

# NORMALLY-CLOSED SOLENOID VALVES

FOR REFRIGERATION PLANTS THAT USE  
TRASCritical R744 REFRIGERANT



# NORMALLY-CLOSED SOLENOID VALVES

## Application

The solenoid valves illustrated in this leaflet have been developed by Castel for all the applications that use the trans-critical R744 refrigeration fluid belonging to Group 2, defined in Article 13, Chapter 1, Point (b) of Directive 2014/68/EU, with reference to EC Regulation No. 1272/2008.

**CAUTION!:** these solenoid valves cannot be used with other refrigerant fluids.

## Operation

The valves listed in this leaflet 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 valves are exclusively sold in the model without coil (suffix S). These valves can be coupled with the coils in series 9320.

The valves in series 1437E and 1438E 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 of the valves are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – CuFe2P (k65) for solder connections of 1437E valves
- Stainless steel tube AISI 304 for solder connections of 1438E valves
- Austenitic stainless steel EN 10088-3 – 1.4305 for enclosure where the plunger moves
- Ferritic stainless steel EN 10088-3 – 1.4105 for the plunger
- Ethylene propylene rubber (EPDM) for outlet seal gaskets
- PEEK for seat gaskets

## Installation

The valves series 1437E and 1438E can be installed on the three main branches of a system (hot gas line, gas cooler line, and suction line), while respecting the limits of use and the capacities.

Table shows 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. 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 PEEK gaskets 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 connections of 1437E valves should be carried out with care, using a low melting point filler

material (min 5% Ag). 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.

We recommend TIG welding for steel connectors of 1438E valves to be performed as quickly as possible according to the method shown in the product instruction sheet. The connection material is AISI 304: it is only possible to use AISI 308 filler material if welding to pipes made from the same type of material. For pipes made from other materials, please contact your welding supplies supplier.

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

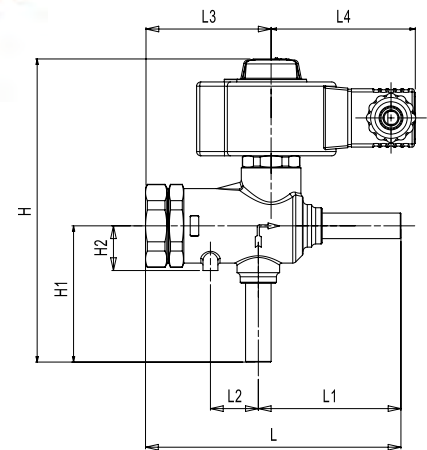
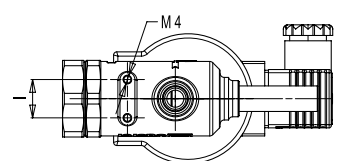
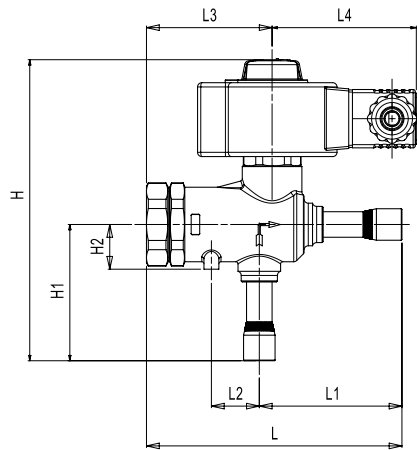
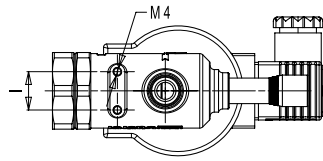
## General characteristics

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.	
						9320 (AC)	9320 (DC)						
1437E/3S050	3/8"	-	5	0,8	0,4	80	80	120	-40	+130	-20	+50	Art. 4.3
1437E/4S050	1/2"	-											
1437E/3S070	3/8"	-	7	1,1									
1437E/4S070	1/2"	-											
1438E/M10S050	-	10	5	0,8	0,4	80	80	140	-40	+130	-20	+50	Art. 4.3
1438E/M12S050	-	12											
1438E/M10S070	-	10	7	1,1									
1438E/M12S050	-	12											

## Refrigerant flow capacity [kW]

Catalogue Number	Gas cooler line	Suction line	Hot Gas line
1437E/3S050	21,0	3,70	15,0
1437E/4S050			
1437E/3S070	28,9	5,09	20,6
1437E/4S070			
1438E/M10S050	21,0	3,70	15,0
1438E/M12S050			
1438E/M10S070	28,9	5,09	20,6
1438E/M12S050			

Gas-cooler outlet temperature	95 °F	(35 °C)
Evaporating temperature	14 °F	(- 10 °C)
Evaporator outlet temperature	23 °F	(- 5 °C)
Evaporator superheating	9 °R	(5 °K)
Suction line temperature	32 °F	(0 °C)
Suction line superheating	9 °R	(5 °K)
Discharge temperature	212 °F	(110 °C)



## Dimensions and weights

Catalogue Number	Dimensions [mm]								Weight [g]
	H1	H1	H2	L	L1	L2	L3	I	
1437E/3S050	143	64	21	120	67	22,5	53	18	704
1437E/4S050	143	64		120	67				704
1437E/3S070	143	64		120	67				704
1437E/4S070	143	64		120	67				704
1438E/M10S050	141	62		118	65				696
1438E/M12S050	143	64		120	67				696
1438E/M10S070	141	62		118	65				696
1438E/M12S050	143	64		120	67				696

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

# GO GREEN

R744 • NATURAL REFRIGERANT



ISO 14001

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. The large range of products belonging to the Castel "GoGreen" line has been developed to be used in CO<sub>2</sub> (R744)- and HC hydrocarbon-filled systems.

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