HANDBOOK
VALVES

Ed. 2017

Castel®
Italian technology

CHAPTER 12
HERMETIC CHECK VALVES
FOR REFRIGERATION PLANTS THAT USE HCFC, HFC, HFO, OR HC REFRIGERANTS

APPLICATIONS
The check 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, 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 check valves, up to DN 25, that is models 3144W/9, 3145W/9, 3184W/9, 3185W/9 can also be installed on systems using the following:
- HFC (R32)
- HFO (R1234yf)
- HC (R290, R600, or R600a)

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
These check valves are available in the following two types:
- Valve types 3112W, 3132W, 3144W, 3184W (standard spring) with a low opening differential; $\Delta p = 0.04$ bar.
- Valve types 3113W, 3133W, 3145W. 3185W (reinforced spring) with a high opening differential; $\Delta p = 0.3$ bar. To be used, for example, with compressors in parallel.

Valves in series 3112W, 3113W, 3132W, 3133W, 3144W, 3145W, 3184W, 3185W are equipped with laser welds between the body and the cover to ensure that the product is sealed hermetically. The main parts of the check valves are made with the following materials:
- Brass bar EN 12164 – CW 614N for body and cover of valves in series 3112W, 3113W, 3132W, and 3133W.
- Hot forged brass EN 12420 – CW 617N for body and cover of valves in series 3144W, 3145W, 3184W, and 3185W.
- Copper pipe EN 12735-1 – Cu--DHP for solder connections
- Austenitic stainless steel AISI 302 for the spring
- Laminated glass fibre fabric and PTFE for gasket seals of valves in series 3112W, 3113W, 3132W, and 3133W.
- PTFE for gasket seals of valves in series 3144W, 3145W, 3184W, and 3185W.

INSTALLATION
The valves can be installed in any section of a refrigeration system where it is necessary to avoid the consequences from undesirable flow inversion, with respect for the operating limits and the capacities indicated in Table 53. Table 52 shows the following functional characteristics of a check valve:
- PS and TS
- Kv factor
- Minimum opening differential pressure at which the valve can open and remain opened.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. Valves with laminated fibreglass and PTFE gaskets are particularly sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body.
The brazing of valves with solder connections 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.

The allowed operating positions are the following:

- 3144W, 3145W: with the piping axis horizontal and valve cover facing upward or to the side, horizontal. With the piping axis vertical and arrow facing either upward or downward. **Note: valves 3144W, 3145W cannot be installed with the valve cover facing downward.**

- 3184W, 3185W: with inlet pipe facing downward and valve cover facing upward. With inlet pipe horizontal and outlet pipe vertical or horizontal. **Note: valves 3184W, and 3185W cannot be installed with the valve input facing upward and the valve cover facing downward.**

Valves 3112W, 3113W, 3132W, 3133W can be installed in any working position.

CERTIFICATIONS

The American certification authority Underwriters Laboratories Inc. has approved the check valves in series 3112W, 3113W, 3132W, 3133W, 3144W, 3145W, 3184W, 3185W. These valves are certified **UL Listed** for the USA with file SA33319, in compliance with American standard UL 207.

TABLE 52: General characteristics of hermetic check valves, UL approved

Catalogue Number	Connections			Kv Factor [m^3/h]	Minimum Opening Pressure Differential [bar]	PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
	SAE Flare	ODS					min.	max.	min.	max.	
		Ø [in.]	Ø [mm]								
3112W/2	1/4"	–	–	0,5	0,04	45 (1)	-40	+150	-40	+50	Art. 4.3
3112W/3	3/8"			1,5							
3112W/4	1/2"			1,8							
3112W/5	5/8"			3,3							
3112W/6	3/4"			5,0							
3113W/2	1/4"	–	–	0,5	0,30	45 (1)	-40	+150	-40	+50	Art. 4.3
3113W/3	3/8"			1,5							
3113W/4	1/2"			1,8							
3113W/5	5/8"			3,3							
3113W/6	3/4"			5,0							
3132W/2	–	1/4"	–	0,5	0,04	45 (1)	-40	+150	-40	+50	Art. 4.3
3132W/3		3/8"	–	1,5							
3132W/M10		–	10								
3132W/M12		–	12	1,8							
3132W/4		1/2"	–								
3132W/5		5/8"	16	3,3							
3132W/M18		–	18	5,0							
3132W/6		3/4"	–								
3132W/7		7/8"	22								
3133W/2	–	1/4"	–	0,5	0,30	45 (1)	-40	+150	-40	+50	Art. 4.3
3133W/3		3/8"	–	1,5							
3133W/M10		–	10								
3133W/M12		–	12	1,8							
3133W/4		1/2"	–								
3133W/5		5/8"	16	3,3							
3133W/M18		–	18	5,0							
3133W/6		3/4"	–								
3133W/7		7/8"	22								

(1) : MWP = 600 psi according to UL approval

Continued

TABLE 52: General characteristics of hermetic check valves, UL approved

Catalogue Number	Connections			Kv Factor [m^3/h]	Minimum Opening Pressure Differential [bar]	PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
	SAE Flare	ODS					min.	max.	min.	max.	
		Ø [in.]	Ø [mm]								
3144W/7	–	7/8"	22	8,1	0,04	45 (1)	– 40	+150	– 40	+50	Art. 4.3
3144W/M28		–	28	10,4							
3144W/9		1.1/8"	–								
3144W/11		1.3/8"	35	15,6							
3144W/13		1.5/8"	–	27,0							I
3144W/M42		–	42								
3144W/17		2.1/8"	54	39,0							
3144W/21		2.5/8"	–								
3144W/25		3.1/8"	–								
3145W/7	–	7/8"	22	8,1	0,3	45 (1)	– 40	+150	– 40	+50	Art. 4.3
3145W/M28		–	28	10,4							
3145W/9		1.1/8"	–								
3145W/11		1.3/8"	35	15,6							
3145W/13		1.5/8"	–	27,0							I
3145W/M42		–	42								
3145W/17		2.1/8"	54	39,0							
3145W/21		2.5/8"	–								
3145W/25		3.1/8"	–								
3184W/7	–	7/8"	22	9,0	0,04	45 (1)	– 40	+150	– 40	+50	Art. 4.3
3184W/M28		–	28	19,0							
3184W/9		1.1/8"	–								
3184W/11		1.3/8"	35	29,0							
3185W/7	–	7/8"	22	9,0	0,3	45 (1)	– 40	+150	– 40	+50	Art. 4.3
3185W/M28		–	28	19,0							
3185W/9		1.1/8"	–								
3185W/11		1.3/8"	35	29,0							

(1) : MWP = 600 psi according to UL approval

TABLE 53: Refrigerant flow capacity of hermetic check valves [kW]

Catalogue Number		Liquid line															
		R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A	R290	R600	R600a
3112W/2	3113W/2	8,50	9,15	12,57	5,95	8,62	8,59	5,75	6,29	7,52	7,83	7,86	7,96	6,07	10,19	11,95	10,60
3112W/3	3113W/3	25,50	27,45	37,70	17,85	25,85	25,76	17,25	18,87	22,56	23,48	23,58	23,87	18,20	30,57	35,85	31,80
3112W/4	3113W/4	30,60	32,94	45,23	21,42	31,01	30,91	20,70	22,64	27,07	28,17	28,30	28,64	21,83	36,68	43,02	38,16
3112W/5	3113W/5	56,10	60,39	82,93	39,27	56,86	56,66	37,95	41,51	49,63	51,65	51,88	52,50	40,03	67,25	78,87	69,96
3112W/6	3113W/6	85,00	91,50	125,65	59,50	86,15	85,85	57,50	62,90	75,20	78,25	78,60	79,55	60,65	101,90	119,50	106,00
3132W/2	3133W/2	8,50	9,15	12,57	5,95	8,62	8,59	5,75	6,29	7,52	7,83	7,86	7,96	6,07	10,19	11,95	10,60
3132W/3	3133W/3	25,50	27,45	37,70	17,85	25,85	25,76	17,25	18,87	22,56	23,48	23,58	23,87	18,20	30,57	35,85	31,80
3132W/M10	3133W/M10																
3132W/M12	3133W/M12	30,60	32,94	45,23	21,42	31,01	30,91	20,70	22,64	27,07	28,17	28,30	28,64	21,83	36,68	43,02	38,16
3132W/4	3133W/4																
3132W/5	3133W/5	56,10	60,39	82,93	39,27	56,86	56,66	37,95	41,51	49,63	51,65	51,88	52,50	40,03	67,25	78,87	69,96
3132W/M18	3133W/M18	85,00	91,50	125,65	59,50	86,15	85,85	57,50	62,90	75,20	78,25	78,60	79,55	60,65	101,90	119,50	106,00
3132W/6	3133W/6																
3132W/7	3133W/7																
3144W/7	3145W/7	137,70	148,23	203,55	96,39	139,56	139,08	93,15	101,90	121,82	126,77	127,33	128,87	98,25	165,08	193,59	171,72
3144W/M28	3145W/M28	176,80	190,32	261,35	123,76	179,19	178,57	119,60	130,83	156,42	162,76	163,49	165,46	126,15	211,95	248,56	220,48
3144W/9	3145W/9																
3144W/11	3145W/11	265,20	285,48		185,64	268,79	267,85	179,40		234,62	244,14	245,23	248,20	189,23			
3144W/13	3145W/13	459,00	494,10		321,30	465,21	463,59	310,50		406,08	422,55	424,44	429,57	327,51			
3144W/M42	3145W/M42																
3144W/17	3145W/17	663,00	713,70		464,10	671,97	669,63	448,50		586,56	610,35	613,08	620,49	473,07			
3144W/21	3145W/21																
3144W/25	3145W/25																
3184W/7	3185W/7	153,00	164,70	226,17	107,10	155,07	154,53	103,50	113,22	135,36	140,85	141,48	143,19	109,17	183,42	215,10	190,80
3184W/M28	3185W/M28	323,00	347,70	477,47	226,10	327,37	326,23	218,50	239,02	285,76	297,35	298,68	302,29	230,47	387,22	454,10	402,80
3184W/9	3185W/9																
3184W/11	3185W/11	493,00	530,70		345,10	499,67	497,93	333,50		436,16	453,85	455,88	461,39	351,77			

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)
Evaporator outlet temperature	50 °F	(9,9 °C)
Evaporator superheating	10 °R	(5,5 °K)
Suction line temperature	65 °F	(18,3 °C)
Suction superheating	15 °R	(8,4 °K)
Discharge temperature	160 °F	(71,1 °C)

Continued

TABLE 53: Refrigerant flow capacity of hermetic check valves [kW]

Catalogue Number		Suction line															
		R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A	R290	R600	R600a
3112W/2	3113W/2	0,91	1,28	2,13	1,10	1,14	1,65	1,12	0,74	0,71	1,20	1,10	0,80	1,06	1,53	0,65	0,79
3112W/3	3113W/3	2,73	3,83	6,38	3,30	3,41	4,95	3,35	2,21	2,13	3,60	3,30	2,39	3,17	4,58	1,94	2,37
3112W/4	3113W/4	3,28	4,59	7,65	3,96	4,09	5,94	4,01	2,65	2,56	4,32	3,96	2,86	3,80	5,49	2,32	2,84
3112W/5	3113W/5	6,01	8,42	14,03	7,26	7,49	10,89	7,36	4,85	4,69	7,92	7,26	5,25	6,96	10,07	4,26	5,21
3112W/6	3113W/6	9,10	12,75	21,25	11,00	11,35	16,50	11,15	7,35	7,10	12,00	11,00	7,95	10,55	15,25	6,45	7,90
3132W/2	3133W/2	0,91	1,28	2,13	1,10	1,14	1,65	1,12	0,74	0,71	1,20	1,10	0,80	1,06	1,53	0,65	0,79
3132W/3	3133W/3	2,73	3,83	6,38	3,30	3,41	4,95	3,35	2,21	2,13	3,60	3,30	2,39	3,17	4,58	1,94	2,37
3132W/M10	3133W/M10																
3132W/M12	3133W/M12	3,28	4,59	7,65	3,96	4,09	5,94	4,01	2,65	2,56	4,32	3,96	2,86	3,80	5,49	2,32	2,84
3132W/4	3133W/4																
3132W/5	3133W/5	6,01	8,42	14,03	7,26	7,49	10,89	7,36	4,85	4,69	7,92	7,26	5,25	6,96	10,07	4,26	5,21
3132W/M18	3133W/M18	9,10	12,75	21,25	11,00	11,35	16,50	11,15	7,35	7,10	12,00	11,00	7,95	10,55	15,25	6,45	7,90
3132W/6	3133W/6																
3132W/7	3133W/7																
3144W/7	3145W/7	14,74	20,66	34,43	17,82	18,39	26,73	18,06	11,91	11,50	19,44	17,82	12,88	17,09	24,71	10,45	12,80
3144W/M28	3145W/M28	18,93	26,52	44,20	22,88	23,61	34,32	23,19	15,29	14,77	24,96	22,88	16,54	21,94	31,72	13,42	16,43
3144W/9	3145W/9																
3144W/11	3145W/11	28,39	39,78		34,32	35,41	51,48	34,79		22,15	37,44	34,32	24,80	32,92			
3144W/13	3145W/13	49,14	68,85		59,40	61,29	89,10	60,21		38,34	64,80	59,40	42,93	56,97			
3144W/M42	3145W/M42																
3144W/17	3145W/17	70,98	99,45		85,80	88,53	128,70	86,97		55,38	93,60	85,80	62,01	82,29			
3144W/21	3145W/21																
3144W/25	3145W/25																
3184W/7	3185W/7	16,38	22,95	38,25	19,80	20,43	29,70	20,07	13,23	12,78	21,60	19,80	14,31	18,99	27,45	11,61	14,22
3184W/M28	3185W/M28	34,58	48,45	80,75	41,80	43,13	62,70	42,37	27,93	26,98	45,60	41,80	30,21	40,09	57,95	24,51	30,02
3184W/9	3185W/9																
3184W/11	3185W/11	52,78	73,95		63,80	65,83	95,70	64,67		41,18	69,60	63,80	46,11	61,19			

Standard rating conditions according to AHRI Standard 760-2007

Continued

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 53: Refrigerant flow capacity of hermetic check valves [kW]

Catalogue Number		Hot Gas line															
		R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A	R290	R600	R600a
3112W/2	3113W/2	4,25	5,60	9,08	4,80	5,95	6,80	4,77	3,32	3,43	5,90	5,39	3,83	4,99	6,38	3,23	3,72
3112W/3	3113W/3	12,75	16,80	27,24	14,40	17,85	20,40	14,31	9,96	10,28	17,70	16,17	11,48	14,97	19,14	9,69	11,16
3112W/4	3113W/4	15,30	20,16	32,69	17,28	21,42	24,48	17,17	11,95	12,33	21,24	19,40	13,77	17,96	22,97	11,63	13,39
3112W/5	3113W/5	28,05	36,96	59,93	31,68	39,27	44,88	31,48	21,91	22,61	38,94	35,57	25,25	32,93	42,11	21,32	24,55
3112W/6	3113W/6	42,50	56,00	90,80	48,00	59,50	68,00	47,70	33,20	34,25	59,00	53,90	38,25	49,90	63,80	32,30	37,20
3132W/2	3133W/2	4,25	5,60	9,08	4,80	5,95	6,80	4,77	3,32	3,43	5,90	5,39	3,83	4,99	6,38	3,23	3,72
3132W/3	3133W/3	12,75	16,80	27,24	14,40	17,85	20,40	14,31	9,96	10,28	17,70	16,17	11,48	14,97	19,14	9,69	11,16
3132W/M10	3133W/M10																
3132W/M12	3133W/M12	15,30	20,16	32,69	17,28	21,42	24,48	17,17	11,95	12,33	21,24	19,40	13,77	17,96	22,97	11,63	13,39
3132W/4	3133W/4																
3132W/5	3133W/5	28,05	36,96	59,93	31,68	39,27	44,88	31,48	21,91	22,61	38,94	35,57	25,25	32,93	42,11	21,32	24,55
3132W/M18	3133W/M18	42,50	56,00	90,80	48,00	59,50	68,00	47,70	33,20	34,25	59,00	53,90	38,25	49,90	63,80	32,30	37,20
3132W/6	3133W/6																
3132W/7	3133W/7																
3144W/7	3145W/7	68,85	90,72	147,10	77,76	96,39	110,16	77,27	53,78	55,49	95,58	87,32	61,97	80,84	103,36	52,33	60,26
3144W/M28	3145W/M28	88,40	116,48	188,86	99,84	123,76	141,44	99,22	69,06	71,24	122,72	112,11	79,56	103,79	132,70	67,18	77,38
3144W/9	3145W/9																
3144W/11	3145W/11	132,60	174,72		149,76	185,64	212,16	148,82		106,86	184,08	168,17	119,34	155,69			
3144W/13	3145W/13	229,50	302,40		259,20	321,30	367,20	257,58		184,95	318,60	291,06	206,55	269,46			
3144W/M42	3145W/M42																
3144W/17	3145W/17	331,50	436,80		374,40	464,10	530,40	372,06		267,15	460,20	420,42	298,35	389,22			
3144W/21	3145W/21																
3144W/25	3145W/25																
3184W/7	3185W/7	76,50	100,80	163,44	86,40	107,10	122,40	85,86	59,76	61,65	106,20	97,02	68,85	89,82	114,84	58,14	66,96
3184W/M28	3185W/M28	161,50	212,80	345,04	182,40	226,10	258,40	181,26	126,16	130,15	224,20	204,82	145,35	189,62	242,44	122,74	141,36
3184W/9	3185W/9																
3184W/11	3185W/11	246,50	324,80		278,40	345,10	394,40	276,66		198,65	342,20	312,62	221,85	289,42			

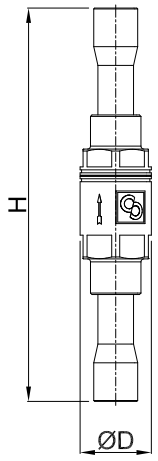
Standard rating conditions according to AHRI Standard 760-2007

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)

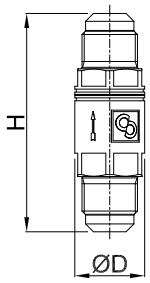
TABLE 54: Dimensions and weights of hermetic check valves

Catalogue Number		Dimensions [mm]						Weight [g]
		L	L_1	D	H	H_1	Ch	
3112W/2	3113W/2	58	–	18	–	–	16	60
3112W/3	3113W/3	70		22			20	100
3112W/4	3113W/4	75		24			22	132
3112W/5	3113W/5	87		29			26	204
3112W/6	3113W/6	100		35			32	330
3132W/2	3133W/2	93	–	18	–	–	–	65
3132W/3	3133W/3	108		22				120
3132W/M10	3133W/M10							
3132W/M12	3133W/M12	133		24				157
3132W/4	3133W/4							
3132W/5	3133W/5	140		29				220
3132W/M18	3133W/M18	165		35				304
3132W/6	3133W/6							
3132W/7	3133W/7							
3144W/7	3145W/7	170	–	50	96	24	–	1055
3144W/M28	3145W/M28	201						1062
3144W/9	3145W/9							
3144W/11	3145W/11	232		56	115	29		1300
3144W/13	3145W/13	255		67	148	36		
3144W/M42	3145W/M42							
3144W/17	3145W/17	285		79	167	44		
3144W/21	3145W/21							
3144W/25	3145W/25	329						
3184W/7	3185W/7	111	88	45	146	94	–	600
3184W/M28	3185W/M28	149	123	51	196	141		1010
3184W/9	3185W/9							
3184W/11	3185W/11	151		56	204			1300

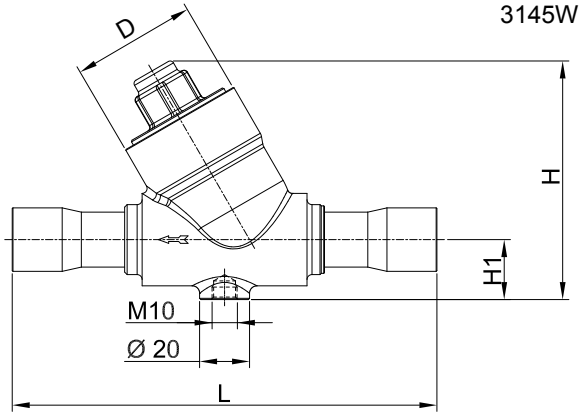
3132W
3133W



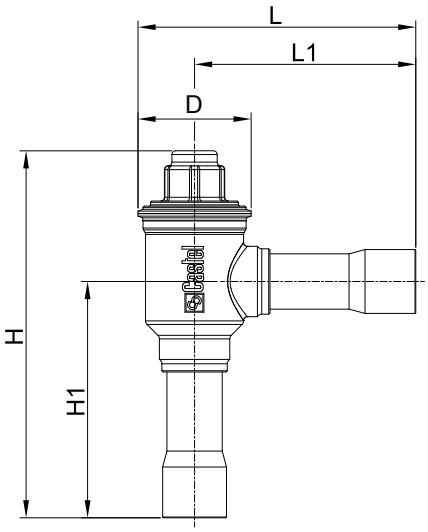
3112W
3113W



3144W
3145W



3184W
3185W



CHAPTER 13
CHECK VALVES
FOR REFRIGERATION PLANTS THAT USE HCFC, HFC OR HFO REFRIGERANTS

APPLICATIONS

The check 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), only valves in series 3122
- 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 check valves, up to DN 25, that is models 3122/9, 3124N/9, 3125N/9 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

These check valves are available in the following two types:

- Valve types 3122, 3124N (standard spring) with a low opening differential; $\Delta p = 0.04$ bar or 0.1 bar.
- Valve types 3125N (reinforced spring) with a high opening differential; $\Delta p = 0.3$ bar. To be used, for example, with compressors in parallel.

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

- Hot forged brass EN 12420 – CW 617N for body and cover.
- Copper pipe EN 12735-1 – Cu--DHP for solder connections
- Austenitic stainless steel AISI 302 for the spring
- Laminated stainless steel / rubber for outlet seal gaskets for valves in series 3122
- Hydrogenated nitrile (HNBR) for outlet seal gaskets for valves in series 3124N, 3125N
- PTFE for seat gaskets

INSTALLATION

The valves can be installed in any section of a refrigeration system where it is necessary to avoid the consequences from undesirable flow inversion, with respect for the operating limits and the yields indicated in Table 56. Table 55 shows the following functional characteristics of a check valve:

- PS and TS
- Kv factor
- Minimum opening differential pressure at which the valve can open and remain opened.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. Valves with PTFE gaskets are particularly sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body.

The brazing of valves with solder connections should be carried out with care, using a low melting point filler material (min. 5% Ag). **Before starting to braze the body, it is necessary to disassemble the valves in series 3122, 3124N, 3125N.** It is important to avoid direct contact between the torch flame and the body, which could be damaged and compromise the proper functioning of the entire valve.

The allowed operating positions are the following:

- 3122, 3124N, 3125N: with the piping axis horizontal and valve cover facing upward or to the side, horizontal. With the piping axis vertical and arrow facing either upward or downward. **Note: valves 3122, 3124N, 3125N cannot be installed with the valve cover facing downward.**

TABLE 55: General characteristics of check valves

Catalogue Number	Connections ODS Ø [in.]	Connections ODS Ø [mm]	Kv Factor [m³/h]	Minimum Opening Pressure Differential [bar]	PS [bar]	TS [°C] min.	TS [°C] max.	TA [°C] min.	TA [°C] max.	Risk Category according to PED Recast
3122/M22	–	22	6,6	0,1	45	– 35	+160	– 35	+50	Art. 4.3
3122/7	7/8"	–								
3122/M28	–	28	8,8							
3122/9	1.1/8"	–								
3122/11	1.3/8"	35	15,2							
3122/13	1.5/8"	–	25,0							I
3122/M42	–	42								
3122/17	2.1/8"	54	40,0							
3124N/M22	–	22	8,1	0,04	45	-40	+150	-40	+50	Art. 4.3
3124N/7	7/8"	–								
3124N/M28	–	28	10,4							
3124N/9	1.1/8"	–								
3124N/11	1.3/8"	35	15,6							
3124N/13	1.5/8"	–	27,0							I
3124N/M42	–	42								
3124N/17	2.1/8"	54	39,0							
3125N/M22	–	22	8,1	0,3	45	-40	+150	-40	+50	Art. 4.3
3125N/7	7/8"	–								
3125N/M28	–	28	10,4							
3125N/9	1.1/8"	–								
3125N/11	1.3/8"	35	15,6							
3125N/13	1.5/8"	–	27,0							I
3125N/M42	–	42								
3125N/17	2.1/8"	54	39,0							

TABLE 56: Refrigerant flow capacity of check valves [kW]

Catalogue Number		Liquid line R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
3122/M22	–	112,20	120,78	165,86	78,54	113,72	113,32	75,90	83,03	99,26	103,29	103,75	105,01	80,06
3122/7	–													
3122/M28	–	149,60	161,04	221,14	104,72	151,62	151,10	101,20	110,70	132,35	137,72	138,34	140,01	106,74
3122/9	–													
3122/11	–	258,40	278,16		180,88	261,90	260,98	174,80		228,61	237,88	238,94	241,83	184,38
3122/13	–	425,00	457,50		297,50	430,75	429,25	287,50		376,00	391,25	393,00	397,75	303,25
3122/M42	–													
3122/17	–	680,00	732,00		476,00	689,20	686,80	460,00		601,60	626,00	628,80	636,40	485,20
3124N/M22	3125N/M22	137,70	148,23	203,55	96,39	139,56	139,08	93,15	101,90	121,82	126,77	127,33	128,87	98,25
3124N/7	3125N/7													
3124N/M28	3125N/M28	176,80	190,32	261,35	123,76	179,19	178,57	119,60	130,83	156,42	162,76	163,49	165,46	126,15
3124N/9	3125N/9													
3124N/11	3125N/11	265,20	285,48		185,64	268,79	267,85	179,40		234,62	244,14	245,23	248,20	189,23
3124N/13	3125N/13	459,00	494,10		321,30	465,21	463,59	310,50		406,08	422,55	424,44	429,57	327,51
3124N/M42	3125N/M42													
3124N/17	3125N/17	663,00	713,70		464,10	671,97	669,63	448,50		586,56	610,35	613,08	620,49	473,07

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)
Evaporator outlet temperature	50 °F	(9,9 °C)
Evaporator superheating	10 °R	(5,5 °K)
Suction line temperature	65 °F	(18,3 °C)
Suction superheating	15 °R	(8,4 °K)
Discharge temperature	160 °F	(71,1 °C)

Continued

TABLE 56: Refrigerant flow capacity of check valves [kW]

Catalogue Number		Suction line											
		R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
3122/M22	–	12,01	16,83	28,05	14,52	14,98	21,78	14,72	9,70	9,37	15,84	14,52	10,49	13,93
3122/7	–													
3122/M28	–	16,02	22,44	37,40	19,36	19,98	29,04	19,62	12,94	12,50	21,12	19,36	13,99	18,57
3122/9	–													
3122/11	–	27,66	38,76		33,44	34,50	50,16	33,90		21,58	36,48	33,44	24,17	32,07
3122/13	–	45,50	63,75		55,00	56,75	82,50	55,75		35,50	60,00	55,00	39,75	52,75
3122/M42	–													
3122/17	–	72,80	102,00		88,00	90,80	132,00	89,20		56,80	96,00	88,00	63,60	84,40
3124N/M22	3125N/M22	14,74	20,66	34,43	17,82	18,39	26,73	18,06	11,91	11,50	19,44	17,82	12,88	17,09
3124N/7	3125N/7													
3124N/M28	3125N/M28	18,93	26,52	44,20	22,88	23,61	34,32	23,19	15,29	14,77	24,96	22,88	16,54	21,94
3124N/9	3125N/9													
3124N/11	3125N/11	28,39	39,78		34,32	35,41	51,48	34,79		22,15	37,44	34,32	24,80	32,92
3124N/13	3125N/13	49,14	68,85		59,40	61,29	89,10	60,21		38,34	64,80	59,40	42,93	56,97
3124N/M42	3125N/M42													
3124N/17	3125N/17	70,98	99,45		85,80	88,53	128,70	86,97		55,38	93,60	85,80	62,01	82,29

Continued

TABLE 56: Refrigerant flow capacity of check valves [kW]

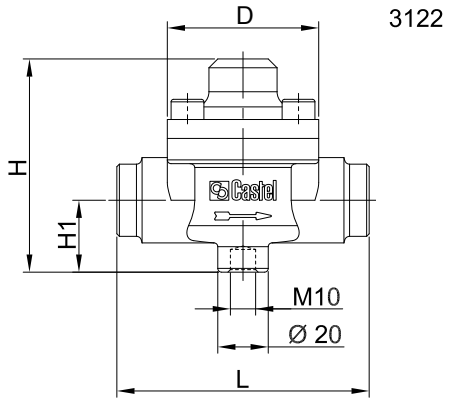
Catalogue Number		Hot Gas line											
		R134a	R22	R32	R404A	R407C	R410A	R507	R1234yf	R1234ze	R448A	R449A	R450A	R452A
3122/M22	–	56,10	73,92	119,86	63,36	78,54	89,76	62,96	43,82	45,21	77,88	71,15	50,49	65,87
3122/7	–													
3122/M28	–	74,80	98,56	159,81	84,48	104,72	119,68	83,95	58,43	60,28	103,84	94,86	67,32	87,82
3122/9	–													
3122/11	–	129,20	170,24		145,92	180,88	206,72	145,01		104,12	179,36	163,86	116,28	151,70
3122/13	–	212,50	280,00		240,00	297,50	340,00	238,50		171,25	295,00	269,50	191,25	249,50
3122/M42	–													
3122/17	–	340,00	448,00		384,00	476,00	544,00	381,60		274,00	472,00	431,20	306,00	399,20
3124N/M22	3125N/M22	68,85	90,72	147,10	77,76	96,39	110,16	77,27	53,78	55,49	95,58	87,32	61,97	80,84
3124N/7	3125N/7													
3124N/M28	3125N/M28	88,40	116,48	188,86	99,84	123,76	141,44	99,22	69,06	71,24	122,72	112,11	79,56	103,79
3124N/9	3125N/9													
3124N/11	3125N/11	132,60	174,72		149,76	185,64	212,16	148,82		106,86	184,08	168,17	119,34	155,69
3124N/13	3125N/13	229,50	302,40		259,20	321,30	367,20	257,58		184,95	318,60	291,06	206,55	269,46
3124N/M42	3125N/M42													
3124N/17	3125N/17	331,50	436,80		374,40	464,10	530,40	372,06		267,15	460,20	420,42	298,35	389,22

Standard rating conditions according to AHRI Standard 760-2007

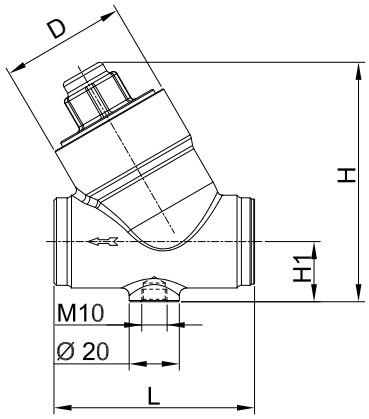
Condensing temperature	110 °F	(43,3 °C)
Liquid temperature	100 °F	(37,8 °C)
Subcooling	10 °R	(5,5 °K)
Evaporating temperature	40 °F	(4,4 °C)
Evaporator outlet temperature	50 °F	(9,9 °C)
Evaporator superheating	10 °R	(5,5 °K)
Suction line temperature	65 °F	(18,3 °C)
Suction superheating	15 °R	(8,4 °K)
Discharge temperature	160 °F	(71,1 °C)

TABLE 57: Dimensions and weights of check valves

Catalogue Number		Dimensions [mm]				Weight [g]
		H	H_1	L	D	
3122/M22	–	84,5	28,5	100	60	1190
3122/7	–					
3122/M28	–					
3122/9	–					
3122/11	–	101,5	34	118	68	1557
3122/13	–	125,5	37	141	88	2990
3122/M42	–					
3122/17	–	142	42,5	173	104	4665
3124N/M22	3125N/M22	96	24	80	50	855
3124N/7	3125N/7					
3124N/M28	3125N/M28					867
3124N/9	3125N/9					
3124N/11	3125N/11	115	29	92	56	1130
3124N/13	3125N/13	148	36	121	67	
3124N/M42	3125N/M42					
3124N/17	3125N/17	167	44	157	79	



3122



3124N
3125N

CHAPTER 14
HERMETIC CHECK VALVES
FOR REFRIGERATION PLANTS THAT USE THE R744 REFRIGERANT

APPLICATIONS

The check valves illustrated in this chapter have been developed by Castel for all the applications that use the sub-critical or 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.

The check valves for plants that operate using refrigerant fluid R744 are the following:

- Valves in series 3132EW, 3133EW, 3145EW and 3185EW with PS = 80 bar, equipped with copper connections for trans-critical plants low and medium pressure sides.
- Valves in series 3137EW, 3147EW and 3187EW with PS = 120 bar equipped with reinforced copper connections (K65) for trans-critical plants high-pressure side.
- Valves in series 3138EW, 3148EW and 3188EW with PS = 140 bar equipped with reinforced stainless steel connections for trans-critical plants high-pressure side.

CAUTION! The check valves in this chapter cannot be used with other refrigerant fluids.

CONSTRUCTION

Only straight check valves in series 3132EW (standard spring) ensure a low opening differential; $\Delta p = 0.04$ bar. All of the other check valves for R744 (reinforced spring) ensure a high opening differential; $\Delta p = 0.3$ bar.

Valves in series 3132EW, 3133EW, 3137EW, 3138EW, 3145EW, 3147EW, 3148EW, 3185EW, 3187EW, 3188EW are equipped with laser welds between the body and the cover to ensure that the product is sealed hermetically.

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

- Brass bar EN 12164 - CW 614N for body and cover of the valves in series 3132EW, 3133EW, 3137EW, 3138EW.
- Hot forged brass EN 12420 - CW 617N for body and cover of the valves in series: 3145EW, 3147EW, 3148EW, 3185EW, 3187EW, 3188EW.
- Austenitic stainless steel AISI 302 for the spring
- Laminated glass fibre fabric and PTFE for seat gaskets of valves in series 3132EW, 3133EW, 3137EW, 3138EW.
- PTFE for seat gaskets of valves in series 3145EW, 3147EW, 3148EW, 3185EW, 3187EW, 3188EW.
- Copper pipe EN 12735-1 – Cu-DHP for welded connections in series 3132EW, 3133EW, 3145EW, 3185EW.
- Copper pipe EN 12735-1 – CuFe2P (K65) for welded connections in series 3137EW, 3147EW, 3187EW
- Stainless steel pipe AISI 304 for welded connections in series 3138EW, 3148EW 3188EW.

INSTALLATION

The valves can be installed in any section of a refrigeration system where it is necessary to avoid the consequences from undesirable flow inversion, with respect for the operating limits and the yields indicated in Table 59. Table 58 shows the following functional characteristics of a check valve:

- PS and TS
- Kv factor
- Minimum opening differential pressure at which the valve can open and remain opened.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. Valves with PTFE gaskets are particularly sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body.

Copper connections: The brazing of valves with copper connections should be carried out with care, using a low melting point filler material (min. 5% Ag). It is not necessary to disassemble the valves, 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.

Steel connectors: TIG welding recommended, 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.

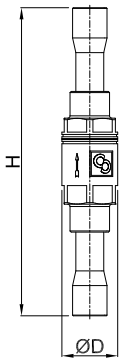
The allowed operating positions are the following:

- 3145EW, 3147EW, 3148EW: with the piping axis horizontal and valve cover facing upward or to the side, horizontal. With piping axis vertical and arrow facing either upward or downward. **Note: valves 3145EW, 3147EW, 3148EW cannot be installed with the valve cover facing downward.**

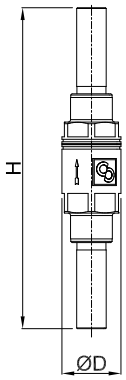
- 3185EW, 3187EW, 3188EW: with inlet pipe facing downward and valve cover facing upward. With inlet pipe horizontal and outlet pipe vertical or horizontal. **Note: valves 3185EW, 3187EW, 3188EW cannot be installed with the valve input facing upward and the valve cover facing downward.**

Valves 3132EW, 3133EW, 3137EW, 3138EW can be installed in any working position.

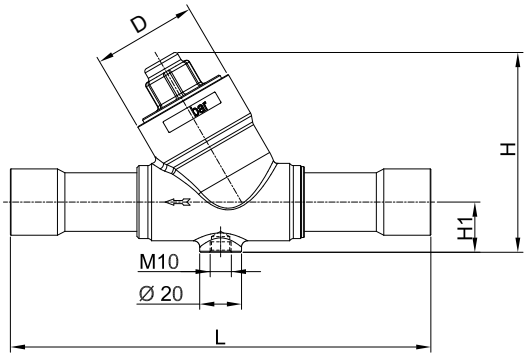
3132EW
3133EW
3137EW



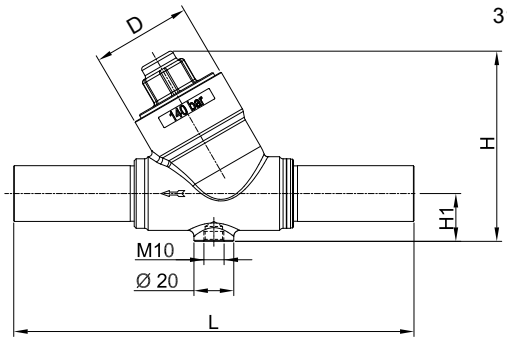
3138EW



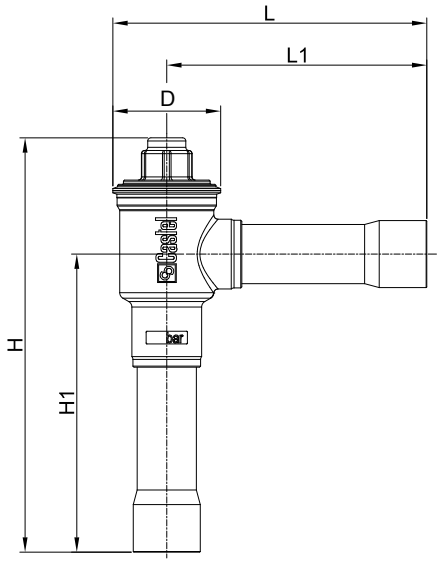
3145EW
3147EW



3148EW



3185EW
3187EW



3188EW

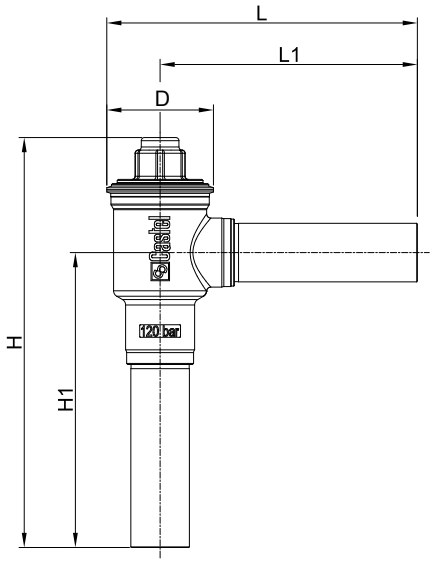


TABLE 58: General Characteristics of hermetic check valves for R744

Catalogue Number	Connections		Kv Factor [m³/h]	Minimum Opening Pressure Differential [bar]	PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
	ODS					min.	max.	min.	max.	
	Ø [in.]	Ø [mm]								
3132EW/2	1/4"	–	0,5	0,04	80	– 40	+150	– 40	+50	Art. 4.3
3132EW/3	3/8"	–	1,5							
3132EW/M10	–	10								
3132EW/M12	–	12	1,8							
3132EW/4	1/2"	–								
3132EW/5	5/8"	16	3,3							
3132EW/M18	–	18	5,0							
3132EW/6	3/4"	–								
3132EW/7	7/8"	22								
3133EW/2	1/4"	–	0,5	0,3						
3133EW/3	3/8"	–	1,5							
3133EW/M10	–	10								
3133EW/M12	–	12	1,8							
3133EW/4	1/2"	–								
3133EW/5	5/8"	16	3,3							
3133EW/M18	–	18	5,0							
3133EW/6	3/4"	–								
3133EW/7	7/8"	22								
3137EW/2	1/4"	–	0,5	0,3	120	-40	+150	-40	+-50	Art. 4.3
3137EW/3	3/8"	–	1,5							
3137EW/4	1/2"	–								
3137EW/5	5/8"	16	3,3							
3138EW/M10	–	10	1,5	0,3	140	-40	+150	-40	+50	Art. 4.3
3138EW/M12	–	12								
3138EW/M16	–	16	3,3							
3145EW/7	7/8"	22	8,1	0,3	80	– 40	+150	– 40	+50	Art. 4.3
3145EW/M28	–	28	10,4							
3145EW/9	1.1/8"	–								
3145EW/11	1.3/8"	35	15,6							
3145EW/13	1.5/8"	–	27,0							I
3145EW/M42	–	42								
3145EW/17	2.1/8"	54	39,0							
3147EW/7	7/8"	22	8,1	0,3	120	– 40	+150	– 40	+50	Art. 4.3
3147EW/9	1.1/8"	–	10,4							
3147EW/11	1.3/8"	35	15,6							
3147EW/13	1.5/8"	–	27,0							I
3147EW/17	2.1/8"	54	39,0							
3148EW/M22	–	22	8,1	0,3	140	– 40	+150	– 40	+50	Art. 4.3
3148EW/M28	–	28	10,4							
3148EW/M35	–	33,4	15,6							
3148EW/M42	–	42,2	27,0							I
3185EW/7	7/8"	22	9,0	0,3	80	– 40	+150	– 40	+50	Art. 4.3
3185EW/M28	–	28	19,0							
3185EW/9	1.1/8"	–								
3185EW/11	1.3/8"	35	29,0							
3187EW/7	7/8"	22	9,0	0,3	120	– 40	+150	– 40	+50	Art. 4.3
3187EW/9	1.1/8"	–	19,0							
3187EW/11	1.3/8"	35	29,0							
3188EW/M22	–	22	9,0	0,3	140	– 40	+150	– 40	+50	Art. 4.3
3188EW/M28	–	28	19,0							
3188EW/M35	–	33,4	29,0							

TABLE 59: Refrigerant flow capacity of check valves [kW]

Catalogue Number		Subcritical system			Transcritical system		
		Liquid line	Suction line	Hot gas line	Gas cooler line	Suction line	Hot gas line
3132EW/2	3133EW/2	13,40	2,65	10,09		2,32	
3132EW/3	3133EW/3	40,20	7,95	30,27		6,95	
3132EW/M10	3133EW/M10						
3132EW/M12	3133EW/M12	48,24	9,54	36,32		8,33	
3132EW/4	3133EW/4						
3132EW/5	3133EW/5	88,44	17,49	66,59		15,28	
3132EW/M18	3133EW/M18	134,00	26,50	100,90		23,15	
3132EW/6	3133EW/6						
3132EW/7	3133EW/7						
3137EW/2	–				13,14	2,32	9,35
3137EW/3	3138EW/M10				39,41	6,95	28,04
3137EW/4	3138EW/M12						
3137EW/5	3138EW/M16				86,69	15,28	61,68
–	3145EW/7	217,08	42,93	163,46		37,50	
	3145EW/M28	278,72	55,12	209,87		48,15	
	3145EW/9						
	3145EW/11	418,08	82,68	314,81		72,23	
	3145EW/13	723,60	143,10	544,86		125,01	
	3145EW/M42						
	3145EW/17	1045,20	206,70	787,02		180,57	
3147EW/7	3148EW/M22				212,79	37,50	151,39
3147EW/9	3148EW/M28				273,21	48,15	194,38
3147EW/11	3148EW/M35				409,81	72,23	291,56
3147EW/13	–				709,29	125,01	504,63
–	3148EW/M42						
3147EW/17	–				1024,53	180,57	728,91
–	3185EW/7	241,20	47,70	181,62		41,67	
	3185EW/M28	509,20	100,70	383,42		87,97	
	3185EW/9						
	3185EW/11	777,20	153,70	585,22		134,27	
3187EW/7	3188EW/M22				236,43	41,67	168,21
3187EW/9	3188EW/M28				499,13	87,97	355,11
3187EW/11	3188EW/M35				761,83	134,27	542,01

TABLE 60: Dimensions and weights of check valves for R744

Catalogue Number		Dimensions [mm]					Weight [g]
		H	H_1	L	L_1	Ø D	
3132EW/2	3133EW/2	93	–	–	–	18	65
3132EW/3	3133EW/3	108				22	120
3132EW/M10	3133EW/M10						
3132EW/M12	3133EW/M12	133				24	157
3132EW/4	3133EW/4						
3132EW/5	3133EW/5	146				29	220
3132EW/M18	3133EW/M18	165				35	304
3132EW/6	3133EW/6						
3132EW/7	3133EW/7						
3137EW/2	–	122				22	65
3137EW/3		126				22	120
3137EW/4		132				24	157
3137EW/5		146				29	220
3138EW/M10		126				22	130
3138EW/M12		132				24	155
3138EW/M16		146				29	242
3145EW/7		96	24	170	–	50	1055
3145EW/M28				201			1062
3145EW/9							
3145EW/11		115	29	232		56	1300
3145EW/13		148	36	255		67	
3145EW/M42							
3145EW/17		167	44	285		79	
3147EW/7		96	24	170		50	1055
3147EW/9				201			1062
3147EW/11		115	29	232		56	1300
3147EW/13		148	36	255		67	
3147EW/17		167	44	285		79	
3148EW/M22		96	24	170		50	
3148EW/M28				201			
3148EW/M35		115	29	232		56	
3148EW/M42		148	36	255		67	
3185EW/7		146	94	111	88	45	600
3185EW/M28		196	141	149	123	51	1010
3185EW/9							
3185EW/11		204		151		56	1300
3187EW/7		146	94	111	88	45	600
3187EW/9		196	141	149	123	51	1010
3187EW/11		204		151		56	1300
3188EW/M22		146	94	111	88	45	
3188EW/M28		196	141	149	123	51	
3188EW/M35		204		151		56	

www.castel.it

ed. 002-VR-ENG

Castel Srl - Via Provinciale 2-4 - 20060 Pessano con Bornago - MI