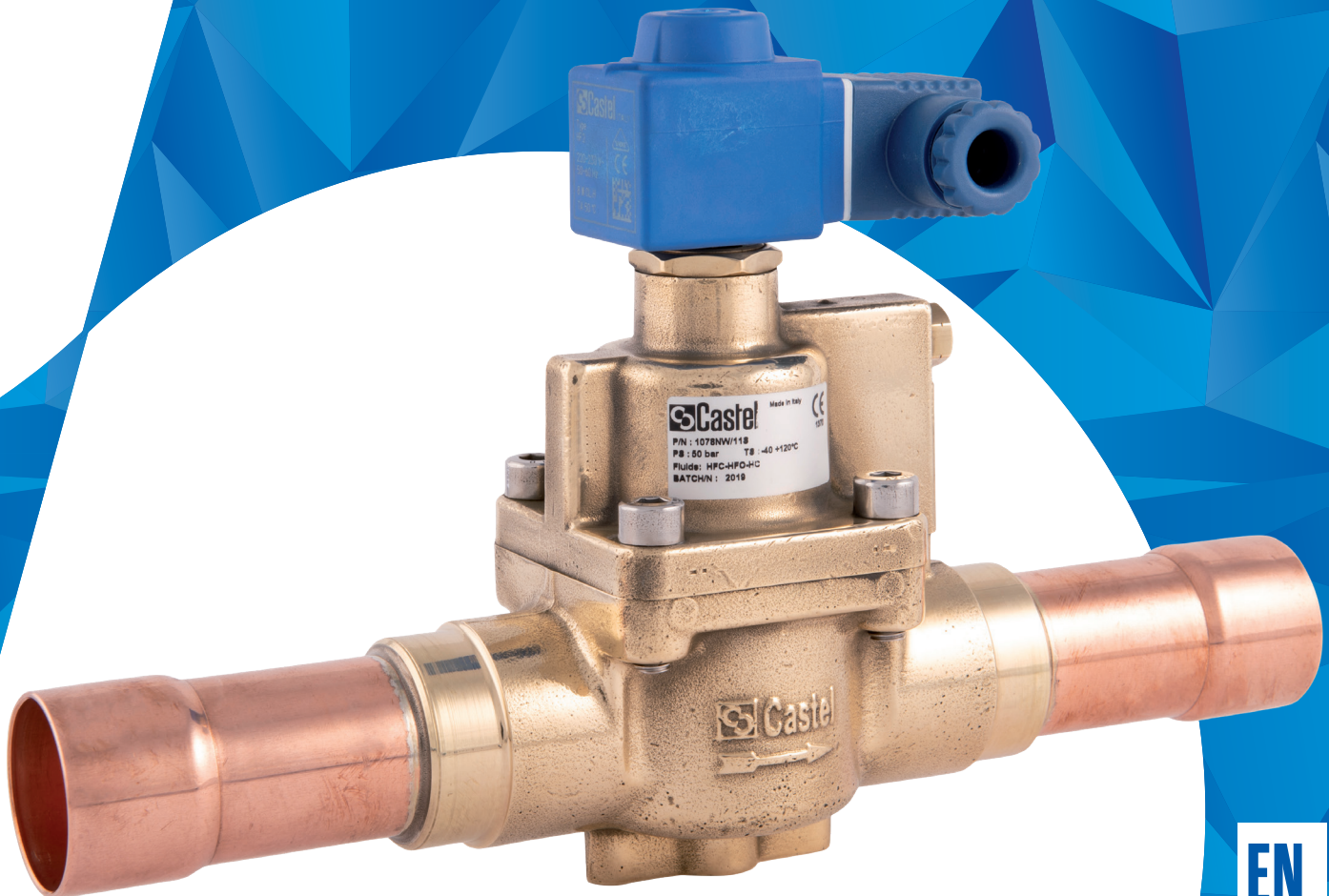
Castel
Italian technology

POLYHEDRA

SOLENOID VALVES

FOR REFRIGERATION PLANTS THAT USE:
HFC, HFO, HC REFRIGERANTS



EN

SOLENOID VALVES

Application

The solenoid valves, illustrated in this brochure, have been developed by Castel to be installed on commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, 1270)
- HFO (R1234yf)

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

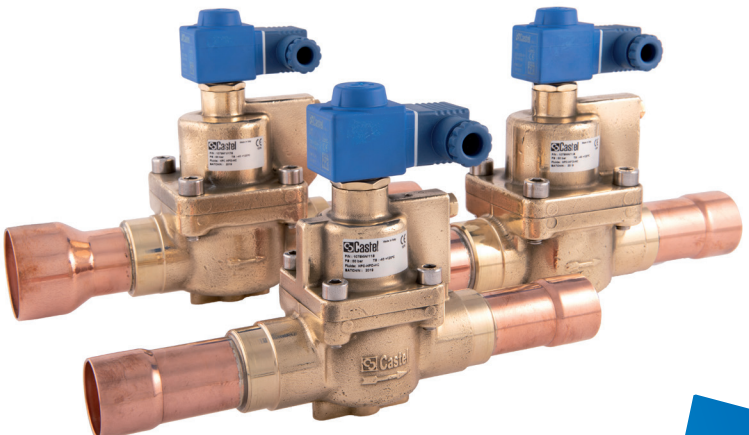
For specific applications with refrigerant fluids not listed above, please contact Castel Technical Department.

CAUTION! The solenoid valves in this brochure CANNOT be installed on systems that use HCFC (R22) refrigerants.

Construction

The main parts of the solenoid valves 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



Operation

The products shown in this brochure are solenoid valves:

- Normally closed (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. These 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).
- Normally open (NO). This means that when the coil is not energised, the plunger opens the fluid flow. When the coil is energized, the plunger closes the fluid flow. These valves are exclusively sold in the model without coil (suffix S). N.B.: the NO valve visually differs from the corresponding NC model by means of a red ring installed below the yellow nut that fastens the coil.

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.

All the other valves, normally closed and normally open, are pilot-operated diaphragm (or 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 diaphragm (or piston) and keep it lifted off the main opening
- close the diaphragm (or piston) and ensure the tightness on the main opening

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

These valves cannot work with zero differential pressure.

Installation

The valves 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 and their capacities. Castel recommends using piston pilot-operated solenoid valves for applications with the hot gas supply line in particularly harsh (temperature/pressure) operating conditions.

The tables 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.

N.B. The NO valves have been designed to work only with direct current coils; therefore, 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). For applications with 220/230 VAC power supply, it is mandatory to couple the NO valves with the following components: Coil 9120/RD6 (HM3 types - 220 VRAC) + Connector/Rectifier 9150/R45 or 9150/R90.

NO SOLENOID VALVES CANNOT BE COUPLED WITH COILS SERIES 9100, 9110, 9120/RA6, 9160, 9300, AND 9320.

General characteristics of NC valves with SAE Flare connections

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 coil series					min.	max.	min. (1)	max.	
						9100 9110 9300 (AC)	9160 (AC)	9120 9320 (AC)	9120 9320 (DC)						
Direct Acting	1020N/2#	1/4"	2,5	0,175	0	21	28	35	21	50	– 40	+130	– 40	+50	Art. 4.3
	1020N/3#	3/8"	3	0,23											
Diaphragm Pilot Operated	1064N/3#	3/8"	6,5	0,80	0,05	21	28	35	18	50	– 40	+120	– 40	+50	Art. 4.3
	1064N/4#	1/2"													
	1070N/4#	1/2"	12,5	2,20					13						
	1070N/5#	5/8"		2,61											
	1090N/5#	5/8"	16,5	3,80					10						
	1090N/6#	3/4"		4,80											
Piston Pilot Operated	1034N/3#	3/8"	6,5	1,00	0,05	21	28	35	18	50	– 40	+120	– 40	+50	Art. 4.3
	1034N/4#	1/2"													
	1040N/4#	1/2"	12,5	2,40	0,07				18						
	1040N/5#	5/8"		3,00											
	1050N/5#	5/8"	16,5	3,80					16						
	1050N/6#	3/4"		4,80											

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

= S , A6

General characteristics of NC valves 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
						min OPD	MOPD coil series					min.	max.	min. (1)	max.	
		Ø [in.]	Ø [mm]				9100 9110 9300 (AC)	9160 (AC)	9120 9320 (AC)	9120 9320 (DC)						
Direct Acting	1028N/2 #	1/4"	–	2,2	0,15	0	21	28	35	21	50	– 40	+130	– 40	+50	Art. 4.3
	1028N/2#.E	1/4"	–	3	0,23											
	1028N/3#	3/8"	–													
	1028N/M10#	–	10													
Diaphragm Pilot Operated	1068N/3#	3/8"	–	6,5	0,80	0,05	21	28	35	18	50	– 40	+120	– 40	+50	Art. 4.3
	1068N/M10#	–	10													
	1068N/M12#	–	12													
	1068N/4#	1/2"	–													
	1078N/M12#	–	12	12,5	2,20					13						
	1078N/4#	1/2"	–													
	1078N/5#	5/8"	16		2,61											
	1079N/7#	7/8"	22													
	1098N/5#	5/8"	16	16,5	3,80					10						
	1098N/6#	3/4"	–		4,80											
	1098N/7#	7/8"	22		5,70											
	1099N/9#	1.1/8"	–													
	1078N/9#	1.1/8"	–	25,5	10					13						
	1079N/11#	1.3/8"	35													
Piston Pilot Operated	1038N/3#	3/8"	–	6,5	1,00	0,05	21	28	35	18	50	– 40	+120	– 40	+50	Art. 4.3
	1038N/M10#	–	10													
	1038N/M12#	–	12													
	1038N/4#	1/2"	–													
	1048N/M12#	–	12	12,5	2,40	0,07				18						
	1048N/4#	1/2"	–													
	1048N/5#	5/8"	16		3,00											
	1049N/7#	7/8"	22													
	1058N/5#	5/8"	16	16,5	3,80					16						
	1058N/6#	3/4"	–		4,80											
	1058N/7#	7/8"	22		5,70											
	1059N/9#	1.1/8"	–													
	1098N/9#	1.1/8"	–	25	10	0,1				18						
	1099N/11#	1.3/8"	35													
	1078NW/11#	1.3/8"	35	27	16											II
	1079NW/13#	1.5/8"	–													
	1079NW/M42#	–	42													
	1078NW/13#	1.5/8"	–	34	25	0,15										
	1078NW/M42#	–	42													
	1079NW/17#	2.1/8"	54													

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

= S , A6

General characteristics of NO valves with SAE Flare connections

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 9120/RD6	MOPD 9120/RD1 9120/RD2		min.	max.	min. (1)	max.	
Diaphragm Pilot Operated	1164N/3S	3/8"	6,5	0,80	0,05	30	16	50	-40	+120	-40	+50	Art. 4.3
	1170N/4S	1/2"	12,5	2,20		30	30						
	1170N/5S	5/8"		2,61									
	1190N/5S	5/8"	16,5	3,80									
	1190N/6S	3/4"		4,80									
Piston Pilot Operated	1134N/3S	3/8"	6,5	1,00	0,05	30	30	50	-40	+120	-40	+50	Art. 4.3
	1140N/4S	1/2"	12,5	2,40	0,07								
	1140N/5S	5/8"		3,00									
	1150N/5S	5/8"	16,5	3,80									
	1150N/6S	3/4"		4,80									

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

General characteristics of NO valves 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 9120/RD6	MOPD 9120/RD1 9120/RD2		min.	max.	min. (1)	max.	
Diaphragm Pilot Operated	1168N/3S	3/8"	–	6,5	0,80	0,05	30	16	50	-40	+120	-40	+50	Art. 4.3
	1168N/M10S	–	10											
	1178N/M12S	–	12	12,5	2,20		30	30						
	1178N/4S	1/2"	–											
	1178N/5S	5/8"	16		2,61									
	1198N/5S	5/8"	16	16,5	3,80									
	1198N/6S	3/4"	–		4,80									
	1198N/7S	7/8"	22		5,70									
	1178N/9S	1.1/8"	–	25,5	10		28	28						
Piston Pilot Operated	1138N/3S	3/8"	–	6,5	1,00	0,05	30	30	50	-10	+120	-40	+50	Art. 4.3
	1138N/M10S	–	10											
	1148N/M12S	–	12	12,5	2,40	0,07								
	1148N/4S	1/2"	–											
	1148N/5S	5/8"	16		3,00									
	1158N/5S	5/8"	16	16,5	3,80									
	1158N/6S	3/4"	–		4,80									
	1158N/7S	7/8"	22		5,70									
	1198N/9S	1.1/8"	–	25	10	0,1	30	16						
	1178NW/11S	1.3/8"	35	27	16									II
	1178NW/13S	1.5/8"	–	34	25	0,15								
	1178NW/M42S	–	42											

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

B01-2019-11N-EN

LOW GWP

Castel has always been aware of environmental sustainability issues and gives its contribution to a cleaner environment, supplying the refrigeration and air conditioning industry with state-of-the-art and environment-friendly technology. With its commitment and steady research in its laboratories, Castel has developed a whole range of products using natural refrigerants, which reduce emissions to the minimum.

ISO 14001

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