

HANDBOOK
REGULATOR VALVES

Ed. 2017

 **Castel**[®]
Italian technology

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THE NATURAL DEVELOPMENT OF QUALITY

Having achieved the goal of fifty-five years working in the Refrigeration and Air Conditioning Industry, Castel's range of quality products is well known and highly appreciated around the world. Quality is the product of our Company philosophy and marks every step of the production cycle. It is certified by the company's Quality Management System (certified by TUV SUD in accordance with the UNI EN ISO 9001:2008 standard), as well as by the various product certifications of compliance with European Directives and European and extra-European Quality Marks.

Product quality is connected with the quality of manufacturing. We produce on high-tech machinery and updated automatic production lines, operating in compliance with the current safety and environmental protection standards.

Castel offers the Refrigeration and Air Conditioning Market and Manufacturers tested certified products suitable for use with the HCF and HFO refrigerants currently used in the Refrigeration & Air Conditioning Industry.

Based on the experience gained in the refrigeration field using fluorinated fluids, Castel is proud to present the Refrigeration and Air Conditioning Market and Manufacturers two complete lines of products developed and proven for use in systems using natural refrigerants: hydrocarbons (HC fluids) and carbon dioxide (R744).



DIRECTIVE 2014/68/EU ISSUED OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 15 MAY 2014 ON PRESSURE EQUIPMENT

Directive 2014/68/EU (PED Recast) applies to the design, manufacture and evaluation of compliance of pressure equipment and assemblies with a maximum allowable pressure, PS, greater than 0.5 bar excluding the cases listed in Article 1, Paragraph 2 of the Directive.

Directive 2014/68/EU was transposed into the Italian legal system by Legislative Decree No. 26 dated 15 February 2016, published in the Official Journal of the Republic of Italy No. 53 of 4 March 2016.

The revised PED Recast Directive repeals previous Directive 97/23/EC. More specifically:

- Article 13 of the PED Recast Directive, regarding the classification of pressure equipment, came into force as of 1 June 2015 and repeals Article 9 of the previous PED Directive.
- All other articles of the PED Recast Directive are in force as of 19 July 2016, repealing all articles of the previous PED directive.

All solenoid valves illustrated in this technical handbook are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of said Directive and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

EXTERNAL LEAKAGE

All the products illustrated in this Handbook individually undergo tightness tests as well as specific functional tests. The allowable external leakage, measurable during the test, complies with the requirements of standards:

- EN 12284: 2003 – Refrigerating systems and heat pumps - Valves - Requirements, testing and marking
- EN 16084:2011 – Refrigerating systems and heat pumps - Qualification of tightness of components and joints

PRESSURE CONTAINMENT

All the products illustrated in this Handbook, if submitted to hydrostatic testing, guarantee a pressure strength at least equal to $1.43 \times PS$ in compliance with Directive 2014/68/EU.

All the products illustrated in this Handbook, if submitted to burst test, guarantee a pressure strength at least equal to $3 \times PS$ according to EN 378-2:2016 Standard.

All the UL-certified products illustrated in this Handbook, if submitted to burst testing, guarantee a pressure strength at least equal to $5 \times MWP$ in compliance with standard UL 207.

WEIGHT

The weights of the items listed in this Handbook include packaging and are not binding.

WARRANTY

All Castel products are covered by a 12-month warranty. This warranty covers all products or parts thereof that turn out to be defective within the warranty period. In this case, at his own expenses, the customer shall return the defective item with a detailed description of the claimed defects. The warranty does not apply if the defect of the Castel product is due to mistakes by the customer or by third parties, such as incorrect installation, use contrary to Castel instructions, or tampering. In the event of defects found in its products, Castel will only replace the defective goods and will not refund damages of any kind. Castel reserves the right to make changes or modifications to its products at any time without prior notice.

The products listed in this handbook are protected according to law.

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]

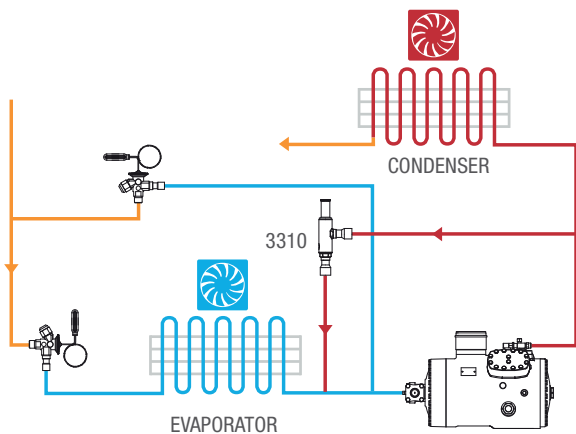
$K_{T_{\text{liquid}}}$ = Correction factor for $T_{\text{liquid}} \neq 36.7 \text{ °C}$. (See Tables 3B, 4B, 5B, 6B and 7B.)

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

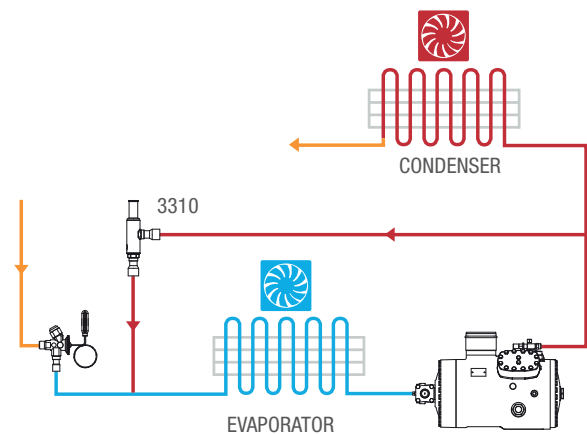


Installation (1)

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

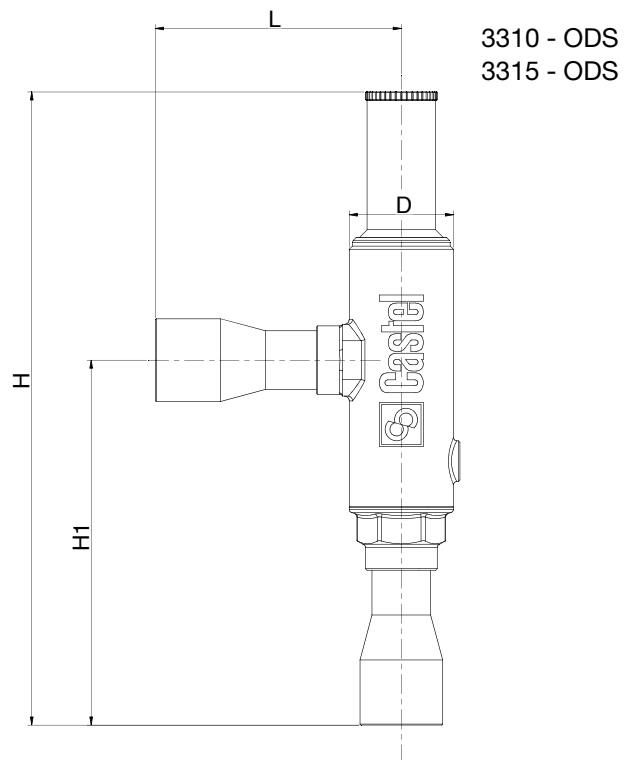
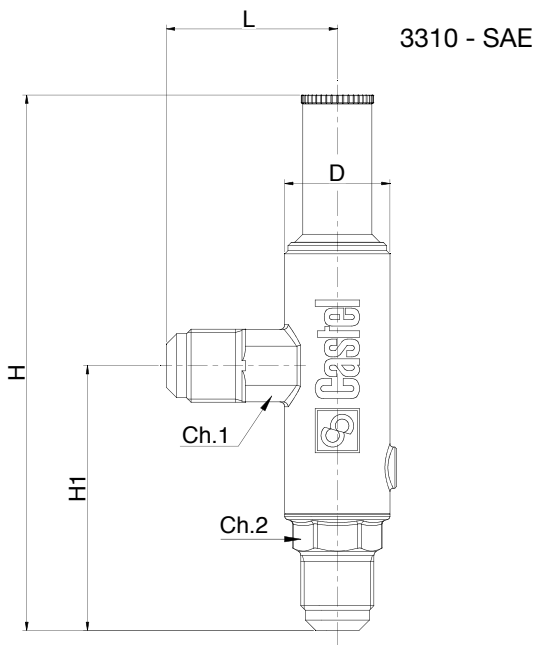
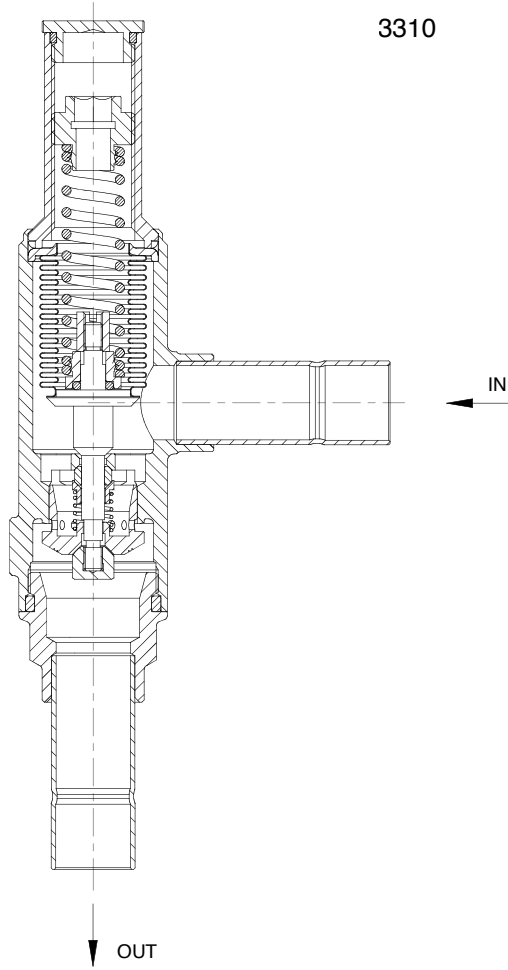


TABLE 1: General characteristics of capacity regulators

| 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 |

CRANKCASE PRESSURE REGULATORS

FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS



APPLICATIONS

The crankcase pressure regulator is an accessory often used in low temperature cooling systems. It is designed to prevent the compressor motor from overloading when the intake pressure exceeds the manufacturer's recommended operating pressure. This can occur in many low temperature refrigeration systems during or after a defrosting cycle, or after an extended shut-down period.

All crankcase 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)

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

Crankcase pressure regulators adjust the flow of hot gas according to changes of suction pressure, downstream the regulator. When the suction 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. 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. Crankcase pressure 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 bellow with an area equal to that of the valve seat. The factory pressure settings for crankcase pressure regulators in series 3320 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 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 calibration range varies from 0.2 to 6 bar.

CONSTRUCTION

The main parts of the crankcase 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

Crankcase pressure regulators in series 3320 are installed in the suction line between the evaporator and the compressor. Normally there are no other components installed downstream of regulator 3320, between the valve outlet and the compressor. This is to ensure that the outlet of regulator senses the true crankcase pressure of the compressor.

SELECTION

To correctly select crankcase 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. **Evaporator capacity**, at system working conditions
3. **Designed evaporating temperature (saturated pressure) at design load condition.**
4. **Maximum allowable suction pressure.** Consult the compressor manufacturer for this value. This data identifies the valve calibration pressure.

5. Allowable pressure drop across the valves at design load condition.

The pressure difference between items 3 and 4 determines how much of the valve stroke is utilized. The valve calibration should be as high as possible without exceeding the compressor manufacturer's recommendation. When the full shutter stroke is used, the only way to increase the valve capacity is to accept an increase in the load loss across the valve. Since excessive suction line pressure losses penalize the system capacity, the pressure drop across regulator 3320 should be minimized. The lower the evaporator temperature, the lower the pressure drop allowed. The refrigeration capacities indicated in Tables 10A, 11A, 12A, and 13A are based on a reference liquid temperature of 36.7 °C. With liquid temperatures other than 36.7 °C the required cooling capacity of regulator is:

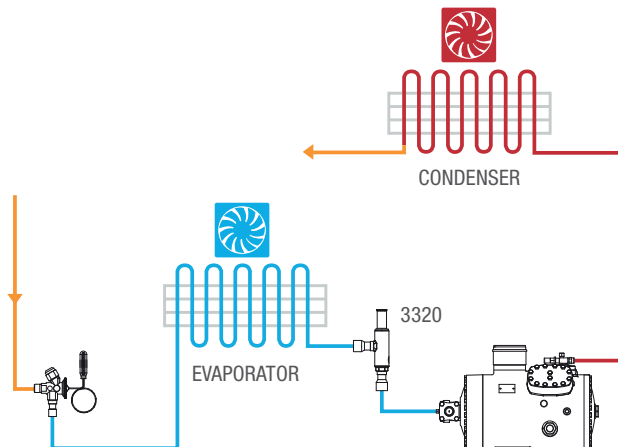
$$\frac{Q_{\text{evap}}}{K_{T \text{ liquid}}} = Q_{\text{valve}}$$

where:

- Q_{evap} = Evaporator capacity [kW]
- $K_{T \text{ liquid}}$ = Correction factor for $T_{\text{liquid}} \neq 36.7 \text{ °C}$.
(vedere tabelle 10B, 11B, 12B, 13B)
- Q_{valve} = Refrigerating capacity requested at regulator. [kW]

EXAMPLE

| | |
|--|-----------|
| Refrigerant: | R404A |
| Refrigeration yield of evaporator: | 4.5 [kW] |
| Designed evaporating temperature: | -25 [°C] |
| Maximum allowable suction pressure (regulator calibration): | 3.5 [bar] |



| | |
|-------------------------------------|------------|
| Pressure drop across the regulator: | 0.07 [bar] |
| Liquid temperature: | 35 [°C] |
| Solder connections | |

1. Use Table 12B to determine the correction factor for the liquid temperature $T_{\text{Liquid}} = 35 \text{ °C}$. $T_{\text{Liquid}} = 35 \text{ °C}$.

$$K_{T \text{ liquid}} = 1.03$$

2. Calculate the refrigerating capacity requested at regulator.

$$Q_{\text{valve}} = \frac{Q_{\text{evap}}}{K_{T \text{ liquid}}} = \frac{4,5}{1,03} = 4,36 \text{ kW}$$

3. With the following parameters:

- Minimum cooling capacity = 4.36 KW
- Evaporating temperature = - 25 °C
- Maximum allowable suction pressure = 3.5 bar
- Pressure drop across the valve = 0.07 bar

Select the right valve from Table 12A.

The selected valves are:

- 3320/M12 with 12 mm diameter solder connections
- 3320/4 with 1/2" diameter solder connections

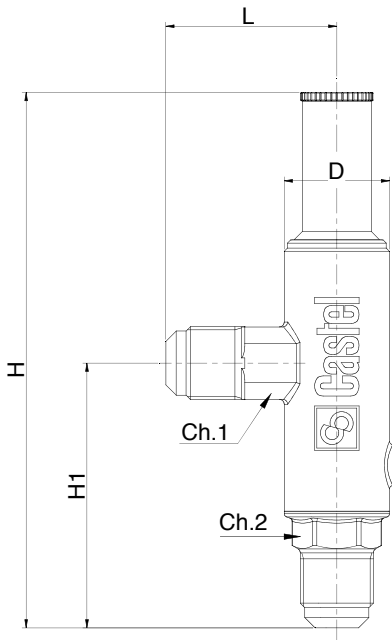
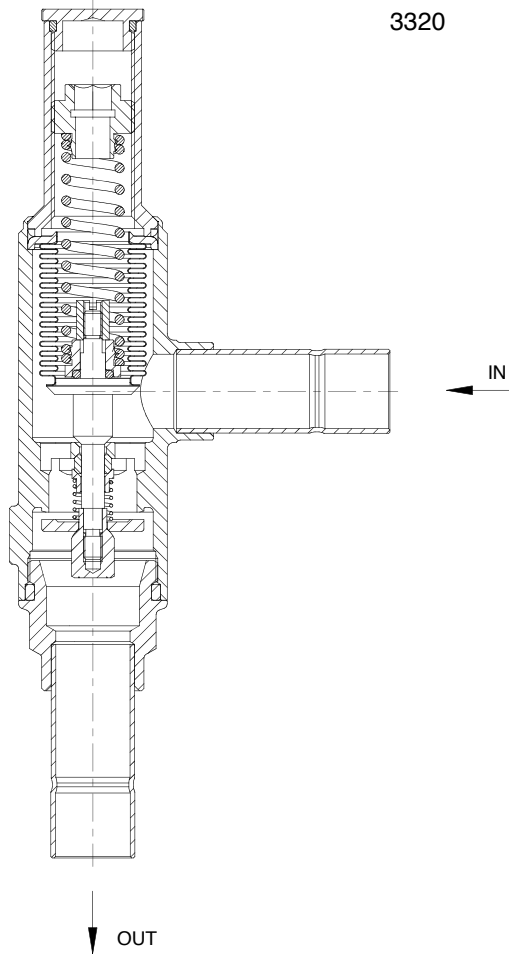
CERTIFICATIONS

Crankcase pressure regulators in series 3320 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.

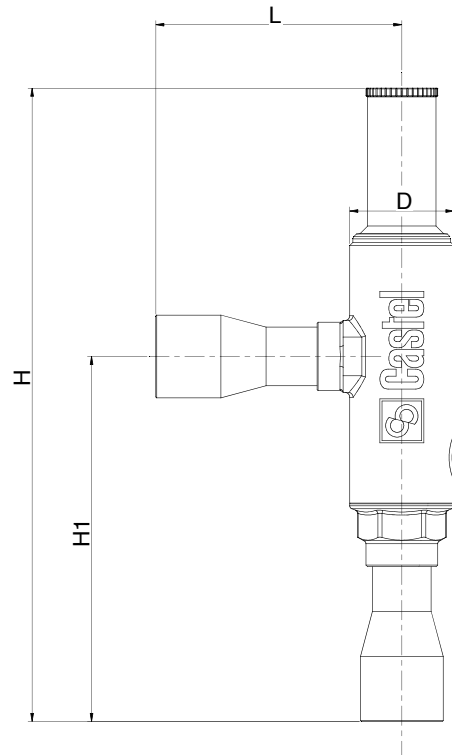
Installation

Refrigerating systems for applications with low evaporation temperatures. The regulator is installed on the suction pipe upstream of the compressor. The regulator opens when suction pressure drops below the calibrated value.

3320



3320 - SAE



3320 - ODS

TABLE 8: General characteristics of crankcase pressure regulators

| Catalogue Number | Connections | | | Kv Factor [m ³ /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] | | | | | | | | | | |
| 3320/4 | 1/2" | - | - | 3,30 | 0,2 | 6 | 2 | 28 | - 40 | +110 | - 40 | +50 | Art. 4.3 |
| 3320/M12S | - | - | 12 | | | | | | | | | | |
| 3320/4S | - | 1/2" | - | | | | | | | | | | |
| 3320/5 | 5/8" | - | - | | | | | | | | | | |
| 3320/5S | - | 5/8" | 16 | | | | | | | | | | |
| 3320/7S | - | 7/8" | 22 | | | | | | | | | | |
| 3320/9S | - | 1.1/8" | - | 8 | | | | | | | | | |
| 3320/M28S | - | - | 28 | | | | | | | | | | |
| 3320/11S | - | 1.3/8" | 35 | | | | | | | | | | |

TABLE 9: Dimensions and weights of crankcase pressure regulators

| Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|------------------|-----------------|----------------|------|----|-----|-----|------------|
| | H | H ₁ | L | D | Ch1 | Ch2 | |
| 3320/4 | 159 | 76,5 | 48 | 32 | 22 | 24 | 470 |
| 3320/M12S | 183 | 100,5 | 64 | | - | - | 490 |
| 3320/4S | 183 | 100,5 | 64 | | - | - | 490 |
| 3320/5 | 163 | 80,5 | 52 | | 22 | 24 | 550 |
| 3320/5S | 183 | 100,5 | 64 | | - | - | 480 |
| 3320/7S | 194 | 112 | 75,5 | | - | - | 550 |
| 3320/9S | 263 | 151 | 105 | 46 | - | - | 1480 |
| 3320/M28S | 263 | 151 | 105 | | | | 1460 |
| 3320/11S | 263 | 151 | 105 | | | | 1490 |

TABLE 10A : Refrigerant Flow Capacity of crankcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|--------------------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | |
| 3320/4 3320/4S 3320/M12S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 2,71 | 3,06 | 2,76 |
| | | 1,4 | - | - | - | - | 4,38 | 4,34 | 3,90 | 3,51 | 3,98 | 3,58 | |
| | | 2,1 | - | - | - | 6,96 | 6,26 | 5,63 | 5,07 | 4,56 | 5,17 | 4,65 | |
| | | 3,5 | - | - | 6,89 | 8,63 | 7,77 | 6,99 | 6,45 | 5,81 | 5,23 | 4,70 | |
| | | 4,2 | - | 5,57 | 8,56 | 9,47 | 8,52 | 7,67 | 6,90 | 6,21 | 5,59 | 5,03 | |
| | 5,5 | - | 6,92 | 8,61 | 9,49 | 8,54 | 7,69 | 6,92 | 6,23 | 5,60 | 5,04 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | 3,87 | 4,38 | 3,94 | |
| | | 1,4 | - | - | - | - | 6,26 | 6,20 | 5,58 | 5,02 | 5,68 | 5,11 | |
| | | 2,1 | - | - | - | 9,94 | 8,94 | 8,05 | 7,24 | 6,52 | 7,38 | 6,64 | |
| | | 3,5 | - | - | 9,85 | 12,33 | 11,10 | 9,99 | 9,22 | 8,30 | 7,47 | 6,72 | |
| | | 4,2 | - | 7,95 | 12,23 | 13,53 | 12,17 | 10,96 | 9,86 | 8,87 | 7,99 | 7,19 | |
| | 5,5 | - | 9,88 | 12,29 | 13,56 | 12,20 | 10,98 | 9,89 | 8,90 | 8,01 | 7,21 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | 3,91 | 4,43 | 3,99 | |
| | | 1,4 | - | - | - | - | 6,34 | 6,27 | 5,65 | 5,08 | 5,75 | 5,18 | |
| | | 2,1 | - | - | - | 10,06 | 9,05 | 8,15 | 7,33 | 6,60 | 7,47 | 6,72 | |
| 3,5 | | - | - | 9,97 | 12,48 | 11,23 | 10,11 | 9,33 | 8,40 | 7,56 | 6,80 | | |
| 4,2 | | - | 8,07 | 12,38 | 13,69 | 12,32 | 11,09 | 9,98 | 8,98 | 8,08 | 7,28 | | |
| 5,5 | - | 10,03 | 12,44 | 13,72 | 12,35 | 11,12 | 10,01 | 9,00 | 8,10 | 7,29 | | | |
| 3320/5 3320/5S | 0,07 | 0,7 | - | - | - | - | - | - | - | 3,37 | 3,82 | 3,44 | |
| | | 1,4 | - | - | - | - | 5,46 | 5,41 | 4,87 | 4,38 | 4,96 | 4,46 | |
| | | 2,1 | - | - | - | 8,67 | 7,80 | 7,02 | 6,32 | 5,69 | 6,44 | 5,80 | |
| | | 3,5 | - | - | 8,58 | 10,76 | 9,68 | 8,71 | 8,05 | 7,24 | 6,52 | 5,86 | |
| | | 4,2 | - | 6,56 | 10,65 | 11,80 | 10,62 | 9,56 | 8,60 | 7,74 | 6,97 | 6,27 | |
| | 5,5 | - | 8,15 | 10,71 | 11,83 | 10,65 | 9,58 | 8,63 | 7,76 | 6,99 | 6,29 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | 4,73 | 5,36 | 4,82 | |
| | | 1,4 | - | - | - | - | 8,67 | 7,59 | 6,83 | 6,15 | 6,96 | 6,26 | |
| | | 2,1 | - | - | - | 12,17 | 10,95 | 9,86 | 8,87 | 7,99 | 9,04 | 8,13 | |
| | | 3,5 | - | - | 12,03 | 15,10 | 13,59 | 12,23 | 11,29 | 10,16 | 9,15 | 8,23 | |
| | | 4,2 | - | 9,15 | 14,95 | 16,56 | 14,91 | 13,42 | 12,08 | 10,87 | 9,78 | 8,80 | |
| | 5,5 | - | 11,37 | 15,03 | 16,61 | 14,95 | 13,45 | 12,11 | 10,90 | 9,81 | 8,83 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | 4,82 | 5,45 | 4,91 | |
| | | 1,4 | - | - | - | - | 7,80 | 7,73 | 6,95 | 6,26 | 7,08 | 6,38 | |
| | | 2,1 | - | - | - | 12,39 | 11,15 | 10,03 | 9,03 | 8,13 | 9,20 | 8,28 | |
| 3,5 | | - | - | 12,25 | 15,37 | 13,83 | 12,45 | 11,49 | 10,34 | 9,31 | 8,38 | | |
| 4,2 | | - | 9,37 | 15,22 | 16,86 | 15,17 | 13,66 | 12,29 | 11,06 | 9,96 | 8,96 | | |
| 5,5 | - | 11,64 | 15,30 | 16,90 | 15,21 | 13,69 | 12,32 | 11,09 | 9,98 | 8,98 | | | |
| 3320/7S | 0,07 | 0,7 | - | - | - | - | - | - | - | 5,01 | 5,67 | 5,10 | |
| | | 1,4 | - | - | - | - | 9,18 | 8,03 | 7,23 | 6,51 | 7,37 | 6,63 | |
| | | 2,1 | - | - | - | 12,88 | 11,59 | 10,43 | 9,39 | 8,45 | 9,57 | 8,61 | |
| | | 3,5 | - | - | 12,84 | 15,98 | 14,38 | 12,94 | 11,95 | 10,76 | 9,68 | 8,71 | |
| | | 4,2 | - | 10,04 | 15,95 | 17,53 | 15,78 | 14,20 | 12,78 | 11,50 | 10,35 | 9,32 | |
| | 5,5 | - | 12,47 | 16,04 | 17,57 | 15,82 | 14,24 | 12,81 | 11,53 | 10,38 | 9,34 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | 7,08 | 8,01 | 7,21 | |
| | | 1,4 | - | - | - | - | 14,57 | 11,35 | 10,22 | 9,19 | 10,41 | 9,37 | |
| | | 2,1 | - | - | - | 18,20 | 16,38 | 14,74 | 13,27 | 11,94 | 13,52 | 12,16 | |
| | | 3,5 | - | - | 18,14 | 22,58 | 20,32 | 18,29 | 16,88 | 15,20 | 13,68 | 12,31 | |
| | | 4,2 | - | 14,30 | 22,54 | 24,77 | 22,29 | 20,06 | 18,06 | 16,25 | 14,63 | 13,16 | |
| | 5,5 | - | 17,77 | 22,66 | 24,83 | 22,35 | 20,11 | 18,10 | 16,29 | 14,66 | 13,20 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | 7,16 | 8,10 | 7,29 | |
| | | 1,4 | - | - | - | - | 13,11 | 11,48 | 10,33 | 9,30 | 10,52 | 9,47 | |
| | | 2,1 | - | - | - | 18,40 | 16,56 | 14,90 | 13,41 | 12,07 | 13,66 | 12,30 | |
| 3,5 | | - | - | 18,35 | 22,83 | 20,55 | 18,49 | 17,07 | 15,36 | 13,83 | 12,45 | | |
| 4,2 | | - | 14,34 | 22,79 | 25,04 | 22,54 | 20,29 | 18,26 | 16,43 | 14,79 | 13,31 | | |
| 5,5 | - | 17,81 | 22,91 | 25,11 | 22,60 | 20,34 | 18,30 | 16,47 | 14,83 | 13,34 | | | |

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)

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

Evaporating temperature 40 °F (4,4 °C)

Discharge temperature 150 °F (65,6 °C)

(1) : This value is the valve pressure setting

Continued

TABLE 10A : Refrigerant Flow Capacity of cranked pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|----------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | |
| 3320/9S 3320/M28S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 8,01 | 9,07 | 8,16 |
| | | 1,4 | - | - | - | - | 12,98 | 12,85 | 11,56 | 10,41 | 11,78 | 10,60 | |
| | | 2,1 | - | - | - | 20,60 | 18,54 | 16,69 | 15,02 | 13,52 | 15,30 | 13,77 | |
| | | 3,5 | - | - | 20,38 | 25,56 | 23,00 | 20,70 | 19,11 | 17,20 | 15,48 | 13,93 | |
| | | 4,2 | - | 15,58 | 25,31 | 28,04 | 25,24 | 22,71 | 20,44 | 18,40 | 16,56 | 14,90 | |
| | | 5,5 | - | 19,36 | 25,44 | 28,11 | 25,30 | 22,77 | 20,49 | 18,44 | 16,60 | 14,94 | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | 11,25 | 12,73 | 11,46 | |
| | | 1,4 | - | - | - | - | 20,60 | 18,03 | 16,23 | 14,61 | 16,53 | 14,88 | |
| | | 2,1 | - | - | - | 28,91 | 26,02 | 23,42 | 21,08 | 18,97 | 21,47 | 19,32 | |
| | | 3,5 | - | - | 28,59 | 35,87 | 32,29 | 29,06 | 26,83 | 24,14 | 21,73 | 19,56 | |
| | | 4,2 | - | 21,74 | 35,52 | 39,35 | 35,42 | 31,88 | 28,69 | 25,82 | 23,24 | 20,91 | |
| | | 5,5 | - | 27,01 | 35,70 | 39,45 | 35,51 | 31,96 | 28,76 | 25,88 | 23,30 | 20,97 | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | 11,45 | 12,96 | 11,66 | |
| | | 1,4 | - | - | - | - | 18,54 | 18,36 | 16,52 | 14,87 | 16,83 | 15,15 | |
| | | 2,1 | - | - | - | 29,43 | 26,49 | 23,84 | 21,46 | 19,31 | 21,86 | 19,67 | |
| | | 3,5 | - | - | 29,11 | 36,52 | 32,86 | 29,58 | 27,31 | 24,57 | 22,12 | 19,91 | |
| | | 4,2 | - | 22,26 | 36,16 | 40,06 | 36,05 | 32,45 | 29,20 | 26,28 | 23,65 | 21,29 | |
| | | 5,5 | - | 27,65 | 36,35 | 40,16 | 36,14 | 32,53 | 29,27 | 26,35 | 23,71 | 21,34 | |
| 3320/11S | 0,07 | 0,7 | - | - | - | - | - | - | - | 11,90 | 13,47 | 12,13 | |
| | | 1,4 | - | - | - | - | 21,80 | 19,09 | 17,18 | 15,46 | 17,50 | 15,75 | |
| | | 2,1 | - | - | - | 30,60 | 27,54 | 24,79 | 22,31 | 20,08 | 22,72 | 20,45 | |
| | | 3,5 | - | - | 30,51 | 37,97 | 34,17 | 30,75 | 28,39 | 25,55 | 23,00 | 20,70 | |
| | | 4,2 | - | 23,84 | 37,90 | 41,65 | 37,48 | 33,74 | 30,36 | 27,33 | 24,59 | 22,13 | |
| | | 5,5 | - | 29,62 | 38,10 | 41,75 | 37,58 | 33,82 | 30,44 | 27,39 | 24,66 | 22,19 | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | 16,82 | 19,04 | 17,13 | |
| | | 1,4 | - | - | - | - | 34,61 | 26,97 | 24,27 | 21,84 | 24,72 | 22,25 | |
| | | 2,1 | - | - | - | 43,24 | 38,91 | 35,02 | 31,52 | 28,37 | 32,11 | 28,90 | |
| | | 3,5 | - | - | 43,11 | 53,64 | 48,28 | 43,45 | 40,11 | 36,10 | 32,49 | 29,24 | |
| | | 4,2 | - | 33,98 | 53,55 | 58,85 | 52,96 | 47,67 | 42,90 | 38,61 | 34,75 | 31,27 | |
| | | 5,5 | - | 42,22 | 53,83 | 59,00 | 53,10 | 47,79 | 43,01 | 38,71 | 34,84 | 31,35 | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | 17,01 | 19,25 | 17,32 | |
| | | 1,4 | - | - | - | - | 31,15 | 27,27 | 24,54 | 22,09 | 25,00 | 22,50 | |
| | | 2,1 | - | - | - | 43,72 | 39,34 | 35,41 | 31,87 | 28,68 | 32,46 | 29,22 | |
| | | 3,5 | - | - | 43,59 | 54,24 | 48,81 | 43,93 | 40,56 | 36,50 | 32,85 | 29,57 | |
| | | 4,2 | - | 34,06 | 54,14 | 59,50 | 53,55 | 48,19 | 43,38 | 39,04 | 35,13 | 31,62 | |
| | | 5,5 | - | 42,31 | 54,43 | 59,65 | 53,68 | 48,32 | 43,48 | 39,14 | 35,22 | 31,70 | |

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) : This value is the valve pressure setting

TABLE 10B : 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 11A : Refrigerant Flow Capacity of crankcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|--------------------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/4 3320/4S 3320/M12S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 3,06 | 2,76 |
| | | 1,4 | – | – | – | – | – | 4,09 | 3,68 | 3,31 | 3,98 | 3,58 | |
| | | 2,1 | – | – | 5,19 | 6,55 | 5,90 | 5,31 | 4,78 | 4,30 | 5,17 | 4,65 | |
| | | 3,5 | – | 5,15 | 6,44 | 8,13 | 7,31 | 6,58 | 6,45 | 5,81 | 5,23 | 4,70 | |
| | | 4,2 | – | 6,38 | 7,99 | 8,91 | 8,02 | 7,22 | 6,50 | 5,85 | 5,26 | 4,74 | |
| | 5,5 | – | 6,44 | 8,04 | 8,93 | 8,03 | 7,23 | 6,51 | 5,86 | 5,27 | 4,74 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 4,38 | 3,94 |
| | | 1,4 | – | – | – | – | – | 5,84 | 5,25 | 4,73 | 5,68 | 5,11 | |
| | | 2,1 | – | – | 7,42 | 9,36 | 8,42 | 7,58 | 6,82 | 6,14 | 7,38 | 6,64 | |
| | | 3,5 | – | 7,35 | 9,20 | 11,61 | 10,45 | 9,40 | 9,22 | 8,30 | 7,47 | 6,72 | |
| | | 4,2 | – | 9,11 | 11,42 | 12,73 | 11,46 | 10,31 | 9,28 | 8,35 | 7,52 | 6,77 | |
| | 5,5 | – | 9,20 | 11,48 | 12,75 | 11,48 | 10,33 | 9,29 | 8,37 | 7,53 | 6,78 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 4,41 | 3,97 |
| | | 1,4 | – | – | – | – | – | 5,89 | 5,30 | 4,77 | 5,73 | 5,16 | |
| | | 2,1 | – | – | 7,37 | 9,44 | 8,50 | 7,65 | 6,88 | 6,19 | 7,44 | 6,70 | |
| 3,5 | | – | 7,24 | 9,14 | 11,71 | 10,54 | 9,49 | 9,30 | 8,37 | 7,53 | 6,78 | | |
| 4,2 | | – | 8,97 | 11,35 | 12,84 | 11,56 | 10,40 | 9,36 | 8,42 | 7,58 | 6,82 | | |
| 5,5 | – | 9,06 | 11,41 | 12,86 | 11,57 | 10,42 | 9,37 | 8,44 | 7,59 | 6,83 | | | |
| 3320/5 3320/5S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 3,80 | 3,42 |
| | | 1,4 | – | – | – | – | – | 5,06 | 4,56 | 4,10 | 4,93 | 4,44 | |
| | | 2,1 | – | – | 6,44 | 8,12 | 7,31 | 6,58 | 5,92 | 5,33 | 6,40 | 5,76 | |
| | | 3,5 | – | 6,16 | 7,99 | 10,07 | 9,07 | 8,16 | 8,00 | 7,20 | 6,48 | 5,83 | |
| | | 4,2 | – | 7,63 | 9,91 | 11,04 | 9,94 | 8,95 | 8,05 | 7,25 | 6,52 | 5,87 | |
| | 5,5 | – | 7,71 | 9,96 | 11,06 | 9,96 | 8,96 | 8,06 | 7,26 | 6,53 | 5,88 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 5,34 | 4,81 |
| | | 1,4 | – | – | – | – | – | 7,13 | 6,41 | 5,77 | 6,94 | 6,24 | |
| | | 2,1 | – | – | 9,06 | 11,42 | 10,28 | 9,25 | 8,33 | 7,50 | 9,01 | 8,11 | |
| | | 3,5 | – | 8,63 | 11,24 | 14,17 | 12,75 | 11,48 | 11,25 | 10,13 | 9,11 | 8,20 | |
| | | 4,2 | – | 10,69 | 13,95 | 15,54 | 13,98 | 12,58 | 11,33 | 10,19 | 9,17 | 8,26 | |
| | 5,5 | – | 10,80 | 14,02 | 15,56 | 14,01 | 12,60 | 11,34 | 10,21 | 9,19 | 8,27 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 5,42 | 4,88 |
| | | 1,4 | – | – | – | – | – | 7,24 | 6,51 | 5,86 | 7,04 | 6,34 | |
| | | 2,1 | – | – | 9,20 | 11,60 | 10,44 | 9,40 | 8,46 | 7,61 | 9,15 | 8,23 | |
| 3,5 | | – | 8,80 | 11,41 | 14,39 | 12,95 | 11,66 | 11,43 | 10,28 | 9,26 | 8,33 | | |
| 4,2 | | – | 10,90 | 14,16 | 15,78 | 14,20 | 12,78 | 11,50 | 10,35 | 9,32 | 8,39 | | |
| 5,5 | – | 11,01 | 14,23 | 15,80 | 14,22 | 12,80 | 11,52 | 10,37 | 9,33 | 8,40 | | | |
| 3320/7S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 5,68 | 5,11 |
| | | 1,4 | – | – | – | – | – | 7,58 | 6,82 | 6,14 | 7,38 | 6,64 | |
| | | 2,1 | – | – | 9,70 | 12,15 | 10,94 | 9,84 | 8,86 | 7,97 | 9,58 | 8,62 | |
| | | 3,5 | – | 8,71 | 12,02 | 15,07 | 13,56 | 12,21 | 11,97 | 10,77 | 9,69 | 8,73 | |
| | | 4,2 | – | 10,79 | 14,92 | 16,52 | 14,87 | 13,39 | 12,05 | 10,84 | 9,76 | 8,78 | |
| | 5,5 | – | 10,90 | 15,00 | 16,55 | 14,90 | 13,41 | 12,07 | 10,86 | 9,77 | 8,80 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 7,99 | 7,19 |
| | | 1,4 | – | – | – | – | – | 10,65 | 9,59 | 8,63 | 10,37 | 9,33 | |
| | | 2,1 | – | – | 13,63 | 17,08 | 15,38 | 13,84 | 12,45 | 11,21 | 13,47 | 12,12 | |
| | | 3,5 | – | 12,17 | 16,90 | 21,19 | 19,07 | 17,16 | 16,83 | 15,15 | 13,63 | 12,27 | |
| | | 4,2 | – | 15,08 | 20,98 | 23,23 | 20,91 | 18,82 | 16,94 | 15,24 | 13,72 | 12,35 | |
| | 5,5 | – | 15,23 | 21,09 | 23,27 | 20,94 | 18,85 | 16,96 | 15,27 | 13,74 | 12,37 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 8,11 | 7,30 |
| | | 1,4 | – | – | – | – | – | 10,83 | 9,74 | 8,77 | 10,54 | 9,48 | |
| | | 2,1 | – | – | 13,85 | 17,36 | 15,62 | 14,06 | 12,65 | 11,39 | 13,69 | 12,32 | |
| 3,5 | | – | 12,44 | 17,18 | 21,53 | 19,38 | 17,44 | 17,10 | 15,39 | 13,85 | 12,46 | | |
| 4,2 | | – | 15,42 | 21,32 | 23,61 | 21,25 | 19,12 | 17,21 | 15,49 | 13,94 | 12,55 | | |
| 5,5 | – | 15,57 | 21,43 | 23,64 | 21,28 | 19,15 | 17,24 | 15,51 | 13,96 | 12,57 | | | |

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)

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

Evaporating temperature 40 °F (4,4 °C)

Discharge temperature 150 °F (65,6 °C)

(1) : This value is the valve pressure setting

Continued

TABLE 11A : Refrigerant Flow Capacity of cranked pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|----------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/9S 3320/M28S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | - | 9,02 | 8,12 |
| | | 1,4 | - | - | - | - | - | 12,03 | 10,83 | 9,75 | 11,71 | 10,54 | |
| | | 2,1 | - | - | 15,30 | 19,29 | 17,36 | 15,63 | 14,06 | 12,66 | 15,21 | 13,69 | |
| | | 3,5 | - | 14,63 | 18,97 | 23,93 | 21,54 | 19,38 | 19,00 | 17,10 | 15,39 | 13,85 | |
| | | 4,2 | - | 18,13 | 23,55 | 26,24 | 23,62 | 21,25 | 19,13 | 17,22 | 15,49 | 13,94 | |
| | 5,5 | - | 18,31 | 23,67 | 26,28 | 23,65 | 21,29 | 19,16 | 17,24 | 15,52 | 13,97 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 12,69 | 11,42 |
| | | 1,4 | - | - | - | - | - | 16,93 | 15,23 | 13,71 | 16,48 | 14,83 | |
| | | 2,1 | - | - | 21,53 | 27,14 | 24,43 | 21,98 | 19,79 | 17,81 | 21,40 | 19,26 | |
| | | 3,5 | - | 20,50 | 26,70 | 33,66 | 30,30 | 27,27 | 26,73 | 24,06 | 21,65 | 19,49 | |
| | | 4,2 | - | 25,41 | 33,14 | 36,91 | 33,22 | 29,90 | 26,91 | 24,22 | 21,80 | 19,62 | |
| | 5,5 | - | 25,66 | 33,32 | 36,97 | 33,27 | 29,95 | 26,95 | 24,26 | 21,83 | 19,65 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 12,88 | 11,60 |
| | | 1,4 | - | - | - | - | - | 17,19 | 15,47 | 13,92 | 16,73 | 15,06 | |
| | | 2,1 | - | - | 21,86 | 27,56 | 24,81 | 22,33 | 20,09 | 18,08 | 21,73 | 19,56 | |
| | | 3,5 | - | 20,90 | 27,10 | 34,19 | 30,77 | 27,69 | 27,15 | 24,43 | 21,99 | 19,79 | |
| | | 4,2 | - | 25,90 | 33,64 | 37,49 | 33,74 | 30,36 | 27,33 | 24,59 | 22,13 | 19,92 | |
| | 5,5 | - | 26,16 | 33,82 | 37,54 | 33,79 | 30,41 | 27,37 | 24,63 | 22,17 | 19,95 | | |
| 3320/11S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 13,49 | 12,14 | |
| | | 1,4 | - | - | - | - | - | 18,00 | 16,20 | 14,58 | 17,53 | 15,77 | |
| | | 2,1 | - | - | 23,04 | 28,87 | 25,98 | 23,38 | 21,04 | 18,94 | 22,76 | 20,48 | |
| | | 3,5 | - | 20,69 | 28,56 | 35,81 | 32,22 | 29,00 | 28,43 | 25,59 | 23,03 | 20,73 | |
| | | 4,2 | - | 25,64 | 35,46 | 39,26 | 35,33 | 31,80 | 28,62 | 25,76 | 23,18 | 20,86 | |
| | 5,5 | - | 25,89 | 35,64 | 39,32 | 35,39 | 31,85 | 28,66 | 25,80 | 23,22 | 20,90 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 18,97 | 17,08 |
| | | 1,4 | - | - | - | - | - | 25,31 | 22,78 | 20,50 | 24,64 | 22,18 | |
| | | 2,1 | - | - | 32,39 | 40,59 | 36,53 | 32,87 | 29,59 | 26,63 | 32,00 | 28,80 | |
| | | 3,5 | - | 28,91 | 40,15 | 50,34 | 45,31 | 40,78 | 39,98 | 35,98 | 32,38 | 29,14 | |
| | | 4,2 | - | 35,83 | 49,84 | 55,20 | 49,68 | 44,71 | 40,24 | 36,22 | 32,59 | 29,33 | |
| | 5,5 | - | 36,18 | 50,11 | 55,29 | 49,76 | 44,78 | 40,30 | 36,27 | 32,65 | 29,38 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 19,28 | 17,35 |
| | | 1,4 | - | - | - | - | - | 25,72 | 23,15 | 20,83 | 25,04 | 22,53 | |
| | | 2,1 | - | - | 32,91 | 41,24 | 37,11 | 33,40 | 30,06 | 27,06 | 32,51 | 29,26 | |
| | | 3,5 | - | 29,55 | 40,80 | 51,15 | 46,04 | 41,43 | 40,62 | 36,56 | 32,90 | 29,61 | |
| | | 4,2 | - | 36,63 | 50,65 | 56,08 | 50,48 | 45,43 | 40,89 | 36,80 | 33,12 | 29,81 | |
| | 5,5 | - | 36,99 | 50,92 | 56,17 | 50,56 | 45,50 | 40,95 | 36,85 | 33,17 | 29,85 | | |

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) : This value is the valve pressure setting

TABLE 11B : 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 12A : Refrigerant Flow Capacity of crankcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|--------------------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/4 3320/4S 3320/M12S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | - | 3,06 | 2,76 |
| | | 1,4 | - | - | - | - | - | 3,62 | 3,26 | 2,93 | 3,98 | 3,58 | |
| | | 2,1 | - | - | - | 5,81 | 5,23 | 4,70 | 4,23 | 3,81 | 5,17 | 4,65 | |
| | | 3,5 | - | 3,65 | 5,72 | 7,20 | 6,48 | 5,83 | 6,45 | 5,81 | 5,23 | 4,70 | |
| | | 4,2 | - | 4,53 | 7,11 | 7,90 | 7,11 | 6,40 | 5,76 | 5,18 | 4,67 | 4,20 | |
| | 5,5 | - | 5,63 | 7,14 | 7,92 | 7,13 | 6,42 | 5,77 | 5,20 | 4,68 | 4,21 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 4,38 | 3,94 |
| | | 1,4 | - | - | - | - | - | 5,17 | 4,66 | 4,19 | 5,68 | 5,11 | |
| | | 2,1 | - | - | - | 8,29 | 7,46 | 6,72 | 6,05 | 5,44 | 7,38 | 6,64 | |
| | | 3,5 | - | 5,21 | 8,17 | 10,29 | 9,26 | 8,33 | 9,22 | 8,30 | 7,47 | 6,72 | |
| | | 4,2 | - | 6,47 | 10,15 | 11,29 | 10,16 | 9,14 | 8,23 | 7,41 | 6,67 | 6,00 | |
| | 5,5 | - | 8,04 | 10,20 | 11,32 | 10,18 | 9,17 | 8,25 | 7,42 | 6,68 | 6,01 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 4,40 | 3,96 |
| | | 1,4 | - | - | - | - | - | 5,20 | 4,68 | 4,21 | 5,72 | 5,14 | |
| | | 2,1 | - | - | - | 8,34 | 7,51 | 6,76 | 6,08 | 5,47 | 7,42 | 6,68 | |
| 3,5 | | - | 5,16 | 8,12 | 10,35 | 9,32 | 8,38 | 9,27 | 8,35 | 7,51 | 6,76 | | |
| 4,2 | | - | 6,42 | 10,09 | 11,35 | 10,22 | 9,20 | 8,28 | 7,45 | 6,70 | 6,03 | | |
| 5,5 | - | 7,97 | 10,14 | 11,38 | 10,24 | 9,22 | 8,30 | 7,47 | 6,72 | 6,05 | | | |
| 3320/5 3320/5S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 3,80 | 3,42 | |
| | | 1,4 | - | - | - | - | - | 4,49 | 4,04 | 3,63 | 4,93 | 4,44 | |
| | | 2,1 | - | - | - | 7,19 | 6,47 | 5,83 | 5,24 | 4,72 | 6,40 | 5,76 | |
| | | 3,5 | - | 4,39 | 7,05 | 8,93 | 8,03 | 7,23 | 8,00 | 7,20 | 6,48 | 5,83 | |
| | | 4,2 | - | 5,45 | 8,76 | 9,79 | 8,81 | 7,93 | 7,14 | 6,42 | 5,78 | 5,20 | |
| | 5,5 | - | 6,77 | 8,80 | 9,82 | 8,83 | 7,95 | 7,16 | 6,44 | 5,80 | 5,22 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 5,32 | 4,79 |
| | | 1,4 | - | - | - | - | - | 6,29 | 5,66 | 5,10 | 6,91 | 6,22 | |
| | | 2,1 | - | - | - | 10,09 | 9,08 | 8,17 | 7,36 | 6,62 | 8,98 | 8,08 | |
| | | 3,5 | - | 6,10 | 9,87 | 12,52 | 11,27 | 10,14 | 11,22 | 10,10 | 9,09 | 8,18 | |
| | | 4,2 | - | 7,58 | 12,26 | 13,73 | 12,36 | 11,12 | 10,01 | 9,01 | 8,11 | 7,30 | |
| | 5,5 | - | 9,42 | 12,32 | 13,77 | 12,39 | 11,15 | 10,04 | 9,03 | 8,13 | 7,32 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 5,42 | 4,88 |
| | | 1,4 | - | - | - | - | - | 6,41 | 5,77 | 5,19 | 7,04 | 6,34 | |
| | | 2,1 | - | - | - | 10,28 | 9,25 | 8,32 | 7,49 | 6,74 | 9,14 | 8,23 | |
| 3,5 | | - | 6,27 | 10,07 | 12,75 | 11,48 | 10,33 | 11,42 | 10,28 | 9,25 | 8,33 | | |
| 4,2 | | - | 7,78 | 12,51 | 13,99 | 12,59 | 11,33 | 10,20 | 9,18 | 8,26 | 7,43 | | |
| 5,5 | - | 9,67 | 12,58 | 14,02 | 12,62 | 11,36 | 10,22 | 9,20 | 8,28 | 7,45 | | | |
| 3320/7S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 5,68 | 5,11 | |
| | | 1,4 | - | - | - | - | - | 6,71 | 6,04 | 5,44 | 7,38 | 6,64 | |
| | | 2,1 | - | - | - | 10,76 | 9,69 | 8,72 | 7,85 | 7,06 | 9,58 | 8,62 | |
| | | 3,5 | - | 6,71 | 10,66 | 13,36 | 12,02 | 10,82 | 11,97 | 10,77 | 9,69 | 8,72 | |
| | | 4,2 | - | 8,33 | 13,24 | 14,65 | 13,19 | 11,87 | 10,68 | 9,61 | 8,65 | 7,79 | |
| | 5,5 | - | 10,35 | 13,31 | 14,69 | 13,22 | 11,90 | 10,71 | 9,64 | 8,67 | 7,81 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 7,96 | 7,16 |
| | | 1,4 | - | - | - | - | - | 9,41 | 8,47 | 7,62 | 10,34 | 9,30 | |
| | | 2,1 | - | - | - | 15,09 | 13,58 | 12,22 | 11,00 | 9,90 | 13,43 | 12,08 | |
| | | 3,5 | - | 9,35 | 14,92 | 18,72 | 16,85 | 15,16 | 16,77 | 15,10 | 13,59 | 12,23 | |
| | | 4,2 | - | 11,62 | 18,54 | 20,54 | 18,48 | 16,63 | 14,97 | 13,47 | 12,13 | 10,91 | |
| | 5,5 | - | 14,43 | 18,64 | 20,59 | 18,53 | 16,68 | 15,01 | 13,51 | 12,16 | 10,94 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 8,11 | 7,30 |
| | | 1,4 | - | - | - | - | - | 9,59 | 8,63 | 7,77 | 10,54 | 9,48 | |
| | | 2,1 | - | - | - | 15,38 | 13,84 | 12,46 | 11,21 | 10,09 | 13,68 | 12,32 | |
| 3,5 | | - | 9,58 | 15,23 | 19,08 | 17,17 | 15,45 | 17,10 | 15,39 | 13,85 | 12,46 | | |
| 4,2 | | - | 11,91 | 18,92 | 20,93 | 18,84 | 16,95 | 15,26 | 13,73 | 12,36 | 11,12 | | |
| 5,5 | - | 14,79 | 19,02 | 20,98 | 18,88 | 17,00 | 15,30 | 13,77 | 12,39 | 11,15 | | | |

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)

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

Evaporating temperature 40 °F (4,4 °C)

Discharge temperature 150 °F (65,6 °C)

(1) : This value is the valve pressure setting

Continued

TABLE 12A : Refrigerant Flow Capacity of crandcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|----------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/9S 3320/M28S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | - | 9,02 | 8,11 |
| | | 1,4 | - | - | - | - | - | 10,66 | 9,59 | 8,63 | 11,71 | 10,54 | |
| | | 2,1 | - | - | - | 17,09 | 15,38 | 13,84 | 12,46 | 11,21 | 15,21 | 13,69 | |
| | | 3,5 | - | 10,42 | 16,75 | 21,20 | 19,08 | 17,17 | 19,00 | 17,10 | 15,39 | 13,85 | |
| | | 4,2 | - | 12,95 | 20,80 | 23,26 | 20,93 | 18,84 | 16,96 | 15,26 | 13,74 | 12,36 | |
| | 5,5 | - | 16,08 | 20,91 | 23,32 | 20,99 | 18,89 | 17,00 | 15,30 | 13,77 | 12,39 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 12,65 | 11,38 |
| | | 1,4 | - | - | - | - | - | 14,95 | 13,46 | 12,11 | 16,43 | 14,78 | |
| | | 2,1 | - | - | - | 23,97 | 21,58 | 19,42 | 17,48 | 15,73 | 21,33 | 19,20 | |
| | | 3,5 | - | 14,50 | 23,45 | 29,74 | 26,77 | 24,09 | 26,65 | 23,99 | 21,59 | 19,43 | |
| | | 4,2 | - | 18,02 | 29,13 | 32,63 | 29,37 | 26,43 | 23,79 | 21,41 | 19,27 | 17,34 | |
| | 5,5 | - | 22,38 | 29,28 | 32,71 | 29,44 | 26,50 | 23,85 | 21,46 | 19,32 | 17,38 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 12,88 | 11,59 |
| | | 1,4 | - | - | - | - | - | 15,23 | 13,70 | 12,33 | 16,73 | 15,06 | |
| | | 2,1 | - | - | - | 24,41 | 21,97 | 19,78 | 17,80 | 16,02 | 21,72 | 19,55 | |
| | | 3,5 | - | 14,89 | 23,93 | 30,29 | 27,26 | 24,54 | 27,14 | 24,43 | 21,98 | 19,79 | |
| | | 4,2 | - | 18,49 | 29,72 | 33,23 | 29,91 | 26,92 | 24,22 | 21,80 | 19,62 | 17,66 | |
| | 5,5 | - | 22,97 | 29,88 | 33,31 | 29,98 | 26,98 | 24,28 | 21,86 | 19,67 | 17,70 | | |
| 3320/11S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 13,49 | 12,14 | |
| | | 1,4 | - | - | - | - | - | 15,95 | 14,36 | 12,92 | 17,52 | 15,77 | |
| | | 2,1 | - | - | - | 25,57 | 23,02 | 20,72 | 18,64 | 16,78 | 22,76 | 20,48 | |
| | | 3,5 | - | 15,94 | 25,33 | 31,73 | 28,56 | 25,70 | 28,43 | 25,59 | 23,03 | 20,73 | |
| | | 4,2 | - | 19,80 | 31,46 | 34,81 | 31,33 | 28,19 | 25,38 | 22,84 | 20,55 | 18,50 | |
| | 5,5 | - | 24,60 | 31,63 | 34,90 | 31,41 | 28,27 | 25,44 | 22,89 | 20,61 | 18,54 | | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 18,91 | 17,02 |
| | | 1,4 | - | - | - | - | - | 22,36 | 20,12 | 18,11 | 24,56 | 22,10 | |
| | | 2,1 | - | - | - | 35,85 | 32,26 | 29,04 | 26,13 | 23,52 | 31,90 | 28,71 | |
| | | 3,5 | - | 22,22 | 35,46 | 44,47 | 40,03 | 36,02 | 39,85 | 35,86 | 32,28 | 29,05 | |
| | | 4,2 | - | 27,60 | 44,05 | 48,79 | 43,91 | 39,52 | 35,57 | 32,01 | 28,81 | 25,93 | |
| | 5,5 | - | 34,28 | 44,28 | 48,91 | 44,02 | 39,62 | 35,66 | 32,09 | 28,88 | 25,99 | | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 19,28 | 17,35 |
| | | 1,4 | - | - | - | - | - | 22,79 | 20,51 | 18,46 | 25,03 | 22,53 | |
| | | 2,1 | - | - | - | 36,54 | 32,88 | 29,59 | 26,63 | 23,97 | 32,51 | 29,26 | |
| | | 3,5 | - | 22,77 | 36,18 | 45,33 | 40,80 | 36,72 | 40,62 | 36,55 | 32,90 | 29,61 | |
| | | 4,2 | - | 28,29 | 44,95 | 49,73 | 44,75 | 40,28 | 36,25 | 32,63 | 29,36 | 26,43 | |
| | 5,5 | - | 35,14 | 45,18 | 49,85 | 44,87 | 40,38 | 36,34 | 32,71 | 29,44 | 26,49 | | |

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) : This value is the valve pressure setting

TABLE 12B : 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 13A : Refrigerant Flow Capacity of crankcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|--------------------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/4 3320/4S 3320/M12S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 3,06 | 2,76 |
| | | 1,4 | – | – | – | – | – | 4,18 | 3,77 | 3,39 | 3,98 | 3,58 | |
| | | 2,1 | – | – | 5,20 | 6,71 | 6,04 | 5,43 | 4,89 | 4,40 | 5,17 | 4,65 | |
| | | 3,5 | – | 4,71 | 6,45 | 8,32 | 7,49 | 6,74 | 6,45 | 5,81 | 5,23 | 4,70 | |
| | | 4,2 | 5,22 | 5,85 | 8,01 | 9,13 | 8,22 | 7,40 | 6,66 | 5,99 | 5,39 | 4,85 | |
| | 5,5 | 6,49 | 7,27 | 8,05 | 9,15 | 8,24 | 7,41 | 6,67 | 6,01 | 5,40 | 4,86 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 4,38 | 3,94 |
| | | 1,4 | – | – | – | – | – | 5,98 | 5,38 | 4,84 | 5,68 | 5,11 | |
| | | 2,1 | – | – | 7,42 | 9,58 | 8,63 | 7,76 | 6,99 | 6,29 | 7,38 | 6,64 | |
| | | 3,5 | – | 6,73 | 9,21 | 11,89 | 10,70 | 9,63 | 9,22 | 8,30 | 7,47 | 6,72 | |
| | | 4,2 | 7,46 | 8,36 | 11,44 | 13,04 | 11,74 | 10,57 | 9,51 | 8,56 | 7,70 | 6,93 | |
| | 5,5 | 9,27 | 10,38 | 11,50 | 13,08 | 11,77 | 10,59 | 9,53 | 8,58 | 7,72 | 6,95 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 4,41 | 3,96 |
| | | 1,4 | – | – | – | – | – | 6,02 | 5,42 | 4,87 | 5,72 | 5,15 | |
| | | 2,1 | – | – | 7,34 | 9,65 | 8,68 | 7,81 | 7,03 | 6,33 | 7,43 | 6,69 | |
| 3,5 | | – | 6,65 | 9,11 | 11,97 | 10,77 | 9,70 | 9,28 | 8,35 | 7,52 | 6,77 | | |
| 4,2 | | 7,37 | 8,26 | 11,32 | 13,13 | 11,82 | 10,64 | 9,57 | 8,62 | 7,75 | 6,98 | | |
| 5,5 | 9,15 | 10,26 | 11,38 | 13,16 | 11,85 | 10,66 | 9,60 | 8,64 | 7,77 | 7,00 | | | |
| 3320/5 3320/5S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 3,80 | 3,42 |
| | | 1,4 | – | – | – | – | – | 5,19 | 4,67 | 4,20 | 4,93 | 4,44 | |
| | | 2,1 | – | – | 6,62 | 8,32 | 7,48 | 6,74 | 6,06 | 5,46 | 6,40 | 5,76 | |
| | | 3,5 | – | 5,85 | 8,22 | 10,32 | 9,29 | 8,36 | 8,00 | 7,20 | 6,48 | 5,83 | |
| | | 4,2 | 6,27 | 7,27 | 10,21 | 11,32 | 10,19 | 9,17 | 8,25 | 7,43 | 6,68 | 6,02 | |
| | 5,5 | 7,79 | 9,03 | 10,26 | 11,35 | 10,21 | 9,19 | 8,27 | 7,44 | 6,70 | 6,03 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 5,33 | 4,80 |
| | | 1,4 | – | – | – | – | – | 7,28 | 6,56 | 5,90 | 6,93 | 6,23 | |
| | | 2,1 | – | – | 9,30 | 11,68 | 10,51 | 9,46 | 8,51 | 7,66 | 8,99 | 8,09 | |
| | | 3,5 | – | 8,19 | 11,54 | 14,49 | 13,04 | 11,74 | 11,24 | 10,11 | 9,10 | 8,19 | |
| | | 4,2 | 8,76 | 10,18 | 14,33 | 15,90 | 14,31 | 12,88 | 11,59 | 10,43 | 9,39 | 8,45 | |
| | 5,5 | 10,88 | 12,64 | 14,40 | 15,94 | 14,34 | 12,91 | 11,62 | 10,46 | 9,41 | 8,47 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 5,42 | 4,88 |
| | | 1,4 | – | – | – | – | – | 7,41 | 6,67 | 6,00 | 7,04 | 6,34 | |
| | | 2,1 | – | – | 9,46 | 11,88 | 10,69 | 9,62 | 8,66 | 7,79 | 9,15 | 8,23 | |
| 3,5 | | – | 8,35 | 11,74 | 14,74 | 13,27 | 11,94 | 11,43 | 10,29 | 9,26 | 8,33 | | |
| 4,2 | | 8,96 | 10,38 | 14,58 | 16,17 | 14,55 | 13,10 | 11,79 | 10,61 | 9,55 | 8,59 | | |
| 5,5 | 11,13 | 12,89 | 14,66 | 16,21 | 14,59 | 13,13 | 11,82 | 10,64 | 9,57 | 8,61 | | | |
| 3320/7S | 0,07 | 0,7 | – | – | – | – | – | – | – | – | – | 5,68 | 5,11 |
| | | 1,4 | – | – | – | – | – | 7,76 | 6,98 | 6,28 | 7,38 | 6,64 | |
| | | 2,1 | – | – | 9,94 | 12,44 | 11,20 | 10,08 | 9,07 | 8,16 | 9,58 | 8,62 | |
| | | 3,5 | – | 8,86 | 12,33 | 15,44 | 13,89 | 12,50 | 11,97 | 10,77 | 9,69 | 8,73 | |
| | | 4,2 | 9,61 | 11,00 | 15,32 | 16,93 | 15,24 | 13,72 | 12,34 | 11,11 | 10,00 | 9,00 | |
| | 5,5 | 11,94 | 13,67 | 15,40 | 16,97 | 15,28 | 13,75 | 12,37 | 11,14 | 10,02 | 9,02 | | |
| | 0,14 | 0,7 | – | – | – | – | – | – | – | – | – | 7,97 | 7,17 |
| | | 1,4 | – | – | – | – | – | 10,89 | 9,80 | 8,82 | 10,35 | 9,32 | |
| | | 2,1 | – | – | 14,09 | 17,46 | 15,71 | 14,14 | 12,73 | 11,45 | 13,44 | 12,10 | |
| | | 3,5 | – | 12,54 | 17,48 | 21,66 | 19,49 | 17,54 | 16,80 | 15,12 | 13,60 | 12,24 | |
| | | 4,2 | 13,59 | 15,58 | 21,71 | 23,76 | 21,38 | 19,25 | 17,32 | 15,59 | 14,03 | 12,63 | |
| | 5,5 | 16,88 | 19,35 | 21,82 | 23,82 | 21,44 | 19,29 | 17,37 | 15,63 | 14,07 | 12,66 | | |
| | 0,21 | 0,7 | – | – | – | – | – | – | – | – | – | 8,11 | 7,30 |
| | | 1,4 | – | – | – | – | – | 11,08 | 9,98 | 8,98 | 10,54 | 9,48 | |
| | | 2,1 | – | – | 14,20 | 17,77 | 16,00 | 14,40 | 12,96 | 11,66 | 13,69 | 12,32 | |
| 3,5 | | – | 12,65 | 17,61 | 22,05 | 19,85 | 17,86 | 17,10 | 15,39 | 13,85 | 12,46 | | |
| 4,2 | | 13,73 | 15,72 | 21,88 | 24,19 | 21,77 | 19,59 | 17,63 | 15,87 | 14,28 | 12,85 | | |
| 5,5 | 17,05 | 19,52 | 21,99 | 24,25 | 21,82 | 19,64 | 17,68 | 15,91 | 14,32 | 12,89 | | | |

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)

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

Evaporating temperature 40 °F (4,4 °C)

Discharge temperature 150 °F (65,6 °C)

(1) : This value is the valve pressure setting

Continued

TABLE 13A : Refrigerant Flow Capacity of crandcase pressure regulators 3320 [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Max allowable suction pressure [bar] (1) | Design evaporator temperature [°C] | | | | | | | | | | |
|----------------------|--------------------------------------|--|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 4,4 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | |
| 3320/9S 3320/M28S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | - | 9,02 | 8,12 |
| | | 1,4 | - | - | - | - | - | 12,32 | 11,09 | 9,98 | 11,72 | 10,54 | |
| | | 2,1 | - | - | 15,73 | 19,76 | 17,78 | 16,00 | 14,40 | 12,96 | 15,22 | 13,69 | |
| | | 3,5 | - | 13,89 | 19,52 | 24,51 | 22,06 | 19,86 | 19,01 | 17,11 | 15,40 | 13,86 | |
| | | 4,2 | 14,90 | 17,26 | 24,25 | 26,89 | 24,20 | 21,78 | 19,60 | 17,64 | 15,88 | 14,29 | |
| | | 5,5 | 18,51 | 21,44 | 24,37 | 26,96 | 24,26 | 21,84 | 19,65 | 17,69 | 15,92 | 14,33 | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 12,67 | 11,40 |
| | | 1,4 | - | - | - | - | - | 17,31 | 15,57 | 14,02 | 16,45 | 14,81 | |
| | | 2,1 | - | - | 22,09 | 27,75 | 24,97 | 22,47 | 20,23 | 18,20 | 21,37 | 19,23 | |
| | | 3,5 | - | 19,46 | 27,41 | 34,42 | 30,98 | 27,88 | 26,69 | 24,02 | 21,62 | 19,46 | |
| | | 4,2 | 20,81 | 24,18 | 34,04 | 37,76 | 33,99 | 30,59 | 27,53 | 24,78 | 22,30 | 20,07 | |
| | | 5,5 | 25,85 | 30,03 | 34,22 | 37,86 | 34,07 | 30,67 | 27,60 | 24,84 | 22,35 | 20,12 | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 12,89 | 11,60 |
| | | 1,4 | - | - | - | - | - | 17,60 | 15,84 | 14,26 | 16,74 | 15,06 | |
| | | 2,1 | - | - | 22,47 | 28,23 | 25,40 | 22,86 | 20,58 | 18,52 | 21,74 | 19,56 | |
| | | 3,5 | - | 19,85 | 27,88 | 35,02 | 31,52 | 28,37 | 27,15 | 24,44 | 22,00 | 19,80 | |
| | | 4,2 | 21,29 | 24,66 | 34,64 | 38,42 | 34,57 | 31,12 | 28,00 | 25,20 | 22,68 | 20,42 | |
| | | 5,5 | 26,44 | 30,63 | 34,82 | 38,51 | 34,66 | 31,19 | 28,07 | 25,27 | 22,74 | 20,47 | |
| 3320/11S | 0,07 | 0,7 | - | - | - | - | - | - | - | - | 13,49 | 12,15 | |
| | | 1,4 | - | - | - | - | - | 18,43 | 16,59 | 14,93 | 17,53 | 15,77 | |
| | | 2,1 | - | - | 23,61 | 29,56 | 26,60 | 23,94 | 21,55 | 19,39 | 22,76 | 20,48 | |
| | | 3,5 | - | 21,04 | 29,29 | 36,67 | 33,00 | 29,70 | 28,44 | 25,59 | 23,03 | 20,73 | |
| | | 4,2 | 22,83 | 26,13 | 36,39 | 40,23 | 36,20 | 32,58 | 29,33 | 26,39 | 23,75 | 21,38 | |
| | | 5,5 | 28,35 | 32,47 | 36,58 | 40,33 | 36,29 | 32,67 | 29,40 | 26,46 | 23,81 | 21,43 | |
| | 0,14 | 0,7 | - | - | - | - | - | - | - | - | - | 18,94 | 17,04 |
| | | 1,4 | - | - | - | - | - | 25,87 | 23,28 | 20,95 | 24,59 | 22,13 | |
| | | 2,1 | - | - | 33,47 | 41,48 | 37,33 | 33,60 | 30,24 | 27,21 | 31,94 | 28,75 | |
| | | 3,5 | - | 29,79 | 41,52 | 51,46 | 46,31 | 41,68 | 39,90 | 35,91 | 32,32 | 29,09 | |
| | | 4,2 | 32,28 | 37,01 | 51,58 | 56,45 | 50,81 | 45,72 | 41,15 | 37,04 | 33,33 | 30,00 | |
| | | 5,5 | 40,10 | 45,97 | 51,85 | 56,59 | 50,93 | 45,84 | 41,26 | 37,13 | 33,42 | 30,08 | |
| | 0,21 | 0,7 | - | - | - | - | - | - | - | - | - | 19,28 | 17,35 |
| | | 1,4 | - | - | - | - | - | 26,33 | 23,70 | 21,33 | 25,04 | 22,53 | |
| | | 2,1 | - | - | 33,73 | 42,22 | 38,00 | 34,20 | 30,78 | 27,70 | 32,52 | 29,26 | |
| | | 3,5 | - | 30,05 | 41,85 | 52,39 | 47,15 | 42,43 | 40,62 | 36,56 | 32,90 | 29,61 | |
| | | 4,2 | 32,61 | 37,34 | 51,98 | 57,47 | 51,72 | 46,55 | 41,89 | 37,70 | 33,93 | 30,54 | |
| | | 5,5 | 40,51 | 46,38 | 52,25 | 57,61 | 51,85 | 46,66 | 42,00 | 37,80 | 34,02 | 30,62 | |

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) : This value is the valve pressure setting

TABLE 13B : 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 |

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

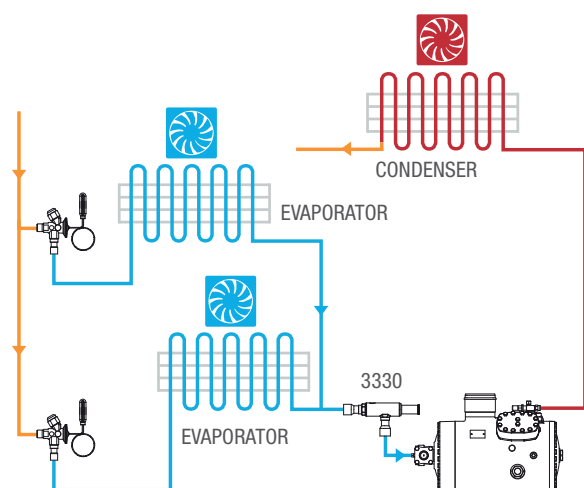
To correctly select evaporating pressure regulators, all information on the system where it will be installed must be available. Selection is based on the following data:

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:

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



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.

where:

- Q_{evap} = Evaporator capacity [kW]
- $K_{T \text{ liquid}}$ = Correction factor for $T_{\text{liquid}} \neq 36.7 \text{ } ^\circ\text{C}$.
(See Tables 16B, 17B, 18B, 19B and 20B.)
- $K_{\Delta P \text{ evap}}$ = Correction factor for $\Delta P_{\text{valve}} \neq 0.56 \text{ bar}$.
(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 $T_{\text{Liquid}} = 40 \text{ } ^\circ\text{C}$.

$$K_{T \text{ liquid}} = 0.95$$

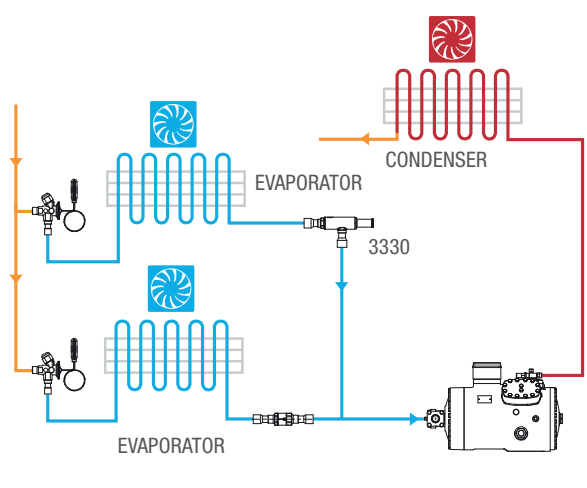
2. Using Table 18C, determine the correction factor for the variation in the evaporating pressure.

$$\Delta P = P_{T \text{ progetto}} - P_{T \text{ min asp}} = 5 - 4.2 = 0.8 \text{ bar}$$

$$K_{\Delta P \text{ evap}} = 1.3$$

3. Calculate the refrigerating capacity requested at regulator.

$$Q_{\text{valve}} = \frac{Q_{\text{evap}}}{K_{T \text{ liquid}} \times K_{\Delta P \text{ evap}}} = \frac{4}{0.95 \times 1.3} = 3.23 \text{ kW}$$



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

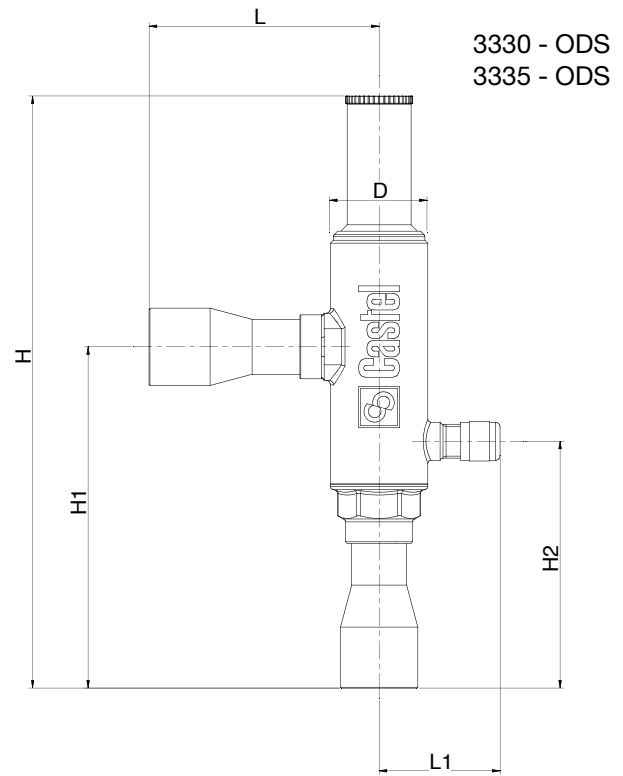
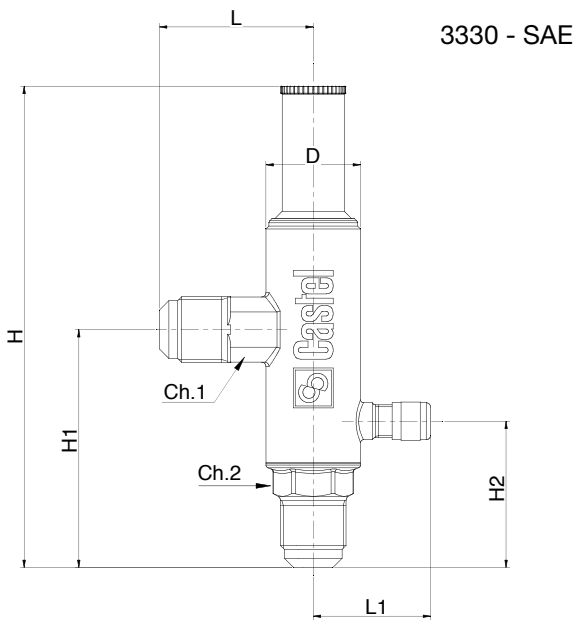
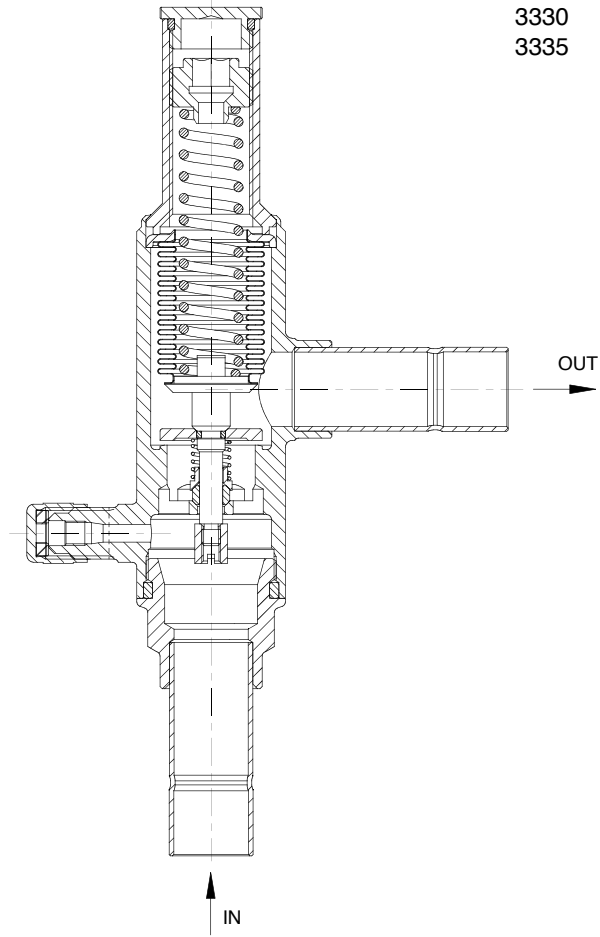


TABLE 14: General characteristics of evaporator pressure regulators

| 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) | 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) | | |

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 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 |

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 | – |
| 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) | 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) | | |

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 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 | – |
| 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 | – |
| 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) | 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) | | |

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 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 |

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 | – | – |
| 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 | – | – |
| 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) | 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) | | | |

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 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) | 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) | | | |

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 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 |

CHAPTER 4

EVAPORATING PRESSURE REGULATORS

FOR REFRIGERATION PLANTS THAT USE THE R744 REFRIGERANT



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 valve prevents too low evaporating pressure and therefore protects against freezing in water chiller or against coil icing in air evaporators. These regulators allow multiple evaporators to operate at different temperatures in a system with only one compressor.

The evaporating pressure regulators illustrated in this chapter have been developed by Castel for all applications that use subcritical 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.

CAUTION!: the evaporating pressure regulators in this chapter cannot be used with other refrigerant fluids.

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 3335EL is 12 bar. This means that until the condensation (discharge) pressure is below 12 bar, the regulator remains closed. When it rises above 12 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 2.5 bar in calibration pressure. The calibration range varies from 12 to 36 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
- Ethylene propylene rubber (EPDM) for outlet seal gaskets

INSTALLATION

Evaporating pressure regulators in series 3335EL 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. 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.

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 = R744

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 in Table 23A are based on:

- A liquid reference temperature of -6.7 °C.
 - An allowable variation in evaporating pressure of 1.12 bar.
- With liquid temperatures other than -6.7 °C and for variations in evaporating pressure other than 1.12 bar, the required cooling capacity of regulator is:

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

where:

Q_{evap} = Evaporator capacity [kW]

$K_{T \text{ liquid}}$ = Correction factor for $T_{\text{liquid}} \neq -6.7 \text{ °C}$.

$K_{\Delta P \text{ evap}}$ = Correction factor for $\Delta P_{\text{valve}} \neq 1.12 \text{ bar}$.

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

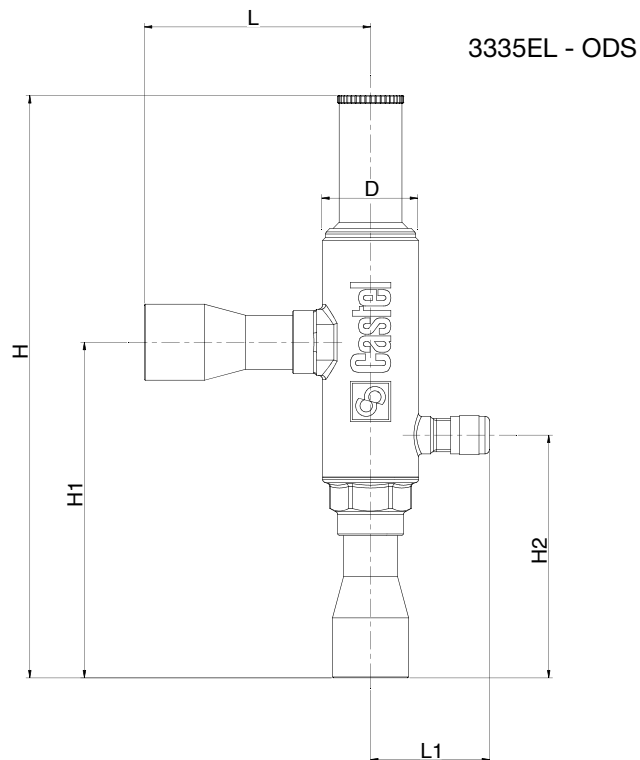


TABLE 21: General characteristics of evaporator pressure regulators for R744

| 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] | | | | | | | | | | |
| 3335EL/M12S | – | – | 12 | 2,7 | 12 | 36 | 12 | 45 | -40 | +120 | -40 | +50 | Art. 4.3 |
| 3335EL/4S | – | 1/2" | – | | | | | | | | | | |
| 3335EL/5S | – | 5/8" | 16 | | | | | | | | | | |
| 3335EL/7S | – | 7/8" | 22 | | | | | | | | | | |

TABLE 22. Dimensions and weights of evaporator pressure regulators for R744

| Catalogue Number | Dimensions [mm] | | | | | | | | Weight [g] |
|------------------|-----------------|----------------|----------------|------|----------------|----|-----|-----|------------|
| | H | H ₁ | H ₂ | L | L ₁ | D | Ch1 | Ch2 | |
| 3335EL/M12S | 183 | 100,5 | 69,5 | 64 | 37 | 32 | - | - | 510 |
| 3335EL/4S | 183 | 100,5 | 69,5 | 64 | | | | | 480 |
| 3335EL/5S | 183 | 100,5 | 69,5 | 64 | | | | | 500 |
| 3335EL/7S | 194 | 112 | 81 | 75,5 | | | | | 560 |

TABLE 23A : Refrigerant Flow Capacity of evaporator pressure regulators 3335EL [kW]

| Catalogue Number | Pressure drop across regulator [bar] | Design evaporator temperature [°C] | | | | | | | | | |
|----------------------|--------------------------------------|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 |
| 3335/4S 3335/M12S | 0,07 | 3,85 | 3,50 | 3,14 | 2,79 | 2,46 | 2,12 | 1,94 | 1,76 | 1,58 | 1,40 |
| | 0,14 | 7,81 | 7,06 | 6,30 | 5,55 | 4,89 | 4,22 | 3,86 | 3,50 | 3,14 | 2,77 |
| | 0,21 | 12,80 | 11,52 | 10,24 | 8,97 | 7,81 | 6,65 | 6,00 | 5,36 | 4,72 | 4,08 |
| | 0,35 | 19,39 | 17,41 | 15,43 | 13,45 | 11,62 | 9,79 | 8,77 | 7,75 | 6,73 | 5,70 |
| | 0,42 | 26,64 | 23,70 | 20,75 | 17,80 | 15,12 | 12,43 | 10,97 | 9,51 | 8,05 | 6,59 |
| | 0,56 | 39,96 | 35,28 | 30,61 | 25,93 | 21,71 | 17,49 | 15,24 | 12,99 | 10,74 | 8,49 |
| | 0,81 | 49,24 | 43,34 | 37,44 | 31,53 | 26,23 | 20,93 | 18,13 | 15,32 | 12,52 | 9,71 |
| | 1,12 | 59,53 | 52,28 | 45,02 | 37,77 | 31,28 | 24,78 | 21,36 | 17,94 | 14,53 | 11,11 |
| 3335/5S | 0,07 | 4,84 | 4,40 | 3,96 | 3,51 | 3,07 | 2,63 | 2,45 | 2,27 | 2,09 | 1,91 |
| | 0,14 | 9,90 | 8,98 | 8,06 | 7,14 | 6,25 | 5,36 | 4,99 | 4,61 | 4,24 | 3,86 |
| | 0,21 | 14,93 | 13,54 | 12,15 | 10,76 | 9,39 | 8,03 | 7,46 | 6,90 | 6,33 | 5,76 |
| | 0,35 | 20,80 | 18,86 | 16,92 | 14,98 | 13,06 | 11,14 | 10,35 | 9,55 | 8,76 | 7,97 |
| | 0,42 | 27,64 | 25,03 | 22,42 | 19,81 | 17,22 | 14,63 | 13,56 | 12,49 | 11,42 | 10,35 |
| | 0,56 | 37,34 | 33,78 | 30,22 | 26,66 | 23,13 | 19,59 | 18,13 | 16,67 | 15,20 | 13,74 |
| | 0,81 | 43,70 | 39,53 | 35,35 | 31,18 | 27,04 | 22,89 | 21,18 | 19,46 | 17,75 | 16,03 |
| | 1,12 | 51,10 | 46,22 | 41,33 | 36,44 | 31,57 | 26,71 | 24,70 | 22,69 | 20,67 | 18,66 |
| 3335/7S | 0,07 | 5,37 | 4,87 | 4,38 | 3,89 | 3,42 | 2,96 | 2,71 | 2,46 | 2,20 | 1,95 |
| | 0,14 | 11,12 | 10,05 | 8,97 | 7,90 | 6,96 | 6,01 | 5,50 | 4,98 | 4,47 | 3,95 |
| | 0,21 | 18,17 | 16,35 | 14,54 | 12,73 | 11,08 | 9,43 | 8,52 | 7,61 | 6,70 | 5,79 |
| | 0,35 | 27,29 | 24,50 | 21,72 | 18,93 | 16,36 | 13,78 | 12,34 | 10,91 | 9,47 | 8,03 |
| | 0,42 | 36,74 | 32,67 | 28,61 | 24,55 | 20,84 | 17,14 | 15,13 | 13,12 | 11,11 | 9,09 |
| | 0,56 | 55,11 | 48,66 | 42,20 | 35,75 | 29,93 | 24,12 | 21,01 | 17,91 | 14,81 | 11,71 |
| | 0,81 | 64,39 | 56,82 | 49,24 | 41,66 | 34,82 | 27,97 | 24,32 | 20,67 | 17,01 | 13,36 |
| | 1,12 | 76,42 | 67,32 | 58,23 | 49,13 | 40,92 | 32,71 | 28,34 | 23,98 | 19,61 | 15,24 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|------------------------|-------|--------|---------------------|------|-------|
| Condensing temperature | 30°F | -1,2°C | Suction temperature | -5°F | -15°C |
| Liquid temperature | 20°F | -6,7°C | Superheating | 15°R | 8,4°K |
| Subcooling | 10° R | 5,5°K | | | |

| | | | | | |
|-------------------------|-------|---------|-----------------------|------|--------|
| Evaporating temperature | -20°F | -28,9°C | Discharge temperature | 80°F | 26,6°C |
|-------------------------|-------|---------|-----------------------|------|--------|

Nominal evaporator pressure change ($T_{\text{design evap}} - T_{\text{min evap}}$) : 16 psi (1,12 bar)

TABLE 23B : Correction factor for liquid temperature different from nominal value

| Liquid temperature [°C] | | | | | | | | |
|-------------------------|------|-----|------|------|------|------|-----|------|
| -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 |
| 1,21 | 1,15 | 1,1 | 1,04 | 0,98 | 0,92 | 0,86 | 0,8 | 0,73 |

TABLE 23C : Correction factor for evaporator pressure change different from nominal value

| Evaporator pressure change [bar] | | | | | | | | |
|----------------------------------|------|------|------|------|------|------|------|------|
| 0,35 | 0,42 | 0,56 | 0,81 | 1,12 | 1,39 | 1,67 | 1,84 | 2,05 |
| 0,35 | 0,48 | 0,72 | 0,84 | 1 | 1,2 | 1,3 | 1,4 | 1,5 |

CHAPTER 5 ■

CONDENSING PRESSURE REGULATORS

FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS



APPLICATIONS

When designing air conditioning and refrigerating systems that use air cooled condensing units, subject to wide range of ambient temperatures, it is very important to provide accurate condenser capacity control. Since a properly sized condensing unit operates satisfactorily at high ambient temperature, capacity control is needed at low ambient temperatures. Good condensing pressure control during low ambient temperature avoids problems during system operation and facilitates start-up. Specifically, this control maintains a sufficient pressure differential across the thermostatic expansion valve ensuring correct refrigerant feed to the evaporator.

Condensing pressure regulators, together with the differential valves, are the solution to this control need. The regulators in series 3340 and 3345 restrict the liquid flow from the condenser to the receiver, reducing the active condenser surface and raising the condensing pressure. The differential valve 3136W by-passes hot gas from the compressor discharge to the receiver, raising the liquid pressure in the receiver.

All condensing 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 3345

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

Condensing pressure regulators adjust the flow of the liquid (hot gas) according to changes of condensation pressure (compressor discharge), upstream of the regulator. When the condensation pressure (discharge) is less than the regulator calibration pressure, the shutter remains closed. As the condensation pressure (discharge) rises above the regulator's calibration setting, the shutter begins to open and modulates in proportion to the variation in condensation pressure (discharge). As the condensing pressure (discharge) 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. Condensing 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 3340 is 8 bar. This means that until the condensation (discharge) pressure is below 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 2.3 bar in calibration pressure (1.5 bar for models 3340/9S, 3340/M28S, and 3340/11S). The calibration range varies from 3 to 20 bar.

The factory pressure settings for regulators in series 3345 is 12 bar. This means that until the condensation (discharge) pressure is below 12 bar, the regulator remains closed. When it rises above 12 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 2.5 bar in calibration pressure. The calibration range varies from 18 to 30 bar.

The differential valves adjust the flow of hot gas to the liquid receiver according to the differential pressure between

compressor discharge and liquid receiver The valves 3136W begin to open when the differential pressure reaches 1.4 bar and are fully open when differential pressure is 3 bar

CONSTRUCTION

The main parts of regulators in series 3340 and 3345 are manufactured 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

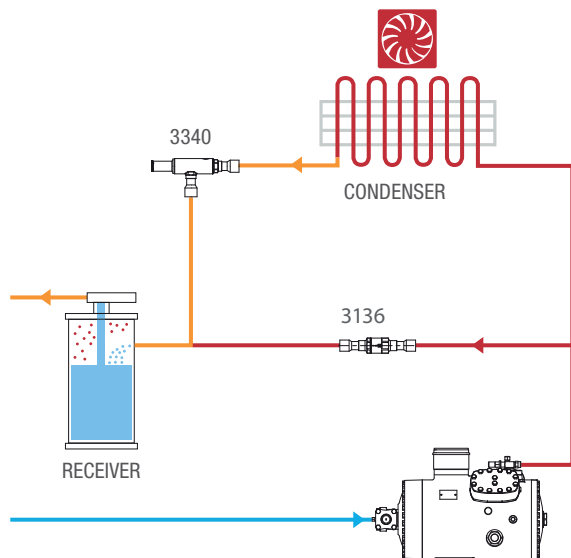
The main parts of the differential valves 3136W are made with the following materials:

- 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
- PTFE for seat gaskets

INSTALLATION

Condensing pressure regulators can be mounted in two locations of the refrigerating system:

- In the liquid line between the condenser and the liquid receiver (for regulator selection see Tables 27A, 28A, 29A, 30A and 31A related to liquid line). Valve 3136W is mounted between the compressor discharge and the inlet of liquid receiver. This choice requires a smaller sized regulator as it is controlling liquid refrigerant. It is most suitable for installations in temperate climates (see installation example 1).
- In the discharge line between the compressor and the condenser (for regulator selection see Tables 27B, 28B, 29B, 30B and 31B related to hot gas line). Valve 3136W is mounted between the compressor discharge and the inlet of liquid receiver. A check valve 3132W must be



Installation (1)

Refrigerating systems with air condensers. The regulator is installed at the condenser outlet on the liquid line, before the liquid receiver.

Injection valve 3136 guarantees sufficiently high pressure under variable conditions (min. diff. 1.4 bar / max 3 bar).

installed between the condenser discharge and receiver inlet to prevent liquid migration during an off cycle. This choice requires a larger sized regulator as it is controlling gaseous refrigerant. It is most suitable for installations in cold climates (see installation example 2).

SELECTION

To correctly select condensing 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 (system) capacity.
3. Evaporating temperature.
4. Condensing temperature.
5. Allowable condensing pressure change.
6. Allowable pressure drop across the regulator.

The refrigerating capacities indicated on Tables 27A, 27B, 28A, 28B, 29A, 29B, 30A, 30B, 31A and 31B are calculated as a function of a reference evaporating temperature of 4.4 °C. With liquid temperatures other than 4.4 °C, the required cooling capacity of regulator is:

$$\frac{Q_{\text{evap}}}{K_{T_{\text{evap}}}} = Q_{\text{valve}}$$

where:

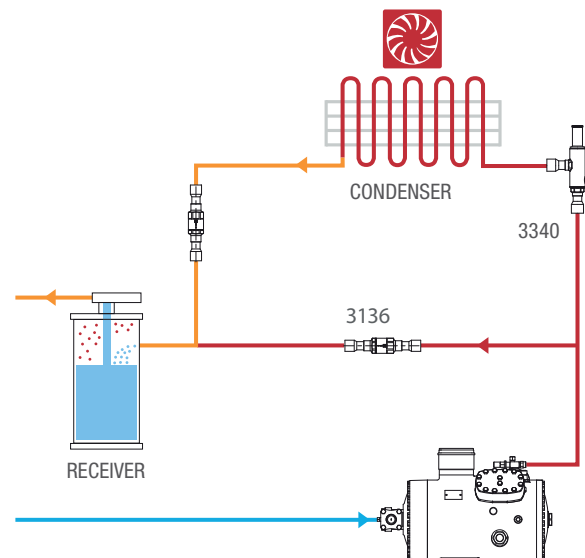
Q_{evap} = Evaporator capacity [kW]

$K_{T_{\text{evap}}}$ = Correction factor for $T_{\text{evap}} \neq 4.4 \text{ °C}$.
(See Tables 27C, 28C, 29C, 30C and 31C.)

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

EXAMPLE

| | |
|------------------------------------|---------|
| Refrigerant: | R404A |
| Refrigeration yield of evaporator: | 20 [kW] |
| Designed evaporating temperature: | 0 [°C] |
| Condensing temperature: | 40 [°C] |



Installation (2)

Refrigerating systems with air condenser and receiver installed in very cold environments.

The regulator is installed upstream of the condenser.

Injection valve 3136 ensures that the receiver has sufficiently high pressure.

Allowed condensing pressure change: 1.5 [bar]
 Pressure drop across the regulator: 0.31 [bar]
 Solder connections

1. Use Table 26C to determine the correction factor for the liquid temperature $T_{evap} = 0\text{ }^{\circ}\text{C}$.

$$K_{Tevap} = 1.02$$

2. Calculate the refrigerating capacity requested at regulator.

$$Q_{valve} = \frac{Q_{evap}}{K_{Tevap}} = \frac{20}{1,02} = 19,60\text{ kW}$$

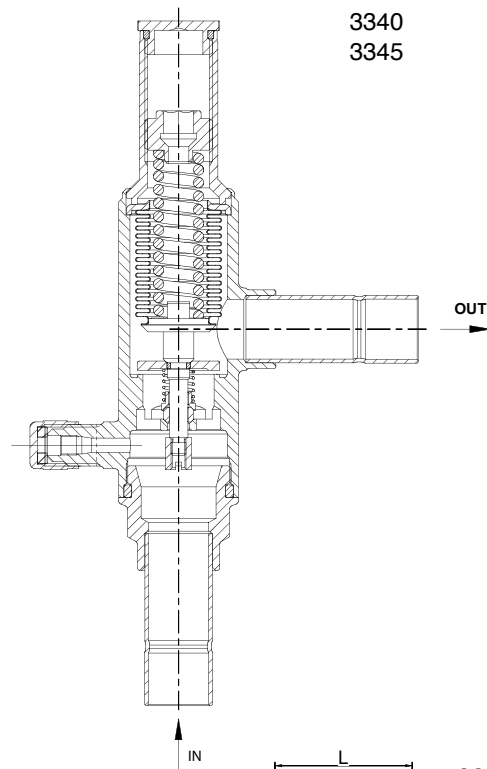
3. With the following parameters:

- Minimum cooling capacity = 19.60 KW
- Condensing temperature = 40 °C
- Condensing pressure change = 1.5 bar
- Pressure drop across the valve = 0.31 bar

Select the right valve from Table 29A. The valve selected is 3340/5S.

CERTIFICATIONS

Condensing pressure regulators in series 3340 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. Condensing pressure regulators in series 3345 have not been approved by the American certification authority Underwriters Laboratories Inc.



3340
3345

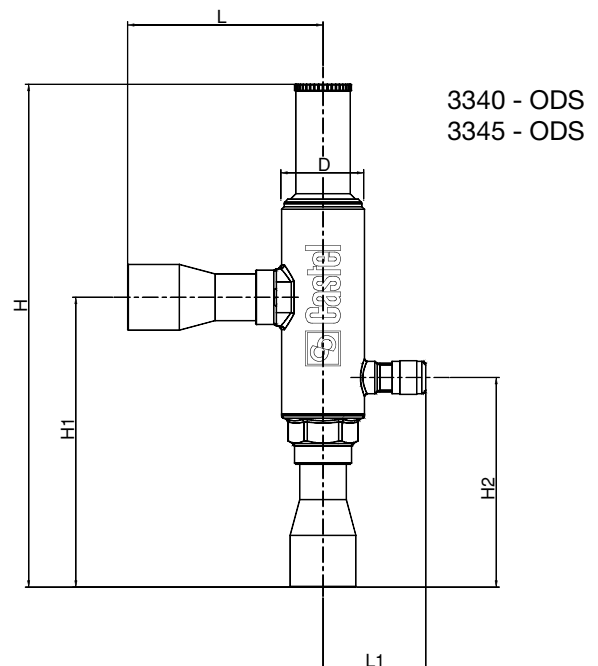
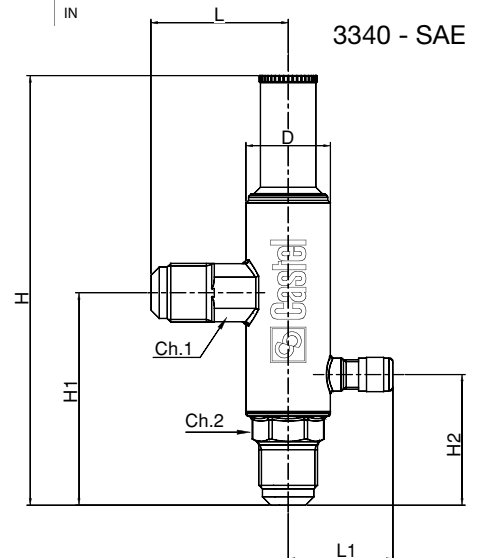


TABLE 24: General characteristics of condensing pressure regulators

| 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] | | | | | | | | | | |
| 3340/4 | 1/2" | - | - | 2,70 | 3 | 20 | 8 | 28 | - 40 | +110 | - 40 | +50 | Art. 4.3 |
| 3340/M12S | - | - | 12 | | | | | | | | | | |
| 3340/4S | - | 1/2" | - | | | | | | | | | | |
| 3340/5 | 5/8" | - | - | | | | | | | | | | |
| 3340/5S | - | 5/8" | 16 | | | | | | | | | | |
| 3340/7S | - | 7/8" | 22 | | | | | | | | | | |
| 3340/9S | - | 1.1/8" | - | 8,4 | | | | | | | | | |
| 3340/M28S | - | - | 28 | | | | | | | | | | |
| 3340/11S | - | 1.3/8" | 35 | | | | | | | | | | |
| 3345/M12S | - | - | 12 | 2,70 | 18 | 30 | 10 | 45 | - 40 | +110 | - 40 | +50 | Art. 4.3 |
| 3345/4S | - | 1/2" | - | | | | | | | | | | |
| 3345/5S | - | 5/8" | 16 | | | | | | | | | | |
| 3345/7S | - | 7/8" | 22 | | | | | | | | | | |

TABLE 25: Dimensions and weights of condensing pressure regulators

| Catalogue Number | Dimensions [mm] | | | | | | | | Weight [g] |
|------------------|-----------------|----------------|----------------|------|----------------|----|-----|-----|------------|
| | H | H ₁ | H ₂ | L | L ₁ | D | Ch1 | Ch2 | |
| 3340/4 | 159 | 76,5 | 45,5 | 48 | 37 | 32 | 22 | 24 | 490 |
| 3340/M12S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3340/4S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3340/5 | 163 | 80,5 | 49,5 | 52 | | | 22 | 24 | 550 |
| 3340/5S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3340/7S | 194 | 112 | 81 | 75,5 | | | - | - | 570 |
| 3340/9S | 263 | 151 | 111 | 105 | 44 | 46 | - | - | 1520 |
| 3340/M28S | 263 | 151 | 111 | 105 | | | | | 1520 |
| 3340/11S | 263 | 151 | 111 | 105 | | | | | 1530 |
| 3345/M12S | 183 | 100,5 | 69,5 | 64 | 37 | 32 | - | - | 506 |
| 3345/4S | 183 | 100,5 | 69,5 | 64 | | | | | 506 |
| 3345/5S | 183 | 100,5 | 69,5 | 64 | | | | | 506 |
| 3345/7S | 194 | 112 | 81 | 75,5 | | | | | 570 |

TABLE 26: General characteristics of differential valves

| Catalogue Number | Connections | | | Kv Factor [m³/h] | Regulating range [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] | | | | | | | | | |
| 3136W/M12 | - | - | 12 | 1,80 | 1,4 | 3 | 45 | - 40 | +110 | - 40 | +50 | Art. 4.3 |
| 3136W/4 | - | 1/2" | - | | | | | | | | | |

TABLE 27A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 17,93 | 17,05 | 16,07 | 15,19 | 14,30 | 13,15 | 12,00 | 11,30 | 10,59 |
| | | 0,14 | 26,22 | 24,80 | 23,24 | 21,81 | 20,38 | 18,75 | 17,10 | 16,06 | 15,02 |
| | | 0,31 | 45,70 | 43,03 | 40,12 | 37,44 | 34,75 | 32,22 | 29,67 | 27,59 | 25,49 |
| | | 0,65 | 61,82 | 57,92 | 53,71 | 49,82 | 45,90 | 42,56 | 39,19 | 36,35 | 33,50 |
| | | 1,03 | 77,67 | 72,46 | 66,84 | 61,63 | 56,38 | 52,27 | 48,14 | 44,55 | 40,94 |
| | | 1,68 | 106,45 | 99,02 | 91,04 | 83,60 | 76,12 | 69,90 | 63,65 | 58,62 | 53,55 |
| | 3 | 0,07 | 32,36 | 31,29 | 28,60 | 27,53 | 26,36 | 25,12 | 23,78 | 22,70 | 21,55 |
| | | 0,14 | 46,39 | 44,80 | 40,90 | 39,31 | 37,57 | 35,86 | 34,01 | 32,41 | 30,71 |
| | | 0,31 | 73,39 | 70,82 | 64,60 | 62,03 | 59,22 | 56,43 | 53,41 | 51,00 | 48,43 |
| | | 0,65 | 104,52 | 100,74 | 91,77 | 87,99 | 83,86 | 80,04 | 75,91 | 72,36 | 68,57 |
| | | 1,03 | 128,57 | 123,78 | 112,61 | 107,82 | 102,58 | 98,07 | 93,18 | 88,67 | 83,87 |
| | | 1,68 | 174,27 | 167,14 | 151,46 | 144,34 | 136,59 | 129,93 | 122,73 | 116,69 | 110,26 |
| 3340/5 3340/5S | 1,5 | 0,07 | 29,89 | 28,42 | 26,79 | 25,32 | 23,84 | 21,92 | 20,00 | 18,83 | 17,66 |
| | | 0,14 | 43,71 | 41,33 | 38,73 | 36,36 | 33,97 | 31,24 | 28,50 | 26,77 | 25,03 |
| | | 0,31 | 76,17 | 71,72 | 66,86 | 62,40 | 57,92 | 53,70 | 49,46 | 45,98 | 42,49 |
| | | 0,65 | 103,03 | 96,54 | 89,51 | 83,03 | 76,50 | 70,93 | 65,32 | 60,59 | 55,83 |
| | | 1,03 | 129,46 | 120,76 | 111,40 | 102,71 | 93,96 | 87,12 | 80,23 | 74,25 | 68,23 |
| | | 1,68 | 177,42 | 165,03 | 151,73 | 139,34 | 126,87 | 116,51 | 106,08 | 97,70 | 89,26 |
| | 3 | 0,07 | 53,93 | 52,15 | 47,67 | 45,89 | 43,94 | 41,87 | 39,63 | 37,83 | 35,91 |
| | | 0,14 | 77,32 | 74,67 | 68,17 | 65,52 | 62,62 | 59,77 | 56,69 | 54,02 | 51,18 |
| | | 0,31 | 122,31 | 118,03 | 107,66 | 103,38 | 98,70 | 94,05 | 89,02 | 85,00 | 80,71 |
| | | 0,65 | 174,21 | 167,90 | 152,96 | 146,65 | 139,77 | 133,41 | 126,52 | 120,59 | 114,29 |
| | | 1,03 | 214,29 | 206,29 | 187,69 | 179,69 | 170,97 | 163,45 | 155,30 | 147,78 | 139,78 |
| | | 1,68 | 290,44 | 278,57 | 252,43 | 240,56 | 227,64 | 216,55 | 204,55 | 194,48 | 183,76 |
| 3340/7S | 1,5 | 0,07 | 38,91 | 38,73 | 34,68 | 34,50 | 34,10 | 32,83 | 31,29 | 30,71 | 30,02 |
| | | 0,14 | 56,59 | 55,99 | 49,84 | 49,25 | 48,29 | 46,51 | 44,32 | 43,39 | 42,29 |
| | | 0,31 | 89,88 | 88,50 | 78,39 | 77,00 | 75,01 | 72,82 | 70,06 | 67,90 | 65,40 |
| | | 0,65 | 128,43 | 125,80 | 110,83 | 108,19 | 104,63 | 101,57 | 97,71 | 94,48 | 90,75 |
| | | 1,03 | 158,18 | 154,18 | 135,14 | 131,13 | 125,92 | 122,23 | 117,59 | 113,44 | 108,67 |
| | | 1,68 | 209,46 | 203,51 | 177,77 | 171,83 | 164,21 | 157,88 | 150,17 | 144,17 | 137,31 |
| | 3 | 0,07 | 60,79 | 60,70 | 53,51 | 53,42 | 52,88 | 51,95 | 50,58 | 49,56 | 48,29 |
| | | 0,14 | 86,43 | 86,19 | 75,87 | 75,63 | 74,72 | 73,54 | 71,74 | 70,17 | 68,23 |
| | | 0,31 | 134,24 | 133,75 | 117,64 | 117,15 | 115,63 | 113,60 | 110,60 | 108,39 | 105,65 |
| | | 0,65 | 187,42 | 186,50 | 163,82 | 162,90 | 160,50 | 157,95 | 154,08 | 150,74 | 146,63 |
| | | 1,03 | 226,69 | 225,29 | 197,64 | 196,24 | 193,03 | 190,27 | 185,95 | 181,62 | 176,32 |
| | | 1,68 | 293,29 | 290,33 | 253,67 | 250,71 | 245,28 | 240,57 | 233,74 | 228,10 | 221,22 |

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

Continued

TABLE 27A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 93,88 | 89,26 | 84,14 | 79,52 | 74,87 | 68,86 | 62,81 | 59,15 | 55,46 |
| | | 0,14 | 137,28 | 129,82 | 121,64 | 114,18 | 106,68 | 98,13 | 89,52 | 84,08 | 78,61 |
| | | 0,31 | 239,25 | 225,25 | 209,99 | 195,99 | 181,91 | 168,66 | 155,34 | 144,42 | 133,44 |
| | | 0,65 | 323,58 | 303,20 | 281,14 | 260,76 | 240,26 | 222,76 | 205,15 | 190,29 | 175,34 |
| | | 1,03 | 406,59 | 379,28 | 349,89 | 322,59 | 295,11 | 273,62 | 251,99 | 233,19 | 214,29 |
| | | 1,68 | 557,24 | 518,31 | 476,54 | 437,62 | 398,45 | 365,91 | 333,18 | 306,84 | 280,34 |
| | 3 | 0,07 | 169,38 | 163,78 | 149,72 | 144,13 | 137,99 | 131,50 | 124,48 | 118,82 | 112,80 |
| | | 0,14 | 242,83 | 234,51 | 214,09 | 205,77 | 196,66 | 187,72 | 178,05 | 169,66 | 160,73 |
| | | 0,31 | 384,15 | 370,71 | 338,14 | 324,69 | 309,98 | 295,38 | 279,59 | 266,96 | 253,50 |
| | | 0,65 | 547,14 | 527,34 | 480,40 | 460,60 | 438,97 | 418,99 | 397,36 | 378,75 | 358,94 |
| | | 1,03 | 673,03 | 647,92 | 589,49 | 564,37 | 536,97 | 513,36 | 487,77 | 464,15 | 439,01 |
| | | 1,68 | 912,20 | 874,92 | 792,82 | 755,53 | 714,97 | 680,12 | 642,45 | 610,81 | 577,15 |
| 3340/11S | 1,5 | 0,07 | 119,33 | 118,77 | 106,36 | 105,80 | 104,56 | 100,69 | 95,94 | 94,18 | 92,06 |
| | | 0,14 | 173,53 | 171,70 | 152,85 | 151,02 | 148,10 | 142,62 | 135,92 | 133,08 | 129,70 |
| | | 0,31 | 275,63 | 271,39 | 240,38 | 236,14 | 230,04 | 223,31 | 214,85 | 208,23 | 200,56 |
| | | 0,65 | 393,87 | 385,79 | 339,87 | 331,79 | 320,86 | 311,47 | 299,65 | 289,74 | 278,31 |
| | | 1,03 | 485,10 | 472,83 | 414,42 | 402,15 | 386,15 | 374,84 | 360,61 | 347,88 | 333,25 |
| | | 1,68 | 642,33 | 624,10 | 545,17 | 526,93 | 503,57 | 484,18 | 460,53 | 442,12 | 421,09 |
| | 3 | 0,07 | 186,43 | 186,16 | 164,09 | 163,82 | 162,15 | 159,32 | 155,12 | 151,98 | 148,09 |
| | | 0,14 | 265,06 | 264,31 | 232,67 | 231,92 | 229,15 | 225,53 | 220,02 | 215,19 | 209,25 |
| | | 0,31 | 411,67 | 410,17 | 360,76 | 359,26 | 354,59 | 348,38 | 339,18 | 332,40 | 323,99 |
| | | 0,65 | 574,77 | 571,94 | 502,38 | 499,55 | 492,21 | 484,39 | 472,50 | 462,27 | 449,67 |
| | | 1,03 | 695,17 | 690,88 | 606,09 | 601,79 | 591,95 | 583,49 | 570,25 | 556,96 | 540,71 |
| | | 1,68 | 899,42 | 890,34 | 777,94 | 768,85 | 752,20 | 737,74 | 716,80 | 699,49 | 678,40 |

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

TABLE 27B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 2,47 | 2,46 | 2,47 | 2,47 | 2,48 | 2,49 | 2,49 | 2,50 | 2,51 |
| | | 0,14 | 3,47 | 3,46 | 3,47 | 3,48 | 3,49 | 3,50 | 3,51 | 3,53 | 3,54 |
| | | 0,31 | 5,88 | 5,87 | 5,88 | 5,90 | 5,92 | 5,93 | 5,95 | 5,97 | 5,99 |
| | | 0,65 | 7,68 | 7,66 | 7,68 | 7,71 | 7,73 | 7,75 | 7,78 | 7,80 | 7,82 |
| | | 1,03 | 9,34 | 9,31 | 9,34 | 9,37 | 9,39 | 9,42 | 9,45 | 9,48 | 9,50 |
| | 1,68 | 11,86 | 11,82 | 11,86 | 11,89 | 11,93 | 11,96 | 12,00 | 12,03 | 12,07 | |
| | 3 | 0,07 | 4,50 | 4,37 | 4,50 | 4,62 | 4,74 | 4,87 | 4,99 | 5,12 | 5,25 |
| | | 0,14 | 6,35 | 6,17 | 6,35 | 6,52 | 6,70 | 6,87 | 7,05 | 7,22 | 7,41 |
| | | 0,31 | 9,99 | 9,71 | 9,99 | 10,26 | 10,54 | 10,81 | 11,09 | 11,37 | 11,66 |
| | | 0,65 | 14,01 | 13,63 | 14,01 | 14,40 | 14,78 | 15,17 | 15,55 | 15,95 | 16,35 |
| 1,03 | | 16,98 | 16,51 | 16,98 | 17,45 | 17,91 | 18,38 | 18,85 | 19,32 | 19,81 | |
| 1,68 | 21,72 | 21,12 | 21,72 | 22,32 | 22,91 | 23,51 | 24,11 | 24,72 | 25,35 | | |
| 3340/5 3340/5S | 1,5 | 0,07 | 4,11 | 4,10 | 4,11 | 4,12 | 4,13 | 4,15 | 4,16 | 4,17 | 4,18 |
| | | 0,14 | 5,79 | 5,77 | 5,79 | 5,81 | 5,82 | 5,84 | 5,86 | 5,88 | 5,89 |
| | | 0,31 | 9,80 | 9,78 | 9,80 | 9,83 | 9,86 | 9,89 | 9,92 | 9,95 | 9,98 |
| | | 0,65 | 12,81 | 12,77 | 12,81 | 12,85 | 12,88 | 12,92 | 12,96 | 13,00 | 13,04 |
| | | 1,03 | 15,56 | 15,52 | 15,56 | 15,61 | 15,65 | 15,70 | 15,75 | 15,79 | 15,84 |
| | 1,68 | 19,76 | 19,71 | 19,76 | 19,82 | 19,88 | 19,94 | 20,00 | 20,06 | 20,12 | |
| | 3 | 0,07 | 7,50 | 7,29 | 7,50 | 7,70 | 7,91 | 8,11 | 8,32 | 8,53 | 8,75 |
| | | 0,14 | 10,58 | 10,29 | 10,58 | 10,87 | 11,16 | 11,45 | 11,74 | 12,04 | 12,35 |
| | | 0,31 | 16,65 | 16,19 | 16,65 | 17,11 | 17,56 | 18,02 | 18,48 | 18,95 | 19,43 |
| | | 0,65 | 23,35 | 22,71 | 23,35 | 23,99 | 24,64 | 25,28 | 25,92 | 26,58 | 27,25 |
| 1,03 | | 28,30 | 27,52 | 28,30 | 29,08 | 29,85 | 30,63 | 31,41 | 32,21 | 33,02 | |
| 1,68 | 36,20 | 35,21 | 36,20 | 37,20 | 38,19 | 39,19 | 40,18 | 41,20 | 42,25 | | |
| 3340/7S | 1,5 | 0,07 | 5,60 | 5,30 | 5,60 | 5,89 | 6,19 | 6,48 | 6,8 | 7,09 | 7,41 |
| | | 0,14 | 7,84 | 7,43 | 7,84 | 8,26 | 8,67 | 9,08 | 9,5 | 9,93 | 10,38 |
| | | 0,31 | 12,10 | 11,46 | 12,10 | 12,74 | 13,37 | 14,01 | 14,6 | 15,32 | 16,01 |
| | | 0,65 | 16,69 | 15,81 | 16,69 | 17,57 | 18,45 | 19,33 | 20,2 | 21,13 | 22,09 |
| | | 1,03 | 19,87 | 18,82 | 19,87 | 20,92 | 21,96 | 23,01 | 24,1 | 25,15 | 26,30 |
| | 1,68 | 24,37 | 23,09 | 24,37 | 25,66 | 26,94 | 28,23 | 29,5 | 30,86 | 32,26 | |
| | 3 | 0,07 | 8,72 | 8,18 | 8,72 | 9,27 | 9,81 | 10,35 | 10,9 | 11,47 | 12,07 |
| | | 0,14 | 12,21 | 11,45 | 12,21 | 12,97 | 13,73 | 14,49 | 15,3 | 16,05 | 16,90 |
| | | 0,31 | 18,86 | 17,69 | 18,86 | 20,04 | 21,21 | 22,39 | 23,6 | 24,80 | 26,10 |
| | | 0,65 | 25,94 | 24,32 | 25,94 | 27,55 | 29,17 | 30,78 | 32,4 | 34,10 | 35,89 |
| 1,03 | | 30,90 | 28,98 | 30,90 | 32,83 | 34,75 | 36,68 | 38,6 | 40,63 | 42,76 | |
| 1,68 | 37,73 | 35,38 | 37,73 | 40,08 | 42,43 | 44,78 | 47,1 | 49,60 | 52,20 | | |

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

Continued

TABLE 27B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|-------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 12,90 | 12,87 | 12,90 | 12,94 | 12,98 | 13,02 | 13,1 | 13,10 | 13,13 |
| | | 0,14 | 18,18 | 18,13 | 18,18 | 18,24 | 18,29 | 18,34 | 18,4 | 18,45 | 18,51 |
| | | 0,31 | 30,79 | 30,70 | 30,79 | 30,88 | 30,98 | 31,07 | 31,2 | 31,25 | 31,34 |
| | | 0,65 | 40,23 | 40,11 | 40,23 | 40,35 | 40,46 | 40,58 | 40,7 | 40,82 | 40,94 |
| | | 1,03 | 48,88 | 48,73 | 48,88 | 49,02 | 49,17 | 49,31 | 49,5 | 49,60 | 49,75 |
| | | 1,68 | 62,07 | 61,89 | 62,07 | 62,26 | 62,44 | 62,63 | 62,8 | 63,00 | 63,18 |
| | 3 | 0,07 | 23,54 | 22,89 | 23,54 | 24,19 | 24,83 | 25,48 | 26,1 | 26,79 | 27,47 |
| | | 0,14 | 33,23 | 32,32 | 33,23 | 34,14 | 35,06 | 35,97 | 36,9 | 37,82 | 38,78 |
| | | 0,31 | 52,29 | 50,85 | 52,29 | 53,72 | 55,16 | 56,60 | 58,0 | 59,51 | 61,02 |
| | | 0,65 | 73,34 | 71,33 | 73,34 | 75,36 | 77,38 | 79,39 | 81,4 | 83,48 | 85,59 |
| | | 1,03 | 88,88 | 86,43 | 88,88 | 91,32 | 93,76 | 96,21 | 98,6 | 101,15 | 103,72 |
| | | 1,68 | 113,70 | 110,57 | 113,70 | 116,82 | 119,95 | 123,07 | 126,2 | 129,40 | 132,69 |
| 3340/11S | 1,5 | 0,07 | 17,17 | 16,26 | 17,17 | 18,07 | 18,98 | 19,88 | 20,8 | 21,74 | 22,73 |
| | | 0,14 | 24,05 | 22,78 | 24,05 | 25,32 | 26,58 | 27,85 | 29,1 | 30,45 | 31,83 |
| | | 0,31 | 37,10 | 35,14 | 37,10 | 39,06 | 41,01 | 42,97 | 44,9 | 46,97 | 49,11 |
| | | 0,65 | 51,18 | 48,48 | 51,18 | 53,88 | 56,58 | 59,28 | 62,0 | 64,80 | 67,75 |
| | | 1,03 | 60,93 | 57,72 | 60,93 | 64,14 | 67,36 | 70,57 | 73,8 | 77,14 | 80,65 |
| | | 1,68 | 74,74 | 70,80 | 74,74 | 78,68 | 82,62 | 86,57 | 90,5 | 94,63 | 98,94 |
| | 3 | 0,07 | 26,76 | 25,09 | 26,76 | 28,42 | 30,09 | 31,75 | 33,4 | 35,17 | 37,02 |
| | | 0,14 | 37,45 | 35,12 | 37,45 | 39,78 | 42,12 | 44,45 | 46,8 | 49,23 | 51,82 |
| | | 0,31 | 57,85 | 54,25 | 57,85 | 61,45 | 65,06 | 68,66 | 72,3 | 76,05 | 80,04 |
| | | 0,65 | 79,55 | 74,59 | 79,55 | 84,50 | 89,45 | 94,41 | 99,4 | 104,57 | 110,06 |
| | | 1,03 | 94,77 | 88,87 | 94,77 | 100,67 | 106,57 | 112,47 | 118,4 | 124,59 | 131,12 |
| | | 1,68 | 115,70 | 108,50 | 115,70 | 122,91 | 130,11 | 137,32 | 144,5 | 152,11 | 160,09 |

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) : pressure change required to move the valve shutter from “start to open” position to rated opening position

TABLE 27C : Correction factor for evaporator temperature different from nominal value

| Evaporator temperature [°C] | | | | | | | | |
|-----------------------------|------|-----|------|------|------|------|-----|------|
| -40 | -30 | -20 | -15 | -10 | -5 | 0 | 4,4 | 10 |
| 1,2 | 1,15 | 1,1 | 1,08 | 1,06 | 1,04 | 1,02 | 1 | 0,98 |

TABLE 28A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 12,67 | 12,16 | 11,66 | 11,16 | 10,66 | 9,94 | 9,23 | 8,51 | 7,78 |
| | | 0,14 | 18,42 | 17,63 | 16,84 | 16,05 | 15,26 | 14,18 | 13,08 | 12,06 | 11,03 |
| | | 0,31 | 31,25 | 29,40 | 27,57 | 25,72 | 23,86 | 22,30 | 20,74 | 19,24 | 17,74 |
| | | 0,65 | 45,19 | 42,42 | 39,65 | 36,88 | 34,08 | 31,71 | 29,33 | 27,21 | 25,08 |
| | | 1,03 | 56,48 | 52,88 | 49,30 | 45,70 | 42,08 | 38,99 | 35,87 | 33,27 | 30,66 |
| | | 1,68 | 77,58 | 71,84 | 66,13 | 60,39 | 54,62 | 50,99 | 47,34 | 43,76 | 40,16 |
| | 3 | 0,07 | 25,93 | 24,97 | 24,10 | 23,14 | 22,09 | 21,04 | 19,91 | 19,02 | 18,06 |
| | | 0,14 | 37,08 | 35,69 | 34,43 | 33,04 | 31,53 | 30,02 | 28,38 | 27,06 | 25,65 |
| | | 0,31 | 58,80 | 56,44 | 54,28 | 51,92 | 49,35 | 47,05 | 44,56 | 42,46 | 40,23 |
| | | 0,65 | 84,03 | 80,62 | 77,51 | 74,11 | 70,41 | 67,08 | 63,49 | 60,39 | 57,09 |
| | | 1,03 | 103,26 | 99,04 | 95,19 | 90,98 | 86,39 | 82,26 | 77,79 | 73,86 | 69,67 |
| | | 1,68 | 137,60 | 131,78 | 126,46 | 120,64 | 114,32 | 108,65 | 102,55 | 98,47 | 94,12 |
| 3340/5 3340/5S | 1,5 | 0,07 | 21,17 | 20,33 | 19,38 | 18,55 | 17,71 | 16,53 | 15,34 | 14,13 | 12,93 |
| | | 0,14 | 30,78 | 29,47 | 27,99 | 26,68 | 25,36 | 23,56 | 21,74 | 20,04 | 18,32 |
| | | 0,31 | 52,22 | 49,15 | 45,81 | 42,74 | 39,65 | 37,06 | 34,46 | 31,98 | 29,48 |
| | | 0,65 | 75,52 | 70,90 | 65,89 | 61,28 | 56,63 | 52,70 | 48,74 | 45,22 | 41,68 |
| | | 1,03 | 94,37 | 88,39 | 81,93 | 75,95 | 69,93 | 64,78 | 59,61 | 55,29 | 50,96 |
| | | 1,68 | 129,63 | 120,09 | 109,90 | 100,36 | 90,76 | 84,73 | 78,67 | 72,72 | 66,74 |
| | 3 | 0,07 | 44,32 | 42,79 | 39,06 | 37,53 | 35,86 | 34,18 | 32,37 | 30,91 | 29,36 |
| | | 0,14 | 63,37 | 61,16 | 55,80 | 53,60 | 51,19 | 48,76 | 46,14 | 43,98 | 41,68 |
| | | 0,31 | 100,49 | 96,73 | 87,99 | 84,22 | 80,11 | 76,42 | 72,43 | 69,02 | 65,39 |
| | | 0,65 | 143,60 | 138,17 | 125,64 | 120,21 | 114,29 | 108,96 | 103,19 | 98,15 | 92,79 |
| | | 1,03 | 176,46 | 169,74 | 154,29 | 147,57 | 140,24 | 133,61 | 126,44 | 120,05 | 113,25 |
| | | 1,68 | 235,12 | 225,84 | 204,97 | 195,68 | 185,57 | 176,49 | 166,68 | 160,05 | 152,98 |
| 3340/7S | 1,5 | 0,07 | 29,23 | 29,42 | 26,65 | 26,84 | 26,90 | 26,28 | 25,47 | 24,47 | 23,33 |
| | | 0,14 | 42,10 | 42,22 | 38,10 | 38,22 | 38,14 | 37,09 | 35,76 | 34,36 | 32,75 |
| | | 0,31 | 70,67 | 69,56 | 61,59 | 60,48 | 58,89 | 57,64 | 55,99 | 54,16 | 52,05 |
| | | 0,65 | 100,94 | 99,08 | 87,48 | 85,63 | 83,06 | 80,92 | 78,19 | 75,62 | 72,66 |
| | | 1,03 | 125,22 | 122,60 | 107,96 | 105,34 | 101,80 | 98,74 | 94,90 | 91,78 | 88,17 |
| | | 1,68 | 167,69 | 162,21 | 141,04 | 135,56 | 128,68 | 125,78 | 121,98 | 117,54 | 112,45 |
| | 3 | 0,07 | 50,98 | 50,83 | 44,73 | 44,58 | 44,04 | 43,28 | 42,15 | 41,32 | 40,29 |
| | | 0,14 | 72,37 | 72,12 | 63,45 | 63,20 | 62,40 | 61,29 | 59,64 | 58,36 | 56,77 |
| | | 0,31 | 113,17 | 112,45 | 98,63 | 97,91 | 96,28 | 94,70 | 92,32 | 90,30 | 87,81 |
| | | 0,65 | 158,86 | 157,79 | 138,35 | 137,28 | 134,94 | 132,64 | 129,20 | 126,14 | 122,40 |
| | | 1,03 | 194,11 | 192,75 | 168,94 | 167,57 | 164,64 | 161,73 | 157,43 | 153,41 | 148,54 |
| | | 1,68 | 251,39 | 249,24 | 218,11 | 215,96 | 211,73 | 207,62 | 201,68 | 198,77 | 195,01 |

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) | | |

Continued

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

TABLE 28A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 66,48 | 63,86 | 60,88 | 58,26 | 55,62 | 51,90 | 48,16 | 44,39 | 40,60 |
| | | 0,14 | 96,67 | 92,55 | 87,91 | 83,79 | 79,65 | 73,99 | 68,29 | 62,93 | 57,55 |
| | | 0,31 | 164,01 | 154,37 | 143,86 | 134,22 | 124,52 | 116,40 | 108,24 | 100,44 | 92,60 |
| | | 0,65 | 237,19 | 222,69 | 206,95 | 192,45 | 177,86 | 165,51 | 153,08 | 142,03 | 130,91 |
| | | 1,03 | 296,40 | 277,62 | 257,31 | 238,53 | 219,63 | 203,47 | 187,20 | 173,66 | 160,04 |
| | | 1,68 | 407,13 | 377,17 | 345,16 | 315,20 | 285,06 | 266,12 | 247,07 | 228,39 | 209,60 |
| | 3 | 0,07 | 139,19 | 134,39 | 122,67 | 117,87 | 112,62 | 107,35 | 101,65 | 97,08 | 92,22 |
| | | 0,14 | 199,03 | 192,10 | 175,27 | 168,34 | 160,76 | 153,14 | 144,90 | 138,13 | 130,92 |
| | | 0,31 | 315,63 | 303,79 | 276,34 | 264,51 | 251,59 | 240,01 | 227,47 | 216,77 | 205,37 |
| | | 0,65 | 451,00 | 433,96 | 394,60 | 377,56 | 358,96 | 342,21 | 324,09 | 308,26 | 291,42 |
| | | 1,03 | 554,21 | 533,10 | 484,59 | 463,48 | 440,45 | 419,64 | 397,13 | 377,04 | 355,67 |
| | | 1,68 | 738,46 | 709,30 | 643,75 | 614,60 | 582,83 | 554,31 | 523,49 | 502,68 | 480,47 |
| 3340/11S | 1,5 | 0,07 | 89,64 | 90,23 | 81,72 | 82,31 | 82,48 | 80,59 | 78,12 | 75,06 | 71,55 |
| | | 0,14 | 129,09 | 129,47 | 116,84 | 117,22 | 116,95 | 113,74 | 109,67 | 105,36 | 100,43 |
| | | 0,31 | 216,72 | 213,31 | 188,88 | 185,47 | 180,60 | 176,77 | 171,70 | 166,09 | 159,62 |
| | | 0,65 | 309,54 | 303,85 | 268,28 | 262,59 | 254,72 | 248,17 | 239,77 | 231,91 | 222,83 |
| | | 1,03 | 384,02 | 375,98 | 331,08 | 323,03 | 312,20 | 302,81 | 291,04 | 281,45 | 270,38 |
| | | 1,68 | 514,24 | 497,45 | 432,51 | 415,72 | 394,62 | 385,71 | 374,07 | 360,47 | 344,86 |
| | 3 | 0,07 | 156,34 | 155,87 | 137,18 | 136,71 | 135,04 | 132,72 | 129,26 | 126,71 | 123,54 |
| | | 0,14 | 221,93 | 221,17 | 194,57 | 193,82 | 191,36 | 187,94 | 182,91 | 178,97 | 174,10 |
| | | 0,31 | 347,07 | 344,86 | 302,47 | 300,26 | 295,27 | 290,42 | 283,11 | 276,91 | 269,29 |
| | | 0,65 | 487,16 | 483,89 | 424,27 | 421,00 | 413,81 | 406,75 | 396,22 | 386,82 | 375,35 |
| | | 1,03 | 595,28 | 591,09 | 518,09 | 513,90 | 504,90 | 495,97 | 482,77 | 470,46 | 455,52 |
| | | 1,68 | 770,93 | 764,32 | 668,88 | 662,27 | 649,30 | 636,70 | 618,48 | 609,57 | 598,03 |

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

TABLE 28B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 2,23 | 2,23 | 2,23 | 2,24 | 2,25 | 2,25 | 2,26 | 2,27 | 2,27 |
| | | 0,14 | 3,15 | 3,14 | 3,15 | 3,16 | 3,17 | 3,18 | 3,19 | 3,20 | 3,21 |
| | | 0,31 | 4,97 | 4,96 | 4,97 | 4,99 | 5,00 | 5,02 | 5,03 | 5,05 | 5,06 |
| | | 0,65 | 7,00 | 6,98 | 7,00 | 7,02 | 7,04 | 7,06 | 7,08 | 7,10 | 7,12 |
| | | 1,03 | 8,52 | 8,49 | 8,52 | 8,54 | 8,57 | 8,60 | 8,62 | 8,65 | 8,67 |
| | | 1,68 | 10,94 | 10,91 | 10,94 | 10,98 | 11,01 | 11,04 | 11,07 | 11,11 | 11,14 |
| | 3 | 0,07 | 4,36 | 4,24 | 4,36 | 4,48 | 4,60 | 4,72 | 4,84 | 4,96 | 5,08 |
| | | 0,14 | 6,15 | 5,98 | 6,15 | 6,32 | 6,49 | 6,66 | 6,83 | 7,00 | 7,18 |
| | | 0,31 | 9,70 | 9,43 | 9,70 | 9,96 | 10,23 | 10,50 | 10,76 | 11,04 | 11,32 |
| | | 0,65 | 13,68 | 13,31 | 13,68 | 14,06 | 14,43 | 14,81 | 15,19 | 15,57 | 15,97 |
| | | 1,03 | 16,60 | 16,15 | 16,60 | 17,06 | 17,52 | 17,97 | 18,43 | 18,90 | 19,38 |
| | | 1,68 | 21,39 | 20,80 | 21,39 | 21,97 | 22,56 | 23,15 | 23,74 | 24,34 | 24,96 |
| 3340/5 3340/5S | 1,5 | 0,07 | 3,72 | 3,71 | 3,72 | 3,73 | 3,74 | 3,75 | 3,77 | 3,78 | 3,79 |
| | | 0,14 | 5,25 | 5,24 | 5,25 | 5,27 | 5,28 | 5,30 | 5,31 | 5,33 | 5,35 |
| | | 0,31 | 8,29 | 8,26 | 8,29 | 8,31 | 8,34 | 8,36 | 8,39 | 8,41 | 8,43 |
| | | 0,65 | 11,67 | 11,63 | 11,67 | 11,70 | 11,73 | 11,77 | 11,80 | 11,84 | 11,87 |
| | | 1,03 | 14,20 | 14,16 | 14,20 | 14,24 | 14,28 | 14,33 | 14,37 | 14,41 | 14,45 |
| | | 1,68 | 18,24 | 18,18 | 18,24 | 18,29 | 18,35 | 18,40 | 18,46 | 18,51 | 18,56 |
| | 3 | 0,07 | 7,26 | 7,06 | 7,26 | 7,46 | 7,66 | 7,86 | 8,06 | 8,26 | 8,47 |
| | | 0,14 | 10,25 | 9,97 | 10,25 | 10,53 | 10,81 | 11,10 | 11,38 | 11,67 | 11,96 |
| | | 0,31 | 16,16 | 15,72 | 16,16 | 16,61 | 17,05 | 17,49 | 17,94 | 18,39 | 18,86 |
| | | 0,65 | 22,80 | 22,18 | 22,80 | 23,43 | 24,06 | 24,68 | 25,31 | 25,95 | 26,61 |
| | | 1,03 | 27,67 | 26,91 | 27,67 | 28,43 | 29,20 | 29,96 | 30,72 | 31,50 | 32,30 |
| | | 1,68 | 35,64 | 34,66 | 35,64 | 36,62 | 37,60 | 38,58 | 39,56 | 40,57 | 41,60 |
| 3340/7S | 1,5 | 0,07 | 5,70 | 5,40 | 5,70 | 6,00 | 6,30 | 6,60 | 6,90 | 7,22 | 7,55 |
| | | 0,14 | 7,97 | 7,55 | 7,97 | 8,39 | 8,81 | 9,23 | 9,65 | 10,09 | 10,54 |
| | | 0,31 | 12,42 | 11,76 | 12,42 | 13,07 | 13,73 | 14,38 | 15,04 | 15,72 | 16,44 |
| | | 0,65 | 17,26 | 16,35 | 17,26 | 18,17 | 19,08 | 19,99 | 20,90 | 21,85 | 22,85 |
| | | 1,03 | 20,85 | 19,75 | 20,85 | 21,95 | 23,05 | 24,15 | 25,25 | 26,40 | 27,60 |
| | | 1,68 | 26,09 | 24,71 | 26,09 | 27,46 | 28,84 | 30,21 | 31,59 | 33,02 | 34,53 |
| | 3 | 0,07 | 9,13 | 8,56 | 9,13 | 9,70 | 10,27 | 10,84 | 11,41 | 12,01 | 12,64 |
| | | 0,14 | 12,80 | 12,00 | 12,80 | 13,59 | 14,39 | 15,19 | 15,99 | 16,82 | 17,71 |
| | | 0,31 | 19,89 | 18,66 | 19,89 | 21,13 | 22,37 | 23,61 | 24,85 | 26,15 | 27,53 |
| | | 0,65 | 27,57 | 25,86 | 27,57 | 29,29 | 31,01 | 32,72 | 34,44 | 36,25 | 38,15 |
| | | 1,03 | 33,27 | 31,20 | 33,27 | 35,35 | 37,42 | 39,49 | 41,56 | 43,74 | 46,04 |
| | | 1,68 | 41,65 | 39,06 | 41,65 | 44,24 | 46,84 | 49,43 | 52,02 | 54,75 | 57,63 |

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

Continued

TABLE 28B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|-------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 11,69 | 11,65 | 11,69 | 11,72 | 11,76 | 11,79 | 11,8 | 11,86 | 11,90 |
| | | 0,14 | 16,49 | 16,44 | 16,49 | 16,54 | 16,59 | 16,64 | 16,7 | 16,74 | 16,79 |
| | | 0,31 | 26,03 | 25,95 | 26,03 | 26,10 | 26,18 | 26,26 | 26,3 | 26,41 | 26,49 |
| | | 0,65 | 36,64 | 36,53 | 36,64 | 36,75 | 36,86 | 36,96 | 37,1 | 37,18 | 37,29 |
| | | 1,03 | 44,60 | 44,46 | 44,60 | 44,73 | 44,86 | 44,99 | 45,1 | 45,26 | 45,39 |
| | | 1,68 | 57,28 | 57,11 | 57,28 | 57,45 | 57,62 | 57,79 | 58,0 | 58,13 | 58,31 |
| | 3 | 0,07 | 22,81 | 22,18 | 22,81 | 23,43 | 24,06 | 24,69 | 25,3 | 25,96 | 26,62 |
| | | 0,14 | 32,19 | 31,31 | 32,19 | 33,08 | 33,96 | 34,85 | 35,7 | 36,64 | 37,57 |
| | | 0,31 | 50,76 | 49,36 | 50,76 | 52,15 | 53,55 | 54,94 | 56,3 | 57,77 | 59,24 |
| | | 0,65 | 71,62 | 69,65 | 71,62 | 73,59 | 75,56 | 77,52 | 79,5 | 81,51 | 83,58 |
| | | 1,03 | 86,92 | 84,53 | 86,92 | 89,31 | 91,69 | 94,08 | 96,5 | 98,92 | 101,43 |
| | | 1,68 | 111,95 | 108,87 | 111,95 | 115,03 | 118,10 | 121,18 | 124,3 | 127,41 | 130,65 |
| 3340/11S | 1,5 | 0,07 | 17,48 | 16,56 | 17,48 | 18,41 | 19,33 | 20,25 | 21,2 | 22,14 | 23,14 |
| | | 0,14 | 24,43 | 23,14 | 24,43 | 25,72 | 27,01 | 28,29 | 29,6 | 30,93 | 32,34 |
| | | 0,31 | 38,08 | 36,07 | 38,08 | 40,09 | 42,10 | 44,11 | 46,1 | 48,21 | 50,41 |
| | | 0,65 | 52,93 | 50,14 | 52,93 | 55,72 | 58,51 | 61,30 | 64,1 | 67,01 | 70,06 |
| | | 1,03 | 63,95 | 60,58 | 63,95 | 67,32 | 70,69 | 74,06 | 77,4 | 80,96 | 84,65 |
| | | 1,68 | 79,99 | 75,78 | 79,99 | 84,21 | 88,43 | 92,65 | 96,9 | 101,28 | 105,89 |
| | 3 | 0,07 | 28,01 | 26,26 | 28,01 | 29,75 | 31,50 | 33,24 | 35,0 | 36,82 | 38,75 |
| | | 0,14 | 39,25 | 36,80 | 39,25 | 41,69 | 44,13 | 46,58 | 49,0 | 51,59 | 54,30 |
| | | 0,31 | 61,01 | 57,21 | 61,01 | 64,81 | 68,61 | 72,41 | 76,2 | 80,20 | 84,41 |
| | | 0,65 | 84,56 | 79,29 | 84,56 | 89,82 | 95,09 | 100,35 | 105,6 | 111,16 | 116,99 |
| | | 1,03 | 102,04 | 95,69 | 102,04 | 108,39 | 114,75 | 121,10 | 127,5 | 134,14 | 141,18 |
| | | 1,68 | 127,73 | 119,77 | 127,73 | 135,68 | 143,64 | 151,59 | 159,5 | 167,91 | 176,72 |

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

TABLE 28C : Correction factor for evaporator temperature different from nominal value

| Evaporator temperature [°C] | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|-----|------|
| -40 | -30 | -20 | -15 | -10 | -5 | 0 | 4,4 | 10 |
| 1,12 | 1,08 | 1,05 | 1,04 | 1,03 | 1,02 | 1,01 | 1 | 0,99 |

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TABLE 29A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 11,30 | 10,61 | 9,87 | 9,19 | 8,50 | 8,06 | 7,62 | 6,95 | 6,27 |
| | | 0,14 | 16,16 | 15,20 | 14,15 | 13,19 | 12,23 | 11,59 | 10,94 | 9,95 | 8,96 |
| | | 0,31 | 26,31 | 24,64 | 22,83 | 21,16 | 19,48 | 18,14 | 16,79 | 15,55 | 14,30 |
| | | 0,65 | 37,42 | 35,08 | 32,55 | 30,21 | 27,86 | 25,94 | 24,00 | 22,17 | 20,33 |
| | | 1,03 | 46,04 | 43,21 | 40,14 | 37,31 | 34,46 | 32,08 | 29,68 | 27,35 | 25,00 |
| | | 1,68 | 62,48 | 58,40 | 53,99 | 49,90 | 45,79 | 42,63 | 39,45 | 36,42 | 33,38 |
| | 3 | 0,07 | 22,15 | 21,52 | 19,77 | 19,14 | 18,45 | 17,64 | 16,76 | 15,81 | 14,80 |
| | | 0,14 | 31,76 | 30,83 | 28,30 | 27,36 | 26,33 | 25,21 | 24,00 | 22,63 | 21,17 |
| | | 0,31 | 52,00 | 50,22 | 45,85 | 44,07 | 42,12 | 40,07 | 37,86 | 35,75 | 33,51 |
| | | 0,65 | 74,00 | 71,40 | 65,12 | 62,52 | 59,68 | 56,86 | 53,81 | 50,79 | 47,58 |
| | | 1,03 | 91,29 | 88,00 | 80,19 | 76,90 | 73,31 | 69,94 | 66,29 | 62,55 | 58,57 |
| | | 1,68 | 120,77 | 116,30 | 105,84 | 101,36 | 96,47 | 92,37 | 87,92 | 82,97 | 77,71 |
| 3340/5 3340/5S | 1,5 | 0,07 | 18,83 | 17,69 | 16,45 | 15,32 | 14,17 | 13,44 | 12,70 | 11,58 | 10,45 |
| | | 0,14 | 26,93 | 25,33 | 23,59 | 21,99 | 20,38 | 19,31 | 18,24 | 16,59 | 14,93 |
| | | 0,31 | 43,85 | 41,07 | 38,05 | 35,27 | 32,47 | 30,23 | 27,99 | 25,92 | 23,84 |
| | | 0,65 | 62,36 | 58,46 | 54,25 | 50,35 | 46,43 | 43,23 | 40,00 | 36,95 | 33,88 |
| | | 1,03 | 76,73 | 72,02 | 66,90 | 62,19 | 57,44 | 53,47 | 49,47 | 45,58 | 41,67 |
| | | 1,68 | 104,14 | 97,33 | 89,98 | 83,17 | 76,32 | 71,05 | 65,75 | 60,71 | 55,63 |
| | 3 | 0,07 | 36,91 | 35,86 | 32,95 | 31,91 | 30,75 | 29,40 | 27,94 | 26,35 | 24,67 |
| | | 0,14 | 52,94 | 51,38 | 47,16 | 45,60 | 43,89 | 42,02 | 40,00 | 37,71 | 35,29 |
| | | 0,31 | 86,67 | 83,70 | 76,41 | 73,45 | 70,20 | 66,79 | 63,10 | 59,59 | 55,86 |
| | | 0,65 | 123,33 | 119,00 | 108,53 | 104,20 | 99,46 | 94,76 | 89,68 | 84,65 | 79,31 |
| | | 1,03 | 152,15 | 146,67 | 133,64 | 128,17 | 122,18 | 116,57 | 110,49 | 104,25 | 97,62 |
| | | 1,68 | 201,29 | 193,83 | 176,39 | 168,93 | 160,78 | 153,95 | 146,53 | 138,28 | 129,52 |
| 3340/7S | 1,5 | 0,07 | 28,72 | 28,08 | 27,66 | 27,02 | 26,18 | 25,92 | 25,54 | 24,27 | 22,84 |
| | | 0,14 | 40,68 | 39,83 | 39,28 | 38,43 | 37,29 | 36,92 | 36,35 | 34,47 | 32,34 |
| | | 0,31 | 65,85 | 64,14 | 62,93 | 61,22 | 59,00 | 57,39 | 55,38 | 53,46 | 51,26 |
| | | 0,65 | 91,91 | 89,64 | 88,06 | 85,79 | 82,83 | 80,55 | 77,71 | 74,83 | 71,53 |
| | | 1,03 | 111,82 | 109,20 | 107,41 | 104,79 | 101,34 | 98,54 | 95,04 | 91,29 | 87,00 |
| | | 1,68 | 149,30 | 145,06 | 142,00 | 137,76 | 132,34 | 128,71 | 124,17 | 119,50 | 114,16 |
| | 3 | 0,07 | 45,07 | 45,08 | 45,42 | 45,43 | 45,11 | 44,34 | 43,22 | 41,84 | 40,20 |
| | | 0,14 | 64,02 | 63,96 | 64,37 | 64,31 | 63,77 | 62,76 | 61,27 | 59,30 | 56,95 |
| | | 0,31 | 104,06 | 103,33 | 103,44 | 102,71 | 101,15 | 98,91 | 95,86 | 92,91 | 89,39 |
| | | 0,65 | 145,90 | 144,72 | 144,73 | 143,55 | 141,17 | 138,25 | 134,20 | 130,02 | 125,03 |
| | | 1,03 | 177,91 | 176,28 | 176,13 | 174,50 | 171,39 | 168,07 | 163,40 | 158,25 | 152,10 |
| | | 1,68 | 230,21 | 227,79 | 227,32 | 224,90 | 220,54 | 217,05 | 211,92 | 205,27 | 197,33 |

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

Continued

TABLE 29A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 59,14 | 55,56 | 51,68 | 48,10 | 44,51 | 42,20 | 39,88 | 36,36 | 32,82 |
| | | 0,14 | 84,57 | 79,54 | 74,08 | 69,05 | 64,00 | 60,65 | 57,28 | 52,11 | 46,90 |
| | | 0,31 | 137,72 | 128,98 | 119,52 | 110,78 | 101,98 | 94,96 | 87,89 | 81,40 | 74,87 |
| | | 0,65 | 195,86 | 183,62 | 170,37 | 158,14 | 145,83 | 135,76 | 125,64 | 116,05 | 106,41 |
| | | 1,03 | 241,00 | 226,19 | 210,12 | 195,31 | 180,40 | 167,92 | 155,37 | 143,16 | 130,87 |
| | | 1,68 | 327,08 | 305,69 | 282,61 | 261,21 | 239,69 | 223,15 | 206,51 | 190,66 | 174,72 |
| | 3 | 0,07 | 115,93 | 112,64 | 103,50 | 100,21 | 96,57 | 92,34 | 87,75 | 82,77 | 77,49 |
| | | 0,14 | 166,26 | 161,37 | 148,12 | 143,23 | 137,85 | 131,99 | 125,62 | 118,45 | 110,83 |
| | | 0,31 | 272,20 | 262,88 | 240,00 | 230,68 | 220,48 | 209,77 | 198,19 | 187,15 | 175,43 |
| | | 0,65 | 387,36 | 373,75 | 340,88 | 327,28 | 312,39 | 297,63 | 281,66 | 265,86 | 249,08 |
| | | 1,03 | 477,86 | 460,66 | 419,74 | 402,54 | 383,74 | 366,10 | 347,01 | 327,41 | 306,60 |
| | | 1,68 | 632,19 | 608,76 | 554,00 | 530,56 | 504,98 | 483,51 | 460,21 | 434,30 | 406,78 |
| 3340/11S | 1,5 | 0,07 | 88,08 | 86,12 | 84,82 | 82,87 | 80,27 | 79,50 | 78,32 | 74,44 | 70,05 |
| | | 0,14 | 124,76 | 122,15 | 120,45 | 117,85 | 114,35 | 113,21 | 111,46 | 105,70 | 99,17 |
| | | 0,31 | 201,93 | 196,69 | 192,98 | 187,74 | 180,95 | 176,00 | 169,83 | 163,96 | 157,20 |
| | | 0,65 | 281,85 | 274,89 | 270,05 | 263,09 | 254,00 | 247,02 | 238,30 | 229,47 | 219,34 |
| | | 1,03 | 342,92 | 334,88 | 329,39 | 321,35 | 310,77 | 302,17 | 291,45 | 279,94 | 266,79 |
| | | 1,68 | 457,86 | 444,86 | 435,46 | 422,46 | 405,85 | 394,70 | 380,77 | 366,48 | 350,09 |
| | 3 | 0,07 | 138,21 | 138,24 | 139,29 | 139,32 | 138,34 | 135,96 | 132,53 | 128,31 | 123,29 |
| | | 0,14 | 196,34 | 196,15 | 197,41 | 197,22 | 195,56 | 192,46 | 187,89 | 181,84 | 174,64 |
| | | 0,31 | 319,11 | 316,88 | 317,22 | 314,99 | 310,18 | 303,34 | 293,98 | 284,94 | 274,14 |
| | | 0,65 | 447,42 | 443,80 | 443,84 | 440,22 | 432,94 | 423,97 | 411,55 | 398,73 | 383,43 |
| | | 1,03 | 545,59 | 540,59 | 540,12 | 535,12 | 525,59 | 515,41 | 501,11 | 485,29 | 466,44 |
| | | 1,68 | 705,98 | 698,57 | 697,12 | 689,70 | 676,33 | 665,63 | 649,87 | 629,48 | 605,16 |

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

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TABLE 29B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 2,08 | 2,07 | 2,08 | 2,08 | 2,09 | 2,10 | 2,10 | 2,11 | 2,11 |
| | | 0,14 | 2,94 | 2,93 | 2,94 | 2,95 | 2,96 | 2,97 | 2,98 | 2,99 | 3,00 |
| | | 0,31 | 4,64 | 4,62 | 4,64 | 4,65 | 4,66 | 4,68 | 4,69 | 4,70 | 4,72 |
| | | 0,65 | 6,54 | 6,52 | 6,54 | 6,55 | 6,57 | 6,59 | 6,61 | 6,63 | 6,65 |
| | | 1,03 | 7,97 | 7,95 | 7,97 | 8,00 | 8,02 | 8,04 | 8,07 | 8,09 | 8,11 |
| | 1,68 | 10,24 | 10,21 | 10,24 | 10,27 | 10,30 | 10,33 | 10,36 | 10,39 | 10,42 | |
| | 3 | 0,07 | 4,26 | 4,14 | 4,26 | 4,38 | 4,49 | 4,61 | 4,73 | 4,85 | 4,97 |
| | | 0,14 | 6,04 | 5,87 | 6,04 | 6,20 | 6,37 | 6,54 | 6,70 | 6,87 | 7,05 |
| | | 0,31 | 9,52 | 9,26 | 9,52 | 9,78 | 10,04 | 10,31 | 10,57 | 10,84 | 11,11 |
| | | 0,65 | 13,40 | 13,03 | 13,40 | 13,77 | 14,14 | 14,51 | 14,87 | 15,25 | 15,64 |
| 1,03 | | 16,35 | 15,90 | 16,35 | 16,80 | 17,25 | 17,70 | 18,15 | 18,61 | 19,08 | |
| 1,68 | 21,01 | 20,43 | 21,01 | 21,59 | 22,16 | 22,74 | 23,32 | 23,91 | 24,52 | | |
| 3340/5 3340/5S | 1,5 | 0,07 | 3,46 | 3,45 | 3,46 | 3,47 | 3,48 | 3,49 | 3,50 | 3,51 | 3,52 |
| | | 0,14 | 4,90 | 4,89 | 4,90 | 4,92 | 4,93 | 4,95 | 4,96 | 4,98 | 4,99 |
| | | 0,31 | 7,73 | 7,70 | 7,73 | 7,75 | 7,77 | 7,80 | 7,82 | 7,84 | 7,86 |
| | | 0,65 | 10,89 | 10,86 | 10,89 | 10,92 | 10,96 | 10,99 | 11,02 | 11,05 | 11,09 |
| | | 1,03 | 13,29 | 13,25 | 13,29 | 13,33 | 13,37 | 13,41 | 13,45 | 13,49 | 13,52 |
| | 1,68 | 17,06 | 17,01 | 17,06 | 17,11 | 17,16 | 17,21 | 17,26 | 17,31 | 17,37 | |
| | 3 | 0,07 | 7,10 | 6,90 | 7,10 | 7,29 | 7,49 | 7,68 | 7,88 | 8,08 | 8,28 |
| | | 0,14 | 10,06 | 9,79 | 10,06 | 10,34 | 10,62 | 10,89 | 11,17 | 11,45 | 11,74 |
| | | 0,31 | 15,87 | 15,43 | 15,87 | 16,30 | 16,74 | 17,18 | 17,61 | 18,06 | 18,52 |
| | | 0,65 | 22,33 | 21,72 | 22,33 | 22,95 | 23,56 | 24,18 | 24,79 | 25,42 | 26,06 |
| 1,03 | | 27,25 | 26,51 | 27,25 | 28,00 | 28,75 | 29,50 | 30,25 | 31,02 | 31,81 | |
| 1,68 | 35,01 | 34,05 | 35,01 | 35,98 | 36,94 | 37,90 | 38,86 | 39,85 | 40,86 | | |
| 3340/7S | 1,5 | 0,07 | 5,80 | 5,49 | 5,80 | 6,11 | 6,41 | 6,72 | 7,02 | 7,34 | 7,68 |
| | | 0,14 | 8,14 | 7,71 | 8,14 | 8,57 | 9,00 | 9,43 | 9,86 | 10,31 | 10,78 |
| | | 0,31 | 12,74 | 12,07 | 12,74 | 13,41 | 14,08 | 14,75 | 15,43 | 16,13 | 16,86 |
| | | 0,65 | 17,63 | 16,70 | 17,63 | 18,56 | 19,49 | 20,42 | 21,35 | 22,32 | 23,34 |
| | | 1,03 | 21,27 | 20,15 | 21,27 | 22,39 | 23,51 | 24,63 | 25,76 | 26,93 | 28,15 |
| | 1,68 | 26,84 | 25,43 | 26,84 | 28,26 | 29,67 | 31,09 | 32,50 | 33,98 | 35,53 | |
| | 3 | 0,07 | 9,51 | 8,92 | 9,51 | 10,11 | 10,70 | 11,29 | 11,88 | 12,51 | 13,16 |
| | | 0,14 | 13,36 | 12,53 | 13,36 | 14,19 | 15,02 | 15,85 | 16,69 | 17,56 | 18,48 |
| | | 0,31 | 20,89 | 19,59 | 20,89 | 22,19 | 23,49 | 24,79 | 26,09 | 27,46 | 28,90 |
| | | 0,65 | 28,96 | 27,16 | 28,96 | 30,77 | 32,57 | 34,37 | 36,18 | 38,08 | 40,07 |
| 1,03 | | 34,93 | 32,76 | 34,93 | 37,11 | 39,28 | 41,46 | 43,63 | 45,92 | 48,33 | |
| 1,68 | 43,88 | 41,15 | 43,88 | 46,62 | 49,35 | 52,08 | 54,82 | 57,69 | 60,72 | | |

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) | | |

Continued

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

TABLE 29B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|-------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 10,87 | 10,84 | 10,87 | 10,90 | 10,94 | 10,97 | 11,0 | 11,03 | 11,07 |
| | | 0,14 | 15,40 | 15,36 | 15,40 | 15,45 | 15,50 | 15,54 | 15,6 | 15,63 | 15,68 |
| | | 0,31 | 24,27 | 24,19 | 24,27 | 24,34 | 24,41 | 24,48 | 24,6 | 24,63 | 24,70 |
| | | 0,65 | 34,21 | 34,11 | 34,21 | 34,31 | 34,41 | 34,52 | 34,6 | 34,72 | 34,82 |
| | | 1,03 | 41,73 | 41,61 | 41,73 | 41,86 | 41,98 | 42,10 | 42,2 | 42,35 | 42,48 |
| | | 1,68 | 53,58 | 53,42 | 53,58 | 53,74 | 53,90 | 54,06 | 54,2 | 54,38 | 54,54 |
| | 3 | 0,07 | 22,29 | 21,68 | 22,29 | 22,90 | 23,52 | 24,13 | 24,7 | 25,37 | 26,02 |
| | | 0,14 | 31,60 | 30,74 | 31,60 | 32,47 | 33,34 | 34,21 | 35,1 | 35,97 | 36,88 |
| | | 0,31 | 49,83 | 48,46 | 49,83 | 51,20 | 52,57 | 53,94 | 55,3 | 56,72 | 58,16 |
| | | 0,65 | 70,14 | 68,22 | 70,14 | 72,07 | 74,00 | 75,93 | 77,9 | 79,83 | 81,86 |
| | | 1,03 | 85,60 | 83,25 | 85,60 | 87,95 | 90,31 | 92,66 | 95,0 | 97,42 | 99,90 |
| | | 1,68 | 109,97 | 106,95 | 109,97 | 113,00 | 116,02 | 119,04 | 122,1 | 125,16 | 128,34 |
| 3340/11S | 1,5 | 0,07 | 17,79 | 16,85 | 17,79 | 18,73 | 19,66 | 20,60 | 21,5 | 22,52 | 23,55 |
| | | 0,14 | 24,97 | 23,66 | 24,97 | 26,29 | 27,61 | 28,92 | 30,2 | 31,62 | 33,06 |
| | | 0,31 | 39,07 | 37,01 | 39,07 | 41,13 | 43,19 | 45,25 | 47,3 | 49,46 | 51,71 |
| | | 0,65 | 54,06 | 51,21 | 54,06 | 56,91 | 59,77 | 62,62 | 65,5 | 68,45 | 71,56 |
| | | 1,03 | 65,23 | 61,79 | 65,23 | 68,67 | 72,10 | 75,54 | 79,0 | 82,58 | 86,34 |
| | | 1,68 | 82,32 | 77,98 | 82,32 | 86,66 | 91,00 | 95,34 | 99,7 | 104,22 | 108,96 |
| | 3 | 0,07 | 29,18 | 27,36 | 29,18 | 30,99 | 32,81 | 34,63 | 36,4 | 38,36 | 40,37 |
| | | 0,14 | 40,97 | 38,41 | 40,97 | 43,52 | 46,07 | 48,62 | 51,2 | 53,85 | 56,68 |
| | | 0,31 | 64,06 | 60,07 | 64,06 | 68,05 | 72,04 | 76,03 | 80,0 | 84,21 | 88,63 |
| | | 0,65 | 88,82 | 83,29 | 88,82 | 94,35 | 99,88 | 105,41 | 110,9 | 116,77 | 122,89 |
| | | 1,03 | 107,12 | 100,45 | 107,12 | 113,80 | 120,47 | 127,14 | 133,8 | 140,83 | 148,22 |
| | | 1,68 | 134,58 | 126,20 | 134,58 | 142,96 | 151,34 | 159,72 | 168,1 | 176,92 | 186,20 |

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

TABLE 29C : Correction factor for evaporator temperature different from nominal value

| Evaporator temperature [°C] | | | | | | | | |
|-----------------------------|------|------|-----|------|------|------|-----|------|
| -40 | -30 | -20 | -15 | -10 | -5 | 0 | 4,4 | 10 |
| 1,26 | 1,19 | 1,13 | 1,1 | 1,07 | 1,05 | 1,02 | 1 | 0,98 |

TABLE 30A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 16,01 | 15,08 | 14,08 | 13,15 | 12,22 | 11,52 | 10,82 | 9,92 | 9,02 |
| | | 0,14 | 23,06 | 21,75 | 20,31 | 19,00 | 17,68 | 16,52 | 15,35 | 14,11 | 12,85 |
| | | 0,31 | 36,67 | 34,37 | 31,87 | 29,56 | 27,24 | 25,65 | 24,04 | 22,24 | 20,44 |
| | | 0,65 | 52,65 | 49,38 | 45,84 | 42,58 | 39,29 | 36,67 | 34,03 | 31,54 | 29,04 |
| | | 1,03 | 65,41 | 61,41 | 57,07 | 53,06 | 49,04 | 45,37 | 41,69 | 38,71 | 35,71 |
| | | 1,68 | 90,55 | 83,88 | 76,76 | 70,09 | 63,38 | 59,02 | 54,62 | 50,52 | 46,40 |
| | 3 | 0,07 | 30,94 | 29,86 | 27,24 | 26,16 | 24,97 | 23,90 | 22,73 | 21,65 | 20,50 |
| | | 0,14 | 44,23 | 42,71 | 38,99 | 37,48 | 35,82 | 34,21 | 32,47 | 30,86 | 29,16 |
| | | 0,31 | 70,70 | 67,89 | 61,59 | 58,78 | 55,71 | 53,36 | 50,81 | 48,36 | 45,75 |
| | | 0,65 | 100,68 | 96,74 | 87,84 | 83,90 | 79,62 | 76,11 | 72,32 | 68,70 | 64,85 |
| | | 1,03 | 124,02 | 119,26 | 108,37 | 103,61 | 98,41 | 93,92 | 89,05 | 84,43 | 79,51 |
| | | 1,68 | 164,06 | 157,56 | 142,98 | 136,49 | 129,42 | 123,12 | 116,32 | 110,26 | 103,82 |
| 3340/5 3340/5S | 1,5 | 0,07 | 26,61 | 25,07 | 23,53 | 21,98 | 20,43 | 19,26 | 18,08 | 16,58 | 15,08 |
| | | 0,14 | 38,33 | 36,14 | 33,95 | 31,76 | 29,55 | 27,61 | 25,66 | 23,58 | 21,48 |
| | | 0,31 | 60,96 | 57,11 | 53,27 | 49,42 | 45,54 | 42,87 | 40,19 | 37,18 | 34,16 |
| | | 0,65 | 87,52 | 82,06 | 76,63 | 71,18 | 65,68 | 61,29 | 56,88 | 52,72 | 48,54 |
| | | 1,03 | 108,73 | 102,04 | 95,39 | 88,70 | 81,97 | 75,85 | 69,69 | 64,71 | 59,70 |
| | | 1,68 | 150,53 | 139,38 | 128,31 | 117,16 | 105,95 | 98,65 | 91,31 | 84,45 | 77,56 |
| | 3 | 0,07 | 50,28 | 48,39 | 46,68 | 44,79 | 42,74 | 40,86 | 38,84 | 36,99 | 35,03 |
| | | 0,14 | 71,87 | 69,23 | 66,82 | 64,18 | 61,29 | 58,50 | 55,49 | 52,74 | 49,83 |
| | | 0,31 | 114,93 | 110,04 | 105,55 | 100,66 | 95,34 | 91,25 | 86,84 | 82,65 | 78,19 |
| | | 0,65 | 163,66 | 156,81 | 150,54 | 143,69 | 136,24 | 130,16 | 123,59 | 117,41 | 110,83 |
| | | 1,03 | 201,60 | 193,30 | 185,72 | 177,42 | 168,41 | 160,60 | 152,18 | 144,28 | 135,89 |
| | | 1,68 | 266,69 | 255,38 | 245,04 | 233,74 | 221,47 | 210,55 | 198,78 | 188,43 | 177,42 |
| 3340/7S | 1,5 | 0,07 | 36,90 | 36,21 | 35,78 | 35,08 | 34,13 | 33,61 | 32,90 | 31,45 | 29,81 |
| | | 0,14 | 52,80 | 51,86 | 51,29 | 50,36 | 49,06 | 47,88 | 46,39 | 44,44 | 42,20 |
| | | 0,31 | 83,13 | 81,03 | 79,57 | 77,47 | 74,74 | 73,50 | 71,82 | 69,28 | 66,35 |
| | | 0,65 | 117,75 | 114,91 | 112,95 | 110,10 | 106,38 | 103,70 | 100,31 | 96,93 | 93,03 |
| | | 1,03 | 144,15 | 140,83 | 138,57 | 135,24 | 130,85 | 126,48 | 121,13 | 117,25 | 112,77 |
| | | 1,68 | 197,40 | 189,76 | 183,85 | 176,21 | 166,83 | 162,27 | 156,57 | 150,96 | 144,52 |
| | 3 | 0,07 | 59,19 | 58,72 | 58,74 | 58,27 | 57,33 | 56,38 | 55,00 | 53,77 | 52,26 |
| | | 0,14 | 83,85 | 83,26 | 83,35 | 82,76 | 81,49 | 80,00 | 77,88 | 75,98 | 73,68 |
| | | 0,31 | 132,79 | 130,95 | 130,28 | 128,44 | 125,43 | 123,49 | 120,61 | 117,83 | 114,42 |
| | | 0,65 | 185,23 | 182,82 | 182,03 | 179,62 | 175,60 | 172,56 | 168,18 | 163,98 | 158,87 |
| | | 1,03 | 226,03 | 223,29 | 222,49 | 219,75 | 215,06 | 210,95 | 205,16 | 199,66 | 193,00 |
| | | 1,68 | 294,35 | 290,35 | 288,93 | 284,93 | 278,35 | 272,19 | 263,77 | 256,63 | 248,02 |

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) | | |

Continued

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

TABLE 30A : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 83,58 | 78,73 | 73,90 | 69,05 | 64,16 | 60,49 | 56,79 | 52,08 | 47,35 |
| | | 0,14 | 120,39 | 113,49 | 106,64 | 99,74 | 92,81 | 86,72 | 80,60 | 74,06 | 67,47 |
| | | 0,31 | 191,47 | 179,36 | 167,32 | 155,21 | 143,02 | 134,64 | 126,21 | 116,78 | 107,29 |
| | | 0,65 | 274,88 | 257,73 | 240,69 | 223,54 | 206,29 | 192,50 | 178,63 | 165,58 | 152,44 |
| | | 1,03 | 341,50 | 320,49 | 299,61 | 278,60 | 257,46 | 238,22 | 218,86 | 203,23 | 187,49 |
| | | 1,68 | 472,78 | 437,77 | 402,98 | 367,97 | 332,75 | 309,83 | 286,77 | 265,24 | 243,59 |
| | 3 | 0,07 | 157,91 | 151,99 | 146,60 | 140,68 | 134,22 | 128,34 | 121,99 | 116,18 | 110,01 |
| | | 0,14 | 225,74 | 217,43 | 209,88 | 201,57 | 192,51 | 183,74 | 174,27 | 165,65 | 156,49 |
| | | 0,31 | 360,98 | 345,59 | 331,52 | 316,13 | 299,43 | 286,61 | 272,73 | 259,58 | 245,59 |
| | | 0,65 | 514,01 | 492,49 | 472,81 | 451,28 | 427,90 | 408,81 | 388,18 | 368,75 | 348,07 |
| | | 1,03 | 633,16 | 607,11 | 583,30 | 557,24 | 528,93 | 504,42 | 477,95 | 453,16 | 426,79 |
| | | 1,68 | 837,61 | 802,10 | 769,62 | 734,11 | 695,57 | 661,28 | 624,33 | 591,81 | 557,24 |
| 3340/11S | 1,5 | 0,07 | 113,17 | 111,05 | 109,71 | 107,59 | 104,68 | 103,08 | 100,89 | 96,46 | 91,41 |
| | | 0,14 | 161,92 | 159,05 | 157,30 | 154,43 | 150,44 | 146,84 | 142,27 | 136,27 | 129,43 |
| | | 0,31 | 254,94 | 248,51 | 244,00 | 237,57 | 229,20 | 225,40 | 220,25 | 212,44 | 203,47 |
| | | 0,65 | 361,10 | 352,38 | 346,37 | 337,65 | 326,23 | 318,01 | 307,62 | 297,25 | 285,28 |
| | | 1,03 | 442,07 | 431,88 | 424,95 | 414,75 | 401,29 | 387,87 | 371,48 | 359,58 | 345,83 |
| | | 1,68 | 605,37 | 581,93 | 563,82 | 540,38 | 511,62 | 497,63 | 480,15 | 462,95 | 443,20 |
| | 3 | 0,07 | 181,50 | 180,08 | 180,14 | 178,71 | 175,80 | 172,90 | 168,68 | 164,90 | 160,26 |
| | | 0,14 | 257,13 | 255,32 | 255,60 | 253,79 | 249,90 | 245,33 | 238,83 | 233,02 | 225,94 |
| | | 0,31 | 407,23 | 401,59 | 399,52 | 393,88 | 384,65 | 378,69 | 369,88 | 361,34 | 350,89 |
| | | 0,65 | 568,04 | 560,66 | 558,22 | 550,84 | 538,52 | 529,19 | 515,75 | 502,87 | 487,22 |
| | | 1,03 | 693,17 | 684,76 | 682,31 | 673,90 | 659,52 | 646,92 | 629,17 | 612,28 | 591,88 |
| | | 1,68 | 902,68 | 890,41 | 886,05 | 873,78 | 853,60 | 834,71 | 808,89 | 787,00 | 760,59 |

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

TABLE 30B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/4 3340/4S 3340/M12S | 1,5 | 0,07 | 16,01 | 15,08 | 14,08 | 13,15 | 12,22 | 11,52 | 10,82 | 9,92 | 9,02 |
| | | 0,14 | 23,06 | 21,75 | 20,31 | 19,00 | 17,68 | 16,52 | 15,35 | 14,11 | 12,85 |
| | | 0,31 | 36,67 | 34,37 | 31,87 | 29,56 | 27,24 | 25,65 | 24,04 | 22,24 | 20,44 |
| | | 0,65 | 52,65 | 49,38 | 45,84 | 42,58 | 39,29 | 36,67 | 34,03 | 31,54 | 29,04 |
| | | 1,03 | 65,41 | 61,41 | 57,07 | 53,06 | 49,04 | 45,37 | 41,69 | 38,71 | 35,71 |
| | | 1,68 | 90,55 | 83,88 | 76,76 | 70,09 | 63,38 | 59,02 | 54,62 | 50,52 | 46,40 |
| | 3 | 0,07 | 30,94 | 29,86 | 27,24 | 26,16 | 24,97 | 23,90 | 22,73 | 21,65 | 20,50 |
| | | 0,14 | 44,23 | 42,71 | 38,99 | 37,48 | 35,82 | 34,21 | 32,47 | 30,86 | 29,16 |
| | | 0,31 | 70,70 | 67,89 | 61,59 | 58,78 | 55,71 | 53,36 | 50,81 | 48,36 | 45,75 |
| | | 0,65 | 100,68 | 96,74 | 87,84 | 83,90 | 79,62 | 76,11 | 72,32 | 68,70 | 64,85 |
| | | 1,03 | 124,02 | 119,26 | 108,37 | 103,61 | 98,41 | 93,92 | 89,05 | 84,43 | 79,51 |
| | | 1,68 | 164,06 | 157,56 | 142,98 | 136,49 | 129,42 | 123,12 | 116,32 | 110,26 | 103,82 |
| 3340/5 3340/5S | 1,5 | 0,07 | 26,61 | 25,07 | 23,53 | 21,98 | 20,43 | 19,26 | 18,08 | 16,58 | 15,08 |
| | | 0,14 | 38,33 | 36,14 | 33,95 | 31,76 | 29,55 | 27,61 | 25,66 | 23,58 | 21,48 |
| | | 0,31 | 60,96 | 57,11 | 53,27 | 49,42 | 45,54 | 42,87 | 40,19 | 37,18 | 34,16 |
| | | 0,65 | 87,52 | 82,06 | 76,63 | 71,18 | 65,68 | 61,29 | 56,88 | 52,72 | 48,54 |
| | | 1,03 | 108,73 | 102,04 | 95,39 | 88,70 | 81,97 | 75,85 | 69,69 | 64,71 | 59,70 |
| | | 1,68 | 150,53 | 139,38 | 128,31 | 117,16 | 105,95 | 98,65 | 91,31 | 84,45 | 77,56 |
| | 3 | 0,07 | 50,28 | 48,39 | 46,68 | 44,79 | 42,74 | 40,86 | 38,84 | 36,99 | 35,03 |
| | | 0,14 | 71,87 | 69,23 | 66,82 | 64,18 | 61,29 | 58,50 | 55,49 | 52,74 | 49,83 |
| | | 0,31 | 114,93 | 110,04 | 105,55 | 100,66 | 95,34 | 91,25 | 86,84 | 82,65 | 78,19 |
| | | 0,65 | 163,66 | 156,81 | 150,54 | 143,69 | 136,24 | 130,16 | 123,59 | 117,41 | 110,83 |
| | | 1,03 | 201,60 | 193,30 | 185,72 | 177,42 | 168,41 | 160,60 | 152,18 | 144,28 | 135,89 |
| | | 1,68 | 266,69 | 255,38 | 245,04 | 233,74 | 221,47 | 210,55 | 198,78 | 188,43 | 177,42 |
| 3340/7S | 1,5 | 0,07 | 36,90 | 36,21 | 35,78 | 35,08 | 34,13 | 33,61 | 32,90 | 31,45 | 29,81 |
| | | 0,14 | 52,80 | 51,86 | 51,29 | 50,36 | 49,06 | 47,88 | 46,39 | 44,44 | 42,20 |
| | | 0,31 | 83,13 | 81,03 | 79,57 | 77,47 | 74,74 | 73,50 | 71,82 | 69,28 | 66,35 |
| | | 0,65 | 117,75 | 114,91 | 112,95 | 110,10 | 106,38 | 103,70 | 100,31 | 96,93 | 93,03 |
| | | 1,03 | 144,15 | 140,83 | 138,57 | 135,24 | 130,85 | 126,48 | 121,13 | 117,25 | 112,77 |
| | | 1,68 | 197,40 | 189,76 | 183,85 | 176,21 | 166,83 | 162,27 | 156,57 | 150,96 | 144,52 |
| | 3 | 0,07 | 59,19 | 58,72 | 58,74 | 58,27 | 57,33 | 56,38 | 55,00 | 53,77 | 52,26 |
| | | 0,14 | 83,85 | 83,26 | 83,35 | 82,76 | 81,49 | 80,00 | 77,88 | 75,98 | 73,68 |
| | | 0,31 | 132,79 | 130,95 | 130,28 | 128,44 | 125,43 | 123,49 | 120,61 | 117,83 | 114,42 |
| | | 0,65 | 185,23 | 182,82 | 182,03 | 179,62 | 175,60 | 172,56 | 168,18 | 163,98 | 158,87 |
| | | 1,03 | 226,03 | 223,29 | 222,49 | 219,75 | 215,06 | 210,95 | 205,16 | 199,66 | 193,00 |
| | | 1,68 | 294,35 | 290,35 | 288,93 | 284,93 | 278,35 | 272,19 | 263,77 | 256,63 | 248,02 |

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

Continued

TABLE 30B : Refrigerant Flow Capacity of condensing pressure regulators 3340 [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3340/9S 3340/M28S | 1,5 | 0,07 | 83,58 | 78,73 | 73,90 | 69,05 | 64,16 | 60,49 | 56,79 | 52,08 | 47,35 |
| | | 0,14 | 120,39 | 113,49 | 106,64 | 99,74 | 92,81 | 86,72 | 80,60 | 74,06 | 67,47 |
| | | 0,31 | 191,47 | 179,36 | 167,32 | 155,21 | 143,02 | 134,64 | 126,21 | 116,78 | 107,29 |
| | | 0,65 | 274,88 | 257,73 | 240,69 | 223,54 | 206,29 | 192,50 | 178,63 | 165,58 | 152,44 |
| | | 1,03 | 341,50 | 320,49 | 299,61 | 278,60 | 257,46 | 238,22 | 218,86 | 203,23 | 187,49 |
| | | 1,68 | 472,78 | 437,77 | 402,98 | 367,97 | 332,75 | 309,83 | 286,77 | 265,24 | 243,59 |
| | 3 | 0,07 | 157,91 | 151,99 | 146,60 | 140,68 | 134,22 | 128,34 | 121,99 | 116,18 | 110,01 |
| | | 0,14 | 225,74 | 217,43 | 209,88 | 201,57 | 192,51 | 183,74 | 174,27 | 165,65 | 156,49 |
| | | 0,31 | 360,98 | 345,59 | 331,52 | 316,13 | 299,43 | 286,61 | 272,73 | 259,58 | 245,59 |
| | | 0,65 | 514,01 | 492,49 | 472,81 | 451,28 | 427,90 | 408,81 | 388,18 | 368,75 | 348,07 |
| | | 1,03 | 633,16 | 607,11 | 583,30 | 557,24 | 528,93 | 504,42 | 477,95 | 453,16 | 426,79 |
| | | 1,68 | 837,61 | 802,10 | 769,62 | 734,11 | 695,57 | 661,28 | 624,33 | 591,81 | 557,24 |
| 3340/11S | 1,5 | 0,07 | 113,17 | 111,05 | 109,71 | 107,59 | 104,68 | 103,08 | 100,89 | 96,46 | 91,41 |
| | | 0,14 | 161,92 | 159,05 | 157,30 | 154,43 | 150,44 | 146,84 | 142,27 | 136,27 | 129,43 |
| | | 0,31 | 254,94 | 248,51 | 244,00 | 237,57 | 229,20 | 225,40 | 220,25 | 212,44 | 203,47 |
| | | 0,65 | 361,10 | 352,38 | 346,37 | 337,65 | 326,23 | 318,01 | 307,62 | 297,25 | 285,28 |
| | | 1,03 | 442,07 | 431,88 | 424,95 | 414,75 | 401,29 | 387,87 | 371,48 | 359,58 | 345,83 |
| | | 1,68 | 605,37 | 581,93 | 563,82 | 540,38 | 511,62 | 497,63 | 480,15 | 462,95 | 443,20 |
| | 3 | 0,07 | 181,50 | 180,08 | 180,14 | 178,71 | 175,80 | 172,90 | 168,68 | 164,90 | 160,26 |
| | | 0,14 | 257,13 | 255,32 | 255,60 | 253,79 | 249,90 | 245,33 | 238,83 | 233,02 | 225,94 |
| | | 0,31 | 407,23 | 401,59 | 399,52 | 393,88 | 384,65 | 378,69 | 369,88 | 361,34 | 350,89 |
| | | 0,65 | 568,04 | 560,66 | 558,22 | 550,84 | 538,52 | 529,19 | 515,75 | 502,87 | 487,22 |
| | | 1,03 | 693,17 | 684,76 | 682,31 | 673,90 | 659,52 | 646,92 | 629,17 | 612,28 | 591,88 |
| | | 1,68 | 902,68 | 890,41 | 886,05 | 873,78 | 853,60 | 834,71 | 808,89 | 787,00 | 760,59 |

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

TABLE 30C : Correction factor for evaporator temperature different from nominal value

| Evaporator temperature [°C] | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|-----|------|
| -40 | -30 | -20 | -15 | -10 | -5 | 0 | 4,4 | 10 |
| 1,18 | 1,13 | 1,09 | 1,07 | 1,05 | 1,03 | 1,02 | 1 | 0,98 |

TABLE 31A : Refrigerant Flow Capacity of condensing pressure regulators 3345 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3345/4S 3345/M12S | 1,5 | 0,07 | 18,87 | 17,73 | 16,49 | 15,35 | 14,20 | 13,46 | 12,72 | 11,60 | 10,47 |
| | | 0,14 | 26,98 | 25,38 | 23,63 | 22,03 | 20,42 | 19,35 | 18,28 | 16,62 | 14,96 |
| | | 0,31 | 43,94 | 41,15 | 38,13 | 35,34 | 32,53 | 30,29 | 28,04 | 25,97 | 23,89 |
| | | 0,65 | 62,49 | 58,58 | 54,35 | 50,45 | 46,52 | 43,31 | 40,08 | 37,03 | 33,95 |
| | | 1,03 | 76,89 | 72,16 | 67,04 | 62,31 | 57,55 | 53,57 | 49,57 | 45,67 | 41,75 |
| | | 1,68 | 104,35 | 97,52 | 90,16 | 83,34 | 76,47 | 71,19 | 65,88 | 60,83 | 55,74 |
| | 3 | 0,07 | 36,98 | 35,93 | 33,02 | 31,97 | 30,81 | 29,46 | 27,99 | 26,41 | 24,72 |
| | | 0,14 | 53,04 | 51,48 | 47,25 | 45,70 | 43,98 | 42,11 | 40,08 | 37,79 | 35,36 |
| | | 0,31 | 86,84 | 83,87 | 76,57 | 73,59 | 70,34 | 66,92 | 63,23 | 59,71 | 55,97 |
| | | 0,65 | 123,58 | 119,24 | 108,75 | 104,41 | 99,66 | 94,95 | 89,86 | 84,82 | 79,47 |
| | | 1,03 | 152,45 | 146,97 | 133,91 | 128,42 | 122,43 | 116,80 | 110,71 | 104,45 | 97,81 |
| | | 1,68 | 201,69 | 194,21 | 176,74 | 169,27 | 161,10 | 154,25 | 146,82 | 138,56 | 129,78 |
| | 5 | 0,07 | 61,64 | 59,89 | 55,03 | 53,28 | 51,35 | 49,10 | 46,66 | 44,01 | 41,20 |
| | | 0,14 | 88,40 | 85,81 | 78,76 | 76,16 | 73,30 | 70,18 | 66,80 | 62,98 | 58,93 |
| | | 0,31 | 144,74 | 139,78 | 127,61 | 122,66 | 117,23 | 111,54 | 105,38 | 99,51 | 93,28 |
| | | 0,65 | 205,97 | 198,73 | 181,25 | 174,02 | 166,11 | 158,26 | 149,76 | 141,36 | 132,44 |
| | | 1,03 | 254,09 | 244,94 | 223,18 | 214,04 | 204,04 | 194,66 | 184,51 | 174,09 | 163,02 |
| | | 1,68 | 336,15 | 323,69 | 294,57 | 282,11 | 268,51 | 257,09 | 244,71 | 230,93 | 216,29 |
| | 7 | 0,07 | 86,30 | 83,85 | 77,04 | 74,59 | 71,89 | 68,74 | 65,32 | 61,62 | 57,68 |
| | | 0,14 | 123,76 | 120,13 | 110,26 | 106,62 | 102,62 | 98,25 | 93,51 | 88,18 | 82,50 |
| | | 0,31 | 202,63 | 195,69 | 178,66 | 171,72 | 164,12 | 156,15 | 147,53 | 139,32 | 130,59 |
| | | 0,65 | 288,35 | 278,23 | 253,75 | 243,63 | 232,55 | 221,56 | 209,67 | 197,91 | 185,42 |
| | | 1,03 | 355,72 | 342,92 | 312,46 | 299,65 | 285,66 | 272,53 | 258,32 | 243,73 | 228,23 |
| | | 1,68 | 470,61 | 453,16 | 412,40 | 394,96 | 375,91 | 359,93 | 342,59 | 323,30 | 302,81 |
| 3345/5S | 1,5 | 0,07 | 31,44 | 29,54 | 27,48 | 25,58 | 23,67 | 22,44 | 21,20 | 19,33 | 17,45 |
| | | 0,14 | 44,97 | 42,29 | 39,39 | 36,72 | 34,03 | 32,25 | 30,46 | 27,71 | 24,94 |
| | | 0,31 | 73,23 | 68,58 | 63,55 | 58,90 | 54,22 | 50,49 | 46,74 | 43,28 | 39,81 |
| | | 0,65 | 104,14 | 97,64 | 90,59 | 84,08 | 77,54 | 72,19 | 66,80 | 61,71 | 56,58 |
| | | 1,03 | 128,15 | 120,27 | 111,73 | 103,85 | 95,92 | 89,29 | 82,61 | 76,12 | 69,59 |
| | | 1,68 | 173,92 | 162,54 | 150,27 | 138,89 | 127,45 | 118,65 | 109,81 | 101,38 | 92,90 |
| | 3 | 0,07 | 61,64 | 59,89 | 55,03 | 53,28 | 51,35 | 49,10 | 46,66 | 44,01 | 41,20 |
| | | 0,14 | 88,40 | 85,81 | 78,76 | 76,16 | 73,30 | 70,18 | 66,80 | 62,98 | 58,93 |
| | | 0,31 | 144,74 | 139,78 | 127,61 | 122,66 | 117,23 | 111,54 | 105,38 | 99,51 | 93,28 |
| | | 0,65 | 205,97 | 198,73 | 181,25 | 174,02 | 166,11 | 158,26 | 149,76 | 141,36 | 132,44 |
| | | 1,03 | 254,09 | 244,94 | 223,18 | 214,04 | 204,04 | 194,66 | 184,51 | 174,09 | 163,02 |
| | | 1,68 | 336,15 | 323,69 | 294,57 | 282,11 | 268,51 | 257,09 | 244,71 | 230,93 | 216,29 |

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

Continued

TABLE 31A : Refrigerant Flow Capacity of condensing pressure regulators 3345 [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3345/5S | 5 | 0,07 | 102,73 | 99,82 | 91,72 | 88,80 | 85,58 | 81,83 | 77,76 | 73,35 | 68,67 |
| | | 0,14 | 147,34 | 143,01 | 131,26 | 126,93 | 122,16 | 116,97 | 111,33 | 104,97 | 98,22 |
| | | 0,31 | 241,23 | 232,97 | 212,69 | 204,43 | 195,39 | 185,89 | 175,64 | 165,86 | 155,47 |
| | | 0,65 | 343,28 | 331,22 | 302,09 | 290,03 | 276,84 | 263,76 | 249,61 | 235,61 | 220,74 |
| | | 1,03 | 423,48 | 408,24 | 371,97 | 356,73 | 340,07 | 324,44 | 307,52 | 290,15 | 271,71 |
| | | 1,68 | 560,25 | 539,48 | 490,96 | 470,19 | 447,51 | 428,49 | 407,84 | 384,88 | 360,49 |
| | 7 | 0,07 | 143,83 | 139,75 | 128,41 | 124,32 | 119,82 | 114,56 | 108,87 | 102,70 | 96,14 |
| | | 0,14 | 206,27 | 200,21 | 183,77 | 177,71 | 171,03 | 163,75 | 155,86 | 146,96 | 137,51 |
| | | 0,31 | 337,72 | 326,15 | 297,76 | 286,20 | 273,54 | 260,25 | 245,89 | 232,20 | 217,65 |
| | | 0,65 | 480,59 | 463,71 | 422,92 | 406,05 | 387,58 | 369,26 | 349,45 | 329,85 | 309,03 |
| | | 1,03 | 592,87 | 571,53 | 520,76 | 499,42 | 476,10 | 454,22 | 430,53 | 406,21 | 380,39 |
| | | 1,68 | 784,35 | 755,27 | 687,34 | 658,26 | 626,52 | 599,88 | 570,98 | 538,83 | 504,69 |
| 3345/7S | 1,5 | 0,07 | 44,52 | 43,53 | 42,87 | 41,88 | 40,57 | 40,18 | 39,58 | 37,63 | 35,41 |
| | | 0,14 | 63,06 | 61,74 | 60,88 | 59,57 | 57,80 | 57,22 | 56,34 | 53,42 | 50,13 |
| | | 0,31 | 102,06 | 99,41 | 97,54 | 94,89 | 91,46 | 88,96 | 85,84 | 82,87 | 79,45 |
| | | 0,65 | 142,46 | 138,94 | 136,49 | 132,97 | 128,38 | 124,85 | 120,45 | 115,98 | 110,86 |
| | | 1,03 | 173,32 | 169,26 | 166,49 | 162,42 | 157,07 | 152,73 | 147,31 | 141,49 | 134,84 |
| | | 1,68 | 231,42 | 224,85 | 220,09 | 213,52 | 205,13 | 199,50 | 192,46 | 185,23 | 176,95 |
| | 3 | 0,07 | 69,86 | 69,87 | 70,40 | 70,42 | 69,92 | 68,72 | 66,98 | 64,85 | 62,32 |
| | | 0,14 | 99,24 | 99,14 | 99,78 | 99,68 | 98,84 | 97,27 | 94,97 | 91,91 | 88,27 |
| | | 0,31 | 161,29 | 160,16 | 160,33 | 159,21 | 156,77 | 153,32 | 148,59 | 144,02 | 138,56 |
| | | 0,65 | 226,14 | 224,31 | 224,33 | 222,50 | 218,82 | 214,29 | 208,01 | 201,53 | 193,80 |
| | | 1,03 | 275,76 | 273,23 | 273,00 | 270,47 | 265,65 | 260,51 | 253,28 | 245,28 | 235,75 |
| | | 1,68 | 356,83 | 353,08 | 352,35 | 348,60 | 341,84 | 336,43 | 328,47 | 318,16 | 305,87 |
| | 5 | 0,07 | 116,43 | 116,45 | 117,34 | 117,36 | 116,54 | 114,53 | 111,64 | 108,09 | 103,86 |
| | | 0,14 | 165,40 | 165,23 | 166,30 | 166,13 | 164,74 | 162,12 | 158,28 | 153,18 | 147,12 |
| | | 0,31 | 268,81 | 266,93 | 267,22 | 265,34 | 261,29 | 255,53 | 247,64 | 240,03 | 230,93 |
| | | 0,65 | 376,90 | 373,85 | 373,89 | 370,84 | 364,70 | 357,15 | 346,69 | 335,89 | 323,00 |
| | | 1,03 | 459,60 | 455,39 | 454,99 | 450,78 | 442,75 | 434,18 | 422,13 | 408,81 | 392,92 |
| | | 1,68 | 594,71 | 588,47 | 587,24 | 581,00 | 569,74 | 560,72 | 547,45 | 530,27 | 509,78 |
| | 7 | 0,07 | 163,00 | 163,04 | 164,27 | 164,31 | 163,15 | 160,35 | 156,30 | 151,33 | 145,41 |
| | | 0,14 | 231,55 | 231,32 | 232,82 | 232,59 | 230,63 | 226,97 | 221,59 | 214,46 | 205,96 |
| | | 0,31 | 376,34 | 373,71 | 374,11 | 371,48 | 365,81 | 357,74 | 346,70 | 336,04 | 323,31 |
| | | 0,65 | 527,66 | 523,39 | 523,44 | 519,17 | 510,58 | 500,01 | 485,36 | 470,24 | 452,20 |
| | | 1,03 | 643,44 | 637,54 | 636,99 | 631,09 | 619,86 | 607,85 | 590,98 | 572,33 | 550,09 |
| | | 1,68 | 832,60 | 823,86 | 822,14 | 813,40 | 797,63 | 785,01 | 766,43 | 742,38 | 713,69 |

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

TABLE 31B : Refrigerant Flow Capacity of condensing pressure regulators 3345 [kW].Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|----------------------|--------------------------------------|--------------------------------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3345/4S 3345/M12S | 1,5 | 0,07 | 3,47 | 3,46 | 3,47 | 3,48 | 3,49 | 3,50 | 3,51 | 3,52 | 3,53 |
| | | 0,14 | 4,91 | 4,90 | 4,91 | 4,93 | 4,94 | 4,96 | 4,97 | 4,99 | 5,00 |
| | | 0,31 | 7,74 | 7,72 | 7,74 | 7,76 | 7,79 | 7,81 | 7,83 | 7,86 | 7,88 |
| | | 0,65 | 10,91 | 10,88 | 10,91 | 10,95 | 10,98 | 11,01 | 11,04 | 11,08 | 11,11 |
| | | 1,03 | 13,31 | 13,27 | 13,31 | 13,35 | 13,39 | 13,43 | 13,47 | 13,51 | 13,55 |
| | | 1,68 | 17,09 | 17,04 | 17,09 | 17,15 | 17,20 | 17,25 | 17,30 | 17,35 | 17,40 |
| | 3 | 0,07 | 7,11 | 6,92 | 7,11 | 7,31 | 7,50 | 7,70 | 7,89 | 8,09 | 8,30 |
| | | 0,14 | 10,08 | 9,81 | 10,08 | 10,36 | 10,64 | 10,91 | 11,19 | 11,48 | 11,77 |
| | | 0,31 | 15,90 | 15,46 | 15,90 | 16,34 | 16,77 | 17,21 | 17,65 | 18,09 | 18,55 |
| | | 0,65 | 22,38 | 21,76 | 22,38 | 22,99 | 23,61 | 24,22 | 24,84 | 25,47 | 26,12 |
| | | 1,03 | 27,31 | 26,56 | 27,31 | 28,06 | 28,81 | 29,56 | 30,31 | 31,08 | 31,87 |
| | | 1,68 | 35,09 | 34,12 | 35,09 | 36,05 | 37,01 | 37,98 | 38,94 | 39,93 | 40,95 |
| | 5 | 0,07 | 11,85 | 11,53 | 11,85 | 12,18 | 12,50 | 12,83 | 13,16 | 13,49 | 13,83 |
| | | 0,14 | 16,80 | 16,34 | 16,80 | 17,27 | 17,73 | 18,19 | 18,65 | 19,13 | 19,61 |
| | | 0,31 | 26,50 | 25,77 | 26,50 | 27,23 | 27,95 | 28,68 | 29,41 | 30,16 | 30,92 |
| | | 0,65 | 37,30 | 36,27 | 37,30 | 38,32 | 39,35 | 40,37 | 41,40 | 42,45 | 43,53 |
| | | 1,03 | 45,52 | 44,26 | 45,52 | 46,77 | 48,02 | 49,27 | 50,52 | 51,80 | 53,12 |
| | | 1,68 | 58,48 | 56,87 | 58,48 | 60,08 | 61,69 | 63,30 | 64,90 | 66,55 | 68,24 |
| | 7 | 0,07 | 16,59 | 16,14 | 16,59 | 17,05 | 17,51 | 17,96 | 18,42 | 18,89 | 19,37 |
| | | 0,14 | 23,53 | 22,88 | 23,53 | 24,17 | 24,82 | 25,47 | 26,11 | 26,78 | 27,46 |
| | | 0,31 | 37,10 | 36,08 | 37,10 | 38,12 | 39,14 | 40,16 | 41,18 | 42,22 | 43,29 |
| | | 0,65 | 52,22 | 50,78 | 52,22 | 53,65 | 55,09 | 56,52 | 57,96 | 59,43 | 60,94 |
| | | 1,03 | 63,72 | 61,97 | 63,72 | 65,47 | 67,22 | 68,98 | 70,73 | 72,52 | 74,37 |
| | | 1,68 | 81,87 | 79,61 | 81,87 | 84,12 | 86,37 | 88,62 | 90,87 | 93,17 | 95,54 |
| 3345/5S | 1,5 | 0,07 | 5,78 | 5,76 | 5,78 | 5,80 | 5,81 | 5,83 | 5,85 | 5,87 | 5,88 |
| | | 0,14 | 8,19 | 8,17 | 8,19 | 8,22 | 8,24 | 8,26 | 8,29 | 8,31 | 8,34 |
| | | 0,31 | 12,90 | 12,86 | 12,90 | 12,94 | 12,98 | 13,02 | 13,06 | 13,10 | 13,13 |
| | | 0,65 | 18,19 | 18,14 | 18,19 | 18,24 | 18,30 | 18,35 | 18,41 | 18,46 | 18,52 |
| | | 1,03 | 22,19 | 22,12 | 22,19 | 22,26 | 22,32 | 22,39 | 22,45 | 22,52 | 22,59 |
| | | 1,68 | 28,49 | 28,41 | 28,49 | 28,58 | 28,66 | 28,74 | 28,83 | 28,91 | 29,00 |
| | 3 | 0,07 | 11,85 | 11,53 | 11,85 | 12,18 | 12,50 | 12,83 | 13,16 | 13,49 | 13,83 |
| | | 0,14 | 16,80 | 16,34 | 16,80 | 17,27 | 17,73 | 18,19 | 18,65 | 19,13 | 19,61 |
| | | 0,31 | 26,50 | 25,77 | 26,50 | 27,23 | 27,95 | 28,68 | 29,41 | 30,16 | 30,92 |
| | | 0,65 | 37,30 | 36,27 | 37,30 | 38,32 | 39,35 | 40,37 | 41,40 | 42,45 | 43,53 |
| | | 1,03 | 45,52 | 44,26 | 45,52 | 46,77 | 48,02 | 49,27 | 50,52 | 51,80 | 53,12 |
| | | 1,68 | 58,48 | 56,87 | 58,48 | 60,08 | 61,69 | 63,30 | 64,90 | 66,55 | 68,24 |

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

Continued

TABLE 31B : Refrigerant Flow Capacity of condensing pressure regulators 3345 [kW].Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | | |
|------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3345/5S | 5 | 0,07 | 19,76 | 19,21 | 19,76 | 20,30 | 20,84 | 21,38 | 21,93 | 22,48 | 23,05 |
| | | 0,14 | 28,01 | 27,24 | 28,01 | 28,78 | 29,55 | 30,32 | 31,09 | 31,88 | 32,69 |
| | | 0,31 | 44,16 | 42,95 | 44,16 | 45,38 | 46,59 | 47,81 | 49,02 | 50,26 | 51,54 |
| | | 0,65 | 62,16 | 60,45 | 62,16 | 63,87 | 65,58 | 67,29 | 69,00 | 70,75 | 72,55 |
| | | 1,03 | 75,86 | 73,77 | 75,86 | 77,94 | 80,03 | 82,11 | 84,20 | 86,34 | 88,53 |
| | | 1,68 | 97,46 | 94,78 | 97,46 | 100,14 | 102,82 | 105,49 | 108,17 | 110,92 | 113,74 |
| | 7 | 0,07 | 27,66 | 26,90 | 27,66 | 28,42 | 29,18 | 29,94 | 30,70 | 31,48 | 32,28 |
| | | 0,14 | 39,21 | 38,13 | 39,21 | 40,29 | 41,37 | 42,44 | 43,52 | 44,63 | 45,76 |
| | | 0,31 | 61,83 | 60,13 | 61,83 | 63,53 | 65,23 | 66,93 | 68,63 | 70,37 | 72,16 |
| | | 0,65 | 87,03 | 84,64 | 87,03 | 89,42 | 91,81 | 94,20 | 96,60 | 99,05 | 101,56 |
| | | 1,03 | 106,20 | 103,28 | 106,20 | 109,12 | 112,04 | 114,96 | 117,88 | 120,87 | 123,94 |
| | | 1,68 | 136,44 | 132,69 | 136,44 | 140,19 | 143,94 | 147,69 | 151,44 | 155,29 | 159,23 |
| 3345/7S | 1,5 | 0,07 | 6,67 | 6,32 | 6,67 | 7,02 | 7,37 | 7,73 | 8,08 | 8,45 | 8,83 |
| | | 0,14 | 9,37 | 8,87 | 9,37 | 9,86 | 10,35 | 10,85 | 11,34 | 11,86 | 12,40 |
| | | 0,31 | 14,65 | 13,88 | 14,65 | 15,42 | 16,19 | 16,97 | 17,74 | 18,55 | 19,39 |
| | | 0,65 | 20,27 | 19,21 | 20,27 | 21,34 | 22,41 | 23,48 | 24,55 | 25,67 | 26,84 |
| | | 1,03 | 24,46 | 23,17 | 24,46 | 25,75 | 27,04 | 28,33 | 29,62 | 30,97 | 32,38 |
| | | 1,68 | 30,87 | 29,24 | 30,87 | 32,50 | 34,12 | 35,75 | 37,38 | 39,08 | 40,86 |
| | 3 | 0,07 | 10,94 | 10,26 | 10,94 | 11,62 | 12,30 | 12,99 | 13,67 | 14,38 | 15,14 |
| | | 0,14 | 15,36 | 14,41 | 15,36 | 16,32 | 17,28 | 18,23 | 19,19 | 20,20 | 21,26 |
| | | 0,31 | 24,02 | 22,53 | 24,02 | 25,52 | 27,01 | 28,51 | 30,01 | 31,58 | 33,24 |
| | | 0,65 | 33,31 | 31,23 | 33,31 | 35,38 | 37,46 | 39,53 | 41,60 | 43,79 | 46,09 |
| | | 1,03 | 40,17 | 37,67 | 40,17 | 42,67 | 45,17 | 47,68 | 50,18 | 52,81 | 55,58 |
| | | 1,68 | 50,47 | 47,32 | 50,47 | 53,61 | 56,75 | 59,89 | 63,04 | 66,34 | 69,83 |
| | 5 | 0,07 | 18,24 | 17,10 | 18,24 | 19,37 | 20,51 | 21,64 | 22,78 | 23,97 | 25,23 |
| | | 0,14 | 25,60 | 24,01 | 25,60 | 27,20 | 28,79 | 30,39 | 31,98 | 33,66 | 35,43 |
| | | 0,31 | 40,04 | 37,54 | 40,04 | 42,53 | 45,02 | 47,52 | 50,01 | 52,63 | 55,40 |
| | | 0,65 | 55,51 | 52,06 | 55,51 | 58,97 | 62,43 | 65,88 | 69,34 | 72,98 | 76,81 |
| | | 1,03 | 66,95 | 62,78 | 66,95 | 71,12 | 75,29 | 79,46 | 83,63 | 88,02 | 92,64 |
| | | 1,68 | 84,11 | 78,87 | 84,11 | 89,35 | 94,59 | 99,82 | 105,06 | 110,57 | 116,38 |
| | 7 | 0,07 | 25,53 | 23,94 | 25,53 | 27,12 | 28,71 | 30,30 | 31,89 | 33,56 | 35,32 |
| | | 0,14 | 35,84 | 33,61 | 35,84 | 38,08 | 40,31 | 42,54 | 44,77 | 47,12 | 49,60 |
| | | 0,31 | 56,05 | 52,56 | 56,05 | 59,54 | 63,03 | 66,52 | 70,01 | 73,69 | 77,55 |
| | | 0,65 | 77,72 | 72,88 | 77,72 | 82,56 | 87,40 | 92,24 | 97,08 | 102,17 | 107,53 |
| | | 1,03 | 93,73 | 87,90 | 93,73 | 99,57 | 105,41 | 111,24 | 117,08 | 123,22 | 129,69 |
| | | 1,68 | 117,76 | 110,42 | 117,76 | 125,09 | 132,42 | 139,75 | 147,09 | 154,80 | 162,93 |

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

TABLE 31C : Correction factor for evaporator temperature different from nominal v

| Evaporator temperature [°C] | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|-----|------|
| -40 | -30 | -20 | -15 | -10 | -5 | 0 | 4,4 | 10 |
| 1,17 | 1,12 | 1,08 | 1,06 | 1,04 | 1,02 | 1,01 | 1 | 0,98 |

CHAPTER 6 ■

CONDENSING PRESSURE REGULATORS

FOR REFRIGERATION PLANTS THAT USE THE R744 REFRIGERANT



APPLICATIONS

When designing air conditioning and refrigerating systems that use air cooled condensing units, subject to wide range of ambient temperatures, it is very important to provide accurate condenser capacity control. Since a properly sized condensing unit operates satisfactorily at high ambient temperature, capacity control is needed at low ambient temperatures. Good condensing pressure control during low ambient temperature avoids problems during system operation and facilitates start-up. Specifically, this control maintains a sufficient pressure differential across the thermostatic expansion valve ensuring correct refrigerant feed to the evaporator.

Condensing pressure regulators, together with the differential valves in series 3136, are the solution to this control need. The regulators in series 3345EL restrict the liquid flow from the condenser to the receiver, reducing the active condenser surface and raising the condensing pressure. The differential valve 3136W by-passes hot gas from the compressor discharge to the receiver, raising the liquid pressure in the receiver.

The condensing pressure regulators illustrated in this chapter have been developed by Castel for all the applications that use the sub-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.

CAUTION!: the evaporating pressure regulators in this chapter cannot be used with other refrigerant fluids.

OPERATION

Condensing pressure regulators adjust the flow of the liquid (hot gas) according to changes of condensation pressure (compressor discharge), upstream of the regulator. When the condensation pressure (discharge) is less than the regulator calibration pressure, the shutter remains closed. As the condensation pressure (discharge) rises above the regulator's calibration setting, the shutter begins to open and modulates in proportion to the variation in condensation pressure (discharge). As the condensing pressure (discharge) 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. Condensing 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 3345EL is 12 bar. This means that until the condensation (discharge) pressure is below 12 bar, the regulator remains closed. When it rises above 12 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 2.5 bar in calibration pressure. The calibration range varies from 12 to 36 bar.

CONSTRUCTION

The main parts of regulators in series 3340 and 3345 are manufactured 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

The main parts of the differential valves 3136W 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
- PTFE for seat gaskets

INSTALLATION

Condensing pressure regulators can be mounted in two locations of the refrigerating system:

- In the liquid line between the condenser and the liquid receiver (for regulator selection see Table 34A related to liquid line). Valve 3136W is mounted between the compressor discharge and the inlet of liquid receiver. This choice requires a smaller sized regulator as it is controlling liquid refrigerant. It is most suitable for installations in temperate climates (see installation example 1).
- In the discharge line between the compressor and the condenser (for regulator selection see Table 34B related to the hot gas line). Valve 3136W is mounted between the compressor discharge and the inlet of liquid receiver. A check valve 3132W must be installed between the condenser discharge and receiver inlet to prevent liquid migration during an off cycle. This choice requires a larger sized regulator as it is controlling gaseous refrigerant. It is most suitable for installations in cold climates (see installation example 2).

SELECTION

To correctly select condensing 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 = R744
2. Designed evaporator (system) capacity.
3. Evaporating temperature.
4. Condensing temperature.
5. Allowable condensing pressure change.
6. Allowable pressure drop across the regulator.

The refrigerating capacities indicated in Tables 34A and 34B are calculated as a function of a reference evaporating temperature of -28.9 °C.

With liquid temperatures other than -28.9 °C, the required cooling capacity of regulator is:

$$\frac{Q_{\text{evap}}}{K_{T_{\text{evap}}}} = Q_{\text{valve}}$$

where:

Q_{evap} = Evaporator capacity [kW]

$K_{T_{\text{evap}}}$ = Correction factor for $T_{\text{evap}} \neq -28.9 \text{ °C}$.
(See Table 34C.)

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

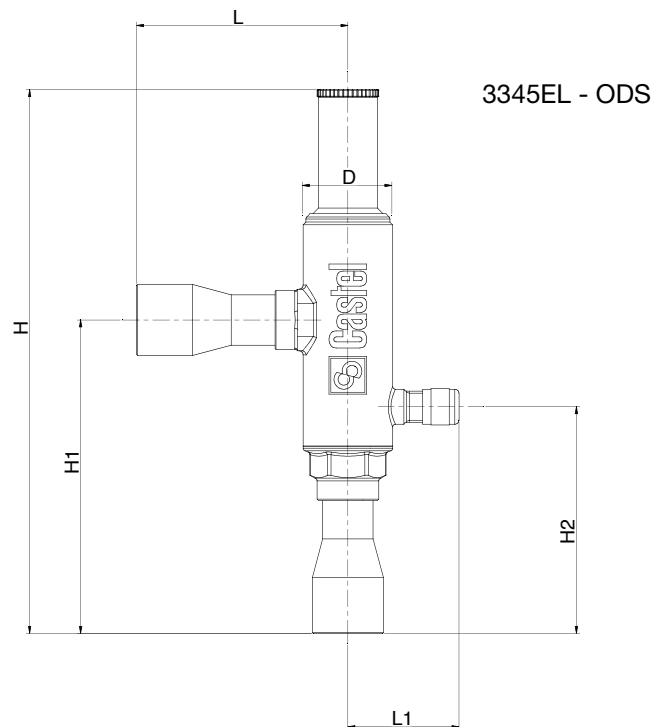


TABLE 32A: General characteristics of condensing pressure regulators for R744

| Catalogue Number | Connections | | | Kv Factor [m ³ /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] | | | | | | | | | | |
| 3345EL/M12S | – | – | 12 | 2,70 | 12 | 36 | 12 | 45 | – 40 | +120 | – 40 | +50 | Art. 4.3 |
| 3345EL/4S | – | 1/2" | – | | | | | | | | | | |
| 3345EL/5S | – | 5/8" | 16 | | | | | | | | | | |
| 3345EL/7S | – | 7/8" | 22 | | | | | | | | | | |

TABLE 33: Dimensions and weights of condensing pressure regulators for R744

| Catalogue Number | Dimensions [mm] | | | | | | | | Weight [g] |
|------------------|-----------------|----------------|----------------|------|----------------|----|-----|-----|------------|
| | H | H ₁ | H ₂ | L | L ₁ | D | Ch1 | Ch2 | |
| 3345EL/M12S | 183 | 100,5 | 69,5 | 64 | 37 | 32 | - | - | 506 |
| 3345EL/4S | 183 | 100,5 | 69,5 | 64 | | | | | 506 |
| 3345EL/5S | 183 | 100,5 | 69,5 | 64 | | | | | 506 |
| 3345EL/7S | 194 | 112 | 81 | 75,5 | | | | | 570 |

TABLE 34A : Refrigerant Flow Capacity of condensing pressure regulators 3345EL [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | |
|--------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| | | | -15 | -10 | -5 | -2,5 | 0 | 2,5 | 5 | 10 |
| 3345EL/4S 3345EL/M12S | 1,5 | 0,07 | 33,07 | 31,63 | 29,72 | 27,64 | 25,73 | 23,81 | 22,57 | 21,33 |
| | | 0,14 | 47,29 | 45,24 | 42,55 | 39,62 | 36,94 | 34,23 | 32,44 | 30,64 |
| | | 0,31 | 77,71 | 73,67 | 68,99 | 63,93 | 59,26 | 54,55 | 50,79 | 47,02 |
| | | 0,65 | 110,51 | 104,77 | 98,22 | 91,13 | 84,59 | 78,00 | 72,62 | 67,20 |
| | | 1,03 | 135,98 | 128,91 | 120,99 | 112,40 | 104,47 | 96,50 | 89,82 | 83,11 |
| | | 1,68 | 184,59 | 174,96 | 163,51 | 151,17 | 139,72 | 128,21 | 119,36 | 110,46 |
| | 3 | 0,07 | 48,20 | 46,51 | 45,19 | 41,52 | 40,20 | 38,74 | 37,04 | 35,20 |
| | | 0,14 | 69,08 | 66,70 | 64,74 | 59,42 | 57,46 | 55,30 | 52,95 | 50,40 |
| | | 0,31 | 113,59 | 109,20 | 105,46 | 96,28 | 92,54 | 88,45 | 84,15 | 79,51 |
| | | 0,65 | 161,55 | 155,40 | 149,94 | 136,75 | 131,30 | 125,33 | 119,40 | 113,00 |
| | | 1,03 | 199,17 | 191,71 | 184,81 | 168,39 | 161,49 | 153,95 | 146,87 | 139,21 |
| | | 1,68 | 263,04 | 253,62 | 244,22 | 222,25 | 212,85 | 202,59 | 193,97 | 184,63 |
| | 5 | 0,07 | 55,427 | 53,483 | 51,965 | 47,749 | 46,231 | 44,555 | 42,601 | 40,483 |
| | | 0,14 | 79,445 | 76,704 | 74,451 | 68,335 | 66,081 | 63,598 | 60,892 | 57,957 |
| | | 0,31 | 130,63 | 125,58 | 121,28 | 110,72 | 106,43 | 101,72 | 96,77 | 91,436 |
| | | 0,65 | 185,78 | 178,71 | 172,43 | 157,27 | 150,99 | 144,12 | 137,31 | 129,94 |
| | | 1,03 | 229,05 | 220,46 | 212,53 | 193,65 | 185,71 | 177,04 | 168,9 | 160,09 |
| | | 1,68 | 302,5 | 291,67 | 280,85 | 255,59 | 244,78 | 232,97 | 223,07 | 212,32 |
| 3345EL/5S | 1,5 | 0,07 | 55,11 | 52,72 | 49,53 | 46,07 | 42,89 | 39,68 | 37,62 | 35,55 |
| | | 0,14 | 78,82 | 75,39 | 70,91 | 66,04 | 61,56 | 57,05 | 54,07 | 51,07 |
| | | 0,31 | 129,51 | 122,78 | 114,98 | 106,55 | 98,76 | 90,92 | 84,66 | 78,36 |
| | | 0,65 | 184,18 | 174,61 | 163,70 | 151,89 | 140,98 | 130,00 | 121,03 | 112,01 |
| | | 1,03 | 226,63 | 214,86 | 201,65 | 187,33 | 174,12 | 160,83 | 149,70 | 138,51 |
| | | 1,68 | 307,65 | 291,60 | 272,52 | 251,95 | 232,87 | 213,68 | 198,94 | 184,11 |
| | 3 | 0,07 | 80,33 | 77,51 | 75,31 | 69,20 | 67,00 | 64,57 | 61,74 | 58,67 |
| | | 0,14 | 115,14 | 111,17 | 107,90 | 99,04 | 95,77 | 92,17 | 88,25 | 84,00 |
| | | 0,31 | 189,32 | 182,00 | 175,77 | 160,47 | 154,24 | 147,42 | 140,26 | 132,52 |
| | | 0,65 | 269,25 | 259,00 | 249,90 | 227,92 | 218,83 | 208,88 | 199,00 | 188,33 |
| | | 1,03 | 331,96 | 319,51 | 308,01 | 280,65 | 269,15 | 256,58 | 244,79 | 232,02 |
| | | 1,68 | 438,40 | 422,70 | 407,03 | 370,42 | 354,75 | 337,64 | 323,29 | 307,71 |
| | 5 | 0,07 | 92,378 | 89,139 | 86,609 | 79,581 | 77,051 | 74,259 | 71,002 | 67,472 |
| | | 0,14 | 132,41 | 127,84 | 124,09 | 113,89 | 110,14 | 106 | 101,49 | 96,595 |
| | | 0,31 | 217,71 | 209,3 | 202,14 | 184,54 | 177,38 | 169,53 | 161,29 | 152,39 |
| | | 0,65 | 309,63 | 297,85 | 287,39 | 262,11 | 251,65 | 240,21 | 228,85 | 216,57 |
| | | 1,03 | 381,75 | 367,44 | 354,21 | 322,75 | 309,52 | 295,07 | 281,51 | 266,82 |
| | | 1,68 | 504,16 | 486,11 | 468,09 | 425,99 | 407,97 | 388,29 | 371,78 | 353,87 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|-------|---------|-----------------------|------|--------|
| Condensing temperature | 30°F | -1,2°C | Suction temperature | -5°F | -15°C |
| Liquid temperature | 20°F | -6,7°C | Superheating | 15°R | 8,4°K |
| Subcooling | 10° R | 5,5°K | | | |
| Evaporating temperature | -20°F | -28,9°C | Discharge temperature | 80°F | 26,6°C |

Continued

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

TABLE 34A : Refrigerant Flow Capacity of condensing pressure regulators 3345EL [kW]. Liquid line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | |
|------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| | | | -15 | -10 | -5 | -2,5 | 0 | 2,5 | 5 | 10 |
| 3345EL/7S | 1,5 | 0,07 | 81,79 | 80,42 | 78,64 | 77,44 | 75,66 | 73,29 | 72,59 | 71,51 |
| | | 0,14 | 115,84 | 113,91 | 111,53 | 109,98 | 107,60 | 104,41 | 103,36 | 101,77 |
| | | 0,31 | 189,89 | 184,37 | 179,58 | 176,20 | 171,41 | 165,21 | 160,70 | 155,06 |
| | | 0,65 | 264,99 | 257,34 | 250,98 | 246,57 | 240,21 | 231,92 | 225,54 | 217,58 |
| | | 1,03 | 322,36 | 313,10 | 305,76 | 300,75 | 293,41 | 283,75 | 275,90 | 266,10 |
| | | 1,68 | 430,84 | 418,04 | 406,17 | 397,59 | 385,72 | 370,56 | 360,38 | 347,66 |
| | 3 | 0,07 | 96,31 | 94,64 | 94,67 | 95,38 | 95,41 | 94,73 | 93,10 | 90,75 |
| | | 0,14 | 136,72 | 134,45 | 134,32 | 135,19 | 135,05 | 133,91 | 131,79 | 128,67 |
| | | 0,31 | 223,55 | 218,52 | 216,99 | 217,23 | 215,70 | 212,40 | 207,72 | 201,31 |
| | | 0,65 | 313,23 | 306,38 | 303,90 | 303,94 | 301,46 | 296,47 | 290,33 | 281,82 |
| | | 1,03 | 381,70 | 373,61 | 370,19 | 369,87 | 366,44 | 359,92 | 352,95 | 343,15 |
| | | 1,68 | 492,87 | 483,44 | 478,37 | 477,37 | 472,30 | 463,14 | 455,81 | 445,02 |
| | 5 | 0,07 | 110,75 | 108,84 | 108,87 | 109,69 | 109,72 | 108,94 | 107,07 | 104,37 |
| | | 0,14 | 157,23 | 154,62 | 154,46 | 155,46 | 155,31 | 154 | 151,56 | 147,97 |
| | | 0,31 | 257,09 | 251,3 | 249,54 | 249,81 | 248,05 | 244,27 | 238,88 | 231,51 |
| | | 0,65 | 360,21 | 352,34 | 349,49 | 349,53 | 346,67 | 340,94 | 333,88 | 324,1 |
| | | 1,03 | 438,96 | 429,65 | 425,72 | 425,35 | 421,41 | 413,9 | 405,89 | 394,62 |
| | | 1,68 | 566,8 | 555,96 | 550,12 | 548,98 | 543,14 | 532,61 | 524,18 | 511,78 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|-------|---------|-----------------------|------|--------|
| Condensing temperature | 30°F | -1,2°C | Suction temperature | -5°F | -15°C |
| Liquid temperature | 20°F | -6,7°C | Superheating | 15°R | 8,4°K |
| Subcooling | 10° R | 5,5°K | Discharge temperature | 80°F | 26,6°C |
| Evaporating temperature | -20°F | -28,9°C | | | |

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

TABLE 34B : Refrigerant Flow Capacity of condensing pressure regulators 3345EL [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | |
|--------------------------|--------------------------------------|--------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| | | | -15 | -10 | -5 | -2,5 | 0 | 2,5 | 5 | 10 |
| 3345EL/4S 3345EL/M12S | 1,5 | 0,07 | 5,78 | 5,81 | 5,80 | 5,81 | 5,83 | 5,85 | 5,87 | 5,88 |
| | | 0,14 | 8,19 | 8,24 | 8,22 | 8,24 | 8,26 | 8,29 | 8,31 | 8,34 |
| | | 0,31 | 12,91 | 12,98 | 12,94 | 12,98 | 13,02 | 13,06 | 13,10 | 13,13 |
| | | 0,65 | 18,20 | 18,30 | 18,24 | 18,30 | 18,35 | 18,41 | 18,46 | 18,52 |
| | | 1,03 | 22,20 | 22,32 | 22,26 | 22,32 | 22,39 | 22,46 | 22,52 | 22,59 |
| | | 1,68 | 28,50 | 28,66 | 28,58 | 28,66 | 28,75 | 28,83 | 28,92 | 29,00 |
| | 3 | 0,07 | 11,32 | 11,92 | 11,60 | 11,92 | 12,25 | 12,58 | 12,91 | 13,24 |
| | | 0,14 | 16,04 | 16,91 | 16,44 | 16,91 | 17,37 | 17,83 | 18,30 | 18,76 |
| | | 0,31 | 25,30 | 26,66 | 25,92 | 26,66 | 27,39 | 28,12 | 28,85 | 29,59 |
| | | 0,65 | 35,61 | 37,52 | 36,49 | 37,52 | 38,55 | 39,58 | 40,61 | 41,65 |
| | | 1,03 | 43,45 | 45,79 | 44,53 | 45,79 | 47,05 | 48,31 | 49,56 | 50,82 |
| | | 1,68 | 55,82 | 58,83 | 57,21 | 58,83 | 60,44 | 62,06 | 63,68 | 65,29 |
| | 5 | 0,07 | 13,013 | 13,713 | 13,336 | 13,713 | 14,09 | 14,466 | 14,843 | 15,22 |
| | | 0,14 | 18,449 | 19,441 | 18,907 | 19,441 | 19,976 | 20,51 | 21,045 | 21,579 |
| | | 0,31 | 29,09 | 30,655 | 29,813 | 30,655 | 31,498 | 32,341 | 33,183 | 34,026 |
| | | 0,65 | 40,946 | 43,149 | 41,963 | 43,149 | 43,335 | 45,521 | 46,707 | 47,893 |
| | | 1,03 | 49,969 | 52,656 | 51,209 | 52,656 | 54,104 | 55,551 | 56,998 | 58,446 |
| | | 1,68 | 64,196 | 67,649 | 65,79 | 67,649 | 69,508 | 71,368 | 73,227 | 75,087 |
| 3345EL/5S | 1,5 | 0,07 | 9,64 | 9,69 | 9,66 | 9,69 | 9,72 | 9,75 | 9,78 | 9,81 |
| | | 0,14 | 13,66 | 13,73 | 13,69 | 13,73 | 13,77 | 13,82 | 13,86 | 13,90 |
| | | 0,31 | 21,51 | 21,63 | 21,57 | 21,63 | 21,70 | 21,76 | 21,83 | 21,89 |
| | | 0,65 | 30,33 | 30,50 | 30,41 | 30,50 | 30,59 | 30,68 | 30,77 | 30,86 |
| | | 1,03 | 37,00 | 37,20 | 37,09 | 37,20 | 37,32 | 37,43 | 37,54 | 37,65 |
| | | 1,68 | 47,51 | 47,77 | 47,63 | 47,77 | 47,91 | 48,05 | 48,20 | 48,34 |
| | 3 | 0,07 | 18,86 | 19,87 | 19,33 | 19,87 | 20,42 | 20,97 | 21,51 | 22,06 |
| | | 0,14 | 26,74 | 28,18 | 27,40 | 28,18 | 28,95 | 29,72 | 30,50 | 31,27 |
| | | 0,31 | 42,16 | 44,43 | 43,21 | 44,43 | 45,65 | 46,87 | 48,09 | 49,31 |
| | | 0,65 | 59,34 | 62,53 | 60,82 | 62,53 | 64,25 | 65,97 | 67,69 | 69,41 |
| | | 1,03 | 72,42 | 76,31 | 74,22 | 76,31 | 78,41 | 80,51 | 82,61 | 84,70 |
| | | 1,68 | 93,04 | 98,04 | 95,35 | 98,04 | 100,74 | 103,43 | 106,13 | 108,82 |
| | 5 | 0,07 | 21,688 | 22,854 | 22,226 | 22,854 | 23,483 | 24,111 | 24,739 | 25,367 |
| | | 0,14 | 30,748 | 32,402 | 31,512 | 32,402 | 33,293 | 34,184 | 35,074 | 35,965 |
| | | 0,31 | 48,484 | 51,092 | 49,688 | 51,092 | 52,497 | 53,901 | 55,305 | 56,710 |
| | | 0,65 | 68,244 | 71,915 | 69,938 | 71,915 | 73,892 | 75,868 | 77,845 | 79,822 |
| | | 1,03 | 83,281 | 87,761 | 85,349 | 87,761 | 90,173 | 92,585 | 94,997 | 97,410 |
| | | 1,68 | 106,99 | 112,75 | 109,65 | 112,75 | 115,85 | 118,95 | 122,05 | 125,14 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|-------|---------|-----------------------|------|--------|
| Condensing temperature | 30°F | -1,2°C | Suction temperature | -5°F | -15°C |
| Liquid temperature | 20°F | -6,7°C | Superheating | 15°R | 8,4°K |
| Subcooling | 10° R | 5,5°K | Discharge temperature | 80°F | 26,6°C |
| Evaporating temperature | -20°F | -28,9°C | | | |

Continued

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

TABLE 34B : Refrigerant Flow Capacity of condensing pressure regulators 3345EL [kW]. Hot gas line

| Catalogue Number | Condensing pressure change [bar] (1) | Pressure drop across regulator [bar] | Condensing temperature [°C] | | | | | | | |
|------------------|--------------------------------------|--------------------------------------|-----------------------------|---------|--------|--------|--------|--------|--------|--------|
| | | | -15 | -10 | -5 | -2,5 | 0 | 2,5 | 5 | 10 |
| 3345EL/7S | 1,5 | 0,07 | 14,65 | 16,24 | 15,39 | 16,24 | 17,10 | 17,95 | 18,81 | 19,67 |
| | | 0,14 | 20,57 | 22,80 | 21,60 | 22,80 | 24,00 | 25,21 | 26,41 | 27,61 |
| | | 0,31 | 32,18 | 35,67 | 33,79 | 35,67 | 37,55 | 39,43 | 41,31 | 43,19 |
| | | 0,65 | 44,53 | 49,36 | 46,76 | 49,36 | 51,97 | 54,57 | 57,17 | 59,77 |
| | | 1,03 | 53,72 | 59,55 | 56,41 | 59,55 | 62,69 | 65,83 | 68,97 | 72,11 |
| | | 1,68 | 67,80 | 75,16 | 71,20 | 75,16 | 79,12 | 83,09 | 87,05 | 91,01 |
| | 3 | 0,07 | 23,56 | 26,64 | 24,98 | 26,64 | 28,30 | 29,96 | 31,62 | 33,27 |
| | | 0,14 | 33,08 | 37,40 | 35,07 | 37,40 | 39,73 | 42,06 | 44,39 | 46,72 |
| | | 0,31 | 51,72 | 58,49 | 54,85 | 58,49 | 62,13 | 65,77 | 69,42 | 73,06 |
| | | 0,65 | 71,72 | 81,10 | 76,05 | 81,10 | 86,15 | 91,20 | 96,25 | 101,30 |
| | | 1,03 | 86,50 | 97,81 | 91,72 | 97,81 | 103,90 | 109,99 | 116,08 | 122,17 |
| | | 1,68 | 108,67 | 122,88 | 115,22 | 122,88 | 130,53 | 138,18 | 145,83 | 153,48 |
| | 5 | 0,07 | 27,093 | 30,635 | 28,728 | 30,635 | 32,543 | 34,451 | 36,359 | 38,266 |
| | | 0,14 | 38,04 | 43,014 | 40,335 | 43,014 | 45,692 | 48,371 | 51,049 | 53,728 |
| | | 0,31 | 59,484 | 67,262 | 63,074 | 67,262 | 71,451 | 75,639 | 79,828 | 84,016 |
| | | 0,65 | 82,477 | 93,263 | 87,455 | 93,263 | 99,07 | 104,88 | 110,69 | 116,49 |
| | | 1,03 | 99,473 | 112,481 | 105,48 | 112,48 | 119,48 | 126,49 | 133,49 | 140,5 |
| | | 1,68 | 124,97 | 141,31 | 132,51 | 141,31 | 150,11 | 158,91 | 167,71 | 176,5 |

Standard rating conditions according to AHRI Standard 770-2014

| | | | | | |
|-------------------------|-------|---------|-----------------------|------|--------|
| Condensing temperature | 30°F | -1,2°C | Suction temperature | -5°F | -15°C |
| Liquid temperature | 20°F | -6,7°C | Superheating | 15°R | 8,4°K |
| Subcooling | 10° R | 5,5°K | Discharge temperature | 80°F | 26,6°C |
| Evaporating temperature | -20°F | -28,9°C | | | |

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

TABLE 34C : Correction factor for evaporator temperature different from nominal value

| Evaporator temperature [°C] | | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 |
| 1,08 | 1,04 | 1,01 | 0,98 | 0,95 | 0,92 | 0,89 | 0,87 | 0,84 | 0,82 |

LIQUID RECEIVER PRESSURE REGULATORS

FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS



APPLICATIONS

Regulator 3350 is used coupled with the regulator 3340, or alternately to the differential valve 3136W. Together, these valves form a regulating system that maintains constant condenser and receiver pressure in plants with heat recovery and air and water condensation. The regulators in series 3340 restrict the liquid flow from the condenser to the receiver, reducing the active condenser surface and raising the condensing pressure. The regulator 3350 by-passes hot gas from the compressor discharge to the receiver, raising the liquid pressure in the receiver.

All receiver 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)

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

Receiver pressure regulators adjust the flow of the hot gas according to changes of liquid receiver pressure,

downstream stream of the regulator. When the receiver pressure is greater than the regulator calibration pressure, the shutter remains closed. As the receiver pressure drops below the regulator's calibration setting, the shutter begins to open and modulates in proportion to the variation in the receiver pressure. As the receiver pressure continues to drop, the shutter continues to open, until the stroke limit is reached and the regulator is open completely. Liquid receiver pressure 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 bellow with an area equal to that of the valve seat

The factory pressure settings for regulators in series 3350 is 8 bar. This means that until the receiver pressure is less than 8 bar, the regulator remains closed. When it drops under 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 2.3 bar in calibration pressure. The calibration range varies from 3 to 20 bar.

CONSTRUCTION

The main parts of regulators in series 3350 are manufactured 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

Condensing pressure regulators 3340 are assembled on the liquid line between the condenser and the liquid receiver. On the other hand, receiver pressure regulator 3350 is assembled in by-pass between the compressor discharge and the liquid receiver inlet.

CERTIFICATIONS

Receiver pressure regulators in series 3350 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.

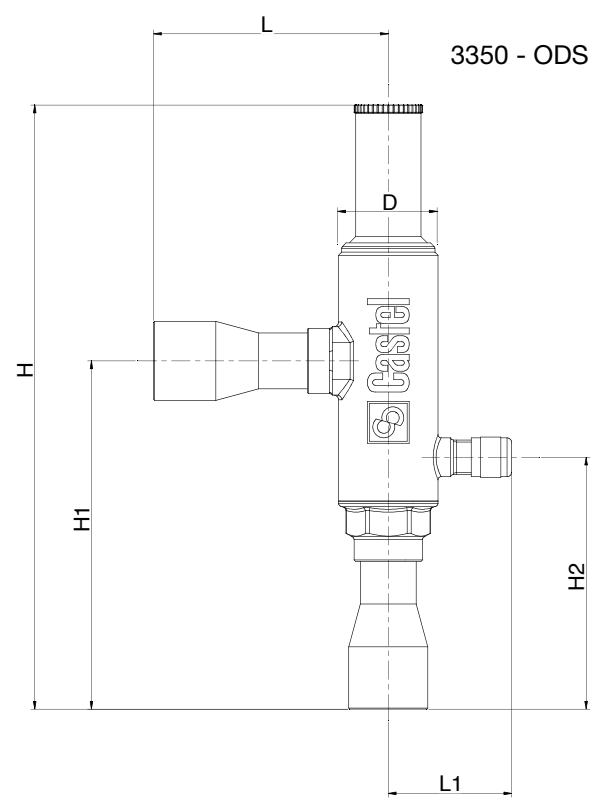
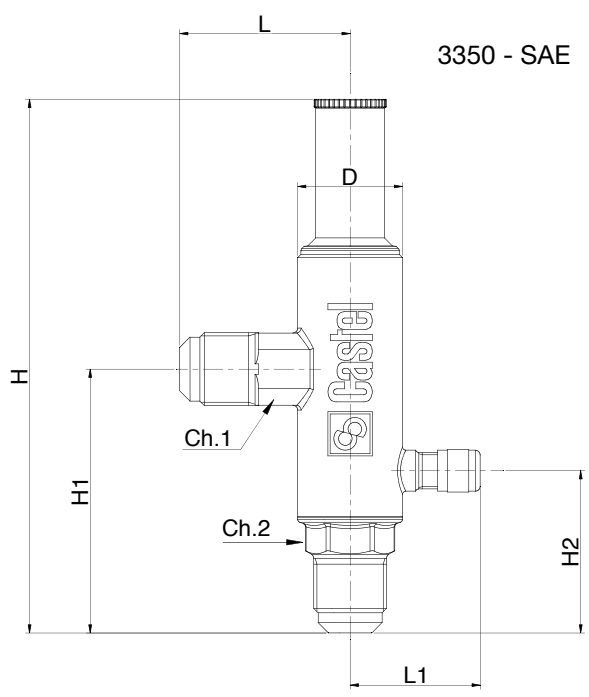
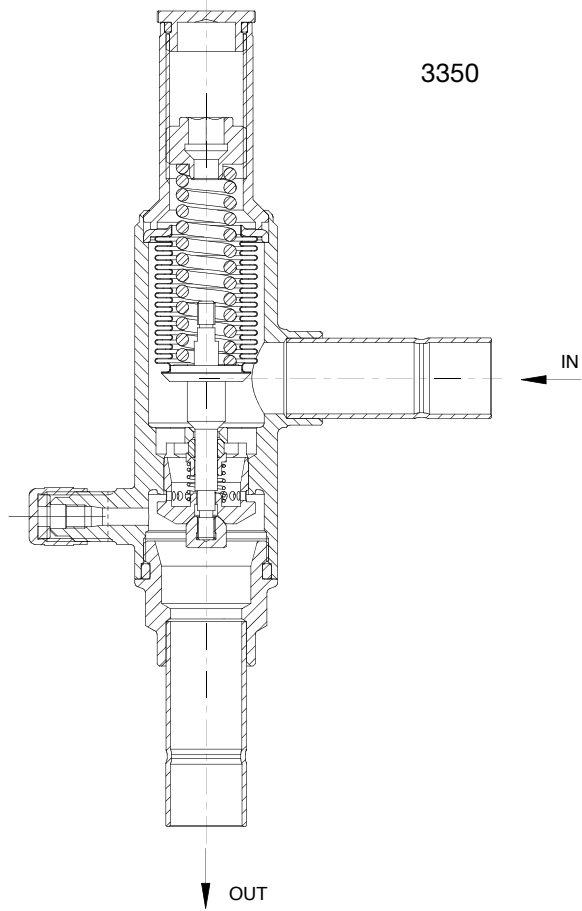


TABLE 35: General characteristics of receiver pressure regulators

| 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] | | | | | | | | | | |
| 3350/4 | 1/2" | – | – | 1,80 | 3 | 20 | 8 | 28 | – 40 | +110 | – 40 | +50 | Art. 43.3 |
| 3350/M12S | – | – | 12 | | | | | | | | | | |
| 3350/4S | – | 1/2" | – | | | | | | | | | | |
| 3350/5 | 5/8" | – | – | | | | | | | | | | |
| 3350/5S | – | 5/8" | 16 | | | | | | | | | | |
| 3350/7S | – | 7/8" | 22 | | | | | | | | | | |

TABLE 36: Dimensions and weights of receiver pressure regulators

| Catalogue Number | Dimensions [mm] | | | | | | | | Weight [g] |
|------------------|-----------------|----------------|----------------|------|----------------|----|-----|-----|------------|
| | H | H ₁ | H ₂ | L | L ₁ | D | Ch1 | Ch2 | |
| 3350/4 | 159 | 76,5 | 45,5 | 48 | 37 | 32 | 22 | 24 | 4902 |
| 3350/M12S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3350/4S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3350/5 | 163 | 80,5 | 49,5 | 52 | | | 22 | 24 | 550 |
| 3350/5S | 183 | 100,5 | 69,5 | 64 | | | - | - | 506 |
| 3350/7S | 194 | 112 | 81 | 75,5 | | | - | - | 570 |

CHAPTER 8

WATER REGULATING VALVES

FOR REFRIGERATION PLANTS THAT USE HCFC OR HFC REFRIGERANTS



APPLICATIONS

Water regulating valves, usually used with condensers fed with either mains or well water, keep the condensation pressure constant at a pre-set value by adjusting the water flow so as to ensure 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 load conditions.

An excessive rise of high pressure affects the refrigerating capacity of the system. On the other hand, lowering the high pressure leads to insufficient refrigerant feed to the evaporator with consequent increased overheating of the gas and a parallel reduction in the gas pressure at the compressor suction.

Castel valves are appropriate for HCFC and HFC refrigerants and only for mains or well water.

OPERATION

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 to close it.

Given a specific spring setting, the valve progressively opens as the condensation pressure increases, and closes when this pressure decreases.

When the compressor stops, the valve closes: water is no longer fed into the condenser, providing significant operating economy.

Valves are calibrated to a pressure of 7.5 bar. This calibration setting can be modified by turning the regulating screw.

There are three reference notches on the spring cover marked with letters A, B and C. Each notch is equivalent to a different spring setting.

- Letter A is equivalent to about 7.5 bar (valid for R134a at a condensation temperature of 30°C)
- Letter B is equivalent to about 14 bar (valid for R404A, R407C and R507 at a condensing temperature of 30°C)
- Letter C is equivalent to about 18 bar (maximum working pressure).

CONSTRUCTION

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

- Hot forged brass EN 12420 – CW 617N for body and cover
- Austenitic stainless steel AISI 303 for the seat
- Nitrile rubber (NBR) for the seat gaskets
- Rubber coated fabric (NBR) for the membranes.

INSTALLATION

The valve must be assembled on the water side of the condenser inlet, preferably vertically, with the bellows downward. The high-pressure connection to the bellows must show no deflection. The arrow on the valve body indicates the water flow direction.

SELECTION

Refrigerating systems with 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 based on the water/refrigerant heat exchange in the condenser: approximately 6 °C above the outlet water temperature, equivalent to 30 °C (with a corresponding saturation pressure) (Fig. 1).
- Refrigeration yield at the evaporator: 18.6 kW under the following conditions: condensation temperature: + 30 °C; evaporation temperature: - 15 °C.

Thermal power to be dispersed at the condenser (see Table 2 for the thermal factor):

$$18.6 \times 1.325 = 24.65 \text{ [kW]}$$

Water flow rate:

$$(24.65 \times 860)/10 = 2120 \text{ l/h} = 2.12 \text{ [m}^3\text{/h]}$$

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 differential available across the water regulating valve is therefore:

$$\Delta p = 3 - 2.5 = 0.5 \text{ bar}$$

At $\Delta p = 0.5 \text{ bar}$, when pressure valve 3210/04 is fully opened, it ensures the required flow rate (Fig. 2).

When the intersection point of the pressure differential across the valve and flow rate falls within the area defined by the curves of two valves, select the valve with larger diameter.

The fully closed pressure of the valve must be equal to the refrigerant saturation pressure at the ambient air temperature at which the condenser is installed. When the valve begins to open, the pressure is about 0,2 bar greater than the fully closed pressure.

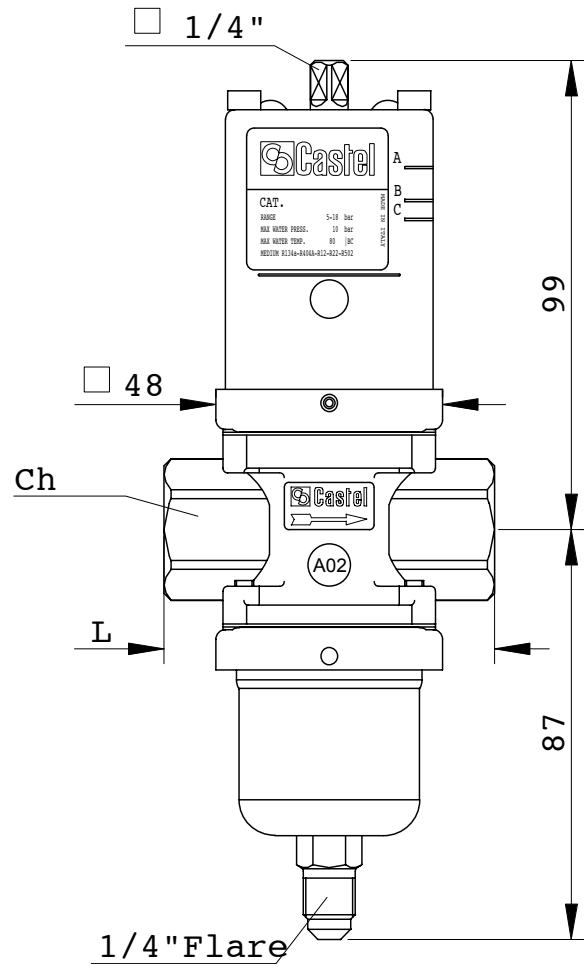


TABLE 37: General characteristic of water regulating valves

| Catalogue Number | Connections UNI ISO 228/1 | Working pressure [bar] | Maximum water pressure [bar] | Maximum water temperature [°C] | Kv Factor [m³/h] | Refrigerant max working pressure [bar] | Ch | L | Weight [g] |
|------------------|---------------------------|------------------------|------------------------------|--------------------------------|------------------|--|----|----|------------|
| 3210/03 | G 3/8" | 5 - 18 | 10 | 80 | 2 | 20 | 27 | 70 | 1015 |
| 3210/04 | G 1/2" | | | | 3 | | | | 985 |
| 3210/06 | G 3/4" | | | | 4,7 | | | | 1010 |

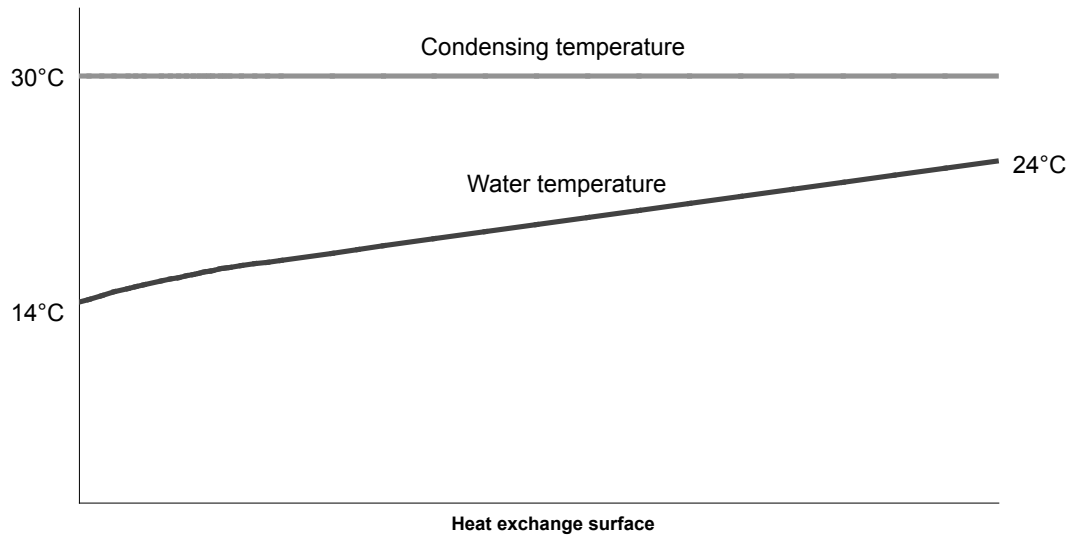


Fig. 1 - Heat exchange pattern in the condenser

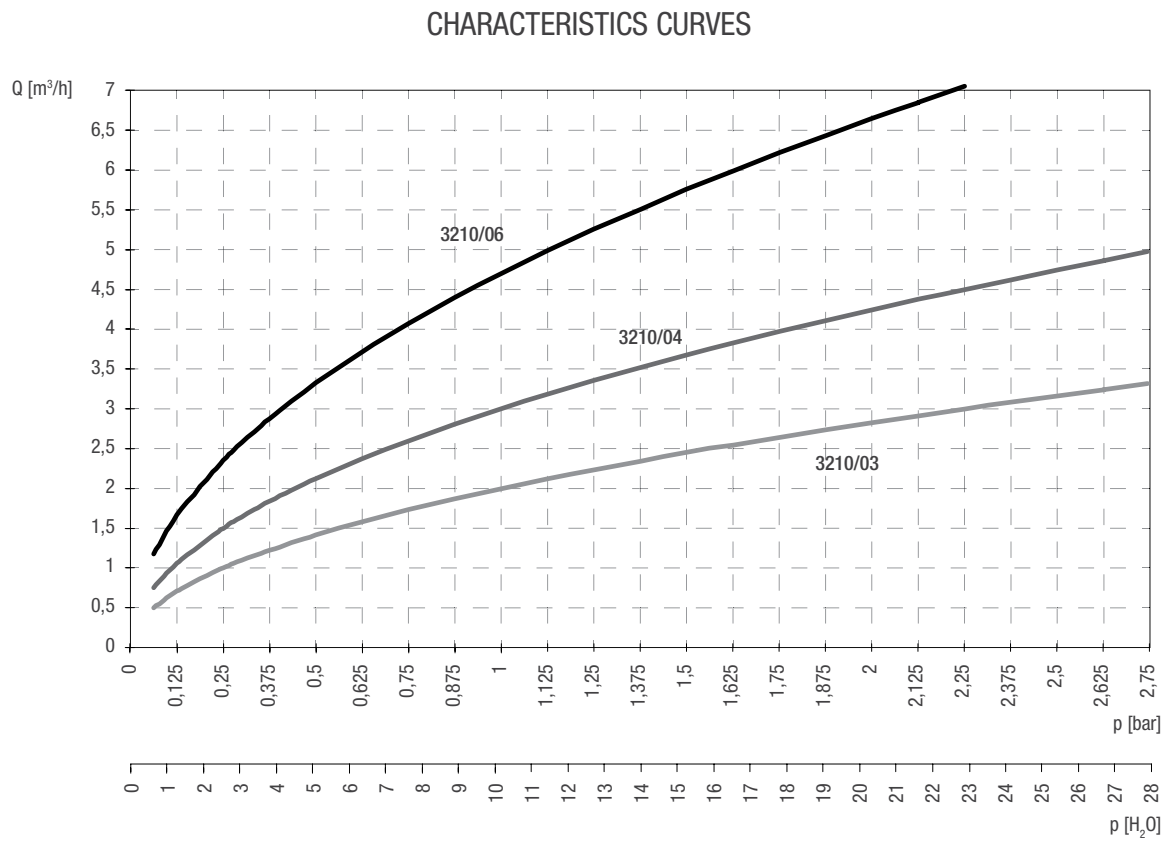


Fig. 2 - Characteristics curves when the valves are completely open

TABLE 38: Thermal factor for hermetic refrigeration compressor. 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 39: Thermal factor for open compressor(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 | 1,530 | 1,441 | 1,396 | 1,350 | 1,306 | 1,265 | 1,224 | 1,185 | 1,152 |
| +45 | - | - | 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 | 1,120 |
| +55 | - | - | - | - | - | 1,426 | 1,369 | 1,320 | 1,274 | 1,228 |
| +60 | - | - | - | - | - | 1,474 | 1,410 | 1,355 | 1,330 | 1,255 |

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