

HANDBOOK
REGULATOR VALVES

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 **Castel**[®]
Italian technology

CHAPTER 1 ■ CAPACITY REGULATORS

FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS



APPLICATIONS

In air conditioning systems, it is desirable to limit the minimum evaporating pressure during periods of low load to prevent coil icing. In refrigerating systems, it is desirable to limit the minimum evaporating pressure during periods of low load to avoid operating the compressor at a lower suction pressure than it was designed to operate. Capacity regulators in series 3310 and 3315 are practical and economical solutions to these problems as they allow a portion of the hot discharge gas in the high pressure line to bypass directly to the low pressure line, returning the evaporation temperature/pressure to the desired value.

The capacity 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 3315

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

Capacity regulators adjust the flow of hot gas according to changes of suction pressure, downstream the regulator.

When the evaporating pressure is greater than the regulator calibration pressure, the shutter remains closed. As the suction pressure drops below the regulator's calibration setting, the shutter begins to open and modulates in proportion to the variation in suction pressure. As the suction pressure continues to drop, the shutter continues to open, until the stroke limit is reached and the regulator is open completely. Under normal conditions, there should be insufficient pressure change to cause open these valves to open completely; rather, they should modulate inside its stroke. Capacity regulators only modulate based on the outlet pressure change, pressure changes on the inlet side do not affect their opening as the valve is equipped with an equalizer bellows with an area equal to that of the valve seat.

The factory pressure settings for capacity regulators in series 3310 and 3315 is 2 bar. This means that until the suction pressure is above 2 bar the regulator remains closed. When the suction pressure drops below 2 bar, it 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 0.6 bar in calibration pressure. The pressure setting ranges are as follows:

- From 0.2 to 6 bar for regulators in series 3310
- From 2 to 7 bar for regulators in series 3315

CONSTRUCTION

The main parts of the capacity 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
- Brass bar EN 12164 – CW 614N 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

Capacity regulators are installed on a branch off the discharge line. The by-passed hot gas can enter in the low pressure side at one of the following locations:

- Compressor inlet (see installation example 1)
- Evaporator inlet, with or without distributor (see installation example 2)

In the first installation example, to avoid the danger of overheating the compressor, it is good practice to install a liquid injection valve that brings liquid refrigerant to the suction line, cooling the hot gas recirculated by the regulator.

SELECTION

To correctly select a capacity regulator, 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. Minimum allowable evaporating temperature at reduced load condition.

This data depends on the system. In air conditioning systems, this value must be set to prevent coil icing. In refrigerating systems, this value must be set to avoid that the suction temperature is lower than minimum values recommended by compressor manufacturers.

3. Minimum required operating evaporating temperature.

This is the temperature when the valve begins to open.

4. Compressor capacity at minimum allowable evaporating temperature

Consult the compressor manufacturer for this value.

5. Minimum evaporator load at which the system is to be operated.

This depends on the type of system. It can be a percentage of maximum load (15-25%) or it can be zero.

6. Liquid temperature at minimum evaporator cooling load.

The capacity regulator must be selected based on the difference between the compressor capacity (item 4) and the minimum evaporator cooling load (item 5). The refrigerating capacities indicated on Tables 3A, 4A, 5A, 6A and 7A are the regulator capacities, not the system capacities on which the valves are installed. These capacities are based on a reference liquid temperature of 36.7 °C. The data listed on these tables are based on:

- Refrigerant used (item 1)
- Minimum allowable evaporating temperature at reduced load condition (item 2)
- Allowed evaporating temperature (pressure) change

downstream the regulator, this is the temperature (pressure) change necessary to move the valve shutter from the initial starting position to the nominal rating capacity position (temperature in item 3 – temperature in item 2).

With liquid temperatures other than 36.7 °C the required cooling capacity of regulator is:

$$(Q_{\text{compr}} - Q_{\text{evap}}) \times K_{T_{\text{liquid}}} = Q_{\text{Valve}}$$

where:

Q_{compr} = Compressor capacity at minimum allowable evaporating temperature [kW]

Q_{evap} = Minimum evaporator load at which the system is to be operated. [kW]

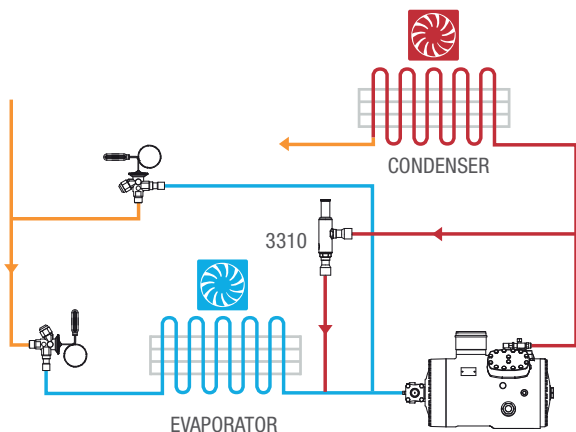
$K_{T_{\text{liquid}}}$ = Correction factor for $T_{\text{liquid}} \neq 36.7 \text{ °C}$. (See Tables 3B, 4B, 5B, 6B and 7B.)

Q_{valve} = Refrigerating capacity requested at regulator. [kW]

EXAMPLE

| | |
|--|-----------|
| Refrigerant: | R404A |
| Minimum required operating evaporating temperature: | - 15 [°C] |
| Minimum allowable evaporating temperature at reduced load condition: | - 19 [°C] |
| Compressor capacity at minimum allowable evaporating temperature: | 10 [kW] |
| Minimum evaporator load at which the system can be operated: | 5 [kW] |
| Liquid temperature at minimum evaporator cooling load: | 35 [°C] |
| Solder connections | |

1. Use Table 5B to determine the correction factor for the

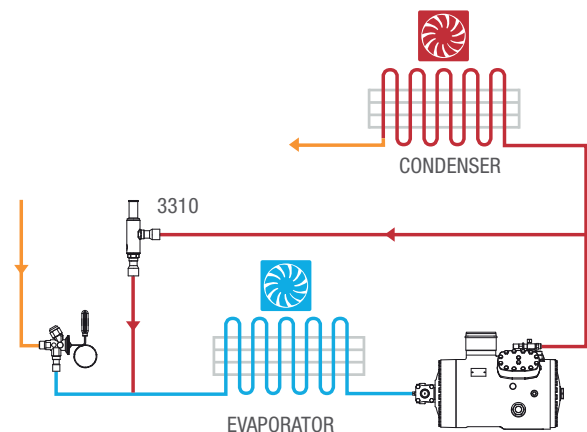


Installation (1)

The regulator is installed as a bypass between compressor discharge and suction line.

The regulator opens as evaporation pressure decreases.

Note: there must be a liquid injection valve for desuperheating suction line gas.



Installation (2)

The regulator may also be installed as a bypass between compressor discharge and the expansion valve outlet.

3310

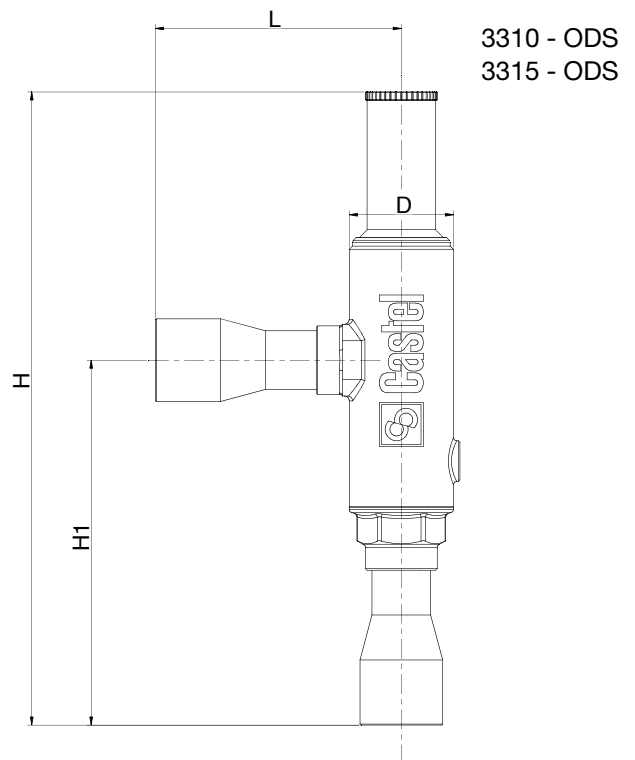
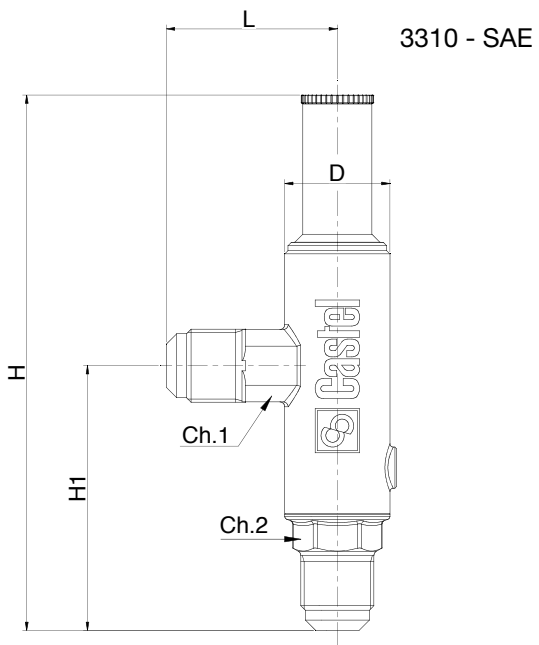
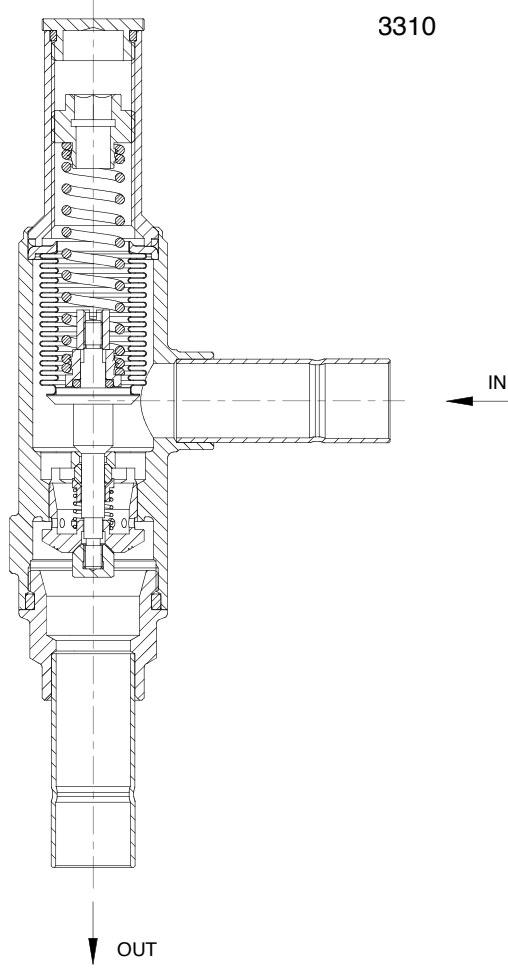


TABLE 1: General characteristics of capacity regulators

| 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] | | | | | | | | | | | |
| 3310/4 | 1/2" | - | - | 0,70 | 0,2 | 6 | 2 | 28 | - 40 | +110 | - 40 | +50 | Art. 4.3 | |
| 3310/M12S | - | - | 12 | | | | | | | | | | | |
| 3310/4S | - | 1/2" | - | | | | | | | | | | | |
| 3310/5 | 5/8" | - | - | | | | | | | | | | | 1,26 |
| 3310/5S | - | 5/8" | 16 | | | | | | | | | | | |
| 3310/7S | - | 7/8" | 22 | 1,84 | | | | | | | | | | |
| 3315/M12S | - | - | 12 | 0,70 | 2 | 7 | 2 | 45 | - 40 | +110 | - 40 | +50 | Art. 4.3 | |
| 3315/4S | - | 1/2" | - | | | | | | | | | | | |
| 3315/5S | - | 5/8" | 16 | | | | | | | | | | | |
| 3315/7S | - | 7/8" | 22 | | | | | | | | | | | 1,84 |

TABLE 2: Dimensions and weights of capacity regulators

| Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|------------------|-----------------|----------------|------|-----|-----|-----|------------|
| | H | H ₁ | L | D | Ch1 | Ch2 | |
| 3310/4 | 159 | 76,5 | 48 | 32 | 22 | 24 | 490 |
| 3310/M12S | 183 | 100,5 | 64 | | - | - | 490 |
| 3310/4S | 183 | 100,5 | 64 | | - | - | 490 |
| 3310/5 | 163 | 80,5 | 52 | | 22 | 24 | 550 |
| 3310/5S | 183 | 100,5 | 64 | | - | - | 480 |
| 3310/7S | 194 | 112 | 75,5 | | - | - | 560 |
| 3315/M12S | 183 | 100,5 | 64 | | 32 | - | - |
| 3315/4S | 183 | 100,5 | 64 | 490 | | | |
| 3315/5S | 183 | 100,5 | 64 | 480 | | | |
| 3315/7S | 194 | 112 | 75,5 | 560 | | | |

liquid temperature $T_{\text{Liquid}} = 35 \text{ °C}$.

$$K_{\text{Tliquid}} = 1,03$$

2. Calculate the refrigerating capacity requested at regulator.

$$Q_{\text{Valve}} = (Q_{\text{compr}} - Q_{\text{evap}}) \times K_{\text{Tliquid}} = (10-5) \times 1,03 = 5,15 \text{ kW}$$

3. Calculate the evaporating temperature change

$$T_{\text{ev}} - T_{\text{ev min}} = -15 - (-19) = 4 \text{ °C}$$

4. With the following parameters:

- Minimum cooling capacity = 5.15 kW
- Evaporating temperature change = 4 °C
- Minimum allowable evaporating temperature = - 19 °C

Choose the proper valve in Table 5A.

The selected valves are:

- 3310/M12 with 12 mm diameter solder connections
- 3310/4 with 1/2" diameter solder connections

CERTIFICATIONS

Regulators in series 3310 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. Regulators in series 3315 have not been approved by the American certification authority Underwriters Laboratories Inc.

TABLE 3A : Refrigerant Flow Capacity of capacity regulators 3310 [kW]

| Catalogue Number | Evaporator temperature change [°C] (1) | Minimum allowable evaporator temperature at reduced load conditions [°C] | | | | | | | | | |
|--------------------------------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 10 | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 |
| 3310/4 3310/4S 3310/M12S | 1 | 1,70 | 1,70 | 1,67 | 1,63 | 1,60 | 1,57 | 1,53 | 1,50 | 1,46 | 1,43 |
| | 2 | 3,30 | 3,30 | 3,23 | 3,17 | 3,10 | 3,04 | 2,97 | 2,91 | 2,84 | 2,78 |
| | 3 | 4,41 | 4,41 | 4,32 | 4,24 | 4,15 | 4,06 | 3,97 | 3,89 | 3,80 | 3,71 |
| | 4 | 4,95 | 4,95 | 4,85 | 4,75 | 4,66 | 4,56 | 4,46 | 4,36 | 4,27 | 4,17 |
| | 5 | 5,21 | 5,21 | 5,10 | 5,00 | 4,90 | 4,79 | 4,69 | 4,59 | 4,49 | 4,38 |
| | 6 | 6,08 | 6,08 | 5,96 | 5,84 | 5,72 | 5,60 | 5,48 | 5,36 | 5,24 | 5,12 |
| 3310/5 3310/5S | 1 | 2,49 | 2,49 | 2,44 | 2,38 | 2,33 | 2,27 | 2,22 | 2,16 | 2,11 | 2,05 |
| | 2 | 4,27 | 4,27 | 4,17 | 4,07 | 3,97 | 3,87 | 3,77 | 3,67 | 3,56 | 3,46 |
| | 3 | 5,92 | 5,92 | 5,80 | 5,68 | 5,56 | 5,43 | 5,31 | 5,19 | 5,07 | 4,95 |
| | 4 | 8,48 | 8,48 | 8,31 | 8,13 | 7,96 | 7,79 | 7,61 | 7,44 | 7,27 | 7,09 |
| | 5 | 10,05 | 10,05 | 9,84 | 9,64 | 9,43 | 9,23 | 9,02 | 8,81 | 8,61 | 8,40 |
| | 6 | 11,43 | 11,43 | 11,19 | 10,96 | 10,72 | 10,49 | 10,25 | 10,02 | 9,79 | 9,55 |
| 3310/7S | 1 | 2,46 | 2,46 | 2,42 | 2,39 | 2,35 | 2,31 | 2,28 | 2,24 | 2,20 | 2,17 |
| | 2 | 4,39 | 4,39 | 4,32 | 4,26 | 4,19 | 4,13 | 4,06 | 4,00 | 3,93 | 3,87 |
| | 3 | 5,62 | 5,62 | 5,54 | 5,45 | 5,37 | 5,29 | 5,20 | 5,12 | 5,03 | 4,95 |
| | 4 | 8,32 | 8,32 | 8,20 | 8,07 | 7,95 | 7,82 | 7,70 | 7,58 | 7,45 | 7,33 |
| | 5 | 11,02 | 11,02 | 10,86 | 10,69 | 10,53 | 10,36 | 10,20 | 10,04 | 9,87 | 9,71 |
| | 6 | 14,60 | 14,60 | 14,38 | 14,16 | 13,94 | 13,73 | 13,51 | 13,29 | 13,08 | 12,86 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|--------|-----------|-----------------------|--------|-----------|
| Condensing temperature | 100 °F | (37,8 °C) | Suction temperature | 65 °F | (18,3 °C) |
| Liquid temperature | 98 °F | (36,7 °C) | Superheating | 25 °R | (13,9 °K) |
| Subcooling | 2 °R | (1,1 °K) | Discharge temperature | 150 °F | (65,6 °C) |
| Evaporating temperature | 40 °F | (4,4 °C) | | | |

(1) : temperature change required to move the valve shutter from "start to open" position to rated opening position

TABLE 3B : 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 4A : Refrigerant Flow Capacity of capacity regulators 3310 [kW]

| Catalogue Number | Evaporator temperature change [°C] (1) | Minimum allowable evaporator temperature at reduced load conditions [°C] | | | | | | | | | |
|--------------------------------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 6 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 |
| 3310/4 3310/4S 3310/M12S | 1 | 2,25 | 2,25 | 2,21 | 2,16 | 2,12 | 2,07 | 2,03 | 1,98 | 1,94 | 1,89 |
| | 2 | 4,65 | 4,65 | 4,56 | 4,47 | 4,37 | 4,28 | 4,19 | 4,10 | 4,01 | 3,92 |
| | 3 | 6,21 | 6,21 | 6,09 | 5,96 | 5,84 | 5,72 | 5,60 | 5,47 | 5,35 | 5,23 |
| | 4 | 6,90 | 6,90 | 6,76 | 6,63 | 6,49 | 6,35 | 6,22 | 6,08 | 5,95 | 5,81 |
| | 5 | 7,25 | 7,25 | 7,10 | 6,96 | 6,82 | 6,67 | 6,53 | 6,39 | 6,24 | 6,10 |
| | 6 | 8,45 | 8,45 | 8,29 | 8,12 | 7,95 | 7,78 | 7,62 | 7,45 | 7,28 | 7,12 |
| 3310/5 3310/5S | 1 | 3,65 | 3,65 | 3,57 | 3,50 | 3,43 | 3,36 | 3,29 | 3,22 | 3,15 | 3,08 |
| | 2 | 6,05 | 6,05 | 5,94 | 5,84 | 5,73 | 5,62 | 5,52 | 5,41 | 5,30 | 5,19 |
| | 3 | 8,22 | 8,22 | 8,05 | 7,88 | 7,71 | 7,55 | 7,38 | 7,21 | 7,04 | 6,87 |
| | 4 | 11,81 | 11,81 | 11,57 | 11,33 | 11,08 | 10,84 | 10,60 | 10,36 | 10,12 | 9,87 |
| | 5 | 14,01 | 14,01 | 13,72 | 13,43 | 13,15 | 12,86 | 12,57 | 12,28 | 12,00 | 11,71 |
| | 6 | 15,94 | 15,94 | 15,61 | 15,28 | 14,96 | 14,63 | 14,30 | 13,98 | 13,65 | 13,32 |
| 3310/7S | 1 | 3,44 | 3,44 | 3,38 | 3,33 | 3,28 | 3,23 | 3,18 | 3,13 | 3,08 | 3,03 |
| | 2 | 6,11 | 6,11 | 6,01 | 5,92 | 5,83 | 5,74 | 5,65 | 5,56 | 5,47 | 5,38 |
| | 3 | 7,83 | 7,83 | 7,71 | 7,60 | 7,48 | 7,36 | 7,25 | 7,13 | 7,01 | 6,90 |
| | 4 | 13,66 | 13,66 | 13,46 | 13,26 | 13,05 | 12,85 | 12,65 | 12,44 | 12,24 | 12,04 |
| | 5 | 16,43 | 16,43 | 16,19 | 15,95 | 15,70 | 15,46 | 15,21 | 14,97 | 14,72 | 14,48 |
| | 6 | 21,57 | 21,57 | 21,24 | 20,92 | 20,60 | 20,28 | 19,96 | 19,64 | 19,32 | 19,00 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|--------|-----------|-----------------------|--------|-----------|
| Condensing temperature | 100 °F | (37,8 °C) | Suction temperature | 65 °F | (18,3 °C) |
| Liquid temperature | 98 °F | (36,7 °C) | Superheating | 25 °R | (13,9 °K) |
| Subcooling | 2 °R | (1,1 °K) | Discharge temperature | 150 °F | (65,6 °C) |
| Evaporating temperature | 40 °F | (4,4 °C) | | | |

(1) : temperature change required to move the valve shutter from "start to open" position to rated opening position

TABLE 4B : 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 |

R404A / R507

TABLE 5A : Refrigerant Flow Capacity of capacity regulators 3310 [kW]

| Catalogue Number | Evaporator temperature change [°C] (1) | Minimum allowable evaporator temperature at reduced load conditions [°C] | | | | | | | | | |
|--------------------------------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 |
| 3310/4 3310/4S 3310/M12S | 1 | 2,46 | 2,38 | 2,34 | 2,30 | 2,26 | 2,21 | 2,17 | 2,13 | 2,09 | 2,05 |
| | 2 | 4,75 | 4,59 | 4,51 | 4,43 | 4,35 | 4,27 | 4,19 | 4,11 | 4,03 | 3,95 |
| | 3 | 6,49 | 6,27 | 6,16 | 6,05 | 5,94 | 5,83 | 5,72 | 5,61 | 5,50 | 5,39 |
| | 4 | 7,08 | 6,84 | 6,72 | 6,60 | 6,48 | 6,36 | 6,24 | 6,12 | 6,00 | 5,88 |
| | 5 | 7,42 | 7,17 | 7,04 | 6,91 | 6,79 | 6,66 | 6,54 | 6,41 | 6,29 | 6,16 |
| | 6 | 8,63 | 8,34 | 8,19 | 8,05 | 7,90 | 7,75 | 7,61 | 7,46 | 7,32 | 7,17 |
| 3310/5 3310/5S | 1 | 3,67 | 3,52 | 3,44 | 3,37 | 3,29 | 3,22 | 3,15 | 3,07 | 3,00 | 2,92 |
| | 2 | 6,30 | 6,04 | 5,91 | 5,78 | 5,65 | 5,53 | 5,40 | 5,27 | 5,14 | 5,01 |
| | 3 | 8,72 | 8,36 | 8,19 | 8,01 | 7,83 | 7,65 | 7,48 | 7,30 | 7,12 | 6,94 |
| | 4 | 12,49 | 11,98 | 11,73 | 11,47 | 11,22 | 10,96 | 10,71 | 10,45 | 10,20 | 9,94 |
| | 5 | 14,80 | 14,19 | 13,89 | 13,59 | 13,29 | 12,99 | 12,69 | 12,38 | 12,08 | 11,78 |
| | 6 | 16,82 | 16,13 | 15,79 | 15,45 | 15,10 | 14,76 | 14,42 | 14,08 | 13,73 | 13,39 |
| 3310/7S | 1 | 3,70 | 3,49 | 3,38 | 3,27 | 3,16 | 3,05 | 2,94 | 2,83 | 2,72 | 2,61 |
| | 2 | 6,59 | 6,21 | 6,01 | 5,82 | 5,62 | 5,43 | 5,24 | 5,04 | 4,85 | 4,65 |
| | 3 | 8,44 | 7,94 | 7,69 | 7,44 | 7,19 | 6,95 | 6,70 | 6,45 | 6,20 | 5,95 |
| | 4 | 14,98 | 14,10 | 13,66 | 13,22 | 12,77 | 12,33 | 11,89 | 11,45 | 11,01 | 10,57 |
| | 5 | 18,18 | 17,11 | 16,58 | 16,04 | 15,51 | 14,97 | 14,44 | 13,90 | 13,37 | 12,83 |
| | 6 | 24,07 | 22,66 | 21,95 | 21,24 | 20,53 | 19,83 | 19,12 | 18,41 | 17,70 | 16,99 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|--------|-----------|-----------------------|--------|-----------|
| Condensing temperature | 100 °F | (37,8 °C) | Suction temperature | 65 °F | (18,3 °C) |
| Liquid temperature | 98 °F | (36,7 °C) | Superheating | 25 °R | (13,9 °K) |
| Subcooling | 2 °R | (1,1 °K) | Discharge temperature | 150 °F | (65,6 °C) |
| Evaporating temperature | 40 °F | (4,4 °C) | | | |

(1) : temperature change required to move the valve shutter from "start to open" position to rated opening position

TABLE 5B : 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 6A : Refrigerant Flow Capacity of capacity regulators 3310 [kW]

| Catalogue Number | Evaporator temperature change [°C] (1) | Minimum allowable evaporator temperature at reduced load conditions [°C] | | | | | | | | | |
|--------------------------------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 8 | 4,4 | 0 | -5 | -10 | -15 | -30 | -35 | -30 | -35 |
| 3310/4 3310/4S 3310/M12S | 1 | 2,88 | 2,88 | 2,81 | 2,74 | 2,66 | 2,59 | 2,52 | 2,45 | 2,38 | 2,30 |
| | 2 | 5,58 | 5,58 | 5,44 | 5,30 | 5,16 | 5,02 | 4,88 | 4,74 | 4,60 | 4,46 |
| | 3 | 7,61 | 7,61 | 7,42 | 7,23 | 7,04 | 6,85 | 6,66 | 6,47 | 6,28 | 6,09 |
| | 4 | 8,53 | 8,53 | 8,31 | 8,10 | 7,89 | 7,67 | 7,46 | 7,25 | 7,04 | 6,82 |
| | 5 | 8,96 | 8,96 | 8,74 | 8,52 | 8,29 | 8,07 | 7,84 | 7,62 | 7,40 | 7,17 |
| | 6 | 10,47 | 10,47 | 10,21 | 9,95 | 9,68 | 9,42 | 9,16 | 8,90 | 8,64 | 8,38 |
| 3310/5 3310/5S | 1 | 4,27 | 4,27 | 4,16 | 4,05 | 3,95 | 3,84 | 3,73 | 3,63 | 3,52 | 3,41 |
| | 2 | 7,36 | 7,36 | 7,18 | 6,99 | 6,81 | 6,62 | 6,44 | 6,26 | 6,07 | 5,89 |
| | 3 | 10,22 | 10,22 | 9,97 | 9,71 | 9,46 | 9,20 | 8,95 | 8,69 | 8,43 | 8,18 |
| | 4 | 14,62 | 14,62 | 14,25 | 13,89 | 13,52 | 13,15 | 12,79 | 12,42 | 12,06 | 11,69 |
| | 5 | 17,31 | 17,31 | 16,87 | 16,44 | 16,01 | 15,57 | 15,14 | 14,71 | 14,28 | 13,84 |
| | 6 | 19,66 | 19,66 | 19,17 | 18,67 | 18,18 | 17,69 | 17,20 | 16,71 | 16,22 | 15,73 |
| 3310/7S | 1 | 4,25 | 4,25 | 4,14 | 4,04 | 3,93 | 3,82 | 3,72 | 3,61 | 3,50 | 3,40 |
| | 2 | 7,56 | 7,56 | 7,37 | 7,18 | 6,99 | 6,80 | 6,62 | 6,43 | 6,24 | 6,05 |
| | 3 | 9,68 | 9,68 | 9,44 | 9,20 | 8,96 | 8,72 | 8,47 | 8,23 | 7,99 | 7,75 |
| | 4 | 17,20 | 17,20 | 16,77 | 16,34 | 15,91 | 15,48 | 15,05 | 14,62 | 14,19 | 13,76 |
| | 5 | 20,89 | 20,89 | 20,37 | 19,84 | 19,32 | 18,80 | 18,28 | 17,76 | 17,23 | 16,71 |
| | 6 | 27,67 | 27,67 | 26,98 | 26,28 | 25,59 | 24,90 | 24,21 | 23,52 | 22,83 | 22,13 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|--------|-----------|-----------------------|--------|-----------|
| Condensing temperature | 100 °F | (37,8 °C) | Suction temperature | 65 °F | (18,3 °C) |
| Liquid temperature | 98 °F | (36,7 °C) | Superheating | 25 °R | (13,9 °K) |
| Subcooling | 2 °R | (1,1 °K) | Discharge temperature | 150 °F | (65,6 °C) |
| Evaporating temperature | 40 °F | (4,4 °C) | | | |

(1) : temperature change required to move the valve shutter from "start to open" position to rated opening position

TABLE 6B : 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 7A : Refrigerant Flow Capacity of capacity regulators 3315 [kW]

| Catalogue Number | Evaporator temperature change [°C] (1) | Minimum allowable evaporator temperature at reduced load conditions [°C] | | | | | | | | | |
|----------------------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 8 | 4,4 | 0 | -5 | -10 | -15 | -30 | -35 | -30 | -35 |
| 3315/4S 3315/M12S | 1 | – | 4,11 | 3,97 | 3,91 | 3,84 | 3,77 | 3,70 | 3,63 | 3,56 | 3,49 |
| | 2 | – | 7,93 | 7,67 | 7,53 | 7,40 | 7,26 | 7,13 | 6,99 | 6,86 | 6,73 |
| | 3 | – | 10,84 | 10,48 | 10,29 | 10,11 | 9,93 | 9,74 | 9,56 | 9,38 | 9,19 |
| | 4 | – | 11,83 | 11,43 | 11,23 | 11,03 | 10,83 | 10,63 | 10,43 | 10,23 | 10,03 |
| | 5 | – | 12,39 | 11,97 | 11,76 | 11,55 | 11,34 | 11,13 | 10,92 | 10,71 | 10,50 |
| | 6 | – | 14,41 | 13,92 | 13,68 | 13,44 | 13,19 | 12,95 | 12,71 | 12,46 | 12,22 |
| 3315/5S | 1 | – | 6,13 | 5,88 | 5,75 | 5,63 | 5,50 | 5,38 | 5,25 | 5,13 | 5,00 |
| | 2 | – | 10,51 | 10,08 | 9,87 | 9,66 | 9,44 | 9,23 | 9,01 | 8,80 | 8,58 |
| | 3 | – | 14,56 | 13,97 | 13,67 | 13,37 | 13,08 | 12,78 | 12,48 | 12,19 | 11,89 |
| | 4 | – | 20,86 | 20,01 | 19,58 | 19,16 | 18,73 | 18,31 | 17,88 | 17,46 | 17,03 |
| | 5 | – | 24,71 | 23,70 | 23,20 | 22,70 | 22,19 | 21,69 | 21,18 | 20,68 | 20,18 |
| | 6 | – | 28,09 | 26,94 | 26,37 | 25,80 | 25,22 | 24,65 | 24,08 | 23,51 | 22,93 |
| 3315/7S | 1 | – | 6,18 | 5,82 | 5,64 | 5,46 | 5,27 | 5,09 | 4,91 | 4,73 | 4,55 |
| | 2 | – | 11,01 | 10,36 | 10,04 | 9,71 | 9,39 | 9,07 | 8,74 | 8,42 | 8,10 |
| | 3 | – | 14,09 | 13,26 | 12,84 | 12,43 | 12,02 | 11,60 | 11,19 | 10,77 | 10,36 |
| | 4 | – | 25,01 | 23,54 | 22,81 | 22,07 | 21,33 | 20,60 | 19,86 | 19,13 | 18,39 |
| | 5 | – | 30,36 | 28,57 | 27,68 | 26,79 | 25,90 | 25,00 | 24,11 | 23,22 | 22,32 |
| | 6 | – | 40,20 | 37,84 | 36,66 | 35,47 | 34,29 | 33,11 | 31,93 | 30,74 | 29,56 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|--------|-----------|-----------------------|--------|-----------|
| Condensing temperature | 100 °F | (37,8 °C) | Suction temperature | 65 °F | (18,3 °C) |
| Liquid temperature | 98 °F | (36,7 °C) | Superheating | 25 °R | (13,9 °K) |
| Subcooling | 2 °R | (1,1 °K) | Discharge temperature | 150 °F | (65,6 °C) |
| Evaporating temperature | 40 °F | (4,4 °C) | | | |

(1) : temperature change required to move the valve shutter from "start to open" position to rated opening position

TABLE 7B : 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 |

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