

HANDBOOK
VALVES

Ed. 2017

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Italian technology

CHAPTER 7 ■ 3-WAY MOTORIZED VALVES WITH BALL SHUTTERS

FOR REFRIGERATION PLANTS THAT USE HCFC, HFC OR HFO REFRIGERANTS



APPLICATIONS

The 3-way valves with ball shutter 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, or R507)
- HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, or 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 valves, up to DN 25, that is models 6690M/9A2 and 6690M/9A6, can also be installed on systems using the following refrigeration fluids:

- HFC (R32)
- HFO (R1234yf)

classified as A2L in the ASHRAE 34-2013 standard, and 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.

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

CONSTRUCTION

The specific design of the 3-way valves with ball shutter in series 6690M:

- Fixing flange with 4 holes
- Extended spindle
- No mechanical stops on the spindle rotation (OPEN and CLOSED positions)

makes them suitable for operating only when coupled with actuators in series 9700 and 9720. For this reason, valves in series 6690M are always sold including the actuator and relative fixing plate in versions with suffix A2 (24 VAC) or suffix A6 (230 VAC).

3-way valves in series 6690M cannot be used without an actuator.

The electric welding of the body and the seal gaskets, assembled on the spindle, ensure perfect hermetic seal of the valves. The spindle construction eliminates the danger of explosion/expulsion.

The main parts of these valves are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Hot forged brass EN 12420 – CW 617N, chromium plated, for the ball
- Copper pipe EN 12735-1 – Cu--DHP for solder connections
- Stainless steel EN 10088-3 – 1.4305 for spindles
- Chloroprene rubber (CR) for outlet seal gaskets
- PTFE for the ball seat gaskets

INSTALLATION

The 3-way valves with ball shutter in series 6690M act as changeover valves, not allowing for bi-direction flow of the refrigerant fluid. The input is always in the centre position, and the two outputs in the lateral positions. These valves are coupled directly to actuators and do not require a flanged adapter between the two parts. The actuator can be mounted on the valve in four different positions, oriented at 90° to each other.

The 3-way valves in series 6690M can be mounted:

- With horizontal output connections and vertical input connection, facing downward.
- With vertical output connections and horizontal input connection.

The actuator for the 3-way valves can never be mounted:

- Upside-down, oriented facing downward
- Vertically, with the cable oriented upwards

Once the valve / actuator has been coupled, remote movement of the valve is possible. In the event power is cut-off, the valve can be operated manually, excluding the actuator with a release clutch. **All of the actuators can be equipped with auxiliary contacts in series 9750, sold separately. For more information on the actuators in series 9700 and 9720, please see Chapter 9.**

The brazing of 3-way valves should be carried out with care, using a low melting point filler material (min. 5% Ag). 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 entire valve.

TABLE 36: General characteristics of 3-ways motorized valves

Catalogue Number	Connections		Ball Port Ø [mm]	Kv Factor [m³/h]	Torque [Nm]	Running Time [sec]	Rotation Angle	PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
	ODS								min.	max.	min.	max.	
	Ø [in.]	Ø [mm]											
6690M/7A2	7/8"	22	19	11	10	60	90°	45	-40	+150	-20	+50	Art. 4.3
6690M/7A6													
6690M/M28A2	-	28	24	16									
6690M/M28A6													
6690M/9A2	1.1/8"	-	24	16									
6690M/9A6													
6690M/11A2	1.3/8"	35	28	20,5	30	120							
6690M/11A6													
6690M/13A2	1.5/8"	-	37	39									
6690M/13A6													
6690M/M42A2	-	42	37	39	I								
6690M/M42A6													

TABLE 37: Electrical characteristics of 3-ways motorized valves

Catalogue Number	Voltage [V]	Voltage tolerance [%]	Frequency [Hz]	Active Power [W]		Apparent Power [VA]		Cable	Wiring Connections		Protection Degree	TA [°C]	
				Operation	Stand-still	Operation	Stand-still		Switching output 2 point (Open/ Close)	Continuous output (0 - 10V)		min.	max.
6690M/7A2	24 A.C.	+20 / -20	50 / 60	4,8	1,5	8,7	3	5 x 0,5 mm² 1,2	YES	YES	IP 54	-20	+50
	24 D.C.	+20 / -20	-										
6690M/7A6	230 A.C.	+15 / -15	50 / 60	2,9	0,5	5,6	5,1	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		
6690M/M28A2	24 A.C.	+20 / -20	50 / 60	4,8	1,5	8,7	3	5 x 0,5 mm² 1,2 m	YES	YES	IP 54		
	24 D.C.	+20 / -20	-										
6690M/M28A6	230 A.C.	+15 / -15	50 / 60	2,9	0,5	5,6	5,1	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		
6690M/9A2	24 A.C.	+20 / -20	50 / 60	4,8	1,5	8,7	3	5 x 0,5 mm² 1,2 m	YES	YES	IP 54		
	24 D.C.	+20 / -20	-										
6690M/9A6	230 A.C.	+15 / -15	50 / 60	2,9	0,5	5,6	5,1	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		
6690M/11A2	24 A.C.	+20 / -20	50 / 60	2,4	0,26	4,3	0,48	3 x 0,75 mm² 1,2 m	YES	YES	IP 54		
	24 D.C.	+20 / -20	-										
6690M/11A6	230 A.C.	+15 / -15	50 / 60	3,7	1,1	4,7	2,7	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		
6690M/13A2	24 A.C.	+20 / -20	50 / 60	2,4	0,26	4,3	0,48	3 x 0,75 mm² 1,2 m	YES	YES	IP 54		
	24 D.C.	+20 / -20	-										
6690M/13A6	230 A.C.	+15 / -15	50 / 60	3,7	1,1	4,7	2,7	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		
6690M/M42A2	24 A.C.	+20 / -20	50 / 60	2,4	0,26	4,3	0,48	3 x 0,75 mm² 1,2 m	YES	YES	IP 54		
	24 D.C.	+20 / -20	-										
6690M/M42A6	230 A.C.	+15 / -15	50 / 60	3,7	1,1	4,7	2,7	3 x 0,75 mm² 1,2 m	YES	NO	IP 43		

TABLE 38: Refrigerant flow capacity of 3-ways motorized valves [kW]

Catalogue Number	Liquid line												
	R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
6690M/7AX	187	201	276	131	190	189	127	138	165	172	173	175	133
6690M/M28AX	272	293	402	190	276	275	184	201	241	250	252	255	194
6690M/9AX													
6690M/11AX	349	375		244	353	352	236		308	321	322	326	249
6690M/13AX	663	714		464	672	670	449		587	610	613	620	473
6690M/M42AX													

Continued

TABLE 38: Refrigerant flow capacity of 3-ways motorized valves [kW]

Catalogue Number	Suction line												
	R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
6690M/7AX	20	28	47	24	25	36	25	16	16	26	24	17	23
6690M/M28AX	29	41	68	35	36	53	36	24	23	38	35	25	34
6690M/9AX													
6690M/11AX	37	52		45	47	68	46		29	49	45	33	43
6690M/13AX	71	99		86	89	129	87		55	94	86	62	82
6690M/M42AX													

Continued

TABLE 38: Refrigerant flow capacity of 3-ways motorized valves [kW]

Catalogue Number	Hot Gas line												
	R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
6690M/7AX	94	123	200	106	131	150	105	73	75	130	119	84	110
6690M/M28AX	136	179	291	154	190	218	153	106	110	189	172	122	160
6690M/9AX													
6690M/11AX	174	230		197	244	279	196		140	242	221	157	205
6690M/13AX	332	437		374	464	530	372		267	460	420	298	389
6690M/M42AX													

Standard rating conditions according to AHRI Standard 760-2007

Condensing temperature	110 °F	(43,3 °C)	Evaporator outlet temperature	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 39: Dimensions and weights of 3-ways motorized valves

Catalogue Number	Figure	Dimensions [mm]						Weight [g]
		H	H ₁	H ₂ (1)	L	L ₁	Ch	
6690M/7A2	1	188	82	246	172	94	6	2,6
6690M/7A6	2	210		246				2,7
6690M/M28A2	1	210	100	268	208	111		3,5
6690M/M28A6	2	231		268				3,6
6690M/9A2	1	210	100	268	208	111		3,5
6690M/9A6	2	231		268				3,6
6690M/11A2	2	240	103	273	211	113	10	4,2
6690M/11A6	2							4,3
6690M/13A2	2	263	121	293	240	127		5,2
6690M/13A6	2							5,3
6690M/M42A2	2	263	121	296	240	127		5,2
6690M/M42A6	2							5,3

(1): total height with optional auxiliary contact

Fig. 1

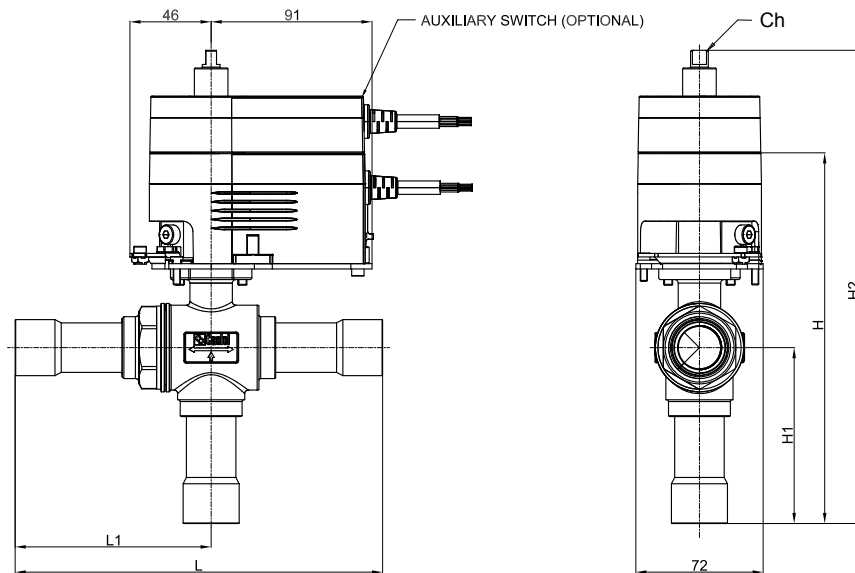
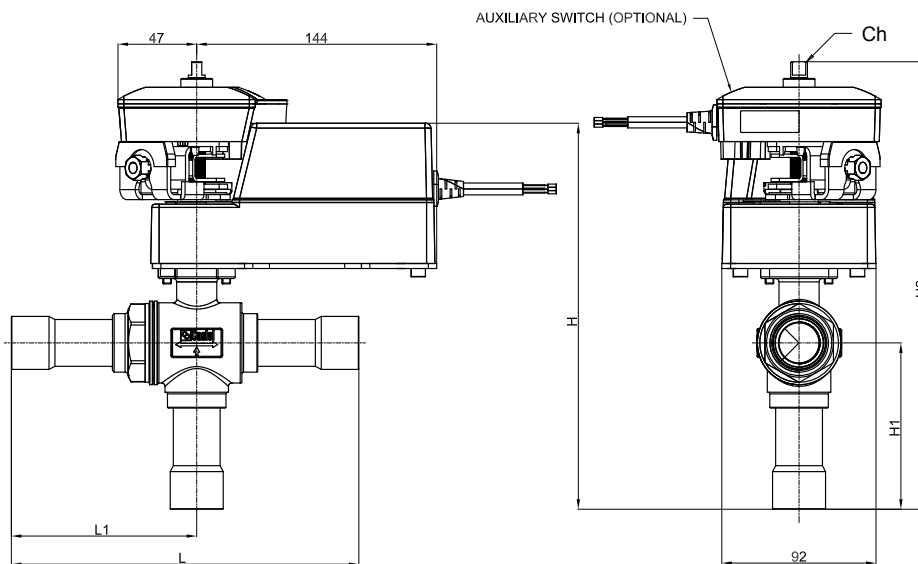


Fig. 2



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ed. 002-VR-ENG

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