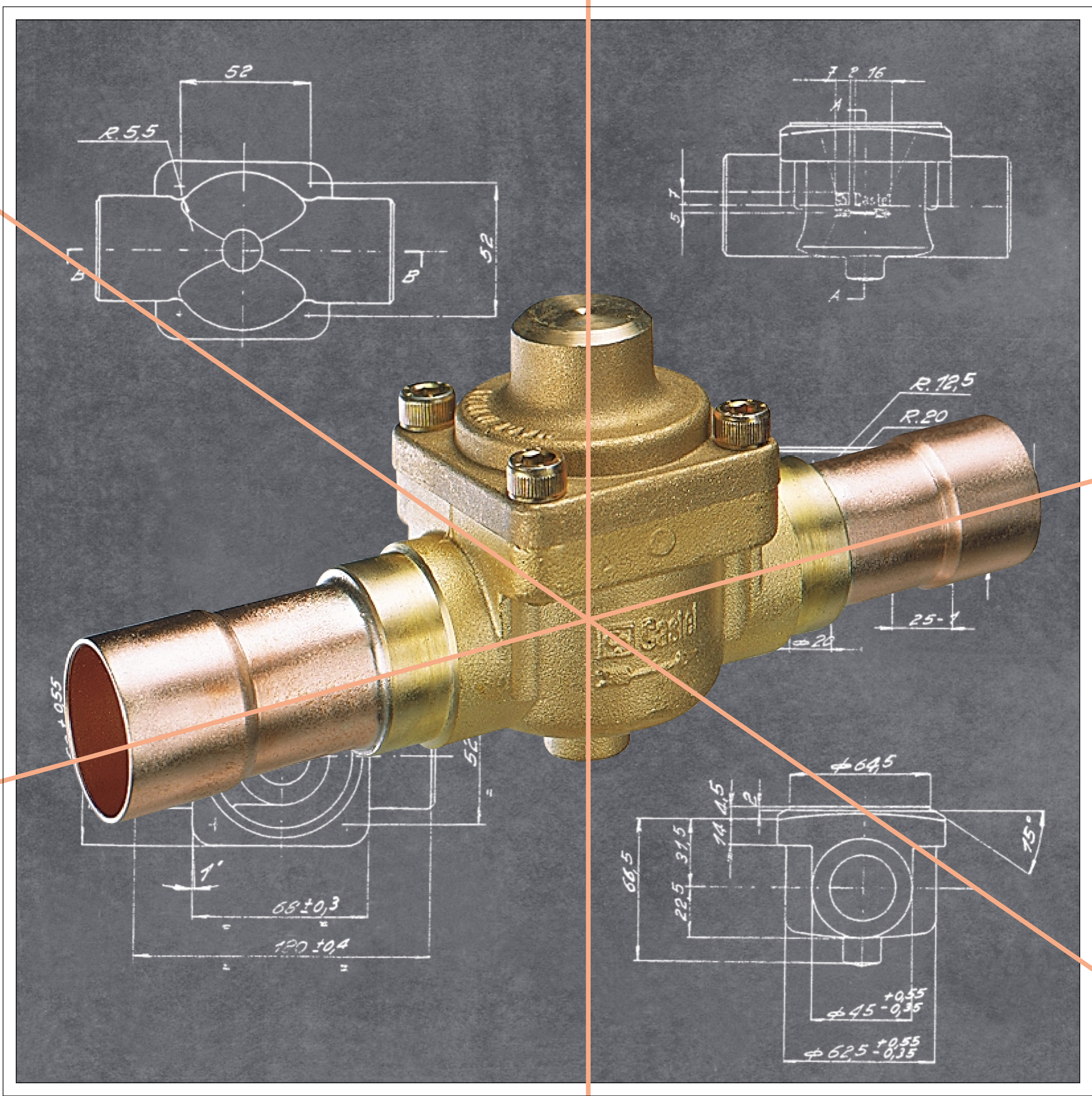

52
R.5,5
52
R.12,5
R.20
25-1
68±0,3
120±0,4
⌀64,5
15°
66,5
31,5
22,5

APPLICATIONS

The check valves illustrated herein are designed for use with refrigerant fluids CFC, HCFC and HFC. Castel check valves can be used on any section of a refrigerating system where it is necessary to avoid an inversion of the refrigerant flow.

MATERIALS

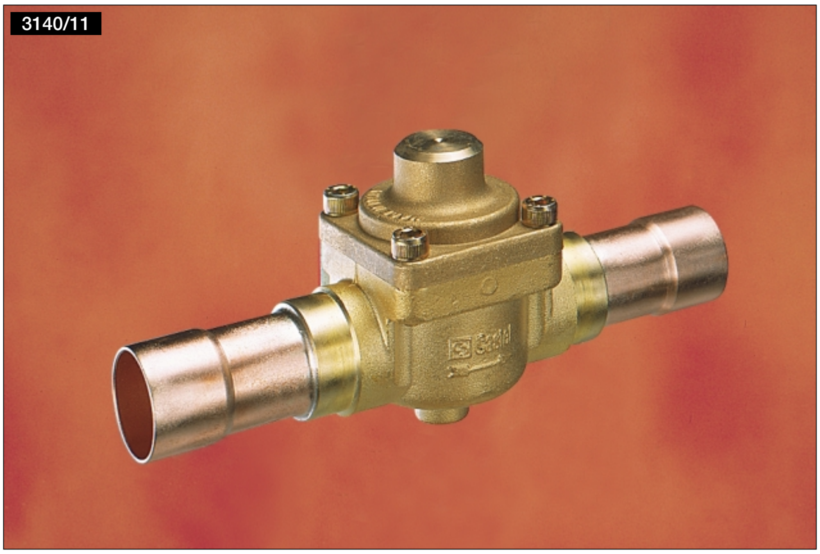
The materials used for the main parts are:

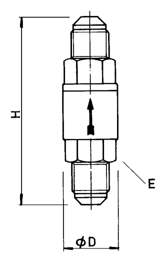
- ST-UNI EN 12165 - CW 617 N hot-forged brass for the main body and the cover;
- austenitic stainless steel – AISI 302 for the spring;
- chloroprene rubber (CR) for outer seal gaskets;
- P.T.F.E. for seat gasket.

INSTALLATION

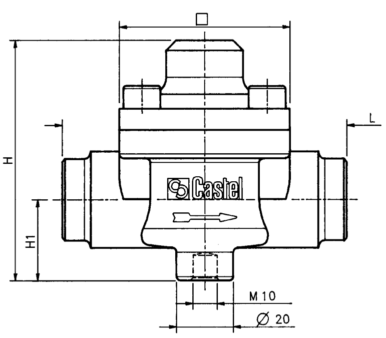
Valves must be mounted so as to have the flow in line with the direction arrow stamped on the main body.
The operating position is the following:

- types 3120, 3140 and 3180 with horizontal axis (valve cover upward);
- types 3110 and 3130 with vertical axis and with arrow upward. Assemblies with inclined or horizontal axis are also possible.

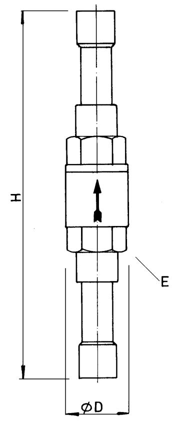




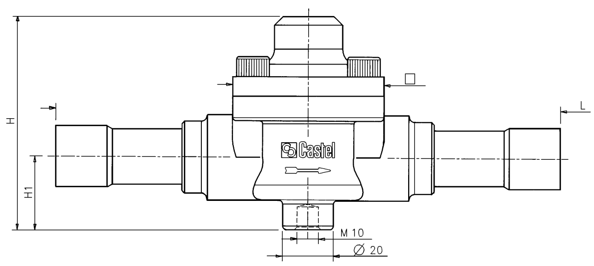
3110



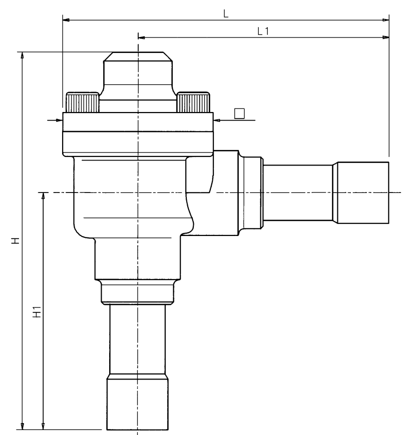
3120



3130
3131



3140



3180

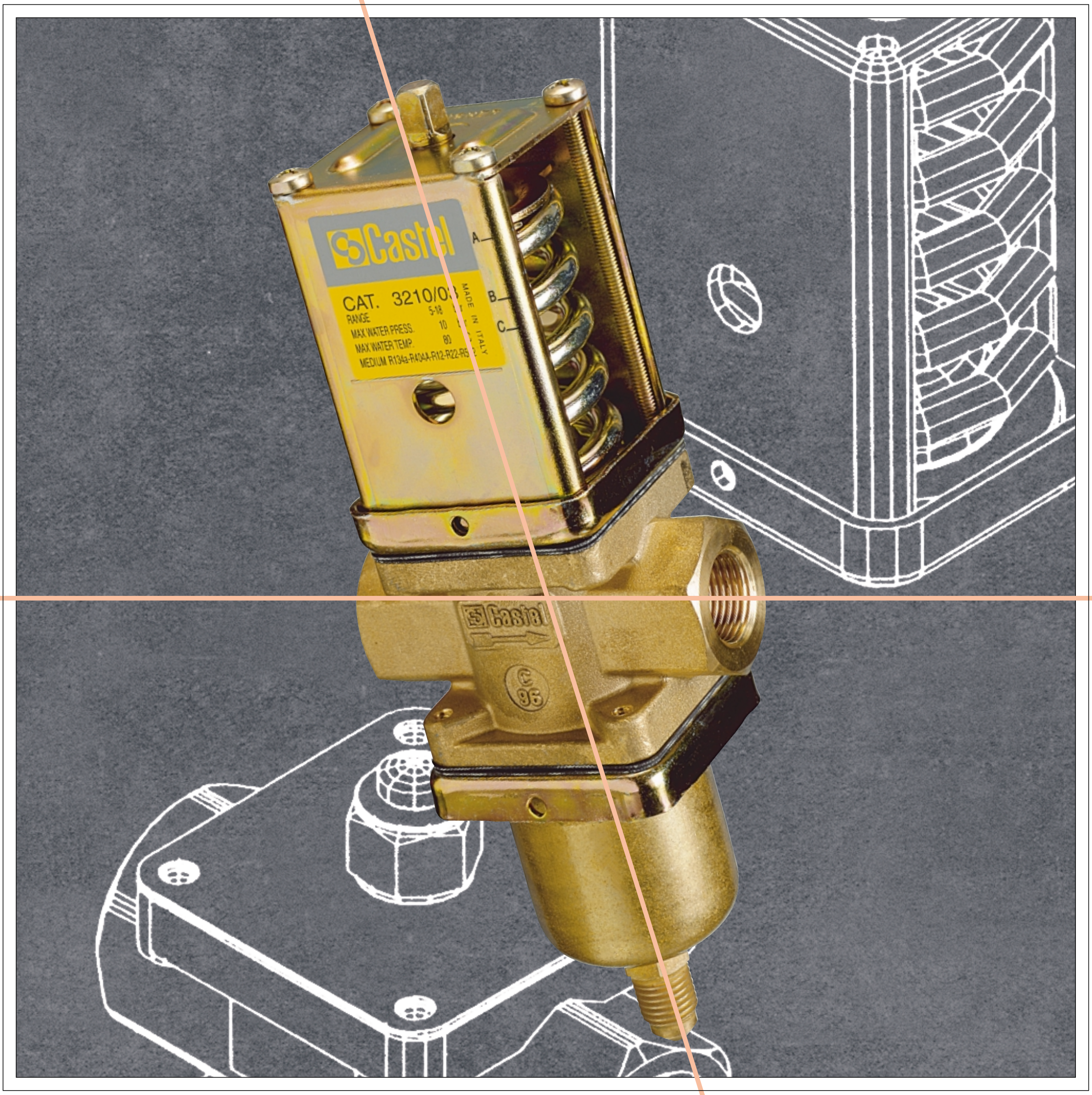
TABLE 1 - General Characteristics

Catalogue Number	Connections			Pressure Differential [bar] (1)	Fluid Tempe-rature		kv Factor [m³/h]	MAX Pressure [bar]	Refrigerating Capacity [kW] (2)								
	SAE	ODS Ø							Liquid			Vapour			Hot gas		
	flare	[in.]	[mm]		min	max			R134a	R22	R404A	R134a	R22	R404A	R134a	R22	R404A
3110/2	1/4”	–	–				0,40		6,7	7,2	4,8	0,9	1,1	0,9	3,4	4,7	4
3110/3	3/8”	–	–				1,60		27	28,8	19	3,5	4,3	3,6	13,6	18,7	16
3110/4	1/2”	–	–				1,80		30,3	32,4	21,4	3,9	4,9	4,1	15,3	21,1	18
3110/5	5/8”	–	–				3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3110/6	3/4”	–	–				3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3120/M22	–	–	22				6,60		111,2	118,8	78,5	14,3	17,8	14,9	56,1	77,2	66
3120/7	–	7/8”	–				6,60		111,2	118,8	78,5	14,3	17,8	14,9	56,1	77,2	66
3120/M28	–	–	28				8,80		148,3	158,4	104,7	19	23,8	19,9	74,8	103	88
3120/9	–	1.1/8”	–				8,80		148,3	158,4	104,7	19	23,8	19,9	74,8	103	88
3120/11	–	1.3/8”	35				15,2		256,1	273,6	180,9	32,8	41	34,4	129,2	177,8	152
3120/13	–	1.5/8”	–				25,0		421,3	450	297,5	54	67,5	56,5	212,5	292,5	250
3120/M42	–	–	42				25,0		421,3	450	297,5	54	67,5	56,5	212,5	292,5	250
3120/17	–	2.1/8”	54	0,10			40,0		674	720	476	86,4	108	90,4	340	468	400
3130/2	–	1/4”	–				0,5		8,4	9	6	1,1	1,4	1,1	4,3	5,9	5
3130/3	–	3/8”	–				1,60		27	28,8	19	3,5	4,3	3,6	13,6	18,7	16
3130/M10	–	–	10				1,60		27	28,8	19	3,5	4,3	3,6	13,6	18,7	16
3130/M12	–	–	12				1,80		30,3	32,4	21,4	3,9	4,9	4,1	15,3	21,1	18
3130/4	–	1/2”	–				1,80		30,3	32,4	21,4	3,9	4,9	4,1	15,3	21,1	18
3130/5	–	5/8”	16				3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3130/M18	–	–	18		-40	+120	3,30	30	55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3130/6	–	3/4”	–				3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3130/7	–	7/8”	22				3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3131/M10	–	–	10	0,30			1,60		27	28,8	19	3,5	4,3	3,6	13,6	18,7	16
3131/5	–	5/8”	16	0,30			3,30		55,6	59,4	39,3	7,1	8,9	7,5	28,1	38,6	33
3140/7		7/8”	22				6,60		111,2	118,8	78,5	14,3	17,8	14,9	56,1	77,2	66
3140/M28		–	28				8,80		148,3	158,4	104,7	19	23,8	19,9	74,8	103	88
3140/9		1.1/8”	–				8,80		148,3	158,4	104,7	19	23,8	19,9	74,8	103	88
3140/11		1.3/8”	35				15,20		256,1	273,6	180,9	32,8	41	34,4	129,2	177,8	152
3140/13		1.5/8”	–				25		421,3	450	297,5	54	67,5	56,5	212,5	292,5	250
3140/M42		–	42				25		421,3	450	297,5	54	67,5	56,5	212,5	292,5	250
3140/17		2.1/8”	54				40		674	720	476	86,4	108	90,4	340	468	400
3140/21		2.5/8”	–	0,10			40		674	720	476	86,4	108	90,4	340	468	400
3180/7		7/8”	22				8,50		143,2	153	101,2	18,4	23	19,2	72,3	99,5	85
3180/M28		–	28				9,50		160,1	171	113,1	20,5	25,7	21,5	80,8	111,2	95
3180/9		1.1/8”	–				9,50		160,1	171	113,1	20,5	25,7	21,5	80,8	111,2	95
3180/11		1.3/8”	35				19		320,2	342	226,1	41	51,3	42,9	161,5	222,3	190
3180/13		1.5/8”	–				37		623,5	666	440,3	79,9	99,9	83,6	314,5	432,9	370
3180/M42		–	42				37		623,5	666	440,3	79,9	99,9	83,6	314,5	432,9	370
3180/17		2.1/8”	54				45,40		765	817,2	540,3	98,1	122,6	102,6	385,9	531,2	454

(1) Minimum pressure differential at which the valve is fully open.

(2) Refrigeration capacity relating to the following reference operating conditions:
Evaporation temperature: + 4°C
Condensation temperature: + 38°C

TABLE 2 - Dimensions and Weights											
Catalogue Number	Connections			Dimensions [mm]							Weight [g]
	SAE	ODS Ø									
	flare	[in.]	[mm]	H	H_1	L	L_1	❏	Ø D	E	
3110/2	1/4”			84							150
3110/3	3/8”			84,5					23	20	155
3110/4	1/2”			83							165
3110/5	5/8”			109					37	27	440
3110/6	3/4”			108							460
3120/M22		–	22								1180
3120/7		7/8”	–	84,5	28,5	100		60			
3120/M28		–	28								1090
3120/9		1.1/8”	–								
3120/11		1.3/8”	35	101,5	34	118		68			1625
3120/13		1.5/8”	–	124,5	37	141		88			2955
3120/M42		–	42								2950
3120/17		2.1/8”	54	140	42,5	173		104			4225
3130/2		1/4”	–	144							170
3130/3		3/8”	–								185
3130/M10		–	10	148					23	20	
3130/M12		–	12								185
3130/4		1/2”	–								
3130/5		5/8”	16								440
3130/M18		–	18	183					37	28	440
3130/6		3/4”	–								445
3130/7		7/8”	22	198							450
3131/M10		–	10	148					23	20	185
3131/5		5/8”	16	183					37	28	450
3140/7		7/8”	22			170					1300
3140/M28		–	28	85	29	201		60			1320
3140/9		1.1/8”	–			201					1320
3140/11		1.3/8”	35	101,5	34	232		68			1885
3140/13		1.5/8”	–	123,5	37	256		88			3315
3140/M42		–	42	123,5	37	256		88			3315
3140/17		2.1/8”	54	140,5	43	285		104			4875
3140/21		2.5/8”	–	140,5	43	285		104			4875
3180/7		7/8”	22	150,5	94,5	130	100	60			1280
3180/M28		–	28	151	95	130,5	100,5	60			1295
3180/9		1.1/8”	–	151	95	130,5	100,5	60			1295
3180/11		1.3/8”	35	177	109,5	150	116	68			1855
3180/13		1.5/8”	–	221	123,5	195,5	143,5	104			3255
3180/M42		–	42	221	123,5	195,5	143,5	104			3255
3180/17		2.1/8”	54	220	122,5	194,5	142,5	104			4780


Castel
RANGE
MAX WATER PRESS.
MAX WATER TEMP.
MADE IN ITALY

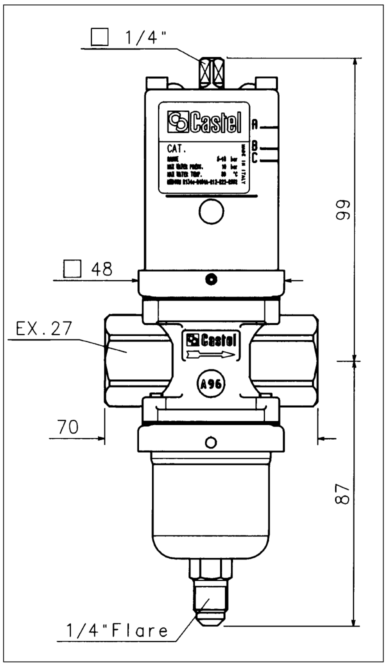
WATER REGULATING VALVES

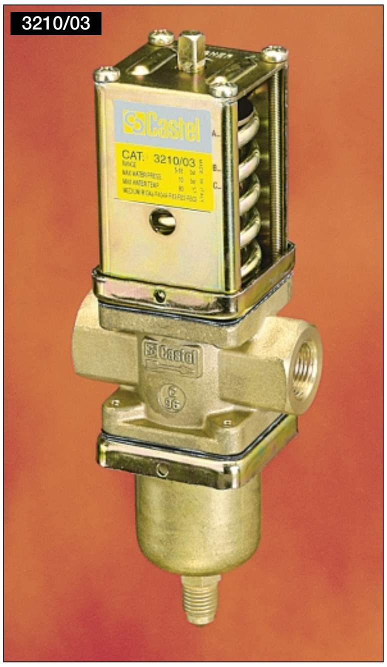
APPLICATIONS

The water regulating valve, employed with condenser fed with either main or well water, keeps the condensation pressure constant at the previously set value by adjusting the water flow so as to ensure a balanced heat exchange under all conditions. At plant start-up, this adjustment is designed to allow the thermostatic valve to rapidly reach normal operating conditions and subsequently, during operations, to avoid excessive pressure increases or decreases under different flow conditions. An excessive rise of high pressure affects the refrigerating capacity of the system. On the other side, pressure lowering leads to insufficient refrigerant feeding of the evaporator with a consequent increased gas overheating and parallel reduction of gas pressure at compressor suction. Castel valves are appropriate for refrigerant fluids CFC, HCFC and HFC and only for main and well water.

OPERATIONS

The moving elements of the valve are a metal bellows and a shutter. The thrust of the refrigerant condensation pressure outside the bellows favours the opening of the valve and the thrust of the adjustment spring on the shutter acts in the opposite sense. Given a specific setting of the spring, the valve progressively opens in line with the increasing condensation pressure, and closes when this pressure decreases. When the compressor stops, the valve





closes: water is no longer fed into the condenser, this being a notable operating economy. Valve setting is performed in the works at a pressure of 7.5 bars. Setting is modified by turning the control screw. Three reference notches, marked with letters A, B, and C, are present on the spring cover. Each notch is equivalent to a different spring setting.
The notches are referred to the following condensation pressures:

- letter A equivalent to about 7.5 bar (valid for R12 and R134a at a temperature of condensation of 30 °C)

TABLE 1 - General Characteristics

Catalogue Number	Connec-tions BSP	Working pressure [bar]	Maximum water pressure [bar]	Maximum water Temperature [°C]	Kv Factor [m³/h]	Refrigerant max working pressure [bar]	Weight [g]
3210/03	G 3/8”	5÷18	10	80	2	20	1015
3210/04	G 1/2”				3		985

Maximum allowable pressure at bellow 23 bar

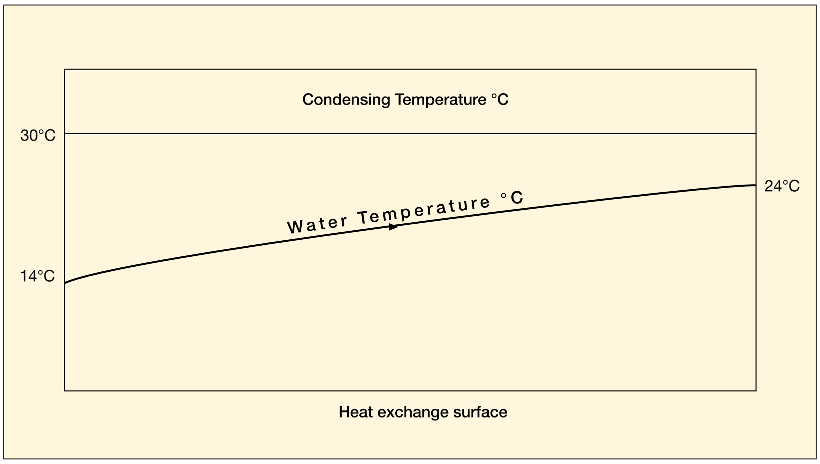


Fig. 1 - Heat exchange pattern in the condenser

- letter B equivalent to about 14 bar (valid for R404A, R407C and R507 at a temperature of condensation of 30 °C)
- letter C equivalent to about 18 bar (top limit of working pressure).

MATERIALS

The materials used for the main parts are:

- ST-UNI EN 12165 - CW 617 N hot-forged brass for the main body;
- austenitic stainless steel – AISI 303 for the seat;
- nitril rubber (NBR) for seat gasket;
- NBR coated-fabric for diaphragms.

INSTALLATION

The valve will be mounted on the water outlet side of the condenser, preferably vertically, with the bellows downward.
The high pressure connection to the bellow must show no deflection.
The arrow on the valve body shows water flow direction.

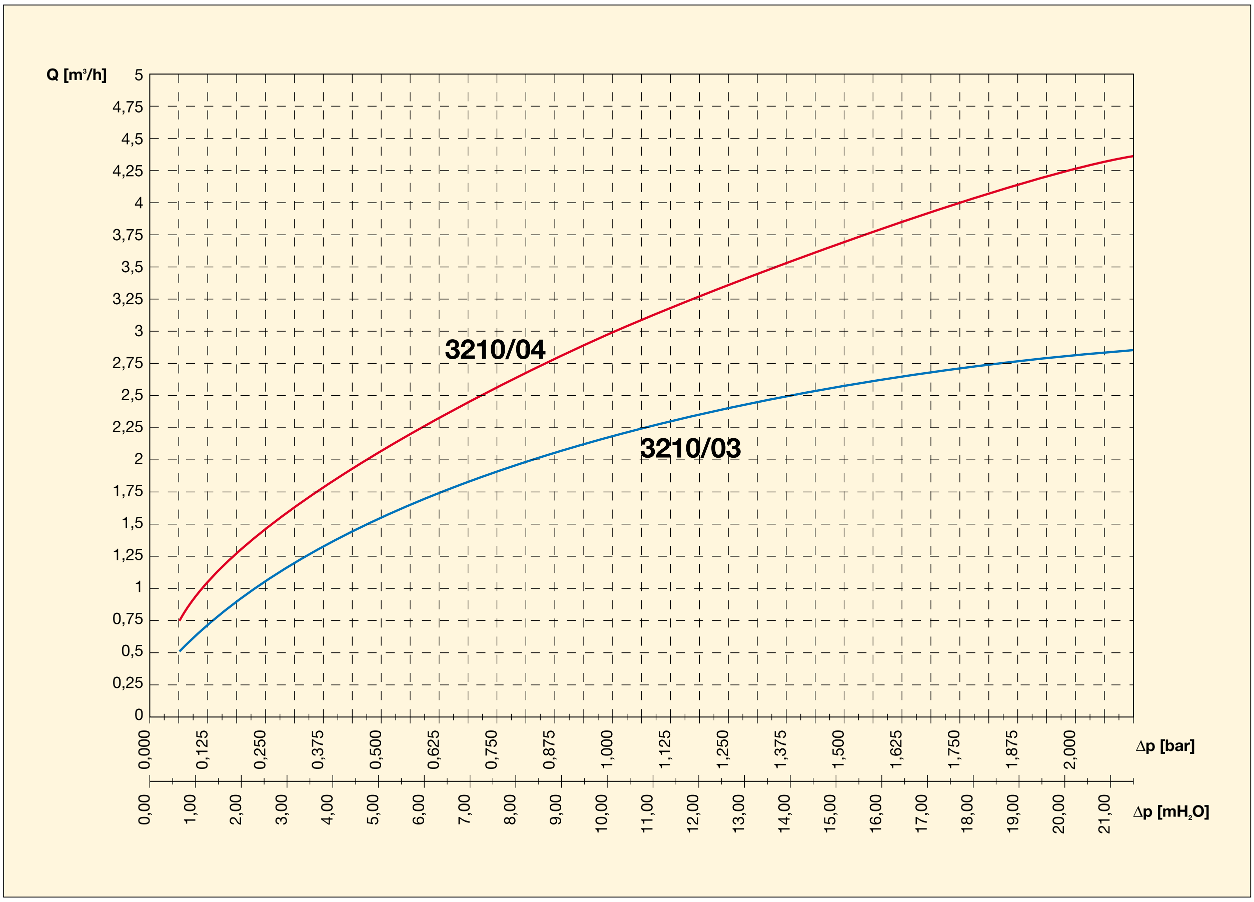


Fig. 2 - Characteristic curves when the valves are completely open.

EXAMPLE OF VALVE SELECTION

A refrigerating system including a hermetic compressor and a condenser fed with mains water.

- Mains water pressure: 3 bar
- Water temperature at the condenser inlet: 14 °C.
- Expected thermal difference: Dt = 10 °C.
- Condensation temperature expected on the basis of the water/refrigerant heat exchange in the condenser: approximately 6 °C above the water temperature at the outlet, equivalent to 30 °C (with a corresponding saturation pressure) (fig. 1).
- Refrigeration yield at the level of the evaporator: 18,6 kW under the following operating conditions, condensation temperature: + 30 °C; evaporation temperature: –15 °C.

Thermal power to be disposed of at the level of the condenser (Table 2):

18.6 x 1.325 = 24.65 [kW]

Water flow rate:

$$\frac{24{,}65 \times 860}{10} = 2120 \text{ l/h} = 2.12 \text{ [m}^3\text{/h]}$$

TABLE 2 - Thermal factor for hermetic refrigeration compressors. Relationship between the total heat to be disposed of at the level of the condenser and refrigeration capacity at the level of the evaporator.

Condensing Temperature [°C]	Evaporating Temperature [°C]									
	–35	–30	–25	–20	–15	–10	–5	0	5	10
30	1,524	1,473	1,421	1,371	1,325	1,281	1,238	1,200	1,163	1,133
35	1,553	1,503	1,453	1,403	1,355	1,310	1,268	1,228	1,188	1,155
40	1,578	1,531	1,484	1,435	1,387	1,340	1,295	1,254	1,210	1,175
45	–	–	1,521	1,475	1,425	1,377	1,330	1,285	1,240	1,200
50	–	–	–	–	1,468	1,420	1,369	1,320	1,270	1,227
55	–	–	–	–	1,520	1,465	1,412	1,363	1,304	1,255
60	–	–	–	–	–	1,526	1,457	1,398	1,338	1,285

TABLE 3 - Thermal factor for open compressors (direct or belt driven). Relationship between the total heat to be disposed of at the level of the condenser and refrigeration capacity at the level of the evaporator.

Condensing Temperature [°C]	Evaporating Temperature [°C]									
	–35	–30	–25	–20	–15	–10	–5	0	5	10
30	1,460	1,417	1,371	1,330	1,291	1,243	1,213	1,178	1,143	1,114
35	1,495	1,450	1,405	1,367	1,320	1,279	1,240	1,202	1,168	1,133
40	1,537	1,487	1,441	1,396	1,350	1,306	1,265	1,224	1,185	1,152
45	–	1,530	1,485	1,437	1,390	1,342	1,295	1,252	1,211	1,175
50	–	–	–	1,482	1,431	1,381	1,334	1,288	1,241	1,200
55	–	–	–	–	–	1,426	1,369	1,320	1,274	1,228
60	–	–	–	–	–	1,474	1,410	1,355	1,330	1,255

The pressure drop corresponding to the water flow rate specified above in the condenser/piping circuit, with the exclusion of the water regulating valve, is about 2.5 bar.

The pressure difference through the solenoid valve is:

$\Delta p = 3 - 2{,}5 = 0{,}5$ bar

when $\Delta p = 0{,}5$ bar, the 3210/04 water regulating valve is open, and ensures the required flow rate (fig. 2).

When the point of intersection between pressure difference through the valve and flow range is within the area below the two curves which are characteristic for the two valves in question, select the valve with the largest diameter.

When the valve is completely closed, the pressure must be the same as the refrigerant saturation pressure at the air temperature of the place where the condenser is installed.
When the valve begins to open, the pressure is about 0.2 bar above the pressure when the valve is totally closed.