068/M12																		
	1068/4																		
	1070/4	37,4	40,3	26,2	37,9	37,8	25,3	4,16	5,61	4,91	4,99	6,60	4,91	18,7	23,8	21,1	25,6	29,9	21,0
	1070/5	44,4	47,8	31,1	45,0	44,8	30,0	4,93	6,66	5,82	5,92	7,83	5,82	22,2	28,2	25,1	30,3	35,5	24,9
	1078/M12	37,4	40,3	26,2	37,9	37,8	25,3	4,16	5,61	4,91	4,99	6,60	4,91	18,7	23,8	21,1	25,6	29,9	21,0
	1078/4																		
	1078/5	44,4	47,8	31,1	45,0	44,8	30,0	4,93	6,66	5,82	5,92	7,83	5,82	22,2	28,2	25,1	30,3	35,5	24,9
	1079/7																		
	1090/5	37,4	40,3	26,2	37,9	37,8	25,3	4,16	5,61	4,91	4,99	6,60	4,91	18,7	23,8	21,1	25,6	29,9	21,0
	1090/6	44,4	47,8	31,1	45,0	44,8	30,0	4,93	6,66	5,82	5,92	7,83	5,82	22,2	28,2	25,1	30,3	35,5	24,9
	1098/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1098/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1098/7	96,9	104,3	67,8	98,2	97,9	65,6	10,8	14,5	12,7	12,9	17,1	12,7	48,5	61,6	54,7	66,2	77,5	54,4
	1099/9																		
	1078/9	170,0	183,0	119,0	172,3	171,7	115,0	18,9	25,5	22,3	22,7	30,0	22,3	85,0	108,0	96,0	116,2	136,0	95,4
	1079/11																		
Piston Pilot Operated	1034/3	17,0	18,3	11,9	17,2	17,2	11,5	1,89	2,55	2,23	2,27	3,00	2,23	8,5	10,8	9,6	11,6	13,6	9,5
	1034/4																		
	1038/3																		
	1038/M10																		
	1038/M12																		
	1038/4																		
	1040/4	40,8	43,9	28,6	41,4	41,2	27,6	4,54	6,12	5,35	5,45	7,20	5,35	20,4	25,9	23,0	27,9	32,6	22,9
	1040/5	51,0	54,9	35,7	51,7	51,5	34,5	5,67	7,65	6,69	6,81	9,00	6,69	25,5	32,4	28,8	34,9	40,8	28,6
	1048/M12	40,8	43,9	28,6	41,4	41,2	27,6	4,54	6,12	5,35	5,45	7,20	5,35	20,4	25,9	23,0	27,9	32,6	22,9
	1048/4																		
	1048/5	51,0	54,9	35,7	51,7	51,5	34,5	5,67	7,65	6,69	6,81	9,00	6,69	25,5	32,4	28,8	34,9	40,8	28,6
	1049/7																		
	1050/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1050/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1058/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1058/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1058/7	96,9	104,3	67,8	98,2	97,9	65,6	10,8	14,5	12,7	12,9	17,1	12,7	48,5	61,6	54,7	66,2	77,5	54,4
	1059/9																		
	1098/9	170,0	183,0	119,0	172,3	171,7	115,0	18,9	25,5	22,3	22,7	30,0	22,3	85,0	108,0	96,0	116,2	136,0	95,4
	1099/11																		
	1078/11	272,0	292,8	190,4	275,7	274,7	184,0	30,2	40,8	35,7	36,3	48,0	35,7	136,0	172,8	153,6	185,9	217,6	152,6
	1079/13																		
	1079/M42																		
	1078/13	425,0	457,5	297,5	430,8	429,3	287,5	47,3	63,8	55,8	56,8	75,0	55,8	212,5	270,0	240,0	290,5	340,0	238,5
	1078/M42																		
	1079/17																		

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)
Liquid temperature	100 °F	(37,8 °C)
Subcooling	10 °R	(5,5 °K)
Evaporating temperature	40 °F	(4,4 °C)
Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	160 °F	(71,1 °C)

NORMALLY OPEN SOLENOID VALVES FOR REFRIGERATING SYSTEMS

APPLICATIONS

The solenoid valves, shown in this chapter, are classified "Pressure accessories" in the sense of the Pressure Equipment Directive 94/23/EC, Article 1, Section 2.1.4 and are subject of Article 3, Section 1.3 of the same Directive.
They are designed for installation on commercial refrigerating systems and on civil and industrial conditioning plants, which use the following refrigerant fluids: R22 , R134a , R404A , R407C , R410A , R507 proper to the Group II (as defined in Article 9, Section 2.2 of Directive 97/23/EC and referred to in Directive 67/548/EEC). For specific applications with refrigerant fluids not listed above, always proper to the Group II, please contact Castel Technical Department.

OPERATION

The valves series 1134 ; 1138 ; 1140 ; 1148 ; 1150 ; 1158 ; 1164 ; 1168 ; 1170 ; 1178 ; 1190 ; 1198 are normally open valves.
NO = when the coil is de-energised the plunger opens the valve seat connecting the inlet to the outlet, when the coil is electrically energised the plunger stops the fluid flow.
The NO valves are supplied only without coil (S type).
N.B.: the NO valve visually differs from the corresponding NC model by means of the red ring installed below the yellow nut that fastens the coil.

The valves series 1164 ; 1168 ; 1170 ; 1178 (excluded /11 , /13 , /M42) ; 1190 ; 1198 (excluded /9) are **diaphragm pilot operated valves**.
The operation depends not only on the magnetic field produced by the current flow into the coil but it's also necessary a minimum inlet pressure to move the diaphragm and to keep it lift off the main seat. Opening/closing of main seat is controlled by the diaphragm while opening/closing of pilot seat is controlled by the mobile plunger. These valves cannot work with zero pressure differential.

The valves series 1134 ; 1138 ; 1140 ; 1148 ; 1150 ; 1158 ; 1178 (/11 , /13 , /M42) ; 1198/9 are **piston pilot operated valves**.
The operation depends not only on the magnetic field produced by the current flow into the coil but it's also necessary a minimum inlet pressure to move the piston and to keep it lift off the main seat. Opening/closing of main seat is controlled by the piston while opening/closing of pilot seat is controlled by the mobile plunger. These valves cannot work with zero pressure differential.

CONSTRUCTION

The main parts of the valves are made 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 plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover
- Chloroprene rubber (CR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

INSTALLATION

The valves can be installed in all sections of a refrigerating system, in compliance with the limits and capacities indicated in TABLE 8. Castel recommends using piston valves in those applications with hard operating conditions (temperature/pressure), for example in hot gas line.
TABLES 5 and 6 show the following functional characteristics of a solenoid valve:

- Connections
- PS : maximum allowable pressure
- TS : maximum / minimum allowable temperature
- Kv : discharge factor
- minOPD : minimum Opening Pressure Differential. That is the minimum pressure differential between inlet and outlet at which a solenoid valve, pilot operated, can open and stay opened.
- MOPD : maximum Opening Pressure Differential according to ARI STANDARD 760 : 2001. That is the maximum pressure differential between inlet and outlet at which a solenoid valve, pilot operated, 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 body of the valve. All the valves can be mounted in whatever position except with the coil pointing 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's 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.

N.B.

The NO valves have been designed to work only with direct current coils; then they can be used solely with coils 9120/RD1 (HM3 type – 12 VDC) , 9120/RD2 (HM3 type – 24 VDC) , 9120/RD4 (HM3 type – 48 VDC). To use them in applications with 220/230 VAC supply it's necessary to mate the NO valve with the following components:
Coil 9120/RD6 (HM3 type – 220 VRAC) + Connector/ Rectifier 9150/R45 or 9150/R90.
NO solenoid valves are not be able to work with alternate current coils type HM2 , CM2 , HM4.

TABLE 5: General Characteristics of NO valves (normally open) with SAE Flare connections

Operating Principles	Catalogue Number	SAE Flare Connections	Seat size nominal Ø [mm]	Kv Factor [m^3/h]	Opening Pressure Differential [bar]		TS [°C]		PS [bar]	Risk Category according to PED
					min OPD	MOPD	min.	max.		
Diaphragm Pilot Operated	1164/3	3/8"	6,5	6,5	0,05	21	- 35	+105 (1)	45	Art. 3.3
	1170/4	1/2"	12,5	12,5						
	1170/5	5/8"								
	1190/5	5/8"	16,5	16,5		19				
	1190/6	3/4"								
Piston Pilot Operated	1134/3	3/8"	6,5	1,00	0,05	21	- 35	+110 (2)	45	Art. 3.3
	1140/4	1/2"	12,5	2,40	0,07					
	1140/5	5/8"		3,00						
	1150/5	5/8"	16,5	3,80		19				
	1150/6	3/4"		4,80						

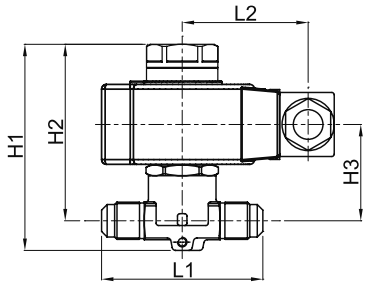
(1) Temperature peaks of 120 °C are allowed during defrosting
(2) Temperature peaks of 130 °C are allowed during defrosting

TABLE 6: General Characteristics of NO valves (normally open) with ODS connections											
Operating Principles	Catalogue Number	Connections ODS		Seat size nominal Ø [mm]	Kv Factor [m^3/h]	Opening Pressure Differential [bar]		TS [°C]		PS [bar]	Risk Category according to PED
		Ø [in.]	Ø [mm]			min OPD	MOPD	min.	max.		
Diaphragm Pilot Operated	1168/3	3/8"	–	6,5	0,80	0,05	21	- 35	+105 (1)	45	Art. 3.3
	1168/M10	–	10								
	1178/M12	–	12	12,5	2,20						
	1178/4	1/2"	–								
	1178/5	5/8"	16		2,61						
	1198/5	5/8"	16	16,5	3,80		19				
	1198/6	3/4"	–		4,80						
	1198/7	7/8"	22		5,70						
	1178/9	1.1/8"	–	25,5	10						
Piston Pilot Operated	1138/3	3/8"	–	6,5	1,00	0,05	21	- 35	+110 (2)	45	Art. 3.3
	1138/M10	–	10								
	1148/M12	–	12	12,5	2,40	0,07					
	1148/4	1/2"	–								
	1148/5	5/8"	16		3,00						
	1158/5	5/8"	16	16,5	3,80		19				
	1158/6	3/4"	–		4,80						
	1158/7	7/8"	22		5,70						
	1198/9	1.1/8"	–	25	10	0,1					
	1178/11	1.3/8"	35	27	16						
	1178/13	1.5/8"	–	34	25	0,15					I
	1178/M42	–	42								

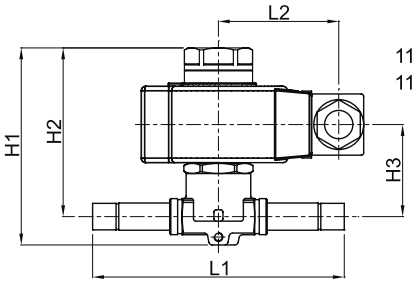
(1) Temperature peaks of 120 °C are allowed during defrosting
(2) Temperature peaks of 130 °C are allowed during defrosting

TABLE 7: Dimensions and Weights of NO valves with 9120 coils								
Operating Principles	Catalogue Number	Dimensions [mm]						Weight [g]
		H_1	H_2	H_3	L_1	L_2	Q	
Diaphragm Pilot Operated	1164/3	87	74,5	40	68	50	–	705
	1168/3				111			705
	1168/M10				111			700
	1170/4	96	80	47	100		45	1015
	1170/5				106			1060
	1178/M12				127			995
	1178/4				127			985
	1178/5				175			1080
	1190/5	111	83	50	120		57	1340
	1190/6				124			1670
	1198/5				175			1300
	1198/6				175			1490
	1198/7				180			1475
	1178/9	120	101	72	250		80	2870
Piston Pilot Operated	1134/3	97,5	85	50,5	68	50	–	775
	1138/3				111			775
	1138/M11				111			770
	1140/4	105,5	89,5	56,5	100		45	1117
	1140/5				106			1166
	1148/M12				127			1095
	1148/4				127			1084
	1148/5				175			1188
	1150/5	126	98	70	120		57	1462
	1150/6				124			1792
	1158/5				175			1422
	1158/6				175			1612
	1158/7				180			1597
	1198/9	162	132	99	235		60	2355
	1178/11	180	146	113	278		68	3015
	1178/13	195	158	130	280		88	3820
	1178/M42							3820

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



1134/3 1164/3



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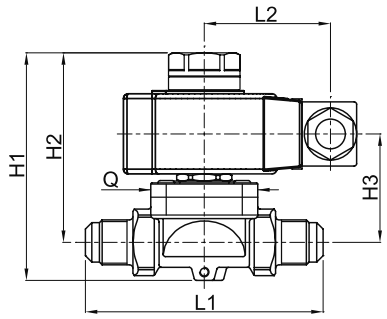
1138/M10 1168/M10



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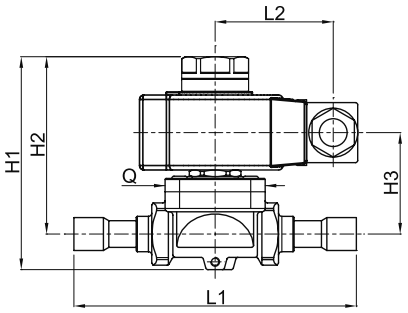
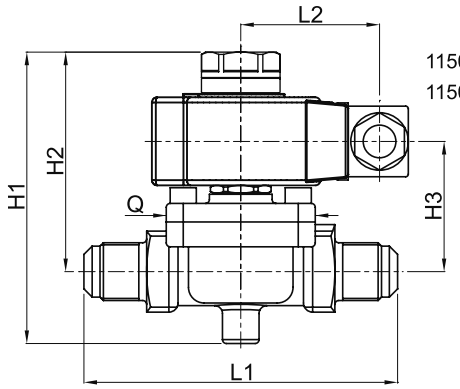
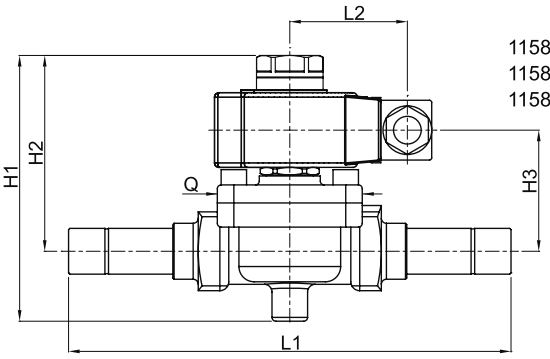
1140/5 1170/5



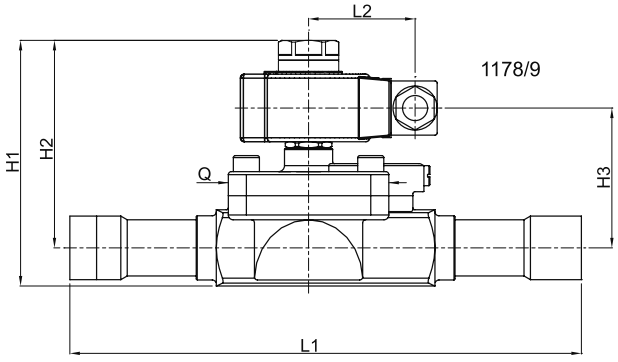
1148/M12 1178/M12
1148/4 1178/4
1148/5 1178/5



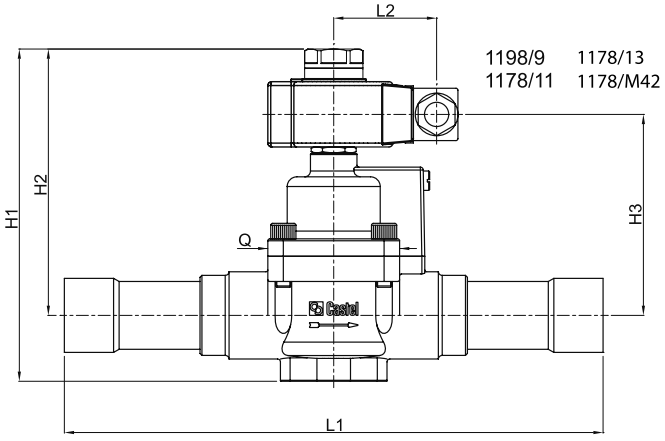
1150/5 1190/5
1150/6 1190/6



1158/5 1198/5
1158/6 1198/6
1158/7 1198/7



1178/9



1198/9 1178/13
1178/11 1178/M42

TABELLA 8: Rese frigorifere valvole NA [kW]

Operating Principles	Catalogue Number	Liquid line						Suction line						Hot Gas line					
		R134a	R22	R404A	R407C	R410A	R507	R134a	R22	R404A	R407C	R410A	R507	R134a	R22	R404A	R407C	R410A	R507
Diaphragm Pilot Operated	1164/3	13,6	14,6	9,5	13,8	13,7	9,2	1,51	2,04	1,78	1,82	2,40	1,78	6,8	8,6	7,7	9,3	10,9	7,6
	1168/3																		
	1168/M10																		
	1170/4	37,4	40,3	26,2	37,9	37,8	25,3	4,16	5,61	4,91	4,99	6,60	4,91	18,7	23,8	21,1	25,6	29,9	21,0
	1170/5	44,4	47,8	31,1	45,0	44,8	30,0	4,93	6,66	5,82	5,92	7,83	5,82	22,2	28,2	25,1	30,3	35,5	24,9
	1178/M12	37,4	40,3	26,2	37,9	37,8	25,3	4,16	5,61	4,91	4,99	6,60	4,91	18,7	23,8	21,1	25,6	29,9	21,0
	1178/4																		
	1178/5	44,4	47,8	31,1	45,0	44,8	30,0	4,93	6,66	5,82	5,92	7,83	5,82	22,2	28,2	25,1	30,3	35,5	24,9
	1190/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1190/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1198/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1198/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1198/7	96,9	104,3	67,8	98,2	97,9	65,6	10,8	14,5	12,7	12,9	17,1	12,7	48,5	61,6	54,7	66,2	77,5	54,4
	1178/9	170,0	183,0	119,0	172,3	171,7	115,0	18,9	25,5	22,3	22,7	30,0	22,3	85,0	108,0	96,0	116,2	136,0	95,4
Piston Pilot Operated	1134/3	17,0	18,3	11,9	17,2	17,2	11,5	1,89	2,55	2,23	2,27	3,00	2,23	8,5	10,8	9,6	11,6	13,6	9,5
	1138/3																		
	1138/M10																		
	1140/4	40,8	43,9	28,6	41,4	41,2	27,6	4,54	6,12	5,35	5,45	7,20	5,35	20,4	25,9	23,0	27,9	32,6	22,9
	1140/5	51,0	54,9	35,7	51,7	51,5	34,5	5,67	7,65	6,69	6,81	9,00	6,69	25,5	32,4	28,8	34,9	40,8	28,6
	1148/M12	40,8	43,9	28,6	41,4	41,2	27,6	4,54	6,12	5,35	5,45	7,20	5,35	20,4	25,9	23,0	27,9	32,6	22,9
	1148/4																		
	1148/5	51,0	54,9	35,7	51,7	51,5	34,5	5,67	7,65	6,69	6,81	9,00	6,69	25,5	32,4	28,8	34,9	40,8	28,6
	1150/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1150/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1158/5	64,6	69,5	45,2	65,5	65,2	43,7	7,2	9,7	8,5	8,6	11,4	8,5	32,3	41,0	36,5	44,2	51,7	36,3
	1158/6	81,6	87,8	57,1	82,7	82,4	55,2	9,1	12,2	10,7	10,9	14,4	10,7	40,8	51,8	46,1	55,8	65,3	45,8
	1158/7	96,9	104,3	67,8	98,2	97,9	65,6	10,8	14,5	12,7	12,9	17,1	12,7	48,5	61,6	54,7	66,2	77,5	54,4
	1198/9	170,0	183,0	119,0	172,3	171,7	115,0	18,9	25,5	22,3	22,7	30,0	22,3	85,0	108,0	96,0	116,2	136,0	95,4
	1178/11	272,0	292,8	190,4	275,7	274,7	184,0	30,2	40,8	35,7	36,3	48,0	35,7	136,0	172,8	153,6	185,9	217,6	152,6
	1178/13	425,0	457,5	297,5	430,8	429,3	287,5	47,3	63,8	55,8	56,8	75,0	55,8	212,5	270,0	240,0	290,5	340,0	238,5
	1178/M42																		

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)
Liquid temperature	100 °F	(37,8 °C)
Subcooling	10 °R	(5,5 °K)
Evaporating temperature	40 °F	(4,4 °C)
Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	160 °F	(71,1 °C)