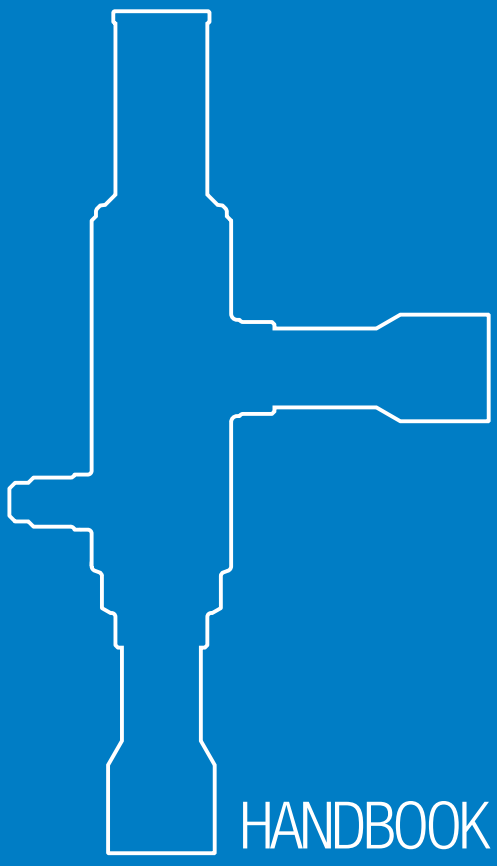


HANDBOOK

REGULATOR VALVES

Ed. 2017

Castel®
Italian technology

CHAPTER 3
EVAPORATING PRESSURE REGULATORS
FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS

APPLICATIONS

Evaporating pressure regulators are an accessory designed to maintain a constant evaporating pressure and thereby a constant surface temperature on the evaporator under varying evaporator loads. This regulator prevents too low evaporating pressure and therefore protects the water chiller from freezing or the formation of ice in air evaporators. These regulators allow multiple evaporators to operate at different temperatures in a system with only one compressor.

All evaporating pressure regulators 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, or R507)
- HFC (R410A), only series 3335

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.

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

OPERATION

Evaporating pressure regulators adjust the flow of hot gas according to changes of suction pressure, upstream the regulator. When the evaporating pressure is less than the regulator calibration pressure, the shutter remains closed. As the suction pressure rises above the regulator's calibration setting, the shutter begins to open and modulates in proportion to the variation in evaporating pressure. As the evaporating pressure continues to rise, the shutter continues to open, until the stroke limit is reached and the regulator is open completely. When the shutter is fully open, a further increase in the valve capacity can be obtained only by increasing the load loss across the valve. Evaporating pressure regulators only modulate based on the inlet pressure change, pressure changes on the outlet side do not affect their opening as the valve is equipped with an equalizer bellow with an area equal to that of the valve seat.

The factory pressure settings for regulators in series 3330 is 2 bar. This means that until the evaporating pressure is less than 2 bar the regulator remains closed. When it rises above 2 bar, the regulator begins to open. According to the characteristics of the refrigerating system it may be necessary to change the factory setting by adjusting the adjustment ring on the top of the regulator body. Turn this ring clockwise to increase the regulator's calibration pressure; turn it counter-clockwise to decrease the calibration pressure. Each turn of the ring corresponds to an increase/decrease of 0.5 bar in calibration pressure (0.3 bar for models 3330/9S, 3330/M28S, and 3330/11S). The calibration range varies from 0.2 to 5.5 bar.

The factory pressure settings for regulators in series 3335 is 8 bar. This means that until the evaporating pressure is less than 8 bar the regulator remains closed. When it rises above 8 bar, the regulator begins to open. According to the characteristics of the refrigerating system it may be necessary to change the factory setting by adjusting the adjustment ring on the top of the regulator body. Turn this ring clockwise to increase the regulator's calibration pressure; turn it counter-clockwise to decrease the calibration pressure. Each turn of the ring corresponds to an increase/decrease of 1.6 bar in calibration pressure. The calibration range varies from 3 to 20 bar.

CONSTRUCTION

The main parts of the evaporating pressure regulators are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Copper pipe EN 12735-1 – Cu--DHP for solder connections
- Austenitic stainless steel AISI 321 for the bellows
- Austenitic stainless steel AISI 303 for the shutter
- Brass bar EN 12164 – CW 614N for regulator ring
- Spring steel DIN 17223/84 Class C/D for setting spring
- Chloroprene rubber (CR) for outlet seal gaskets

INSTALLATION

Evaporating pressure regulators in series 3330 and 3335 are installed in the suction line between the evaporator and the compressor.

Refrigerating system with one compressor serving two or more evaporators in parallel, where the same evaporating temperature is required. In this case the evaporating pressure regulator is installed on the common suction line (installation example 1).
Refrigerating system with one compressor serving two or more evaporators in parallel, where different evaporating temperature are required. In this case the evaporating pressure regulator is installed downstream the evaporator with the highest temperature. Downstream of the evaporators with lower temperatures, it is necessary to install a check valve to avoid refrigerant condensing during compressor stops (installation example 2).

SELECTION

To correctly select evaporating pressure regulators, all information on the system where it will be installed must be available. Selection is based on the following data:

1. **Type of refrigerant**
2. **Designed evaporator capacity.**
3. **Designed evaporating temperature.**
4. **Minimum evaporating temperature.** This data identifies the valve calibration pressure
5. **Allowable pressure drop across the valves at design load condition.**
6. **Liquid temperature**

The refrigerating capacities indicated on Tables 16A, 17A, 18A, 19A and 20A are calculated as a function of:

- A liquid reference temperature of 36.7 °C.
- An allowable variation in evaporating pressure of 0.56 bar.

With liquid temperatures other than 36.7 °C and for variations in evaporating pressure other than 0.56 bar, the required cooling capacity of regulator is:

$$\frac{Q_{evap}}{K_{T\ liquid} \times K_{\Delta P\ evap}} = Q_{valve}$$

where:

Q_{evap} = Evaporator capacity [kW]
$K_{T\ liquid}$ = Correction factor for T liquid ≠ 36.7 °C. (See Tables 16B, 17B, 18B, 19B and 20B.)
$K_{\Delta P\ evap}$ = Correction factor for ΔP_{valve} ≠ 0.56 bar. (See Tables 16C, 17C, 18C, 19C, and 20C.)
Q_{valve} = Refrigerating capacity requested at regulator. [kW]

EXAMPLE

Refrigerant:	R404A
Refrigeration yield of evaporator:	4 [kW]
Designed evaporating temperature:	0 [°C] (corresponding to 5 [bar])
Minimum allowable suction temperature (regulator calibration):	- 5 [°C] (corresponding to 4.2 [bar])
Pressure drop across the regulator:	0.42 [bar]
Liquid temperature:	40 [°C]
Solder connections	

1. Use Table 18B to determine the correction factor for the liquid temperature T_{Liquid} = 40 °C.

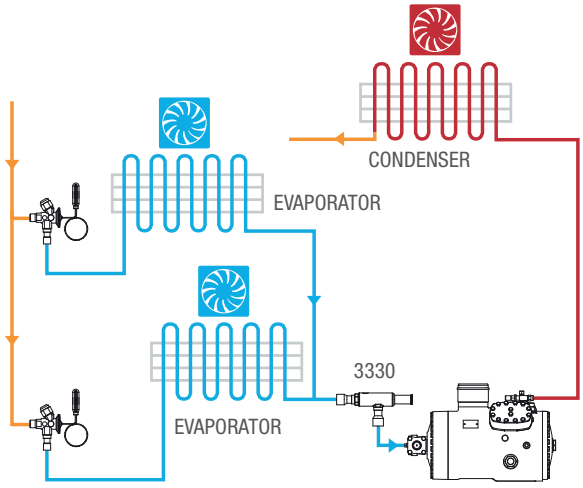
   $K_{Tliquid}$ = 0.95

2. Using Table 18C, determine the correction factor for the variation in the evaporating pressure. $\Delta P = P_{T\ progetto} - P_{Tmin\ asp} = 5 - 4.2 = 0.8$ bar

   K_{DPevap} = 1.3

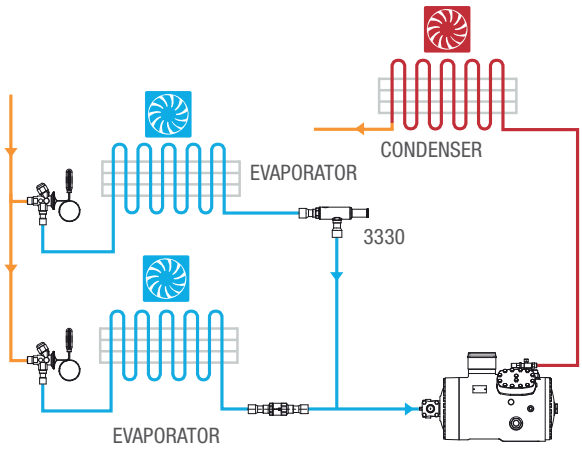
3. Calculate the refrigerating capacity requested at regulator.

$$Q_{valve} = \frac{Q_{evap}}{K_{T\ liquid} \times K_{\Delta Pevap}} = \frac{4}{0{,}95 \times 1{,}3} = 3{,}23\ kW$$



Installation (1)

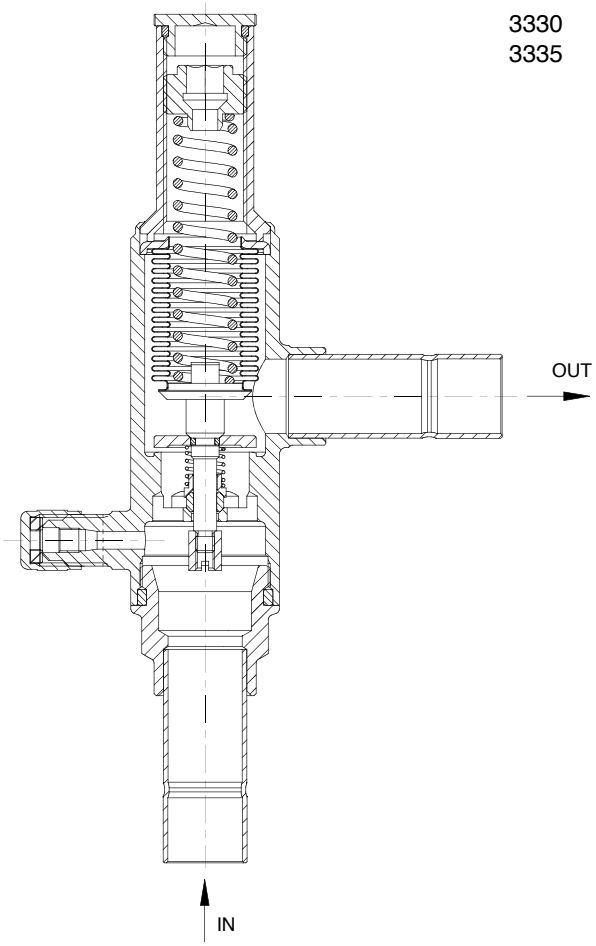
Refrigerating systems with a single compressor serving multiple evaporators in parallel, where the same evaporation pressure is required.
The valve is installed on the common suction pipe.



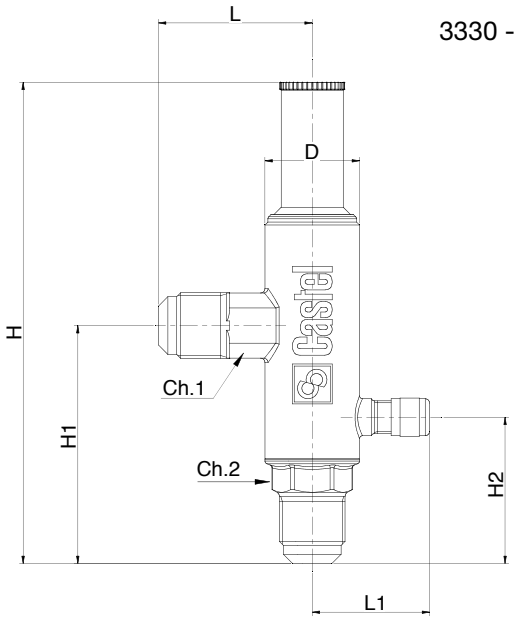
Installation (2)

Refrigerating systems with multiple evaporators which work with different evaporation pressures. The regulator is installed downstream of the evaporator with the highest pressure.

3330
3335



3330 - SAE



3330 - ODS
3335 - ODS

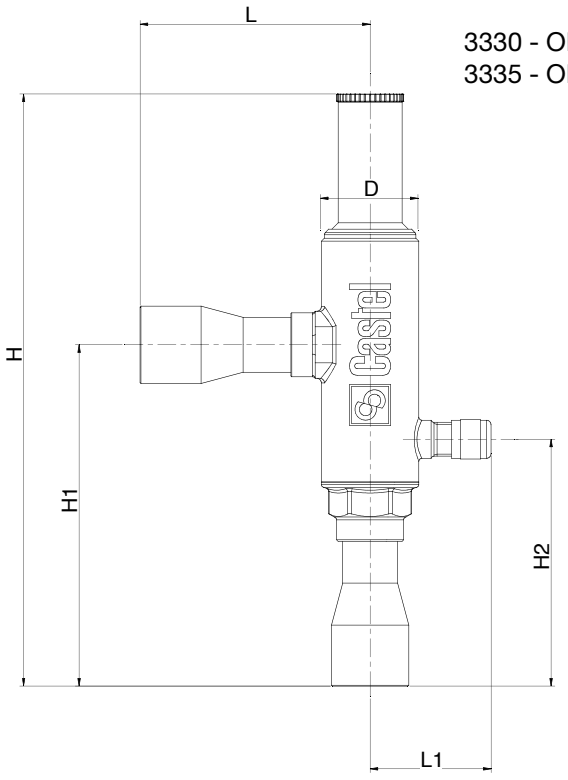


TABLE 14: General characteristics of evaporator pressure regulators												
Catalogue Number	Connections			Kv Factor [m³/h]	Regulating range [bar]		Factory setting [bar]	PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
	SAE Flare	ODS			min.	max.			min.	max.	min.	max.	
		Ø [in.]	Ø [mm]										
3330/4	1/2"	–	–	2,7	0,2	5,5	2	28	– 40	+110	– 40	+50	Art. 4.3
3330/M12S	–	–	12										
3330/4S	–	1/2"	–										
3330/5	5/8"	–	–										
3330/5S	–	5/8"	16										
3330/7S	–	7/8"	22										
3330/9S	–	1.1/8"	–	8,4									
3330/M28S	–	–	28										
3330/11S	–	1.3/8"	35										
3335/M12S	–	–	12	2,7	3	20	5	45	-40	+110	-40	+50	Art. 4.3
3335/4S	–	1/2"	–										
3335/5S	–	5/8"	16										
3335/7S	–	7/8"	22										

TABLE 15: Dimensions and weights of evaporator pressure regulators									
Catalogue Number	Dimensions [mm]								Weight [g]
	H	H_1	H_2	L	L_1	D	Ch1	Ch2	
3330/4	159	76,5	45,5	48	37	32	22	24	530
3330/M12S	183	100,5	69,5	64			-	-	510
3330/4S	183	100,5	69,5	64			-	-	480
3330/5	163	80,5	49,5	52			22	24	500
3330/5S	183	100,5	69,5	64			-	-	500
3330/7S	194	112	81	75,5			-	-	560
3330/9S	263	151	111	105	44	46	-	-	1470
3330/M28S	263	151	111	105					1470
3330/11S	263	151	111	105					1480
3335/M12S	183	100,5	69,5	64	37	32	-	-	510
3335/4S	183	100,5	69,5	64					480
3335/5S	183	100,5	69,5	64					500
3335/7S	194	112	81	75,5					560

4. With the following parameters
   - Minimum cooling capacity = 3.23 KW
   - Evaporating temperature = 0 °C
   - Pressure drop across the valve = 0.42 bar

Select the right valve from Table 18A.
The selected valves are:
   - 3330/M12 with 12 mm diameter solder connections
   - 3330/4 with 1/2” diameter solder connections

CERTIFICATIONS

Evaporating pressure regulators in series 3330 have been approved by the American certification authority Underwriters Laboratories Inc. These regulators are **UL Listed** certified for the USA with file SA33319, in compliance with American standard UL 207. Evaporating pressure regulators in series 3335 have not been approved by the American certification authority Underwriters Laboratories Inc.

TABLE 16A : Refrigerant Flow Capacity of evaporator pressure regulators 3330 [kW]

Catalogue Number	Pressure drop across regulator [bar]	Design evaporator temperature [°C]									
		20	15	10	5	0	-5	-10	-15	-20	-25
3330/4 3330/4S 3330/M12S	0,07	–	–	1,10	0,99	0,88	0,77	0,67	0,57	–	–
	0,14	–	–	2,27	2,03	1,79	1,55	1,34	1,13	–	–
	0,21	–	–	3,70	3,26	2,83	2,39	2,01	1,63	–	–
	0,35	–	–	5,62	4,91	4,21	3,50	2,88	2,26	–	–
	0,42	–	–	7,17	6,18	5,18	4,18	3,44	–	–	–
	0,56	–	–	10,16	8,63	7,10	5,58	4,59	–	–	–
3330/5 3330/5S	0,07	–	–	1,42	1,28	1,15	1,01	0,89	0,77	–	–
	0,14	–	–	2,89	2,60	2,32	2,04	1,80	1,56	–	–
	0,21	–	–	4,37	3,93	3,50	3,07	2,70	2,33	–	–
	0,35	–	–	6,08	5,47	4,87	4,27	3,74	3,21	–	–
	0,42	–	–	8,02	7,20	6,38	5,56	4,87	–	–	–
	0,56	–	–	10,80	9,67	8,54	7,41	6,50	–	–	–
3330/7S	0,07	–	–	1,42	1,27	1,13	0,99	0,86	0,73	–	–
	0,14	–	–	2,92	2,61	2,30	1,99	1,72	1,45	–	–
	0,21	–	–	5,27	4,64	4,00	3,37	2,59	2,26	–	–
	0,35	–	–	7,63	6,67	5,71	4,75	3,91	3,07	–	–
	0,42	–	–	10,81	9,28	7,74	6,21	4,74	–	–	–
	0,56	–	–	13,99	11,88	9,78	7,68	6,32	–	–	–
3330/9S 3330/M28S	0,07	–	–	4,47	4,03	3,60	3,16	2,80	2,43	–	–
	0,14	–	–	9,07	8,18	7,29	6,40	5,65	4,91	–	–
	0,21	–	–	13,71	12,35	11,00	9,64	8,48	7,32	–	–
	0,35	–	–	19,09	17,20	15,30	13,40	11,75	10,09	–	–
	0,42	–	–	25,18	22,60	20,03	17,45	15,30	–	–	–
	0,56	–	–	33,93	30,38	26,83	23,29	20,41	–	–	–
3330/11S	0,07	–	–	4,34	3,90	3,46	3,02	2,64	2,25	–	–
	0,14	–	–	8,94	7,99	7,05	6,10	5,27	4,45	–	–
	0,21	–	–	16,17	14,22	12,28	10,33	7,94	6,93	–	–
	0,35	–	–	23,39	20,45	17,51	14,57	11,99	9,42	–	–
	0,42	–	–	33,15	28,45	23,75	19,05	14,54	–	–	–
	0,56	–	–	42,90	36,45	29,99	23,54	19,38	–	–	–

Standard rating conditions according to AHRI Standard 770-2014

Condensing temperature	100 °F	(37,8 °C)
Liquid temperature	98 °F	(36,7 °C)
Subcooling	2 °R	(1,1 °K)
Evaporating temperature	40 °F	(4,4 °C)

Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	150 °F	(65,6 °C)

Nominal evaporator pressure change ($T_{design\ evap}$ -$T_{min\ evap}$) : 8 psi (0,56 bar)

TABLE 16B : Correction factor for liquid temperature different from nominal value

Liquid temperature [°C]								
10	15	20	25	30	35	40	45	50
1,28	1,23	1,18	1,13	1,08	1,03	0,97	0,92	0,86

TABLE 16C : Correction factor for evaporator pressure change different from nominal value

Evaporator pressure change [bar]							
0,14	0,28	0,42	0,56	0,7	0,84	0,98	1,12
0,3	0,6	0,8	1	1,2	1,3	1,4	1,5

R22

TABLE 17A : Refrigerant Flow Capacity of evaporator pressure regulators 3330 [kW]

Catalogue Number	Pressure drop across regulator [bar]	Design evaporator temperature [°C]									
		4,4	0	-5	-10	-15	-20	-25	-30	-35	-40
3330/4 3330/4S 3330/M12S	0,07	1,29	1,18	1,06	0,95	0,83	0,77	0,70	0,64	0,58	–
	0,14	2,66	2,41	2,15	1,90	1,65	1,52	1,39	1,26	1,13	–
	0,21	4,68	4,20	3,71	3,26	2,80	2,50	2,20	1,90	1,60	–
	0,35	7,51	6,70	5,88	5,13	4,37	3,82	3,26	2,71	2,16	–
	0,42	9,72	8,56	7,40	6,30	5,21	4,55	3,90	3,24	2,58	–
	0,56	13,85	12,07	10,30	8,61	6,92	6,06	5,19	4,32	3,45	–
3330/5 3330/5S	0,07	1,64	1,49	1,34	1,21	1,07	1,00	0,92	0,85	0,78	–
	0,14	3,30	2,99	2,69	2,42	2,15	2,00	1,85	1,70	1,55	–
	0,21	5,01	4,55	4,08	3,67	3,26	3,02	2,79	2,55	2,31	–
	0,35	7,00	6,35	5,69	5,11	4,53	4,20	3,86	3,53	3,20	–
	0,42	9,30	8,41	7,53	6,75	5,96	5,50	5,05	4,59	4,13	–
	0,56	12,58	11,38	10,17	9,09	8,01	7,38	6,75	6,12	5,49	–
3330/7S	0,07	1,62	1,47	1,32	1,18	1,04	0,96	0,88	0,80	0,72	–
	0,14	3,45	3,11	2,78	2,46	2,14	1,97	1,80	1,63	1,46	–
	0,21	6,04	5,41	4,79	4,20	3,61	3,22	2,84	2,45	2,06	–
	0,35	10,09	9,00	7,90	6,89	5,88	5,13	4,39	3,64	2,89	–
	0,42	13,41	11,81	10,21	8,70	7,19	6,28	5,38	4,47	3,56	–
	0,56	19,44	16,95	14,47	12,09	9,72	8,50	7,28	6,07	4,85	–
3330/9S 3330/M28S	0,07	5,14	4,67	4,21	3,79	3,37	3,14	2,90	2,67	2,44	–
	0,14	10,35	9,40	8,45	7,60	6,76	6,29	5,81	5,34	4,86	–
	0,21	15,75	14,28	12,82	11,52	10,23	9,49	8,75	8,01	7,27	–
	0,35	22,00	19,94	17,88	16,06	14,24	13,19	12,14	11,09	10,04	–
	0,42	29,20	26,43	23,65	21,19	18,72	17,28	15,85	14,42	12,98	–
	0,56	39,52	35,73	31,94	28,55	25,16	23,18	21,20	19,22	17,24	–
3330/11S	0,07	4,96	4,51	4,05	3,63	3,20	2,95	2,70	2,45	2,20	–
	0,14	10,57	9,55	8,52	7,54	6,56	6,04	5,52	5,00	4,48	–
	0,21	18,53	16,60	14,68	12,88	11,07	9,88	8,70	7,51	6,33	–
	0,35	30,94	27,59	24,24	21,13	18,02	15,73	13,45	11,16	8,88	–
	0,42	41,12	36,22	31,31	26,68	22,04	19,27	16,49	13,71	10,93	–
	0,56	59,63	51,99	44,36	37,09	29,81	26,08	22,34	18,60	14,87	–

Standard rating conditions according to AHRI Standard 770-2014

Condensing temperature	100 °F	(37,8 °C)
Liquid temperature	98 °F	(36,7 °C)
Subcooling	2 °R	(1,1 °K)
Evaporating temperature	40 °F	(4,4 °C)

Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	150 °F	(65,6 °C)

Nominal evaporator pressure change ($T_{design\ evap}$ -$T_{min\ evap}$) : 8 psi (0,56 bar)

TABLE 17B : Correction factor for liquid temperature different from nominal value

Liquid temperature [°C]								
10	15	20	25	30	35	40	45	50
1,23	1,19	1,16	1,11	1,06	1,01	0,98	0,94	0,9

TABLE 17C : Correction factor for evaporator pressure change different from nominal value

Evaporator pressure change [bar]							
0,14	0,28	0,42	0,56	0,7	0,84	0,98	1,12
0,3	0,6	0,8	1	1,2	1,3	1,4	1,5

TABLE 18A : Refrigerant Flow Capacity of evaporator pressure regulators 3330 [kW]

Catalogue Number	Pressure drop across regulator [bar]	Design evaporator temperature [°C]									
		4,4	0	-5	-10	-15	-20	-25	-30	-35	-40
3330/4 3330/4S 3330/M12S	0,07	1,24	1,11	0,99	0,87	0,75	0,69	0,62	0,56	0,50	–
	0,14	2,50	2,23	1,96	1,73	1,49	1,37	1,24	1,11	0,98	–
	0,21	4,08	3,63	3,17	2,76	2,35	2,12	1,90	1,67	1,44	–
	0,35	6,16	5,46	4,76	4,11	3,47	3,10	2,74	2,38	2,02	–
	0,42	8,38	7,34	6,30	5,35	4,40	3,88	3,37	2,85	2,33	–
	0,56	12,49	10,83	9,17	7,68	6,19	5,39	4,60	3,80	3,00	–
3330/5 3330/5S	0,07	1,56	1,40	1,24	1,09	0,93	0,87	0,80	0,74	0,68	–
	0,14	3,18	2,85	2,53	2,21	1,90	1,76	1,63	1,50	1,37	–
	0,21	4,79	4,30	3,81	3,32	2,84	2,64	2,44	2,24	2,04	–
	0,35	6,67	5,99	5,30	4,62	3,94	3,66	3,38	3,10	2,82	–
	0,42	8,86	7,93	7,01	6,09	5,18	4,80	4,42	4,04	3,66	–
	0,56	11,95	10,69	9,43	8,18	6,93	6,42	5,90	5,38	4,86	–
3330/7S	0,07	1,72	1,55	1,38	1,21	1,05	0,96	0,87	0,78	0,69	–
	0,14	3,56	3,18	2,80	2,46	2,13	1,94	1,76	1,58	1,40	–
	0,21	5,79	5,14	4,50	3,92	3,34	3,02	2,69	2,37	2,05	–
	0,35	8,67	7,69	6,70	5,79	4,88	4,37	3,86	3,35	2,84	–
	0,42	11,56	10,12	8,69	7,38	6,07	5,35	4,64	3,93	3,22	–
	0,56	17,22	14,93	12,65	10,59	8,53	7,44	6,34	5,24	4,14	–
3330/9S 3330/M28S	0,07	4,89	4,40	3,91	3,41	2,92	2,72	2,52	2,32	2,12	–
	0,14	9,98	8,95	7,93	6,95	5,96	5,54	5,13	4,71	4,30	–
	0,21	15,05	13,50	11,96	10,44	8,93	8,30	7,67	7,04	6,40	–
	0,35	20,96	18,80	16,64	14,51	12,38	11,50	10,62	9,74	8,86	–
	0,42	27,82	24,91	22,01	19,14	16,26	15,07	13,88	12,69	11,50	–
	0,56	37,54	33,59	29,63	25,70	21,78	20,15	18,52	16,90	15,27	–
3330/11S	0,07	5,29	4,75	4,22	3,71	3,21	2,94	2,66	2,39	2,12	–
	0,14	10,90	9,74	8,57	7,55	6,52	5,96	5,40	4,85	4,29	–
	0,21	17,75	15,78	13,81	12,02	10,24	9,25	8,26	7,27	6,28	–
	0,35	26,59	23,57	20,55	17,75	14,96	13,40	11,83	10,27	8,71	–
	0,42	35,46	31,05	26,64	22,62	18,60	16,42	14,24	12,05	9,87	–
	0,56	52,80	45,80	38,80	32,48	26,17	22,80	19,44	16,07	12,70	–

Standard rating conditions according to AHRI Standard 770-2014

Condensing temperature	100 °F	(37,8 °C)
Liquid temperature	98 °F	(36,7 °C)
Subcooling	2 °R	(1,1 °K)
Evaporating temperature	40 °F	(4,4 °C)

Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	150 °F	(65,6 °C)

Nominal evaporator pressure change ($T_{design\ evap}$ -$T_{min\ evap}$) : 8 psi (0,56 bar)

TABLE 18B : Correction factor for liquid temperature different from nominal value

Liquid temperature [°C]								
10	15	20	25	30	35	40	45	50
1,43	1,35	1,28	1,2	1,12	1,03	0,95	0,86	0,76

TABLE 18C : Correction factor for evaporator pressure change different from nominal value

Evaporator pressure change [bar]							
0,14	0,28	0,42	0,56	0,7	0,84	0,98	1,12
0,3	0,6	0,8	1	1,2	1,3	1,4	1,5

R407C

TABLE 19A : Refrigerant Flow Capacity of evaporator pressure regulators 3330 [kW]

Catalogue Number	Pressure drop across regulator [bar]	Design evaporator temperature [°C]									
		15	10	4,4	0	-5	-10	-15	-20	-25	-30
3330/4 3330/4S 3330/M12S	0,07	–	1,07	0,96	0,91	0,85	0,81	0,76	0,65	–	–
	0,14	–	2,19	1,96	1,84	1,72	1,63	1,53	1,29	–	–
	0,21	–	3,55	3,13	2,92	2,71	2,55	2,38	1,93	–	–
	0,35	–	5,27	4,60	4,27	3,94	3,69	3,44	2,70	–	–
	0,42	–	6,88	5,92	5,45	4,97	4,58	4,20	3,30	–	–
	0,56	–	9,74	8,27	7,54	6,81	6,21	5,60	4,40	–	–
3330/5 3330/5S	0,07	–	1,37	1,24	1,17	1,11	1,05	0,99	0,86	–	–
	0,14	–	2,77	2,50	2,37	2,23	2,11	1,99	1,73	–	–
	0,21	–	4,19	3,77	3,57	3,36	3,18	3,00	2,59	–	–
	0,35	–	5,71	5,14	4,85	4,57	4,33	4,08	3,51	–	–
	0,42	–	7,71	6,92	6,52	6,13	5,79	5,45	4,68	–	–
	0,56	–	10,37	9,29	8,74	8,20	7,73	7,26	6,24	–	–
3330/7S	0,07	–	1,37	1,23	1,16	1,09	1,03	0,97	0,83	–	–
	0,14	–	2,80	2,50	2,35	2,20	2,08	1,96	1,65	–	–
	0,21	–	5,00	4,40	4,10	3,80	3,33	2,87	2,48	–	–
	0,35	–	7,24	6,33	5,87	5,42	5,07	4,72	3,71	–	–
	0,42	–	10,35	8,88	8,15	7,42	6,61	5,81	4,56	–	–
	0,56	–	13,46	11,43	10,42	9,41	8,58	7,74	6,08	–	–
3330/9S 3330/M28S	0,07	–	4,32	3,90	3,69	3,48	3,29	3,11	2,70	–	–
	0,14	–	8,71	7,86	7,43	7,00	6,63	6,25	5,43	–	–
	0,21	–	13,15	11,85	11,20	10,55	9,99	9,43	8,13	–	–
	0,35	–	17,92	16,14	15,25	14,36	13,59	12,83	11,02	–	–
	0,42	–	24,20	21,72	20,48	19,24	18,17	17,11	14,70	–	–
	0,56	–	32,57	29,17	27,46	25,76	24,28	22,81	19,60	–	–
3330/11S	0,07	–	4,19	3,76	3,55	3,34	3,16	2,98	2,55	–	–
	0,14	–	8,58	7,67	7,21	6,76	6,38	6,00	5,06	–	–
	0,21	–	15,34	13,49	12,57	11,65	10,22	8,79	7,61	–	–
	0,35	–	22,20	19,40	18,01	16,61	15,55	14,49	11,38	–	–
	0,42	–	31,74	27,24	24,99	22,74	20,27	17,81	13,98	–	–
	0,56	–	41,27	35,06	31,96	28,86	26,30	23,74	18,65	–	–

Standard rating conditions according to AHRI Standard 770-2014

Condensing temperature	100 °F	(37,8 °C)
Liquid temperature	98 °F	(36,7 °C)
Subcooling	2 °R	(1,1 °K)
Evaporating temperature	40 °F	(4,4 °C)

Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	150 °F	(65,6 °C)

Nominal evaporator pressure change ($T_{design\ evap}$ -$T_{min\ evap}$) : 8 psi (0,56 bar)

TABLE 19B : Correction factor for liquid temperature different from nominal value

Liquid temperature [°C]								
10	15	20	25	30	35	40	45	50
1,3	1,25	1,2	1,14	1,09	1,03	0,97	0,9	0,84

TABLE 19C : Correction factor for evaporator pressure change different from nominal value

Evaporator pressure change [bar]							
0,14	0,28	0,42	0,56	0,7	0,84	0,98	1,12
0,3	0,6	0,8	1	1,2	1,3	1,4	1,5

TABLE 20A : Refrigerant Flow Capacity of evaporator pressure regulators 3335 [kW]

Catalogue Number	Pressure drop across regulator [bar]	Design evaporator temperature [°C]									
		10	4,4	0	-5	-10	-15	-20	-25	-30	-35
3335/4S 3335/M12S	0,07	–	2,07	1,86	1,65	1,45	1,26	1,15	1,04	0,94	–
	0,14	–	4,17	3,73	3,28	2,89	2,50	2,28	2,07	1,85	–
	0,21	–	6,81	6,05	5,30	4,61	3,93	3,55	3,17	2,79	–
	0,35	–	10,29	9,12	7,95	6,87	5,79	5,18	4,58	3,97	–
	0,42	–	14,00	12,26	10,52	8,93	7,35	6,48	5,62	4,76	–
	0,56	–	20,85	18,09	15,32	12,83	10,33	9,01	7,68	6,35	–
	0,81	–	27,70	23,91	20,12	16,72	13,32	11,53	9,73	7,93	–
	1,12	–	34,55	29,74	24,92	20,62	16,31	14,05	11,78	9,52	–
3335/5S	0,07	–	2,60	2,34	2,08	1,82	1,55	1,45	1,34	1,24	–
	0,14	–	5,30	4,76	4,22	3,69	3,17	2,95	2,73	2,51	–
	0,21	–	8,00	7,18	6,36	5,55	4,75	4,41	4,08	3,74	–
	0,35	–	11,14	10,00	8,85	7,72	6,58	6,11	5,65	5,18	–
	0,42	–	14,79	13,25	11,70	10,17	8,65	8,01	7,38	6,75	–
	0,56	–	19,96	17,86	15,75	13,67	11,58	10,71	9,85	8,98	–
	0,81	–	25,13	22,47	19,80	17,16	14,51	13,42	12,32	11,22	–
	1,12	–	30,30	27,08	23,86	20,65	17,45	16,12	14,79	13,46	–
3335/7S	0,07	–	2,88	2,59	2,30	2,02	1,75	1,60	1,45	1,30	–
	0,14	–	5,94	5,30	4,67	4,11	3,55	3,25	2,94	2,64	–
	0,21	–	9,66	8,59	7,52	6,55	5,57	5,04	4,50	3,96	–
	0,35	–	14,48	12,83	11,19	9,67	8,14	7,29	6,44	5,59	–
	0,42	–	19,31	16,91	14,51	12,32	10,13	8,94	7,75	6,56	–
	0,56	–	28,75	24,94	21,13	17,69	14,25	12,42	10,58	8,75	–
	0,81	–	38,20	32,97	27,75	23,06	18,37	15,89	13,42	10,94	–
	1,12	–	47,64	41,01	34,37	28,43	22,49	19,37	16,25	13,13	–

Standard rating conditions according to AHRI Standard 770-2014

Condensing temperature	100 °F	(37,8 °C)
Liquid temperature	98 °F	(36,7 °C)
Subcooling	2 °R	(1,1 °K)
Evaporating temperature	40 °F	(4,4 °C)

Suction temperature	65 °F	(18,3 °C)
Superheating	25 °R	(13,9 °K)
Discharge temperature	150 °F	(65,6 °C)

Nominal evaporator pressure change ($T_{design\ evap}$ -$T_{min\ evap}$) : 8 psi (0,56 bar)

TABLE 20B : Correction factor for liquid temperature different from nominal value

Liquid temperature [°C]								
10	15	20	25	30	35	40	45	50
1,39	1,31	1,24	1,17	1,11	1,04	0,97	0,9	0,84

TABLE 20C : Correction factor for evaporator pressure change different from nominal value

Evaporator pressure change [bar]							
0,14	0,28	0,42	0,56	0,7	0,84	0,98	1,12
0,3	0,6	0,8	1	1,2	1,3	1,4	1,5

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