

P  LYHEDRA

— TECHNICAL HANDBOOK



CASTEL

THE COMPANY AND THE PRODUCTS

Castel, a leading supplier of refrigeration and air conditioning components, is a 100% Italian-owned family-run company which has grown and established a name for itself since 1961, thanks to its outstanding pursuit of innovation and unwavering desire to conquer markets not only in Italy, but also abroad.

Mission

Supporting an increase in our customer base with reliable, durable, high quality and technologically advanced products, manufactured with respect for the environment, and supported and improved upon by levels of service that exceed industry standards, in order to consolidate the Castel brand's presence in its existing markets, and make the brand known in emerging ones.

Castel is now present in more than 90 countries on 5 continents. In 2010, Castel opened an associated company in China, "Castel Refrigeration (Shanghai) Co., Ltd", to support development in these countries, creating a logistics and commercial development platform for the entire Asian continent and the Pacific. Recently, an associated company in the United States, "Castel USA, Inc.", was established to support commercial and logistic development in the Americas.

Castel was one of the first Italian companies in the sector to obtain Business Quality System Certification issued by TÜV SÜD according to EN ISO 9001:2015 standard before subsequently receiving certification also for its Environmental Management System from TÜV SÜD according to EN ISO 14001:2015 standard. The company has also obtained several product certifications in conformity with European Directives and Certification Marks (e.g. VDE) and extra-European (e.g. "UL", "EAC") Quality Approvals.

Castel has dedicated constant attention for years to the evolution of the refrigerant market in adapting to international protocols aimed at reducing harmful emissions and global warming. The implementation in the European Union of the so-called F-Gas Regulation and similar legislation in important extra-European nations is leading to a progressive reduction and abandonment of many traditional refrigerants in favor of alternative synthetic or natural refrigerants.

In response to these developments in the market, in recent years Castel has progressively restructured its offer and is now proud to offer to its customers this 2020 Handbook about the line of products:

POLYHEDRA

New products compatible with the widest possible range of refrigerants classified A1, A2L and A3 according to ASHRAE STANDARD 34-2019 # :

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

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REFERENCE STANDARDS

EXTERNAL LEAKAGE

All the products are submitted, one by one, to tightness tests as well as specific functional tests. The allowable external leakage, measurable during the test, complies with the requirements of standards:

- EN 12178:2003 – Refrigerating systems and heat pumps
Liquid-level indicators - Requirements, testing and marking
- EN 12284:2003 – Refrigerating systems and heat pumps
Valves - Requirements, testing and marking
- EN 14276-1:2011 – Pressure equipment for refrigerating systems and heat pumps.
Part 1: Vessels - General requirements
- EN ISO 14903:2017 – Refrigerating systems and heat pumps
Qualification of tightness of components and joints

PRESSURE CONTAINMENT

All the products, if submitted to hydrostatic testing, guarantee a pressure strength at least equal to 1.43 x PS in compliance with Directive 2014/68/EU.

All the products, if submitted to burst testing, guarantee a pressure strength at least equal to 3 x PS in compliance with standard EN 378-2:2016.

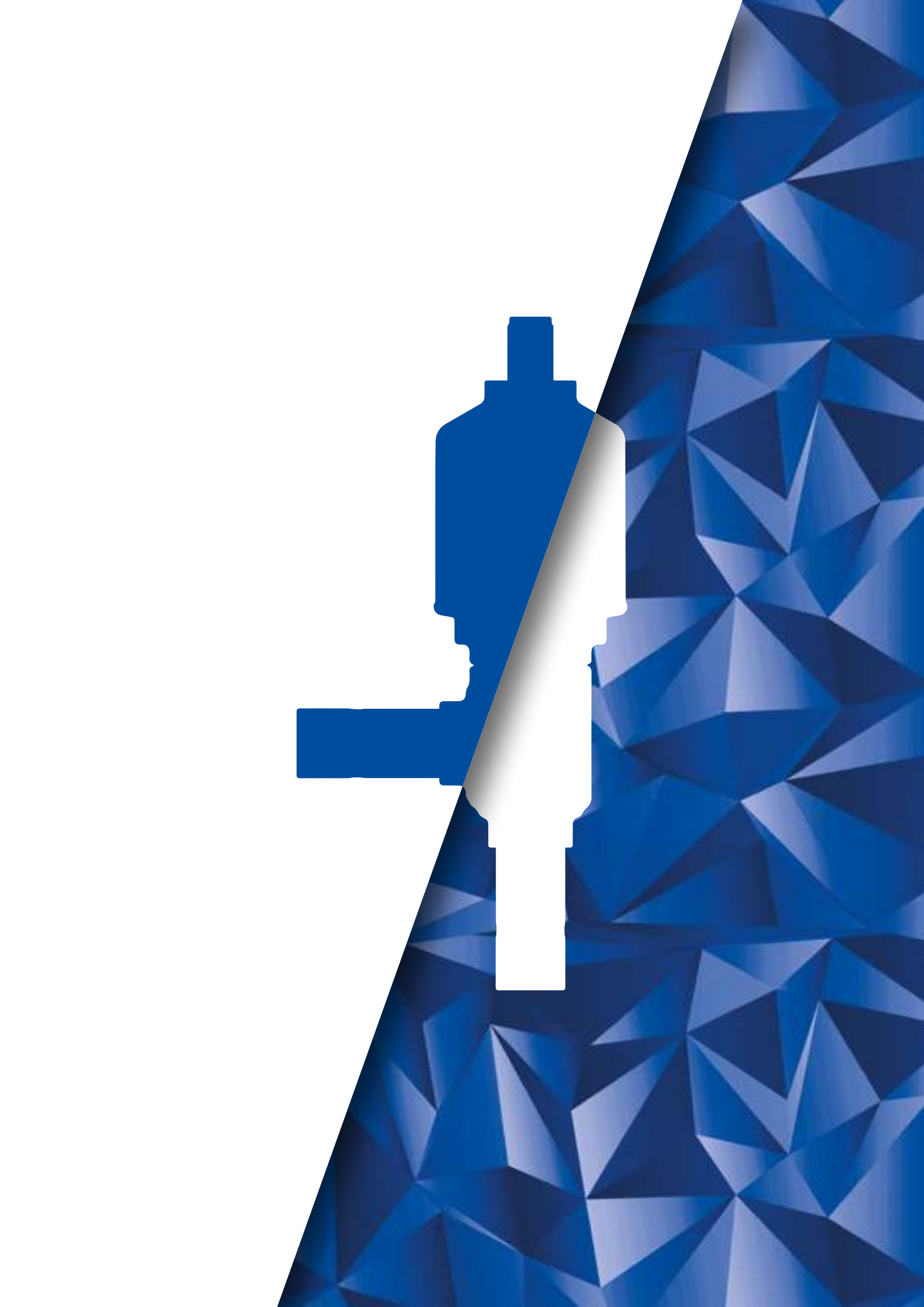
All the UL-certified products, if submitted to burst testing, guarantee a pressure strength at least equal to 5 x MWP in compliance with standard UL 207 or UL 429.

WEIGHT

The weight of the items listed in this Handbook includes packaging and is not binding.







The background of the entire page is a complex, repeating geometric pattern of blue triangles and polygons, creating a 3D effect of depth and shadow. The colors range from light sky blue to deep navy blue.

EXPANSION VALVES

P  LYHEDRA

EXPANSION VALVES

1.1 – SOLENOID EXPANSION VALVES

APPLICATIONS

The solenoid expansion valves in series 2028N can be used in a wide range of applications as listed below:

- Refrigeration systems (display cases in supermarkets, freezers, ice cream and icemaker machines, refrigerated shipping, etc.)
- Air conditioning systems
- Heat pump systems
- Liquid chillers

These valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

The valve in series 2028N is a throttling device that receives liquid from the condenser and injects it into the evaporator, creating the necessary pressure drop across the expansion orifice. It regulates the refrigerant flow into the evaporator by modulating the opening time phase of the shutter, allowing for a wide power range. It is an ON/OFF valve that must be regulated with the **Pulse Width Modulation** (PWM) principle and it can be actuated by a very simple electronic controller. According to the PWM principle, the evaporator refrigerant flow rate, Q_T , required in a fixed period “T”, is delivered by the valve in a time interval “t”, shorter than “T”, during which the maximum flow rate is allowed (ON step). In time period that remains, T - t, the valve stays closed (OFF phase).

For an effective regulation, the PWM valve must be sized in such a way that, under the most severe operating load conditions, the orifice of the valve is large enough to deliver the refrigerant required. In these extreme conditions, the valve will stay open for the entire period “T”.

The use of an electronic regulator allows a more accurate metering of the refrigerant, obtaining a greater efficiency in time (and a sensible decrease in machinery management costs) and a faster

response to the variations of the evaporator load.

CONSTRUCTION

The valves in series 2028N are supplied complete with orifice. Nine different orifices with nine different maximum capacities that range from orifice 01 to orifice 09 can be assembled. The last two numbers in the part number identify the type of orifice that has been mounted on the valve at the factory. For example, part number 2028N/3S02 identifies a 3/8” valve with solder connections and size 02 orifice. The orifices are interchangeable and can be mounted even after the valve is soldered on the system. If you wish to change orifice, purchase the corresponding spare parts kit, according to the part number indicated in Table 3. Inside the valve body is a ring mesh filter that traps dirt and contaminants at the valve inlet.

Valves in series 2028N are sold exclusively without coil (suffix S). For these valves are available:

- Coils in series 9300 (coils type HF2)
- Coils in series 9320 (coils type HF3)
- Coils in series 9360 (coils type HF4)

The main parts of the valves in series 2028N are manufactured with the following materials:

- Hot forged brass EN 12420 – CW617N for the body
- Ferritic stainless steel EN 10088-3 – 1.4105 for the fixed and mobile plungers
- Austenitic stainless steel EN 10088-3 – 1.4305 for mobile plunger valve sleeve and orifice
- Austenitic stainless steel EN 10088-3 – 1.4301 for the mesh filter
- Copper pipe EN 12735-1 – Cu -DHP for solder connections
- P.T.F.E. for seat gaskets
- Hydrogenate nitrile rubber (HNBR) for outlet seal gaskets

SELECTION

To dimension correctly a valve 2028N for a refrigerating system, the following design parameters must be available:

- Type of refrigerant
- Evaporator capacity, Q_e
- Evaporating temperature/pressure, T_e / p_e
- Minimum condensing temperature/pressure, T_c / p_c
- Liquid refrigerant temperature at valve inlet, T_l
- Pressure drop in the liquid line, distributor and evaporator, Δp

The following procedure helps the correct dimensioning of an expansion valve for a refrigeration plant.



Step 1

Determine the pressure drop across the valve. The pressure drop is calculated using the equation:

$$\Delta p_{\text{tot}} = p_c - (p_e + \Delta p)$$

where:

- P_c = condensing pressure
- P_e = evaporating pressure
- Δp = sum of pressure drops in the liquid line, distributor and evaporator at the maximum flow rate, that is with the valve always open

Step 2

Evaporator capacity correction with subcooling. The evaporator capacity, Q_e , must be suitably sized based on the subcooling value. The subcooling is calculated using the equation:

$$\Delta T_{\text{sub}} = T_c - T_l$$

In the subcooling correction factor table, find the appropriate correction factor, F_{sub} , corresponding to the calculated ΔT_{sub} value and determine the required valve capacity using the equation:

$$Q_{\text{sub}} = \frac{Q_e}{F_{\text{sub}}}$$

Step 3

Capacity correction based on the application. To obtain a correct regulation with this valve, it is necessary it be oversized so that its closing period is 25% to 50% of the regulator's total period, T . The correct choice of this potential margin depends on the application, which can have variable flow rate peaks, and on the control algorithm used by the electronic control unit.

Generally, however, this correction factor, F_{ev} , is highly dependent by the evaporation temperature, T_e , so it be assumed equal to 125% for $T_e \geq -15$ °C and 150% for $T_e < -15$ °C. These generic values must be verified based on the specific application.

The capacity of the valve must be at least equal to:

$$Q_{\text{ev}} = F_{\text{ev}} \cdot Q_{\text{sub}}$$

Step 4

Determine required orifice size. Use the pressure drop across the valve, the evaporating temperature and the correct evaporator capacity, Q_e , calculated above, to select the corresponding orifice size from the capacity table corresponding to the chosen refrigerant fluid.

Step 5

Liquid line sizing. Since the valve operates under ON/OFF criteria, during the opening phase, the flow rate can be much higher than the average flow rate in the time period. For this reason, the designer must size the diameter of the pipes of the liquid line according to the maximum flow rate across the orifice in the real conditions of Δp_{tot} and to avoid that a drop-in load cause a reduction in the maximum valve power.

DIMENSIONING EXAMPLE

- Type of refrigerant: R404A
- Evaporator capacity, Q_e 2.8 kW
- Evaporating temperature, T_e - 10 °C
- Minimum condensing temperature, T_c + 35 °C
- Liquid refrigerant temperature, T_l + 20 °C
- Pressure drop in the liquid line, distributor and evaporator, Δp 2 bar

Step 1 - Determine the pressure drop across the valve.

- Condensing pressure at + 35 °C - $P_c = 16.9$ bar
- Evaporating pressure at - 10 °C - $P_e = 4.4$ bar

$$\Delta p_{\text{tot}} = 16,9 - (4,4 + 2) = 10,5 \cdot \text{bar}$$

Step 2 - Determine required valve capacity

$$\Delta T_{\text{sub}} = 35 - 20 = 15 \cdot \text{°K}$$

From the subcooling correction factor Table 6B, we find the appropriate correction factor, F_{sub} , equal to 1.17 for $\Delta T_{\text{sub}} = 15$ °K. The required valve capacity is

$$Q_{\text{sub}} = \frac{2,8}{1,17} = 2,39 \cdot \text{kW}$$

Step 3 - Capacity correction based on the application

According to the above criterion, a correction of + 25% is applied to the calculated capacity:

$$Q_{\text{ev}} = 1,25 \cdot 2,39 = 3 \cdot \text{kW}$$

Step 4 - Determine required orifice dimension.

Using the capacity Table 6A for refrigerant fluid R404A, enter the data:

- Pressure drop across the valve = 10.5 bar
- Evaporating temperature = - 10 °C
- Calculated evaporator capacity = 3 kW

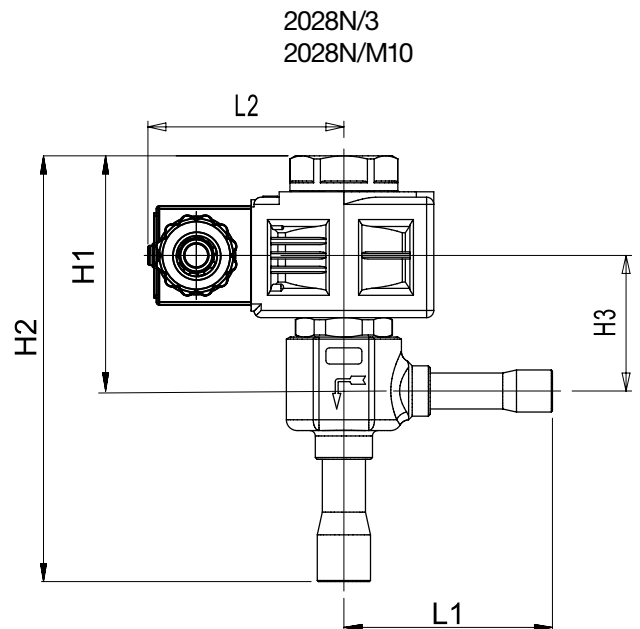
Select the corresponding orifice, 04 (Note: the expansion valve capacity must be equal to or slightly greater than the calculated evaporator capacity)

Table 1: General characteristics of PWM expansion valves

| Catalogue number | Orifice Type | ODS Connections | | | | Kv Factor [m³/h] | Opening Pressure Differential [bar] | | | | | Operating principles | Minimum Working Time [s] | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------------|-----------------|------|------|-----|------------------|-------------------------------------|-----------------|--------------|--------------|-----------------|----------------------|--------------------------|----------|--------------|--|---------------------------------------|----|----|----|----|----|---|----|-----|------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | [in] | | [mm] | | | MinOPD | MOPD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | IN | OUT | IN | OUT | | | AC coils series | | | DC coils series | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | 9110 9300 | 9160 9360 | 9120 9320 | 9160 9360 | | | | 9120 9320 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S01 | 01 | 3/8" | 1/2" | - | - | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M10S01 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S02 | 02 | 3/8" | 1/2" | - | - | | | | | | | | | | | | | 37 | 37 | 37 | 37 | 37 | 1 | 50 | -40 | +100 | Art.4.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M10S02 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S03 | 03 | 3/8" | 1/2" | - | - | | | | | | | | | | | | | | | | | | | | | | | 27 | 27 | 18 | 15 | 18 | 15 | 18 | 12 | 18 | 10 | 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M10S03 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S04 | 04 | 3/8" | 1/2" | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 | 18 | 27 | 12 | 18 | 12 | 18 | 10 | 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M10S04 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S05 | 05 | 3/8" | 1/2" | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | 18 | 27 | 10 | 22 | 10 | 22 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M10S05 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/3S06 | 06 | 3/8" | 1/2" | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 15 | 18 | 27 | 15 | 18 | 15 | 18 | 10 | 22 | | | | | | | | | | | | | | | | |
| 2028N/M10S06 | | - | - | 10 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/4S07 | 07 | 1/2" | 5/8" | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 | 18 | 27 | 12 | 18 | 12 | 18 | 10 | 22 | | | | | | | |
| 2028N/M12S07 | | - | - | 12 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/4S08 | 08 | 1/2" | 5/8" | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | 18 | 27 | 10 | 22 | 10 | 22 |
| 2028N/M12S08 | | - | - | 12 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/4S09 | 09 | 1/2" | 5/8" | - | - | 10 | 18 | 27 | 10 | 22 | 10 | 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2028N/M12S09 | | - | - | 12 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 2: Dimensions and weights of PWM expansion valves with 9360 coils (1)

| Catalogue number | Dimensions [mm] | | | | | Weight [g] | | | | |
|------------------|-----------------|-----|----|----|------|------------|----|----|------|-----|
| | H1 | H2 | H3 | L1 | L2 | | | | | |
| 2028N/3S01 | 66 | 119 | 38 | 58 | 35,5 | 430 | | | | |
| 2028N/M10S01 | | | | | | | | | | |
| 2028N/3S02 | | | | | | | | | | |
| 2028N/M10S02 | | | | | | | | | | |
| 2028N/3S03 | | | | | | | | | | |
| 2028N/M10S03 | | | | | | | | | | |
| 2028N/3S04 | | 150 | | | | 450 | | | | |
| 2028N/M10S04 | | | | | | | | | | |
| 2028N/3S05 | | | | | | | | | | |
| 2028N/M10S05 | | | | | | | | | | |
| 2028N/3S06 | | | | | | | | | | |
| 2028N/M10S06 | | | | | | | | | | |
| 2028N/4S07 | | 66 | | | | 119 | 38 | 58 | 35,5 | 430 |
| 2028N/M12S07 | | | | | | | | | | |
| 2028N/4S08 | | | | | | | | | | |
| 2028N/M12S08 | | | | | | | | | | |
| 2028N/4S09 | | | | | | | | | | |
| 2028N/M12S09 | | | | | | | | | | |



(1) : with coil 9300 the dimension L2 is equal to 34 and the weight must be decreased of 45 g
 (1) : with coil 9320 the dimension L2 is equal to 47 and the weight must be increased of 245 g
 Connectors are not included in the boxes and have to be ordered separately

Table 3: Orifices - Rated capacities in kW

| Catalogue number | Orifice Type | Orifice Size [mm] | Refrigerant | | | | | | | | | | | | | | | | | | |
|------------------|--------------|-------------------|-------------|-------|-------|-------|-------|-------|---------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | R134a | R32 | R404A | R407C | R410A | R507 | R1234ze | R1234yf | R448A | R449A | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 9150N/R63 | 01 | 0,5 | 0,79 | 1,75 | 0,74 | 1,03 | 1,21 | 0,72 | 0,62 | 0,58 | 0,98 | 0,97 | 0,69 | 0,76 | 1,36 | 1,38 | 0,67 | 1,06 | 0,68 | 0,70 | 1,19 |
| 9150N/R64 | 02 | 0,7 | 1,57 | 3,48 | 1,47 | 2,04 | 2,40 | 1,44 | 1,23 | 1,16 | 1,96 | 1,92 | 1,38 | 1,52 | 2,71 | 2,73 | 1,33 | 2,11 | 1,34 | 1,39 | 2,37 |
| 9150N/R65 | 03 | 0,8 | 1,86 | 4,13 | 1,75 | 2,42 | 2,84 | 1,70 | 1,46 | 1,37 | 2,32 | 2,27 | 1,63 | 1,80 | 3,21 | 3,24 | 1,58 | 2,51 | 1,59 | 1,64 | 2,80 |
| 9150N/R66 | 04 | 1,1 | 3,01 | 6,68 | 2,83 | 3,92 | 4,60 | 2,76 | 2,36 | 2,22 | 3,75 | 3,68 | 2,64 | 2,91 | 5,19 | 5,24 | 2,55 | 4,05 | 2,57 | 2,66 | 4,54 |
| 9150N/R67 | 05 | 1,3 | 5,15 | 11,43 | 4,84 | 6,71 | 7,88 | 4,72 | 4,05 | 3,80 | 6,42 | 6,30 | 4,52 | 4,98 | 8,88 | 8,97 | 4,37 | 6,94 | 4,40 | 4,55 | 7,76 |
| 9150N/R68 | 06 | 1,7 | 7,14 | 15,84 | 6,71 | 9,30 | 10,92 | 6,54 | 5,61 | 5,26 | 8,90 | 8,73 | 6,27 | 6,90 | 12,31 | 12,44 | 6,06 | 9,62 | 6,11 | 6,31 | 10,76 |
| 9150N/R69 | 07 | 2,3 | 11,26 | 24,98 | 10,58 | 14,66 | 17,22 | 10,32 | 8,84 | 8,30 | 14,03 | 13,77 | 9,88 | 10,88 | 19,42 | 19,61 | 9,55 | 15,17 | 9,63 | 9,95 | 16,98 |
| 9150N/R78 | 08 | 2,5 | 13,57 | 30,11 | 12,75 | 17,67 | 20,75 | 12,44 | 10,66 | 10,00 | 16,91 | 16,60 | 11,91 | 13,11 | 23,40 | 23,64 | 11,51 | 18,28 | 11,60 | 12,00 | 20,46 |
| 9150N/R79 | 09 | 2,7 | 15,05 | 33,39 | 14,14 | 19,60 | 23,02 | 13,79 | 11,82 | 11,09 | 18,76 | 18,40 | 13,21 | 14,54 | 25,95 | 26,21 | 12,76 | 20,27 | 12,87 | 13,31 | 22,69 |

Rated capacities are based on:

- Evaporating temperature $T_{evap} = + 5 \text{ }^\circ\text{C}$
- Condensing temperature $T_{cond} = + 32 \text{ }^\circ\text{C}$
- Refrigerant liquid temperature ahead of valve $T_{liq} = + 28 \text{ }^\circ\text{C}$

Table 4A: Refrigerant R134a - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|-------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,58 | 0,74 | 0,83 | 0,88 | 0,90 | 0,91 | 0,91 | 0,89 | 0,87 |
| 02 | 1,15 | 1,47 | 1,65 | 1,75 | 1,80 | 1,81 | 1,80 | 1,77 | 1,72 |
| 03 | 1,36 | 1,74 | 1,95 | 2,07 | 2,13 | 2,15 | 2,13 | 2,10 | 2,04 |
| 04 | 2,20 | 2,82 | 3,16 | 3,35 | 3,44 | 3,47 | 3,45 | 3,39 | 3,30 |
| 05 | 3,77 | 4,83 | 5,40 | 5,73 | 5,89 | 5,94 | 5,91 | 5,81 | 5,65 |
| 06 | 5,22 | 6,69 | 7,49 | 7,94 | 8,16 | 8,23 | 8,19 | 8,05 | 7,83 |
| 07 | 8,23 | 10,56 | 11,81 | 12,52 | 12,88 | 12,99 | 12,91 | 12,69 | 12,35 |
| 08 | 9,92 | 12,72 | 14,24 | 15,09 | 15,52 | 15,65 | 15,56 | 15,30 | 14,89 |
| 09 | 11,01 | 14,11 | 15,79 | 16,73 | 17,21 | 17,36 | 17,26 | 16,97 | 16,51 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,60 | 0,76 | 0,84 | 0,89 | 0,91 | 0,91 | 0,91 | 0,89 | 0,86 |
| 02 | 1,19 | 1,51 | 1,67 | 1,77 | 1,81 | 1,82 | 1,80 | 1,76 | 1,71 |
| 03 | 1,41 | 1,79 | 1,98 | 2,09 | 2,14 | 2,15 | 2,13 | 2,09 | 2,03 |
| 04 | 2,28 | 2,89 | 3,21 | 3,38 | 3,47 | 3,48 | 3,45 | 3,38 | 3,28 |
| 05 | 3,90 | 4,95 | 5,49 | 5,79 | 5,93 | 5,96 | 5,91 | 5,79 | 5,62 |
| 06 | 5,40 | 6,86 | 7,62 | 8,03 | 8,22 | 8,26 | 8,19 | 8,03 | 7,79 |
| 07 | 8,52 | 10,81 | 12,01 | 12,66 | 12,97 | 13,03 | 12,91 | 12,66 | 12,28 |
| 08 | 10,27 | 13,03 | 14,48 | 15,26 | 15,63 | 15,70 | 15,56 | 15,25 | 14,80 |
| 09 | 11,39 | 14,45 | 16,06 | 16,92 | 17,33 | 17,42 | 17,26 | 16,92 | 16,42 |

Table 4A: Refrigerant R134a - Capacities in kW

| Evaporating Temperature -10 °C | | | | | | | | | |
|--|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,61 | 0,77 | 0,85 | 0,89 | 0,90 | 0,91 | 0,89 | 0,87 | 0,84 |
| 02 | 1,22 | 1,53 | 1,68 | 1,76 | 1,80 | 1,80 | 1,78 | 1,73 | 1,68 |
| 03 | 1,44 | 1,81 | 1,99 | 2,09 | 2,13 | 2,13 | 2,10 | 2,06 | 1,99 |
| 04 | 2,33 | 2,93 | 3,23 | 3,38 | 3,45 | 3,45 | 3,41 | 3,33 | 3,22 |
| 05 | 3,99 | 5,01 | 5,52 | 5,79 | 5,90 | 5,90 | 5,83 | 5,69 | 5,50 |
| 06 | 5,54 | 6,94 | 7,65 | 8,02 | 8,18 | 8,18 | 8,08 | 7,89 | 7,63 |
| 07 | 8,73 | 10,95 | 12,07 | 12,65 | 12,89 | 12,90 | 12,74 | 12,44 | 12,03 |
| 08 | 10,52 | 13,19 | 14,55 | 15,25 | 15,54 | 15,55 | 15,35 | 14,99 | 14,50 |
| 09 | 11,67 | 14,63 | 16,13 | 16,91 | 17,23 | 17,25 | 17,03 | 16,63 | 16,08 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,62 | 0,77 | 0,84 | 0,88 | 0,89 | 0,89 | 0,87 | 0,85 | 0,82 |
| 02 | 1,23 | 1,53 | 1,67 | 1,74 | 1,77 | 1,76 | 1,73 | 1,68 | 1,62 |
| 03 | 1,46 | 1,81 | 1,98 | 2,06 | 2,09 | 2,09 | 2,05 | 1,99 | 1,92 |
| 04 | 2,37 | 2,93 | 3,21 | 3,34 | 3,39 | 3,38 | 3,32 | 3,23 | 3,11 |
| 05 | 4,05 | 5,02 | 5,49 | 5,72 | 5,80 | 5,78 | 5,68 | 5,52 | 5,32 |
| 06 | 5,62 | 6,95 | 7,61 | 7,93 | 8,04 | 8,01 | 7,87 | 7,65 | 7,37 |
| 07 | 8,86 | 10,97 | 12,00 | 12,50 | 12,68 | 12,63 | 12,41 | 12,07 | 11,62 |
| 08 | 10,67 | 13,21 | 14,46 | 15,06 | 15,28 | 15,22 | 14,96 | 14,55 | 14,01 |
| 09 | 11,84 | 14,66 | 16,03 | 16,71 | 16,94 | 16,88 | 16,59 | 16,13 | 15,53 |
| Evaporating Temperature -30 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,62 | 0,76 | 0,83 | 0,86 | 0,87 | 0,86 | 0,84 | 0,81 | 0,78 |
| 02 | 1,24 | 1,52 | 1,65 | 1,70 | 1,72 | 1,70 | 1,67 | 1,61 | 1,55 |
| 03 | 1,47 | 1,80 | 1,95 | 2,02 | 2,04 | 2,02 | 1,98 | 1,91 | 1,83 |
| 04 | 2,38 | 2,91 | 3,16 | 3,27 | 3,30 | 3,27 | 3,20 | 3,09 | 2,96 |
| 05 | 4,07 | 4,97 | 5,40 | 5,59 | 5,64 | 5,59 | 5,47 | 5,29 | 5,07 |
| 06 | 5,64 | 6,89 | 7,49 | 7,75 | 7,82 | 7,75 | 7,59 | 7,34 | 7,03 |
| 07 | 8,89 | 10,87 | 11,80 | 12,23 | 12,33 | 12,23 | 11,96 | 11,57 | 11,08 |
| 08 | 10,71 | 13,10 | 14,23 | 14,73 | 14,86 | 14,74 | 14,42 | 13,95 | 13,36 |
| 09 | 11,88 | 14,53 | 15,78 | 16,34 | 16,49 | 16,34 | 15,99 | 15,47 | 14,81 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,62 | 0,75 | 0,81 | 0,83 | 0,83 | 0,82 | 0,80 | 0,77 | 0,73 |
| 02 | 1,23 | 1,49 | 1,61 | 1,65 | 1,66 | 1,64 | 1,59 | 1,53 | 1,46 |
| 03 | 1,46 | 1,76 | 1,90 | 1,96 | 1,96 | 1,94 | 1,89 | 1,81 | 1,73 |
| 04 | 2,36 | 2,86 | 3,08 | 3,17 | 3,18 | 3,14 | 3,05 | 2,93 | 2,79 |
| 05 | 4,04 | 4,89 | 5,27 | 5,42 | 5,44 | 5,36 | 5,22 | 5,02 | 4,78 |
| 06 | 5,60 | 6,77 | 7,30 | 7,52 | 7,54 | 7,44 | 7,24 | 6,96 | 6,63 |
| 07 | 8,84 | 10,68 | 11,51 | 11,85 | 11,89 | 11,73 | 11,41 | 10,98 | 10,45 |
| 08 | 10,65 | 12,87 | 13,87 | 14,28 | 14,33 | 14,13 | 13,75 | 13,23 | 12,59 |
| 09 | 11,81 | 14,28 | 15,39 | 15,84 | 15,90 | 15,68 | 15,25 | 14,67 | 13,97 |
| TABLE 4B - Correction factors for subcooling Δtsub ≠ 4°K | | | | | | | | | |
| Δtsub [°K] | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,17 | 1,23 | 1,29 | 1,35 | 1,44 | 1,49 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 4B

Table 5A: Refrigerant R32 - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,87 | 1,18 | 1,38 | 1,54 | 1,65 | 1,74 | 1,81 | 1,86 | 1,90 |
| 02 | 1,73 | 2,34 | 2,75 | 3,05 | 3,28 | 3,46 | 3,60 | 3,70 | 3,78 |
| 03 | 2,05 | 2,77 | 3,26 | 3,62 | 3,89 | 4,10 | 4,26 | 4,38 | 4,48 |
| 04 | 3,32 | 4,49 | 5,27 | 5,85 | 6,29 | 6,63 | 6,89 | 7,10 | 7,25 |
| 05 | 5,67 | 7,68 | 9,02 | 10,01 | 10,76 | 11,34 | 11,80 | 12,14 | 12,40 |
| 06 | 7,86 | 10,65 | 12,51 | 13,88 | 14,92 | 15,73 | 16,35 | 16,83 | 17,19 |
| 07 | 12,40 | 16,79 | 19,73 | 21,89 | 23,53 | 24,80 | 25,79 | 26,54 | 27,10 |
| 08 | 14,95 | 20,24 | 23,78 | 26,38 | 28,36 | 29,89 | 31,08 | 31,99 | 32,66 |
| 09 | 16,58 | 22,45 | 26,37 | 29,25 | 31,45 | 33,15 | 34,47 | 35,48 | 36,23 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,93 | 1,25 | 1,47 | 1,62 | 1,74 | 1,83 | 1,90 | 1,96 | 2,00 |
| 02 | 1,84 | 2,49 | 2,91 | 3,22 | 3,46 | 3,64 | 3,78 | 3,89 | 3,97 |
| 03 | 2,18 | 2,95 | 3,45 | 3,82 | 4,10 | 4,31 | 4,48 | 4,61 | 4,71 |
| 04 | 3,54 | 4,77 | 5,58 | 6,18 | 6,63 | 6,98 | 7,25 | 7,46 | 7,62 |
| 05 | 6,05 | 8,16 | 9,55 | 10,57 | 11,34 | 11,94 | 12,41 | 12,76 | 13,03 |
| 06 | 8,39 | 11,31 | 13,24 | 14,66 | 15,73 | 16,56 | 17,20 | 17,70 | 18,07 |
| 07 | 13,23 | 17,83 | 20,88 | 23,11 | 24,80 | 26,11 | 27,13 | 27,91 | 28,49 |
| 08 | 15,94 | 21,49 | 25,17 | 27,85 | 29,89 | 31,47 | 32,69 | 33,63 | 34,34 |
| 09 | 17,68 | 23,83 | 27,91 | 30,89 | 33,15 | 34,90 | 36,26 | 37,30 | 38,08 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,98 | 1,31 | 1,53 | 1,69 | 1,81 | 1,90 | 1,97 | 2,03 | 2,07 |
| 02 | 1,95 | 2,61 | 3,04 | 3,36 | 3,60 | 3,78 | 3,92 | 4,03 | 4,11 |
| 03 | 2,30 | 3,09 | 3,60 | 3,98 | 4,26 | 4,48 | 4,65 | 4,78 | 4,87 |
| 04 | 3,73 | 5,00 | 5,83 | 6,44 | 6,89 | 7,25 | 7,52 | 7,73 | 7,88 |
| 05 | 6,38 | 8,56 | 9,98 | 11,01 | 11,80 | 12,40 | 12,86 | 13,22 | 13,49 |
| 06 | 8,85 | 11,86 | 13,84 | 15,27 | 16,35 | 17,19 | 17,83 | 18,33 | 18,70 |
| 07 | 13,95 | 18,71 | 21,82 | 24,08 | 25,79 | 27,11 | 28,12 | 28,91 | 29,50 |
| 08 | 16,81 | 22,54 | 26,30 | 29,02 | 31,08 | 32,67 | 33,89 | 34,84 | 35,55 |
| 09 | 18,65 | 25,00 | 29,17 | 32,19 | 34,47 | 36,23 | 37,59 | 38,64 | 39,42 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 1,02 | 1,36 | 1,58 | 1,74 | 1,86 | 1,95 | 2,02 | 2,07 | 2,12 |
| 02 | 2,03 | 2,71 | 3,14 | 3,46 | 3,69 | 3,88 | 4,02 | 4,12 | 4,20 |
| 03 | 2,41 | 3,21 | 3,72 | 4,10 | 4,38 | 4,59 | 4,76 | 4,88 | 4,98 |
| 04 | 3,90 | 5,19 | 6,03 | 6,63 | 7,08 | 7,43 | 7,70 | 7,90 | 8,06 |
| 05 | 6,67 | 8,88 | 10,31 | 11,34 | 12,12 | 12,71 | 13,17 | 13,52 | 13,79 |
| 06 | 9,24 | 12,31 | 14,30 | 15,73 | 16,80 | 17,63 | 18,26 | 18,75 | 19,12 |
| 07 | 14,58 | 19,41 | 22,55 | 24,80 | 26,50 | 27,80 | 28,80 | 29,57 | 30,15 |
| 08 | 17,57 | 23,40 | 27,17 | 29,89 | 31,93 | 33,50 | 34,71 | 35,64 | 36,33 |
| 09 | 19,48 | 25,95 | 30,14 | 33,15 | 35,41 | 37,15 | 38,50 | 39,52 | 40,29 |

Table 5A: Refrigerant R32 - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 1,06 | 1,40 | 1,62 | 1,77 | 1,89 | 1,98 | 2,05 | 2,10 | 2,14 |
| 02 | 2,10 | 2,78 | 3,21 | 3,52 | 3,76 | 3,93 | 4,07 | 4,17 | 4,25 |
| 03 | 2,49 | 3,30 | 3,81 | 4,18 | 4,45 | 4,66 | 4,82 | 4,94 | 5,04 |
| 04 | 4,03 | 5,33 | 6,16 | 6,76 | 7,20 | 7,54 | 7,80 | 8,00 | 8,15 |
| 05 | 6,90 | 9,12 | 10,55 | 11,56 | 12,32 | 12,90 | 13,35 | 13,69 | 13,94 |
| 06 | 9,57 | 12,65 | 14,62 | 16,03 | 17,08 | 17,89 | 18,51 | 18,98 | 19,33 |
| 07 | 15,09 | 19,95 | 23,06 | 25,28 | 26,94 | 28,21 | 29,19 | 29,93 | 30,48 |
| 08 | 18,19 | 24,04 | 27,79 | 30,46 | 32,47 | 34,00 | 35,17 | 36,07 | 36,74 |
| 09 | 20,17 | 26,66 | 30,82 | 33,79 | 36,01 | 37,71 | 39,01 | 40,01 | 40,75 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 1,09 | 1,42 | 1,64 | 1,79 | 1,90 | 1,99 | 2,06 | 2,11 | 2,14 |
| 02 | 2,16 | 2,83 | 3,26 | 3,56 | 3,78 | 3,96 | 4,09 | 4,19 | 4,26 |
| 03 | 2,56 | 3,35 | 3,86 | 4,22 | 4,48 | 4,69 | 4,84 | 4,96 | 5,05 |
| 04 | 4,14 | 5,43 | 6,24 | 6,82 | 7,26 | 7,58 | 7,84 | 8,03 | 8,17 |
| 05 | 7,08 | 9,29 | 10,68 | 11,68 | 12,41 | 12,98 | 13,41 | 13,73 | 13,97 |
| 06 | 9,82 | 12,87 | 14,81 | 16,19 | 17,21 | 17,99 | 18,59 | 19,04 | 19,37 |
| 07 | 15,49 | 20,30 | 23,36 | 25,53 | 27,14 | 28,37 | 29,31 | 30,02 | 30,55 |
| 08 | 18,67 | 24,47 | 28,15 | 30,76 | 32,71 | 34,19 | 35,33 | 36,18 | 36,82 |
| 09 | 20,70 | 27,14 | 31,22 | 34,12 | 36,28 | 37,92 | 39,18 | 40,13 | 40,83 |

| TABLE 5B - Correction factors for subcooling $\Delta t_{sub} = 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 5B

Table 6A: Refrigerant R404A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,46 | 0,59 | 0,67 | 0,71 | 0,73 | 0,74 | 0,73 | 0,71 | 0,69 |
| 02 | 0,91 | 1,18 | 1,33 | 1,41 | 1,46 | 1,47 | 1,45 | 1,42 | 1,37 |
| 03 | 1,07 | 1,39 | 1,57 | 1,67 | 1,72 | 1,74 | 1,72 | 1,68 | 1,62 |
| 04 | 1,74 | 2,26 | 2,55 | 2,71 | 2,79 | 2,81 | 2,79 | 2,72 | 2,62 |
| 05 | 2,97 | 3,86 | 4,36 | 4,64 | 4,78 | 4,81 | 4,77 | 4,65 | 4,48 |
| 06 | 4,12 | 5,35 | 6,04 | 6,43 | 6,62 | 6,67 | 6,61 | 6,45 | 6,21 |
| 07 | 6,49 | 8,44 | 9,53 | 10,14 | 10,44 | 10,52 | 10,42 | 10,17 | 9,80 |
| 08 | 7,83 | 10,17 | 11,48 | 12,22 | 12,58 | 12,68 | 12,56 | 12,26 | 11,80 |
| 09 | 8,68 | 11,28 | 12,73 | 13,55 | 13,96 | 14,06 | 13,93 | 13,60 | 13,09 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,49 | 0,63 | 0,71 | 0,75 | 0,77 | 0,77 | 0,77 | 0,75 | 0,72 |
| 02 | 0,97 | 1,25 | 1,40 | 1,49 | 1,53 | 1,54 | 1,52 | 1,49 | 1,44 |
| 03 | 1,15 | 1,48 | 1,66 | 1,76 | 1,81 | 1,82 | 1,80 | 1,76 | 1,70 |
| 04 | 1,85 | 2,39 | 2,69 | 2,85 | 2,93 | 2,95 | 2,92 | 2,85 | 2,75 |
| 05 | 3,17 | 4,09 | 4,60 | 4,88 | 5,01 | 5,04 | 4,99 | 4,88 | 4,71 |
| 06 | 4,40 | 5,68 | 6,37 | 6,76 | 6,95 | 6,99 | 6,92 | 6,77 | 6,53 |
| 07 | 6,93 | 8,95 | 10,05 | 10,66 | 10,96 | 11,03 | 10,92 | 10,67 | 10,30 |
| 08 | 8,35 | 10,79 | 12,11 | 12,85 | 13,21 | 13,29 | 13,16 | 12,86 | 12,41 |
| 09 | 9,27 | 11,96 | 13,43 | 14,25 | 14,65 | 14,74 | 14,59 | 14,26 | 13,76 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,51 | 0,66 | 0,73 | 0,77 | 0,79 | 0,79 | 0,78 | 0,77 | 0,74 |
| 02 | 1,02 | 1,30 | 1,45 | 1,53 | 1,57 | 1,58 | 1,56 | 1,52 | 1,47 |
| 03 | 1,21 | 1,54 | 1,72 | 1,82 | 1,86 | 1,87 | 1,85 | 1,80 | 1,74 |
| 04 | 1,95 | 2,50 | 2,79 | 2,94 | 3,01 | 3,02 | 2,99 | 2,92 | 2,81 |
| 05 | 3,34 | 4,27 | 4,77 | 5,03 | 5,16 | 5,18 | 5,12 | 4,99 | 4,82 |
| 06 | 4,63 | 5,92 | 6,61 | 6,98 | 7,15 | 7,18 | 7,09 | 6,92 | 6,68 |
| 07 | 7,30 | 9,34 | 10,42 | 11,01 | 11,27 | 11,32 | 11,18 | 10,92 | 10,53 |
| 08 | 8,80 | 11,26 | 12,56 | 13,27 | 13,59 | 13,64 | 13,48 | 13,16 | 12,69 |
| 09 | 9,76 | 12,48 | 13,93 | 14,71 | 15,07 | 15,12 | 14,95 | 14,59 | 14,07 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,67 | 0,75 | 0,78 | 0,80 | 0,80 | 0,79 | 0,77 | 0,74 |
| 02 | 1,06 | 1,34 | 1,48 | 1,56 | 1,59 | 1,59 | 1,57 | 1,53 | 1,47 |
| 03 | 1,25 | 1,59 | 1,76 | 1,85 | 1,88 | 1,88 | 1,86 | 1,81 | 1,74 |
| 04 | 2,03 | 2,57 | 2,85 | 2,99 | 3,05 | 3,05 | 3,01 | 2,93 | 2,82 |
| 05 | 3,47 | 4,40 | 4,87 | 5,12 | 5,22 | 5,22 | 5,14 | 5,01 | 4,82 |
| 06 | 4,81 | 6,10 | 6,75 | 7,09 | 7,23 | 7,23 | 7,13 | 6,94 | 6,68 |
| 07 | 7,59 | 9,61 | 10,65 | 11,19 | 11,41 | 11,41 | 11,24 | 10,94 | 10,53 |
| 08 | 9,15 | 11,58 | 12,83 | 13,48 | 13,75 | 13,75 | 13,55 | 13,19 | 12,70 |
| 09 | 10,15 | 12,85 | 14,23 | 14,95 | 15,25 | 15,25 | 15,03 | 14,63 | 14,08 |

Table 6A: Refrigerant R404A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,55 | 0,69 | 0,75 | 0,79 | 0,80 | 0,79 | 0,78 | 0,76 | 0,73 |
| 02 | 1,09 | 1,36 | 1,50 | 1,56 | 1,59 | 1,58 | 1,55 | 1,50 | 1,44 |
| 03 | 1,29 | 1,61 | 1,77 | 1,85 | 1,88 | 1,87 | 1,84 | 1,78 | 1,71 |
| 04 | 2,09 | 2,61 | 2,87 | 3,00 | 3,04 | 3,03 | 2,97 | 2,88 | 2,76 |
| 05 | 3,57 | 4,47 | 4,91 | 5,13 | 5,20 | 5,18 | 5,09 | 4,93 | 4,73 |
| 06 | 4,95 | 6,19 | 6,81 | 7,11 | 7,21 | 7,18 | 7,05 | 6,84 | 6,56 |
| 07 | 7,81 | 9,76 | 10,73 | 11,21 | 11,37 | 11,33 | 11,12 | 10,78 | 10,34 |
| 08 | 9,41 | 11,77 | 12,93 | 13,51 | 13,71 | 13,65 | 13,40 | 13,00 | 12,47 |
| 09 | 10,43 | 13,05 | 14,34 | 14,98 | 15,20 | 15,14 | 14,86 | 14,41 | 13,82 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,56 | 0,69 | 0,75 | 0,78 | 0,79 | 0,78 | 0,76 | 0,73 | 0,70 |
| 02 | 1,11 | 1,37 | 1,49 | 1,55 | 1,56 | 1,55 | 1,51 | 1,46 | 1,39 |
| 03 | 1,31 | 1,62 | 1,76 | 1,83 | 1,85 | 1,83 | 1,79 | 1,73 | 1,65 |
| 04 | 2,12 | 2,62 | 2,86 | 2,96 | 2,99 | 2,96 | 2,90 | 2,80 | 2,67 |
| 05 | 3,63 | 4,48 | 4,89 | 5,07 | 5,12 | 5,07 | 4,96 | 4,79 | 4,57 |
| 06 | 5,03 | 6,21 | 6,77 | 7,03 | 7,10 | 7,03 | 6,87 | 6,64 | 6,33 |
| 07 | 7,94 | 9,80 | 10,68 | 11,08 | 11,19 | 11,09 | 10,84 | 10,46 | 9,99 |
| 08 | 9,56 | 11,81 | 12,87 | 13,36 | 13,49 | 13,37 | 13,06 | 12,61 | 12,04 |
| 09 | 10,61 | 13,10 | 14,28 | 14,82 | 14,96 | 14,82 | 14,49 | 13,99 | 13,35 |
| TABLE 6B - Correction factors for subcooling $\Delta t_{sub} = 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,09 | 1,17 | 1,26 | 1,34 | 1,42 | 1,50 | 1,56 | 1,63 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporator capacity by dividing by the appropriate correction factor found in Table 6B

Table 7A: Refrigerant R407C - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,57 | 0,75 | 0,87 | 0,94 | 0,99 | 1,02 | 1,04 | 1,04 | 1,04 |
| 02 | 1,13 | 1,50 | 1,72 | 1,87 | 1,97 | 2,03 | 2,06 | 2,07 | 2,07 |
| 03 | 1,34 | 1,78 | 2,04 | 2,21 | 2,33 | 2,40 | 2,44 | 2,46 | 2,45 |
| 04 | 2,18 | 2,88 | 3,30 | 3,58 | 3,77 | 3,89 | 3,95 | 3,97 | 3,96 |
| 05 | 3,72 | 4,92 | 5,65 | 6,13 | 6,45 | 6,65 | 6,76 | 6,80 | 6,78 |
| 06 | 5,16 | 6,82 | 7,83 | 8,50 | 8,94 | 9,22 | 9,37 | 9,42 | 9,39 |
| 07 | 8,14 | 10,76 | 12,35 | 13,40 | 14,10 | 14,54 | 14,78 | 14,86 | 14,81 |
| 08 | 9,81 | 12,96 | 14,89 | 16,15 | 16,99 | 17,52 | 17,81 | 17,91 | 17,85 |
| 09 | 10,88 | 14,38 | 16,51 | 17,92 | 18,84 | 19,43 | 19,75 | 19,87 | 19,80 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,60 | 0,79 | 0,90 | 0,98 | 1,02 | 1,05 | 1,07 | 1,07 | 1,07 |
| 02 | 1,20 | 1,57 | 1,79 | 1,94 | 2,03 | 2,09 | 2,13 | 2,13 | 2,13 |
| 03 | 1,42 | 1,86 | 2,13 | 2,30 | 2,41 | 2,48 | 2,52 | 2,53 | 2,52 |
| 04 | 2,29 | 3,01 | 3,44 | 3,72 | 3,90 | 4,01 | 4,07 | 4,09 | 4,08 |
| 05 | 3,92 | 5,15 | 5,89 | 6,36 | 6,67 | 6,87 | 6,97 | 7,00 | 6,98 |
| 06 | 5,44 | 7,14 | 8,16 | 8,82 | 9,25 | 9,52 | 9,66 | 9,71 | 9,67 |
| 07 | 8,58 | 11,26 | 12,87 | 13,91 | 14,59 | 15,02 | 15,24 | 15,31 | 15,25 |
| 08 | 10,34 | 13,57 | 15,51 | 16,77 | 17,59 | 18,10 | 18,37 | 18,45 | 18,38 |
| 09 | 11,47 | 15,05 | 17,20 | 18,60 | 19,50 | 20,07 | 20,37 | 20,46 | 20,38 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,63 | 0,82 | 0,93 | 1,00 | 1,05 | 1,07 | 1,09 | 1,09 | 1,08 |
| 02 | 1,25 | 1,62 | 1,85 | 1,99 | 2,08 | 2,13 | 2,16 | 2,17 | 2,15 |
| 03 | 1,48 | 1,92 | 2,19 | 2,35 | 2,46 | 2,53 | 2,56 | 2,57 | 2,55 |
| 04 | 2,39 | 3,11 | 3,54 | 3,81 | 3,98 | 4,09 | 4,14 | 4,15 | 4,13 |
| 05 | 4,09 | 5,33 | 6,05 | 6,52 | 6,81 | 6,99 | 7,08 | 7,10 | 7,06 |
| 06 | 5,68 | 7,39 | 8,39 | 9,04 | 9,45 | 9,69 | 9,82 | 9,85 | 9,79 |
| 07 | 8,95 | 11,65 | 13,24 | 14,25 | 14,90 | 15,29 | 15,49 | 15,53 | 15,45 |
| 08 | 10,79 | 14,04 | 15,95 | 17,17 | 17,95 | 18,43 | 18,66 | 18,72 | 18,62 |
| 09 | 11,96 | 15,57 | 17,69 | 19,05 | 19,91 | 20,43 | 20,70 | 20,76 | 20,65 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,65 | 0,84 | 0,94 | 1,01 | 1,05 | 1,08 | 1,09 | 1,09 | 1,08 |
| 02 | 1,29 | 1,66 | 1,88 | 2,01 | 2,09 | 2,14 | 2,17 | 2,17 | 2,15 |
| 03 | 1,53 | 1,97 | 2,22 | 2,38 | 2,48 | 2,54 | 2,57 | 2,57 | 2,55 |
| 04 | 2,47 | 3,19 | 3,60 | 3,86 | 4,02 | 4,11 | 4,15 | 4,15 | 4,12 |
| 05 | 4,23 | 5,45 | 6,16 | 6,60 | 6,87 | 7,03 | 7,10 | 7,11 | 7,06 |
| 06 | 5,86 | 7,56 | 8,53 | 9,15 | 9,53 | 9,75 | 9,85 | 9,86 | 9,78 |
| 07 | 9,25 | 11,92 | 13,46 | 14,42 | 15,02 | 15,37 | 15,53 | 15,54 | 15,43 |
| 08 | 11,14 | 14,37 | 16,22 | 17,38 | 18,11 | 18,53 | 18,72 | 18,73 | 18,59 |
| 09 | 12,36 | 15,93 | 17,99 | 19,28 | 20,08 | 20,55 | 20,76 | 20,77 | 20,62 |

Table 7A: Refrigerant R407C - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,66 | 0,85 | 0,95 | 1,01 | 1,05 | 1,07 | 1,08 | 1,08 | 1,07 |
| 02 | 1,32 | 1,68 | 1,89 | 2,01 | 2,09 | 2,13 | 2,15 | 2,14 | 2,12 |
| 03 | 1,56 | 1,99 | 2,24 | 2,39 | 2,48 | 2,52 | 2,54 | 2,54 | 2,52 |
| 04 | 2,53 | 3,23 | 3,62 | 3,86 | 4,01 | 4,09 | 4,12 | 4,11 | 4,07 |
| 05 | 4,33 | 5,52 | 6,19 | 6,60 | 6,85 | 6,99 | 7,04 | 7,03 | 6,96 |
| 06 | 6,00 | 7,65 | 8,59 | 9,16 | 9,50 | 9,69 | 9,77 | 9,75 | 9,66 |
| 07 | 9,46 | 12,07 | 13,54 | 14,44 | 14,99 | 15,29 | 15,40 | 15,37 | 15,23 |
| 08 | 11,40 | 14,55 | 16,32 | 17,40 | 18,06 | 18,42 | 18,56 | 18,53 | 18,35 |
| 09 | 12,65 | 16,13 | 18,10 | 19,30 | 20,03 | 20,43 | 20,59 | 20,55 | 20,35 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,67 | 0,85 | 0,95 | 1,00 | 1,04 | 1,06 | 1,06 | 1,06 | 1,04 |
| 02 | 1,34 | 1,69 | 1,88 | 2,00 | 2,06 | 2,10 | 2,11 | 2,10 | 2,07 |
| 03 | 1,58 | 2,00 | 2,23 | 2,36 | 2,45 | 2,49 | 2,50 | 2,49 | 2,46 |
| 04 | 2,56 | 3,23 | 3,61 | 3,83 | 3,96 | 4,02 | 4,04 | 4,02 | 3,97 |
| 05 | 4,39 | 5,53 | 6,17 | 6,55 | 6,77 | 6,88 | 6,92 | 6,88 | 6,80 |
| 06 | 6,08 | 7,67 | 8,55 | 9,08 | 9,39 | 9,54 | 9,59 | 9,54 | 9,43 |
| 07 | 9,59 | 12,10 | 13,49 | 14,32 | 14,80 | 15,05 | 15,12 | 15,05 | 14,87 |
| 08 | 11,56 | 14,58 | 16,25 | 17,25 | 17,84 | 18,14 | 18,22 | 18,14 | 17,92 |
| 09 | 12,82 | 16,17 | 18,03 | 19,13 | 19,78 | 20,12 | 20,21 | 20,12 | 19,87 |
| TABLE 7B - Correction factors for subcooling $\Delta t_{sub} = 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,19 | 1,25 | 1,31 | 1,37 | 1,44 | 1,49 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 7B

Table 8A: Refrigerant R410A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,63 | 0,84 | 0,98 | 1,08 | 1,14 | 1,19 | 1,22 | 1,24 | 1,25 |
| 02 | 1,25 | 1,68 | 1,95 | 2,14 | 2,27 | 2,37 | 2,43 | 2,47 | 2,48 |
| 03 | 1,48 | 1,99 | 2,31 | 2,53 | 2,69 | 2,80 | 2,88 | 2,92 | 2,94 |
| 04 | 2,40 | 3,22 | 3,74 | 4,10 | 4,35 | 4,53 | 4,65 | 4,73 | 4,76 |
| 05 | 4,11 | 5,50 | 6,39 | 7,01 | 7,45 | 7,76 | 7,96 | 8,09 | 8,14 |
| 06 | 5,70 | 7,63 | 8,87 | 9,72 | 10,33 | 10,76 | 11,04 | 11,21 | 11,29 |
| 07 | 8,99 | 12,03 | 13,98 | 15,33 | 16,29 | 16,96 | 17,41 | 17,68 | 17,80 |
| 08 | 10,83 | 14,50 | 16,85 | 18,48 | 19,63 | 20,44 | 20,99 | 21,31 | 21,45 |
| 09 | 12,01 | 16,08 | 18,69 | 20,49 | 21,77 | 22,67 | 23,27 | 23,63 | 23,79 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,68 | 0,90 | 1,04 | 1,14 | 1,21 | 1,26 | 1,29 | 1,31 | 1,32 |
| 02 | 1,34 | 1,79 | 2,08 | 2,27 | 2,41 | 2,50 | 2,57 | 2,61 | 2,63 |
| 03 | 1,59 | 2,12 | 2,46 | 2,69 | 2,85 | 2,97 | 3,04 | 3,09 | 3,11 |
| 04 | 2,58 | 3,44 | 3,98 | 4,35 | 4,62 | 4,80 | 4,93 | 5,00 | 5,04 |
| 05 | 4,41 | 5,88 | 6,81 | 7,45 | 7,90 | 8,22 | 8,43 | 8,56 | 8,62 |
| 06 | 6,12 | 8,15 | 9,44 | 10,33 | 10,95 | 11,39 | 11,69 | 11,87 | 11,95 |
| 07 | 9,65 | 12,86 | 14,88 | 16,28 | 17,27 | 17,96 | 18,43 | 18,72 | 18,85 |
| 08 | 11,62 | 15,49 | 17,94 | 19,62 | 20,81 | 21,65 | 22,21 | 22,56 | 22,72 |
| 09 | 12,89 | 17,18 | 19,89 | 21,76 | 23,09 | 24,01 | 24,64 | 25,02 | 25,19 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,72 | 0,95 | 1,09 | 1,19 | 1,26 | 1,31 | 1,34 | 1,36 | 1,37 |
| 02 | 1,42 | 1,89 | 2,18 | 2,37 | 2,51 | 2,61 | 2,67 | 2,71 | 2,73 |
| 03 | 1,69 | 2,24 | 2,58 | 2,81 | 2,97 | 3,09 | 3,16 | 3,21 | 3,23 |
| 04 | 2,73 | 3,62 | 4,17 | 4,55 | 4,81 | 5,00 | 5,12 | 5,19 | 5,23 |
| 05 | 4,67 | 6,19 | 7,14 | 7,78 | 8,23 | 8,55 | 8,76 | 8,89 | 8,95 |
| 06 | 6,48 | 8,58 | 9,89 | 10,79 | 11,41 | 11,85 | 12,14 | 12,32 | 12,40 |
| 07 | 10,22 | 13,53 | 15,60 | 17,01 | 18,00 | 18,69 | 19,15 | 19,43 | 19,56 |
| 08 | 12,32 | 16,31 | 18,80 | 20,50 | 21,69 | 22,52 | 23,08 | 23,42 | 23,57 |
| 09 | 13,66 | 18,09 | 20,85 | 22,74 | 24,06 | 24,98 | 25,60 | 25,97 | 26,14 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,75 | 0,99 | 1,13 | 1,23 | 1,30 | 1,34 | 1,38 | 1,39 | 1,40 |
| 02 | 1,49 | 1,96 | 2,25 | 2,44 | 2,58 | 2,67 | 2,73 | 2,77 | 2,78 |
| 03 | 1,77 | 2,32 | 2,66 | 2,90 | 3,05 | 3,16 | 3,24 | 3,28 | 3,30 |
| 04 | 2,86 | 3,76 | 4,31 | 4,68 | 4,94 | 5,12 | 5,24 | 5,31 | 5,34 |
| 05 | 4,90 | 6,43 | 7,38 | 8,02 | 8,46 | 8,76 | 8,96 | 9,08 | 9,13 |
| 06 | 6,79 | 8,92 | 10,23 | 11,11 | 11,73 | 12,15 | 12,43 | 12,59 | 12,66 |
| 07 | 10,71 | 14,07 | 16,13 | 17,53 | 18,49 | 19,16 | 19,60 | 19,86 | 19,97 |
| 08 | 12,90 | 16,96 | 19,44 | 21,12 | 22,29 | 23,09 | 23,62 | 23,93 | 24,07 |
| 09 | 14,31 | 18,80 | 21,56 | 23,42 | 24,72 | 25,61 | 26,19 | 26,54 | 26,69 |

Table 8A: Refrigerant R410A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,78 | 1,01 | 1,16 | 1,25 | 1,32 | 1,36 | 1,39 | 1,41 | 1,41 |
| 02 | 1,55 | 2,02 | 2,30 | 2,49 | 2,62 | 2,70 | 2,76 | 2,79 | 2,80 |
| 03 | 1,83 | 2,39 | 2,72 | 2,95 | 3,10 | 3,20 | 3,27 | 3,31 | 3,32 |
| 04 | 2,97 | 3,86 | 4,41 | 4,77 | 5,01 | 5,18 | 5,29 | 5,35 | 5,38 |
| 05 | 5,08 | 6,61 | 7,54 | 8,16 | 8,58 | 8,87 | 9,05 | 9,16 | 9,20 |
| 06 | 7,04 | 9,17 | 10,45 | 11,31 | 11,90 | 12,30 | 12,55 | 12,70 | 12,75 |
| 07 | 11,10 | 14,46 | 16,48 | 17,83 | 18,76 | 19,39 | 19,80 | 20,03 | 20,11 |
| 08 | 13,38 | 17,42 | 19,86 | 21,49 | 22,61 | 23,37 | 23,86 | 24,14 | 24,24 |
| 09 | 14,84 | 19,32 | 22,03 | 23,84 | 25,07 | 25,92 | 26,46 | 26,77 | 26,88 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,80 | 1,03 | 1,17 | 1,26 | 1,32 | 1,36 | 1,39 | 1,40 | 1,41 |
| 02 | 1,59 | 2,05 | 2,32 | 2,50 | 2,62 | 2,71 | 2,76 | 2,78 | 2,79 |
| 03 | 1,88 | 2,43 | 2,75 | 2,96 | 3,11 | 3,21 | 3,27 | 3,30 | 3,31 |
| 04 | 3,05 | 3,93 | 4,45 | 4,80 | 5,03 | 5,19 | 5,29 | 5,34 | 5,35 |
| 05 | 5,21 | 6,72 | 7,62 | 8,21 | 8,61 | 8,88 | 9,04 | 9,13 | 9,16 |
| 06 | 7,22 | 9,32 | 10,56 | 11,38 | 11,94 | 12,31 | 12,54 | 12,66 | 12,70 |
| 07 | 11,39 | 14,69 | 16,65 | 17,95 | 18,82 | 19,41 | 19,78 | 19,97 | 20,03 |
| 08 | 13,73 | 17,70 | 20,07 | 21,63 | 22,69 | 23,39 | 23,83 | 24,07 | 24,13 |
| 09 | 15,23 | 19,63 | 22,26 | 23,99 | 25,16 | 25,94 | 26,43 | 26,69 | 26,77 |
| TABLE 8B - Correction factors for subcooling $\Delta t_{sub} = 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,07 | 1,14 | 1,21 | 1,28 | 1,34 | 1,41 | 1,48 | 1,54 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 8B

Table 9A: Refrigerant R507A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,45 | 0,58 | 0,65 | 0,69 | 0,72 | 0,72 | 0,71 | 0,69 | 0,67 |
| 02 | 0,89 | 1,15 | 1,30 | 1,38 | 1,42 | 1,43 | 1,42 | 1,38 | 1,33 |
| 03 | 1,05 | 1,36 | 1,54 | 1,64 | 1,68 | 1,69 | 1,68 | 1,63 | 1,57 |
| 04 | 1,70 | 2,21 | 2,49 | 2,65 | 2,72 | 2,74 | 2,71 | 2,65 | 2,54 |
| 05 | 2,91 | 3,78 | 4,26 | 4,53 | 4,66 | 4,69 | 4,64 | 4,53 | 4,35 |
| 06 | 4,03 | 5,24 | 5,90 | 6,28 | 6,46 | 6,51 | 6,44 | 6,27 | 6,03 |
| 07 | 6,35 | 8,26 | 9,31 | 9,90 | 10,19 | 10,26 | 10,15 | 9,90 | 9,51 |
| 08 | 7,66 | 9,95 | 11,22 | 11,94 | 12,29 | 12,36 | 12,23 | 11,93 | 11,46 |
| 09 | 8,49 | 11,04 | 12,45 | 13,24 | 13,62 | 13,71 | 13,57 | 13,23 | 12,71 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,48 | 0,62 | 0,69 | 0,73 | 0,75 | 0,76 | 0,75 | 0,73 | 0,70 |
| 02 | 0,95 | 1,22 | 1,37 | 1,46 | 1,50 | 1,50 | 1,49 | 1,45 | 1,40 |
| 03 | 1,12 | 1,45 | 1,63 | 1,72 | 1,77 | 1,78 | 1,76 | 1,72 | 1,66 |
| 04 | 1,82 | 2,34 | 2,63 | 2,79 | 2,87 | 2,88 | 2,85 | 2,78 | 2,68 |
| 05 | 3,11 | 4,01 | 4,50 | 4,78 | 4,90 | 4,93 | 4,88 | 4,76 | 4,59 |
| 06 | 4,31 | 5,56 | 6,24 | 6,62 | 6,80 | 6,84 | 6,76 | 6,60 | 6,36 |
| 07 | 6,79 | 8,77 | 9,85 | 10,44 | 10,72 | 10,78 | 10,67 | 10,41 | 10,04 |
| 08 | 8,19 | 10,57 | 11,87 | 12,58 | 12,92 | 12,99 | 12,86 | 12,55 | 12,09 |
| 09 | 9,08 | 11,72 | 13,16 | 13,96 | 14,33 | 14,41 | 14,26 | 13,92 | 13,41 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,50 | 0,64 | 0,72 | 0,76 | 0,78 | 0,78 | 0,77 | 0,75 | 0,72 |
| 02 | 1,00 | 1,28 | 1,43 | 1,51 | 1,54 | 1,55 | 1,53 | 1,49 | 1,43 |
| 03 | 1,18 | 1,51 | 1,69 | 1,78 | 1,83 | 1,83 | 1,81 | 1,76 | 1,70 |
| 04 | 1,92 | 2,45 | 2,73 | 2,89 | 2,95 | 2,96 | 2,93 | 2,85 | 2,75 |
| 05 | 3,28 | 4,19 | 4,68 | 4,94 | 5,06 | 5,07 | 5,01 | 4,88 | 4,70 |
| 06 | 4,54 | 5,81 | 6,49 | 6,85 | 7,01 | 7,03 | 6,94 | 6,77 | 6,52 |
| 07 | 7,16 | 9,17 | 10,23 | 10,80 | 11,05 | 11,09 | 10,95 | 10,68 | 10,29 |
| 08 | 8,63 | 11,05 | 12,33 | 13,01 | 13,32 | 13,36 | 13,19 | 12,87 | 12,40 |
| 09 | 9,58 | 12,25 | 13,67 | 14,43 | 14,77 | 14,82 | 14,63 | 14,27 | 13,75 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,52 | 0,66 | 0,73 | 0,77 | 0,79 | 0,79 | 0,77 | 0,75 | 0,72 |
| 02 | 1,04 | 1,32 | 1,46 | 1,53 | 1,56 | 1,56 | 1,54 | 1,49 | 1,44 |
| 03 | 1,23 | 1,56 | 1,73 | 1,81 | 1,85 | 1,85 | 1,82 | 1,77 | 1,70 |
| 04 | 1,99 | 2,52 | 2,80 | 2,94 | 2,99 | 2,99 | 2,95 | 2,86 | 2,75 |
| 05 | 3,41 | 4,32 | 4,79 | 5,02 | 5,12 | 5,12 | 5,04 | 4,90 | 4,71 |
| 06 | 4,73 | 5,99 | 6,63 | 6,97 | 7,10 | 7,10 | 6,99 | 6,80 | 6,53 |
| 07 | 7,46 | 9,45 | 10,46 | 10,98 | 11,20 | 11,19 | 11,02 | 10,72 | 10,30 |
| 08 | 8,99 | 11,38 | 12,61 | 13,24 | 13,49 | 13,49 | 13,28 | 12,92 | 12,42 |
| 09 | 9,97 | 12,62 | 13,98 | 14,68 | 14,97 | 14,96 | 14,73 | 14,32 | 13,77 |

Table 9A: Refrigerant R507A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,54 | 0,67 | 0,74 | 0,77 | 0,78 | 0,78 | 0,77 | 0,74 | 0,71 |
| 02 | 1,07 | 1,34 | 1,47 | 1,54 | 1,56 | 1,55 | 1,52 | 1,47 | 1,41 |
| 03 | 1,27 | 1,59 | 1,74 | 1,82 | 1,85 | 1,84 | 1,80 | 1,75 | 1,67 |
| 04 | 2,05 | 2,57 | 2,82 | 2,94 | 2,99 | 2,97 | 2,92 | 2,83 | 2,71 |
| 05 | 3,51 | 4,39 | 4,83 | 5,04 | 5,11 | 5,09 | 4,99 | 4,83 | 4,63 |
| 06 | 4,87 | 6,09 | 6,69 | 6,98 | 7,08 | 7,05 | 6,92 | 6,70 | 6,42 |
| 07 | 7,68 | 9,60 | 10,55 | 11,01 | 11,17 | 11,12 | 10,91 | 10,57 | 10,13 |
| 08 | 9,25 | 11,57 | 12,72 | 13,27 | 13,46 | 13,40 | 13,14 | 12,74 | 12,20 |
| 09 | 10,26 | 12,84 | 14,11 | 14,72 | 14,93 | 14,86 | 14,58 | 14,13 | 13,53 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,55 | 0,68 | 0,74 | 0,76 | 0,77 | 0,76 | 0,75 | 0,72 | 0,69 |
| 02 | 1,09 | 1,34 | 1,47 | 1,52 | 1,53 | 1,52 | 1,48 | 1,43 | 1,36 |
| 03 | 1,29 | 1,59 | 1,74 | 1,80 | 1,82 | 1,80 | 1,76 | 1,69 | 1,62 |
| 04 | 2,09 | 2,58 | 2,81 | 2,91 | 2,94 | 2,91 | 2,84 | 2,74 | 2,61 |
| 05 | 3,57 | 4,41 | 4,81 | 4,99 | 5,03 | 4,98 | 4,86 | 4,69 | 4,47 |
| 06 | 4,95 | 6,11 | 6,66 | 6,91 | 6,97 | 6,91 | 6,74 | 6,50 | 6,20 |
| 07 | 7,81 | 9,64 | 10,51 | 10,90 | 11,00 | 10,89 | 10,64 | 10,26 | 9,78 |
| 08 | 9,41 | 11,62 | 12,67 | 13,14 | 13,25 | 13,13 | 12,82 | 12,36 | 11,79 |
| 09 | 10,44 | 12,89 | 14,05 | 14,57 | 14,70 | 14,56 | 14,22 | 13,71 | 13,07 |

| TABLE 9B - Correction factors for subcooling $\Delta t_{sub} = 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,09 | 1,18 | 1,26 | 1,35 | 1,44 | 1,52 | 1,60 | 1,67 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 9B

Table 10A: Refrigerant R1234ze - Capacities in kW

| Evaporating Temperature 20 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,49 | 0,62 | 0,68 | 0,71 | 0,72 | 0,71 | 0,69 | 0,66 | 0,62 |
| 02 | 0,98 | 1,23 | 1,36 | 1,41 | 1,42 | 1,40 | 1,36 | 1,30 | 1,23 |
| 03 | 1,16 | 1,46 | 1,61 | 1,67 | 1,68 | 1,66 | 1,61 | 1,54 | 1,45 |
| 04 | 1,87 | 2,36 | 2,60 | 2,70 | 2,73 | 2,69 | 2,61 | 2,50 | 2,35 |
| 05 | 3,21 | 4,04 | 4,45 | 4,62 | 4,66 | 4,60 | 4,47 | 4,27 | 4,02 |
| 06 | 4,44 | 5,60 | 6,16 | 6,41 | 6,46 | 6,38 | 6,19 | 5,92 | 5,58 |
| 07 | 7,01 | 8,84 | 9,72 | 10,11 | 10,20 | 10,06 | 9,76 | 9,34 | 8,80 |
| 08 | 8,45 | 10,65 | 11,71 | 12,19 | 12,29 | 12,13 | 11,77 | 11,25 | 10,61 |
| 09 | 9,37 | 11,81 | 12,99 | 13,52 | 13,63 | 13,45 | 13,05 | 12,48 | 11,76 |
| Evaporating Temperature 10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,51 | 0,63 | 0,69 | 0,71 | 0,72 | 0,70 | 0,68 | 0,65 | 0,61 |
| 02 | 1,01 | 1,26 | 1,37 | 1,42 | 1,42 | 1,40 | 1,35 | 1,28 | 1,20 |
| 03 | 1,20 | 1,49 | 1,63 | 1,68 | 1,69 | 1,65 | 1,60 | 1,52 | 1,43 |
| 04 | 1,94 | 2,41 | 2,63 | 2,72 | 2,73 | 2,68 | 2,59 | 2,46 | 2,31 |
| 05 | 3,31 | 4,13 | 4,50 | 4,65 | 4,67 | 4,58 | 4,42 | 4,21 | 3,95 |
| 06 | 4,59 | 5,72 | 6,24 | 6,45 | 6,47 | 6,35 | 6,13 | 5,84 | 5,48 |
| 07 | 7,24 | 9,03 | 9,84 | 10,17 | 10,20 | 10,02 | 9,67 | 9,21 | 8,64 |
| 08 | 8,73 | 10,88 | 11,86 | 12,26 | 12,29 | 12,07 | 11,66 | 11,09 | 10,41 |
| 09 | 9,68 | 12,07 | 13,16 | 13,60 | 13,63 | 13,39 | 12,93 | 12,30 | 11,54 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,52 | 0,64 | 0,69 | 0,71 | 0,71 | 0,69 | 0,66 | 0,63 | 0,58 |
| 02 | 1,03 | 1,27 | 1,37 | 1,41 | 1,40 | 1,37 | 1,31 | 1,24 | 1,16 |
| 03 | 1,22 | 1,50 | 1,63 | 1,67 | 1,66 | 1,62 | 1,56 | 1,47 | 1,37 |
| 04 | 1,98 | 2,44 | 2,63 | 2,70 | 2,69 | 2,62 | 2,52 | 2,38 | 2,22 |
| 05 | 3,39 | 4,17 | 4,50 | 4,62 | 4,60 | 4,49 | 4,31 | 4,08 | 3,80 |
| 06 | 4,70 | 5,78 | 6,24 | 6,40 | 6,38 | 6,22 | 5,97 | 5,65 | 5,26 |
| 07 | 7,41 | 9,11 | 9,84 | 10,10 | 10,06 | 9,82 | 9,42 | 8,91 | 8,30 |
| 08 | 8,93 | 10,98 | 11,86 | 12,17 | 12,12 | 11,83 | 11,35 | 10,74 | 10,00 |
| 09 | 9,90 | 12,18 | 13,16 | 13,50 | 13,44 | 13,12 | 12,59 | 11,91 | 11,10 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,64 | 0,68 | 0,69 | 0,69 | 0,66 | 0,63 | 0,59 | 0,55 |
| 02 | 1,05 | 1,27 | 1,36 | 1,38 | 1,36 | 1,32 | 1,26 | 1,18 | 1,09 |
| 03 | 1,24 | 1,50 | 1,61 | 1,63 | 1,62 | 1,57 | 1,49 | 1,40 | 1,29 |
| 04 | 2,00 | 2,43 | 2,60 | 2,64 | 2,62 | 2,53 | 2,41 | 2,26 | 2,09 |
| 05 | 3,43 | 4,16 | 4,45 | 4,53 | 4,47 | 4,34 | 4,13 | 3,87 | 3,58 |
| 06 | 4,75 | 5,76 | 6,17 | 6,27 | 6,20 | 6,01 | 5,73 | 5,37 | 4,96 |
| 07 | 7,50 | 9,09 | 9,72 | 9,89 | 9,78 | 9,48 | 9,03 | 8,47 | 7,82 |
| 08 | 9,04 | 10,95 | 11,72 | 11,92 | 11,79 | 11,42 | 10,88 | 10,21 | 9,43 |
| 09 | 10,02 | 12,14 | 13,00 | 13,22 | 13,08 | 12,67 | 12,07 | 11,32 | 10,46 |

Table 10A: Refrigerant R1234ze - Capacities in kW

| Evaporating Temperature -20 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,63 | 0,67 | 0,67 | 0,66 | 0,63 | 0,60 | 0,56 | 0,51 |
| 02 | 1,05 | 1,25 | 1,32 | 1,34 | 1,31 | 1,26 | 1,19 | 1,10 | 1,01 |
| 03 | 1,24 | 1,48 | 1,57 | 1,58 | 1,55 | 1,49 | 1,41 | 1,31 | 1,19 |
| 04 | 2,01 | 2,40 | 2,54 | 2,56 | 2,51 | 2,41 | 2,28 | 2,12 | 1,93 |
| 05 | 3,43 | 4,10 | 4,34 | 4,38 | 4,30 | 4,13 | 3,90 | 3,62 | 3,30 |
| 06 | 4,76 | 5,68 | 6,02 | 6,07 | 5,96 | 5,72 | 5,40 | 5,02 | 4,58 |
| 07 | 7,51 | 8,96 | 9,49 | 9,58 | 9,39 | 9,03 | 8,52 | 7,92 | 7,22 |
| 08 | 9,05 | 10,80 | 11,44 | 11,54 | 11,32 | 10,88 | 10,27 | 9,54 | 8,71 |
| 09 | 10,03 | 11,98 | 12,69 | 12,80 | 12,55 | 12,06 | 11,39 | 10,58 | 9,65 |
| Evaporating Temperature -30 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,52 | 0,61 | 0,64 | 0,64 | 0,63 | 0,59 | 0,56 | 0,51 | 0,46 |
| 02 | 1,04 | 1,22 | 1,28 | 1,28 | 1,24 | 1,18 | 1,10 | 1,01 | 0,91 |
| 03 | 1,23 | 1,44 | 1,51 | 1,51 | 1,47 | 1,40 | 1,31 | 1,20 | 1,08 |
| 04 | 1,99 | 2,34 | 2,45 | 2,45 | 2,38 | 2,27 | 2,12 | 1,94 | 1,75 |
| 05 | 3,40 | 4,00 | 4,19 | 4,19 | 4,07 | 3,88 | 3,62 | 3,32 | 2,99 |
| 06 | 4,72 | 5,55 | 5,81 | 5,81 | 5,65 | 5,38 | 5,02 | 4,61 | 4,14 |
| 07 | 7,44 | 8,75 | 9,17 | 9,17 | 8,91 | 8,48 | 7,92 | 7,26 | 6,53 |
| 08 | 8,96 | 10,54 | 11,05 | 11,05 | 10,74 | 10,22 | 9,55 | 8,76 | 7,87 |
| 09 | 9,94 | 11,69 | 12,25 | 12,25 | 11,91 | 11,33 | 10,59 | 9,71 | 8,73 |
| TABLE 10B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,36 | 1,44 | 1,49 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 10B

Table 11A: Refrigerant R1234yf - Capacities in kW

| Evaporating Temperature 20 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,42 | 0,53 | 0,59 | 0,61 | 0,61 | 0,60 | 0,57 | 0,54 | 0,50 |
| 02 | 0,84 | 1,06 | 1,16 | 1,21 | 1,21 | 1,18 | 1,14 | 1,07 | 0,99 |
| 03 | 0,99 | 1,25 | 1,38 | 1,43 | 1,43 | 1,40 | 1,34 | 1,27 | 1,17 |
| 04 | 1,61 | 2,03 | 2,23 | 2,31 | 2,32 | 2,27 | 2,18 | 2,05 | 1,89 |
| 05 | 2,75 | 3,47 | 3,82 | 3,96 | 3,97 | 3,88 | 3,72 | 3,51 | 3,24 |
| 06 | 3,81 | 4,82 | 5,29 | 5,49 | 5,50 | 5,38 | 5,16 | 4,86 | 4,49 |
| 07 | 6,01 | 7,59 | 8,35 | 8,65 | 8,67 | 8,49 | 8,14 | 7,67 | 7,08 |
| 08 | 7,24 | 9,15 | 10,06 | 10,43 | 10,45 | 10,23 | 9,81 | 9,24 | 8,53 |
| 09 | 8,03 | 10,15 | 11,15 | 11,57 | 11,59 | 11,34 | 10,88 | 10,25 | 9,46 |
| Evaporating Temperature 10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,44 | 0,55 | 0,60 | 0,62 | 0,62 | 0,61 | 0,58 | 0,54 | 0,50 |
| 02 | 0,88 | 1,10 | 1,20 | 1,24 | 1,23 | 1,20 | 1,15 | 1,08 | 1,00 |
| 03 | 1,04 | 1,30 | 1,42 | 1,47 | 1,46 | 1,43 | 1,36 | 1,28 | 1,18 |
| 04 | 1,68 | 2,11 | 2,30 | 2,37 | 2,37 | 2,31 | 2,21 | 2,07 | 1,91 |
| 05 | 2,88 | 3,61 | 3,94 | 4,06 | 4,05 | 3,95 | 3,77 | 3,55 | 3,27 |
| 06 | 3,99 | 5,00 | 5,46 | 5,62 | 5,61 | 5,47 | 5,23 | 4,92 | 4,53 |
| 07 | 6,30 | 7,89 | 8,60 | 8,87 | 8,85 | 8,63 | 8,25 | 7,75 | 7,15 |
| 08 | 7,59 | 9,50 | 10,37 | 10,69 | 10,67 | 10,40 | 9,95 | 9,34 | 8,62 |
| 09 | 8,42 | 10,54 | 11,50 | 11,86 | 11,83 | 11,53 | 11,03 | 10,36 | 9,56 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,46 | 0,57 | 0,61 | 0,63 | 0,62 | 0,60 | 0,57 | 0,54 | 0,49 |
| 02 | 0,91 | 1,13 | 1,22 | 1,25 | 1,24 | 1,20 | 1,14 | 1,07 | 0,98 |
| 03 | 1,08 | 1,33 | 1,44 | 1,48 | 1,47 | 1,42 | 1,35 | 1,26 | 1,16 |
| 04 | 1,75 | 2,16 | 2,34 | 2,39 | 2,37 | 2,30 | 2,19 | 2,05 | 1,88 |
| 05 | 2,99 | 3,69 | 4,00 | 4,09 | 4,06 | 3,94 | 3,75 | 3,50 | 3,21 |
| 06 | 4,14 | 5,12 | 5,54 | 5,67 | 5,63 | 5,46 | 5,19 | 4,85 | 4,45 |
| 07 | 6,53 | 8,08 | 8,74 | 8,95 | 8,87 | 8,61 | 8,19 | 7,66 | 7,02 |
| 08 | 7,87 | 9,73 | 10,53 | 10,78 | 10,69 | 10,37 | 9,87 | 9,23 | 8,46 |
| 09 | 8,73 | 10,80 | 11,68 | 11,96 | 11,86 | 11,50 | 10,95 | 10,23 | 9,39 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,47 | 0,57 | 0,61 | 0,62 | 0,61 | 0,59 | 0,56 | 0,52 | 0,47 |
| 02 | 0,93 | 1,14 | 1,22 | 1,24 | 1,22 | 1,18 | 1,11 | 1,03 | 0,94 |
| 03 | 1,11 | 1,35 | 1,45 | 1,47 | 1,45 | 1,39 | 1,32 | 1,22 | 1,11 |
| 04 | 1,79 | 2,18 | 2,34 | 2,38 | 2,34 | 2,25 | 2,13 | 1,98 | 1,80 |
| 05 | 3,06 | 3,74 | 4,00 | 4,07 | 4,00 | 3,86 | 3,65 | 3,38 | 3,08 |
| 06 | 4,24 | 5,18 | 5,55 | 5,64 | 5,55 | 5,35 | 5,06 | 4,69 | 4,27 |
| 07 | 6,69 | 8,17 | 8,75 | 8,89 | 8,76 | 8,43 | 7,97 | 7,40 | 6,73 |
| 08 | 8,06 | 9,84 | 10,54 | 10,71 | 10,55 | 10,16 | 9,61 | 8,92 | 8,11 |
| 09 | 8,94 | 10,92 | 11,69 | 11,88 | 11,70 | 11,27 | 10,66 | 9,89 | 9,00 |

Table 11A: Refrigerant R1234yf - Capacities in kW

| Evaporating Temperature -20 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|------|------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,48 | 0,57 | 0,61 | 0,61 | 0,60 | 0,57 | 0,53 | 0,49 | 0,44 |
| 02 | 0,95 | 1,14 | 1,21 | 1,21 | 1,19 | 1,13 | 1,06 | 0,98 | 0,88 |
| 03 | 1,12 | 1,35 | 1,43 | 1,44 | 1,41 | 1,34 | 1,26 | 1,16 | 1,04 |
| 04 | 1,81 | 2,18 | 2,31 | 2,33 | 2,28 | 2,17 | 2,04 | 1,87 | 1,69 |
| 05 | 3,10 | 3,73 | 3,96 | 3,98 | 3,89 | 3,72 | 3,49 | 3,20 | 2,88 |
| 06 | 4,30 | 5,17 | 5,48 | 5,52 | 5,40 | 5,16 | 4,83 | 4,44 | 4,00 |
| 07 | 6,78 | 8,16 | 8,65 | 8,71 | 8,51 | 8,13 | 7,62 | 7,01 | 6,30 |
| 08 | 8,17 | 9,83 | 10,42 | 10,50 | 10,26 | 9,80 | 9,19 | 8,44 | 7,60 |
| 09 | 9,06 | 10,90 | 11,56 | 11,64 | 11,38 | 10,87 | 10,19 | 9,36 | 8,43 |
| Evaporating Temperature -30 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,48 | 0,56 | 0,59 | 0,59 | 0,57 | 0,54 | 0,50 | 0,46 | 0,40 |
| 02 | 0,95 | 1,12 | 1,18 | 1,18 | 1,14 | 1,08 | 1,00 | 0,91 | 0,80 |
| 03 | 1,12 | 1,33 | 1,40 | 1,39 | 1,35 | 1,28 | 1,18 | 1,07 | 0,95 |
| 04 | 1,82 | 2,15 | 2,26 | 2,25 | 2,18 | 2,06 | 1,91 | 1,74 | 1,54 |
| 05 | 3,11 | 3,68 | 3,86 | 3,85 | 3,73 | 3,53 | 3,28 | 2,97 | 2,64 |
| 06 | 4,31 | 5,11 | 5,36 | 5,34 | 5,17 | 4,90 | 4,54 | 4,12 | 3,66 |
| 07 | 6,80 | 8,05 | 8,45 | 8,43 | 8,16 | 7,72 | 7,16 | 6,50 | 5,76 |
| 08 | 8,19 | 9,70 | 10,18 | 10,16 | 9,84 | 9,31 | 8,63 | 7,84 | 6,95 |
| 09 | 9,09 | 10,76 | 11,29 | 11,27 | 10,91 | 10,32 | 9,57 | 8,69 | 7,70 |
| TABLE 11B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,07 | 1,15 | 1,22 | 1,29 | 1,36 | 1,43 | 1,49 | 1,55 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 11B

Table 12A: Refrigerant R448A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,54 | 0,71 | 0,82 | 0,89 | 0,93 | 0,96 | 0,97 | 0,98 | 0,97 |
| 02 | 1,07 | 1,42 | 1,63 | 1,76 | 1,85 | 1,91 | 1,93 | 1,94 | 1,93 |
| 03 | 1,27 | 1,68 | 1,93 | 2,09 | 2,19 | 2,26 | 2,29 | 2,30 | 2,28 |
| 04 | 2,06 | 2,72 | 3,12 | 3,38 | 3,55 | 3,65 | 3,71 | 3,72 | 3,70 |
| 05 | 3,52 | 4,65 | 5,34 | 5,78 | 6,07 | 6,25 | 6,34 | 6,36 | 6,32 |
| 06 | 4,88 | 6,45 | 7,40 | 8,02 | 8,42 | 8,67 | 8,79 | 8,82 | 8,77 |
| 07 | 7,69 | 10,17 | 11,67 | 12,65 | 13,28 | 13,67 | 13,87 | 13,91 | 13,83 |
| 08 | 9,27 | 12,25 | 14,06 | 15,24 | 16,01 | 16,48 | 16,71 | 16,77 | 16,66 |
| 09 | 10,28 | 13,59 | 15,59 | 16,90 | 17,75 | 18,27 | 18,54 | 18,60 | 18,48 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,57 | 0,75 | 0,86 | 0,93 | 0,97 | 1,00 | 1,01 | 1,01 | 1,00 |
| 02 | 1,14 | 1,49 | 1,70 | 1,84 | 1,93 | 1,98 | 2,01 | 2,01 | 2,00 |
| 03 | 1,34 | 1,77 | 2,02 | 2,18 | 2,28 | 2,35 | 2,38 | 2,38 | 2,37 |
| 04 | 2,18 | 2,86 | 3,26 | 3,53 | 3,69 | 3,79 | 3,84 | 3,85 | 3,83 |
| 05 | 3,72 | 4,89 | 5,59 | 6,03 | 6,32 | 6,49 | 6,58 | 6,59 | 6,55 |
| 06 | 5,16 | 6,78 | 7,74 | 8,36 | 8,76 | 9,00 | 9,12 | 9,14 | 9,08 |
| 07 | 8,14 | 10,69 | 12,21 | 13,19 | 13,82 | 14,20 | 14,38 | 14,42 | 14,32 |
| 08 | 9,81 | 12,88 | 14,72 | 15,90 | 16,65 | 17,11 | 17,33 | 17,38 | 17,26 |
| 09 | 10,88 | 14,29 | 16,32 | 17,63 | 18,47 | 18,97 | 19,22 | 19,27 | 19,15 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,60 | 0,78 | 0,88 | 0,95 | 0,99 | 1,02 | 1,03 | 1,03 | 1,02 |
| 02 | 1,19 | 1,55 | 1,76 | 1,89 | 1,97 | 2,02 | 2,05 | 2,05 | 2,03 |
| 03 | 1,41 | 1,83 | 2,08 | 2,24 | 2,34 | 2,40 | 2,42 | 2,43 | 2,41 |
| 04 | 2,28 | 2,97 | 3,37 | 3,63 | 3,79 | 3,88 | 3,92 | 3,93 | 3,90 |
| 05 | 3,90 | 5,08 | 5,77 | 6,20 | 6,48 | 6,64 | 6,71 | 6,72 | 6,67 |
| 06 | 5,40 | 7,04 | 8,00 | 8,60 | 8,98 | 9,20 | 9,31 | 9,31 | 9,24 |
| 07 | 8,52 | 11,10 | 12,61 | 13,56 | 14,16 | 14,51 | 14,68 | 14,69 | 14,57 |
| 08 | 10,27 | 13,38 | 15,20 | 16,35 | 17,07 | 17,49 | 17,69 | 17,70 | 17,56 |
| 09 | 11,39 | 14,84 | 16,85 | 18,13 | 18,93 | 19,40 | 19,61 | 19,63 | 19,48 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,62 | 0,80 | 0,90 | 0,97 | 1,01 | 1,03 | 1,04 | 1,03 | 1,02 |
| 02 | 1,23 | 1,59 | 1,79 | 1,92 | 2,00 | 2,04 | 2,06 | 2,06 | 2,04 |
| 03 | 1,46 | 1,88 | 2,12 | 2,27 | 2,37 | 2,42 | 2,44 | 2,44 | 2,41 |
| 04 | 2,36 | 3,05 | 3,44 | 3,68 | 3,83 | 3,91 | 3,95 | 3,94 | 3,90 |
| 05 | 4,04 | 5,21 | 5,88 | 6,30 | 6,55 | 6,70 | 6,75 | 6,74 | 6,68 |
| 06 | 5,60 | 7,23 | 8,16 | 8,73 | 9,08 | 9,28 | 9,36 | 9,35 | 9,26 |
| 07 | 8,83 | 11,39 | 12,86 | 13,77 | 14,33 | 14,64 | 14,76 | 14,74 | 14,60 |
| 08 | 10,64 | 13,73 | 15,50 | 16,59 | 17,27 | 17,64 | 17,79 | 17,77 | 17,60 |
| 09 | 11,80 | 15,23 | 17,19 | 18,40 | 19,15 | 19,57 | 19,73 | 19,71 | 19,52 |

Table 12A: Refrigerant R448A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,64 | 0,81 | 0,91 | 0,97 | 1,00 | 1,02 | 1,03 | 1,03 | 1,01 |
| 02 | 1,26 | 1,61 | 1,81 | 1,93 | 2,00 | 2,03 | 2,05 | 2,04 | 2,01 |
| 03 | 1,50 | 1,91 | 2,14 | 2,28 | 2,37 | 2,41 | 2,42 | 2,41 | 2,39 |
| 04 | 2,42 | 3,09 | 3,47 | 3,69 | 3,83 | 3,90 | 3,92 | 3,91 | 3,86 |
| 05 | 4,14 | 5,29 | 5,93 | 6,32 | 6,55 | 6,67 | 6,71 | 6,68 | 6,60 |
| 06 | 5,75 | 7,34 | 8,22 | 8,76 | 9,08 | 9,25 | 9,30 | 9,27 | 9,16 |
| 07 | 9,06 | 11,57 | 12,97 | 13,82 | 14,32 | 14,59 | 14,67 | 14,61 | 14,44 |
| 08 | 10,92 | 13,94 | 15,63 | 16,65 | 17,26 | 17,58 | 17,68 | 17,61 | 17,40 |
| 09 | 12,11 | 15,46 | 17,34 | 18,47 | 19,14 | 19,50 | 19,61 | 19,53 | 19,30 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,65 | 0,82 | 0,91 | 0,96 | 0,99 | 1,01 | 1,01 | 1,01 | 0,99 |
| 02 | 1,28 | 1,62 | 1,80 | 1,91 | 1,98 | 2,01 | 2,01 | 2,00 | 1,97 |
| 03 | 1,52 | 1,92 | 2,14 | 2,27 | 2,34 | 2,38 | 2,38 | 2,37 | 2,33 |
| 04 | 2,46 | 3,11 | 3,46 | 3,67 | 3,79 | 3,84 | 3,86 | 3,83 | 3,77 |
| 05 | 4,21 | 5,32 | 5,92 | 6,28 | 6,48 | 6,58 | 6,60 | 6,55 | 6,46 |
| 06 | 5,84 | 7,37 | 8,21 | 8,70 | 8,99 | 9,12 | 9,15 | 9,08 | 8,95 |
| 07 | 9,21 | 11,62 | 12,95 | 13,73 | 14,17 | 14,38 | 14,42 | 14,33 | 14,12 |
| 08 | 11,10 | 14,01 | 15,60 | 16,54 | 17,08 | 17,33 | 17,38 | 17,26 | 17,01 |
| 09 | 12,31 | 15,53 | 17,30 | 18,35 | 18,94 | 19,22 | 19,28 | 19,15 | 18,87 |
| TABLE 12B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,07 | 1,14 | 1,20 | 1,27 | 1,33 | 1,40 | 1,48 | 1,54 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 12B

Table 13A: Refrigerant R449A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,54 | 0,71 | 0,81 | 0,88 | 0,92 | 0,95 | 0,96 | 0,96 | 0,95 |
| 02 | 1,06 | 1,41 | 1,61 | 1,74 | 1,83 | 1,88 | 1,90 | 1,91 | 1,89 |
| 03 | 1,26 | 1,66 | 1,91 | 2,07 | 2,17 | 2,23 | 2,26 | 2,26 | 2,24 |
| 04 | 2,04 | 2,69 | 3,09 | 3,34 | 3,51 | 3,60 | 3,65 | 3,66 | 3,63 |
| 05 | 3,49 | 4,61 | 5,28 | 5,72 | 6,00 | 6,17 | 6,25 | 6,26 | 6,21 |
| 06 | 4,84 | 6,39 | 7,32 | 7,93 | 8,32 | 8,55 | 8,66 | 8,68 | 8,61 |
| 07 | 7,63 | 10,08 | 11,55 | 12,50 | 13,12 | 13,49 | 13,66 | 13,69 | 13,58 |
| 08 | 9,20 | 12,14 | 13,92 | 15,07 | 15,81 | 16,25 | 16,47 | 16,49 | 16,36 |
| 09 | 10,20 | 13,47 | 15,44 | 16,71 | 17,53 | 18,02 | 18,26 | 18,29 | 18,15 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,57 | 0,74 | 0,85 | 0,91 | 0,96 | 0,98 | 0,99 | 0,99 | 0,99 |
| 02 | 1,13 | 1,48 | 1,69 | 1,82 | 1,90 | 1,95 | 1,98 | 1,98 | 1,96 |
| 03 | 1,33 | 1,75 | 2,00 | 2,15 | 2,25 | 2,31 | 2,34 | 2,34 | 2,32 |
| 04 | 2,16 | 2,83 | 3,23 | 3,49 | 3,65 | 3,74 | 3,79 | 3,79 | 3,76 |
| 05 | 3,70 | 4,85 | 5,53 | 5,96 | 6,24 | 6,40 | 6,48 | 6,49 | 6,43 |
| 06 | 5,12 | 6,72 | 7,67 | 8,27 | 8,65 | 8,88 | 8,98 | 8,99 | 8,92 |
| 07 | 8,08 | 10,60 | 12,09 | 13,04 | 13,65 | 14,00 | 14,17 | 14,18 | 14,07 |
| 08 | 9,74 | 12,77 | 14,57 | 15,72 | 16,44 | 16,87 | 17,07 | 17,09 | 16,95 |
| 09 | 10,80 | 14,16 | 16,16 | 17,43 | 18,24 | 18,71 | 18,93 | 18,95 | 18,80 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,59 | 0,77 | 0,88 | 0,94 | 0,98 | 1,00 | 1,01 | 1,01 | 1,00 |
| 02 | 1,18 | 1,53 | 1,74 | 1,87 | 1,95 | 2,00 | 2,01 | 2,01 | 1,99 |
| 03 | 1,40 | 1,82 | 2,06 | 2,21 | 2,31 | 2,36 | 2,39 | 2,39 | 2,36 |
| 04 | 2,26 | 2,94 | 3,34 | 3,58 | 3,74 | 3,82 | 3,86 | 3,86 | 3,82 |
| 05 | 3,87 | 5,03 | 5,71 | 6,13 | 6,39 | 6,54 | 6,61 | 6,60 | 6,54 |
| 06 | 5,36 | 6,98 | 7,91 | 8,50 | 8,87 | 9,07 | 9,16 | 9,16 | 9,07 |
| 07 | 8,46 | 11,00 | 12,48 | 13,41 | 13,98 | 14,31 | 14,45 | 14,44 | 14,31 |
| 08 | 10,19 | 13,26 | 15,04 | 16,16 | 16,85 | 17,24 | 17,41 | 17,40 | 17,24 |
| 09 | 11,31 | 14,70 | 16,68 | 17,92 | 18,69 | 19,12 | 19,31 | 19,30 | 19,12 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,61 | 0,79 | 0,89 | 0,95 | 0,99 | 1,01 | 1,02 | 1,02 | 1,01 |
| 02 | 1,22 | 1,57 | 1,77 | 1,90 | 1,97 | 2,01 | 2,03 | 2,02 | 2,00 |
| 03 | 1,45 | 1,86 | 2,10 | 2,25 | 2,34 | 2,38 | 2,40 | 2,39 | 2,37 |
| 04 | 2,34 | 3,02 | 3,40 | 3,64 | 3,78 | 3,86 | 3,88 | 3,87 | 3,83 |
| 05 | 4,01 | 5,16 | 5,82 | 6,22 | 6,47 | 6,60 | 6,65 | 6,63 | 6,55 |
| 06 | 5,56 | 7,16 | 8,07 | 8,63 | 8,96 | 9,15 | 9,21 | 9,19 | 9,08 |
| 07 | 8,77 | 11,29 | 12,73 | 13,61 | 14,14 | 14,43 | 14,53 | 14,49 | 14,33 |
| 08 | 10,56 | 13,61 | 15,34 | 16,40 | 17,04 | 17,38 | 17,51 | 17,46 | 17,27 |
| 09 | 11,72 | 15,09 | 17,01 | 18,19 | 18,90 | 19,28 | 19,42 | 19,36 | 19,15 |

Table 13A: Refrigerant R449A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,63 | 0,80 | 0,90 | 0,96 | 0,99 | 1,01 | 1,01 | 1,01 | 0,99 |
| 02 | 1,25 | 1,60 | 1,79 | 1,90 | 1,97 | 2,00 | 2,01 | 2,00 | 1,97 |
| 03 | 1,49 | 1,89 | 2,12 | 2,25 | 2,33 | 2,37 | 2,38 | 2,37 | 2,34 |
| 04 | 2,40 | 3,06 | 3,43 | 3,65 | 3,78 | 3,84 | 3,86 | 3,84 | 3,78 |
| 05 | 4,11 | 5,24 | 5,87 | 6,24 | 6,46 | 6,57 | 6,60 | 6,56 | 6,48 |
| 06 | 5,70 | 7,27 | 8,14 | 8,66 | 8,96 | 9,11 | 9,15 | 9,10 | 8,98 |
| 07 | 8,99 | 11,46 | 12,83 | 13,65 | 14,13 | 14,37 | 14,43 | 14,35 | 14,16 |
| 08 | 10,84 | 13,81 | 15,46 | 16,45 | 17,03 | 17,32 | 17,39 | 17,29 | 17,06 |
| 09 | 12,02 | 15,32 | 17,15 | 18,24 | 18,88 | 19,20 | 19,29 | 19,18 | 18,92 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,64 | 0,81 | 0,90 | 0,95 | 0,98 | 0,99 | 0,99 | 0,99 | 0,97 |
| 02 | 1,27 | 1,60 | 1,78 | 1,89 | 1,95 | 1,97 | 1,98 | 1,96 | 1,93 |
| 03 | 1,51 | 1,90 | 2,11 | 2,24 | 2,31 | 2,34 | 2,34 | 2,32 | 2,28 |
| 04 | 2,44 | 3,08 | 3,42 | 3,62 | 3,73 | 3,78 | 3,79 | 3,76 | 3,70 |
| 05 | 4,18 | 5,26 | 5,85 | 6,20 | 6,39 | 6,48 | 6,48 | 6,43 | 6,32 |
| 06 | 5,79 | 7,30 | 8,12 | 8,59 | 8,86 | 8,98 | 8,99 | 8,91 | 8,77 |
| 07 | 9,13 | 11,51 | 12,80 | 13,55 | 13,97 | 14,16 | 14,17 | 14,06 | 13,83 |
| 08 | 11,01 | 13,87 | 15,42 | 16,33 | 16,84 | 17,06 | 17,08 | 16,94 | 16,66 |
| 09 | 12,21 | 15,38 | 17,11 | 18,11 | 18,67 | 18,92 | 18,95 | 18,79 | 18,48 |

| TABLE 13B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,07 | 1,14 | 1,21 | 1,27 | 1,34 | 1,40 | 1,48 | 1,54 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 13B

Table 14A: Refrigerant R450A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,67 | 0,74 | 0,78 | 0,79 | 0,78 | 0,77 | 0,74 | 0,71 |
| 02 | 1,05 | 1,33 | 1,47 | 1,54 | 1,57 | 1,56 | 1,53 | 1,48 | 1,42 |
| 03 | 1,25 | 1,58 | 1,74 | 1,83 | 1,86 | 1,85 | 1,81 | 1,75 | 1,68 |
| 04 | 2,02 | 2,55 | 2,82 | 2,96 | 3,00 | 2,99 | 2,93 | 2,84 | 2,71 |
| 05 | 3,45 | 4,37 | 4,83 | 5,06 | 5,14 | 5,12 | 5,02 | 4,86 | 4,64 |
| 06 | 4,79 | 6,06 | 6,70 | 7,01 | 7,12 | 7,09 | 6,95 | 6,73 | 6,44 |
| 07 | 7,55 | 9,55 | 10,56 | 11,06 | 11,23 | 11,18 | 10,97 | 10,62 | 10,15 |
| 08 | 9,10 | 11,51 | 12,73 | 13,33 | 13,54 | 13,48 | 13,22 | 12,79 | 12,24 |
| 09 | 10,09 | 12,77 | 14,11 | 14,78 | 15,01 | 14,95 | 14,66 | 14,19 | 13,57 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,55 | 0,68 | 0,75 | 0,78 | 0,79 | 0,78 | 0,76 | 0,73 | 0,70 |
| 02 | 1,08 | 1,36 | 1,49 | 1,55 | 1,56 | 1,55 | 1,51 | 1,46 | 1,39 |
| 03 | 1,28 | 1,61 | 1,76 | 1,83 | 1,85 | 1,83 | 1,79 | 1,73 | 1,64 |
| 04 | 2,08 | 2,60 | 2,85 | 2,96 | 3,00 | 2,97 | 2,90 | 2,79 | 2,66 |
| 05 | 3,56 | 4,45 | 4,87 | 5,07 | 5,13 | 5,08 | 4,96 | 4,78 | 4,55 |
| 06 | 4,93 | 6,16 | 6,76 | 7,03 | 7,11 | 7,04 | 6,87 | 6,63 | 6,31 |
| 07 | 7,77 | 9,72 | 10,66 | 11,09 | 11,21 | 11,10 | 10,84 | 10,45 | 9,95 |
| 08 | 9,37 | 11,71 | 12,84 | 13,36 | 13,50 | 13,38 | 13,06 | 12,59 | 11,99 |
| 09 | 10,39 | 12,99 | 14,24 | 14,82 | 14,98 | 14,84 | 14,49 | 13,97 | 13,30 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,56 | 0,69 | 0,75 | 0,77 | 0,77 | 0,76 | 0,74 | 0,71 | 0,67 |
| 02 | 1,10 | 1,36 | 1,48 | 1,53 | 1,54 | 1,52 | 1,47 | 1,41 | 1,34 |
| 03 | 1,31 | 1,61 | 1,76 | 1,81 | 1,82 | 1,80 | 1,74 | 1,67 | 1,58 |
| 04 | 2,12 | 2,61 | 2,84 | 2,94 | 2,95 | 2,91 | 2,82 | 2,71 | 2,56 |
| 05 | 3,62 | 4,47 | 4,86 | 5,02 | 5,05 | 4,97 | 4,83 | 4,63 | 4,38 |
| 06 | 5,02 | 6,20 | 6,74 | 6,96 | 6,99 | 6,89 | 6,69 | 6,42 | 6,08 |
| 07 | 7,92 | 9,78 | 10,63 | 10,98 | 11,03 | 10,87 | 10,56 | 10,12 | 9,59 |
| 08 | 9,55 | 11,78 | 12,81 | 13,23 | 13,29 | 13,10 | 12,72 | 12,20 | 11,55 |
| 09 | 10,59 | 13,07 | 14,20 | 14,68 | 14,74 | 14,53 | 14,11 | 13,53 | 12,81 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,56 | 0,68 | 0,73 | 0,75 | 0,75 | 0,74 | 0,71 | 0,68 | 0,64 |
| 02 | 1,11 | 1,36 | 1,46 | 1,50 | 1,50 | 1,47 | 1,41 | 1,35 | 1,27 |
| 03 | 1,32 | 1,61 | 1,73 | 1,78 | 1,77 | 1,74 | 1,68 | 1,60 | 1,50 |
| 04 | 2,14 | 2,60 | 2,80 | 2,87 | 2,87 | 2,81 | 2,71 | 2,58 | 2,43 |
| 05 | 3,65 | 4,45 | 4,79 | 4,92 | 4,91 | 4,81 | 4,64 | 4,42 | 4,15 |
| 06 | 5,07 | 6,17 | 6,64 | 6,81 | 6,80 | 6,66 | 6,43 | 6,13 | 5,76 |
| 07 | 7,99 | 9,72 | 10,47 | 10,75 | 10,73 | 10,51 | 10,14 | 9,66 | 9,08 |
| 08 | 9,63 | 11,72 | 12,62 | 12,95 | 12,93 | 12,67 | 12,22 | 11,64 | 10,95 |
| 09 | 10,68 | 13,00 | 14,00 | 14,36 | 14,34 | 14,05 | 13,56 | 12,91 | 12,14 |

Table 14A: Refrigerant R450A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,56 | 0,67 | 0,72 | 0,73 | 0,72 | 0,70 | 0,67 | 0,64 | 0,59 |
| 02 | 1,11 | 1,33 | 1,42 | 1,45 | 1,44 | 1,40 | 1,34 | 1,27 | 1,18 |
| 03 | 1,32 | 1,58 | 1,69 | 1,72 | 1,70 | 1,66 | 1,59 | 1,50 | 1,40 |
| 04 | 2,13 | 2,56 | 2,73 | 2,78 | 2,76 | 2,68 | 2,57 | 2,43 | 2,26 |
| 05 | 3,65 | 4,38 | 4,67 | 4,76 | 4,72 | 4,59 | 4,40 | 4,16 | 3,87 |
| 06 | 5,06 | 6,07 | 6,48 | 6,60 | 6,54 | 6,36 | 6,10 | 5,76 | 5,37 |
| 07 | 7,97 | 9,57 | 10,22 | 10,41 | 10,32 | 10,04 | 9,62 | 9,09 | 8,47 |
| 08 | 9,61 | 11,53 | 12,31 | 12,54 | 12,43 | 12,10 | 11,59 | 10,95 | 10,21 |
| 09 | 10,66 | 12,79 | 13,66 | 13,91 | 13,79 | 13,42 | 12,85 | 12,15 | 11,32 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,55 | 0,65 | 0,69 | 0,70 | 0,69 | 0,67 | 0,63 | 0,59 | 0,55 |
| 02 | 1,10 | 1,30 | 1,38 | 1,39 | 1,37 | 1,32 | 1,26 | 1,18 | 1,08 |
| 03 | 1,30 | 1,54 | 1,63 | 1,65 | 1,62 | 1,57 | 1,49 | 1,39 | 1,28 |
| 04 | 2,11 | 2,49 | 2,64 | 2,67 | 2,63 | 2,53 | 2,41 | 2,25 | 2,08 |
| 05 | 3,60 | 4,27 | 4,52 | 4,56 | 4,49 | 4,34 | 4,12 | 3,86 | 3,56 |
| 06 | 4,99 | 5,92 | 6,26 | 6,33 | 6,23 | 6,01 | 5,71 | 5,35 | 4,93 |
| 07 | 7,88 | 9,33 | 9,87 | 9,98 | 9,82 | 9,48 | 9,01 | 8,43 | 7,77 |
| 08 | 9,49 | 11,25 | 11,90 | 12,03 | 11,83 | 11,42 | 10,86 | 10,16 | 9,37 |
| 09 | 10,53 | 12,47 | 13,20 | 13,34 | 13,13 | 12,67 | 12,04 | 11,27 | 10,39 |

| TABLE 14B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,36 | 1,40 | 1,45 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 14B

Table 15A: Refrigerant R452A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,44 | 0,58 | 0,65 | 0,70 | 0,72 | 0,73 | 0,73 | 0,72 | 0,70 |
| 02 | 0,87 | 1,14 | 1,30 | 1,39 | 1,44 | 1,46 | 1,45 | 1,43 | 1,39 |
| 03 | 1,04 | 1,35 | 1,54 | 1,64 | 1,70 | 1,72 | 1,72 | 1,69 | 1,65 |
| 04 | 1,68 | 2,19 | 2,48 | 2,66 | 2,75 | 2,79 | 2,78 | 2,74 | 2,66 |
| 05 | 2,87 | 3,75 | 4,25 | 4,55 | 4,71 | 4,77 | 4,76 | 4,69 | 4,56 |
| 06 | 3,98 | 5,20 | 5,89 | 6,31 | 6,53 | 6,62 | 6,60 | 6,50 | 6,32 |
| 07 | 6,27 | 8,20 | 9,30 | 9,94 | 10,30 | 10,44 | 10,41 | 10,25 | 9,96 |
| 08 | 7,56 | 9,88 | 11,20 | 11,98 | 12,41 | 12,58 | 12,55 | 12,35 | 12,01 |
| 09 | 8,39 | 10,96 | 12,42 | 13,29 | 13,77 | 13,95 | 13,92 | 13,70 | 13,31 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,47 | 0,61 | 0,69 | 0,73 | 0,76 | 0,76 | 0,76 | 0,75 | 0,73 |
| 02 | 0,93 | 1,21 | 1,36 | 1,45 | 1,50 | 1,52 | 1,51 | 1,49 | 1,45 |
| 03 | 1,10 | 1,43 | 1,62 | 1,72 | 1,78 | 1,80 | 1,79 | 1,77 | 1,72 |
| 04 | 1,79 | 2,32 | 2,61 | 2,79 | 2,88 | 2,91 | 2,90 | 2,86 | 2,78 |
| 05 | 3,06 | 3,96 | 4,47 | 4,77 | 4,93 | 4,99 | 4,97 | 4,89 | 4,76 |
| 06 | 4,24 | 5,50 | 6,20 | 6,61 | 6,83 | 6,91 | 6,89 | 6,78 | 6,60 |
| 07 | 6,68 | 8,67 | 9,78 | 10,43 | 10,77 | 10,90 | 10,86 | 10,69 | 10,41 |
| 08 | 8,05 | 10,45 | 11,79 | 12,57 | 12,98 | 13,14 | 13,09 | 12,88 | 12,54 |
| 09 | 8,93 | 11,59 | 13,07 | 13,94 | 14,40 | 14,57 | 14,52 | 14,29 | 13,91 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,49 | 0,63 | 0,71 | 0,75 | 0,78 | 0,78 | 0,78 | 0,77 | 0,74 |
| 02 | 0,98 | 1,26 | 1,41 | 1,50 | 1,54 | 1,56 | 1,55 | 1,52 | 1,48 |
| 03 | 1,16 | 1,49 | 1,67 | 1,77 | 1,83 | 1,84 | 1,83 | 1,80 | 1,75 |
| 04 | 1,88 | 2,41 | 2,71 | 2,87 | 2,96 | 2,98 | 2,97 | 2,92 | 2,83 |
| 05 | 3,21 | 4,13 | 4,63 | 4,91 | 5,06 | 5,10 | 5,08 | 4,99 | 4,85 |
| 06 | 4,45 | 5,73 | 6,42 | 6,81 | 7,01 | 7,08 | 7,04 | 6,91 | 6,72 |
| 07 | 7,02 | 9,03 | 10,13 | 10,75 | 11,06 | 11,16 | 11,10 | 10,90 | 10,60 |
| 08 | 8,46 | 10,88 | 12,20 | 12,95 | 13,33 | 13,45 | 13,38 | 13,14 | 12,78 |
| 09 | 9,38 | 12,07 | 13,53 | 14,36 | 14,78 | 14,92 | 14,83 | 14,58 | 14,17 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,51 | 0,65 | 0,73 | 0,77 | 0,78 | 0,79 | 0,78 | 0,77 | 0,74 |
| 02 | 1,02 | 1,29 | 1,44 | 1,52 | 1,56 | 1,57 | 1,55 | 1,52 | 1,48 |
| 03 | 1,20 | 1,53 | 1,71 | 1,80 | 1,85 | 1,86 | 1,84 | 1,80 | 1,75 |
| 04 | 1,95 | 2,48 | 2,76 | 2,92 | 2,99 | 3,00 | 2,98 | 2,92 | 2,83 |
| 05 | 3,34 | 4,25 | 4,73 | 4,99 | 5,11 | 5,14 | 5,09 | 4,99 | 4,84 |
| 06 | 4,63 | 5,89 | 6,55 | 6,92 | 7,09 | 7,13 | 7,06 | 6,92 | 6,71 |
| 07 | 7,29 | 9,28 | 10,33 | 10,91 | 11,18 | 11,24 | 11,14 | 10,92 | 10,59 |
| 08 | 8,79 | 11,19 | 12,45 | 13,14 | 13,47 | 13,54 | 13,43 | 13,15 | 12,76 |
| 09 | 9,75 | 12,41 | 13,81 | 14,58 | 14,94 | 15,02 | 14,89 | 14,59 | 14,15 |

Table 15A: Refrigerant R452A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,66 | 0,73 | 0,77 | 0,78 | 0,78 | 0,77 | 0,75 | 0,73 |
| 02 | 1,04 | 1,31 | 1,45 | 1,52 | 1,55 | 1,55 | 1,54 | 1,50 | 1,45 |
| 03 | 1,24 | 1,56 | 1,72 | 1,80 | 1,84 | 1,84 | 1,82 | 1,78 | 1,72 |
| 04 | 2,00 | 2,52 | 2,78 | 2,92 | 2,98 | 2,98 | 2,94 | 2,87 | 2,78 |
| 05 | 3,43 | 4,31 | 4,76 | 4,99 | 5,09 | 5,10 | 5,04 | 4,92 | 4,75 |
| 06 | 4,75 | 5,98 | 6,60 | 6,92 | 7,06 | 7,07 | 6,98 | 6,82 | 6,59 |
| 07 | 7,49 | 9,42 | 10,41 | 10,92 | 11,14 | 11,15 | 11,01 | 10,75 | 10,39 |
| 08 | 9,03 | 11,36 | 12,54 | 13,16 | 13,42 | 13,44 | 13,27 | 12,95 | 12,52 |
| 09 | 10,02 | 12,60 | 13,91 | 14,60 | 14,89 | 14,90 | 14,71 | 14,37 | 13,88 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,66 | 0,73 | 0,76 | 0,77 | 0,77 | 0,75 | 0,73 | 0,70 |
| 02 | 1,06 | 1,32 | 1,44 | 1,51 | 1,53 | 1,52 | 1,50 | 1,45 | 1,40 |
| 03 | 1,26 | 1,56 | 1,71 | 1,78 | 1,81 | 1,80 | 1,77 | 1,72 | 1,66 |
| 04 | 2,04 | 2,53 | 2,77 | 2,89 | 2,93 | 2,92 | 2,87 | 2,79 | 2,68 |
| 05 | 3,48 | 4,32 | 4,74 | 4,94 | 5,01 | 4,99 | 4,91 | 4,77 | 4,59 |
| 06 | 4,83 | 5,99 | 6,57 | 6,85 | 6,95 | 6,92 | 6,80 | 6,61 | 6,36 |
| 07 | 7,61 | 9,45 | 10,36 | 10,80 | 10,96 | 10,92 | 10,73 | 10,43 | 10,03 |
| 08 | 9,17 | 11,39 | 12,48 | 13,01 | 13,20 | 13,16 | 12,93 | 12,57 | 12,09 |
| 09 | 10,18 | 12,63 | 13,84 | 14,43 | 14,64 | 14,59 | 14,34 | 13,94 | 13,41 |

| TABLE 15B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,14 | 1,15 | 1,23 | 1,30 | 1,37 | 1,45 | 1,49 | 1,56 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 15B

Table 16A: Refrigerant R452B - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,70 | 0,94 | 1,10 | 1,21 | 1,29 | 1,35 | 1,39 | 1,42 | 1,44 |
| 02 | 1,40 | 1,88 | 2,19 | 2,41 | 2,56 | 2,68 | 2,76 | 2,82 | 2,85 |
| 03 | 1,65 | 2,22 | 2,59 | 2,85 | 3,04 | 3,18 | 3,27 | 3,34 | 3,38 |
| 04 | 2,68 | 3,60 | 4,19 | 4,61 | 4,92 | 5,14 | 5,30 | 5,41 | 5,47 |
| 05 | 4,58 | 6,15 | 7,17 | 7,89 | 8,41 | 8,79 | 9,07 | 9,25 | 9,36 |
| 06 | 6,35 | 8,53 | 9,94 | 10,94 | 11,66 | 12,19 | 12,57 | 12,82 | 12,97 |
| 07 | 10,01 | 13,45 | 15,68 | 17,25 | 18,39 | 19,23 | 19,82 | 20,22 | 20,45 |
| 08 | 12,07 | 16,21 | 18,89 | 20,79 | 22,17 | 23,17 | 23,89 | 24,37 | 24,65 |
| 09 | 13,39 | 17,98 | 20,95 | 23,06 | 24,59 | 25,70 | 26,49 | 27,03 | 27,34 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,75 | 1,00 | 1,16 | 1,28 | 1,36 | 1,42 | 1,46 | 1,49 | 1,51 |
| 02 | 1,49 | 1,99 | 2,31 | 2,54 | 2,70 | 2,82 | 2,91 | 2,96 | 3,00 |
| 03 | 1,77 | 2,36 | 2,74 | 3,01 | 3,20 | 3,34 | 3,44 | 3,51 | 3,55 |
| 04 | 2,86 | 3,82 | 4,43 | 4,87 | 5,18 | 5,41 | 5,57 | 5,68 | 5,75 |
| 05 | 4,89 | 6,53 | 7,59 | 8,33 | 8,86 | 9,25 | 9,53 | 9,72 | 9,83 |
| 06 | 6,78 | 9,06 | 10,52 | 11,54 | 12,29 | 12,83 | 13,21 | 13,47 | 13,63 |
| 07 | 10,69 | 14,28 | 16,59 | 18,21 | 19,38 | 20,23 | 20,84 | 21,25 | 21,50 |
| 08 | 12,88 | 17,21 | 19,99 | 21,94 | 23,35 | 24,38 | 25,11 | 25,61 | 25,91 |
| 09 | 14,28 | 19,09 | 22,17 | 24,33 | 25,90 | 27,04 | 27,85 | 28,40 | 28,73 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,79 | 1,05 | 1,21 | 1,33 | 1,41 | 1,47 | 1,51 | 1,54 | 1,56 |
| 02 | 1,57 | 2,09 | 2,41 | 2,64 | 2,80 | 2,92 | 3,01 | 3,06 | 3,10 |
| 03 | 1,86 | 2,47 | 2,86 | 3,13 | 3,32 | 3,46 | 3,56 | 3,63 | 3,67 |
| 04 | 3,01 | 4,00 | 4,63 | 5,06 | 5,38 | 5,60 | 5,76 | 5,87 | 5,94 |
| 05 | 5,16 | 6,85 | 7,92 | 8,66 | 9,20 | 9,59 | 9,86 | 10,05 | 10,16 |
| 06 | 7,15 | 9,49 | 10,98 | 12,01 | 12,75 | 13,29 | 13,67 | 13,93 | 14,08 |
| 07 | 11,27 | 14,97 | 17,31 | 18,94 | 20,11 | 20,96 | 21,56 | 21,96 | 22,21 |
| 08 | 13,58 | 18,04 | 20,86 | 22,82 | 24,24 | 25,26 | 25,98 | 26,47 | 26,76 |
| 09 | 15,07 | 20,01 | 23,14 | 25,31 | 26,88 | 28,01 | 28,81 | 29,36 | 29,68 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,83 | 1,09 | 1,25 | 1,37 | 1,45 | 1,50 | 1,54 | 1,57 | 1,59 |
| 02 | 1,64 | 2,16 | 2,49 | 2,71 | 2,87 | 2,99 | 3,07 | 3,12 | 3,15 |
| 03 | 1,94 | 2,56 | 2,95 | 3,21 | 3,40 | 3,54 | 3,63 | 3,70 | 3,74 |
| 04 | 3,15 | 4,15 | 4,77 | 5,20 | 5,51 | 5,73 | 5,88 | 5,98 | 6,04 |
| 05 | 5,38 | 7,10 | 8,16 | 8,90 | 9,42 | 9,80 | 10,06 | 10,24 | 10,34 |
| 06 | 7,46 | 9,84 | 11,32 | 12,34 | 13,07 | 13,59 | 13,95 | 14,20 | 14,34 |
| 07 | 11,77 | 15,51 | 17,85 | 19,46 | 20,60 | 21,43 | 22,00 | 22,39 | 22,61 |
| 08 | 14,18 | 18,70 | 21,51 | 23,45 | 24,83 | 25,82 | 26,52 | 26,98 | 27,25 |
| 09 | 15,73 | 20,74 | 23,86 | 26,01 | 27,54 | 28,64 | 29,41 | 29,92 | 30,22 |

Table 16A: Refrigerant R452B - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|---|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,85 | 1,12 | 1,28 | 1,39 | 1,46 | 1,52 | 1,56 | 1,58 | 1,60 |
| 02 | 1,70 | 2,22 | 2,54 | 2,76 | 2,91 | 3,02 | 3,10 | 3,15 | 3,17 |
| 03 | 2,01 | 2,63 | 3,01 | 3,27 | 3,45 | 3,58 | 3,67 | 3,73 | 3,76 |
| 04 | 3,25 | 4,25 | 4,87 | 5,28 | 5,58 | 5,79 | 5,94 | 6,03 | 6,08 |
| 05 | 5,57 | 7,28 | 8,33 | 9,04 | 9,55 | 9,91 | 10,16 | 10,32 | 10,41 |
| 06 | 7,72 | 10,09 | 11,54 | 12,53 | 13,24 | 13,73 | 14,08 | 14,30 | 14,43 |
| 07 | 12,17 | 15,91 | 18,20 | 19,77 | 20,87 | 21,66 | 22,20 | 22,56 | 22,76 |
| 08 | 14,67 | 19,17 | 21,94 | 23,82 | 25,16 | 26,10 | 26,76 | 27,19 | 27,42 |
| 09 | 16,27 | 21,26 | 24,33 | 26,42 | 27,90 | 28,95 | 29,68 | 30,15 | 30,41 |
| Evaporating Temperature -40 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,87 | 1,13 | 1,29 | 1,40 | 1,47 | 1,52 | 1,56 | 1,58 | 1,59 |
| 02 | 1,74 | 2,25 | 2,56 | 2,77 | 2,92 | 3,02 | 3,09 | 3,14 | 3,16 |
| 03 | 2,06 | 2,67 | 3,04 | 3,28 | 3,46 | 3,58 | 3,66 | 3,72 | 3,74 |
| 04 | 3,33 | 4,32 | 4,91 | 5,32 | 5,60 | 5,80 | 5,93 | 6,02 | 6,06 |
| 05 | 5,70 | 7,38 | 8,41 | 9,09 | 9,58 | 9,92 | 10,15 | 10,29 | 10,37 |
| 06 | 7,91 | 10,24 | 11,65 | 12,61 | 13,28 | 13,75 | 14,07 | 14,27 | 14,37 |
| 07 | 12,47 | 16,15 | 18,38 | 19,88 | 20,94 | 21,68 | 22,18 | 22,50 | 22,67 |
| 08 | 15,03 | 19,46 | 22,15 | 23,96 | 25,23 | 26,13 | 26,73 | 27,12 | 27,32 |
| 09 | 16,67 | 21,58 | 24,56 | 26,58 | 27,99 | 28,98 | 29,65 | 30,08 | 30,30 |
| TABLE 16B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 16B

Table 17A: Refrigerant R454B - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,71 | 0,95 | 1,11 | 1,22 | 1,31 | 1,36 | 1,41 | 1,44 | 1,45 |
| 02 | 1,41 | 1,90 | 2,21 | 2,43 | 2,59 | 2,71 | 2,80 | 2,85 | 2,89 |
| 03 | 1,67 | 2,25 | 2,62 | 2,88 | 3,07 | 3,21 | 3,31 | 3,38 | 3,42 |
| 04 | 2,71 | 3,63 | 4,24 | 4,66 | 4,97 | 5,20 | 5,36 | 5,47 | 5,54 |
| 05 | 4,63 | 6,22 | 7,25 | 7,98 | 8,51 | 8,90 | 9,17 | 9,36 | 9,47 |
| 06 | 6,42 | 8,62 | 10,05 | 11,06 | 11,80 | 12,33 | 12,72 | 12,98 | 13,13 |
| 07 | 10,12 | 13,59 | 15,85 | 17,44 | 18,60 | 19,45 | 20,06 | 20,47 | 20,71 |
| 08 | 12,20 | 16,38 | 19,10 | 21,02 | 22,42 | 23,44 | 24,17 | 24,66 | 24,96 |
| 09 | 13,53 | 18,17 | 21,18 | 23,31 | 24,86 | 26,00 | 26,81 | 27,35 | 27,68 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,76 | 1,01 | 1,18 | 1,29 | 1,37 | 1,43 | 1,48 | 1,51 | 1,53 |
| 02 | 1,50 | 2,01 | 2,34 | 2,56 | 2,73 | 2,85 | 2,94 | 3,00 | 3,03 |
| 03 | 1,78 | 2,38 | 2,77 | 3,04 | 3,23 | 3,38 | 3,48 | 3,55 | 3,59 |
| 04 | 2,88 | 3,86 | 4,48 | 4,92 | 5,23 | 5,46 | 5,63 | 5,74 | 5,81 |
| 05 | 4,93 | 6,60 | 7,66 | 8,41 | 8,95 | 9,35 | 9,63 | 9,83 | 9,94 |
| 06 | 6,84 | 9,14 | 10,62 | 11,66 | 12,41 | 12,96 | 13,36 | 13,62 | 13,79 |
| 07 | 10,79 | 14,42 | 16,75 | 18,39 | 19,58 | 20,44 | 21,06 | 21,48 | 21,74 |
| 08 | 13,00 | 17,38 | 20,19 | 22,16 | 23,59 | 24,64 | 25,38 | 25,89 | 26,20 |
| 09 | 14,42 | 19,28 | 22,39 | 24,58 | 26,17 | 27,32 | 28,15 | 28,72 | 29,06 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,80 | 1,06 | 1,23 | 1,34 | 1,42 | 1,48 | 1,53 | 1,56 | 1,57 |
| 02 | 1,59 | 2,11 | 2,44 | 2,67 | 2,83 | 2,95 | 3,04 | 3,09 | 3,13 |
| 03 | 1,88 | 2,50 | 2,89 | 3,16 | 3,35 | 3,50 | 3,60 | 3,67 | 3,71 |
| 04 | 3,04 | 4,04 | 4,67 | 5,11 | 5,43 | 5,66 | 5,82 | 5,93 | 6,00 |
| 05 | 5,20 | 6,91 | 7,99 | 8,74 | 9,29 | 9,68 | 9,96 | 10,15 | 10,26 |
| 06 | 7,21 | 9,58 | 11,08 | 12,12 | 12,87 | 13,42 | 13,81 | 14,07 | 14,23 |
| 07 | 11,37 | 15,11 | 17,47 | 19,12 | 20,30 | 21,16 | 21,77 | 22,19 | 22,44 |
| 08 | 13,71 | 18,21 | 21,05 | 23,04 | 24,47 | 25,50 | 26,24 | 26,74 | 27,04 |
| 09 | 15,20 | 20,19 | 23,35 | 25,55 | 27,14 | 28,28 | 29,10 | 29,66 | 29,99 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,83 | 1,10 | 1,26 | 1,38 | 1,46 | 1,52 | 1,56 | 1,59 | 1,60 |
| 02 | 1,66 | 2,18 | 2,51 | 2,74 | 2,90 | 3,02 | 3,10 | 3,15 | 3,18 |
| 03 | 1,96 | 2,58 | 2,97 | 3,24 | 3,43 | 3,57 | 3,67 | 3,73 | 3,77 |
| 04 | 3,17 | 4,18 | 4,81 | 5,25 | 5,56 | 5,78 | 5,94 | 6,04 | 6,11 |
| 05 | 5,43 | 7,16 | 8,23 | 8,98 | 9,51 | 9,89 | 10,16 | 10,34 | 10,45 |
| 06 | 7,53 | 9,92 | 11,42 | 12,45 | 13,18 | 13,71 | 14,09 | 14,33 | 14,48 |
| 07 | 11,87 | 15,65 | 18,00 | 19,63 | 20,79 | 21,62 | 22,21 | 22,61 | 22,84 |
| 08 | 14,30 | 18,86 | 21,70 | 23,66 | 25,06 | 26,06 | 26,77 | 27,24 | 27,52 |
| 09 | 15,86 | 20,91 | 24,06 | 26,24 | 27,79 | 28,90 | 29,69 | 30,22 | 30,53 |

Table 17A: Refrigerant R454B - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,86 | 1,13 | 1,29 | 1,40 | 1,48 | 1,53 | 1,57 | 1,60 | 1,61 |
| 02 | 1,71 | 2,24 | 2,56 | 2,78 | 2,94 | 3,05 | 3,12 | 3,17 | 3,20 |
| 03 | 2,03 | 2,65 | 3,03 | 3,29 | 3,48 | 3,61 | 3,70 | 3,76 | 3,80 |
| 04 | 3,28 | 4,29 | 4,91 | 5,33 | 5,63 | 5,84 | 5,99 | 6,09 | 6,14 |
| 05 | 5,61 | 7,33 | 8,39 | 9,12 | 9,63 | 9,99 | 10,25 | 10,41 | 10,51 |
| 06 | 7,78 | 10,17 | 11,64 | 12,64 | 13,35 | 13,86 | 14,21 | 14,44 | 14,57 |
| 07 | 12,27 | 16,04 | 18,35 | 19,93 | 21,05 | 21,85 | 22,41 | 22,77 | 22,97 |
| 08 | 14,79 | 19,33 | 22,12 | 24,02 | 25,37 | 26,33 | 27,00 | 27,44 | 27,69 |
| 09 | 16,40 | 21,43 | 24,53 | 26,64 | 28,14 | 29,21 | 29,95 | 30,43 | 30,71 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,88 | 1,14 | 1,30 | 1,41 | 1,48 | 1,53 | 1,57 | 1,59 | 1,61 |
| 02 | 1,75 | 2,27 | 2,58 | 2,80 | 2,94 | 3,05 | 3,12 | 3,17 | 3,19 |
| 03 | 2,08 | 2,69 | 3,06 | 3,31 | 3,49 | 3,61 | 3,70 | 3,75 | 3,78 |
| 04 | 3,36 | 4,35 | 4,95 | 5,36 | 5,64 | 5,85 | 5,98 | 6,07 | 6,12 |
| 05 | 5,75 | 7,44 | 8,47 | 9,17 | 9,66 | 10,00 | 10,24 | 10,39 | 10,47 |
| 06 | 7,97 | 10,32 | 11,75 | 12,71 | 13,39 | 13,87 | 14,19 | 14,40 | 14,51 |
| 07 | 12,57 | 16,27 | 18,52 | 20,05 | 21,12 | 21,87 | 22,38 | 22,71 | 22,88 |
| 08 | 15,14 | 19,61 | 22,32 | 24,16 | 25,45 | 26,35 | 26,97 | 27,37 | 27,58 |
| 09 | 16,79 | 21,75 | 24,76 | 26,79 | 28,22 | 29,23 | 29,91 | 30,35 | 30,58 |

| TABLE 17B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 17B

Table 18A: Refrigerant R513A - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,49 | 0,62 | 0,69 | 0,72 | 0,73 | 0,73 | 0,71 | 0,68 | 0,65 |
| 02 | 0,98 | 1,24 | 1,37 | 1,43 | 1,45 | 1,44 | 1,41 | 1,36 | 1,29 |
| 03 | 1,16 | 1,47 | 1,62 | 1,70 | 1,72 | 1,71 | 1,67 | 1,61 | 1,53 |
| 04 | 1,87 | 2,38 | 2,63 | 2,75 | 2,79 | 2,77 | 2,71 | 2,61 | 2,48 |
| 05 | 3,20 | 4,07 | 4,50 | 4,71 | 4,77 | 4,74 | 4,63 | 4,46 | 4,23 |
| 06 | 4,44 | 5,64 | 6,24 | 6,52 | 6,62 | 6,57 | 6,42 | 6,18 | 5,87 |
| 07 | 7,00 | 8,89 | 9,83 | 10,29 | 10,43 | 10,36 | 10,12 | 9,75 | 9,26 |
| 08 | 8,44 | 10,71 | 11,85 | 12,40 | 12,57 | 12,49 | 12,20 | 11,74 | 11,16 |
| 09 | 9,36 | 11,88 | 13,14 | 13,75 | 13,95 | 13,85 | 13,53 | 13,03 | 12,38 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,51 | 0,64 | 0,70 | 0,73 | 0,74 | 0,73 | 0,71 | 0,68 | 0,65 |
| 02 | 1,01 | 1,27 | 1,40 | 1,45 | 1,47 | 1,45 | 1,41 | 1,35 | 1,28 |
| 03 | 1,20 | 1,51 | 1,66 | 1,72 | 1,74 | 1,72 | 1,67 | 1,60 | 1,52 |
| 04 | 1,94 | 2,44 | 2,68 | 2,79 | 2,81 | 2,78 | 2,71 | 2,60 | 2,46 |
| 05 | 3,33 | 4,18 | 4,58 | 4,77 | 4,81 | 4,76 | 4,63 | 4,44 | 4,21 |
| 06 | 4,61 | 5,79 | 6,35 | 6,61 | 6,67 | 6,59 | 6,42 | 6,16 | 5,83 |
| 07 | 7,27 | 9,13 | 10,02 | 10,42 | 10,52 | 10,40 | 10,12 | 9,71 | 9,20 |
| 08 | 8,77 | 11,00 | 12,08 | 12,56 | 12,68 | 12,53 | 12,20 | 11,70 | 11,08 |
| 09 | 9,72 | 12,20 | 13,40 | 13,93 | 14,06 | 13,90 | 13,53 | 12,98 | 12,29 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,52 | 0,65 | 0,71 | 0,73 | 0,73 | 0,72 | 0,70 | 0,67 | 0,63 |
| 02 | 1,04 | 1,29 | 1,41 | 1,45 | 1,46 | 1,43 | 1,39 | 1,33 | 1,25 |
| 03 | 1,23 | 1,53 | 1,67 | 1,72 | 1,73 | 1,70 | 1,64 | 1,57 | 1,48 |
| 04 | 2,00 | 2,48 | 2,69 | 2,78 | 2,79 | 2,75 | 2,66 | 2,54 | 2,39 |
| 05 | 3,42 | 4,24 | 4,61 | 4,76 | 4,78 | 4,70 | 4,55 | 4,35 | 4,10 |
| 06 | 4,74 | 5,87 | 6,39 | 6,60 | 6,63 | 6,52 | 6,31 | 6,03 | 5,68 |
| 07 | 7,47 | 9,26 | 10,08 | 10,41 | 10,45 | 10,28 | 9,95 | 9,51 | 8,96 |
| 08 | 9,00 | 11,16 | 12,15 | 12,55 | 12,59 | 12,39 | 11,99 | 11,46 | 10,79 |
| 09 | 9,99 | 12,38 | 13,47 | 13,92 | 13,97 | 13,74 | 13,30 | 12,70 | 11,97 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,65 | 0,70 | 0,72 | 0,72 | 0,70 | 0,68 | 0,64 | 0,60 |
| 02 | 1,06 | 1,29 | 1,40 | 1,43 | 1,43 | 1,40 | 1,34 | 1,28 | 1,19 |
| 03 | 1,25 | 1,53 | 1,65 | 1,70 | 1,69 | 1,65 | 1,59 | 1,51 | 1,41 |
| 04 | 2,03 | 2,48 | 2,68 | 2,75 | 2,74 | 2,68 | 2,58 | 2,45 | 2,29 |
| 05 | 3,47 | 4,25 | 4,58 | 4,70 | 4,68 | 4,58 | 4,41 | 4,18 | 3,92 |
| 06 | 4,81 | 5,89 | 6,35 | 6,51 | 6,49 | 6,35 | 6,11 | 5,80 | 5,43 |
| 07 | 7,59 | 9,28 | 10,01 | 10,27 | 10,24 | 10,01 | 9,64 | 9,15 | 8,56 |
| 08 | 9,15 | 11,19 | 12,07 | 12,38 | 12,34 | 12,07 | 11,62 | 11,03 | 10,32 |
| 09 | 10,15 | 12,41 | 13,38 | 13,73 | 13,69 | 13,39 | 12,88 | 12,23 | 11,45 |

Table 18A: Refrigerant R513A - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,54 | 0,65 | 0,69 | 0,70 | 0,70 | 0,68 | 0,65 | 0,61 | 0,56 |
| 02 | 1,06 | 1,28 | 1,37 | 1,40 | 1,38 | 1,34 | 1,28 | 1,21 | 1,12 |
| 03 | 1,26 | 1,52 | 1,62 | 1,65 | 1,64 | 1,59 | 1,52 | 1,43 | 1,33 |
| 04 | 2,04 | 2,46 | 2,63 | 2,68 | 2,65 | 2,57 | 2,46 | 2,32 | 2,15 |
| 05 | 3,49 | 4,21 | 4,50 | 4,58 | 4,54 | 4,41 | 4,21 | 3,97 | 3,68 |
| 06 | 4,84 | 5,83 | 6,24 | 6,35 | 6,29 | 6,11 | 5,84 | 5,50 | 5,10 |
| 07 | 7,63 | 9,20 | 9,84 | 10,01 | 9,92 | 9,63 | 9,21 | 8,67 | 8,05 |
| 08 | 9,19 | 11,09 | 11,85 | 12,07 | 11,95 | 11,61 | 11,09 | 10,45 | 9,70 |
| 09 | 10,20 | 12,30 | 13,15 | 13,39 | 13,26 | 12,87 | 12,30 | 11,59 | 10,76 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,53 | 0,63 | 0,67 | 0,68 | 0,67 | 0,64 | 0,61 | 0,57 | 0,52 |
| 02 | 1,06 | 1,26 | 1,33 | 1,35 | 1,32 | 1,28 | 1,21 | 1,13 | 1,04 |
| 03 | 1,25 | 1,49 | 1,58 | 1,60 | 1,57 | 1,51 | 1,43 | 1,34 | 1,23 |
| 04 | 2,03 | 2,41 | 2,56 | 2,58 | 2,54 | 2,45 | 2,32 | 2,16 | 1,99 |
| 05 | 3,47 | 4,13 | 4,37 | 4,42 | 4,34 | 4,19 | 3,97 | 3,70 | 3,40 |
| 06 | 4,81 | 5,72 | 6,06 | 6,12 | 6,02 | 5,80 | 5,50 | 5,13 | 4,71 |
| 07 | 7,59 | 9,03 | 9,56 | 9,66 | 9,49 | 9,15 | 8,67 | 8,10 | 7,43 |
| 08 | 9,14 | 10,88 | 11,52 | 11,64 | 11,44 | 11,03 | 10,45 | 9,76 | 8,96 |
| 09 | 10,14 | 12,06 | 12,78 | 12,91 | 12,69 | 12,23 | 11,59 | 10,82 | 9,94 |

TABLE 18B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| Fsub | 1,00 | 1,07 | 1,13 | 1,20 | 1,27 | 1,33 | 1,40 | 1,48 | 1,54 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 18B

Table 19A: Refrigerant R290 - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,71 | 0,93 | 1,05 | 1,12 | 1,16 | 1,18 | 1,17 | 1,16 | 1,13 |
| 02 | 1,42 | 1,84 | 2,08 | 2,23 | 2,30 | 2,34 | 2,33 | 2,30 | 2,24 |
| 03 | 1,68 | 2,18 | 2,47 | 2,64 | 2,73 | 2,77 | 2,76 | 2,73 | 2,66 |
| 04 | 2,72 | 3,53 | 4,00 | 4,27 | 4,42 | 4,48 | 4,47 | 4,41 | 4,30 |
| 05 | 4,65 | 6,05 | 6,84 | 7,30 | 7,56 | 7,66 | 7,65 | 7,55 | 7,36 |
| 06 | 6,44 | 8,38 | 9,48 | 10,12 | 10,48 | 10,62 | 10,61 | 10,46 | 10,21 |
| 07 | 10,16 | 13,22 | 14,95 | 15,96 | 16,52 | 16,75 | 16,73 | 16,50 | 16,10 |
| 08 | 12,25 | 15,93 | 18,01 | 19,24 | 19,91 | 20,19 | 20,16 | 19,88 | 19,40 |
| 09 | 13,58 | 17,67 | 19,98 | 21,34 | 22,08 | 22,39 | 22,36 | 22,05 | 21,51 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,74 | 0,96 | 1,08 | 1,15 | 1,18 | 1,20 | 1,19 | 1,18 | 1,15 |
| 02 | 1,48 | 1,91 | 2,14 | 2,28 | 2,35 | 2,38 | 2,37 | 2,34 | 2,28 |
| 03 | 1,75 | 2,26 | 2,54 | 2,70 | 2,79 | 2,82 | 2,81 | 2,77 | 2,70 |
| 04 | 2,83 | 3,66 | 4,11 | 4,37 | 4,51 | 4,56 | 4,55 | 4,48 | 4,36 |
| 05 | 4,84 | 6,26 | 7,04 | 7,48 | 7,72 | 7,81 | 7,78 | 7,66 | 7,47 |
| 06 | 6,72 | 8,67 | 9,75 | 10,38 | 10,71 | 10,83 | 10,79 | 10,62 | 10,35 |
| 07 | 10,59 | 13,68 | 15,38 | 16,36 | 16,88 | 17,07 | 17,01 | 16,75 | 16,32 |
| 08 | 12,77 | 16,48 | 18,54 | 19,72 | 20,35 | 20,58 | 20,50 | 20,19 | 19,67 |
| 09 | 14,16 | 18,28 | 20,56 | 21,87 | 22,57 | 22,82 | 22,74 | 22,39 | 21,82 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,77 | 0,98 | 1,10 | 1,16 | 1,20 | 1,21 | 1,20 | 1,18 | 1,14 |
| 02 | 1,53 | 1,95 | 2,18 | 2,31 | 2,38 | 2,40 | 2,38 | 2,34 | 2,27 |
| 03 | 1,81 | 2,31 | 2,59 | 2,74 | 2,82 | 2,84 | 2,82 | 2,77 | 2,69 |
| 04 | 2,93 | 3,74 | 4,19 | 4,43 | 4,56 | 4,59 | 4,56 | 4,48 | 4,36 |
| 05 | 5,01 | 6,41 | 7,16 | 7,58 | 7,79 | 7,86 | 7,81 | 7,67 | 7,46 |
| 06 | 6,94 | 8,88 | 9,93 | 10,51 | 10,81 | 10,89 | 10,82 | 10,63 | 10,34 |
| 07 | 10,94 | 14,01 | 15,66 | 16,58 | 17,04 | 17,18 | 17,07 | 16,77 | 16,30 |
| 08 | 13,19 | 16,88 | 18,87 | 19,98 | 20,54 | 20,70 | 20,57 | 20,21 | 19,65 |
| 09 | 14,63 | 18,72 | 20,93 | 22,16 | 22,78 | 22,96 | 22,82 | 22,41 | 21,79 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,79 | 1,00 | 1,11 | 1,17 | 1,19 | 1,20 | 1,19 | 1,16 | 1,13 |
| 02 | 1,56 | 1,98 | 2,20 | 2,32 | 2,37 | 2,38 | 2,36 | 2,31 | 2,24 |
| 03 | 1,85 | 2,35 | 2,61 | 2,75 | 2,81 | 2,82 | 2,80 | 2,74 | 2,65 |
| 04 | 3,00 | 3,80 | 4,22 | 4,44 | 4,55 | 4,57 | 4,52 | 4,43 | 4,29 |
| 05 | 5,13 | 6,50 | 7,21 | 7,60 | 7,78 | 7,82 | 7,74 | 7,58 | 7,35 |
| 06 | 7,11 | 9,01 | 10,00 | 10,54 | 10,79 | 10,83 | 10,73 | 10,51 | 10,18 |
| 07 | 11,21 | 14,20 | 15,77 | 16,62 | 17,01 | 17,09 | 16,92 | 16,57 | 16,06 |
| 08 | 13,51 | 17,12 | 19,01 | 20,03 | 20,50 | 20,59 | 20,39 | 19,97 | 19,36 |
| 09 | 14,98 | 18,99 | 21,08 | 22,22 | 22,74 | 22,84 | 22,62 | 22,15 | 21,47 |

Table 19A: Refrigerant R290 - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,80 | 1,00 | 1,10 | 1,16 | 1,18 | 1,18 | 1,16 | 1,14 | 1,10 |
| 02 | 1,59 | 1,99 | 2,19 | 2,30 | 2,34 | 2,34 | 2,31 | 2,26 | 2,18 |
| 03 | 1,88 | 2,36 | 2,60 | 2,73 | 2,78 | 2,78 | 2,74 | 2,67 | 2,58 |
| 04 | 3,04 | 3,82 | 4,21 | 4,41 | 4,49 | 4,50 | 4,44 | 4,33 | 4,18 |
| 05 | 5,21 | 6,53 | 7,20 | 7,55 | 7,69 | 7,69 | 7,59 | 7,40 | 7,15 |
| 06 | 7,22 | 9,05 | 9,98 | 10,46 | 10,66 | 10,66 | 10,52 | 10,26 | 9,91 |
| 07 | 11,38 | 14,27 | 15,74 | 16,50 | 16,81 | 16,82 | 16,59 | 16,19 | 15,63 |
| 08 | 13,72 | 17,20 | 18,97 | 19,88 | 20,26 | 20,27 | 20,00 | 19,51 | 18,84 |
| 09 | 15,22 | 19,08 | 21,04 | 22,05 | 22,47 | 22,48 | 22,18 | 21,63 | 20,89 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,80 | 1,00 | 1,09 | 1,14 | 1,15 | 1,15 | 1,13 | 1,10 | 1,06 |
| 02 | 1,60 | 1,98 | 2,17 | 2,26 | 2,29 | 2,29 | 2,25 | 2,18 | 2,10 |
| 03 | 1,89 | 2,35 | 2,57 | 2,68 | 2,72 | 2,71 | 2,66 | 2,58 | 2,48 |
| 04 | 3,06 | 3,80 | 4,16 | 4,34 | 4,40 | 4,38 | 4,31 | 4,18 | 4,02 |
| 05 | 5,24 | 6,50 | 7,12 | 7,42 | 7,53 | 7,50 | 7,37 | 7,15 | 6,88 |
| 06 | 7,27 | 9,01 | 9,87 | 10,29 | 10,44 | 10,40 | 10,21 | 9,92 | 9,54 |
| 07 | 11,46 | 14,21 | 15,57 | 16,23 | 16,46 | 16,39 | 16,11 | 15,64 | 15,04 |
| 08 | 13,81 | 17,13 | 18,76 | 19,56 | 19,84 | 19,76 | 19,41 | 18,85 | 18,12 |
| 09 | 15,32 | 19,00 | 20,80 | 21,69 | 22,00 | 21,91 | 21,53 | 20,91 | 20,10 |

| TABLE 19B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,35 | 1,40 | 1,45 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 19B

Table 20A: Refrigerant R600 - Capacities in kW

| Evaporating Temperature 12 °C | | | | | | | | | |
|-------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,54 | 0,70 | 0,84 | 0,88 | 0,88 | 0,85 | 0,80 | 0,74 | 0,67 |
| 02 | 1,08 | 1,39 | 1,66 | 1,75 | 1,75 | 1,69 | 1,59 | 1,47 | 1,33 |
| 03 | 1,28 | 1,65 | 1,97 | 2,07 | 2,07 | 2,00 | 1,89 | 1,74 | 1,57 |
| 04 | 2,08 | 2,66 | 3,19 | 3,36 | 3,35 | 3,24 | 3,06 | 2,82 | 2,54 |
| 05 | 3,55 | 4,56 | 5,45 | 5,74 | 5,73 | 5,54 | 5,23 | 4,83 | 4,35 |
| 06 | 4,92 | 6,32 | 7,56 | 7,96 | 7,95 | 7,69 | 7,25 | 6,69 | 6,04 |
| 07 | 7,76 | 9,97 | 11,92 | 12,56 | 12,54 | 12,12 | 11,44 | 10,55 | 9,52 |
| 08 | 9,36 | 12,01 | 14,37 | 15,13 | 15,11 | 14,61 | 13,78 | 12,72 | 11,47 |
| 09 | 10,38 | 13,32 | 15,94 | 16,78 | 16,76 | 16,20 | 15,29 | 14,11 | 12,72 |
| Evaporating Temperature 4 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,55 | 0,70 | 0,83 | 0,86 | 0,86 | 0,82 | 0,77 | 0,70 | 0,63 |
| 02 | 1,09 | 1,39 | 1,64 | 1,72 | 1,70 | 1,63 | 1,53 | 1,40 | 1,24 |
| 03 | 1,29 | 1,65 | 1,95 | 2,03 | 2,02 | 1,93 | 1,81 | 1,65 | 1,47 |
| 04 | 2,10 | 2,66 | 3,15 | 3,29 | 3,26 | 3,13 | 2,93 | 2,67 | 2,38 |
| 05 | 3,59 | 4,56 | 5,39 | 5,63 | 5,58 | 5,35 | 5,01 | 4,58 | 4,08 |
| 06 | 4,97 | 6,32 | 7,48 | 7,81 | 7,74 | 7,42 | 6,94 | 6,34 | 5,65 |
| 07 | 7,84 | 9,97 | 11,79 | 12,31 | 12,20 | 11,71 | 10,95 | 10,01 | 8,92 |
| 08 | 9,45 | 12,01 | 14,21 | 14,84 | 14,70 | 14,11 | 13,20 | 12,06 | 10,75 |
| 09 | 10,48 | 13,32 | 15,76 | 16,45 | 16,31 | 15,65 | 14,64 | 13,37 | 11,92 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,55 | 0,70 | 0,82 | 0,85 | 0,84 | 0,80 | 0,75 | 0,68 | 0,60 |
| 02 | 1,10 | 1,39 | 1,63 | 1,70 | 1,67 | 1,60 | 1,49 | 1,35 | 1,20 |
| 03 | 1,30 | 1,64 | 1,93 | 2,01 | 1,98 | 1,89 | 1,76 | 1,60 | 1,42 |
| 04 | 2,10 | 2,66 | 3,13 | 3,25 | 3,21 | 3,07 | 2,86 | 2,59 | 2,30 |
| 05 | 3,60 | 4,55 | 5,35 | 5,56 | 5,49 | 5,25 | 4,89 | 4,44 | 3,93 |
| 06 | 4,99 | 6,31 | 7,42 | 7,71 | 7,61 | 7,27 | 6,77 | 6,16 | 5,45 |
| 07 | 7,86 | 9,95 | 11,70 | 12,16 | 12,01 | 11,47 | 10,68 | 9,71 | 8,59 |
| 08 | 9,48 | 11,99 | 14,10 | 14,66 | 14,47 | 13,82 | 12,87 | 11,70 | 10,35 |
| 09 | 10,51 | 13,30 | 15,64 | 16,26 | 16,05 | 15,33 | 14,28 | 12,97 | 11,48 |
| Evaporating Temperature -8 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,55 | 0,69 | 0,80 | 0,83 | 0,81 | 0,77 | 0,71 | 0,64 | 0,55 |
| 02 | 1,10 | 1,38 | 1,60 | 1,65 | 1,61 | 1,53 | 1,41 | 1,26 | 1,10 |
| 03 | 1,30 | 1,63 | 1,89 | 1,95 | 1,91 | 1,81 | 1,67 | 1,50 | 1,30 |
| 04 | 2,11 | 2,64 | 3,07 | 3,16 | 3,09 | 2,93 | 2,70 | 2,42 | 2,11 |
| 05 | 3,60 | 4,52 | 5,25 | 5,41 | 5,29 | 5,01 | 4,62 | 4,15 | 3,61 |
| 06 | 5,00 | 6,26 | 7,27 | 7,50 | 7,34 | 6,95 | 6,40 | 5,75 | 5,01 |
| 07 | 7,88 | 9,87 | 11,47 | 11,82 | 11,57 | 10,96 | 10,10 | 9,06 | 7,89 |
| 08 | 9,50 | 11,90 | 13,82 | 14,25 | 13,94 | 13,20 | 12,17 | 10,92 | 9,51 |
| 09 | 10,53 | 13,20 | 15,33 | 15,80 | 15,46 | 14,64 | 13,50 | 12,11 | 10,55 |

| Table 20A: Refrigerant R600 - Capacities in kW | | | | | | | | | |
|--|----------------------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,55 | 0,68 | 0,77 | 0,79 | 0,76 | 0,71 | 0,64 | 0,56 | 0,47 |
| 02 | 1,09 | 1,35 | 1,54 | 1,56 | 1,51 | 1,41 | 1,27 | 1,12 | 0,94 |
| 03 | 1,29 | 1,60 | 1,82 | 1,85 | 1,79 | 1,67 | 1,51 | 1,32 | 1,12 |
| 04 | 2,09 | 2,58 | 2,95 | 3,00 | 2,89 | 2,70 | 2,44 | 2,14 | 1,81 |
| 05 | 3,58 | 4,42 | 5,04 | 5,13 | 4,95 | 4,61 | 4,18 | 3,66 | 3,09 |
| 06 | 4,97 | 6,13 | 6,99 | 7,11 | 6,86 | 6,40 | 5,79 | 5,08 | 4,29 |
| 07 | 7,83 | 9,67 | 11,03 | 11,21 | 10,82 | 10,09 | 9,13 | 8,01 | 6,76 |
| 08 | 9,44 | 11,65 | 13,29 | 13,51 | 13,04 | 12,16 | 11,00 | 9,65 | 8,15 |
| 09 | 10,47 | 12,92 | 14,74 | 14,98 | 14,46 | 13,49 | 12,20 | 10,70 | 9,03 |

| TABLE 20B - Correction factors for subcooling $\Delta t_{sub} \neq 4 \text{ °K}$ | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} \text{ [°K]}$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,09 | 1,14 | 1,19 | 1,23 | 1,28 | 1,38 | 1,43 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 20B

Table 21A: Refrigerant R600a - Capacities in kW

| Evaporating Temperature 12 °C | | | | | | | | | |
|-------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,50 | 0,65 | 0,79 | 0,84 | 0,85 | 0,83 | 0,79 | 0,73 | 0,67 |
| 02 | 0,99 | 1,29 | 1,57 | 1,67 | 1,69 | 1,64 | 1,56 | 1,46 | 1,33 |
| 03 | 1,18 | 1,53 | 1,86 | 1,98 | 2,00 | 1,95 | 1,85 | 1,73 | 1,57 |
| 04 | 1,91 | 2,48 | 3,01 | 3,21 | 3,23 | 3,15 | 3,00 | 2,79 | 2,54 |
| 05 | 3,26 | 4,24 | 5,15 | 5,49 | 5,53 | 5,39 | 5,13 | 4,78 | 4,35 |
| 06 | 4,52 | 5,87 | 7,14 | 7,60 | 7,66 | 7,47 | 7,11 | 6,62 | 6,03 |
| 07 | 7,13 | 9,26 | 11,26 | 11,99 | 12,09 | 11,79 | 11,22 | 10,44 | 9,51 |
| 08 | 8,59 | 11,16 | 13,57 | 14,45 | 14,57 | 14,21 | 13,52 | 12,59 | 11,47 |
| 09 | 9,53 | 12,38 | 15,05 | 16,03 | 16,16 | 15,76 | 14,99 | 13,96 | 12,72 |
| Evaporating Temperature 4 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,51 | 0,66 | 0,79 | 0,83 | 0,83 | 0,81 | 0,76 | 0,71 | 0,64 |
| 02 | 1,01 | 1,30 | 1,57 | 1,66 | 1,66 | 1,61 | 1,52 | 1,40 | 1,27 |
| 03 | 1,20 | 1,54 | 1,86 | 1,96 | 1,97 | 1,90 | 1,80 | 1,66 | 1,50 |
| 04 | 1,94 | 2,50 | 3,01 | 3,18 | 3,18 | 3,08 | 2,91 | 2,69 | 2,43 |
| 05 | 3,32 | 4,28 | 5,14 | 5,43 | 5,44 | 5,27 | 4,98 | 4,60 | 4,16 |
| 06 | 4,60 | 5,93 | 7,13 | 7,53 | 7,54 | 7,31 | 6,91 | 6,38 | 5,76 |
| 07 | 7,25 | 9,35 | 11,25 | 11,88 | 11,90 | 11,53 | 10,89 | 10,06 | 9,08 |
| 08 | 8,74 | 11,27 | 13,55 | 14,32 | 14,34 | 13,89 | 13,13 | 12,13 | 10,95 |
| 09 | 9,70 | 12,50 | 15,03 | 15,88 | 15,90 | 15,40 | 14,56 | 13,45 | 12,14 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,51 | 0,66 | 0,79 | 0,83 | 0,83 | 0,80 | 0,75 | 0,69 | 0,62 |
| 02 | 1,02 | 1,31 | 1,56 | 1,65 | 1,64 | 1,58 | 1,49 | 1,37 | 1,23 |
| 03 | 1,21 | 1,55 | 1,85 | 1,95 | 1,94 | 1,88 | 1,77 | 1,63 | 1,46 |
| 04 | 1,95 | 2,51 | 3,00 | 3,15 | 3,15 | 3,04 | 2,86 | 2,63 | 2,36 |
| 05 | 3,34 | 4,29 | 5,13 | 5,40 | 5,38 | 5,20 | 4,89 | 4,50 | 4,04 |
| 06 | 4,63 | 5,95 | 7,11 | 7,48 | 7,46 | 7,21 | 6,78 | 6,24 | 5,61 |
| 07 | 7,31 | 9,38 | 11,21 | 11,80 | 11,77 | 11,36 | 10,70 | 9,84 | 8,84 |
| 08 | 8,80 | 11,30 | 13,51 | 14,22 | 14,19 | 13,69 | 12,89 | 11,86 | 10,65 |
| 09 | 9,77 | 12,53 | 14,99 | 15,77 | 15,73 | 15,19 | 14,30 | 13,16 | 11,81 |
| Evaporating Temperature -8 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,52 | 0,66 | 0,78 | 0,81 | 0,80 | 0,77 | 0,72 | 0,66 | 0,58 |
| 02 | 1,03 | 1,31 | 1,55 | 1,61 | 1,60 | 1,53 | 1,43 | 1,30 | 1,16 |
| 03 | 1,22 | 1,55 | 1,83 | 1,91 | 1,89 | 1,81 | 1,69 | 1,54 | 1,37 |
| 04 | 1,97 | 2,51 | 2,97 | 3,10 | 3,06 | 2,94 | 2,74 | 2,50 | 2,22 |
| 05 | 3,38 | 4,29 | 5,08 | 5,30 | 5,24 | 5,02 | 4,69 | 4,27 | 3,79 |
| 06 | 4,68 | 5,95 | 7,04 | 7,34 | 7,27 | 6,97 | 6,50 | 5,93 | 5,26 |
| 07 | 7,38 | 9,39 | 11,10 | 11,58 | 11,47 | 10,99 | 10,26 | 9,34 | 8,29 |
| 08 | 8,90 | 11,31 | 13,37 | 13,96 | 13,82 | 13,24 | 12,36 | 11,26 | 9,99 |
| 09 | 9,87 | 12,55 | 14,83 | 15,48 | 15,32 | 14,68 | 13,71 | 12,49 | 11,08 |

Table 21A: Refrigerant R600a - Capacities in kW

| Evaporating Temperature -20 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| 01 | 0,52 | 0,65 | 0,76 | 0,78 | 0,76 | 0,72 | 0,66 | 0,59 | 0,52 |
| 02 | 1,04 | 1,30 | 1,51 | 1,55 | 1,52 | 1,44 | 1,32 | 1,18 | 1,03 |
| 03 | 1,23 | 1,54 | 1,79 | 1,84 | 1,80 | 1,70 | 1,57 | 1,40 | 1,21 |
| 04 | 1,99 | 2,49 | 2,89 | 2,98 | 2,91 | 2,75 | 2,53 | 2,27 | 1,97 |
| 05 | 3,40 | 4,26 | 4,94 | 5,09 | 4,98 | 4,71 | 4,33 | 3,88 | 3,36 |
| 06 | 4,71 | 5,90 | 6,85 | 7,06 | 6,90 | 6,53 | 6,01 | 5,38 | 4,66 |
| 07 | 7,43 | 9,31 | 10,81 | 11,13 | 10,89 | 10,30 | 9,47 | 8,48 | 7,35 |
| 08 | 8,96 | 11,22 | 13,03 | 13,42 | 13,12 | 12,41 | 11,42 | 10,22 | 8,86 |
| 09 | 9,93 | 12,44 | 14,45 | 14,88 | 14,55 | 13,76 | 12,66 | 11,33 | 9,83 |

TABLE 21B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| Fsub | 1,00 | 1,06 | 1,11 | 1,16 | 1,21 | 1,26 | 1,31 | 1,40 | 1,45 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 21B

Table 22A: Refrigerant R1270 - Capacities in kW

| Evaporating Temperature 10 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,74 | 0,97 | 1,11 | 1,20 | 1,26 | 1,29 | 1,31 | 1,31 | 1,30 |
| 02 | 1,47 | 1,93 | 2,21 | 2,39 | 2,50 | 2,57 | 2,60 | 2,60 | 2,57 |
| 03 | 1,74 | 2,29 | 2,62 | 2,83 | 2,97 | 3,04 | 3,08 | 3,08 | 3,05 |
| 04 | 2,81 | 3,70 | 4,24 | 4,58 | 4,80 | 4,93 | 4,98 | 4,98 | 4,94 |
| 05 | 4,81 | 6,34 | 7,26 | 7,84 | 8,21 | 8,43 | 8,53 | 8,53 | 8,45 |
| 06 | 6,67 | 8,79 | 10,06 | 10,87 | 11,39 | 11,69 | 11,82 | 11,82 | 11,71 |
| 07 | 10,52 | 13,86 | 15,86 | 17,15 | 17,96 | 18,43 | 18,64 | 18,64 | 18,47 |
| 08 | 12,67 | 16,70 | 19,12 | 20,66 | 21,64 | 22,21 | 22,47 | 22,47 | 22,26 |
| 09 | 14,06 | 18,52 | 21,20 | 22,92 | 24,00 | 24,64 | 24,92 | 24,92 | 24,68 |
| Evaporating Temperature 0 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,77 | 1,01 | 1,16 | 1,24 | 1,30 | 1,33 | 1,35 | 1,34 | 1,33 |
| 02 | 1,54 | 2,01 | 2,30 | 2,47 | 2,58 | 2,65 | 2,67 | 2,67 | 2,65 |
| 03 | 1,82 | 2,39 | 2,72 | 2,93 | 3,06 | 3,14 | 3,17 | 3,17 | 3,13 |
| 04 | 2,95 | 3,86 | 4,40 | 4,74 | 4,96 | 5,08 | 5,13 | 5,12 | 5,07 |
| 05 | 5,05 | 6,61 | 7,53 | 8,11 | 8,48 | 8,69 | 8,77 | 8,76 | 8,68 |
| 06 | 7,00 | 9,16 | 10,44 | 11,25 | 11,75 | 12,04 | 12,16 | 12,15 | 12,03 |
| 07 | 11,03 | 14,45 | 16,47 | 17,74 | 18,54 | 18,99 | 19,18 | 19,16 | 18,97 |
| 08 | 13,30 | 17,42 | 19,85 | 21,38 | 22,34 | 22,89 | 23,12 | 23,09 | 22,86 |
| 09 | 14,75 | 19,32 | 22,01 | 23,71 | 24,78 | 25,38 | 25,64 | 25,61 | 25,36 |
| Evaporating Temperature -10 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,80 | 1,05 | 1,19 | 1,27 | 1,33 | 1,35 | 1,37 | 1,36 | 1,35 |
| 02 | 1,60 | 2,08 | 2,36 | 2,53 | 2,63 | 2,69 | 2,71 | 2,71 | 2,68 |
| 03 | 1,89 | 2,46 | 2,79 | 3,00 | 3,12 | 3,19 | 3,22 | 3,21 | 3,17 |
| 04 | 3,07 | 3,99 | 4,52 | 4,85 | 5,05 | 5,16 | 5,20 | 5,19 | 5,13 |
| 05 | 5,25 | 6,82 | 7,73 | 8,30 | 8,64 | 8,83 | 8,90 | 8,88 | 8,78 |
| 06 | 7,27 | 9,46 | 10,72 | 11,50 | 11,98 | 12,25 | 12,34 | 12,31 | 12,17 |
| 07 | 11,47 | 14,91 | 16,91 | 18,14 | 18,90 | 19,31 | 19,47 | 19,42 | 19,20 |
| 08 | 13,82 | 17,97 | 20,37 | 21,86 | 22,77 | 23,27 | 23,46 | 23,40 | 23,14 |
| 09 | 15,33 | 19,93 | 22,60 | 24,25 | 25,26 | 25,81 | 26,02 | 25,95 | 25,66 |
| Evaporating Temperature -20 °C | | | | | | | | | |
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,83 | 1,07 | 1,21 | 1,29 | 1,34 | 1,36 | 1,37 | 1,36 | 1,35 |
| 02 | 1,65 | 2,13 | 2,40 | 2,56 | 2,66 | 2,71 | 2,72 | 2,71 | 2,67 |
| 03 | 1,95 | 2,52 | 2,84 | 3,03 | 3,15 | 3,21 | 3,23 | 3,21 | 3,17 |
| 04 | 3,16 | 4,07 | 4,59 | 4,91 | 5,09 | 5,19 | 5,22 | 5,20 | 5,13 |
| 05 | 5,41 | 6,97 | 7,86 | 8,40 | 8,71 | 8,88 | 8,93 | 8,89 | 8,77 |
| 06 | 7,50 | 9,66 | 10,89 | 11,64 | 12,08 | 12,31 | 12,38 | 12,32 | 12,16 |
| 07 | 11,83 | 15,24 | 17,18 | 18,36 | 19,05 | 19,42 | 19,53 | 19,43 | 19,18 |
| 08 | 14,25 | 18,37 | 20,70 | 22,12 | 22,96 | 23,40 | 23,53 | 23,42 | 23,11 |
| 09 | 15,81 | 20,37 | 22,96 | 24,53 | 25,47 | 25,95 | 26,10 | 25,98 | 25,63 |

Table 22A: Refrigerant R1270 - Capacities in kW

| Evaporating Temperature -30 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,85 | 1,08 | 1,21 | 1,29 | 1,33 | 1,36 | 1,36 | 1,35 | 1,33 |
| 02 | 1,69 | 2,15 | 2,41 | 2,56 | 2,65 | 2,69 | 2,70 | 2,68 | 2,64 |
| 03 | 2,00 | 2,55 | 2,86 | 3,04 | 3,14 | 3,19 | 3,20 | 3,18 | 3,13 |
| 04 | 3,23 | 4,13 | 4,62 | 4,92 | 5,08 | 5,17 | 5,18 | 5,14 | 5,06 |
| 05 | 5,53 | 7,06 | 7,91 | 8,41 | 8,70 | 8,84 | 8,86 | 8,80 | 8,66 |
| 06 | 7,67 | 9,79 | 10,96 | 11,66 | 12,06 | 12,25 | 12,29 | 12,20 | 12,01 |
| 07 | 12,09 | 15,43 | 17,29 | 18,39 | 19,02 | 19,32 | 19,38 | 19,24 | 18,94 |
| 08 | 14,57 | 18,60 | 20,83 | 22,16 | 22,92 | 23,29 | 23,35 | 23,19 | 22,82 |
| 09 | 16,16 | 20,63 | 23,11 | 24,58 | 25,42 | 25,83 | 25,90 | 25,71 | 25,31 |

| Evaporating Temperature -40 °C | | | | | | | | | |
|--------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Orifice Type | Pressure drop across valve [bar] | | | | | | | | |
| | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 01 | 0,86 | 1,09 | 1,21 | 1,28 | 1,32 | 1,34 | 1,34 | 1,32 | 1,30 |
| 02 | 1,71 | 2,16 | 2,40 | 2,55 | 2,62 | 2,66 | 2,66 | 2,63 | 2,58 |
| 03 | 2,02 | 2,56 | 2,85 | 3,02 | 3,11 | 3,15 | 3,15 | 3,12 | 3,06 |
| 04 | 3,28 | 4,14 | 4,61 | 4,88 | 5,03 | 5,09 | 5,09 | 5,04 | 4,95 |
| 05 | 5,61 | 7,08 | 7,89 | 8,35 | 8,61 | 8,71 | 8,71 | 8,63 | 8,47 |
| 06 | 7,77 | 9,82 | 10,93 | 11,58 | 11,93 | 12,08 | 12,08 | 11,96 | 11,74 |
| 07 | 12,26 | 15,49 | 17,24 | 18,26 | 18,82 | 19,05 | 19,05 | 18,86 | 18,51 |
| 08 | 14,77 | 18,67 | 20,78 | 22,00 | 22,68 | 22,96 | 22,96 | 22,73 | 22,31 |
| 09 | 16,38 | 20,70 | 23,05 | 24,40 | 25,15 | 25,46 | 25,46 | 25,21 | 24,74 |

| TABLE 22B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Fsub | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,35 | 1,40 | 1,45 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 22B

EXPANSION VALVES

1.2 – SOLENOID EXPANSION VALVES, ATEX - CERTIFIED

APPLICATIONS

The solenoid expansion valves in series 2028EX comply with the European standard EN 80079-36:2016, EN 80079-37:2016 and, therefore, comply with the ESR of Directive 2014/34/EU – ATEX. This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” risk of explosion, according to the definition in Annex I of Directive 1999/92/EC.

These valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These solenoid expansion valves cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

Please refer to Chapter 1.1, second paragraph, for the description of the operation of the valves in series 2028EX, as it is identical to that of valves in series 2028N.

CONSTRUCTION

The valves in series 2028EX are supplied complete with orifice. Nine different orifices with nine different maximum capacities that range from orifice 01 to orifice 09 can be assembled. The last two numbers in the part number identify the type of orifice that has been mounted on the valve at the factory. For example, part number 2028EX/3S02 identifies a 3/8” valve with solder connections and size 02 orifice. The orifices are interchangeable and can be mounted even after the valve is soldered on the system. If you wish to change orifice, purchase the corresponding spare parts kit, according to the part number indicated in Table 3.

Valves in series 2028EX are sold only in the version with coil series 9100EX (A6 suffix with coil, 9100EX-220/230 VAC, ATEX certified).

For these solenoid expansion valves are available:

- Coils in series 9100EX (coils type HM2)
- Coils in series 9110EX (coils type CM2)

The coils in series 9100EX and 9110EX must be coupled only with connectors 9150EX/R02. The protection rating guaranteed by the

coil + connector system is IP65 according to the EN 60529 standard.

The main parts of the valves in series 22028EX are made from the same materials as the valves in series 2028N.

SELECTION

Please refer to Chapter 1.1, paragraph 4, for the description of the selection of the valves in series 2028EX, as it is identical to that of valves in series 2028N.

DIMENSIONING EXAMPLE

- Type of refrigerant: R290
- Evaporator capacity, Q_e 2.8 kW
- Evaporating temperature, T_e : 0 °C
- Minimum condensing temperature, T_c +35 °C
- Liquid refrigerant temperature, T_l +20 °C
- Pressure drop in the liquid line, distributor and evaporator, Δp 2 bar

Step 1 - Determine the pressure drop across the valve.

- Condensing pressure at + 35 °C - $P_c = 12.2$ bar
- Evaporating pressure at 0 °C - $P_e = 4.7$ bar

$$\Delta p_{\text{tot}} = 12,2 - (4,7 + 2) = 5,5 \cdot \text{bar}$$

Step 2 - Determine required valve capacity

$$\Delta T_{\text{sub}} = 35 - 20 = 15 \cdot \text{°K}$$

From the subcooling correction factor Table 19B, par. 1.1, we find the appropriate correction factor, F_{sub} , equal to 1.12 for $\Delta T_{\text{sub}} = 15$ °K. The required valve capacity is

$$Q_{\text{sub}} = \frac{2,8}{1,12} = 2,5 \cdot \text{kW}$$

Step 3 - Capacity correction based on the application

According to the above sizing criterion, a correction of + 25% is applied to the calculated capacity:

$$Q_{\text{ev}} = 1,25 \cdot 2,5 = 3,1 \cdot \text{kW}$$

Step 4 - Determine the orifice size.

Using the capacity Table 19A, par. 1.1 for R290 refrigerant, enter the data:

- Pressure drop across the valve = 5.5 bar
- Evaporating temperature = 0 °C
- Calculated evaporator capacity = 3.1 kW

Select the corresponding orifice, 02 (Note: the expansion valve capacity must be equal to or slightly greater than the calculated evaporator capacity)



Castel ITALY
 Type 1001
 220/230 V -
 50/60 Hz
 IEC 13 IATEX 100 A
 Ex mc IIC T5 Ga I 2GD
 Ex mc IIC T120°C Dc IPE3
 Temp. 20/60°C
 Max 1000 A
 1000000

WARNING
 POTENTIAL ELECTROSTATIC
 CHARGING HAZARD.
 INSTALLATION SHALL BE
 PERFORMED IN ORDER
 TO GIVE MECHANICAL
 PROTECTION TO
 ELECTRICAL CONNECTOR.
 INSTALLATION WITH
 SUITABLE CABLE UP TO 75°C.
 SEE INSTRUCTIONS.

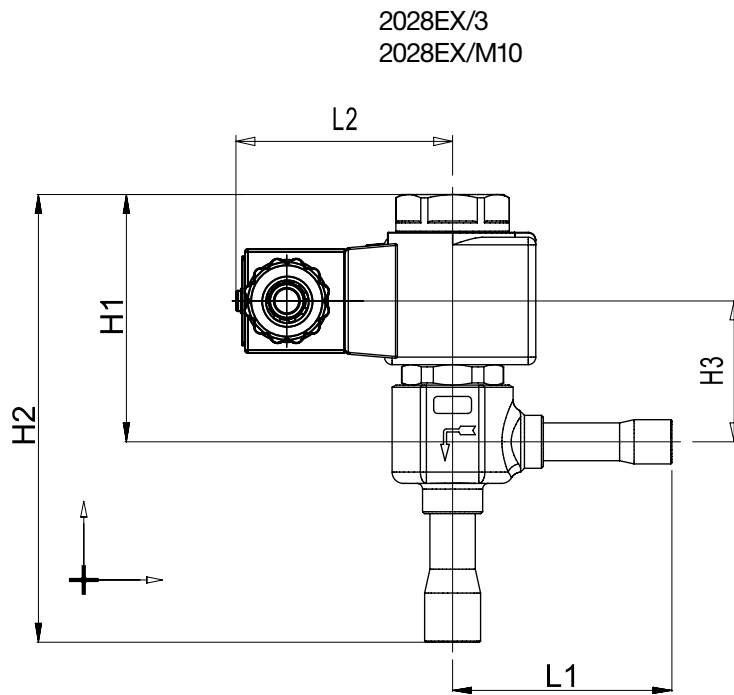
Table 23: General characteristics of PWM expansion valves - ATEX conformity for use in EX Zone 2

| Catalogue number | Orifice Type | ODS Connections | | | | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | Operating principles | Minimum Working Time [s] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|--------------|-----------------|------|------|-----|-------------------------------|-------------------------------------|------------------------------|----------------------|--------------------------|----------|---------|---------|---------------------------------------|
| | | [in] | | [mm] | | | MinOPD | MOPD 9100EX 9110EX (AC) | | | | min. | max. | |
| | | IN | OUT | IN | OUT | | | | | | | | | |
| 2028EX/3A601 | 01 | 3/8" | 1/2" | - | - | 0,010 | | | | | | | | |
| 2028EX/M10A601 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/3A602 | 02 | 3/8" | 1/2" | - | - | 0,017 | | | | | | | | |
| 2028EX/M10A602 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/3A603 | 03 | 3/8" | 1/2" | - | - | 0,023 | 37 | | | | | | | |
| 2028EX/M10A603 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/3A604 | 04 | 3/8" | 1/2" | - | - | 0,043 | | | | | | | | |
| 2028EX/M10A604 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/3A605 | 05 | 3/8" | 1/2" | - | - | 0,065 | 0 | PWM (Pulse Width Modulating) | 1 | 50 | -40 | +100 | Art.4.3 | |
| 2028EX/M10A605 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/3A606 | 06 | 3/8" | 1/2" | - | - | 0,113 | | | | | | | | |
| 2028EX/M10A606 | | - | - | 10 | 12 | | | | | | | | | |
| 2028EX/4A607 | 07 | 1/2" | 5/8" | - | - | 0,200 | | | | | | | | |
| 2028EX/M12A607 | | - | - | 12 | 16 | | | | | | | | | |
| 2028EX/4A608 | 08 | 1/2" | 5/8" | - | - | 0,230 | | | | | | | | |
| 2028EX/M12A608 | | - | - | 12 | 16 | | | | | | | | | |
| 2028EX/4A609 | 09 | 1/2" | 5/8" | - | - | 0,250 | | | | | | | | |
| 2028EX/M12A609 | | - | - | 12 | 16 | | | | | | | | | |

Table 24: Dimensions and weights of PWM expansion valves with 9100EX coils

| Catalogue number | Dimensions [mm] | | | | | Weight [g] | |
|------------------|-----------------|-----|----|----|----|------------|-----|
| | H1 | H2 | H3 | L1 | L2 | | |
| 2028EX/3A601 | 66 | 119 | 37 | 58 | 35 | 370 | |
| 2028EX/M10A601 | | | | | | | |
| 2028EX/3A602 | | | | | | | |
| 2028EX/M10A602 | | | | | | | |
| 2028EX/3A603 | | | | | | | |
| 2028EX/M10A603 | | | | | | | |
| 2028EX/3A604 | | 150 | 37 | 58 | 35 | | 390 |
| 2028EX/M10A604 | | | | | | | |
| 2028EX/3A605 | | | | | | | |
| 2028EX/M10A605 | | | | | | | |
| 2028EX/3A606 | | | | | | | |
| 2028EX/M10A606 | | | | | | | |
| 2028EX/4A607 | 66 | 150 | 37 | 58 | 35 | 390 | |
| 2028EX/M12A607 | | | | | | | |
| 2028EX/4A608 | | | | | | | |
| 2028EX/M12A608 | | | | | | | |
| 2028EX/4A609 | | | | | | | |
| 2028EX/M12A609 | | | | | | | |

Connectors are not included in the boxes and have to be ordered separately



EXPANSION VALVES

1.3 – MOTORIZED EXPANSION VALVES

APPLICATIONS

Castel step-motor expansion valves series 271, 272, 273 regulate the flow of the liquid refrigerant into evaporators by modulating the valve shutter position in a calibrated orifice, allowing a wide capacity regulation range.

These right-angle valves permit bi-directional flow (the side connection is the liquid preferential inlet) and ensure a high precision and reliable control in both directions and contributing to increasing the efficiency of the entire refrigerating system.

Step-motor expansion valves can be used in a wide range of applications as listed below:

- Refrigeration systems
- Air conditioning systems
- Heat pump systems

These valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixture (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

Step-motor expansion valves in series 271, 272, 273 is a lamination device that receives liquid from the condenser and injects it into the evaporator, creating the necessary pressure drop across the expansion orifice.

This valve finds applications in air conditioning systems and refrigeration plants that have a significant variation in thermal load during the entire period of operation.

This device can very quickly and efficiently vary its throttling capacity, even under significant variations in the potential demand, continuously modulating the refrigerant flow to the evaporator by opening and closing the shutter.

These valves are equipped with a linear stepper motor. The positioning of the valve shutter is controlled by an external electronic device called “driver” or “controller”. This device calculates the superheating by data acquired from the pressure transmitter and the temperature probe immediately mounted downstream of the evaporator and generate the positioning signal for the stepper motor.

In this way, the step-motor expansion valve can provide very accurate regulation of the refrigerant flow and, therefore, is able to control the superheating value, even under significant changes in thermal load, or under large power variations of the refrigeration cycle.

These valves have been developed with high linearity of the stroke/flow rate characteristic, this means that these valves can be used in operating range between 10% and 95% (maximum value to be used under transitory conditions) of declared nominal capacity. This allows the system to maintain maximum performance efficiency under any condition of thermal load and preventing the superheating value swings across the entire range of adjustment.

Tips and tricks:

1.The performance and lifetime of the step-motor expansion valves in series 271, 272, 273 are guaranteed only if in the circuit lubricant oil is mixed with the refrigerant.

In oil-free systems, the performance, nominal capacity and the lifetime cannot be guaranteed.

2.The stepper motor is sensitive to the dirt/residue presence in the system, carried by the refrigerant. So, It is very important to protect the valve by installing a mechanical filter upstream of the inlet connection.

3.Step-motor expansion valves are not equipped with position control. Therefore, in order to operate, the linear stepper motor uses the seat valve as mechanical zero position. In this way, the initial position can be successfully detected.

4.The design of the linear stepper motor guarantees the irreversible motion. This means that when the valve is not powered, the valve shaft maintains the last reached position.

5.During continuous operation, due to their construction, a stepper motor is subject to step losses. In order to guarantee correct operation over the lifetime of the valve, the driver or controller must include in the algorithm a special feature that adjust and recover any lost steps.



CONSTRUCTION

Expansion valves series 271 are manufactured in a total hermetic construction making the two main components inseparable:

- Valve body: where are located the copper connections and the machined calibrated orifice
- Motor unit: where the stepper motor and all the electrical connections are located

Expansion valves series 272 and 273 are manufactured in a semi-hermetical construction. The two main components are:

- Valve body: where are located the copper connections and the machined calibrated orifice
- Motor unit: where the stepper motor and all the electrical connections are located

These components are separate, but they are supplied assembled by Castel to the correct torque. It is strongly recommended to not disassemble the motor unit from the valve body during brazing operation, to avoid damages to the motor shutter.

For all expansion valve series 271, 272, 273 brazing must be performed with care, using a low melting point filler material. During brazing operation, it is mandatory to avoid direct contact between the torch flame and the valve body and cover the motor unit with a wet cloth.

The main parts of valves in series 271, 272, 273 are made with the following materials:

- Hot forged brass EN 12240 – CW 617N for the valve body
- Austenitic stainless steel EN 10088-3 – 1.4301 for the motor unit
- Brass bar EN 12164 – CW 614N for the shutter
- Austenitic stainless steel EN 10088-3 – 1.4301 for the hermetic connector
- Copper pipe EN 12735-1 – Cu DHP for solder connections
- Bronze filled P.T.F.E. for seat gaskets
- Hydrogenate nitrile rubber (HNBR) for outlet seal gaskets

SELECTION

To correctly select a step-motor expansion valve series 271, 272, 273 on a refrigerating system, the following design parameters must be available:

- Type of refrigerant
- Evaporator capacity, Q_e
- Evaporating temperature/pressure, T_e / p_e
- Minimum condensing temperature/pressure, T_c / p_c
- Liquid refrigerant temperature at valve inlet, T_l
- Pressure drop in the liquid line, distributor and evaporator, Δp

The following procedure helps to select the correct expansion valve for the refrigeration system.

Step 1

Determine the pressure drop across the valve. The pressure drop is calculated using the equation:

$$\Delta p_{\text{tot}} = p_c - (p_e + \Delta p)$$

where:

- P_c = condensing pressure
- P_e = evaporating pressure
- Δp = sum of pressure drops in the liquid line, distributor and evaporator with the valve open

Step 2

Subcooling correction. Use the evaporating capacity Q_e to select the required valve size at a given evaporating temperature. If necessary, correct the evaporator capacity by the actual subcooling value. The subcooling is calculated by the equation:

$$\Delta T_{\text{sub}} = T_c - T_l$$

From the subcooling corrector factor table find the appropriate corrector factor F_{sub} corresponding to the ΔT_{sub} calculated and determine the required valve capacity by the formula:

$$Q_{\text{sub}} = Q_e / F_{\text{sub}}$$

Step 3

Capacity correction based on the application. To obtain a correct regulation, both in transitory period and in stable running condition, it is necessary to oversize the valve.

In this way the valve correctly works over the entire range of the system's capacity.

Generally, this correction factor, F_{ev} , can be assumed equal to 125% of the maximum evaporator's capacity. This allows the valve to modulate from about 75% during full running operation.

The capacity of the valve must be at least equal to:

$$Q_{\text{sub}} = Q_e / F_{\text{sub}}$$

Step 4

Determine required orifice size. Use the pressure drop across the valve, the evaporating temperature and the calculated evaporator capacity Q_e , to select the corresponding orifice size from the capacity table corresponding to the chosen refrigerant fluid.

DIMENSIONING EXAMPLE

- Type of refrigerant: R410A
- Evaporator capacity, Q_e : 70 kW
- Evaporating temperature, T_e : 0°C
- Minimum condensing temperature, T_c : +40°C
- Liquid refrigerant temperature, T_l : +30°C
- Pressure drop in the liquid line, distributor and evaporator, Δp : 1 bar

Step 1 - *Determine the pressure drop across the valve.*

- Condensing pressure at + 40 °C - $P_c = 24,2$ bar
- Evaporating pressure at 0 °C - $P_e = 8$ bar

$$\Delta p_{\text{tot}} = 24,2 - (8 + 1) = 15,2 \text{ bar}$$

Step 2 - Determine required valve capacity

$$\Delta T_{\text{sub}} = 40 - 30 = 10 \text{ }^{\circ}\text{C}$$

From the subcooling correction factor Table 33B, we find the appropriate correction factor, F_{sub} , equal to 1,07 for $\Delta T_{\text{sub}} = 10 \text{ }^{\circ}\text{C}$. The required valve capacity is

$$Q_{\text{sub}} = 70 / 1,07 = 65,4 \text{ kW}$$

Step 3 - Potential correction based on the application

According to the above sizing criterion, $F_{\text{ev}} = 1,25$:

$$Q_{\text{ev}} = 1,25 \cdot 65,4 = 81,2 \text{ kW}$$

Step 4 - Determine the valve size.

Using the capacity Table 33A for refrigerant R410A, with:

- Pressure drop across the valve = 15,2 bar
- Evaporating temperature = 0 $^{\circ}\text{C}$
- Calculated evaporator capacity = 81,8 kW

Select the corresponding step valve code: 27340

Please Note: the expansion valve capacity must be equal to or slightly greater than the calculated evaporator capacity

ELECTRICAL CONNECTIONS

All the expansion valves series 271, 272, 273 are equipped with an M12 male connector with 4 pins.

The connection cable to the driver / controller must be order separately.

The cable with 4 pins M12 female connector can be supplied in two different lengths:

- Part no. 9901/X08: cable length: 3 m
- Part no. 9901/X20: cable length: 15 m

N.B.: It is important to control the overall resistance of the connection, cables and joints, between the driver and the valve. A significant increase of the resistance could lead to a drop in performance of the valve or in the driven proper shutter positioning. In case of greater overall resistances or longer cables, please contact the Castel Technical Department.

TABLE 25: General characteristics of stepper-motor expansion valves

| Body Size | Catalogue number | ODS Connections | | | | Equivalent port Ø [mm] | MOPD [bar] | Operating principles | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------|------------------|-----------------|--------|------|-----|------------------------|------------|-------------------------------|----------|---------|------|---------------------------------------|
| | | [in] | | [mm] | | | | | | min. | max. | |
| | | IN | OUT | IN | OUT | | | | | | | |
| 271 | 27115/3 | 3/8" | 3/8" | - | - | 1,5 | 45 | Stepper motor without gearbox | 50 | -40 | +60 | Art. 4.3 |
| | 27115/M10 | - | - | 10 | 10 | | | | | | | |
| | 27115/M12 | - | - | 12 | 12 | | | | | | | |
| | 27115/4 | 1/2" | 1/2" | - | - | | | | | | | |
| | 27120/3 | 3/8" | 3/8" | - | - | 2,0 | 45 | | | | | |
| | 27120/M10 | - | - | 10 | 10 | | | | | | | |
| | 27120/M12 | - | - | 12 | 12 | | | | | | | |
| | 27120/4 | 1/2" | 1/2" | - | - | | | | | | | |
| | 27127/3 | 3/8" | 3/8" | - | - | 2,7 | 45 | | | | | |
| | 27127/M10 | - | - | 10 | 10 | | | | | | | |
| 27127/M12 | - | - | 12 | 12 | | | | | | | | |
| 27127/4 | 1/2" | 1/2" | - | - | | | | | | | | |
| 272 | 27232/M12 | - | - | 12 | 12 | 3,2 | 30 | | | | | |
| | 27232/4 | 1/2" | 1/2" | - | - | | | | | | | |
| | 27232/5 | 5/8" | 5/8" | 16 | 16 | | | | | | | |
| | 27232/7 | 7/8" | 7/8" | 22 | 22 | | | | | | | |
| | 27236/M12 | - | - | 12 | 12 | 3,6 | 30 | | | | | |
| | 27236/4 | 1/2" | 1/2" | - | - | | | | | | | |
| | 27236/5 | 5/8" | 5/8" | 16 | 16 | | | | | | | |
| 27236/7 | 7/8" | 7/8" | 22 | 22 | | | | | | | | |
| 273 | 27340/7 | 7/8" | 7/8" | 22 | 22 | 4,0 | 30 | | | | | |
| | 27340/9 | 1.1/8" | 1.1/8" | - | - | | | | | | | |
| | 27344/7 | 7/8" | 7/8" | 22 | 22 | 4,4 | 30 | | | | | |
| | 27344/9 | 1.1/8" | 1.1/8" | - | - | | | | | | | |

TABLE 26. General characteristics of electric motor

| BODY SIZE | 271 | 272 | 273 |
|--|-----------------------------|-----------------------------|-----------------------------|
| Stepper motor type | bi-polar - permanent magnet | bi-polar - permanent magnet | bi-polar - permanent magnet |
| Step mode | full step drive | full step drive | full step drive |
| Duty cycle [%] | 100 | 100 | 100 |
| Nominal voltage [V] | 6 | 9 | 9 |
| Max phase current [mA] | 200 | 300 | 300 |
| Holding current [mA] | 50 | 50 | 50 |
| Nominal power [W] | 2,4 | 5,4 | 5,4 |
| Phase resistance [ohm] | 30 (at 23 °C) | 30 (at 23 °C) | 30 (at 23 °C) |
| Resistance tolerances [%] | +/- 10 | +/- 10 | +/- 10 |
| Phase inductance [mH] | 20 | 20 | 20 |
| Step travel [mm] | 0,025 | 0,025 | 0,025 |
| Speed rotation [steps/sec] | 35 | 35 | 35 |
| Minimum speed rotation [steps/sec] | 10 | 10 | 10 |
| Acceleration/deceleration | 50 | 50 | 50 |
| Acceleration/deceleration [ms x 10/step] | 10,5 | 10,5 | 10,5 |
| N° steps x nominal stroke | 415 | 415 | 415 |
| N° steps of extra-travel | 100 | 100 | 100 |
| N° cycles x nominal stroke | 500.000 min | 500.000 min | 500.000 min |
| Electrical connection | Circular connector M12 | Circular connector M12 | Circular connector M12 |
| Protection degree | IP 65 according to EN 60529 | IP 65 according to EN 60529 | IP 65 according to EN 60529 |

TABLE 27: Dimensions and weights of stepper-motor expansion valves

| Body Size | Catalogue number | H | L1 | L2 | D | Ch | Weight [g] |
|-------------|------------------|-----|------|----|----|----|------------|
| 271 (Fig.1) | 27115/-- | 160 | 54 | 52 | 40 | - | 530 |
| | 27120/-- | | | | | | |
| | 27127/-- | | | | | | |
| 272 (Fig.2) | 27232/4-M12S | 176 | 62 | 59 | 50 | 36 | 820 |
| | 27236/4-M12S | | | | | | |
| | 27232/5 | 179 | 65,5 | 62 | | | 850 |
| | 27236/5 | | | | | | |
| | 27232/7 | | | | | | |
| 27236/7 | 190,5 | 77 | 73,5 | | | | |
| 273 (Fig.2) | 27340/-- | 190 | 76,5 | 73 | 50 | 36 | 900 |
| | 27344/-- | | | | | | |

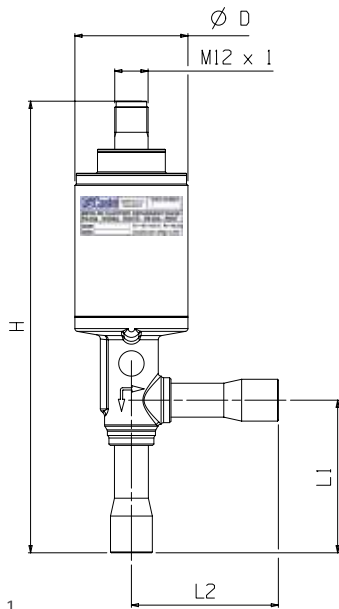


Fig. 1

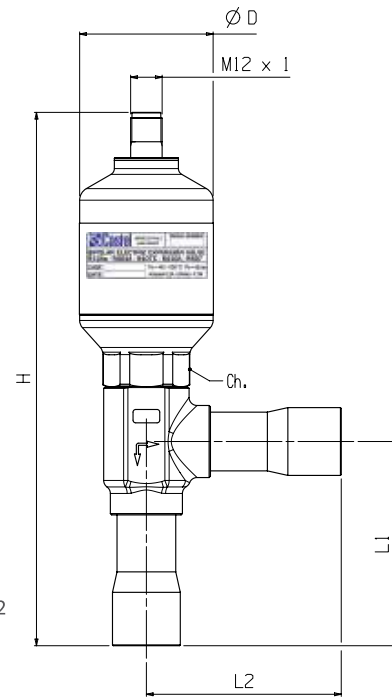
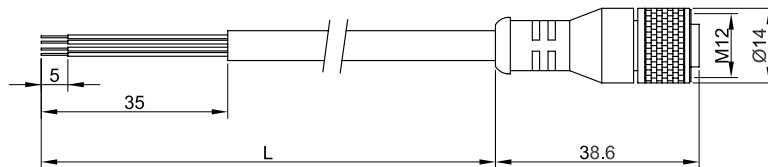


Fig. 2



9901/X28 L=3m

9901/X20 L=15m

TABLE 28: Rated capacities in kW of stepper-motor expansion valves (1)

| Body Size | Catalogue number | Equivalent port Ø [mm] | Refrigerant | | | | | | | | | |
|-----------|------------------|------------------------|-------------|--------|-------|-------|-------|-------|---------|---------|-------|-------|
| | | | R134a | R32 | R404A | R407C | R410A | R507A | R1234yf | R1234ze | R448A | R449A |
| 271 | 27115/-- | 1,5 | 15,30 | 33,94 | 14,37 | 19,92 | 23,40 | 14,02 | 11,28 | 12,02 | 19,07 | 18,71 |
| | 27120/-- | 2,0 | 20,40 | 45,26 | 19,16 | 26,56 | 31,20 | 18,70 | 15,04 | 16,02 | 25,42 | 24,95 |
| | 27127/-- | 2,7 | 25,20 | 55,91 | 23,67 | 32,81 | 38,54 | 23,09 | 18,57 | 19,79 | 31,41 | 30,82 |
| 272 | 27232/-- | 3,2 | 32,20 | 71,44 | 30,24 | 41,92 | 49,24 | 29,51 | 23,73 | 25,29 | 40,13 | 39,38 |
| | 27236/-- | 3,6 | 44,10 | 97,84 | 41,42 | 57,42 | 67,44 | 40,42 | 32,51 | 34,64 | 54,96 | 53,93 |
| 273 | 27340/-- | 4,0 | 51,00 | 113,15 | 47,90 | 66,40 | 78,00 | 46,74 | 37,59 | 40,00 | 63,56 | 62,37 |
| | 27344/-- | 4,4 | 59,32 | 131,60 | 55,71 | 77,24 | 90,72 | 54,36 | 43,72 | 46,59 | 73,93 | 72,54 |

| Body Size | Catalogue number | Equivalent port Ø [mm] | Refrigerant | | | | | | | | |
|-----------|------------------|------------------------|-------------|-------|--------|--------|-------|-------|-------|-------|-------|
| | | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 271 | 27115/-- | 1,5 | 13,43 | 14,78 | 26,38 | 26,65 | 12,98 | 20,61 | 13,08 | 13,53 | 23,07 |
| | 27120/-- | 2,0 | 17,90 | 19,71 | 35,18 | 35,53 | 17,30 | 27,48 | 17,44 | 18,03 | 30,75 |
| | 27127/-- | 2,7 | 22,11 | 24,35 | 43,45 | 43,89 | 21,37 | 33,94 | 21,55 | 22,28 | 38,00 |
| 272 | 27232/-- | 3,2 | 28,26 | 31,11 | 55,52 | 56,09 | 27,31 | 43,37 | 27,53 | 28,47 | 48,54 |
| | 27236/-- | 3,6 | 38,70 | 42,61 | 76,04 | 76,81 | 37,40 | 59,40 | 37,71 | 39,00 | 66,48 |
| 273 | 27340/-- | 4,0 | 44,75 | 49,28 | 87,94 | 88,83 | 43,25 | 68,69 | 43,61 | 45,09 | 76,89 |
| | 27344/-- | 4,4 | 52,05 | 57,32 | 102,29 | 103,32 | 50,31 | 79,89 | 50,72 | 52,44 | 89,43 |

(1): Rated capacity with fully open valve and liquid flow from radial to axial connection

Rated capacities are based on:

- Evaporating temperature $T_{evap} = + 5 \text{ }^\circ\text{C}$
- Condensing temperature $T_{cond} = + 32 \text{ }^\circ\text{C}$
- Refrigerant liquid temperature ahead of valve $T_{liq} = + 28 \text{ }^\circ\text{C}$

Valves operating range from 10% up to 95% of declared nominal capacities

Table 29A: Refrigerant R134a - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,19 | 14,34 | 16,05 | 17,01 | 17,49 | 17,65 | 17,55 | 17,25 | 16,78 | 16,18 | 15,44 |
| 27120/-- | 2,0 | 14,92 | 19,13 | 21,40 | 22,68 | 23,33 | 23,53 | 23,40 | 23,00 | 22,38 | 21,57 | 20,59 |
| 27127/-- | 2,7 | 18,43 | 23,63 | 26,44 | 28,02 | 28,81 | 29,06 | 28,90 | 28,41 | 27,64 | 26,64 | 25,44 |
| 27232/-- | 3,2 | 23,55 | 30,19 | 33,78 | 35,80 | 36,82 | 37,14 | 36,93 | 36,30 | 35,32 | 34,04 | 32,50 |
| 27236/-- | 3,6 | 32,25 | 41,35 | 46,27 | 49,03 | 50,43 | 50,86 | 50,57 | 49,71 | 48,37 | 46,63 | 44,51 |
| 27340/-- | 4,0 | 37,30 | 47,82 | 53,51 | 56,70 | 58,32 | 58,82 | 58,49 | 57,49 | 55,94 | 53,92 | 51,48 |
| 27344/-- | 4,4 | 43,38 | 55,62 | 62,23 | 65,95 | 67,83 | 68,42 | 68,03 | 66,87 | 65,07 | 62,72 | 59,88 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,58 | 14,69 | 16,32 | 17,20 | 17,62 | 17,71 | 17,55 | 17,20 | 16,69 | 16,05 | 15,29 |
| 27120/-- | 2,0 | 15,44 | 19,59 | 21,76 | 22,94 | 23,49 | 23,61 | 23,40 | 22,93 | 22,25 | 21,40 | 20,38 |
| 27127/-- | 2,7 | 19,07 | 24,20 | 26,88 | 28,34 | 29,02 | 29,16 | 28,90 | 28,33 | 27,49 | 26,43 | 25,18 |
| 27232/-- | 3,2 | 24,37 | 30,92 | 34,35 | 36,21 | 37,08 | 37,26 | 36,93 | 36,20 | 35,13 | 33,77 | 32,17 |
| 27236/-- | 3,6 | 33,38 | 42,34 | 47,05 | 49,59 | 50,78 | 51,03 | 50,58 | 49,57 | 48,11 | 46,26 | 44,06 |
| 27340/-- | 4,0 | 38,60 | 48,97 | 54,41 | 57,35 | 58,73 | 59,02 | 58,49 | 57,33 | 55,64 | 53,49 | 50,95 |
| 27344/-- | 4,4 | 44,90 | 56,96 | 63,28 | 66,70 | 68,31 | 68,65 | 68,04 | 66,68 | 64,71 | 62,22 | 59,26 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,87 | 14,88 | 16,40 | 17,19 | 17,52 | 17,53 | 17,31 | 16,90 | 16,35 | 15,66 | 14,86 |
| 27120/-- | 2,0 | 15,82 | 19,83 | 21,87 | 22,92 | 23,36 | 23,38 | 23,08 | 22,54 | 21,80 | 20,88 | 19,82 |
| 27127/-- | 2,7 | 19,54 | 24,50 | 27,01 | 28,31 | 28,85 | 28,88 | 28,51 | 27,84 | 26,92 | 25,79 | 24,48 |
| 27232/-- | 3,2 | 24,97 | 31,31 | 34,52 | 36,17 | 36,87 | 36,90 | 36,43 | 35,58 | 34,40 | 32,96 | 31,28 |
| 27236/-- | 3,6 | 34,20 | 42,88 | 47,27 | 49,54 | 50,50 | 50,54 | 49,90 | 48,73 | 47,12 | 45,14 | 42,84 |
| 27340/-- | 4,0 | 39,55 | 49,58 | 54,67 | 57,30 | 58,40 | 58,44 | 57,70 | 56,35 | 54,49 | 52,20 | 49,54 |
| 27344/-- | 4,4 | 46,00 | 57,67 | 63,59 | 66,64 | 67,92 | 67,98 | 67,12 | 65,54 | 63,38 | 60,72 | 57,62 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,03 | 14,90 | 16,30 | 16,98 | 17,22 | 17,16 | 16,87 | 16,40 | 15,79 | 15,06 | 14,22 |
| 27120/-- | 2,0 | 16,04 | 19,87 | 21,73 | 22,64 | 22,96 | 22,88 | 22,49 | 21,87 | 21,05 | 20,08 | 18,96 |
| 27127/-- | 2,7 | 19,82 | 24,54 | 26,85 | 27,97 | 28,37 | 28,26 | 27,78 | 27,01 | 26,01 | 24,80 | 23,42 |
| 27232/-- | 3,2 | 25,32 | 31,36 | 34,31 | 35,74 | 36,25 | 36,11 | 35,50 | 34,52 | 33,23 | 31,69 | 29,92 |
| 27236/-- | 3,6 | 34,68 | 42,95 | 46,98 | 48,95 | 49,64 | 49,46 | 48,62 | 47,28 | 45,51 | 43,40 | 40,98 |
| 27340/-- | 4,0 | 40,11 | 49,66 | 54,34 | 56,61 | 57,41 | 57,20 | 56,23 | 54,67 | 52,64 | 50,19 | 47,40 |
| 27344/-- | 4,4 | 46,65 | 57,77 | 63,20 | 65,84 | 66,78 | 66,53 | 65,40 | 63,59 | 61,22 | 58,38 | 55,13 |

Table 29A: Refrigerant R134a - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,08 | 14,77 | 16,04 | 16,61 | 16,76 | 16,62 | 16,26 | 15,73 | 15,06 | 14,28 | 13,40 |
| 27120/-- | 2,0 | 16,11 | 19,70 | 21,39 | 22,15 | 22,35 | 22,15 | 21,67 | 20,97 | 20,08 | 19,04 | 17,86 |
| 27127/-- | 2,7 | 19,89 | 24,33 | 26,42 | 27,36 | 27,60 | 27,37 | 26,77 | 25,90 | 24,81 | 23,52 | 22,07 |
| 27232/-- | 3,2 | 25,42 | 31,09 | 33,76 | 34,96 | 35,27 | 34,97 | 34,21 | 33,10 | 31,70 | 30,05 | 28,20 |
| 27236/-- | 3,6 | 34,82 | 42,58 | 46,23 | 47,88 | 48,31 | 47,89 | 46,85 | 45,33 | 43,41 | 41,16 | 38,62 |
| 27340/-- | 4,0 | 40,26 | 49,24 | 53,47 | 55,37 | 55,86 | 55,38 | 54,18 | 52,42 | 50,20 | 47,60 | 44,66 |
| 27344/-- | 4,4 | 46,83 | 57,28 | 62,19 | 64,41 | 64,98 | 64,42 | 63,02 | 60,97 | 58,39 | 55,36 | 51,95 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,01 | 14,51 | 15,64 | 16,11 | 16,16 | 15,94 | 15,51 | 14,92 | 14,20 | 13,37 | 12,44 |
| 27120/-- | 2,0 | 16,01 | 19,35 | 20,86 | 21,47 | 21,55 | 21,25 | 20,68 | 19,89 | 18,93 | 17,82 | 16,59 |
| 27127/-- | 2,7 | 19,78 | 23,91 | 25,77 | 26,53 | 26,62 | 26,25 | 25,54 | 24,57 | 23,38 | 22,02 | 20,49 |
| 27232/-- | 3,2 | 25,27 | 30,55 | 32,92 | 33,89 | 34,01 | 33,54 | 32,64 | 31,39 | 29,88 | 28,13 | 26,19 |
| 27236/-- | 3,6 | 34,61 | 41,84 | 45,09 | 46,42 | 46,58 | 45,94 | 44,70 | 43,00 | 40,92 | 38,53 | 35,86 |
| 27340/-- | 4,0 | 40,02 | 48,38 | 52,14 | 53,68 | 53,87 | 53,12 | 51,69 | 49,72 | 47,32 | 44,56 | 41,48 |
| 27344/-- | 4,4 | 46,55 | 56,28 | 60,65 | 62,44 | 62,66 | 61,79 | 60,12 | 57,84 | 55,04 | 51,83 | 48,24 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 29B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,17 | 1,23 | 1,29 | 1,35 | 1,44 | 1,49 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 29B

Table 30A: Refrigerant R32 - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,85 | 22,82 | 26,81 | 29,74 | 31,97 | 33,70 | 35,04 | 36,06 | 36,82 | 37,36 | 37,70 |
| 27120/-- | 2,0 | 22,47 | 30,43 | 35,75 | 39,65 | 42,63 | 44,94 | 46,72 | 48,09 | 49,11 | 49,82 | 50,27 |
| 27127/-- | 2,7 | 27,76 | 37,59 | 44,16 | 48,99 | 52,66 | 55,51 | 57,72 | 59,41 | 60,66 | 61,54 | 62,10 |
| 27232/-- | 3,2 | 35,47 | 48,03 | 56,43 | 62,59 | 67,29 | 70,93 | 73,75 | 75,91 | 77,51 | 78,64 | 79,35 |
| 27236/-- | 3,6 | 48,57 | 65,77 | 77,28 | 85,72 | 92,16 | 97,14 | 101,00 | 103,96 | 106,16 | 107,70 | 108,67 |
| 27340/-- | 4,0 | 56,17 | 76,07 | 89,37 | 99,14 | 106,58 | 112,34 | 116,81 | 120,23 | 122,77 | 124,55 | 125,67 |
| 27344/-- | 4,4 | 65,33 | 88,47 | 103,94 | 115,30 | 123,96 | 130,66 | 135,86 | 139,83 | 142,79 | 144,86 | 146,16 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 17,97 | 24,23 | 28,37 | 31,40 | 33,70 | 35,48 | 36,86 | 37,92 | 38,71 | 39,28 | 39,65 |
| 27120/-- | 2,0 | 23,96 | 32,31 | 37,84 | 41,87 | 44,94 | 47,31 | 49,15 | 50,56 | 51,62 | 52,38 | 52,88 |
| 27127/-- | 2,7 | 29,60 | 39,91 | 46,74 | 51,73 | 55,52 | 58,44 | 60,72 | 62,46 | 63,77 | 64,71 | 65,32 |
| 27232/-- | 3,2 | 37,82 | 50,99 | 59,73 | 66,10 | 70,94 | 74,68 | 77,58 | 79,81 | 81,49 | 82,68 | 83,46 |
| 27236/-- | 3,6 | 51,80 | 69,84 | 81,80 | 90,52 | 97,15 | 102,28 | 106,25 | 109,31 | 111,60 | 113,24 | 114,30 |
| 27340/-- | 4,0 | 59,91 | 80,77 | 94,60 | 104,68 | 112,35 | 118,28 | 122,88 | 126,41 | 129,06 | 130,96 | 132,19 |
| 27344/-- | 4,4 | 69,67 | 93,94 | 110,02 | 121,75 | 130,67 | 137,57 | 142,91 | 147,02 | 150,10 | 152,31 | 153,75 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 18,96 | 25,42 | 29,65 | 32,72 | 35,04 | 36,83 | 38,21 | 39,27 | 40,07 | 40,65 | 41,03 |
| 27120/-- | 2,0 | 25,28 | 33,89 | 39,54 | 43,63 | 46,72 | 49,11 | 50,96 | 52,37 | 53,44 | 54,20 | 54,71 |
| 27127/-- | 2,7 | 31,23 | 41,87 | 48,84 | 53,90 | 57,72 | 60,66 | 62,95 | 64,70 | 66,01 | 66,96 | 67,58 |
| 27232/-- | 3,2 | 39,90 | 53,50 | 62,41 | 68,87 | 73,75 | 77,51 | 80,43 | 82,67 | 84,35 | 85,56 | 86,36 |
| 27236/-- | 3,6 | 54,65 | 73,27 | 85,47 | 94,32 | 101,00 | 106,16 | 110,15 | 113,22 | 115,52 | 117,18 | 118,27 |
| 27340/-- | 4,0 | 63,20 | 84,73 | 98,85 | 109,07 | 116,81 | 122,77 | 127,39 | 130,93 | 133,60 | 135,51 | 136,78 |
| 27344/-- | 4,4 | 73,50 | 98,55 | 114,96 | 126,86 | 135,86 | 142,79 | 148,16 | 152,28 | 155,38 | 157,61 | 159,08 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 19,81 | 26,38 | 30,63 | 33,69 | 36,00 | 37,77 | 39,13 | 40,18 | 40,96 | 41,52 | 41,89 |
| 27120/-- | 2,0 | 26,41 | 35,17 | 40,85 | 44,93 | 48,00 | 50,36 | 52,18 | 53,58 | 54,62 | 55,37 | 55,86 |
| 27127/-- | 2,7 | 32,63 | 43,45 | 50,46 | 55,51 | 59,30 | 62,21 | 64,46 | 66,18 | 67,47 | 68,40 | 69,00 |
| 27232/-- | 3,2 | 41,69 | 55,52 | 64,48 | 70,92 | 75,77 | 79,49 | 82,37 | 84,57 | 86,21 | 87,39 | 88,17 |
| 27236/-- | 3,6 | 57,10 | 76,04 | 88,31 | 97,13 | 103,77 | 108,87 | 112,80 | 115,82 | 118,07 | 119,69 | 120,75 |
| 27340/-- | 4,0 | 66,03 | 87,93 | 102,13 | 112,33 | 120,01 | 125,91 | 130,46 | 133,94 | 136,55 | 138,42 | 139,65 |
| 27344/-- | 4,4 | 76,80 | 102,27 | 118,78 | 130,65 | 139,58 | 146,44 | 151,73 | 155,78 | 158,81 | 160,99 | 162,42 |

Table 30A: Refrigerant R32 - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 20,51 | 27,10 | 31,33 | 34,34 | 36,60 | 38,33 | 39,65 | 40,67 | 41,42 | 41,95 | 42,30 |
| 27120/-- | 2,0 | 27,35 | 36,14 | 41,77 | 45,80 | 48,81 | 51,11 | 52,88 | 54,23 | 55,23 | 55,95 | 56,41 |
| 27127/-- | 2,7 | 33,78 | 44,65 | 51,60 | 56,57 | 60,29 | 63,14 | 65,32 | 66,99 | 68,23 | 69,11 | 69,68 |
| 27232/-- | 3,2 | 43,17 | 57,05 | 65,94 | 72,29 | 77,04 | 80,68 | 83,47 | 85,60 | 87,18 | 88,31 | 89,03 |
| 27236/-- | 3,6 | 59,12 | 78,13 | 90,30 | 99,00 | 105,51 | 110,49 | 114,31 | 117,23 | 119,40 | 120,94 | 121,94 |
| 27340/-- | 4,0 | 68,37 | 90,35 | 104,43 | 114,49 | 122,02 | 127,78 | 132,20 | 135,57 | 138,08 | 139,86 | 141,02 |
| 27344/-- | 4,4 | 79,52 | 105,09 | 121,46 | 133,16 | 141,92 | 148,62 | 153,76 | 157,68 | 160,60 | 162,67 | 164,01 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 21,05 | 27,59 | 31,74 | 34,68 | 36,88 | 38,55 | 39,83 | 40,79 | 41,51 | 42,01 | 42,32 |
| 27120/-- | 2,0 | 28,07 | 36,79 | 42,32 | 46,25 | 49,18 | 51,41 | 53,11 | 54,40 | 55,35 | 56,02 | 56,44 |
| 27127/-- | 2,7 | 34,67 | 45,44 | 52,28 | 57,13 | 60,75 | 63,50 | 65,61 | 67,20 | 68,37 | 69,20 | 69,72 |
| 27232/-- | 3,2 | 44,30 | 58,07 | 66,80 | 73,00 | 77,62 | 81,14 | 83,83 | 85,86 | 87,37 | 88,42 | 89,08 |
| 27236/-- | 3,6 | 60,67 | 79,52 | 91,48 | 99,98 | 106,31 | 111,12 | 114,81 | 117,59 | 119,65 | 121,09 | 122,00 |
| 27340/-- | 4,0 | 70,16 | 91,97 | 105,80 | 115,62 | 122,94 | 128,51 | 132,77 | 135,99 | 138,37 | 140,04 | 141,10 |
| 27344/-- | 4,4 | 81,60 | 106,96 | 123,05 | 134,48 | 142,99 | 149,47 | 154,42 | 158,17 | 160,94 | 162,88 | 164,10 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 30B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| Fsub | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 30B

Table 31A: Refrigerant R404A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,82 | 11,47 | 12,94 | 13,78 | 14,19 | 14,29 | 14,16 | 13,82 | 13,31 | 12,63 | 11,79 |
| 27120/-- | 2,0 | 11,77 | 15,30 | 17,26 | 18,37 | 18,92 | 19,06 | 18,88 | 18,43 | 17,75 | 16,84 | 15,72 |
| 27127/-- | 2,7 | 14,54 | 18,90 | 21,32 | 22,69 | 23,37 | 23,54 | 23,32 | 22,77 | 21,92 | 20,81 | 19,42 |
| 27232/-- | 3,2 | 18,57 | 24,14 | 27,24 | 28,99 | 29,85 | 30,08 | 29,79 | 29,08 | 28,01 | 26,59 | 24,81 |
| 27236/-- | 3,6 | 25,43 | 33,07 | 37,31 | 39,71 | 40,89 | 41,20 | 40,80 | 39,84 | 38,36 | 36,42 | 33,98 |
| 27340/-- | 4,0 | 29,41 | 38,24 | 43,14 | 45,92 | 47,29 | 47,64 | 47,19 | 46,07 | 44,37 | 42,11 | 39,30 |
| 27344/-- | 4,4 | 34,21 | 44,48 | 50,18 | 53,40 | 55,00 | 55,41 | 54,88 | 53,58 | 51,60 | 48,98 | 45,71 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,42 | 12,16 | 13,66 | 14,49 | 14,89 | 14,98 | 14,84 | 14,50 | 13,99 | 13,34 | 12,54 |
| 27120/-- | 2,0 | 12,56 | 16,22 | 18,21 | 19,32 | 19,85 | 19,98 | 19,78 | 19,33 | 18,66 | 17,78 | 16,72 |
| 27127/-- | 2,7 | 15,52 | 20,03 | 22,50 | 23,86 | 24,52 | 24,68 | 24,44 | 23,88 | 23,05 | 21,97 | 20,65 |
| 27232/-- | 3,2 | 19,82 | 25,59 | 28,74 | 30,49 | 31,33 | 31,53 | 31,22 | 30,51 | 29,44 | 28,07 | 26,38 |
| 27236/-- | 3,6 | 27,15 | 35,06 | 39,36 | 41,76 | 42,92 | 43,18 | 42,76 | 41,79 | 40,33 | 38,44 | 36,14 |
| 27340/-- | 4,0 | 31,40 | 40,54 | 45,52 | 48,29 | 49,63 | 49,94 | 49,46 | 48,32 | 46,64 | 44,46 | 41,79 |
| 27344/-- | 4,4 | 36,52 | 47,15 | 52,94 | 56,17 | 57,72 | 58,08 | 57,52 | 56,20 | 54,25 | 51,70 | 48,61 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,92 | 12,69 | 14,16 | 14,96 | 15,32 | 15,38 | 15,20 | 14,83 | 14,31 | 13,65 | 12,85 |
| 27120/-- | 2,0 | 13,22 | 16,92 | 18,89 | 19,94 | 20,43 | 20,50 | 20,26 | 19,78 | 19,08 | 18,19 | 17,14 |
| 27127/-- | 2,7 | 16,34 | 20,91 | 23,33 | 24,64 | 25,23 | 25,33 | 25,03 | 24,43 | 23,57 | 22,48 | 21,17 |
| 27232/-- | 3,2 | 20,87 | 26,71 | 29,81 | 31,48 | 32,24 | 32,36 | 31,98 | 31,21 | 30,11 | 28,71 | 27,04 |
| 27236/-- | 3,6 | 28,59 | 36,58 | 40,83 | 43,11 | 44,16 | 44,32 | 43,81 | 42,75 | 41,24 | 39,33 | 37,04 |
| 27340/-- | 4,0 | 33,06 | 42,31 | 47,21 | 49,86 | 51,06 | 51,25 | 50,66 | 49,44 | 47,70 | 45,48 | 42,84 |
| 27344/-- | 4,4 | 38,45 | 49,21 | 54,91 | 57,99 | 59,39 | 59,61 | 58,92 | 57,50 | 55,47 | 52,90 | 49,82 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,32 | 13,06 | 14,47 | 15,20 | 15,50 | 15,50 | 15,28 | 14,87 | 14,31 | 13,63 | 12,82 |
| 27120/-- | 2,0 | 13,76 | 17,41 | 19,29 | 20,27 | 20,67 | 20,67 | 20,37 | 19,83 | 19,09 | 18,17 | 17,09 |
| 27127/-- | 2,7 | 16,99 | 21,51 | 23,84 | 25,04 | 25,53 | 25,53 | 25,16 | 24,49 | 23,58 | 22,44 | 21,11 |
| 27232/-- | 3,2 | 21,71 | 27,49 | 30,45 | 31,98 | 32,62 | 32,62 | 32,15 | 31,29 | 30,12 | 28,67 | 26,97 |
| 27236/-- | 3,6 | 29,74 | 37,65 | 41,71 | 43,81 | 44,68 | 44,68 | 44,03 | 42,86 | 41,26 | 39,28 | 36,95 |
| 27340/-- | 4,0 | 34,39 | 43,54 | 48,23 | 50,66 | 51,67 | 51,67 | 50,92 | 49,57 | 47,71 | 45,42 | 42,73 |
| 27344/-- | 4,4 | 40,00 | 50,64 | 56,10 | 58,92 | 60,09 | 60,10 | 59,22 | 57,65 | 55,49 | 52,83 | 49,69 |

Table 31A: Refrigerant R404A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,61 | 13,27 | 14,58 | 15,23 | 15,45 | 15,39 | 15,11 | 14,65 | 14,05 | 13,33 | 12,50 |
| 27120/-- | 2,0 | 14,14 | 17,69 | 19,44 | 20,30 | 20,61 | 20,52 | 20,14 | 19,54 | 18,74 | 17,78 | 16,66 |
| 27127/-- | 2,7 | 17,47 | 21,85 | 24,02 | 25,08 | 25,46 | 25,35 | 24,89 | 24,14 | 23,15 | 21,96 | 20,59 |
| 27232/-- | 3,2 | 22,32 | 27,92 | 30,69 | 32,04 | 32,52 | 32,39 | 31,79 | 30,84 | 29,58 | 28,06 | 26,30 |
| 27236/-- | 3,6 | 30,58 | 38,24 | 42,03 | 43,89 | 44,54 | 44,36 | 43,55 | 42,24 | 40,51 | 38,43 | 36,03 |
| 27340/-- | 4,0 | 35,36 | 44,22 | 48,61 | 50,76 | 51,51 | 51,30 | 50,36 | 48,84 | 46,85 | 44,44 | 41,66 |
| 27344/-- | 4,4 | 41,12 | 51,43 | 56,54 | 59,03 | 59,91 | 59,66 | 58,57 | 56,81 | 54,49 | 51,69 | 48,45 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,78 | 13,31 | 14,51 | 15,06 | 15,21 | 15,07 | 14,73 | 14,22 | 13,57 | 12,81 | 11,95 |
| 27120/-- | 2,0 | 14,38 | 17,75 | 19,35 | 20,08 | 20,27 | 20,09 | 19,64 | 18,96 | 18,10 | 17,08 | 15,93 |
| 27127/-- | 2,7 | 17,76 | 21,93 | 23,91 | 24,81 | 25,05 | 24,82 | 24,26 | 23,42 | 22,36 | 21,10 | 19,68 |
| 27232/-- | 3,2 | 22,69 | 28,02 | 30,54 | 31,70 | 32,00 | 31,71 | 30,99 | 29,92 | 28,56 | 26,96 | 25,14 |
| 27236/-- | 3,6 | 31,08 | 38,37 | 41,84 | 43,41 | 43,83 | 43,44 | 42,45 | 40,98 | 39,13 | 36,93 | 34,43 |
| 27340/-- | 4,0 | 35,94 | 44,38 | 48,38 | 50,21 | 50,69 | 50,24 | 49,09 | 47,39 | 45,25 | 42,71 | 39,82 |
| 27344/-- | 4,4 | 41,80 | 51,61 | 56,27 | 58,39 | 58,95 | 58,43 | 57,09 | 55,12 | 52,62 | 49,67 | 46,31 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 31B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,09 | 1,17 | 1,26 | 1,34 | 1,42 | 1,50 | 1,56 | 1,63 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 31B

Table 32A: Refrigerant R407C - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,06 | 14,62 | 16,79 | 18,21 | 19,16 | 19,75 | 20,08 | 20,19 | 20,13 | 19,91 | 19,54 |
| 27120/-- | 2,0 | 14,74 | 19,49 | 22,38 | 24,28 | 25,54 | 26,34 | 26,77 | 26,93 | 26,84 | 26,54 | 26,06 |
| 27127/-- | 2,7 | 18,21 | 24,07 | 27,65 | 30,00 | 31,55 | 32,53 | 33,07 | 33,26 | 33,15 | 32,79 | 32,19 |
| 27232/-- | 3,2 | 23,27 | 30,76 | 35,32 | 38,33 | 40,31 | 41,57 | 42,26 | 42,50 | 42,36 | 41,89 | 41,13 |
| 27236/-- | 3,6 | 31,88 | 42,13 | 48,39 | 52,50 | 55,22 | 56,93 | 57,88 | 58,21 | 58,02 | 57,38 | 56,33 |
| 27340/-- | 4,0 | 36,86 | 48,72 | 55,95 | 60,71 | 63,85 | 65,84 | 66,93 | 67,32 | 67,09 | 66,35 | 65,14 |
| 27344/-- | 4,4 | 42,88 | 56,68 | 65,09 | 70,62 | 74,28 | 76,59 | 77,86 | 78,30 | 78,05 | 77,19 | 75,78 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,66 | 15,30 | 17,49 | 18,90 | 19,83 | 20,40 | 20,71 | 20,80 | 20,72 | 20,49 | 20,12 |
| 27120/-- | 2,0 | 15,54 | 20,40 | 23,31 | 25,20 | 26,44 | 27,20 | 27,61 | 27,74 | 27,63 | 27,32 | 26,83 |
| 27127/-- | 2,7 | 19,20 | 25,20 | 28,80 | 31,14 | 32,66 | 33,60 | 34,11 | 34,26 | 34,13 | 33,75 | 33,14 |
| 27232/-- | 3,2 | 24,53 | 32,20 | 36,80 | 39,78 | 41,73 | 42,93 | 43,58 | 43,78 | 43,61 | 43,12 | 42,34 |
| 27236/-- | 3,6 | 33,60 | 44,11 | 50,40 | 54,49 | 57,15 | 58,81 | 59,69 | 59,97 | 59,73 | 59,06 | 58,00 |
| 27340/-- | 4,0 | 38,85 | 51,00 | 58,29 | 63,01 | 66,09 | 68,00 | 69,03 | 69,34 | 69,07 | 68,29 | 67,07 |
| 27344/-- | 4,4 | 45,20 | 59,33 | 67,80 | 73,30 | 76,88 | 79,11 | 80,30 | 80,67 | 80,35 | 79,44 | 78,02 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,16 | 15,83 | 17,99 | 19,36 | 20,24 | 20,77 | 21,04 | 21,10 | 20,99 | 20,73 | 20,34 |
| 27120/-- | 2,0 | 16,21 | 21,11 | 23,98 | 25,82 | 26,99 | 27,70 | 28,05 | 28,13 | 27,98 | 27,64 | 27,12 |
| 27127/-- | 2,7 | 20,03 | 26,07 | 29,63 | 31,89 | 33,34 | 34,22 | 34,66 | 34,75 | 34,57 | 34,14 | 33,50 |
| 27232/-- | 3,2 | 25,59 | 33,31 | 37,85 | 40,75 | 42,60 | 43,72 | 44,28 | 44,40 | 44,17 | 43,62 | 42,81 |
| 27236/-- | 3,6 | 35,05 | 45,63 | 51,85 | 55,81 | 58,35 | 59,88 | 60,65 | 60,82 | 60,50 | 59,75 | 58,63 |
| 27340/-- | 4,0 | 40,54 | 52,77 | 59,95 | 64,54 | 67,47 | 69,24 | 70,14 | 70,33 | 69,96 | 69,10 | 67,80 |
| 27344/-- | 4,4 | 47,15 | 61,38 | 69,74 | 75,08 | 78,49 | 80,55 | 81,59 | 81,82 | 81,38 | 80,38 | 78,87 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,56 | 16,20 | 18,29 | 19,60 | 20,41 | 20,89 | 21,10 | 21,12 | 20,96 | 20,67 | 20,25 |
| 27120/-- | 2,0 | 16,75 | 21,60 | 24,38 | 26,13 | 27,22 | 27,85 | 28,14 | 28,16 | 27,95 | 27,56 | 27,00 |
| 27127/-- | 2,7 | 20,69 | 26,68 | 30,12 | 32,28 | 33,62 | 34,40 | 34,76 | 34,78 | 34,53 | 34,05 | 33,36 |
| 27232/-- | 3,2 | 26,44 | 34,09 | 38,49 | 41,24 | 42,96 | 43,96 | 44,41 | 44,44 | 44,12 | 43,50 | 42,62 |
| 27236/-- | 3,6 | 36,22 | 46,69 | 52,72 | 56,49 | 58,84 | 60,21 | 60,83 | 60,87 | 60,43 | 59,58 | 58,38 |
| 27340/-- | 4,0 | 41,88 | 53,99 | 60,96 | 65,32 | 68,04 | 69,62 | 70,35 | 70,39 | 69,88 | 68,90 | 67,51 |
| 27344/-- | 4,4 | 48,72 | 62,81 | 70,91 | 75,98 | 79,15 | 80,99 | 81,83 | 81,88 | 81,29 | 80,15 | 78,53 |

Table 32A: Refrigerant R407C - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,86 | 16,40 | 18,40 | 19,62 | 20,36 | 20,77 | 20,93 | 20,89 | 20,69 | 20,35 | 19,90 |
| 27120/-- | 2,0 | 17,14 | 21,87 | 24,53 | 26,16 | 27,15 | 27,69 | 27,90 | 27,85 | 27,59 | 27,14 | 26,54 |
| 27127/-- | 2,7 | 21,18 | 27,01 | 30,30 | 32,31 | 33,54 | 34,21 | 34,47 | 34,41 | 34,08 | 33,53 | 32,78 |
| 27232/-- | 3,2 | 27,06 | 34,51 | 38,71 | 41,29 | 42,85 | 43,71 | 44,04 | 43,96 | 43,54 | 42,84 | 41,88 |
| 27236/-- | 3,6 | 37,06 | 47,28 | 53,03 | 56,55 | 58,69 | 59,87 | 60,32 | 60,21 | 59,64 | 58,67 | 57,37 |
| 27340/-- | 4,0 | 42,86 | 54,67 | 61,32 | 65,40 | 67,87 | 69,23 | 69,76 | 69,63 | 68,97 | 67,85 | 66,34 |
| 27344/-- | 4,4 | 49,86 | 63,59 | 71,33 | 76,07 | 78,95 | 80,53 | 81,15 | 81,00 | 80,22 | 78,93 | 77,17 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,03 | 16,44 | 18,32 | 19,45 | 20,11 | 20,45 | 20,55 | 20,45 | 20,20 | 19,82 | 19,33 |
| 27120/-- | 2,0 | 17,38 | 21,92 | 24,43 | 25,94 | 26,82 | 27,27 | 27,39 | 27,27 | 26,94 | 26,43 | 25,78 |
| 27127/-- | 2,7 | 21,46 | 27,08 | 30,18 | 32,04 | 33,13 | 33,68 | 33,84 | 33,69 | 33,28 | 32,65 | 31,84 |
| 27232/-- | 3,2 | 27,42 | 34,60 | 38,56 | 40,93 | 42,32 | 43,03 | 43,24 | 43,04 | 42,52 | 41,72 | 40,69 |
| 27236/-- | 3,6 | 37,56 | 47,39 | 52,82 | 56,07 | 57,97 | 58,95 | 59,22 | 58,95 | 58,24 | 57,15 | 55,73 |
| 27340/-- | 4,0 | 43,44 | 54,81 | 61,08 | 64,84 | 67,04 | 68,16 | 68,48 | 68,17 | 67,34 | 66,08 | 64,44 |
| 27344/-- | 4,4 | 50,53 | 63,75 | 71,05 | 75,42 | 77,98 | 79,29 | 79,66 | 79,30 | 78,34 | 76,87 | 74,96 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 32B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,19 | 1,25 | 1,31 | 1,37 | 1,44 | 1,49 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 32B

Table 33A: Refrigerant R410A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,21 | 16,35 | 19,00 | 20,83 | 22,14 | 23,05 | 23,66 | 24,03 | 24,19 | 24,16 | 23,97 |
| 27120/-- | 2,0 | 16,28 | 21,80 | 25,33 | 27,78 | 29,52 | 30,73 | 31,55 | 32,04 | 32,25 | 32,22 | 31,96 |
| 27127/-- | 2,7 | 20,11 | 26,93 | 31,29 | 34,31 | 36,46 | 37,96 | 38,97 | 39,57 | 39,84 | 39,79 | 39,48 |
| 27232/-- | 3,2 | 25,69 | 34,41 | 39,98 | 43,84 | 46,58 | 48,50 | 49,79 | 50,56 | 50,90 | 50,84 | 50,44 |
| 27236/-- | 3,6 | 35,19 | 47,13 | 54,75 | 60,05 | 63,80 | 66,43 | 68,19 | 69,25 | 69,71 | 69,64 | 69,08 |
| 27340/-- | 4,0 | 40,70 | 54,51 | 63,33 | 69,45 | 73,79 | 76,83 | 78,87 | 80,09 | 80,62 | 80,54 | 79,90 |
| 27344/-- | 4,4 | 47,34 | 63,40 | 73,66 | 80,77 | 85,82 | 89,36 | 91,74 | 93,16 | 93,77 | 93,67 | 92,93 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,11 | 17,47 | 20,23 | 22,13 | 23,47 | 24,41 | 25,05 | 25,43 | 25,61 | 25,62 | 25,46 |
| 27120/-- | 2,0 | 17,48 | 23,29 | 26,97 | 29,50 | 31,29 | 32,55 | 33,40 | 33,91 | 34,15 | 34,15 | 33,94 |
| 27127/-- | 2,7 | 21,59 | 28,77 | 33,31 | 36,44 | 38,65 | 40,21 | 41,25 | 41,89 | 42,19 | 42,19 | 41,93 |
| 27232/-- | 3,2 | 27,58 | 36,76 | 42,56 | 46,56 | 49,39 | 51,37 | 52,70 | 53,52 | 53,90 | 53,90 | 53,57 |
| 27236/-- | 3,6 | 37,77 | 50,35 | 58,29 | 63,77 | 67,64 | 70,36 | 72,19 | 73,30 | 73,82 | 73,83 | 73,37 |
| 27340/-- | 4,0 | 43,69 | 58,23 | 67,42 | 73,76 | 78,23 | 81,37 | 83,49 | 84,78 | 85,38 | 85,39 | 84,86 |
| 27344/-- | 4,4 | 50,81 | 67,72 | 78,42 | 85,78 | 90,99 | 94,64 | 97,10 | 98,60 | 99,30 | 99,31 | 98,70 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,89 | 18,39 | 21,20 | 23,12 | 24,46 | 25,40 | 26,02 | 26,40 | 26,58 | 26,58 | 26,43 |
| 27120/-- | 2,0 | 18,52 | 24,52 | 28,27 | 30,82 | 32,61 | 33,86 | 34,70 | 35,21 | 35,44 | 35,44 | 35,24 |
| 27127/-- | 2,7 | 22,87 | 30,29 | 34,92 | 38,07 | 40,29 | 41,83 | 42,86 | 43,49 | 43,78 | 43,78 | 43,53 |
| 27232/-- | 3,2 | 29,22 | 38,70 | 44,61 | 48,64 | 51,47 | 53,44 | 54,76 | 55,56 | 55,93 | 55,93 | 55,61 |
| 27236/-- | 3,6 | 40,02 | 53,00 | 61,10 | 66,62 | 70,50 | 73,20 | 75,00 | 76,10 | 76,60 | 76,61 | 76,16 |
| 27340/-- | 4,0 | 46,29 | 61,30 | 70,67 | 77,06 | 81,54 | 84,66 | 86,75 | 88,01 | 88,60 | 88,60 | 88,09 |
| 27344/-- | 4,4 | 53,84 | 71,30 | 82,19 | 89,62 | 94,83 | 98,47 | 100,90 | 102,37 | 103,05 | 103,05 | 102,46 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,55 | 19,12 | 21,92 | 23,82 | 25,13 | 26,03 | 26,63 | 26,98 | 27,14 | 27,12 | 26,95 |
| 27120/-- | 2,0 | 19,40 | 25,49 | 29,23 | 31,75 | 33,51 | 34,71 | 35,51 | 35,98 | 36,18 | 36,16 | 35,93 |
| 27127/-- | 2,7 | 23,96 | 31,49 | 36,11 | 39,22 | 41,39 | 42,88 | 43,86 | 44,44 | 44,69 | 44,66 | 44,39 |
| 27232/-- | 3,2 | 30,62 | 40,23 | 46,13 | 50,11 | 52,88 | 54,78 | 56,04 | 56,78 | 57,10 | 57,06 | 56,71 |
| 27236/-- | 3,6 | 41,93 | 55,10 | 63,18 | 68,64 | 72,42 | 75,03 | 76,75 | 77,77 | 78,21 | 78,15 | 77,67 |
| 27340/-- | 4,0 | 48,50 | 63,73 | 73,08 | 79,38 | 83,76 | 86,78 | 88,77 | 89,95 | 90,45 | 90,39 | 89,83 |
| 27344/-- | 4,4 | 56,41 | 74,12 | 84,99 | 92,33 | 97,42 | 100,93 | 103,25 | 104,62 | 105,21 | 105,13 | 104,48 |

Table 33A: Refrigerant R410A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,08 | 19,64 | 22,40 | 24,23 | 25,49 | 26,35 | 26,90 | 27,21 | 27,33 | 27,28 | 27,09 |
| 27120/-- | 2,0 | 20,11 | 26,19 | 29,86 | 32,31 | 33,99 | 35,13 | 35,87 | 36,29 | 36,44 | 36,38 | 36,12 |
| 27127/-- | 2,7 | 24,84 | 32,35 | 36,89 | 39,91 | 41,99 | 43,40 | 44,31 | 44,82 | 45,01 | 44,93 | 44,62 |
| 27232/-- | 3,2 | 31,74 | 41,33 | 47,13 | 50,99 | 53,64 | 55,44 | 56,61 | 57,27 | 57,51 | 57,41 | 57,00 |
| 27236/-- | 3,6 | 43,47 | 56,61 | 64,55 | 69,84 | 73,47 | 75,94 | 77,53 | 78,43 | 78,77 | 78,63 | 78,07 |
| 27340/-- | 4,0 | 50,28 | 65,48 | 74,65 | 80,78 | 84,98 | 87,83 | 89,67 | 90,71 | 91,10 | 90,94 | 90,30 |
| 27344/-- | 4,4 | 58,48 | 76,15 | 86,83 | 93,95 | 98,83 | 102,15 | 104,29 | 105,51 | 105,96 | 105,77 | 105,02 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,48 | 19,96 | 22,63 | 24,39 | 25,58 | 26,37 | 26,87 | 27,14 | 27,21 | 27,13 | 26,90 |
| 27120/-- | 2,0 | 20,64 | 26,62 | 30,17 | 32,52 | 34,10 | 35,17 | 35,83 | 36,18 | 36,28 | 36,17 | 35,87 |
| 27127/-- | 2,7 | 25,50 | 32,88 | 37,27 | 40,17 | 42,13 | 43,44 | 44,26 | 44,70 | 44,82 | 44,68 | 44,30 |
| 27232/-- | 3,2 | 32,57 | 42,01 | 47,62 | 51,32 | 53,82 | 55,50 | 56,55 | 57,11 | 57,26 | 57,08 | 56,60 |
| 27236/-- | 3,6 | 44,61 | 57,53 | 65,22 | 70,29 | 73,72 | 76,01 | 77,45 | 78,21 | 78,43 | 78,18 | 77,53 |
| 27340/-- | 4,0 | 51,60 | 66,54 | 75,43 | 81,29 | 85,26 | 87,91 | 89,58 | 90,46 | 90,71 | 90,42 | 89,67 |
| 27344/-- | 4,4 | 60,01 | 77,39 | 87,73 | 94,55 | 99,17 | 102,25 | 104,18 | 105,21 | 105,50 | 105,16 | 104,29 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 33B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,07 | 1,14 | 1,21 | 1,28 | 1,34 | 1,41 | 1,48 | 1,54 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 33B

Table 34A: Refrigerant R507A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,63 | 11,22 | 12,65 | 13,46 | 13,85 | 13,94 | 13,79 | 13,44 | 12,92 | 12,23 | 11,38 |
| 27120/-- | 2,0 | 11,51 | 14,96 | 16,87 | 17,95 | 18,47 | 18,59 | 18,39 | 17,93 | 17,24 | 16,32 | 15,17 |
| 27127/-- | 2,7 | 14,21 | 18,48 | 20,84 | 22,16 | 22,81 | 22,96 | 22,71 | 22,14 | 21,28 | 20,15 | 18,73 |
| 27232/-- | 3,2 | 18,17 | 23,61 | 26,63 | 28,32 | 29,15 | 29,34 | 29,03 | 28,30 | 27,20 | 25,75 | 23,94 |
| 27236/-- | 3,6 | 24,88 | 32,34 | 36,47 | 38,80 | 39,93 | 40,19 | 39,76 | 38,76 | 37,26 | 35,27 | 32,79 |
| 27340/-- | 4,0 | 28,77 | 37,40 | 42,18 | 44,86 | 46,17 | 46,47 | 45,98 | 44,82 | 43,08 | 40,79 | 37,92 |
| 27344/-- | 4,4 | 33,46 | 43,50 | 49,05 | 52,18 | 53,70 | 54,05 | 53,47 | 52,13 | 50,10 | 47,44 | 44,11 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,23 | 11,92 | 13,38 | 14,19 | 14,57 | 14,65 | 14,49 | 14,15 | 13,63 | 12,97 | 12,17 |
| 27120/-- | 2,0 | 12,31 | 15,89 | 17,84 | 18,92 | 19,43 | 19,54 | 19,33 | 18,87 | 18,19 | 17,30 | 16,23 |
| 27127/-- | 2,7 | 15,20 | 19,63 | 22,03 | 23,36 | 23,99 | 24,13 | 23,87 | 23,30 | 22,46 | 21,36 | 20,04 |
| 27232/-- | 3,2 | 19,43 | 25,08 | 28,16 | 29,86 | 30,67 | 30,83 | 30,51 | 29,78 | 28,70 | 27,30 | 25,61 |
| 27236/-- | 3,6 | 26,61 | 34,36 | 38,57 | 40,90 | 42,00 | 42,23 | 41,79 | 40,79 | 39,31 | 37,40 | 35,07 |
| 27340/-- | 4,0 | 30,77 | 39,73 | 44,60 | 47,29 | 48,57 | 48,84 | 48,32 | 47,16 | 45,45 | 43,25 | 40,56 |
| 27344/-- | 4,4 | 35,79 | 46,21 | 51,87 | 55,00 | 56,49 | 56,80 | 56,20 | 54,85 | 52,87 | 50,30 | 47,17 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,73 | 12,46 | 13,90 | 14,67 | 15,02 | 15,06 | 14,88 | 14,50 | 13,97 | 13,31 | 12,51 |
| 27120/-- | 2,0 | 12,98 | 16,61 | 18,53 | 19,57 | 20,03 | 20,09 | 19,84 | 19,34 | 18,64 | 17,75 | 16,68 |
| 27127/-- | 2,7 | 16,03 | 20,51 | 22,89 | 24,16 | 24,73 | 24,80 | 24,50 | 23,89 | 23,02 | 21,92 | 20,60 |
| 27232/-- | 3,2 | 20,49 | 26,22 | 29,25 | 30,88 | 31,61 | 31,70 | 31,31 | 30,53 | 29,41 | 28,01 | 26,33 |
| 27236/-- | 3,6 | 28,06 | 35,91 | 40,06 | 42,29 | 43,29 | 43,42 | 42,89 | 41,81 | 40,29 | 38,36 | 36,06 |
| 27340/-- | 4,0 | 32,45 | 41,52 | 46,33 | 48,90 | 50,06 | 50,21 | 49,59 | 48,35 | 46,59 | 44,36 | 41,70 |
| 27344/-- | 4,4 | 37,74 | 48,29 | 53,88 | 56,88 | 58,22 | 58,40 | 57,68 | 56,23 | 54,18 | 51,59 | 48,50 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,14 | 12,83 | 14,21 | 14,92 | 15,21 | 15,20 | 14,97 | 14,56 | 14,00 | 13,31 | 12,50 |
| 27120/-- | 2,0 | 13,52 | 17,12 | 18,96 | 19,91 | 20,29 | 20,28 | 19,97 | 19,42 | 18,67 | 17,75 | 16,67 |
| 27127/-- | 2,7 | 16,69 | 21,13 | 23,41 | 24,58 | 25,05 | 25,04 | 24,66 | 23,98 | 23,06 | 21,92 | 20,58 |
| 27232/-- | 3,2 | 21,33 | 27,01 | 29,92 | 31,41 | 32,02 | 32,00 | 31,51 | 30,65 | 29,47 | 28,01 | 26,31 |
| 27236/-- | 3,6 | 29,22 | 37,00 | 40,98 | 43,03 | 43,86 | 43,83 | 43,16 | 41,98 | 40,36 | 38,37 | 36,03 |
| 27340/-- | 4,0 | 33,79 | 42,78 | 47,39 | 49,75 | 50,71 | 50,69 | 49,91 | 48,54 | 46,67 | 44,37 | 41,66 |
| 27344/-- | 4,4 | 39,30 | 49,76 | 55,11 | 57,86 | 58,98 | 58,95 | 58,05 | 56,45 | 54,28 | 51,60 | 48,46 |

Table 34A: Refrigerant R507A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,43 | 13,05 | 14,34 | 14,96 | 15,18 | 15,11 | 14,82 | 14,36 | 13,76 | 13,03 | 12,20 |
| 27120/-- | 2,0 | 13,91 | 17,40 | 19,12 | 19,96 | 20,25 | 20,15 | 19,76 | 19,15 | 18,35 | 17,38 | 16,27 |
| 27127/-- | 2,7 | 17,18 | 21,49 | 23,61 | 24,64 | 25,00 | 24,88 | 24,40 | 23,65 | 22,66 | 21,46 | 20,09 |
| 27232/-- | 3,2 | 21,96 | 27,46 | 30,18 | 31,50 | 31,95 | 31,80 | 31,19 | 30,22 | 28,96 | 27,43 | 25,67 |
| 27236/-- | 3,6 | 30,07 | 37,62 | 41,34 | 43,14 | 43,76 | 43,55 | 42,72 | 41,39 | 39,66 | 37,57 | 35,16 |
| 27340/-- | 4,0 | 34,78 | 43,50 | 47,80 | 49,89 | 50,60 | 50,36 | 49,40 | 47,87 | 45,86 | 43,45 | 40,66 |
| 27344/-- | 4,4 | 40,45 | 50,59 | 55,59 | 58,02 | 58,85 | 58,57 | 57,45 | 55,67 | 53,34 | 50,53 | 47,29 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,61 | 13,10 | 14,28 | 14,81 | 14,94 | 14,80 | 14,45 | 13,94 | 13,29 | 12,53 | 11,66 |
| 27120/-- | 2,0 | 14,16 | 17,47 | 19,05 | 19,75 | 19,93 | 19,74 | 19,27 | 18,59 | 17,73 | 16,71 | 15,55 |
| 27127/-- | 2,7 | 17,48 | 21,58 | 23,52 | 24,39 | 24,61 | 24,37 | 23,80 | 22,95 | 21,89 | 20,63 | 19,20 |
| 27232/-- | 3,2 | 22,34 | 27,58 | 30,05 | 31,17 | 31,45 | 31,15 | 30,41 | 29,34 | 27,97 | 26,37 | 24,54 |
| 27236/-- | 3,6 | 30,60 | 37,77 | 41,17 | 42,70 | 43,08 | 42,67 | 41,66 | 40,18 | 38,32 | 36,12 | 33,62 |
| 27340/-- | 4,0 | 35,38 | 43,68 | 47,60 | 49,37 | 49,82 | 49,34 | 48,17 | 46,46 | 44,31 | 41,76 | 38,87 |
| 27344/-- | 4,4 | 41,15 | 50,80 | 55,36 | 57,42 | 57,94 | 57,38 | 56,02 | 54,04 | 51,53 | 48,57 | 45,21 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 34B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,09 | 1,18 | 1,26 | 1,35 | 1,44 | 1,52 | 1,60 | 1,67 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 34B

Table 35A: Refrigerant R1234yf - Capacities in kW (1)

| Evaporating Temperature 20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,16 | 10,32 | 11,34 | 11,76 | 11,79 | 11,53 | 11,07 | 10,42 | 9,62 | 8,68 | 7,59 |
| 27120/-- | 2,0 | 10,88 | 13,76 | 15,12 | 15,68 | 15,72 | 15,38 | 14,75 | 13,89 | 12,83 | 11,57 | 10,13 |
| 27127/-- | 2,7 | 13,44 | 16,99 | 18,67 | 19,36 | 19,40 | 18,99 | 18,22 | 17,15 | 15,84 | 14,29 | 12,50 |
| 27232/-- | 3,2 | 17,17 | 21,71 | 23,86 | 24,74 | 24,80 | 24,26 | 23,28 | 21,92 | 20,24 | 18,26 | 15,98 |
| 27236/-- | 3,6 | 23,52 | 29,75 | 32,69 | 33,89 | 33,97 | 33,24 | 31,89 | 30,03 | 27,73 | 25,02 | 21,89 |
| 27340/-- | 4,0 | 27,20 | 34,40 | 37,80 | 39,19 | 39,28 | 38,44 | 36,87 | 34,72 | 32,06 | 28,93 | 25,31 |
| 27344/-- | 4,4 | 31,64 | 40,01 | 43,96 | 45,58 | 45,69 | 44,71 | 42,89 | 40,38 | 37,29 | 33,64 | 29,43 |
| Evaporating Temperature 10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,56 | 10,72 | 11,69 | 12,06 | 12,03 | 11,73 | 11,22 | 10,54 | 9,72 | 8,77 | 7,69 |
| 27120/-- | 2,0 | 11,41 | 14,29 | 15,59 | 16,07 | 16,04 | 15,64 | 14,96 | 14,05 | 12,95 | 11,69 | 10,26 |
| 27127/-- | 2,7 | 14,09 | 17,64 | 19,25 | 19,85 | 19,80 | 19,31 | 18,47 | 17,35 | 16,00 | 14,43 | 12,66 |
| 27232/-- | 3,2 | 18,01 | 22,55 | 24,60 | 25,36 | 25,31 | 24,67 | 23,60 | 22,17 | 20,44 | 18,44 | 16,18 |
| 27236/-- | 3,6 | 24,67 | 30,89 | 33,70 | 34,74 | 34,67 | 33,80 | 32,33 | 30,37 | 28,00 | 25,27 | 22,17 |
| 27340/-- | 4,0 | 28,53 | 35,72 | 38,97 | 40,17 | 40,09 | 39,08 | 37,38 | 35,12 | 32,38 | 29,21 | 25,63 |
| 27344/-- | 4,4 | 33,18 | 41,54 | 45,32 | 46,72 | 46,62 | 45,46 | 43,48 | 40,84 | 37,66 | 33,98 | 29,82 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,87 | 10,98 | 11,87 | 12,16 | 12,06 | 11,70 | 11,13 | 10,41 | 9,55 | 8,57 | 7,48 |
| 27120/-- | 2,0 | 11,83 | 14,64 | 15,83 | 16,21 | 16,08 | 15,59 | 14,84 | 13,87 | 12,73 | 11,43 | 9,98 |
| 27127/-- | 2,7 | 14,61 | 18,07 | 19,55 | 20,01 | 19,85 | 19,25 | 18,32 | 17,13 | 15,72 | 14,11 | 12,32 |
| 27232/-- | 3,2 | 18,67 | 23,09 | 24,98 | 25,58 | 25,37 | 24,60 | 23,42 | 21,89 | 20,08 | 18,03 | 15,74 |
| 27236/-- | 3,6 | 25,57 | 31,64 | 34,22 | 35,04 | 34,76 | 33,71 | 32,08 | 29,99 | 27,51 | 24,70 | 21,57 |
| 27340/-- | 4,0 | 29,57 | 36,58 | 39,57 | 40,51 | 40,19 | 38,97 | 37,09 | 34,67 | 31,81 | 28,56 | 24,94 |
| 27344/-- | 4,4 | 34,39 | 42,55 | 46,02 | 47,12 | 46,74 | 45,33 | 43,14 | 40,33 | 37,00 | 33,21 | 29,00 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,09 | 11,10 | 11,89 | 12,08 | 11,90 | 11,46 | 10,83 | 10,06 | 9,15 | 8,14 | 7,03 |
| 27120/-- | 2,0 | 12,13 | 14,80 | 15,86 | 16,11 | 15,87 | 15,28 | 14,45 | 13,41 | 12,20 | 10,85 | 9,37 |
| 27127/-- | 2,7 | 14,97 | 18,27 | 19,58 | 19,89 | 19,59 | 18,87 | 17,84 | 16,55 | 15,07 | 13,40 | 11,57 |
| 27232/-- | 3,2 | 19,13 | 23,35 | 25,02 | 25,41 | 25,03 | 24,11 | 22,79 | 21,15 | 19,25 | 17,12 | 14,78 |
| 27236/-- | 3,6 | 26,21 | 31,99 | 34,27 | 34,82 | 34,29 | 33,04 | 31,23 | 28,98 | 26,37 | 23,46 | 20,25 |
| 27340/-- | 4,0 | 30,31 | 36,99 | 39,63 | 40,26 | 39,65 | 38,20 | 36,11 | 33,51 | 30,50 | 27,12 | 23,42 |
| 27344/-- | 4,4 | 35,25 | 43,02 | 46,09 | 46,82 | 46,12 | 44,43 | 41,99 | 38,97 | 35,47 | 31,54 | 27,24 |

Table 35A: Refrigerant R1234yf - Capacities in kW (1)

| Evaporating Temperature -20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,22 | 11,09 | 11,76 | 11,84 | 11,57 | 11,05 | 10,36 | 9,52 | 8,57 | 7,52 | 6,37 |
| 27120/-- | 2,0 | 12,29 | 14,78 | 15,67 | 15,79 | 15,42 | 14,74 | 13,81 | 12,70 | 11,43 | 10,02 | 8,49 |
| 27127/-- | 2,7 | 15,17 | 18,25 | 19,35 | 19,49 | 19,04 | 18,20 | 17,05 | 15,68 | 14,11 | 12,37 | 10,49 |
| 27232/-- | 3,2 | 19,39 | 23,32 | 24,73 | 24,91 | 24,34 | 23,25 | 21,79 | 20,03 | 18,03 | 15,81 | 13,40 |
| 27236/-- | 3,6 | 26,57 | 31,95 | 33,88 | 34,12 | 33,34 | 31,86 | 29,86 | 27,44 | 24,70 | 21,66 | 18,36 |
| 27340/-- | 4,0 | 30,72 | 36,95 | 39,17 | 39,45 | 38,55 | 36,84 | 34,52 | 31,73 | 28,56 | 25,04 | 21,23 |
| 27344/-- | 4,4 | 35,73 | 42,97 | 45,56 | 45,89 | 44,84 | 42,84 | 40,15 | 36,91 | 33,21 | 29,13 | 24,69 |

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,24 | 10,94 | 11,48 | 11,45 | 11,09 | 10,50 | 9,73 | 8,84 | 7,83 | 6,74 | 5,56 |
| 27120/-- | 2,0 | 12,32 | 14,59 | 15,31 | 15,27 | 14,79 | 14,00 | 12,98 | 11,78 | 10,45 | 8,98 | 7,41 |
| 27127/-- | 2,7 | 15,21 | 18,02 | 18,90 | 18,86 | 18,26 | 17,28 | 16,03 | 14,55 | 12,90 | 11,09 | 9,15 |
| 27232/-- | 3,2 | 19,44 | 23,02 | 24,15 | 24,10 | 23,33 | 22,08 | 20,48 | 18,59 | 16,48 | 14,17 | 11,69 |
| 27236/-- | 3,6 | 26,63 | 31,54 | 33,09 | 33,01 | 31,97 | 30,26 | 28,06 | 25,47 | 22,58 | 19,42 | 16,02 |
| 27340/-- | 4,0 | 30,79 | 36,47 | 38,26 | 38,17 | 36,96 | 34,98 | 32,44 | 29,45 | 26,11 | 22,45 | 18,52 |
| 27344/-- | 4,4 | 35,81 | 42,42 | 44,50 | 44,40 | 42,99 | 40,69 | 37,73 | 34,26 | 30,36 | 26,11 | 21,54 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 35B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,07 | 1,15 | 1,22 | 1,29 | 1,36 | 1,43 | 1,49 | 1,55 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 35B

Table 36A: Refrigerant R1234ze - Capacities in kW (1)

| Evaporating Temperature 20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,52 | 12,01 | 13,21 | 13,74 | 13,86 | 13,67 | 13,27 | 12,69 | 11,96 | 11,10 | 10,12 |
| 27120/-- | 2,0 | 12,69 | 16,01 | 17,61 | 18,32 | 18,47 | 18,22 | 17,69 | 16,91 | 15,94 | 14,79 | 13,49 |
| 27127/-- | 2,7 | 15,68 | 19,77 | 21,75 | 22,63 | 22,81 | 22,51 | 21,85 | 20,89 | 19,69 | 18,27 | 16,66 |
| 27232/-- | 3,2 | 20,04 | 25,27 | 27,79 | 28,91 | 29,15 | 28,77 | 27,92 | 26,70 | 25,16 | 23,35 | 21,29 |
| 27236/-- | 3,6 | 27,45 | 34,61 | 38,07 | 39,60 | 39,93 | 39,41 | 38,24 | 36,57 | 34,47 | 31,99 | 29,16 |
| 27340/-- | 4,0 | 31,70 | 39,97 | 43,96 | 45,73 | 46,11 | 45,51 | 44,16 | 42,23 | 39,80 | 36,94 | 33,67 |
| 27344/-- | 4,4 | 36,92 | 46,55 | 51,20 | 53,27 | 53,71 | 53,00 | 51,44 | 49,18 | 46,36 | 43,02 | 39,22 |
| Evaporating Temperature 10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,84 | 12,27 | 13,38 | 13,83 | 13,86 | 13,61 | 13,15 | 12,51 | 11,74 | 10,84 | 9,84 |
| 27120/-- | 2,0 | 13,12 | 16,35 | 17,83 | 18,43 | 18,48 | 18,14 | 17,52 | 16,68 | 15,64 | 14,45 | 13,11 |
| 27127/-- | 2,7 | 16,21 | 20,20 | 22,03 | 22,77 | 22,83 | 22,41 | 21,64 | 20,60 | 19,32 | 17,85 | 16,19 |
| 27232/-- | 3,2 | 20,71 | 25,81 | 28,15 | 29,09 | 29,17 | 28,64 | 27,66 | 26,32 | 24,69 | 22,81 | 20,69 |
| 27236/-- | 3,6 | 28,37 | 35,35 | 38,56 | 39,85 | 39,95 | 39,23 | 37,89 | 36,06 | 33,82 | 31,24 | 28,34 |
| 27340/-- | 4,0 | 32,76 | 40,83 | 44,53 | 46,02 | 46,14 | 45,30 | 43,75 | 41,64 | 39,06 | 36,08 | 32,73 |
| 27344/-- | 4,4 | 38,16 | 47,55 | 51,86 | 53,60 | 53,74 | 52,76 | 50,96 | 48,50 | 45,49 | 42,02 | 38,12 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,07 | 12,38 | 13,38 | 13,72 | 13,67 | 13,34 | 12,80 | 12,11 | 11,28 | 10,34 | 9,30 |
| 27120/-- | 2,0 | 13,42 | 16,50 | 17,83 | 18,29 | 18,22 | 17,78 | 17,07 | 16,14 | 15,04 | 13,78 | 12,40 |
| 27127/-- | 2,7 | 16,58 | 20,38 | 22,03 | 22,60 | 22,51 | 21,96 | 21,08 | 19,94 | 18,58 | 17,03 | 15,32 |
| 27232/-- | 3,2 | 21,18 | 26,05 | 28,15 | 28,88 | 28,76 | 28,07 | 26,94 | 25,48 | 23,74 | 21,76 | 19,57 |
| 27236/-- | 3,6 | 29,02 | 35,68 | 38,55 | 39,55 | 39,40 | 38,44 | 36,90 | 34,90 | 32,51 | 29,81 | 26,81 |
| 27340/-- | 4,0 | 33,51 | 41,20 | 44,52 | 45,67 | 45,49 | 44,39 | 42,61 | 40,30 | 37,55 | 34,42 | 30,96 |
| 27344/-- | 4,4 | 39,03 | 47,99 | 51,85 | 53,20 | 52,99 | 51,70 | 49,63 | 46,94 | 43,73 | 40,09 | 36,06 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,19 | 12,35 | 13,21 | 13,45 | 13,30 | 12,88 | 12,27 | 11,51 | 10,63 | 9,64 | 8,56 |
| 27120/-- | 2,0 | 13,58 | 16,46 | 17,61 | 17,92 | 17,72 | 17,17 | 16,36 | 15,34 | 14,17 | 12,85 | 11,41 |
| 27127/-- | 2,7 | 16,78 | 20,33 | 21,76 | 22,14 | 21,89 | 21,21 | 20,21 | 18,96 | 17,50 | 15,88 | 14,10 |
| 27232/-- | 3,2 | 21,44 | 25,98 | 27,80 | 28,29 | 27,97 | 27,10 | 25,82 | 24,22 | 22,37 | 20,29 | 18,02 |
| 27236/-- | 3,6 | 29,36 | 35,59 | 38,08 | 38,75 | 38,32 | 37,12 | 35,37 | 33,18 | 30,64 | 27,79 | 24,68 |
| 27340/-- | 4,0 | 33,91 | 41,09 | 43,97 | 44,75 | 44,25 | 42,87 | 40,84 | 38,31 | 35,38 | 32,09 | 28,50 |
| 27344/-- | 4,4 | 39,49 | 47,86 | 51,22 | 52,12 | 51,54 | 49,93 | 47,57 | 44,63 | 41,21 | 37,38 | 33,19 |

Table 36A: Refrigerant R1234ze - Capacities in kW (1)

| Evaporating Temperature -20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,20 | 12,18 | 12,90 | 13,02 | 12,77 | 12,27 | 11,58 | 10,76 | 9,82 | 8,78 | 7,66 |
| 27120/-- | 2,0 | 13,60 | 16,23 | 17,19 | 17,35 | 17,01 | 16,35 | 15,44 | 14,34 | 13,08 | 11,70 | 10,21 |
| 27127/-- | 2,7 | 16,80 | 20,05 | 21,24 | 21,43 | 21,02 | 20,19 | 19,07 | 17,71 | 16,16 | 14,46 | 12,61 |
| 27232/-- | 3,2 | 21,47 | 25,63 | 27,14 | 27,39 | 26,86 | 25,81 | 24,37 | 22,63 | 20,66 | 18,47 | 16,11 |
| 27236/-- | 3,6 | 29,40 | 35,10 | 37,18 | 37,51 | 36,79 | 35,35 | 33,38 | 31,00 | 28,29 | 25,30 | 22,07 |
| 27340/-- | 4,0 | 33,95 | 40,53 | 42,93 | 43,32 | 42,48 | 40,82 | 38,54 | 35,80 | 32,67 | 29,22 | 25,48 |
| 27344/-- | 4,4 | 39,54 | 47,21 | 50,00 | 50,45 | 49,48 | 47,54 | 44,89 | 41,70 | 38,05 | 34,03 | 29,68 |

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,11 | 11,89 | 12,46 | 12,46 | 12,11 | 11,52 | 10,76 | 9,87 | 8,88 | 7,79 | 6,62 |
| 27120/-- | 2,0 | 13,47 | 15,84 | 16,61 | 16,60 | 16,14 | 15,36 | 14,35 | 13,16 | 11,83 | 10,38 | 8,82 |
| 27127/-- | 2,7 | 16,64 | 19,57 | 20,52 | 20,51 | 19,93 | 18,97 | 17,72 | 16,26 | 14,61 | 12,82 | 10,90 |
| 27232/-- | 3,2 | 21,27 | 25,01 | 26,22 | 26,21 | 25,48 | 24,24 | 22,65 | 20,77 | 18,67 | 16,39 | 13,93 |
| 27236/-- | 3,6 | 29,13 | 34,26 | 35,91 | 35,90 | 34,89 | 33,21 | 31,02 | 28,45 | 25,58 | 22,44 | 19,08 |
| 27340/-- | 4,0 | 33,64 | 39,56 | 41,47 | 41,46 | 40,29 | 38,34 | 35,82 | 32,86 | 29,54 | 25,92 | 22,03 |
| 27344/-- | 4,4 | 39,18 | 46,08 | 48,30 | 48,29 | 46,93 | 44,66 | 41,72 | 38,27 | 34,40 | 30,19 | 25,66 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 36B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,36 | 1,44 | 1,49 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 36B

Table 37A: Refrigerant R448A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,45 | 13,81 | 15,86 | 17,18 | 18,05 | 18,58 | 18,85 | 18,91 | 18,79 | 18,51 | 18,10 |
| 27120/-- | 2,0 | 13,93 | 18,42 | 21,13 | 22,91 | 24,06 | 24,76 | 25,12 | 25,20 | 25,05 | 24,68 | 24,13 |
| 27127/-- | 2,7 | 17,22 | 22,75 | 26,12 | 28,30 | 29,73 | 30,60 | 31,04 | 31,14 | 30,95 | 30,50 | 29,81 |
| 27232/-- | 3,2 | 22,00 | 29,07 | 33,37 | 36,16 | 37,98 | 39,10 | 39,66 | 39,79 | 39,54 | 38,96 | 38,09 |
| 27236/-- | 3,6 | 30,13 | 39,81 | 45,70 | 49,53 | 52,02 | 53,54 | 54,32 | 54,49 | 54,15 | 53,36 | 52,16 |
| 27340/-- | 4,0 | 34,84 | 46,04 | 52,85 | 57,28 | 60,16 | 61,92 | 62,82 | 63,02 | 62,62 | 61,71 | 60,32 |
| 27344/-- | 4,4 | 40,52 | 53,56 | 61,47 | 66,62 | 69,97 | 72,02 | 73,07 | 73,30 | 72,84 | 71,78 | 70,17 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,06 | 14,53 | 16,59 | 17,92 | 18,78 | 19,29 | 19,55 | 19,59 | 19,47 | 19,19 | 18,78 |
| 27120/-- | 2,0 | 14,75 | 19,36 | 22,12 | 23,89 | 25,03 | 25,72 | 26,05 | 26,12 | 25,95 | 25,58 | 25,03 |
| 27127/-- | 2,7 | 18,22 | 23,93 | 27,33 | 29,52 | 30,93 | 31,78 | 32,19 | 32,27 | 32,06 | 31,60 | 30,93 |
| 27232/-- | 3,2 | 23,28 | 30,57 | 34,92 | 37,72 | 39,52 | 40,60 | 41,13 | 41,23 | 40,96 | 40,38 | 39,51 |
| 27236/-- | 3,6 | 31,88 | 41,87 | 47,83 | 51,66 | 54,12 | 55,60 | 56,33 | 56,47 | 56,10 | 55,30 | 54,11 |
| 27340/-- | 4,0 | 36,87 | 48,42 | 55,31 | 59,74 | 62,59 | 64,30 | 65,15 | 65,30 | 64,88 | 63,95 | 62,58 |
| 27344/-- | 4,4 | 42,89 | 56,32 | 64,33 | 69,49 | 72,80 | 74,79 | 75,78 | 75,96 | 75,46 | 74,39 | 72,79 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,58 | 15,08 | 17,14 | 18,43 | 19,25 | 19,72 | 19,94 | 19,96 | 19,80 | 19,51 | 19,08 |
| 27120/-- | 2,0 | 15,44 | 20,11 | 22,84 | 24,57 | 25,66 | 26,29 | 26,58 | 26,60 | 26,40 | 26,00 | 25,43 |
| 27127/-- | 2,7 | 19,08 | 24,85 | 28,22 | 30,36 | 31,70 | 32,49 | 32,85 | 32,87 | 32,62 | 32,13 | 31,43 |
| 27232/-- | 3,2 | 24,37 | 31,74 | 36,06 | 38,79 | 40,50 | 41,50 | 41,97 | 42,00 | 41,68 | 41,05 | 40,15 |
| 27236/-- | 3,6 | 33,38 | 43,47 | 49,38 | 53,12 | 55,47 | 56,84 | 57,47 | 57,52 | 57,08 | 56,22 | 54,99 |
| 27340/-- | 4,0 | 38,60 | 50,28 | 57,11 | 61,43 | 64,15 | 65,74 | 66,47 | 66,52 | 66,01 | 65,01 | 63,59 |
| 27344/-- | 4,4 | 44,90 | 58,48 | 66,43 | 71,45 | 74,61 | 76,46 | 77,31 | 77,37 | 76,78 | 75,62 | 73,97 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,00 | 15,48 | 17,48 | 18,71 | 19,47 | 19,89 | 20,06 | 20,04 | 19,84 | 19,51 | 19,06 |
| 27120/-- | 2,0 | 16,00 | 20,64 | 23,30 | 24,94 | 25,95 | 26,52 | 26,74 | 26,71 | 26,45 | 26,01 | 25,41 |
| 27127/-- | 2,7 | 19,77 | 25,50 | 28,79 | 30,82 | 32,07 | 32,76 | 33,05 | 33,00 | 32,69 | 32,14 | 31,40 |
| 27232/-- | 3,2 | 25,26 | 32,58 | 36,78 | 39,38 | 40,97 | 41,86 | 42,22 | 42,16 | 41,76 | 41,06 | 40,11 |
| 27236/-- | 3,6 | 34,59 | 44,62 | 50,37 | 53,93 | 56,11 | 57,33 | 57,82 | 57,74 | 57,19 | 56,24 | 54,94 |
| 27340/-- | 4,0 | 40,00 | 51,61 | 58,25 | 62,37 | 64,89 | 66,30 | 66,87 | 66,78 | 66,14 | 65,04 | 63,53 |
| 27344/-- | 4,4 | 46,53 | 60,03 | 67,76 | 72,54 | 75,48 | 77,12 | 77,78 | 77,67 | 76,93 | 75,65 | 73,90 |

Table 37A: Refrigerant R448A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,32 | 15,72 | 17,63 | 18,78 | 19,47 | 19,82 | 19,94 | 19,86 | 19,62 | 19,26 | 18,77 |
| 27120/-- | 2,0 | 16,42 | 20,96 | 23,50 | 25,03 | 25,95 | 26,42 | 26,58 | 26,47 | 26,16 | 25,67 | 25,02 |
| 27127/-- | 2,7 | 20,28 | 25,89 | 29,03 | 30,93 | 32,06 | 32,65 | 32,84 | 32,71 | 32,32 | 31,71 | 30,91 |
| 27232/-- | 3,2 | 25,92 | 33,08 | 37,09 | 39,52 | 40,96 | 41,72 | 41,96 | 41,79 | 41,30 | 40,52 | 39,50 |
| 27236/-- | 3,6 | 35,49 | 45,31 | 50,80 | 54,12 | 56,10 | 57,13 | 57,46 | 57,24 | 56,56 | 55,49 | 54,09 |
| 27340/-- | 4,0 | 41,05 | 52,40 | 58,75 | 62,59 | 64,88 | 66,07 | 66,45 | 66,19 | 65,41 | 64,18 | 62,56 |
| 27344/-- | 4,4 | 47,74 | 60,94 | 68,33 | 72,81 | 75,46 | 76,85 | 77,29 | 76,99 | 76,08 | 74,65 | 72,76 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,51 | 15,79 | 17,59 | 18,65 | 19,26 | 19,55 | 19,60 | 19,47 | 19,18 | 18,77 | 18,25 |
| 27120/-- | 2,0 | 16,68 | 21,05 | 23,45 | 24,86 | 25,67 | 26,05 | 26,13 | 25,95 | 25,57 | 25,02 | 24,32 |
| 27127/-- | 2,7 | 20,61 | 26,02 | 28,98 | 30,72 | 31,72 | 32,19 | 32,28 | 32,06 | 31,60 | 30,92 | 30,06 |
| 27232/-- | 3,2 | 26,33 | 33,24 | 37,02 | 39,25 | 40,52 | 41,13 | 41,24 | 40,97 | 40,37 | 39,50 | 38,40 |
| 27236/-- | 3,6 | 36,06 | 45,52 | 50,70 | 53,76 | 55,50 | 56,33 | 56,49 | 56,10 | 55,29 | 54,10 | 52,59 |
| 27340/-- | 4,0 | 41,70 | 52,64 | 58,63 | 62,17 | 64,18 | 65,15 | 65,32 | 64,88 | 63,94 | 62,57 | 60,82 |
| 27344/-- | 4,4 | 48,50 | 61,23 | 68,20 | 72,31 | 74,66 | 75,78 | 75,98 | 75,47 | 74,37 | 72,77 | 70,74 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 37B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,07 | 1,14 | 1,20 | 1,27 | 1,33 | 1,40 | 1,48 | 1,54 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 37B

Table 38A: Refrigerant R449A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,37 | 13,69 | 15,70 | 16,99 | 17,82 | 18,32 | 18,56 | 18,60 | 18,45 | 18,15 | 17,71 |
| 27120/-- | 2,0 | 13,83 | 18,26 | 20,93 | 22,66 | 23,77 | 24,43 | 24,75 | 24,80 | 24,60 | 24,20 | 23,61 |
| 27127/-- | 2,7 | 17,09 | 22,56 | 25,85 | 27,99 | 29,36 | 30,18 | 30,58 | 30,63 | 30,39 | 29,89 | 29,16 |
| 27232/-- | 3,2 | 21,83 | 28,82 | 33,04 | 35,76 | 37,51 | 38,56 | 39,07 | 39,14 | 38,83 | 38,20 | 37,26 |
| 27236/-- | 3,6 | 29,90 | 39,47 | 45,24 | 48,97 | 51,38 | 52,81 | 53,51 | 53,60 | 53,18 | 52,31 | 51,03 |
| 27340/-- | 4,0 | 34,58 | 45,64 | 52,32 | 56,64 | 59,42 | 61,08 | 61,88 | 61,99 | 61,50 | 60,50 | 59,02 |
| 27344/-- | 4,4 | 40,22 | 53,09 | 60,85 | 65,87 | 69,10 | 71,04 | 71,97 | 72,09 | 71,53 | 70,36 | 68,64 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,98 | 14,40 | 16,43 | 17,72 | 18,54 | 19,02 | 19,25 | 19,27 | 19,11 | 18,81 | 18,37 |
| 27120/-- | 2,0 | 14,64 | 19,20 | 21,90 | 23,63 | 24,72 | 25,37 | 25,67 | 25,69 | 25,49 | 25,08 | 24,49 |
| 27127/-- | 2,7 | 18,09 | 23,72 | 27,06 | 29,19 | 30,54 | 31,34 | 31,71 | 31,74 | 31,48 | 30,98 | 30,26 |
| 27232/-- | 3,2 | 23,11 | 30,30 | 34,57 | 37,30 | 39,02 | 40,04 | 40,51 | 40,55 | 40,23 | 39,58 | 38,66 |
| 27236/-- | 3,6 | 31,65 | 41,50 | 47,35 | 51,08 | 53,44 | 54,83 | 55,48 | 55,53 | 55,09 | 54,21 | 52,95 |
| 27340/-- | 4,0 | 36,60 | 47,99 | 54,76 | 59,07 | 61,80 | 63,41 | 64,16 | 64,22 | 63,71 | 62,69 | 61,23 |
| 27344/-- | 4,4 | 42,57 | 55,82 | 63,68 | 68,70 | 71,88 | 73,75 | 74,63 | 74,70 | 74,10 | 72,92 | 71,22 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,49 | 14,95 | 16,96 | 18,22 | 19,00 | 19,44 | 19,63 | 19,62 | 19,44 | 19,11 | 18,66 |
| 27120/-- | 2,0 | 15,33 | 19,93 | 22,61 | 24,29 | 25,33 | 25,93 | 26,18 | 26,16 | 25,92 | 25,49 | 24,88 |
| 27127/-- | 2,7 | 18,93 | 24,62 | 27,93 | 30,01 | 31,29 | 32,03 | 32,34 | 32,32 | 32,02 | 31,48 | 30,74 |
| 27232/-- | 3,2 | 24,19 | 31,46 | 35,69 | 38,34 | 39,98 | 40,92 | 41,32 | 41,29 | 40,91 | 40,23 | 39,27 |
| 27236/-- | 3,6 | 33,13 | 43,09 | 48,88 | 52,51 | 54,76 | 56,04 | 56,59 | 56,55 | 56,03 | 55,09 | 53,78 |
| 27340/-- | 4,0 | 38,31 | 49,83 | 56,53 | 60,72 | 63,33 | 64,81 | 65,44 | 65,40 | 64,79 | 63,71 | 62,20 |
| 27344/-- | 4,4 | 44,56 | 57,96 | 65,74 | 70,62 | 73,65 | 75,38 | 76,11 | 76,06 | 75,36 | 74,10 | 72,34 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 11,91 | 15,34 | 17,29 | 18,49 | 19,21 | 19,60 | 19,74 | 19,68 | 19,47 | 19,11 | 18,63 |
| 27120/-- | 2,0 | 15,88 | 20,46 | 23,06 | 24,65 | 25,62 | 26,14 | 26,32 | 26,25 | 25,96 | 25,48 | 24,84 |
| 27127/-- | 2,7 | 19,62 | 25,27 | 28,48 | 30,45 | 31,64 | 32,29 | 32,52 | 32,43 | 32,06 | 31,48 | 30,69 |
| 27232/-- | 3,2 | 25,07 | 32,29 | 36,39 | 38,91 | 40,43 | 41,25 | 41,55 | 41,43 | 40,97 | 40,22 | 39,21 |
| 27236/-- | 3,6 | 34,33 | 44,22 | 49,84 | 53,29 | 55,37 | 56,49 | 56,90 | 56,74 | 56,11 | 55,08 | 53,70 |
| 27340/-- | 4,0 | 39,70 | 51,14 | 57,64 | 61,63 | 64,04 | 65,34 | 65,81 | 65,62 | 64,89 | 63,70 | 62,10 |
| 27344/-- | 4,4 | 46,17 | 59,48 | 67,04 | 71,68 | 74,48 | 75,99 | 76,54 | 76,32 | 75,47 | 74,09 | 72,23 |

Table 38A: Refrigerant R449A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,22 | 15,57 | 17,43 | 18,55 | 19,20 | 19,52 | 19,61 | 19,50 | 19,24 | 18,84 | 18,33 |
| 27120/-- | 2,0 | 16,29 | 20,76 | 23,25 | 24,73 | 25,60 | 26,03 | 26,14 | 26,00 | 25,65 | 25,12 | 24,44 |
| 27127/-- | 2,7 | 20,13 | 25,65 | 28,71 | 30,55 | 31,62 | 32,16 | 32,30 | 32,12 | 31,69 | 31,03 | 30,19 |
| 27232/-- | 3,2 | 25,72 | 32,77 | 36,69 | 39,04 | 40,40 | 41,09 | 41,27 | 41,04 | 40,49 | 39,65 | 38,58 |
| 27236/-- | 3,6 | 35,22 | 44,88 | 50,25 | 53,46 | 55,33 | 56,27 | 56,51 | 56,20 | 55,45 | 54,31 | 52,83 |
| 27340/-- | 4,0 | 40,73 | 51,90 | 58,11 | 61,82 | 63,99 | 65,08 | 65,36 | 65,00 | 64,12 | 62,80 | 61,10 |
| 27344/-- | 4,4 | 47,37 | 60,37 | 67,58 | 71,91 | 74,42 | 75,69 | 76,01 | 75,60 | 74,58 | 73,05 | 71,06 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 12,41 | 15,64 | 17,39 | 18,41 | 18,98 | 19,24 | 19,26 | 19,10 | 18,79 | 18,35 | 17,80 |
| 27120/-- | 2,0 | 16,55 | 20,85 | 23,19 | 24,55 | 25,31 | 25,65 | 25,68 | 25,47 | 25,05 | 24,47 | 23,74 |
| 27127/-- | 2,7 | 20,44 | 25,76 | 28,65 | 30,33 | 31,27 | 31,69 | 31,73 | 31,46 | 30,95 | 30,23 | 29,32 |
| 27232/-- | 3,2 | 26,12 | 32,91 | 36,60 | 38,75 | 39,95 | 40,49 | 40,54 | 40,20 | 39,54 | 38,62 | 37,47 |
| 27236/-- | 3,6 | 35,77 | 45,07 | 50,12 | 53,07 | 54,71 | 55,45 | 55,51 | 55,05 | 54,15 | 52,89 | 51,31 |
| 27340/-- | 4,0 | 41,37 | 52,13 | 57,97 | 61,37 | 63,27 | 64,13 | 64,20 | 63,67 | 62,63 | 61,17 | 59,34 |
| 27344/-- | 4,4 | 48,11 | 60,63 | 67,42 | 71,38 | 73,59 | 74,58 | 74,67 | 74,05 | 72,84 | 71,14 | 69,01 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 38B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,07 | 1,14 | 1,21 | 1,27 | 1,34 | 1,40 | 1,48 | 1,54 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 38B

Table 39A: Refrigerant R450A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,26 | 12,99 | 14,35 | 15,03 | 15,27 | 15,20 | 14,91 | 14,43 | 13,80 | 13,04 | 12,17 |
| 27120/-- | 2,0 | 13,68 | 17,31 | 19,13 | 20,03 | 20,35 | 20,26 | 19,87 | 19,23 | 18,40 | 17,39 | 16,22 |
| 27127/-- | 2,7 | 16,90 | 21,38 | 23,63 | 24,74 | 25,14 | 25,03 | 24,54 | 23,76 | 22,72 | 21,48 | 20,03 |
| 27232/-- | 3,2 | 21,60 | 27,32 | 30,20 | 31,62 | 32,13 | 31,99 | 31,37 | 30,36 | 29,04 | 27,45 | 25,61 |
| 27236/-- | 3,6 | 29,58 | 37,42 | 41,36 | 43,31 | 44,00 | 43,81 | 42,96 | 41,58 | 39,77 | 37,59 | 35,06 |
| 27340/-- | 4,0 | 34,20 | 43,27 | 47,83 | 50,08 | 50,87 | 50,65 | 49,67 | 48,08 | 45,99 | 43,46 | 40,55 |
| 27344/-- | 4,4 | 39,78 | 50,33 | 55,63 | 58,25 | 59,17 | 58,92 | 57,77 | 55,93 | 53,49 | 50,56 | 47,16 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,57 | 13,21 | 14,49 | 15,07 | 15,23 | 15,09 | 14,74 | 14,20 | 13,53 | 12,73 | 11,82 |
| 27120/-- | 2,0 | 14,08 | 17,61 | 19,31 | 20,09 | 20,30 | 20,12 | 19,64 | 18,93 | 18,03 | 16,97 | 15,76 |
| 27127/-- | 2,7 | 17,40 | 21,75 | 23,85 | 24,81 | 25,07 | 24,85 | 24,26 | 23,38 | 22,27 | 20,96 | 19,46 |
| 27232/-- | 3,2 | 22,24 | 27,80 | 30,48 | 31,71 | 32,05 | 31,76 | 31,01 | 29,89 | 28,47 | 26,79 | 24,88 |
| 27236/-- | 3,6 | 30,45 | 38,07 | 41,74 | 43,43 | 43,89 | 43,49 | 42,46 | 40,93 | 38,98 | 36,68 | 34,07 |
| 27340/-- | 4,0 | 35,21 | 44,02 | 48,27 | 50,22 | 50,75 | 50,29 | 49,10 | 47,33 | 45,08 | 42,42 | 39,40 |
| 27344/-- | 4,4 | 40,96 | 51,20 | 56,14 | 58,41 | 59,03 | 58,50 | 57,11 | 55,05 | 52,43 | 49,34 | 45,82 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,77 | 13,29 | 14,44 | 14,93 | 14,99 | 14,78 | 14,35 | 13,76 | 13,03 | 12,19 | 11,24 |
| 27120/-- | 2,0 | 14,35 | 17,71 | 19,25 | 19,89 | 19,98 | 19,70 | 19,13 | 18,34 | 17,37 | 16,24 | 14,98 |
| 27127/-- | 2,7 | 17,73 | 21,87 | 23,78 | 24,57 | 24,68 | 24,33 | 23,63 | 22,65 | 21,45 | 20,06 | 18,51 |
| 27232/-- | 3,2 | 22,66 | 27,96 | 30,39 | 31,41 | 31,55 | 31,10 | 30,20 | 28,95 | 27,42 | 25,65 | 23,66 |
| 27236/-- | 3,6 | 31,03 | 38,29 | 41,62 | 43,01 | 43,21 | 42,58 | 41,35 | 39,65 | 37,55 | 35,12 | 32,40 |
| 27340/-- | 4,0 | 35,88 | 44,27 | 48,12 | 49,73 | 49,96 | 49,24 | 47,82 | 45,84 | 43,42 | 40,61 | 37,46 |
| 27344/-- | 4,4 | 41,73 | 51,50 | 55,97 | 57,84 | 58,11 | 57,27 | 55,62 | 53,32 | 50,50 | 47,23 | 43,57 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,86 | 13,22 | 14,24 | 14,61 | 14,58 | 14,28 | 13,79 | 13,13 | 12,35 | 11,46 | 10,47 |
| 27120/-- | 2,0 | 14,47 | 17,61 | 18,98 | 19,47 | 19,44 | 19,04 | 18,37 | 17,50 | 16,46 | 15,27 | 13,95 |
| 27127/-- | 2,7 | 17,88 | 21,76 | 23,44 | 24,05 | 24,01 | 23,52 | 22,70 | 21,62 | 20,33 | 18,86 | 17,24 |
| 27232/-- | 3,2 | 22,85 | 27,81 | 29,96 | 30,74 | 30,68 | 30,06 | 29,01 | 27,63 | 25,98 | 24,11 | 22,03 |
| 27236/-- | 3,6 | 31,29 | 38,08 | 41,03 | 42,09 | 42,02 | 41,16 | 39,72 | 37,84 | 35,58 | 33,01 | 30,17 |
| 27340/-- | 4,0 | 36,18 | 44,04 | 47,44 | 48,68 | 48,59 | 47,60 | 45,93 | 43,75 | 41,14 | 38,17 | 34,89 |
| 27344/-- | 4,4 | 42,08 | 51,22 | 55,18 | 56,62 | 56,52 | 55,36 | 53,43 | 50,89 | 47,85 | 44,40 | 40,58 |

Table 39A: Refrigerant R450A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,84 | 13,01 | 13,89 | 14,15 | 14,02 | 13,64 | 13,07 | 12,35 | 11,51 | 10,57 | 9,54 |
| 27120/-- | 2,0 | 14,44 | 17,34 | 18,51 | 18,85 | 18,69 | 18,18 | 17,42 | 16,46 | 15,35 | 14,09 | 12,72 |
| 27127/-- | 2,7 | 17,84 | 21,42 | 22,86 | 23,29 | 23,09 | 22,46 | 21,52 | 20,34 | 18,95 | 17,41 | 15,71 |
| 27232/-- | 3,2 | 22,80 | 27,37 | 29,22 | 29,76 | 29,51 | 28,71 | 27,51 | 25,99 | 24,23 | 22,25 | 20,08 |
| 27236/-- | 3,6 | 31,22 | 37,48 | 40,02 | 40,76 | 40,41 | 39,31 | 37,67 | 35,60 | 33,18 | 30,47 | 27,50 |
| 27340/-- | 4,0 | 36,11 | 43,34 | 46,28 | 47,13 | 46,73 | 45,46 | 43,56 | 41,16 | 38,36 | 35,23 | 31,80 |
| 27344/-- | 4,4 | 42,00 | 50,42 | 53,83 | 54,82 | 54,35 | 52,88 | 50,66 | 47,87 | 44,62 | 40,98 | 36,99 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,71 | 12,68 | 13,42 | 13,56 | 13,35 | 12,89 | 12,24 | 11,46 | 10,57 | 9,58 | 8,50 |
| 27120/-- | 2,0 | 14,27 | 16,90 | 17,89 | 18,08 | 17,79 | 17,17 | 16,32 | 15,28 | 14,08 | 12,76 | 11,33 |
| 27127/-- | 2,7 | 17,62 | 20,88 | 22,10 | 22,33 | 21,97 | 21,21 | 20,16 | 18,87 | 17,39 | 15,76 | 14,00 |
| 27232/-- | 3,2 | 22,53 | 26,69 | 28,24 | 28,54 | 28,09 | 27,11 | 25,76 | 24,12 | 22,23 | 20,15 | 17,89 |
| 27236/-- | 3,6 | 30,85 | 36,55 | 38,67 | 39,09 | 38,46 | 37,13 | 35,28 | 33,03 | 30,45 | 27,59 | 24,50 |
| 27340/-- | 4,0 | 35,67 | 42,26 | 44,72 | 45,20 | 44,48 | 42,94 | 40,79 | 38,19 | 35,21 | 31,91 | 28,33 |
| 27344/-- | 4,4 | 41,49 | 49,15 | 52,02 | 52,57 | 51,73 | 49,94 | 47,45 | 44,42 | 40,95 | 37,11 | 32,95 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 39B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,36 | 1,40 | 1,45 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 39B

Table 40A: Refrigerant R452A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 8,52 | 11,14 | 12,63 | 13,51 | 13,99 | 14,18 | 14,14 | 13,92 | 13,53 | 13,00 | 12,32 |
| 27120/-- | 2,0 | 11,37 | 14,85 | 16,84 | 18,02 | 18,66 | 18,91 | 18,86 | 18,56 | 18,05 | 17,33 | 16,43 |
| 27127/-- | 2,7 | 14,04 | 18,35 | 20,80 | 22,26 | 23,05 | 23,36 | 23,30 | 22,93 | 22,30 | 21,41 | 20,30 |
| 27232/-- | 3,2 | 17,94 | 23,44 | 26,58 | 28,44 | 29,45 | 29,85 | 29,77 | 29,30 | 28,48 | 27,36 | 25,93 |
| 27236/-- | 3,6 | 24,58 | 32,11 | 36,40 | 38,95 | 40,34 | 40,88 | 40,78 | 40,13 | 39,01 | 37,47 | 35,52 |
| 27340/-- | 4,0 | 28,42 | 37,13 | 42,10 | 45,04 | 46,65 | 47,28 | 47,16 | 46,41 | 45,12 | 43,34 | 41,08 |
| 27344/-- | 4,4 | 33,06 | 43,19 | 48,97 | 52,39 | 54,26 | 55,00 | 54,85 | 53,98 | 52,48 | 50,41 | 47,78 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,08 | 11,78 | 13,29 | 14,16 | 14,63 | 14,81 | 14,76 | 14,52 | 14,14 | 13,61 | 12,96 |
| 27120/-- | 2,0 | 12,10 | 15,70 | 17,72 | 18,89 | 19,51 | 19,75 | 19,68 | 19,37 | 18,85 | 18,15 | 17,28 |
| 27127/-- | 2,7 | 14,95 | 19,40 | 21,89 | 23,34 | 24,11 | 24,40 | 24,31 | 23,93 | 23,29 | 22,42 | 21,34 |
| 27232/-- | 3,2 | 19,10 | 24,79 | 27,97 | 29,82 | 30,80 | 31,17 | 31,06 | 30,57 | 29,75 | 28,65 | 27,27 |
| 27236/-- | 3,6 | 26,16 | 33,95 | 38,31 | 40,84 | 42,19 | 42,69 | 42,55 | 41,87 | 40,75 | 39,23 | 37,35 |
| 27340/-- | 4,0 | 30,26 | 39,26 | 44,30 | 47,23 | 48,79 | 49,38 | 49,21 | 48,43 | 47,13 | 45,38 | 43,20 |
| 27344/-- | 4,4 | 35,19 | 45,67 | 51,53 | 54,93 | 56,75 | 57,43 | 57,23 | 56,33 | 54,82 | 52,78 | 50,24 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,54 | 12,27 | 13,76 | 14,60 | 15,03 | 15,16 | 15,08 | 14,81 | 14,40 | 13,86 | 13,20 |
| 27120/-- | 2,0 | 12,72 | 16,36 | 18,35 | 19,47 | 20,04 | 20,22 | 20,11 | 19,76 | 19,21 | 18,48 | 17,61 |
| 27127/-- | 2,7 | 15,71 | 20,21 | 22,66 | 24,05 | 24,75 | 24,98 | 24,84 | 24,41 | 23,73 | 22,84 | 21,75 |
| 27232/-- | 3,2 | 20,08 | 25,82 | 28,96 | 30,73 | 31,63 | 31,91 | 31,74 | 31,18 | 30,32 | 29,18 | 27,79 |
| 27236/-- | 3,6 | 27,50 | 35,37 | 39,66 | 42,08 | 43,32 | 43,71 | 43,47 | 42,71 | 41,52 | 39,96 | 38,06 |
| 27340/-- | 4,0 | 31,80 | 40,91 | 45,87 | 48,67 | 50,10 | 50,55 | 50,27 | 49,39 | 48,02 | 46,22 | 44,02 |
| 27344/-- | 4,4 | 36,99 | 47,58 | 53,35 | 56,61 | 58,27 | 58,80 | 58,47 | 57,45 | 55,86 | 53,76 | 51,20 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,91 | 12,61 | 14,04 | 14,82 | 15,19 | 15,27 | 15,13 | 14,83 | 14,38 | 13,81 | 13,13 |
| 27120/-- | 2,0 | 13,21 | 16,82 | 18,72 | 19,76 | 20,25 | 20,36 | 20,18 | 19,77 | 19,18 | 18,42 | 17,51 |
| 27127/-- | 2,7 | 16,33 | 20,78 | 23,13 | 24,41 | 25,02 | 25,15 | 24,93 | 24,43 | 23,69 | 22,75 | 21,63 |
| 27232/-- | 3,2 | 20,86 | 26,55 | 29,55 | 31,19 | 31,96 | 32,14 | 31,85 | 31,21 | 30,27 | 29,07 | 27,64 |
| 27236/-- | 3,6 | 28,57 | 36,36 | 40,48 | 42,72 | 43,78 | 44,01 | 43,63 | 42,75 | 41,46 | 39,82 | 37,86 |
| 27340/-- | 4,0 | 33,04 | 42,05 | 46,81 | 49,40 | 50,63 | 50,90 | 50,46 | 49,44 | 47,95 | 46,05 | 43,78 |
| 27344/-- | 4,4 | 38,43 | 48,91 | 54,45 | 57,46 | 58,89 | 59,21 | 58,69 | 57,51 | 55,77 | 53,56 | 50,92 |

Table 40A: Refrigerant R452A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,18 | 12,80 | 14,14 | 14,84 | 15,13 | 15,15 | 14,96 | 14,60 | 14,11 | 13,50 | 12,79 |
| 27120/-- | 2,0 | 13,58 | 17,07 | 18,86 | 19,78 | 20,18 | 20,20 | 19,94 | 19,47 | 18,82 | 18,01 | 17,06 |
| 27127/-- | 2,7 | 16,77 | 21,09 | 23,30 | 24,44 | 24,93 | 24,95 | 24,64 | 24,05 | 23,25 | 22,25 | 21,08 |
| 27232/-- | 3,2 | 21,43 | 26,95 | 29,76 | 31,23 | 31,85 | 31,88 | 31,48 | 30,73 | 29,70 | 28,42 | 26,93 |
| 27236/-- | 3,6 | 29,35 | 36,91 | 40,77 | 42,77 | 43,62 | 43,67 | 43,12 | 42,09 | 40,68 | 38,93 | 36,88 |
| 27340/-- | 4,0 | 33,94 | 42,69 | 47,15 | 49,46 | 50,45 | 50,50 | 49,87 | 48,68 | 47,05 | 45,02 | 42,66 |
| 27344/-- | 4,4 | 39,48 | 49,65 | 54,84 | 57,53 | 58,68 | 58,74 | 58,00 | 56,62 | 54,72 | 52,37 | 49,62 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,34 | 12,84 | 14,07 | 14,67 | 14,88 | 14,83 | 14,58 | 14,17 | 13,63 | 12,98 | 12,24 |
| 27120/-- | 2,0 | 13,79 | 17,12 | 18,76 | 19,56 | 19,85 | 19,78 | 19,44 | 18,89 | 18,18 | 17,31 | 16,32 |
| 27127/-- | 2,7 | 17,04 | 21,15 | 23,18 | 24,17 | 24,52 | 24,43 | 24,02 | 23,34 | 22,45 | 21,39 | 20,16 |
| 27232/-- | 3,2 | 21,77 | 27,03 | 29,61 | 30,88 | 31,33 | 31,21 | 30,68 | 29,82 | 28,69 | 27,33 | 25,76 |
| 27236/-- | 3,6 | 29,82 | 37,02 | 40,56 | 42,29 | 42,91 | 42,75 | 42,02 | 40,84 | 39,29 | 37,43 | 35,28 |
| 27340/-- | 4,0 | 34,48 | 42,81 | 46,91 | 48,91 | 49,62 | 49,44 | 48,60 | 47,24 | 45,44 | 43,28 | 40,80 |
| 27344/-- | 4,4 | 40,11 | 49,80 | 54,56 | 56,89 | 57,72 | 57,51 | 56,53 | 54,94 | 52,86 | 50,35 | 47,46 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 40B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,14 | 1,15 | 1,23 | 1,30 | 1,37 | 1,45 | 1,49 | 1,56 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 40B

Table 41A: Refrigerant R452B - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,61 | 18,27 | 21,30 | 23,44 | 24,99 | 26,13 | 26,93 | 27,47 | 27,79 | 27,91 | 27,86 |
| 27120/-- | 2,0 | 18,14 | 24,37 | 28,40 | 31,25 | 33,33 | 34,84 | 35,92 | 36,64 | 37,06 | 37,23 | 37,16 |
| 27127/-- | 2,7 | 22,41 | 30,10 | 35,08 | 38,60 | 41,16 | 43,03 | 44,36 | 45,25 | 45,77 | 45,98 | 45,89 |
| 27232/-- | 3,2 | 28,64 | 38,46 | 44,83 | 49,32 | 52,60 | 54,98 | 56,68 | 57,82 | 58,49 | 58,75 | 58,64 |
| 27236/-- | 3,6 | 39,22 | 52,67 | 61,39 | 67,55 | 72,04 | 75,31 | 77,63 | 79,19 | 80,10 | 80,46 | 80,31 |
| 27340/-- | 4,0 | 45,36 | 60,92 | 71,00 | 78,13 | 83,31 | 87,09 | 89,78 | 91,58 | 92,64 | 93,05 | 92,88 |
| 27344/-- | 4,4 | 52,76 | 70,86 | 82,59 | 90,88 | 96,91 | 101,30 | 104,43 | 106,53 | 107,76 | 108,24 | 108,04 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,52 | 19,40 | 22,54 | 24,73 | 26,33 | 27,49 | 28,31 | 28,87 | 29,21 | 29,35 | 29,33 |
| 27120/-- | 2,0 | 19,36 | 25,88 | 30,05 | 32,99 | 35,11 | 36,66 | 37,76 | 38,50 | 38,95 | 39,14 | 39,11 |
| 27127/-- | 2,7 | 23,91 | 31,96 | 37,12 | 40,74 | 43,36 | 45,27 | 46,63 | 47,55 | 48,11 | 48,35 | 48,31 |
| 27232/-- | 3,2 | 30,56 | 40,84 | 47,43 | 52,06 | 55,41 | 57,85 | 59,59 | 60,76 | 61,47 | 61,78 | 61,72 |
| 27236/-- | 3,6 | 41,85 | 55,93 | 64,96 | 71,30 | 75,89 | 79,23 | 81,61 | 83,22 | 84,19 | 84,61 | 84,54 |
| 27340/-- | 4,0 | 48,40 | 64,68 | 75,13 | 82,46 | 87,77 | 91,63 | 94,38 | 96,25 | 97,37 | 97,85 | 97,77 |
| 27344/-- | 4,4 | 56,29 | 75,24 | 87,39 | 95,91 | 102,09 | 106,58 | 109,79 | 111,95 | 113,25 | 113,82 | 113,72 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,31 | 20,34 | 23,52 | 25,73 | 27,32 | 28,47 | 29,29 | 29,84 | 30,17 | 30,31 | 30,29 |
| 27120/-- | 2,0 | 20,42 | 27,13 | 31,37 | 34,32 | 36,44 | 37,97 | 39,06 | 39,79 | 40,23 | 40,42 | 40,39 |
| 27127/-- | 2,7 | 25,22 | 33,50 | 38,74 | 42,38 | 45,00 | 46,90 | 48,24 | 49,15 | 49,69 | 49,92 | 49,88 |
| 27232/-- | 3,2 | 32,23 | 42,81 | 49,50 | 54,16 | 57,51 | 59,93 | 61,65 | 62,80 | 63,50 | 63,79 | 63,74 |
| 27236/-- | 3,6 | 44,14 | 58,63 | 67,80 | 74,17 | 78,76 | 82,08 | 84,43 | 86,01 | 86,96 | 87,37 | 87,30 |
| 27340/-- | 4,0 | 51,05 | 67,81 | 78,41 | 85,78 | 91,08 | 94,92 | 97,64 | 99,47 | 100,57 | 101,04 | 100,96 |
| 27344/-- | 4,4 | 59,38 | 78,87 | 91,20 | 99,78 | 105,95 | 110,41 | 113,58 | 115,71 | 116,98 | 117,53 | 117,44 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,99 | 21,08 | 24,25 | 26,44 | 27,99 | 29,11 | 29,90 | 30,42 | 30,72 | 30,84 | 30,80 |
| 27120/-- | 2,0 | 21,32 | 28,11 | 32,34 | 35,25 | 37,33 | 38,82 | 39,87 | 40,57 | 40,97 | 41,13 | 41,08 |
| 27127/-- | 2,7 | 26,34 | 34,72 | 39,94 | 43,54 | 46,11 | 47,95 | 49,24 | 50,10 | 50,60 | 50,80 | 50,74 |
| 27232/-- | 3,2 | 33,65 | 44,36 | 51,04 | 55,64 | 58,92 | 61,27 | 62,92 | 64,02 | 64,66 | 64,92 | 64,83 |
| 27236/-- | 3,6 | 46,09 | 60,76 | 69,90 | 76,20 | 80,69 | 83,91 | 86,18 | 87,68 | 88,56 | 88,91 | 88,79 |
| 27340/-- | 4,0 | 53,31 | 70,27 | 80,84 | 88,12 | 93,32 | 97,05 | 99,66 | 101,40 | 102,42 | 102,82 | 102,69 |
| 27344/-- | 4,4 | 62,00 | 81,73 | 94,03 | 102,50 | 108,55 | 112,88 | 115,93 | 117,95 | 119,13 | 119,60 | 119,45 |

Table 41A: Refrigerant R452B - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,54 | 21,61 | 24,73 | 26,86 | 28,36 | 29,43 | 30,17 | 30,65 | 30,92 | 31,01 | 30,94 |
| 27120/-- | 2,0 | 22,05 | 28,82 | 32,98 | 35,82 | 37,82 | 39,24 | 40,23 | 40,87 | 41,23 | 41,35 | 41,26 |
| 27127/-- | 2,7 | 27,24 | 35,60 | 40,73 | 44,24 | 46,71 | 48,47 | 49,69 | 50,48 | 50,92 | 51,07 | 50,96 |
| 27232/-- | 3,2 | 34,80 | 45,48 | 52,05 | 56,52 | 59,69 | 61,93 | 63,49 | 64,50 | 65,07 | 65,26 | 65,12 |
| 27236/-- | 3,6 | 47,67 | 62,29 | 71,29 | 77,41 | 81,75 | 84,82 | 86,96 | 88,34 | 89,12 | 89,38 | 89,19 |
| 27340/-- | 4,0 | 55,13 | 72,04 | 82,44 | 89,53 | 94,54 | 98,10 | 100,56 | 102,17 | 103,06 | 103,36 | 103,14 |
| 27344/-- | 4,4 | 64,12 | 83,80 | 95,89 | 104,14 | 109,97 | 114,11 | 116,97 | 118,84 | 119,88 | 120,23 | 119,97 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,94 | 21,94 | 24,97 | 27,01 | 28,45 | 29,45 | 30,14 | 30,57 | 30,80 | 30,85 | 30,75 |
| 27120/-- | 2,0 | 22,59 | 29,25 | 33,30 | 36,03 | 37,94 | 39,28 | 40,19 | 40,77 | 41,07 | 41,14 | 41,01 |
| 27127/-- | 2,7 | 27,90 | 36,13 | 41,12 | 44,50 | 46,86 | 48,51 | 49,64 | 50,35 | 50,73 | 50,81 | 50,65 |
| 27232/-- | 3,2 | 35,65 | 46,17 | 52,55 | 56,86 | 59,87 | 61,99 | 63,43 | 64,34 | 64,82 | 64,93 | 64,72 |
| 27236/-- | 3,6 | 48,83 | 63,23 | 71,97 | 77,87 | 82,00 | 84,90 | 86,88 | 88,12 | 88,78 | 88,93 | 88,64 |
| 27340/-- | 4,0 | 56,47 | 73,13 | 83,23 | 90,06 | 94,84 | 98,19 | 100,47 | 101,91 | 102,67 | 102,84 | 102,51 |
| 27344/-- | 4,4 | 65,69 | 85,06 | 96,81 | 104,75 | 110,31 | 114,21 | 116,87 | 118,54 | 119,42 | 119,62 | 119,24 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 41B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 41B

Table 42A: Refrigerant R454B - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,75 | 18,47 | 21,53 | 23,70 | 25,28 | 26,43 | 27,25 | 27,81 | 28,14 | 28,28 | 28,24 |
| 27120/-- | 2,0 | 18,33 | 24,63 | 28,71 | 31,59 | 33,70 | 35,24 | 36,33 | 37,08 | 37,52 | 37,70 | 37,65 |
| 27127/-- | 2,7 | 22,65 | 30,42 | 35,46 | 39,03 | 41,63 | 43,53 | 44,88 | 45,80 | 46,34 | 46,57 | 46,51 |
| 27232/-- | 3,2 | 28,94 | 38,88 | 45,32 | 49,88 | 53,20 | 55,63 | 57,36 | 58,53 | 59,23 | 59,51 | 59,43 |
| 27236/-- | 3,6 | 39,63 | 53,24 | 62,06 | 68,30 | 72,85 | 76,17 | 78,55 | 80,15 | 81,11 | 81,50 | 81,39 |
| 27340/-- | 4,0 | 45,84 | 61,57 | 71,77 | 78,99 | 84,25 | 88,09 | 90,84 | 92,69 | 93,80 | 94,25 | 94,13 |
| 27344/-- | 4,4 | 53,31 | 71,61 | 83,48 | 91,87 | 97,99 | 102,46 | 105,66 | 107,81 | 109,10 | 109,63 | 109,48 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,66 | 19,60 | 22,76 | 24,99 | 26,60 | 27,78 | 28,62 | 29,19 | 29,54 | 29,70 | 29,68 |
| 27120/-- | 2,0 | 19,55 | 26,13 | 30,35 | 33,31 | 35,46 | 37,03 | 38,16 | 38,92 | 39,39 | 39,59 | 39,58 |
| 27127/-- | 2,7 | 24,14 | 32,27 | 37,49 | 41,15 | 43,81 | 45,75 | 47,13 | 48,08 | 48,65 | 48,91 | 48,89 |
| 27232/-- | 3,2 | 30,86 | 41,24 | 47,91 | 52,59 | 55,99 | 58,46 | 60,24 | 61,44 | 62,18 | 62,51 | 62,48 |
| 27236/-- | 3,6 | 42,25 | 56,48 | 65,60 | 72,02 | 76,67 | 80,06 | 82,49 | 84,14 | 85,15 | 85,60 | 85,56 |
| 27340/-- | 4,0 | 48,87 | 65,32 | 75,87 | 83,29 | 88,67 | 92,59 | 95,40 | 97,31 | 98,47 | 98,99 | 98,95 |
| 27344/-- | 4,4 | 56,84 | 75,97 | 88,25 | 96,87 | 103,13 | 107,69 | 110,96 | 113,18 | 114,53 | 115,14 | 115,09 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,45 | 20,53 | 23,74 | 25,98 | 27,59 | 28,76 | 29,59 | 30,15 | 30,49 | 30,64 | 30,63 |
| 27120/-- | 2,0 | 20,60 | 27,37 | 31,65 | 34,63 | 36,78 | 38,34 | 39,44 | 40,20 | 40,65 | 40,85 | 40,83 |
| 27127/-- | 2,7 | 25,45 | 33,81 | 39,10 | 42,78 | 45,43 | 47,36 | 48,73 | 49,65 | 50,21 | 50,47 | 50,44 |
| 27232/-- | 3,2 | 32,53 | 43,20 | 49,96 | 54,67 | 58,06 | 60,52 | 62,27 | 63,45 | 64,17 | 64,49 | 64,46 |
| 27236/-- | 3,6 | 44,54 | 59,16 | 68,42 | 74,87 | 79,51 | 82,88 | 85,27 | 86,90 | 87,88 | 88,32 | 88,28 |
| 27340/-- | 4,0 | 51,51 | 68,42 | 79,13 | 86,58 | 91,95 | 95,85 | 98,62 | 100,49 | 101,63 | 102,14 | 102,09 |
| 27344/-- | 4,4 | 59,92 | 79,58 | 92,03 | 100,70 | 106,95 | 111,48 | 114,70 | 116,89 | 118,21 | 118,80 | 118,75 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,13 | 21,26 | 24,46 | 26,67 | 28,25 | 29,38 | 30,18 | 30,72 | 31,03 | 31,17 | 31,14 |
| 27120/-- | 2,0 | 21,50 | 28,35 | 32,62 | 35,56 | 37,66 | 39,17 | 40,24 | 40,95 | 41,37 | 41,55 | 41,51 |
| 27127/-- | 2,7 | 26,56 | 35,02 | 40,29 | 43,93 | 46,52 | 48,39 | 49,71 | 50,59 | 51,11 | 51,33 | 51,28 |
| 27232/-- | 3,2 | 33,95 | 44,75 | 51,49 | 56,14 | 59,46 | 61,84 | 63,53 | 64,65 | 65,32 | 65,59 | 65,53 |
| 27236/-- | 3,6 | 46,49 | 61,28 | 70,51 | 76,87 | 81,42 | 84,69 | 86,99 | 88,53 | 89,44 | 89,82 | 89,74 |
| 27340/-- | 4,0 | 53,76 | 70,87 | 81,54 | 88,90 | 94,16 | 97,94 | 100,61 | 102,39 | 103,44 | 103,88 | 103,78 |
| 27344/-- | 4,4 | 62,53 | 82,43 | 94,85 | 103,40 | 109,52 | 113,92 | 117,02 | 119,09 | 120,32 | 120,82 | 120,71 |

Table 42A: Refrigerant R454B - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,67 | 21,79 | 24,94 | 27,09 | 28,61 | 29,69 | 30,45 | 30,94 | 31,22 | 31,32 | 31,26 |
| 27120/-- | 2,0 | 22,23 | 29,05 | 33,25 | 36,11 | 38,14 | 39,59 | 40,59 | 41,25 | 41,62 | 41,75 | 41,68 |
| 27127/-- | 2,7 | 27,46 | 35,89 | 41,07 | 44,61 | 47,12 | 48,90 | 50,14 | 50,95 | 51,41 | 51,58 | 51,48 |
| 27232/-- | 3,2 | 35,09 | 45,86 | 52,49 | 57,01 | 60,21 | 62,49 | 64,08 | 65,12 | 65,71 | 65,92 | 65,80 |
| 27236/-- | 3,6 | 48,05 | 62,80 | 71,88 | 78,07 | 82,46 | 85,58 | 87,75 | 89,17 | 89,98 | 90,26 | 90,10 |
| 27340/-- | 4,0 | 55,57 | 72,63 | 83,13 | 90,29 | 95,36 | 98,97 | 101,48 | 103,12 | 104,06 | 104,39 | 104,20 |
| 27344/-- | 4,4 | 64,64 | 84,48 | 96,69 | 105,02 | 110,92 | 115,11 | 118,03 | 119,95 | 121,03 | 121,42 | 121,20 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 17,07 | 22,11 | 25,17 | 27,24 | 28,69 | 29,71 | 30,41 | 30,86 | 31,09 | 31,15 | 31,06 |
| 27120/-- | 2,0 | 22,76 | 29,48 | 33,56 | 36,32 | 38,25 | 39,61 | 40,54 | 41,14 | 41,45 | 41,54 | 41,42 |
| 27127/-- | 2,7 | 28,12 | 36,42 | 41,46 | 44,86 | 47,25 | 48,93 | 50,08 | 50,82 | 51,21 | 51,31 | 51,16 |
| 27232/-- | 3,2 | 35,94 | 46,54 | 52,98 | 57,33 | 60,39 | 62,54 | 64,01 | 64,94 | 65,44 | 65,57 | 65,38 |
| 27236/-- | 3,6 | 49,21 | 63,73 | 72,55 | 78,51 | 82,69 | 85,64 | 87,65 | 88,93 | 89,61 | 89,79 | 89,53 |
| 27340/-- | 4,0 | 56,91 | 73,70 | 83,90 | 90,80 | 95,64 | 99,04 | 101,37 | 102,85 | 103,64 | 103,84 | 103,54 |
| 27344/-- | 4,4 | 66,19 | 85,73 | 97,59 | 105,61 | 111,24 | 115,19 | 117,90 | 119,63 | 120,54 | 120,78 | 120,43 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 42B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,06 | 1,11 | 1,16 | 1,22 | 1,27 | 1,32 | 1,43 | 1,48 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 42B

Table 43A: Refrigerant R513A - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,52 | 12,08 | 13,37 | 13,98 | 14,18 | 14,08 | 13,75 | 13,25 | 12,58 | 11,79 | 10,87 |
| 27120/-- | 2,0 | 12,69 | 16,10 | 17,81 | 18,64 | 18,90 | 18,77 | 18,33 | 17,66 | 16,77 | 15,71 | 14,48 |
| 27127/-- | 2,7 | 15,68 | 19,89 | 22,01 | 23,02 | 23,35 | 23,18 | 22,65 | 21,81 | 20,72 | 19,41 | 17,89 |
| 27232/-- | 3,2 | 20,03 | 25,42 | 28,12 | 29,42 | 29,84 | 29,63 | 28,94 | 27,87 | 26,48 | 24,80 | 22,86 |
| 27236/-- | 3,6 | 27,43 | 34,81 | 38,51 | 40,30 | 40,86 | 40,57 | 39,63 | 38,17 | 36,26 | 33,97 | 31,31 |
| 27340/-- | 4,0 | 31,73 | 40,26 | 44,54 | 46,60 | 47,26 | 46,92 | 45,83 | 44,14 | 41,93 | 39,28 | 36,21 |
| 27344/-- | 4,4 | 36,90 | 46,83 | 51,81 | 54,20 | 54,97 | 54,58 | 53,31 | 51,34 | 48,78 | 45,69 | 42,12 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 9,89 | 12,41 | 13,62 | 14,17 | 14,30 | 14,14 | 13,76 | 13,20 | 12,50 | 11,68 | 10,74 |
| 27120/-- | 2,0 | 13,18 | 16,54 | 18,16 | 18,88 | 19,06 | 18,84 | 18,33 | 17,60 | 16,66 | 15,56 | 14,31 |
| 27127/-- | 2,7 | 16,28 | 20,43 | 22,43 | 23,33 | 23,54 | 23,27 | 22,65 | 21,73 | 20,58 | 19,22 | 17,68 |
| 27232/-- | 3,2 | 20,80 | 26,11 | 28,66 | 29,81 | 30,08 | 29,74 | 28,94 | 27,78 | 26,30 | 24,57 | 22,59 |
| 27236/-- | 3,6 | 28,49 | 35,76 | 39,25 | 40,82 | 41,20 | 40,73 | 39,64 | 38,04 | 36,02 | 33,64 | 30,94 |
| 27340/-- | 4,0 | 32,94 | 41,35 | 45,39 | 47,21 | 47,64 | 47,10 | 45,83 | 43,99 | 41,66 | 38,91 | 35,77 |
| 27344/-- | 4,4 | 38,32 | 48,10 | 52,80 | 54,92 | 55,42 | 54,79 | 53,32 | 51,17 | 48,46 | 45,26 | 41,61 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,15 | 12,59 | 13,70 | 14,16 | 14,20 | 13,97 | 13,53 | 12,92 | 12,17 | 11,31 | 10,34 |
| 27120/-- | 2,0 | 13,53 | 16,78 | 18,26 | 18,87 | 18,93 | 18,62 | 18,03 | 17,22 | 16,23 | 15,08 | 13,78 |
| 27127/-- | 2,7 | 16,72 | 20,72 | 22,56 | 23,31 | 23,38 | 23,00 | 22,27 | 21,27 | 20,04 | 18,62 | 17,03 |
| 27232/-- | 3,2 | 21,37 | 26,48 | 28,83 | 29,78 | 29,88 | 29,39 | 28,46 | 27,18 | 25,62 | 23,80 | 21,76 |
| 27236/-- | 3,6 | 29,26 | 36,27 | 39,48 | 40,79 | 40,93 | 40,25 | 38,98 | 37,23 | 35,08 | 32,59 | 29,80 |
| 27340/-- | 4,0 | 33,84 | 41,94 | 45,65 | 47,17 | 47,33 | 46,55 | 45,08 | 43,05 | 40,57 | 37,69 | 34,46 |
| 27344/-- | 4,4 | 39,36 | 48,79 | 53,10 | 54,87 | 55,05 | 54,15 | 52,43 | 50,08 | 47,19 | 43,84 | 40,09 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,32 | 12,62 | 13,61 | 13,96 | 13,92 | 13,61 | 13,10 | 12,44 | 11,64 | 10,74 | 9,73 |
| 27120/-- | 2,0 | 13,75 | 16,82 | 18,14 | 18,61 | 18,56 | 18,14 | 17,46 | 16,58 | 15,52 | 14,31 | 12,97 |
| 27127/-- | 2,7 | 16,99 | 20,77 | 22,41 | 22,99 | 22,92 | 22,41 | 21,57 | 20,48 | 19,17 | 17,67 | 16,02 |
| 27232/-- | 3,2 | 21,71 | 26,55 | 28,64 | 29,38 | 29,29 | 28,64 | 27,57 | 26,17 | 24,49 | 22,59 | 20,47 |
| 27236/-- | 3,6 | 29,73 | 36,36 | 39,22 | 40,23 | 40,12 | 39,22 | 37,75 | 35,83 | 33,54 | 30,93 | 28,04 |
| 27340/-- | 4,0 | 34,38 | 42,04 | 45,35 | 46,52 | 46,39 | 45,36 | 43,66 | 41,44 | 38,79 | 35,77 | 32,42 |
| 27344/-- | 4,4 | 39,99 | 48,91 | 52,76 | 54,12 | 53,96 | 52,76 | 50,79 | 48,20 | 45,12 | 41,61 | 37,72 |

Table 43A: Refrigerant R513A - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,37 | 12,51 | 13,37 | 13,61 | 13,48 | 13,09 | 12,51 | 11,79 | 10,94 | 9,99 | 8,95 |
| 27120/-- | 2,0 | 13,82 | 16,67 | 17,82 | 18,14 | 17,97 | 17,45 | 16,68 | 15,71 | 14,58 | 13,31 | 11,92 |
| 27127/-- | 2,7 | 17,07 | 20,59 | 22,01 | 22,41 | 22,19 | 21,55 | 20,60 | 19,41 | 18,01 | 16,44 | 14,73 |
| 27232/-- | 3,2 | 21,82 | 26,31 | 28,13 | 28,64 | 28,36 | 27,54 | 26,33 | 24,80 | 23,02 | 21,01 | 18,82 |
| 27236/-- | 3,6 | 29,88 | 36,04 | 38,52 | 39,22 | 38,84 | 37,72 | 36,05 | 33,96 | 31,52 | 28,78 | 25,77 |
| 27340/-- | 4,0 | 34,55 | 41,67 | 44,55 | 45,36 | 44,92 | 43,62 | 41,69 | 39,27 | 36,45 | 33,28 | 29,81 |
| 27344/-- | 4,4 | 40,19 | 48,48 | 51,82 | 52,76 | 52,25 | 50,74 | 48,50 | 45,68 | 42,40 | 38,71 | 34,67 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 10,31 | 12,27 | 13,00 | 13,13 | 12,91 | 12,44 | 11,79 | 11,00 | 10,10 | 9,11 | 8,03 |
| 27120/-- | 2,0 | 13,74 | 16,35 | 17,32 | 17,50 | 17,20 | 16,58 | 15,72 | 14,67 | 13,47 | 12,14 | 10,70 |
| 27127/-- | 2,7 | 16,98 | 20,20 | 21,39 | 21,62 | 21,25 | 20,48 | 19,41 | 18,12 | 16,64 | 14,99 | 13,21 |
| 27232/-- | 3,2 | 21,70 | 25,81 | 27,34 | 27,62 | 27,15 | 26,17 | 24,81 | 23,15 | 21,26 | 19,16 | 16,89 |
| 27236/-- | 3,6 | 29,71 | 35,35 | 37,44 | 37,83 | 37,19 | 35,84 | 33,98 | 31,71 | 29,11 | 26,24 | 23,12 |
| 27340/-- | 4,0 | 34,36 | 40,88 | 43,30 | 43,75 | 43,00 | 41,44 | 39,29 | 36,67 | 33,67 | 30,35 | 26,74 |
| 27344/-- | 4,4 | 39,97 | 47,55 | 50,37 | 50,89 | 50,02 | 48,21 | 45,70 | 42,65 | 39,16 | 35,30 | 31,11 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 43B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,07 | 1,13 | 1,20 | 1,27 | 1,33 | 1,40 | 1,48 | 1,54 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 43B

Table 44A: Refrigerant R290 - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 13,81 | 17,96 | 20,31 | 21,70 | 22,45 | 22,76 | 22,73 | 22,42 | 21,88 | 21,13 | 20,20 |
| 27120/-- | 2,0 | 18,41 | 23,95 | 27,08 | 28,93 | 29,94 | 30,35 | 30,31 | 29,89 | 29,17 | 28,17 | 26,94 |
| 27127/-- | 2,7 | 22,74 | 29,58 | 33,45 | 35,73 | 36,98 | 37,49 | 37,43 | 36,92 | 36,02 | 34,80 | 33,27 |
| 27232/-- | 3,2 | 29,06 | 37,80 | 42,74 | 45,66 | 47,25 | 47,90 | 47,83 | 47,18 | 46,03 | 44,46 | 42,51 |
| 27236/-- | 3,6 | 39,80 | 51,77 | 58,54 | 62,53 | 64,72 | 65,61 | 65,51 | 64,61 | 63,05 | 60,90 | 58,22 |
| 27340/-- | 4,0 | 46,03 | 59,87 | 67,70 | 72,31 | 74,84 | 75,87 | 75,76 | 74,72 | 72,91 | 70,42 | 67,33 |
| 27344/-- | 4,4 | 53,53 | 69,63 | 78,74 | 84,10 | 87,04 | 88,24 | 88,11 | 86,90 | 84,80 | 81,91 | 78,31 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,39 | 18,59 | 20,90 | 22,24 | 22,94 | 23,20 | 23,12 | 22,76 | 22,18 | 21,41 | 20,46 |
| 27120/-- | 2,0 | 19,19 | 24,78 | 27,87 | 29,65 | 30,59 | 30,94 | 30,83 | 30,35 | 29,58 | 28,55 | 27,28 |
| 27127/-- | 2,7 | 23,71 | 30,61 | 34,43 | 36,62 | 37,78 | 38,21 | 38,07 | 37,49 | 36,53 | 35,26 | 33,70 |
| 27232/-- | 3,2 | 30,29 | 39,11 | 43,99 | 46,80 | 48,28 | 48,82 | 48,65 | 47,90 | 46,68 | 45,05 | 43,06 |
| 27236/-- | 3,6 | 41,49 | 53,57 | 60,25 | 64,10 | 66,13 | 66,87 | 66,63 | 65,61 | 63,94 | 61,71 | 58,97 |
| 27340/-- | 4,0 | 47,98 | 61,95 | 69,67 | 74,12 | 76,47 | 77,33 | 77,05 | 75,87 | 73,94 | 71,36 | 68,20 |
| 27344/-- | 4,4 | 55,80 | 72,05 | 81,03 | 86,21 | 88,94 | 89,94 | 89,62 | 88,24 | 85,99 | 82,99 | 79,32 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,87 | 19,03 | 21,28 | 22,53 | 23,16 | 23,35 | 23,20 | 22,79 | 22,16 | 21,34 | 20,36 |
| 27120/-- | 2,0 | 19,83 | 25,38 | 28,37 | 30,04 | 30,88 | 31,13 | 30,93 | 30,38 | 29,54 | 28,45 | 27,14 |
| 27127/-- | 2,7 | 24,49 | 31,35 | 35,04 | 37,11 | 38,14 | 38,45 | 38,20 | 37,52 | 36,48 | 35,14 | 33,52 |
| 27232/-- | 3,2 | 31,30 | 40,05 | 44,78 | 47,42 | 48,74 | 49,13 | 48,82 | 47,95 | 46,62 | 44,90 | 42,84 |
| 27236/-- | 3,6 | 42,86 | 54,86 | 61,33 | 64,94 | 66,75 | 67,29 | 66,86 | 65,67 | 63,85 | 61,50 | 58,67 |
| 27340/-- | 4,0 | 49,57 | 63,44 | 70,92 | 75,10 | 77,19 | 77,81 | 77,32 | 75,94 | 73,84 | 71,12 | 67,84 |
| 27344/-- | 4,4 | 57,65 | 73,78 | 82,48 | 87,34 | 89,78 | 90,50 | 89,92 | 88,32 | 85,88 | 82,71 | 78,91 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,23 | 19,30 | 21,44 | 22,59 | 23,12 | 23,22 | 23,00 | 22,52 | 21,83 | 20,96 | 19,93 |
| 27120/-- | 2,0 | 20,31 | 25,74 | 28,58 | 30,12 | 30,83 | 30,96 | 30,66 | 30,02 | 29,10 | 27,94 | 26,58 |
| 27127/-- | 2,7 | 25,09 | 31,79 | 35,30 | 37,20 | 38,07 | 38,24 | 37,87 | 37,08 | 35,95 | 34,51 | 32,82 |
| 27232/-- | 3,2 | 32,06 | 40,62 | 45,11 | 47,53 | 48,65 | 48,86 | 48,39 | 47,38 | 45,93 | 44,10 | 41,95 |
| 27236/-- | 3,6 | 43,91 | 55,64 | 61,79 | 65,10 | 66,64 | 66,93 | 66,28 | 64,90 | 62,91 | 60,40 | 57,45 |
| 27340/-- | 4,0 | 50,77 | 64,34 | 71,45 | 75,28 | 77,06 | 77,39 | 76,65 | 75,05 | 72,75 | 69,85 | 66,43 |
| 27344/-- | 4,4 | 59,05 | 74,83 | 83,10 | 87,56 | 89,62 | 90,01 | 89,15 | 87,29 | 84,61 | 81,24 | 77,27 |

Table 44A: Refrigerant R290 - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,47 | 19,40 | 21,39 | 22,42 | 22,85 | 22,85 | 22,55 | 22,00 | 21,24 | 20,32 | 19,24 |
| 27120/-- | 2,0 | 20,63 | 25,86 | 28,52 | 29,89 | 30,46 | 30,47 | 30,07 | 29,33 | 28,32 | 27,09 | 25,65 |
| 27127/-- | 2,7 | 25,48 | 31,94 | 35,23 | 36,92 | 37,62 | 37,64 | 37,13 | 36,22 | 34,98 | 33,46 | 31,68 |
| 27232/-- | 3,2 | 32,56 | 40,82 | 45,01 | 47,18 | 48,08 | 48,09 | 47,45 | 46,29 | 44,70 | 42,75 | 40,49 |
| 27236/-- | 3,6 | 44,59 | 55,90 | 61,65 | 64,62 | 65,85 | 65,87 | 64,99 | 63,40 | 61,22 | 58,55 | 55,45 |
| 27340/-- | 4,0 | 51,57 | 64,64 | 71,29 | 74,72 | 76,15 | 76,17 | 75,15 | 73,31 | 70,79 | 67,71 | 64,12 |
| 27344/-- | 4,4 | 59,97 | 75,18 | 82,92 | 86,91 | 88,56 | 88,59 | 87,41 | 85,26 | 82,34 | 78,75 | 74,58 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,58 | 19,31 | 21,15 | 22,05 | 22,37 | 22,28 | 21,89 | 21,26 | 20,44 | 19,45 | 18,32 |
| 27120/-- | 2,0 | 20,77 | 25,75 | 28,20 | 29,40 | 29,82 | 29,71 | 29,18 | 28,35 | 27,25 | 25,94 | 24,43 |
| 27127/-- | 2,7 | 25,65 | 31,81 | 34,84 | 36,32 | 36,84 | 36,69 | 36,04 | 35,01 | 33,66 | 32,03 | 30,17 |
| 27232/-- | 3,2 | 32,78 | 40,64 | 44,51 | 46,40 | 47,07 | 46,88 | 46,06 | 44,74 | 43,01 | 40,93 | 38,56 |
| 27236/-- | 3,6 | 44,90 | 55,67 | 60,97 | 63,56 | 64,47 | 64,21 | 63,08 | 61,27 | 58,90 | 56,06 | 52,81 |
| 27340/-- | 4,0 | 51,92 | 64,37 | 70,50 | 73,50 | 74,55 | 74,25 | 72,95 | 70,86 | 68,12 | 64,83 | 61,07 |
| 27344/-- | 4,4 | 60,39 | 74,87 | 82,00 | 85,48 | 86,70 | 86,36 | 84,84 | 82,41 | 79,22 | 75,40 | 71,03 |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

| TABLE 44B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,35 | 1,40 | 1,45 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 44B

Table 45A: Refrigerant R600 - Capacities in kW (1)

| Evaporating Temperature 12 °C | | | | | | | | | | | | |
|-------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,55 | 13,54 | 16,20 | 17,06 | 17,03 | 16,47 | 15,54 | 14,34 | 12,93 | | |
| 27120/-- | 2,0 | 14,06 | 18,05 | 21,60 | 22,74 | 22,71 | 21,96 | 20,72 | 19,12 | 17,24 | | |
| 27127/-- | 2,7 | 17,38 | 22,31 | 26,69 | 28,10 | 28,06 | 27,14 | 25,60 | 23,62 | 21,30 | | |
| 27232/-- | 3,2 | 22,20 | 28,50 | 34,09 | 35,90 | 35,85 | 34,67 | 32,70 | 30,18 | 27,22 | | |
| 27236/-- | 3,6 | 30,41 | 39,03 | 46,70 | 49,18 | 49,11 | 47,48 | 44,80 | 41,34 | 37,28 | | |
| 27340/-- | 4,0 | 35,17 | 45,14 | 54,01 | 56,88 | 56,79 | 54,91 | 51,81 | 47,80 | 43,11 | | |
| 27344/-- | 4,4 | 40,90 | 52,50 | 62,81 | 66,15 | 66,05 | 63,87 | 60,25 | 55,60 | 50,14 | | |
| Evaporating Temperature 4 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,65 | 13,54 | 16,02 | 16,73 | 16,57 | 15,90 | 14,88 | 13,59 | 12,11 | | |
| 27120/-- | 2,0 | 14,20 | 18,06 | 21,36 | 22,30 | 22,10 | 21,20 | 19,84 | 18,13 | 16,15 | | |
| 27127/-- | 2,7 | 17,55 | 22,31 | 26,39 | 27,56 | 27,31 | 26,20 | 24,51 | 22,40 | 19,96 | | |
| 27232/-- | 3,2 | 22,42 | 28,50 | 33,71 | 35,20 | 34,89 | 33,47 | 31,31 | 28,61 | 25,50 | | |
| 27236/-- | 3,6 | 30,71 | 39,04 | 46,18 | 48,22 | 47,79 | 45,85 | 42,89 | 39,19 | 34,92 | | |
| 27340/-- | 4,0 | 35,51 | 45,15 | 53,40 | 55,76 | 55,26 | 53,02 | 49,60 | 45,32 | 40,39 | | |
| 27344/-- | 4,4 | 41,30 | 52,51 | 62,11 | 64,86 | 64,27 | 61,67 | 57,69 | 52,71 | 46,97 | | |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,68 | 13,52 | 15,89 | 16,52 | 16,31 | 15,58 | 14,51 | 13,19 | 11,67 | | |
| 27120/-- | 2,0 | 14,24 | 18,02 | 21,19 | 22,03 | 21,75 | 20,78 | 19,35 | 17,58 | 15,56 | | |
| 27127/-- | 2,7 | 17,60 | 22,27 | 26,18 | 27,22 | 26,87 | 25,68 | 23,91 | 21,73 | 19,23 | | |
| 27232/-- | 3,2 | 22,48 | 28,45 | 33,45 | 34,78 | 34,33 | 32,80 | 30,54 | 27,76 | 24,56 | | |
| 27236/-- | 3,6 | 30,80 | 38,97 | 45,82 | 47,64 | 47,02 | 44,93 | 41,84 | 38,02 | 33,65 | | |
| 27340/-- | 4,0 | 35,62 | 45,07 | 52,99 | 55,09 | 54,38 | 51,96 | 48,38 | 43,97 | 38,91 | | |
| 27344/-- | 4,4 | 41,42 | 52,42 | 61,63 | 64,08 | 63,25 | 60,43 | 56,27 | 51,14 | 45,25 | | |
| Evaporating Temperature -8 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,71 | 13,41 | 15,58 | 16,06 | 15,72 | 14,89 | 13,72 | 12,31 | 10,72 | | |
| 27120/-- | 2,0 | 14,28 | 17,89 | 20,78 | 21,41 | 20,96 | 19,85 | 18,29 | 16,42 | 14,30 | | |
| 27127/-- | 2,7 | 17,64 | 22,10 | 25,68 | 26,46 | 25,90 | 24,52 | 22,60 | 20,29 | 17,67 | | |
| 27232/-- | 3,2 | 22,54 | 28,23 | 32,80 | 33,80 | 33,08 | 31,33 | 28,88 | 25,92 | 22,57 | | |
| 27236/-- | 3,6 | 30,87 | 38,67 | 44,93 | 46,30 | 45,32 | 42,92 | 39,56 | 35,50 | 30,92 | | |
| 27340/-- | 4,0 | 35,70 | 44,72 | 51,96 | 53,54 | 52,41 | 49,63 | 45,74 | 41,06 | 35,76 | | |
| 27344/-- | 4,4 | 41,52 | 52,01 | 60,43 | 62,27 | 60,95 | 57,72 | 53,20 | 47,75 | 41,59 | | |

Table 45A: Refrigerant R600 - Capacities in kW (1)

| Evaporating Temperature -20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,64 | 13,13 | 14,98 | 15,23 | 14,70 | 13,71 | 12,40 | 10,88 | 9,18 | | |
| 27120/-- | 2,0 | 14,19 | 17,51 | 19,98 | 20,30 | 19,60 | 18,28 | 16,54 | 14,50 | 12,24 | | |
| 27127/-- | 2,7 | 17,53 | 21,63 | 24,69 | 25,09 | 24,22 | 22,58 | 20,44 | 17,92 | 15,13 | | |
| 27232/-- | 3,2 | 22,40 | 27,64 | 31,54 | 32,05 | 30,94 | 28,85 | 26,11 | 22,90 | 19,33 | | |
| 27236/-- | 3,6 | 30,68 | 37,86 | 43,20 | 43,90 | 42,38 | 39,52 | 35,76 | 31,36 | 26,47 | | |
| 27340/-- | 4,0 | 35,48 | 43,78 | 49,96 | 50,77 | 49,00 | 45,70 | 41,36 | 36,27 | 30,61 | | |
| 27344/-- | 4,4 | 41,27 | 50,92 | 58,11 | 59,04 | 56,99 | 53,15 | 48,10 | 42,18 | 35,61 | | |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 45B - Correction factors for subcooling $\Delta t_{sub} \neq 4 \text{ °K}$

| $\Delta t_{sub} \text{ [°K]}$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|-------------------------------|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,06 | 1,09 | 1,14 | 1,19 | 1,23 | 1,28 | 1,38 | 1,43 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporator capacity by dividing by the appropriate correction factor found in Table 45B

Table 46A: Refrigerant R600a - Capacities in kW (1)

| Evaporating Temperature 12 °C | | | | | | | | | | | | |
|-------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 9,69 | 12,59 | 15,31 | 16,30 | 16,43 | 16,02 | 15,25 | 14,19 | 12,93 | | |
| 27120/-- | 2,0 | 12,91 | 16,78 | 20,40 | 21,72 | 21,89 | 21,35 | 20,32 | 18,92 | 17,23 | | |
| 27127/-- | 2,7 | 15,95 | 20,73 | 25,21 | 26,84 | 27,05 | 26,38 | 25,10 | 23,37 | 21,29 | | |
| 27232/-- | 3,2 | 20,38 | 26,49 | 32,21 | 34,30 | 34,57 | 33,71 | 32,08 | 29,87 | 27,21 | | |
| 27236/-- | 3,6 | 27,92 | 36,29 | 44,12 | 46,99 | 47,36 | 46,18 | 43,94 | 40,92 | 37,27 | | |
| 27340/-- | 4,0 | 32,28 | 41,96 | 51,01 | 54,32 | 54,75 | 53,39 | 50,81 | 47,31 | 43,09 | | |
| 27344/-- | 4,4 | 37,55 | 48,80 | 59,33 | 63,18 | 63,68 | 62,10 | 59,09 | 55,02 | 50,12 | | |
| Evaporating Temperature 4 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 9,86 | 12,71 | 15,29 | 16,15 | 16,17 | 15,66 | 14,80 | 13,68 | 12,35 | | |
| 27120/-- | 2,0 | 13,14 | 16,94 | 20,37 | 21,52 | 21,55 | 20,87 | 19,73 | 18,23 | 16,45 | | |
| 27127/-- | 2,7 | 16,24 | 20,93 | 25,17 | 26,60 | 26,62 | 25,80 | 24,38 | 22,52 | 20,33 | | |
| 27232/-- | 3,2 | 20,75 | 26,74 | 32,16 | 33,98 | 34,02 | 32,96 | 31,15 | 28,78 | 25,98 | | |
| 27236/-- | 3,6 | 28,42 | 36,63 | 44,06 | 46,55 | 46,60 | 45,15 | 42,67 | 39,43 | 35,59 | | |
| 27340/-- | 4,0 | 32,86 | 42,35 | 50,94 | 53,82 | 53,88 | 52,20 | 49,33 | 45,58 | 41,15 | | |
| 27344/-- | 4,4 | 38,21 | 49,26 | 59,24 | 62,60 | 62,67 | 60,71 | 57,38 | 53,01 | 47,86 | | |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 9,93 | 12,74 | 15,24 | 16,04 | 16,00 | 15,45 | 14,54 | 13,38 | 12,01 | | |
| 27120/-- | 2,0 | 13,23 | 16,98 | 20,31 | 21,37 | 21,32 | 20,58 | 19,38 | 17,83 | 16,01 | | |
| 27127/-- | 2,7 | 16,35 | 20,98 | 25,10 | 26,41 | 26,34 | 25,43 | 23,94 | 22,03 | 19,78 | | |
| 27232/-- | 3,2 | 20,89 | 26,81 | 32,07 | 33,75 | 33,66 | 32,50 | 30,60 | 28,15 | 25,28 | | |
| 27236/-- | 3,6 | 28,62 | 36,73 | 43,93 | 46,23 | 46,11 | 44,52 | 41,91 | 38,56 | 34,63 | | |
| 27340/-- | 4,0 | 33,09 | 42,47 | 50,79 | 53,45 | 53,31 | 51,47 | 48,46 | 44,58 | 40,04 | | |
| 27344/-- | 4,4 | 38,49 | 49,39 | 59,07 | 62,16 | 62,01 | 59,86 | 56,36 | 51,85 | 46,56 | | |
| Evaporating Temperature -8 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,04 | 12,76 | 15,08 | 15,74 | 15,58 | 14,93 | 13,94 | 12,70 | 11,27 | | |
| 27120/-- | 2,0 | 13,37 | 17,00 | 20,10 | 20,98 | 20,77 | 19,90 | 18,58 | 16,93 | 15,02 | | |
| 27127/-- | 2,7 | 16,53 | 21,01 | 24,84 | 25,92 | 25,66 | 24,59 | 22,95 | 20,91 | 18,56 | | |
| 27232/-- | 3,2 | 21,12 | 26,85 | 31,74 | 33,12 | 32,79 | 31,42 | 29,33 | 26,73 | 23,72 | | |
| 27236/-- | 3,6 | 28,93 | 36,78 | 43,48 | 45,37 | 44,92 | 43,04 | 40,18 | 36,61 | 32,49 | | |
| 27340/-- | 4,0 | 33,45 | 42,52 | 50,27 | 52,46 | 51,93 | 49,76 | 46,46 | 42,33 | 37,56 | | |
| 27344/-- | 4,4 | 38,90 | 49,45 | 58,46 | 61,01 | 60,40 | 57,87 | 54,03 | 49,23 | 43,68 | | |

Table 46A: Refrigerant R600a - Capacities in kW (1)

| Evaporating Temperature -20 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 27115/-- | 1,5 | 10,10 | 12,65 | 14,69 | 15,13 | 14,80 | 14,00 | 12,88 | 11,53 | 10,00 | | |
| 27120/-- | 2,0 | 13,46 | 16,86 | 19,58 | 20,16 | 19,72 | 18,65 | 17,16 | 15,36 | 13,32 | | |
| 27127/-- | 2,7 | 16,63 | 20,83 | 24,19 | 24,92 | 24,37 | 23,05 | 21,20 | 18,98 | 16,46 | | |
| 27232/-- | 3,2 | 21,25 | 26,62 | 30,91 | 31,84 | 31,14 | 29,45 | 27,10 | 24,25 | 21,03 | | |
| 27236/-- | 3,6 | 29,11 | 36,46 | 42,35 | 43,62 | 42,66 | 40,35 | 37,12 | 33,22 | 28,81 | | |
| 27340/-- | 4,0 | 33,66 | 42,15 | 48,96 | 50,43 | 49,32 | 46,65 | 42,91 | 38,41 | 33,31 | | |
| 27344/-- | 4,4 | 39,15 | 49,03 | 56,94 | 58,65 | 57,35 | 54,25 | 49,91 | 44,67 | 38,74 | | |

(1): Capacity with fully open valve and liquid flow from radial to axial connection

TABLE 46B - Correction factors for subcooling $\Delta t_{sub} \neq 4 \text{ }^\circ\text{K}$

| $\Delta t_{sub} \text{ [}^\circ\text{K]}$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|------|------|------|------|------|------|------|------|------|
| F_{sub} | 1,00 | 1,06 | 1,11 | 1,16 | 1,21 | 1,26 | 1,31 | 1,40 | 1,45 |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporator capacity by dividing by the appropriate correction factor found in Table 46B

Table 47A: Refrigerant R1270 - Capacities in kW (1)

| Evaporating Temperature 10 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|--------|--------|--------|--------|--------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,29 | 18,84 | 21,56 | 23,30 | 24,41 | 25,05 | 25,34 | 25,34 | 25,10 | 24,65 | 24,00 |
| 27120/-- | 2,0 | 19,05 | 25,11 | 28,74 | 31,06 | 32,53 | 33,39 | 33,77 | 33,77 | 33,45 | 32,85 | 31,99 |
| 27127/-- | 2,7 | 23,54 | 31,03 | 35,51 | 38,38 | 40,20 | 41,26 | 41,74 | 41,74 | 41,34 | 40,59 | 39,54 |
| 27232/-- | 3,2 | 30,07 | 39,63 | 45,36 | 49,03 | 51,35 | 52,71 | 53,31 | 53,32 | 52,81 | 51,85 | 50,50 |
| 27236/-- | 3,6 | 41,19 | 54,28 | 62,12 | 67,15 | 70,34 | 72,19 | 73,02 | 73,02 | 72,32 | 71,02 | 69,17 |
| 27340/-- | 4,0 | 47,64 | 62,78 | 71,85 | 77,67 | 81,35 | 83,49 | 84,45 | 84,45 | 83,65 | 82,14 | 80,00 |
| 27344/-- | 4,4 | 55,41 | 73,02 | 83,57 | 90,33 | 94,62 | 97,11 | 98,23 | 98,23 | 97,29 | 95,54 | 93,05 |
| Evaporating Temperature 0 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 14,99 | 19,64 | 22,38 | 24,11 | 25,19 | 25,81 | 26,07 | 26,04 | 25,78 | 25,32 | 24,67 |
| 27120/-- | 2,0 | 19,99 | 26,18 | 29,83 | 32,14 | 33,58 | 34,40 | 34,75 | 34,71 | 34,36 | 33,74 | 32,88 |
| 27127/-- | 2,7 | 24,70 | 32,35 | 36,86 | 39,72 | 41,50 | 42,51 | 42,94 | 42,90 | 42,47 | 41,70 | 40,63 |
| 27232/-- | 3,2 | 31,55 | 41,32 | 47,09 | 50,73 | 53,01 | 54,30 | 54,85 | 54,80 | 54,25 | 53,27 | 51,90 |
| 27236/-- | 3,6 | 43,21 | 56,60 | 64,49 | 69,48 | 72,60 | 74,37 | 75,12 | 75,05 | 74,29 | 72,95 | 71,09 |
| 27340/-- | 4,0 | 49,98 | 65,46 | 74,59 | 80,36 | 83,96 | 86,01 | 86,88 | 86,80 | 85,93 | 84,38 | 82,22 |
| 27344/-- | 4,4 | 58,13 | 76,13 | 86,76 | 93,47 | 97,66 | 100,04 | 101,05 | 100,96 | 99,94 | 98,14 | 95,63 |
| Evaporating Temperature -10 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 15,59 | 20,27 | 22,98 | 24,66 | 25,68 | 26,25 | 26,46 | 26,39 | 26,09 | 25,59 | 24,92 |
| 27120/-- | 2,0 | 20,78 | 27,01 | 30,62 | 32,86 | 34,23 | 34,98 | 35,27 | 35,17 | 34,78 | 34,11 | 33,22 |
| 27127/-- | 2,7 | 25,68 | 33,38 | 37,84 | 40,61 | 42,30 | 43,23 | 43,58 | 43,47 | 42,98 | 42,16 | 41,05 |
| 27232/-- | 3,2 | 32,80 | 42,64 | 48,34 | 51,88 | 54,04 | 55,22 | 55,67 | 55,52 | 54,90 | 53,85 | 52,44 |
| 27236/-- | 3,6 | 44,93 | 58,40 | 66,21 | 71,05 | 74,01 | 75,63 | 76,24 | 76,05 | 75,18 | 73,75 | 71,82 |
| 27340/-- | 4,0 | 51,96 | 67,55 | 76,57 | 82,18 | 85,60 | 87,48 | 88,18 | 87,95 | 86,96 | 85,30 | 83,06 |
| 27344/-- | 4,4 | 60,44 | 78,57 | 89,06 | 95,58 | 99,56 | 101,74 | 102,56 | 102,30 | 101,14 | 99,21 | 96,61 |
| Evaporating Temperature -20 °C | | | | | | | | | | | | |
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,07 | 20,71 | 23,35 | 24,95 | 25,90 | 26,39 | 26,54 | 26,41 | 26,06 | 25,52 | 24,81 |
| 27120/-- | 2,0 | 21,42 | 27,61 | 31,12 | 33,25 | 34,52 | 35,17 | 35,37 | 35,20 | 34,74 | 34,02 | 33,08 |
| 27127/-- | 2,7 | 26,47 | 34,12 | 38,45 | 41,09 | 42,65 | 43,47 | 43,71 | 43,51 | 42,93 | 42,04 | 40,87 |
| 27232/-- | 3,2 | 33,82 | 43,58 | 49,12 | 52,49 | 54,49 | 55,52 | 55,83 | 55,57 | 54,84 | 53,70 | 52,21 |
| 27236/-- | 3,6 | 46,32 | 59,69 | 67,27 | 71,89 | 74,62 | 76,04 | 76,47 | 76,11 | 75,10 | 73,55 | 71,51 |
| 27340/-- | 4,0 | 53,57 | 69,04 | 77,81 | 83,14 | 86,31 | 87,95 | 88,45 | 88,03 | 86,87 | 85,06 | 82,70 |
| 27344/-- | 4,4 | 62,31 | 80,30 | 90,50 | 96,70 | 100,38 | 102,29 | 102,87 | 102,39 | 101,03 | 98,94 | 96,19 |

Table 47A: Refrigerant R1270 - Capacities in kW (1)

| Evaporating Temperature -30 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|--------|--------|--------|--------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,43 | 20,97 | 23,49 | 24,99 | 25,85 | 26,26 | 26,34 | 26,15 | 25,74 | 25,15 | 24,40 |
| 27120/-- | 2,0 | 21,90 | 27,96 | 31,32 | 33,31 | 34,46 | 35,00 | 35,10 | 34,85 | 34,31 | 33,52 | 32,52 |
| 27127/-- | 2,7 | 27,07 | 34,55 | 38,70 | 41,17 | 42,58 | 43,26 | 43,38 | 43,07 | 42,40 | 41,42 | 40,18 |
| 27232/-- | 3,2 | 34,57 | 44,13 | 49,43 | 52,58 | 54,39 | 55,25 | 55,41 | 55,01 | 54,16 | 52,91 | 51,33 |
| 27236/-- | 3,6 | 47,35 | 60,44 | 67,70 | 72,02 | 74,49 | 75,68 | 75,89 | 75,35 | 74,17 | 72,47 | 70,30 |
| 27340/-- | 4,0 | 54,77 | 69,91 | 78,31 | 83,30 | 86,16 | 87,53 | 87,78 | 87,14 | 85,79 | 83,82 | 81,31 |
| 27344/-- | 4,4 | 63,70 | 81,31 | 91,08 | 96,88 | 100,21 | 101,80 | 102,09 | 101,36 | 99,78 | 97,49 | 94,57 |

| Evaporating Temperature -40 °C | | | | | | | | | | | | |
|--------------------------------|------------------------|----------------------------------|-------|-------|-------|-------|--------|--------|-------|-------|-------|-------|
| Catalogue number | Equivalent port Ø [mm] | Pressure drop across valve [bar] | | | | | | | | | | |
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
| 27115/-- | 1,5 | 16,66 | 21,05 | 23,43 | 24,81 | 25,57 | 25,89 | 25,89 | 25,63 | 25,16 | 24,51 | 23,71 |
| 27120/-- | 2,0 | 22,21 | 28,06 | 31,24 | 33,07 | 34,08 | 34,51 | 34,51 | 34,16 | 33,54 | 32,68 | 31,61 |
| 27127/-- | 2,7 | 27,44 | 34,67 | 38,60 | 40,87 | 42,12 | 42,65 | 42,64 | 42,22 | 41,44 | 40,38 | 39,06 |
| 27232/-- | 3,2 | 35,05 | 44,29 | 49,31 | 52,21 | 53,80 | 54,48 | 54,47 | 53,93 | 52,94 | 51,58 | 49,90 |
| 27236/-- | 3,6 | 48,01 | 60,66 | 67,53 | 71,51 | 73,69 | 74,61 | 74,60 | 73,86 | 72,51 | 70,64 | 68,34 |
| 27340/-- | 4,0 | 55,53 | 70,16 | 78,10 | 82,70 | 85,22 | 86,30 | 86,29 | 85,42 | 83,86 | 81,70 | 79,04 |
| 27344/-- | 4,4 | 64,58 | 81,60 | 90,84 | 96,19 | 99,12 | 100,37 | 100,36 | 99,35 | 97,54 | 95,03 | 91,93 |

TABLE 47B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$

| TABLE 47B - Correction factors for subcooling $\Delta t_{sub} \neq 4^\circ K$ | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|--|
| $\Delta t_{sub} [^\circ K]$ | 4 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | |
| F_{sub} | 1,00 | 1,06 | 1,12 | 1,18 | 1,24 | 1,30 | 1,35 | 1,40 | 1,45 | |

When subcooling ahead of the expansion valve is other than 4 °K , adjust the evaporatore capacity by dividing by the appropriate correction factor found in Table 47B



The background of the entire page is a complex, repeating pattern of blue geometric shapes, primarily triangles and polygons, creating a 3D effect of depth and shadow. The colors range from light sky blue to deep navy blue.

SOLENOID VALVES

P  LYHEDRA

SOLENOID VALVES

2.1 – NORMALLY CLOSED SOLENOID VALVES

APPLICATION

The normally closed solenoid valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! The solenoid valves illustrated in this chapter cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

A normally closed valves (NC) means that:

- when the coil is not energised, the plunger closes the fluid flow
- when the coil is energised, the plunger opens the valve seat connecting the inlet to the outlet.

NC solenoid valves are sold without coil (with the S suffix) or with coil (for example A6 suffix with coil 9300/RA6-220/230 VAC). For these solenoid valves are available:

- Coils in series 9110 (coils type CM2)
- Coils in series 9300 (coils type HF2)
- Coils in series 9320 (coils type HF3)
- Coils in series 9360 (coils type HF4)

The valves in series 1020N and 1028N are direct acting valves. Their operation depends only on the magnetic field produced by the current flow into the coil. Opening/closing of main valve seat, the only seat, is directly controlled by the mobile plunger.

These valves can work with zero pressure differential.

All the other NC valves are pilot-operated solenoid valves (diaphragm or piston operated). Their operation depends not only on the magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the diaphragm/piston and keep it lifted off the main opening

- close the diaphragm/piston and ensure the tightness on the main opening

Opening/closing of main valve seat is controlled by the diaphragm/piston while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

CONSTRUCTION

The main parts of the solenoid valves described in this chapter are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Austenitic stainless steel EN 10088-2 – 1.4303 for enclosure where the plunger moves
- Ferritic stainless steel EN 10088-3 – 1.4105 for the plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

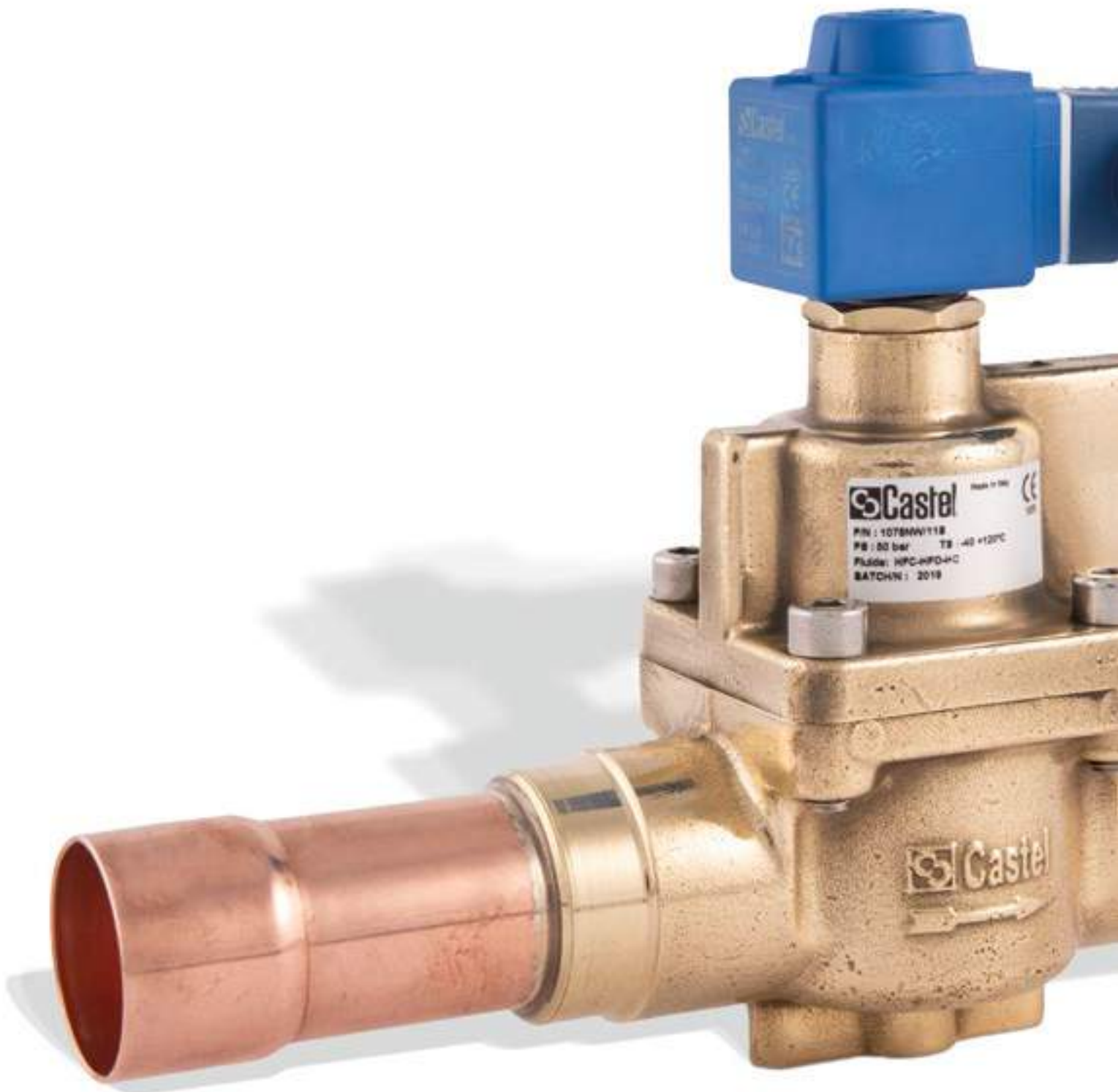
INSTALLATION

All the valves in this chapter can be installed on the three main branches of a plant (hot gas line, liquid line, and suction line), while respecting the limits of use indicated in TABLES 1 and 2 and the capacities indicated in TABLES 4, 5 and 6. Castel recommends using piston pilot-operated solenoid valves for applications with the hot gas supply line in particularly harsh (temperature/pressure) operating conditions.

TABLES 1 and 2 show the following functional characteristics of a solenoid valve:

- Connection dimensions
- PS: maximum allowable pressure of the refrigerant
- TS: maximum / minimum allowable temperature of the refrigerant
- Kv: discharge factor
- minOPD : minimum opening pressure differential. This is the minimum pressure differential between inlet and outlet at which a pilot-operated solenoid valve can open and stay opened or close and maintain the seal.
- MOPD: maximum Opening Pressure Differential according to AHRI STANDARD 760 : 2014. This is the maximum pressure differential between inlet and outlet at which a solenoid valve can open.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. In fact, valves with



P.T.F.E. gaskets, and particularly piston valves, are sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body. All the valves can be mounted in any position so long as the coil does not point downwards. The brazing of valves with solder connections should be carried out with care, using a low melting point filler material. It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

Before connecting a valve to the electrical system, be sure that the line voltage and frequency correspond to the values marked on the coil.

TRACEABILITY

A laser marking on the valve enclosure of the mobile plunger identifies:

- Direct action valves in series 1020N and 1028N
- Pilot-operated piston valves in series 1034N, 1038N, 1040N, 1048N, 1049N,
- Pilot-operated diaphragm valves in series 1064N, 1068N, 1070N, 1078N up to 1078/5, 1079N up to 1079/7

This laser marking includes the following data: valve code, refrigerants, PS, TS and batch number.

All the other pilot-operated valves (diaphragm and piston) are identified by a plastic label fit on the valve enclosure of the mobile plunger (under the coil when indicated). This label includes the following data: valve code, refrigerants, PS, TS and batch number.

TABLE 1: General characteristics of NC valves with SAE Flare connections

| Operating Principles | Catalogue Number | SAE Flare Connections | Seat size nominal Ø [mm] | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | |
|--------------------------|------------------|-----------------------|--------------------------|-------------------------------|-------------------------------------|-----------------|-----------|-----------|-----------------|----------|---------|------|---------------------------------------|-----------|
| | | | | | min OPD | MOPD | | | | | min. | max. | | |
| | | | | | | AC coils series | | | DC coils series | | | | | |
| | | | | | | 9110 9300 | 9160 9360 | 9120 9320 | 9160 9360 | | | | | 9120 9320 |
| Direct Acting | 1020N/2# | 1/4" | 2,5 | 0,175 | 0 | 21 | 28 | 35 | 20 | 21 | 50 | -40 | +130 | Art. 4.3 |
| | 1020N/3# | 3/8" | 3 | 0,23 | | | | | | | | | | |
| Diaphragm Pilot Operated | 1064N/3# | 3/8" | 6,5 | 0,8 | 0,05 | 21 | 28 | 35 | 17 | 18 | 50 | -40 | +120 | Art. 4.3 |
| | 1064N/4# | 1/2" | | | | | | | | | | | | |
| | 1070N/4# | 1/2" | 12,5 | 2,2 | | | | | 10 | 13 | | | | |
| | 1070N/5# | 5/8" | 16,5 | 2,61 | | | | | 8 | 10 | | | | |
| | 1090N/5# | 5/8" | | 3,8 | | | | | | | | | | |
| | 1090N/6# | 3/4" | | 4,8 | | | | | | | | | | |
| Piston Pilot Operated | 1034N/3# | 3/8" | 6,5 | 1,0 | 0,05 | 21 | 28 | 35 | 10 | 18 | 50 | -40 | +130 | Art. 4.3 |
| | 1034N/4# | 1/2" | | | | | | | | | | | | |
| | 1040N/4# | 1/2" | 12,5 | 2,4 | | | | | 14 | 18 | | | | |
| | 1040N/5# | 5/8" | 16,5 | 3,0 | | | | | 8 | 16 | | | | |
| | 1050N/5# | 5/8" | | 3,8 | | | | | | | | | | |
| | 1050N/6# | 3/4" | | 4,8 | | | | | | | | | | |

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TABLE 2: General characteristics of NC valves with ODS connections

| Operating Principles | Catalogue Number | Connections ODS | | Seat size nominal Ø [mm] | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | |
|--------------------------|------------------|-----------------|--------|--------------------------|-------------------------------|-------------------------------------|-----------------|-----------|-----------|-----------------|----------|---------|------|---------------------------------------|-----------|
| | | Ø [in.] | Ø [mm] | | | min OPD | MOPD | | | | | min. | max. | | |
| | | | | | | | AC coils series | | | DC coils series | | | | | |
| | | | | | | | 9110 9300 | 9160 9360 | 9120 9320 | 9160 9360 | | | | | 9120 9320 |
| Direct Acting | 1028N/2# | 1/4" | – | 2,2 | 0,15 | 0 | 21 | 28 | 35 | 20 | 21 | 50 | –40 | +130 | Art. 4.3 |
| | 1028N/2#.E | 1/4" | – | 3 | 0,23 | | | | | | | | | | |
| | 1028N/3# | 3/8" | – | | | | | | | | | | | | |
| | 1028N/M10# | – | 10 | | | | | | | | | | | | |
| Diaphragm Pilot Operated | 1068N/3# | 3/8" | – | 6,5 | 0,8 | 0,05 | 21 | 28 | 35 | 17 | 18 | 50 | –40 | +120 | Art. 4.3 |
| | 1068N/M10# | – | 10 | | | | | | | | | | | | |
| | 1068N/M12# | – | 12 | | | | | | | | | | | | |
| | 1068N/4# | 1/2" | – | | | | | | | | | | | | |
| | 1078N/M12# | – | 12 | 12,5 | 2,2 | | | | | | | | | | |
| | 1078N/4# | 1/2" | – | | | | | | | | | | | | |
| | 1078N/5# | 5/8" | 16 | 16,5 | 2,61 | | | | | | | | | | |
| | 1079N/7# | 7/8" | 22 | | | | | | | | | | | | |
| | 1098N/5# | 5/8" | 16 | | | | | | | | | | | | |
| | 1098N/6# | 3/4" | – | 25,5 | 10 | | | | | | | | | | |
| | 1098N/7# | 7/8" | 22 | | | | | | | | | | | | |
| | 1099N/9# | 1.1/8" | – | | | | | | | | | | | | |
| | 1078N/9# | 1.1/8" | – | 16,5 | 3,8 | | | | | | | | | | |
| 1079N/11# | 1.3/8" | 35 | | | | | | | | | | | | | |
| Piston Pilot Operated | 1038N/3# | 3/8" | – | 6,5 | 1,0 | 0,05 | 21 | 28 | 35 | 10 | 18 | 50 | –40 | +130 | Art. 4.3 |
| | 1038N/M10# | – | 10 | | | | | | | | | | | | |
| | 1038N/M12# | – | 12 | | | | | | | | | | | | |
| | 1038N/4# | 1/2" | – | | | | | | | | | | | | |
| | 1048N/M12# | – | 12 | 12,5 | 2,4 | | | | | | | | | | |
| | 1048N/4# | 1/2" | – | | | | | | | | | | | | |
| | 1048N/5# | 5/8" | 16 | | | | | | | | | | | | |
| | 1049N/7# | 7/8" | 22 | 16,5 | 3,0 | | | | | | | | | | |
| | 1058N/5# | 5/8" | 16 | | | | | | | | | | | | |
| | 1058N/6# | 3/4" | – | | | | | | | | | | | | |
| | 1058N/7# | 7/8" | 22 | 25 | 10 | | | | | | | | | | |
| | 1059N/9# | 1.1/8" | – | | | | | | | | | | | | |
| | 1098N/9# | 1.1/8" | – | | | | | | | | | | | | |
| | 1099N/11# | 1.3/8" | 35 | 27 | 16 | | | | | | | | | | |
| | 1078NW/11# | 1.3/8" | 35 | | | | | | | | | | | | |
| | 1079NW/13# | 1.5/8" | – | | | | | | | | | | | | |
| | 1079NW/M42# | – | 42 | 34 | 25 | | | | | | | | | | |
| 1078NW/13# | 1.5/8" | – | | | | | | | | | | | | | |
| 1078NW/M42# | – | 42 | | | | | | | | | | | | | |
| 1079NW/17# | 2.1/8" | 54 | 34 | 25 | | | | | | | | | | | |

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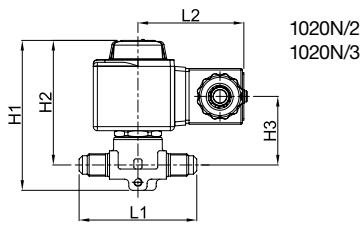
TABLE 3: Dimensions and weights of NC valves with 9300 coils (1)

| Operating Principles | Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|--------------------------|------------------|-----------------|------|------|-----|----|----|------------|
| | | H1 | H2 | H3 | L1 | L2 | Q | |
| Direct Acting | 1020N/2# | 75 | 62,5 | 34 | 58 | 52 | - | 340 |
| | 1020N/3# | | | | 65 | | | 355 |
| | 1028N/2# | | | | 125 | | | 350 |
| | 1028N/2#.E | | | | 125 | | | 350 |
| | 1028N/3# | | | | 125 | | | 365 |
| | 1028N/M10# | | | | 125 | | | 365 |
| Diaphragm Pilot Operated | 1064N/3# | 82 | 69,5 | 40 | 68 | 52 | - | 400 |
| | 1064N/4# | | | | 72 | | | 415 |
| | 1068N/3# | | | | 111 | | | 400 |
| | 1068N/M10# | | | | 111 | | | 395 |
| | 1068N/M12# | | | | 127 | | | 420 |
| | 1068N/4# | | | | 127 | | | 420 |
| | 1070N/4# | 91 | 75 | 47 | 100 | | 45 | 710 |
| | 1070N/5# | | | | 106 | | | 755 |
| | 1078N/M12# | | | | 127 | | | 690 |
| | 1078N/4# | | | | 127 | | | 680 |
| | 1078N/5# | | | | 175 | | | 775 |
| | 1079N/7# | | | | 190 | | | 765 |
| | 1090N/5# | 106 | 78 | 50 | 120 | | 57 | 1035 |
| | 1090N/6# | | | | 124 | | | 1365 |
| | 1098N/5# | | | | 175 | | | 995 |
| | 1098N/6# | | | | 175 | | | 1185 |
| | 1098N/7# | | | | 180 | | | 1170 |
| | 1099N/9# | | | | 216 | | | 1225 |
| | 1078N/9# | 115 | 96 | 72 | 250 | | 80 | 2565 |
| | 1079N/11#ve | | | | 292 | | | 2620 |
| Piston Pilot Operated | 1034N/3# | 92,5 | 80 | 50,5 | 68 | 52 | - | 440 |
| | 1034N/4# | | | | 72 | | | 457 |
| | 1038N/3# | | | | 111 | | | 440 |
| | 1038N/M10# | | | | 111 | | | 435 |
| | 1038N/M12# | | | | 127 | | | 462 |
| | 1038N/4# | | | | 127 | | | 462 |
| | 1040N/4# | 100,5 | 84,5 | 56,5 | 100 | | 45 | 781 |
| | 1040N/5# | | | | 106 | | | 831 |
| | 1048N/M12# | | | | 127 | | | 759 |
| | 1048N/4# | | | | 127 | | | 748 |
| | 1048N/5# | | | | 175 | | | 853 |
| | 1049N/7# | | | | 190 | | | 842 |
| | 1050N/5# | 121 | 93 | 65 | 120 | | 57 | 1157 |
| | 1050N/6# | | | | 124 | | | 1487 |
| | 1058N/5# | | | | 175 | | | 1117 |
| | 1058N/6# | | | | 175 | | | 1307 |
| | 1058N/7# | | | | 180 | | | 1292 |
| | 1059N/9# | | | | 216 | | | 1347 |
| | 1098N/9# | 157 | 127 | 99 | 235 | | 60 | 2050 |
| | 1099N/11# | | | | 277 | | | 2130 |
| | 1078NW/11# | 171 | 137 | 110 | 254 | | 68 | 2710 |
| | 1079NW/13# | | | | 278 | | | 2750 |
| | 1079NW/M42# | | | | 278 | | | 2750 |
| | 1078NW/13# | 192 | 155 | 128 | 265 | | 88 | 3810 |
| | 1078NW/M42# | | | | 265 | | | 3810 |
| | 1079NW/17# | | | | 280 | | | 3880 |

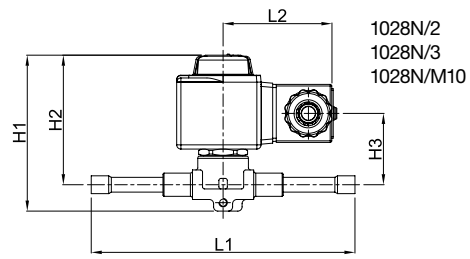
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- (1) : With coil 9360 the dimension L2 is equal to 57 mm and the weights must be increased of 240 g.
- (1) : With coil 9320 the dimension L2 is equal to 65 mm and the weights must be increased of 500 g.

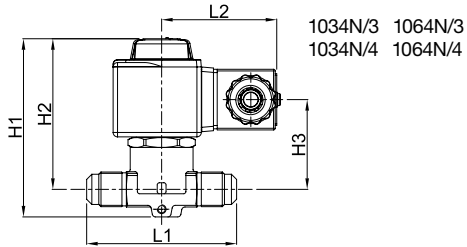
Connectors are not included in the boxes and have to be ordered separately



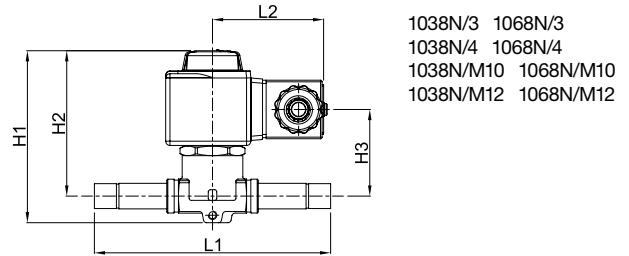
1020N/2
1020N/3



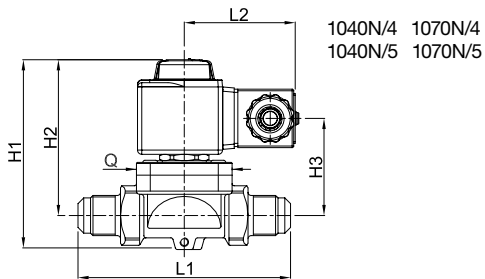
1028N/2
1028N/3
1028N/M10



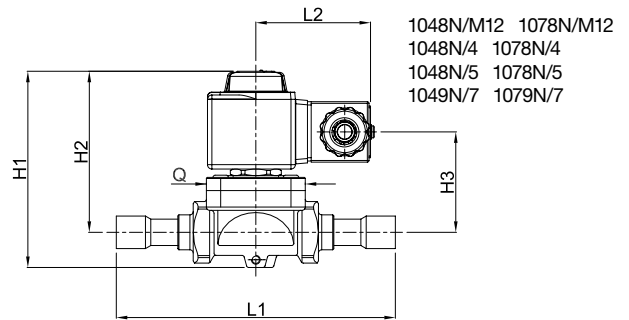
1034N/3 1064N/3
1034N/4 1064N/4



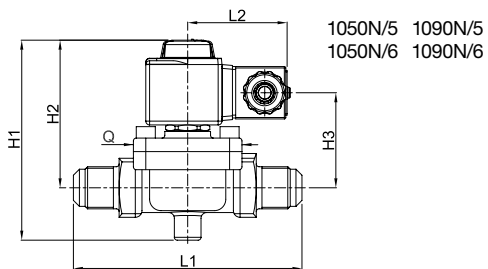
1038N/3 1068N/3
1038N/4 1068N/4
1038N/M10 1068N/M10
1038N/M12 1068N/M12



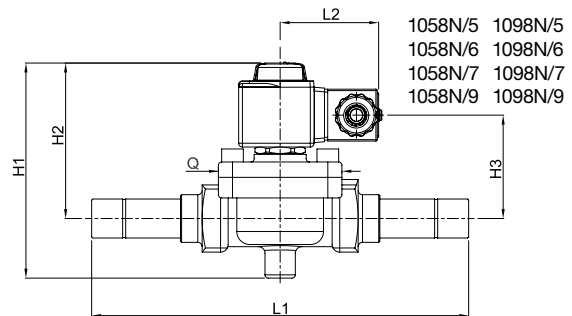
1040N/4 1070N/4
1040N/5 1070N/5



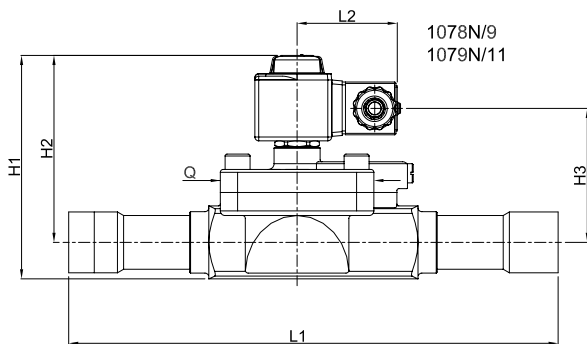
1048N/M12 1078N/M12
1048N/4 1078N/4
1048N/5 1078N/5
1049N/7 1079N/7



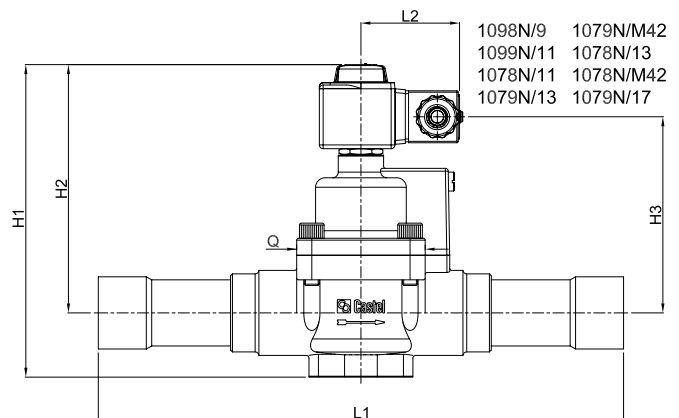
1050N/5 1090N/5
1050N/6 1090N/6



1058N/5 1098N/5
1058N/6 1098N/6
1058N/7 1098N/7
1058N/9 1098N/9



1078N/9
1079N/11



1098N/9 1079N/M42
1099N/11 1078N/13
1078N/11 1078N/M42
1079N/13 1079N/17

TABLE 4: Refrigerant flow capacity of NC valves in liquid line [kW]

| Operating Principles | Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|--------------------------|------------------|-------|-------|-------|-------|-------|-------|---------|---------|-------|-------|
| Direct Acting | 1020N/2# | 2,98 | 4,40 | 2,08 | 3,02 | 3,00 | 2,01 | 2,20 | 2,63 | 2,74 | 2,75 |
| | 1020N/3# | 3,91 | 5,78 | 2,74 | 3,96 | 3,95 | 2,65 | 2,89 | 3,46 | 3,60 | 3,62 |
| | 1028N/2# | 2,55 | 3,77 | 1,79 | 2,58 | 2,58 | 1,73 | 1,89 | 2,26 | 2,35 | 2,36 |
| | 1028N/2#.E | 3,91 | 5,78 | 2,74 | 3,96 | 3,95 | 2,65 | 2,89 | 3,46 | 3,60 | 3,62 |
| | 1028N/3# | | | | | | | | | | |
| | 1028N/M10# | | | | | | | | | | |
| 1028N/M12# | | | | | | | | | | | |
| Diaphragm Pilot Operated | 1064N/3# | 13,6 | 20,1 | 9,5 | 13,8 | 13,7 | 9,2 | 10,1 | 12,0 | 12,5 | 12,6 |
| | 1064N/4# | | | | | | | | | | |
| | 1068N/3# | | | | | | | | | | |
| | 1068N/M10# | | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | | |
| | 1068N/4# | | | | | | | | | | |
| | 1070N/4# | 37,4 | 55,3 | 26,2 | 37,9 | 37,8 | 25,3 | 27,7 | 33,1 | 34,4 | 34,6 |
| | 1070N/5# | 44,4 | 65,6 | 31,1 | 45,0 | 44,8 | 30,0 | 32,8 | 39,3 | 40,8 | 41,0 |
| | 1078N/M12# | 37,4 | 55,3 | 26,2 | 37,9 | 37,8 | 25,3 | 27,7 | 33,1 | 34,4 | 34,6 |
| | 1078N/4# | | | | | | | | | | |
| | 1078N/5# | 44,4 | 65,6 | 31,1 | 45,0 | 44,8 | 30,0 | 32,8 | 39,3 | 40,8 | 41,0 |
| | 1079N/7# | 64,6 | 95,5 | 45,2 | 65,5 | 65,2 | 43,7 | 47,8 | 57,2 | 59,5 | 59,7 |
| | 1090N/5# | 81,6 | 120,6 | 57,1 | 82,7 | 82,4 | 55,2 | 60,4 | 72,2 | 75,1 | 75,5 |
| | 1090N/6# | 64,6 | 95,5 | 45,2 | 65,5 | 65,2 | 43,7 | 47,8 | 57,2 | 59,5 | 59,7 |
| | 1098N/5# | 81,6 | 120,6 | 57,1 | 82,7 | 82,4 | 55,2 | 60,4 | 72,2 | 75,1 | 75,5 |
| | 1098N/6# | 96,9 | 143,2 | 67,8 | 98,2 | 97,9 | 65,6 | 71,7 | 85,7 | 89,2 | 89,6 |
| | 1098N/7# | 170,0 | 251,3 | 119,0 | 172,3 | 171,7 | 115,0 | 125,8 | 150,4 | 156,5 | 157,2 |
| | 1099N/9# | | | | | | | | | | |
| | 1078N/9# | 170,0 | 251,3 | 119,0 | 172,3 | 171,7 | 115,0 | 125,8 | 150,4 | 156,5 | 157,2 |
| | 1079N/11# | | | | | | | | | | |
| Piston Pilot Operated | 1034N/3# | 17,0 | 25,1 | 11,9 | 17,2 | 17,2 | 11,5 | 12,6 | 15,0 | 15,7 | 15,7 |
| | 1034N/4# | | | | | | | | | | |
| | 1038N/3# | | | | | | | | | | |
| | 1038N/M10# | | | | | | | | | | |
| | 1038N/M12# | | | | | | | | | | |
| | 1038N/4# | | | | | | | | | | |
| | 1040N/4# | 40,8 | 60,3 | 28,6 | 41,4 | 41,2 | 27,6 | 30,2 | 36,1 | 37,6 | 37,7 |
| | 1040N/5# | 51,0 | 75,4 | 35,7 | 51,7 | 51,5 | 34,5 | 37,7 | 45,1 | 47,0 | 47,2 |
| | 1048N/M12# | 40,8 | 60,3 | 28,6 | 41,4 | 41,2 | 27,6 | 30,2 | 36,1 | 37,6 | 37,7 |
| | 1048N/4# | | | | | | | | | | |
| | 1048N/5# | 51,0 | 75,4 | 35,7 | 51,7 | 51,5 | 34,5 | 37,7 | 45,1 | 47,0 | 47,2 |
| | 1049N/7# | 64,6 | 95,5 | 45,2 | 65,5 | 65,2 | 43,7 | 47,8 | 57,2 | 59,5 | 59,7 |
| | 1050N/5# | 81,6 | 120,6 | 57,1 | 82,7 | 82,4 | 55,2 | 60,4 | 72,2 | 75,1 | 75,5 |
| | 1050N/6# | 64,6 | 95,5 | 45,2 | 65,5 | 65,2 | 43,7 | 47,8 | 57,2 | 59,5 | 59,7 |
| | 1058N/5# | 81,6 | 120,6 | 57,1 | 82,7 | 82,4 | 55,2 | 60,4 | 72,2 | 75,1 | 75,5 |
| | 1058N/6# | 96,9 | 143,2 | 67,8 | 98,2 | 97,9 | 65,6 | 71,7 | 85,7 | 89,2 | 89,6 |
| | 1058N/7# | 170,0 | 251,3 | 119,0 | 172,3 | 171,7 | 115,0 | 125,8 | 150,4 | 156,5 | 157,2 |
| | 1059N/9# | | | | | | | | | | |
| | 1098N/9# | 170,0 | 251,3 | 119,0 | 172,3 | 171,7 | 115,0 | 125,8 | 150,4 | 156,5 | 157,2 |
| | 1099N/11# | | | | | | | | | | |
| | 1078NW/11# | 272,0 | 402,1 | 190,4 | 275,7 | 274,7 | 184,0 | 201,3 | 240,6 | 250,4 | 251,5 |
| | 1079NW/13# | | | | | | | | | | |
| | 1079NW/M42# | | | | | | | | | | |
| 1078NW/13# | 425,0 | 628,3 | 297,5 | 430,8 | 429,3 | 287,5 | 314,5 | 376,0 | 391,3 | 393,0 | |
| 1078NW/M42# | | | | | | | | | | | |
| 1079NW/17# | | | | | | | | | | | |

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continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 4: Refrigerant flow capacity of NC valves in liquid line [kW]

| Operating Principles | Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|--------------------------|-----------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Direct Acting | 1020N/2# | 2,78 | 2,12 | 3,51 | 3,58 | 2,55 | 3,57 | 4,18 | 3,71 | 3,71 |
| | 1020N/3# | 3,66 | 2,79 | 4,61 | 4,71 | 3,35 | 4,69 | 5,50 | 4,88 | 4,88 |
| | 1028N/2# | 2,39 | 1,82 | 3,01 | 3,07 | 2,18 | 3,06 | 3,59 | 3,18 | 3,18 |
| | 1028N/2#.E | 3,66 | 2,79 | 4,61 | 4,71 | 3,35 | 4,69 | 5,50 | 4,88 | 4,88 |
| | 1028N/3# | | | | | | | | | |
| | 1028N/M10# | | | | | | | | | |
| 1064N/3# | | | | | | | | | | |
| Diaphragm Pilot Operated | 1064N/4# | 12,7 | 9,7 | 16,0 | 16,4 | 11,6 | 16,3 | 19,1 | 17,0 | 17,0 |
| | 1068N/3# | | | | | | | | | |
| | 1068N/M10# | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | |
| | 1068N/4# | | | | | | | | | |
| | 1070N/4# | | | | | | | | | |
| | 1070N/5# | 35,0 | 26,7 | 44,1 | 45,0 | 32,0 | 44,8 | 52,6 | 46,6 | 46,6 |
| | 1078N/M12# | 41,5 | 31,7 | 52,3 | 53,4 | 38,0 | 53,2 | 62,4 | 55,3 | 55,3 |
| | 1078N/4# | 35,0 | 26,7 | 44,1 | 45,0 | 32,0 | 44,8 | 52,6 | 46,6 | 46,6 |
| | 1078N/5# | 41,5 | 31,7 | 52,3 | 53,4 | 38,0 | 53,2 | 62,4 | 55,3 | 55,3 |
| | 1079N/7# | 60,5 | 46,1 | 76,2 | 77,7 | 55,3 | 77,4 | 90,8 | 80,6 | 80,6 |
| | 1090N/5# | 76,4 | 58,2 | 96,2 | 98,2 | 69,9 | 97,8 | 114,7 | 101,8 | 101,8 |
| | 1090N/6# | 60,5 | 46,1 | 76,2 | 77,7 | 55,3 | 77,4 | 90,8 | 80,6 | 80,6 |
| | 1098N/5# | 76,4 | 58,2 | 96,2 | 98,2 | 69,9 | 97,8 | 114,7 | 101,8 | 101,8 |
| | 1098N/6# | 90,7 | 69,1 | 114,3 | 116,6 | 83,0 | 116,2 | 136,2 | 120,8 | 120,8 |
| | 1098N/7# | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| | 1099N/9# | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| | 1078N/9# | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| | 1079N/11# | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| | Piston Pilot Operated | 1034N/3# | 15,9 | 12,1 | 20,1 | 20,5 | 14,6 | 20,4 | 23,9 | 21,2 |
| 1034N/4# | | | | | | | | | | |
| 1038N/3# | | | | | | | | | | |
| 1038N/M10# | | | | | | | | | | |
| 1038N/M12# | | | | | | | | | | |
| 1038N/4# | | | | | | | | | | |
| 1040N/4# | | 38,2 | 29,1 | 48,1 | 49,1 | 34,9 | 48,9 | 57,4 | 50,9 | 50,9 |
| 1040N/5# | | 47,7 | 36,4 | 60,2 | 61,4 | 43,7 | 61,1 | 71,7 | 63,6 | 63,6 |
| 1048N/M12# | | 38,2 | 29,1 | 48,1 | 49,1 | 34,9 | 48,9 | 57,4 | 50,9 | 50,9 |
| 1048N/4# | | 47,7 | 36,4 | 60,2 | 61,4 | 43,7 | 61,1 | 71,7 | 63,6 | 63,6 |
| 1048N/5# | | 47,7 | 36,4 | 60,2 | 61,4 | 43,7 | 61,1 | 71,7 | 63,6 | 63,6 |
| 1049N/7# | | 60,5 | 46,1 | 76,2 | 77,7 | 55,3 | 77,4 | 90,8 | 80,6 | 80,6 |
| 1050N/5# | | 76,4 | 58,2 | 96,2 | 98,2 | 69,9 | 97,8 | 114,7 | 101,8 | 101,8 |
| 1050N/6# | | 60,5 | 46,1 | 76,2 | 77,7 | 55,3 | 77,4 | 90,8 | 80,6 | 80,6 |
| 1058N/5# | | 76,4 | 58,2 | 96,2 | 98,2 | 69,9 | 97,8 | 114,7 | 101,8 | 101,8 |
| 1058N/6# | | 90,7 | 69,1 | 114,3 | 116,6 | 83,0 | 116,2 | 136,2 | 120,8 | 120,8 |
| 1058N/7# | | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| 1059N/9# | | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| 1098N/9# | | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| 1099N/11# | | 159,1 | 121,3 | 200,5 | 204,6 | 145,6 | 203,8 | 239,0 | 212,0 | 212,0 |
| 1078NW/11# | | 254,6 | 194,1 | 320,8 | 327,4 | 233,0 | 326,1 | 382,4 | 339,2 | 339,2 |
| 1079NW/13# | | 254,6 | 194,1 | 320,8 | 327,4 | 233,0 | 326,1 | 382,4 | 339,2 | 339,2 |
| 1079NW/M42# | | 397,8 | 303,3 | 501,3 | 511,5 | 364,0 | 509,5 | 597,5 | 530,0 | 530,0 |
| 1078NW/13# | 397,8 | 303,3 | 501,3 | 511,5 | 364,0 | 509,5 | 597,5 | 530,0 | 530,0 | |
| 1078NW/M42# | 397,8 | 303,3 | 501,3 | 511,5 | 364,0 | 509,5 | 597,5 | 530,0 | 530,0 | |
| 1079NW/17# | 397,8 | 303,3 | 501,3 | 511,5 | 364,0 | 509,5 | 597,5 | 530,0 | 530,0 | |

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| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 5: Refrigerant flow capacity of NC valves in suction line [kW]

| Operating Principles | Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A | | | | | | | | | | |
|----------------------------|------------------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|------|------|------|------|------|------|-----|-----|------|------|
| "Direct Acting" | 1020N/2# | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | |
| | 1020N/3# | | | | | | | | | | | | | | | | | | | | |
| | 1028N/2# | | | | | | | | | | | | | | | | | | | | |
| | 1028N/2#.E | | | | | | | | | | | | | | | | | | | | |
| | 1028N/3# | | | | | | | | | | | | | | | | | | | | |
| | 1028N/M10# | | | | | | | | | | | | | | | | | | | | |
| "Diaphragm Pilot Operated" | 1064N/3# | 1,46 | 3,40 | 1,76 | 1,82 | 2,64 | 1,78 | 1,18 | 1,14 | 1,92 | 1,76 | | | | | | | | | | |
| | 1064N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1068N/3# | | | | | | | | | | | | | | | | | | | | |
| | 1068N/M10# | | | | | | | | | | | | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | | | | | | | | | | | | |
| | 1068N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1070N/4# | 4,00 | 9,35 | 4,84 | 4,99 | 7,26 | 4,91 | 3,23 | 3,12 | 5,28 | 4,84 | | | | | | | | | | |
| | 1070N/5# | 4,75 | 11,09 | 5,74 | 5,92 | 8,61 | 5,82 | 3,84 | 3,71 | 6,26 | 5,74 | | | | | | | | | | |
| | 1078N/M12# | 4,00 | 9,35 | 4,84 | 4,99 | 7,26 | 4,91 | 3,23 | 3,12 | 5,28 | 4,84 | | | | | | | | | | |
| | 1078N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1078N/5# | 4,75 | 11,09 | 5,74 | 5,92 | 8,61 | 5,82 | 3,84 | 3,71 | 6,26 | 5,74 | | | | | | | | | | |
| | 1079N/7# | 6,9 | 16,2 | 8,4 | 8,6 | 12,5 | 8,5 | 5,6 | 5,4 | 9,1 | 8,4 | | | | | | | | | | |
| | 1090N/5# | | | | | | | | | | | | | | | | | | | | |
| | 1090N/6# | | | | | | | | | | | 8,7 | 20,4 | 10,6 | 10,9 | 15,8 | 10,7 | 7,1 | 6,8 | 11,5 | 10,6 |
| | 1098N/5# | | | | | | | | | | | 6,9 | 16,2 | 8,4 | 8,6 | 12,5 | 8,5 | 5,6 | 5,4 | 9,1 | 8,4 |
| | 1098N/6# | | | | | | | | | | | 8,7 | 20,4 | 10,6 | 10,9 | 15,8 | 10,7 | 7,1 | 6,8 | 11,5 | 10,6 |
| | 1098N/7# | | | | | | | | | | | 10,4 | 24,2 | 12,5 | 12,9 | 18,8 | 12,7 | 8,4 | 8,1 | 13,7 | 12,5 |
| | 1099N/9# | 18,2 | 42,5 | 22,0 | 22,7 | 33,0 | 22,3 | 14,7 | 14,2 | 24,0 | 22,0 | | | | | | | | | | |
| | 1078N/9# | | | | | | | | | | | | | | | | | | | | |
| | 1079N/11# | 18,2 | 42,5 | 22,0 | 22,7 | 33,0 | 22,3 | 14,7 | 14,2 | 24,0 | 22,0 | | | | | | | | | | |
| "Piston Pilot Operated" | 1034N/3# | 1,82 | 4,25 | 2,20 | 2,27 | 3,30 | 2,23 | 1,47 | 1,42 | 2,40 | 2,20 | | | | | | | | | | |
| | 1034N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1038N/3# | | | | | | | | | | | | | | | | | | | | |
| | 1038N/M10# | | | | | | | | | | | | | | | | | | | | |
| | 1038N/M12# | | | | | | | | | | | | | | | | | | | | |
| | 1038N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1040N/4# | 4,37 | 10,20 | 5,28 | 5,45 | 7,92 | 5,35 | 3,53 | 3,41 | 5,76 | 5,28 | | | | | | | | | | |
| | 1040N/5# | 5,46 | 12,75 | 6,60 | 6,81 | 9,90 | 6,69 | 4,41 | 4,26 | 7,20 | 6,60 | | | | | | | | | | |
| | 1048N/M12# | 4,37 | 10,20 | 5,28 | 5,45 | 7,92 | 5,35 | 3,53 | 3,41 | 5,76 | 5,28 | | | | | | | | | | |
| | 1048N/4# | | | | | | | | | | | | | | | | | | | | |
| | 1048N/5# | 5,46 | 12,75 | 6,60 | 6,81 | 9,90 | 6,69 | 4,41 | 4,26 | 7,20 | 6,60 | | | | | | | | | | |
| | 1049N/7# | 6,9 | 16,2 | 8,4 | 8,6 | 12,5 | 8,5 | 5,6 | 5,4 | 9,1 | 8,4 | | | | | | | | | | |
| | 1050N/5# | | | | | | | | | | | | | | | | | | | | |
| | 1050N/6# | | | | | | | | | | | 8,7 | 20,4 | 10,6 | 10,9 | 15,8 | 10,7 | 7,1 | 6,8 | 11,5 | 10,6 |
| | 1058N/5# | | | | | | | | | | | 6,9 | 16,2 | 8,4 | 8,6 | 12,5 | 8,5 | 5,6 | 5,4 | 9,1 | 8,4 |
| | 1058N/6# | | | | | | | | | | | 8,7 | 20,4 | 10,6 | 10,9 | 15,8 | 10,7 | 7,1 | 6,8 | 11,5 | 10,6 |
| | 1058N/7# | | | | | | | | | | | 10,4 | 24,2 | 12,5 | 12,9 | 18,8 | 12,7 | 8,4 | 8,1 | 13,7 | 12,5 |
| | 1059N/9# | | | | | | | | | | | | | | | | | | | | |
| | 1098N/9# | 18,2 | 42,5 | 22,0 | 22,7 | 33,0 | 22,3 | 14,7 | 14,2 | 24,0 | 22,0 | | | | | | | | | | |
| | 1099N/11# | | | | | | | | | | | | | | | | | | | | |
| | 1078NW/11# | 29,1 | 68,0 | 35,2 | 36,3 | 52,8 | 35,7 | 23,5 | 22,7 | 38,4 | 35,2 | | | | | | | | | | |
| | 1079NW/13# | | | | | | | | | | | | | | | | | | | | |
| | 1079NW/M42# | | | | | | | | | | | | | | | | | | | | |
| | 1078NW/13# | 45,5 | 106,3 | 55,0 | 56,8 | 82,5 | 55,8 | 36,8 | 35,5 | 60,0 | 55,0 | | | | | | | | | | |
| 1078NW/M42# | | | | | | | | | | | | | | | | | | | | | |
| 1079NW/17# | | | | | | | | | | | | | | | | | | | | | |

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| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 5: Refrigerant flow capacity of NC valves in suction line [kW]

| Operating Principles | Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|--------------------------|------------------|-------|-------|-------|-------|-------|------|------|-------|-------|
| Direct Acting | 1020N/2# | - | - | - | - | - | - | - | - | - |
| | 1020N/3# | | | | | | | | | |
| | 1028N/2# | | | | | | | | | |
| | 1028N/2#.E | | | | | | | | | |
| | 1028N/3# | | | | | | | | | |
| | 1028N/M10# | | | | | | | | | |
| Diaphragm Pilot Operated | 1064N/3# | 1,27 | 1,69 | 2,79 | 2,80 | 1,43 | 2,44 | 1,03 | 1,26 | 2,78 |
| | 1064N/4# | | | | | | | | | |
| | 1068N/3# | | | | | | | | | |
| | 1068N/M10# | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | |
| | 1068N/4# | | | | | | | | | |
| | 1070N/4# | 3,50 | 4,64 | 7,68 | 7,70 | 3,94 | 6,71 | 2,84 | 3,48 | 7,66 |
| | 1070N/5# | 4,15 | 5,51 | 9,11 | 9,14 | 4,67 | 7,96 | 3,37 | 4,12 | 9,08 |
| | 1078N/M12# | 3,50 | 4,64 | 7,68 | 7,70 | 3,94 | 6,71 | 2,84 | 3,48 | 7,66 |
| | 1078N/4# | | | | | | | | | |
| | 1078N/5# | 4,15 | 5,51 | 9,11 | 9,14 | 4,67 | 7,96 | 3,37 | 4,12 | 9,08 |
| | 1079N/7# | | | | | | | | | |
| | 1090N/5# | 6,0 | 8,0 | 13,3 | 13,3 | 6,8 | 11,6 | 4,9 | 6,0 | 13,2 |
| | 1090N/6# | 7,6 | 10,1 | 16,8 | 16,8 | 8,6 | 14,6 | 6,2 | 7,6 | 16,7 |
| | 1098N/5# | 6,0 | 8,0 | 13,3 | 13,3 | 6,8 | 11,6 | 4,9 | 6,0 | 13,2 |
| | 1098N/6# | 7,6 | 10,1 | 16,8 | 16,8 | 8,6 | 14,6 | 6,2 | 7,6 | 16,7 |
| | 1098N/7# | 9,1 | 12,0 | 19,9 | 20,0 | 10,2 | 17,4 | 7,4 | 9,0 | 19,8 |
| | 1099N/9# | | | | | | | | | |
| | 1078N/9# | 15,9 | 21,1 | 34,9 | 35,0 | 17,9 | 30,5 | 12,9 | 15,8 | 34,8 |
| | 1079N/11# | | | | | | | | | |
| Piston Pilot Operated | 1034N/3# | 1,59 | 2,11 | 3,49 | 3,50 | 1,79 | 3,05 | 1,29 | 1,58 | 3,48 |
| | 1034N/4# | | | | | | | | | |
| | 1038N/3# | | | | | | | | | |
| | 1038N/M10# | | | | | | | | | |
| | 1038N/M12# | | | | | | | | | |
| | 1038N/4# | | | | | | | | | |
| | 1040N/4# | 3,82 | 5,06 | 8,38 | 8,40 | 4,30 | 7,32 | 3,10 | 3,79 | 8,35 |
| | 1040N/5# | 4,77 | 6,33 | 10,47 | 10,50 | 5,37 | 9,15 | 3,87 | 4,74 | 10,44 |
| | 1048N/M12# | 3,82 | 5,06 | 8,38 | 8,40 | 4,30 | 7,32 | 3,10 | 3,79 | 8,35 |
| | 1048N/4# | | | | | | | | | |
| | 1048N/5# | 4,77 | 6,33 | 10,47 | 10,50 | 5,37 | 9,15 | 3,87 | 4,74 | 10,44 |
| | 1049N/7# | | | | | | | | | |
| | 1050N/5# | 6,0 | 8,0 | 13,3 | 13,3 | 6,8 | 11,6 | 4,9 | 6,0 | 13,2 |
| | 1050N/6# | 7,6 | 10,1 | 16,8 | 16,8 | 8,6 | 14,6 | 6,2 | 7,6 | 16,7 |
| | 1058N/5# | 6,0 | 8,0 | 13,3 | 13,3 | 6,8 | 11,6 | 4,9 | 6,0 | 13,2 |
| | 1058N/6# | 7,6 | 10,1 | 16,8 | 16,8 | 8,6 | 14,6 | 6,2 | 7,6 | 16,7 |
| | 1058N/7# | 9,1 | 12,0 | 19,9 | 20,0 | 10,2 | 17,4 | 7,4 | 9,0 | 19,8 |
| | 1059N/9# | | | | | | | | | |
| | 1098N/9# | 15,9 | 21,1 | 34,9 | 35,0 | 17,9 | 30,5 | 12,9 | 15,8 | 34,8 |
| | 1099N/11# | | | | | | | | | |
| | 1078NW/11# | 25,4 | 33,8 | 55,8 | 56,0 | 28,6 | 48,8 | 20,6 | 25,3 | 55,7 |
| | 1079NW/13# | | | | | | | | | |
| | 1079NW/M42# | | | | | | | | | |
| 1078NW/13# | 39,8 | 52,8 | 87,3 | 87,5 | 44,8 | 76,3 | 32,3 | 39,5 | 87,0 | |
| 1078NW/M42# | | | | | | | | | | |
| 1079NW/17# | | | | | | | | | | |

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| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 6: Refrigerant flow capacity of NC valves in hot gas line line [kW]

| Operating Principles | Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|----------------------------|------------------|-------|-------|-------|-------|-------|-------|---------|---------|-------|-------|
| "Direct Acting" | 1020N/2# | 1,49 | 3,18 | 1,68 | 2,08 | 2,38 | 1,67 | 1,16 | 1,20 | 2,07 | 1,89 |
| | 1020N/3# | 1,96 | 4,18 | 2,21 | 2,74 | 3,13 | 2,19 | 1,53 | 1,58 | 2,71 | 2,48 |
| | 1028N/2# | 1,28 | 2,72 | 1,44 | 1,79 | 2,04 | 1,43 | 1,00 | 1,03 | 1,77 | 1,62 |
| | 1028N/2#.E | | | | | | | | | | |
| | 1028N/3# | 1,96 | 4,18 | 2,21 | 2,74 | 3,13 | 2,19 | 1,53 | 1,58 | 2,71 | 2,48 |
| | 1028N/M10# | | | | | | | | | | |
| "Diaphragm Pilot Operated" | 1064N/3# | | | | | | | | | | |
| | 1064N/4# | | | | | | | | | | |
| | 1068N/3# | 6,8 | 14,5 | 7,7 | 9,5 | 10,9 | 7,6 | 5,3 | 5,5 | 9,4 | 8,6 |
| | 1068N/M10# | | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | | |
| | 1068N/4# | | | | | | | | | | |
| | 1070N/4# | 18,7 | 40,0 | 21,1 | 26,2 | 29,9 | 21,0 | 14,6 | 15,1 | 26,0 | 23,7 |
| | 1070N/5# | 22,2 | 47,4 | 25,1 | 31,1 | 35,5 | 24,9 | 17,3 | 17,9 | 30,8 | 28,1 |
| | 1078N/M12# | | | | | | | | | | |
| | 1078N/4# | 18,7 | 40,0 | 21,1 | 26,2 | 29,9 | 21,0 | 14,6 | 15,1 | 26,0 | 23,7 |
| | 1078N/5# | 22,2 | 47,4 | 25,1 | 31,1 | 35,5 | 24,9 | 17,3 | 17,9 | 30,8 | 28,1 |
| | 1079N/7# | | | | | | | | | | |
| | 1090N/5# | 32,3 | 69,0 | 36,5 | 45,2 | 51,7 | 36,3 | 25,2 | 26,0 | 44,8 | 41,0 |
| | 1090N/6# | 40,8 | 87,2 | 46,1 | 57,1 | 65,3 | 45,8 | 31,9 | 32,9 | 56,6 | 51,7 |
| | 1098N/5# | 32,3 | 69,0 | 36,5 | 45,2 | 51,7 | 36,3 | 25,2 | 26,0 | 44,8 | 41,0 |
| | 1098N/6# | 40,8 | 87,2 | 46,1 | 57,1 | 65,3 | 45,8 | 31,9 | 32,9 | 56,6 | 51,7 |
| | 1098N/7# | | | | | | | | | | |
| | 1099N/9# | 48,5 | 103,5 | 54,7 | 67,8 | 77,5 | 54,4 | 37,8 | 39,0 | 67,3 | 61,4 |
| | 1078N/9# | | | | | | | | | | |
| | 1079N/11# | 85,0 | 181,6 | 96,0 | 119,0 | 136,0 | 95,4 | 66,4 | 68,5 | 118,0 | 107,8 |
| "Piston Pilot Operated" | 1034N/3# | | | | | | | | | | |
| | 1034N/4# | | | | | | | | | | |
| | 1038N/3# | 8,5 | 18,2 | 9,6 | 11,9 | 13,6 | 9,5 | 6,6 | 6,9 | 11,8 | 10,8 |
| | 1038N/M10# | | | | | | | | | | |
| | 1038N/M12# | | | | | | | | | | |
| | 1038N/4# | | | | | | | | | | |
| | 1040N/4# | 20,4 | 43,6 | 23,0 | 28,6 | 32,6 | 22,9 | 15,9 | 16,4 | 28,3 | 25,9 |
| | 1040N/5# | 25,5 | 54,5 | 28,8 | 35,7 | 40,8 | 28,6 | 19,9 | 20,6 | 35,4 | 32,3 |
| | 1048N/M12# | | | | | | | | | | |
| | 1048N/4# | 20,4 | 43,6 | 23,0 | 28,6 | 32,6 | 22,9 | 15,9 | 16,4 | 28,3 | 25,9 |
| | 1048N/5# | | | | | | | | | | |
| | 1049N/7# | 25,5 | 54,5 | 28,8 | 35,7 | 40,8 | 28,6 | 19,9 | 20,6 | 35,4 | 32,3 |
| | 1050N/5# | 32,3 | 69,0 | 36,5 | 45,2 | 51,7 | 36,3 | 25,2 | 26,0 | 44,8 | 41,0 |
| | 1050N/6# | 40,8 | 87,2 | 46,1 | 57,1 | 65,3 | 45,8 | 31,9 | 32,9 | 56,6 | 51,7 |
| | 1058N/5# | 32,3 | 69,0 | 36,5 | 45,2 | 51,7 | 36,3 | 25,2 | 26,0 | 44,8 | 41,0 |
| | 1058N/6# | 40,8 | 87,2 | 46,1 | 57,1 | 65,3 | 45,8 | 31,9 | 32,9 | 56,6 | 51,7 |
| | 1058N/7# | | | | | | | | | | |
| | 1059N/9# | 48,5 | 103,5 | 54,7 | 67,8 | 77,5 | 54,4 | 37,8 | 39,0 | 67,3 | 61,4 |
| | 1098N/9# | | | | | | | | | | |
| | 1099N/11# | 85,0 | 181,6 | 96,0 | 119,0 | 136,0 | 95,4 | 66,4 | 68,5 | 118,0 | 107,8 |
| | 1078NW/11# | | | | | | | | | | |
| | 1079NW/13# | 136,0 | 290,6 | 153,6 | 190,4 | 217,6 | 152,6 | 106,2 | 109,6 | 188,8 | 172,5 |
| | 1079NW/M42# | | | | | | | | | | |
| 1078NW/13# | | | | | | | | | | | |
| 1078NW/M42# | 212,5 | 454,0 | 240,0 | 297,5 | 340,0 | 238,5 | 166,0 | 171,3 | 295,0 | 269,5 | |
| 1079NW/17# | | | | | | | | | | | |

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continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 6: Refrigerant flow capacity of NC valves in hot gas line line [kW]

| Operating Principles | Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|--------------------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Direct Acting | 1020N/2# | 1,34 | 1,75 | 2,68 | 2,70 | 1,42 | 2,23 | 1,13 | 1,30 | 2,52 |
| | 1020N/3# | 1,76 | 2,30 | 3,52 | 3,55 | 1,87 | 2,93 | 1,49 | 1,71 | 3,31 |
| | 1028N/2# | 1,15 | 1,50 | 2,30 | 2,31 | 1,22 | 1,91 | 0,97 | 1,12 | 2,16 |
| | 1028N/2#.E | 1,76 | 2,30 | 3,52 | 3,55 | 1,87 | 2,93 | 1,49 | 1,71 | 3,31 |
| | 1028N/3# | | | | | | | | | |
| | 1028N/M10# | | | | | | | | | |
| 1064N/3# | | | | | | | | | | |
| Diaphragm Pilot Operated | 1064N/4# | 6,1 | 8,0 | 12,2 | 12,3 | 6,5 | 10,2 | 5,2 | 6,0 | 11,5 |
| | 1068N/3# | | | | | | | | | |
| | 1068N/M10# | | | | | | | | | |
| | 1068N/M12# | | | | | | | | | |
| | 1068N/4# | | | | | | | | | |
| | 1070N/4# | | | | | | | | | |
| | 1070N/5# | 16,8 | 22,0 | 33,7 | 33,9 | 17,9 | 28,1 | 14,2 | 16,4 | 31,7 |
| | 1078N/M12# | 20,0 | 26,0 | 39,9 | 40,3 | 21,2 | 33,3 | 16,9 | 19,4 | 37,6 |
| | 1078N/4# | 16,8 | 22,0 | 33,7 | 33,9 | 17,9 | 28,1 | 14,2 | 16,4 | 31,7 |
| | 1078N/5# | 20,0 | 26,0 | 39,9 | 40,3 | 21,2 | 33,3 | 16,9 | 19,4 | 37,6 |
| | 1079N/7# | 29,1 | 37,9 | 58,1 | 58,6 | 30,9 | 48,5 | 24,5 | 28,3 | 54,7 |
| | 1090N/5# | 36,7 | 47,9 | 73,4 | 74,1 | 39,1 | 61,2 | 31,0 | 35,7 | 69,1 |
| | 1090N/6# | 29,1 | 37,9 | 58,1 | 58,6 | 30,9 | 48,5 | 24,5 | 28,3 | 54,7 |
| | 1098N/5# | 36,7 | 47,9 | 73,4 | 74,1 | 39,1 | 61,2 | 31,0 | 35,7 | 69,1 |
| | 1098N/6# | 43,6 | 56,9 | 87,2 | 88,0 | 46,4 | 72,7 | 36,8 | 42,4 | 82,1 |
| | 1098N/7# | 76,5 | 99,8 | 153,0 | 154,3 | 81,4 | 127,6 | 64,6 | 74,4 | 144,0 |
| | 1099N/9# | | | | | | | | | |
| | 1078N/9# | | | | | | | | | |
| | 1079N/11# | 7,7 | 10,0 | 15,3 | 15,4 | 8,1 | 12,8 | 6,5 | 7,4 | 14,4 |
| Piston Pilot Operated | 1034N/3# | 18,4 | 24,0 | 36,7 | 37,0 | 19,5 | 30,6 | 15,5 | 17,9 | 34,6 |
| | 1034N/4# | | | | | | | | | |
| | 1038N/3# | | | | | | | | | |
| | 1038N/M10# | | | | | | | | | |
| | 1038N/M12# | | | | | | | | | |
| | 1038N/4# | | | | | | | | | |
| | 1040N/4# | 23,0 | 29,9 | 45,9 | 46,3 | 24,4 | 38,3 | 19,4 | 22,3 | 43,2 |
| | 1040N/5# | 18,4 | 24,0 | 36,7 | 37,0 | 19,5 | 30,6 | 15,5 | 17,9 | 34,6 |
| | 1048N/M12# | 23,0 | 29,9 | 45,9 | 46,3 | 24,4 | 38,3 | 19,4 | 22,3 | 43,2 |
| | 1048N/4# | | | | | | | | | |
| | 1048N/5# | | | | | | | | | |
| | 1049N/7# | 29,1 | 37,9 | 58,1 | 58,6 | 30,9 | 48,5 | 24,5 | 28,3 | 54,7 |
| | 1050N/5# | 36,7 | 47,9 | 73,4 | 74,1 | 39,1 | 61,2 | 31,0 | 35,7 | 69,1 |
| | 1050N/6# | 29,1 | 37,9 | 58,1 | 58,6 | 30,9 | 48,5 | 24,5 | 28,3 | 54,7 |
| | 1058N/5# | 36,7 | 47,9 | 73,4 | 74,1 | 39,1 | 61,2 | 31,0 | 35,7 | 69,1 |
| | 1058N/6# | 43,6 | 56,9 | 87,2 | 88,0 | 46,4 | 72,7 | 36,8 | 42,4 | 82,1 |
| | 1058N/7# | 76,5 | 99,8 | 153,0 | 154,3 | 81,4 | 127,6 | 64,6 | 74,4 | 144,0 |
| | 1059N/9# | | | | | | | | | |
| | 1098N/9# | | | | | | | | | |
| | 1099N/11# | 122,4 | 159,7 | 244,8 | 246,9 | 130,2 | 204,2 | 103,4 | 119,0 | 230,4 |
| 1078NW/11# | 191,3 | 249,5 | 382,5 | 385,8 | 203,5 | 319,0 | 161,5 | 186,0 | 360,0 | |
| 1079NW/13# | | | | | | | | | | |
| 1079NW/M42# | | | | | | | | | | |
| 1078NW/13# | | | | | | | | | | |
| 1078NW/M42# | | | | | | | | | | |
| 1079NW/17# | | | | | | | | | | |

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| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

SOLENOID VALVES

2.2 – NORMALLY CLOSED PULSE SOLENOID VALVES

APPLICATION

The normally closed pulse solenoid valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves are designed for applications that require a solenoid valve that cycles at high frequencies for a short period, to accurately maintain the regulated temperature of the refrigeration fluid. The NC pulse solenoid valves are suitable to be installed on the oil line of a refrigeration systems. They regulate the passage of oil from the separator to the compressor crankcase and they can also be used to inject oil into screw compressors. These valves can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! The solenoid valves illustrated in this chapter cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

A normally closed valves (NC) means that:

- when the coil is not energised, the plunger closes the fluid flow
- when the coil is energised, the plunger opens the valve seat connecting the inlet to the outlet.

The pulse solenoid valves are exclusively sold without coil (with the S suffix). For these valves are available:

- Coils in series 9110 (coils type CM2)
- Coils in series 9300 (coils type HF2)
- Coils in series 9320 (coils type HF3)
- Coils in series 9360 (coils type HF4)

The valves series 1328N are direct acting valves. Their operation depends only on the magnetic field produced by the current flow into the coil. Opening/closing of main valve seat, the only seat, is directly controlled by the mobile plunger.

These valves can work with zero pressure differential.

The valves in series 1338N, 1348N, 1358N are pilot-operated piston solenoid valves. Their operation depends not only on the

magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the piston and keep it lifted off the main opening
 - close the piston and ensure the tightness on the main opening
- Opening/closing of main valve seat is controlled by the piston, while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

CONSTRUCTION

The NC pulse solenoid valves are equipped with a specific reinforced magnetic unit (mobile plunger + valve sleeve for holding it), specifically designed to guarantee a very high number of work cycles compared to a normal NC solenoid valve.

The main parts of the solenoid valves described in this chapter are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Austenitic stainless steel EN 10088-3 – 1.4305 for mobile plunger valve sleeve
- Ferritic stainless steel EN 10088-3 – 1.4105 for the fixed and mobile plungers
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

INSTALLATION

The valve series 1328N, 1338N, 1348N, 1358N can be used as:

- hot gas by-pass valve between the high and the low pressure sides of a system
- liquid injection valve
- oil valve

within the limits of use indicated in TABLE 7 and the capacities indicated in TABLES 9 and 10.

TABLE 7 shows the following functional characteristics of a solenoid valve:

- Connection dimensions
- PS: maximum allowable pressure of the refrigerant
- TS: maximum / minimum allowable temperature of the refrigerant
- Kv: discharge factor
- minOPD: minimum Opening Pressure Differential. This is the minimum pressure differential between inlet and outlet at which a pilot-operated solenoid valve can open and stay opened or close and maintain the seal.
- MOPD: maximum Opening Pressure Differential according



Castel ITALY
Type
HF2
220-230 V~
50-60 Hz
8W CL-H
TA 50 °C



to AHRI STANDARD 760 : 2014. This is the maximum pressure differential between inlet and outlet at which a solenoid valve can open.

– No. of Cycles: useful operational life expected for the valve expressed in the number of operating cycles, considering a complete cycle consisting of an opening and successive closing of the valve.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. In fact, valves with P.T.F.E. gaskets, and particularly piston valves, are sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body. All the valves can be mounted in any position so long as the coil does not point downwards. The brazing of valves with solder connections should be carried out with care, using a low melting point filler material. It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

Before connecting a valve to the electrical system, be sure that the line voltage and frequency correspond to the values marked on the coil.

TRACEABILITY

A laser marking on the valve enclosure of the mobile plunger identifies:

- Direct action valves in series 1328N
- Pilot-operated piston valves in series 1338N, 1348N

This laser marking includes the following data: valve code, refrigerants, PS, TS and batch number.

All the other pilot-operated piston valves are identified by a plastic label fit on the valve enclosure of the mobile plunger (under the coil when indicated). This label includes the following data: valve code, refrigerants, PS, TS and batch number.

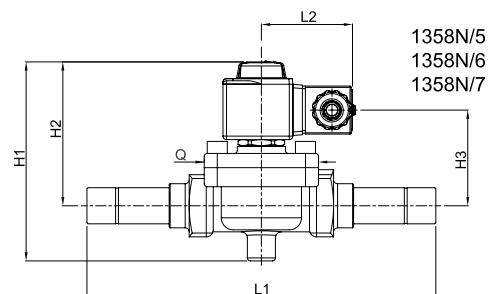
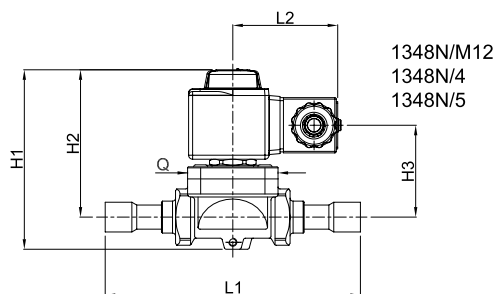
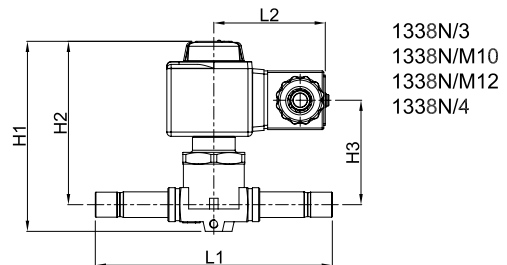
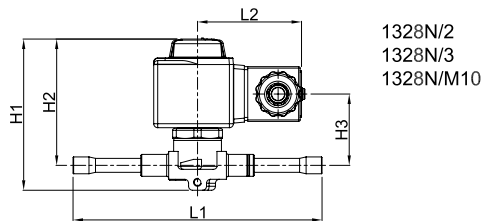


TABLE 7: General Characteristics of NC pulse valves with ODS connections

| Operating Principles | Catalogue Number | Connections ODS | | Seat size nominal Ø [mm] | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | | | | PS [bar] | TS [°C] | | Cycles No min | Risk Category according to PED Recast | |
|-----------------------|------------------|-----------------|----|--------------------------|-------------------------------|-------------------------------------|-----------------|-----------|-----------|-----------------|----------|---------|------|---------------|---------------------------------------|-----------|
| | | | | | | min OPD | MOPD | | | | | min. | max. | | | |
| | | | | | | | AC coils series | | | DC coils series | | | | | | |
| | | | | | | | 9110 9300 | 9160 9360 | 9120 9320 | 9160 9360 | | | | | | 9120 9320 |
| Direct Acting | 1328N/2S020 | 1/4" | – | 2,2 | 0,15 | 0 | 28 | 30 | 35 | | 21 | 50 | –40 | +150 | 6.000.000 | Art. 4.3 |
| | 1328N/2S030 | 1/4" | – | 3 | 0,23 | | 18 | 21 | 25 | | 18 | | | | | |
| | 1328N/3S020 | 3/8" | – | 2,2 | 0,15 | | 28 | 30 | 35 | | 21 | | | | | |
| | 1328N/3S030 | 3/8" | – | 3 | 0,23 | | 18 | 21 | 25 | | 18 | | | | | |
| | 1328N/M10S020 | – | 10 | 2,2 | 0,15 | | 28 | 30 | 35 | | 21 | | | | | |
| | 1328N/M10S030 | – | 10 | 3 | 0,23 | | 18 | 21 | 25 | | 18 | | | | | |
| Piston Pilot Operated | 1338N/3S065 | 3/8" | – | 6,5 | 1,0 | 0,05 | 21 | 28 | 35 | | 18 | 50 | –40 | +150 | 6.000.000 | Art. 4.3 |
| | 1338N/M10S065 | – | 10 | | | | | | | | | | | | | |
| | 1338N/M12S065 | – | 12 | | | | | | | | | | | | | |
| | 1338N/4S065 | 1/2" | – | | | | | | | | | | | | | |
| | 1348N/M12S125 | – | 12 | 12,5 | 2,4 | 0,07 | 21 | 28 | 35 | | 18 | | | | | |
| | 1348N/4S125 | 1/2" | – | | | | | | | | | | | | | |
| | 1348N/5S125 | 5/8" | 16 | 16,5 | 3,0 | 0,07 | 21 | 28 | 35 | | 16 | | | | | |
| | 1358N/5S165 | 5/8" | 16 | | | | | | | | | | | | | |
| | 1358N/6S165 | 3/4" | – | 16,5 | 4,8 | 0,07 | 21 | 28 | 35 | | 16 | | | | | |
| | 1358N/7S165 | 7/8" | 22 | | | | | | | | | 16,5 | 5,7 | 0,07 | 21 | 28 |

(1) : for use on the oil line TS = -10 / +70 °C

TABLE 8: Dimensions and weights of NC valves with 9300 coils (1)

| Operating Principles | Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|-----------------------|------------------|-----------------|------|------|-----|----|----|------------|
| | | H1 | H2 | H3 | L1 | L2 | Q | |
| Direct Acting | 1328N/2S020 | 75 | 62,5 | 34 | 125 | 52 | – | 350 |
| | 1328N/2S030 | | | | | | | |
| | 1328N/3S020 | | | | | | | |
| | 1328N/3S030 | | | | | | | |
| | 1328N/M10S020 | | | | | | | |
| | 1328N/M10S030 | | | | | | | |
| Piston Pilot Operated | 1338N/3S065 | 92,5 | 80 | 50,5 | 111 | 52 | – | 440 |
| | 1338N/M10S065 | | | | 127 | | | |
| | 1338N/M12S065 | | | | | | | |
| | 1338N/4S065 | | | | | | | |
| | 1348N/M12S125 | 100,5 | 84,5 | 56,5 | 127 | – | 45 | 759 |
| | 1348N/4S125 | | | | 175 | | | 748 |
| | 1348N/5S125 | | | | | | | 853 |
| | 1358N/5S165 | 121 | 93 | 65 | 175 | – | 57 | 1117 |
| | 1358N/6S165 | | | | 180 | | | 1307 |
| | 1358N/7S165 | | | | | | | 1292 |

(1) : With coil 9360 the dimension L2 is equal to 57 mm and the weights must be increased of 240 g.

(1) : With coil 9320 the dimension L2 is equal to 65 mm and the weights must be increased of 500 g.

Connectors are not included in the boxes and have to be ordered separately

TABLE 9: Refrigerant flow capacity of NC pulse valves in liquid line [kW]

| Operating Principles | Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------|-------|------|-------|-------|-------|------|---------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| Direct Acting | 1328N/2S020 | 2,55 | 3,77 | 1,79 | 2,58 | 2,58 | 1,73 | 1,89 | 2,26 | 2,35 | 2,36 | 2,39 | 1,82 | 3,01 | 3,07 | 2,18 | 3,06 | 3,59 | 3,18 | 3,18 | | | | | | | | | | | | | | | | | | | |
| | 1328N/2S030 | 3,91 | 5,78 | 2,74 | 3,96 | 3,95 | 2,65 | 2,89 | 3,46 | 3,60 | 3,62 | 3,66 | 2,79 | 4,61 | 4,71 | 3,35 | 4,69 | 5,50 | 4,88 | 4,88 | | | | | | | | | | | | | | | | | | | |
| | 1328N/3S020 | 2,55 | 3,77 | 1,79 | 2,58 | 2,58 | 1,73 | 1,89 | 2,26 | 2,35 | 2,36 | 2,39 | 1,82 | 3,01 | 3,07 | 2,18 | 3,06 | 3,59 | 3,18 | 3,18 | | | | | | | | | | | | | | | | | | | |
| | 1328N/3S030 | 3,91 | 5,78 | 2,74 | 3,96 | 3,95 | 2,65 | 2,89 | 3,46 | 3,60 | 3,62 | 3,66 | 2,79 | 4,61 | 4,71 | 3,35 | 4,69 | 5,50 | 4,88 | 4,88 | | | | | | | | | | | | | | | | | | | |
| | 1328N/M10S020 | 2,55 | 3,77 | 1,79 | 2,58 | 2,58 | 1,73 | 1,89 | 2,26 | 2,35 | 2,36 | 2,39 | 1,82 | 3,01 | 3,07 | 2,18 | 3,06 | 3,59 | 3,18 | 3,18 | | | | | | | | | | | | | | | | | | | |
| | 1328N/M10S030 | 3,91 | 5,78 | 2,74 | 3,96 | 3,95 | 2,65 | 2,89 | 3,46 | 3,60 | 3,62 | 3,66 | 2,79 | 4,61 | 4,71 | 3,35 | 4,69 | 5,50 | 4,88 | 4,88 | | | | | | | | | | | | | | | | | | | |
| Piston Pilot Operated | 1338N/3S065 | 17,0 | 25,1 | 11,9 | 17,2 | 17,2 | 11,5 | 12,6 | 15,0 | 15,7 | 15,7 | 15,9 | 12,1 | 20,1 | 20,5 | 14,6 | 20,4 | 23,9 | 21,2 | 21,2 | | | | | | | | | | | | | | | | | | | |
| | 1338N/M10S065 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1338N/M12S065 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1338N/4S065 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1348N/M12S125 | 40,8 | 60,3 | 28,6 | 41,4 | 41,2 | 27,6 | 30,2 | 36,1 | 37,6 | 37,7 | 38,2 | 29,1 | 48,1 | 49,1 | 34,9 | 48,9 | 57,4 | 50,9 | 50,9 | | | | | | | | | | | | | | | | | | | |
| | 1348N/4S125 | 51,0 | 75,4 | 35,7 | 51,7 | 51,5 | 34,5 | 37,7 | 45,1 | 47,0 | 47,2 | 47,7 | 36,4 | 60,2 | 61,4 | 43,7 | 61,1 | 71,7 | 63,6 | 63,6 | 63,6 | | | | | | | | | | | | | | | | | | |
| | 1358N/5S165 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1358N/6S165 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1358N/7S165 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1358N/5S165 | 64,6 | | | | | | | | | | | | | | | | | | | | | 95,5 | 45,2 | 65,5 | 65,2 | 43,7 | 47,8 | 57,2 | 59,5 | 59,7 | 60,5 | 46,1 | 76,2 | 77,7 | 55,3 | 77,4 | 90,8 | 80,6 | 80,6 |
| 1358N/6S165 | 81,6 | | | | | | | | | | | | | | | | | | | | | 120,6 | 57,1 | 82,7 | 82,4 | 55,2 | 60,4 | 72,2 | 75,1 | 75,5 | 76,4 | 58,2 | 96,2 | 98,2 | 69,9 | 97,8 | 114,7 | 101,8 | 101,8 |
| 1358N/7S165 | 96,9 | 143,2 | 67,8 | 98,2 | 97,9 | 65,6 | 71,7 | 85,7 | 89,2 | 89,6 | 90,7 | 69,1 | 114,3 | 116,6 | 83,0 | 116,2 | 136,2 | 120,8 | 120,8 | | | | | | | | | | | | | | | | | | | | |

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Temperature leaving evaporator | 50 °F | (9,9 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 10: Refrigerant flow capacity of NC pulse valves in hot gas line [kW]

| Operating Principles | Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|-----------------------|------------------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|
| Direct Acting | 1328N/2S020 | 1,28 | 2,72 | 1,44 | 1,79 | 2,04 | 1,43 | 1,00 | 1,03 | 1,77 | 1,62 | 1,15 | 1,50 | 2,30 | 2,31 | 1,22 | 1,91 | 0,97 | 1,12 | 2,16 |
| | 1328N/2S030 | 1,96 | 4,18 | 2,21 | 2,74 | 3,13 | 2,19 | 1,53 | 1,58 | 2,71 | 2,48 | 1,76 | 2,30 | 3,52 | 3,55 | 1,87 | 2,93 | 1,49 | 1,71 | 3,31 |
| | 1328N/3S020 | 1,28 | 2,72 | 1,44 | 1,79 | 2,04 | 1,43 | 1,00 | 1,03 | 1,77 | 1,62 | 1,15 | 1,50 | 2,30 | 2,31 | 1,22 | 1,91 | 0,97 | 1,12 | 2,16 |
| | 1328N/3S030 | 1,96 | 4,18 | 2,21 | 2,74 | 3,13 | 2,19 | 1,53 | 1,58 | 2,71 | 2,48 | 1,76 | 2,30 | 3,52 | 3,55 | 1,87 | 2,93 | 1,49 | 1,71 | 3,31 |
| | 1328N/M10S020 | 1,28 | 2,72 | 1,44 | 1,79 | 2,04 | 1,43 | 1,00 | 1,03 | 1,77 | 1,62 | 1,15 | 1,50 | 2,30 | 2,31 | 1,22 | 1,91 | 0,97 | 1,12 | 2,16 |
| | 1328N/M10S030 | 1,96 | 4,18 | 2,21 | 2,74 | 3,13 | 2,19 | 1,53 | 1,58 | 2,71 | 2,48 | 1,76 | 2,30 | 3,52 | 3,55 | 1,87 | 2,93 | 1,49 | 1,71 | 3,31 |
| Piston Pilot Operated | 1338N/3S065 | 8,5 | 18,2 | 9,6 | 11,9 | 13,6 | 9,5 | 6,6 | 6,9 | 11,8 | 10,8 | 7,7 | 10,0 | 15,3 | 15,4 | 8,1 | 12,8 | 6,5 | 7,4 | 14,4 |
| | 1338N/M10S065 | | | | | | | | | | | | | | | | | | | |
| | 1338N/M12S065 | | | | | | | | | | | | | | | | | | | |
| | 1338N/4S065 | | | | | | | | | | | | | | | | | | | |
| | 1348N/M12S125 | 20,4 | 43,6 | 23,0 | 28,6 | 32,6 | 22,9 | 15,9 | 16,4 | 28,3 | 25,9 | 18,4 | 24,0 | 36,7 | 37,0 | 19,5 | 30,6 | 15,5 | 17,9 | 34,6 |
| | 1348N/4S125 | 25,5 | 54,5 | 28,8 | 35,7 | 40,8 | 28,6 | 19,9 | 20,6 | 35,4 | 32,3 | 23,0 | 29,9 | 45,9 | 46,3 | 24,4 | 38,3 | 19,4 | 22,3 | 43,2 |
| | 1348N/5S125 | | | | | | | | | | | | | | | | | | | |
| | 1358N/5S165 | | | | | | | | | | | | | | | | | | | |
| | 1358N/6S165 | | | | | | | | | | | | | | | | | | | |
| | 1358N/7S165 | 48,5 | 103,5 | 54,7 | 67,8 | 77,5 | 54,4 | 37,8 | 39,0 | 67,3 | 61,4 | 43,6 | 56,9 | 87,2 | 88,0 | 46,4 | 72,7 | 36,8 | 42,4 | 82,1 |

Standard rating conditions according to AHRI Standard 760-2014

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

SOLENOID VALVES

2.3 – NORMALLY CLOSED SOLENOID VALVES, ATEX – CERTIFIED

APPLICATION

The “ATEX-Certified” solenoid valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

The solenoid valves with an “EX” suffix (1028EX, 1068EX, 1078EX, 1079EX, 1098EX, 1099EX) comply with the European Standards EN 80079-36:2016, EN 80079-37:2016 and, therefore, comply with the ESR of Directive 2014/34/EU – ATEX. This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” risk of explosion, according to the definition in Annex I of Directive 1999/92/EC.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! The solenoid valves illustrated in this chapter cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

A normally closed valves (NC) means that:

- when the coil is not energised, the plunger closes the fluid flow
- when the coil is energised, the plunger opens the valve seat connecting the inlet to the outlet.

The “ATEX” valves are sold only in the version with coil series 9100EX (A6 suffix with coil, 9100EX-220/230 VAC, ATEX certified).

For these solenoid valves are available:

- Coils in series 9100EX (coils type HM2)
- Coils in series 9110EX (coils type CM2)

The coils in series 9100EX and 9110EX must be coupled only with connectors 9150EX/R02. The protection rating guaranteed by the coil + connector system is IP65 according to the EN 60529 standard.

The valves in series 1028EX are direct acting valves. Their operation depends only on the magnetic field produced by the current flow

into the coil. Opening/closing of main valve seat, the only seat, is directly controlled by the mobile plunger.

These valves can work with zero pressure differential.

The valves in series 1068EX, 1078EX, 1079EX, 1098EX/7, 1099EX/9 are pilot-operated solenoid valves (diaphragm or piston). Their operation depends not only on the magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the diaphragm/piston and keep it lifted off the main opening
- close the diaphragm/piston and ensure the tightness on the main opening

Opening/closing of main valve seat is controlled by the diaphragm/piston while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

CONSTRUCTION

The main parts of the valves are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Austenitic stainless steel EN 10088-2 – 1.4303 for enclosure where the plunger moves
- Ferritic stainless steel EN 10088-3 – 1.4105 for the plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

The valves with an “EX” suffix are also equipped with:

- Identification label for compliance of the valve to the ATEX Directive.
- Operating instructions regarding installation of the valve in areas classified as at risk of explosion.
- Operating instructions regarding installation of the coil in areas classified as at risk of explosion.

INSTALLATION

The valves in series 1028EX, 1068EX, 1078EX, 1079EX, 1098EX, 1099EX can be installed on the three main branches of a system (hot gas line, liquid line, and suction line), while respecting the limits of use and the capacities indicated in TABLE 11.

TABLE 11 shows the following functional characteristics of a solenoid valve:



Castel ITALY
Type H82
230/230 V ~
50-60 Hz
IMQ 13 ATEX 002 X
Ex mc II C T3 Gc II 30D
Ex mc IIC T1 100°C Dc IP65
Temp. -20/+80°C
Icc=1500 A
In=85mA
CE

WARNING
POTENTIAL ELECTROSTATIC
CHARGING HAZARD.
INSTALLATION SHALL BE
PERFORMED IN ORDER
TO GIVE MECHANICAL
PROTECTION TO
ELECTRICAL CONNECTOR.
INSTALLATION WITH
SUITABLE CABLE UP TO 75°C.
SEE INSTRUCTIONS.

- Connections
- PS: maximum allowable pressure
- TS: maximum / minimum allowable temperature
- Kv: discharge factor
- minOPD: minimum Opening Pressure Differential. This is the minimum pressure differential between inlet and outlet at which a pilot-operated solenoid valve can open and stay opened or close and maintain the seal.
- MOPD: maximum Opening Pressure Differential according to AHRI STANDARD 760 : 2014. This is the maximum pressure differential between inlet and outlet at which a solenoid valve can open.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. In fact, valves with P.T.F.E. gaskets, and particularly piston valves, are sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body. All the valves can be mounted in any position so long as the coil does not point downwards. The brazing of valves with solder connections should be carried out with care, using a low melting point filler material. It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

Before connecting a valve to the electrical system, be sure that the line voltage and frequency correspond to the values marked on the coil.

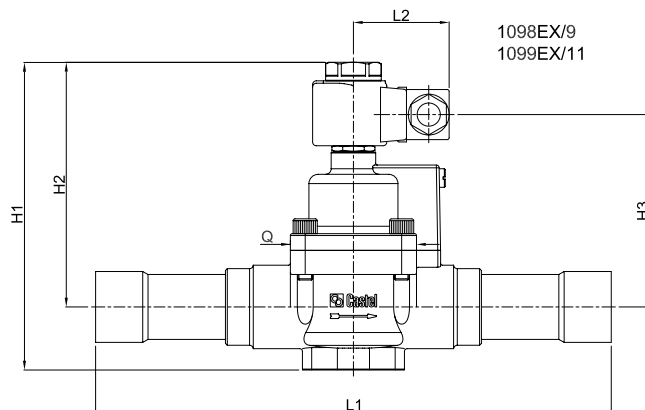
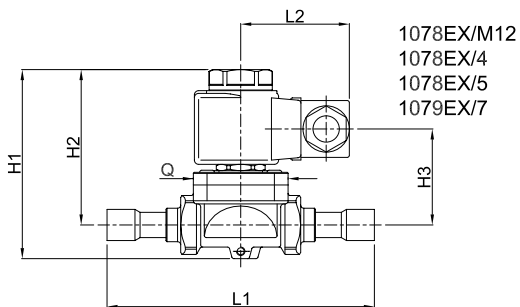
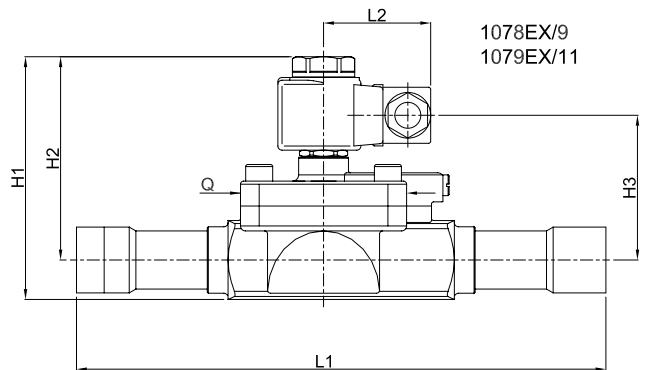
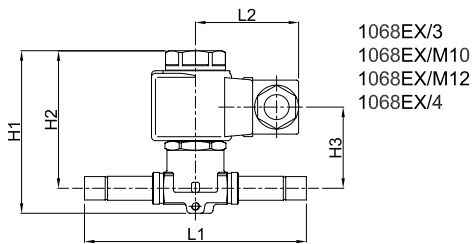
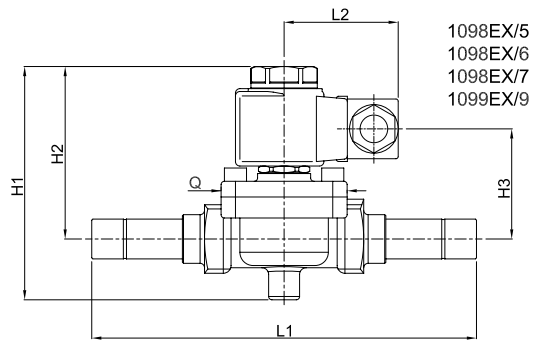
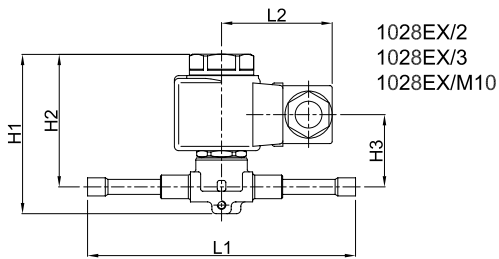
TABLE 11: General characteristics of NC valves - ATEX conformity for use in EX Zone 2

| Operating Principles | Catalogue Number | Connections ODS | | Seat size nominal Ø [mm] | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|--------------------------|------------------|-----------------|--------|--------------------------|-------------------------------|-------------------------------------|------|----------|---------|------|---------------------------------------|
| | | Ø [in.] | Ø [mm] | | | min OPD | MOPD | | min. | max. | |
| Direct Acting | 1028EX/2A6 | 1/4" | – | 2,2 | 0,15 | 0 | 21 | 50 | –40 | +130 | Art. 4.3 |
| | 1028EX/2A6.E | 1/4" | – | 3 | 0,23 | | | | | | |
| | 1028EX/3A6 | 3/8" | – | | | | | | | | |
| | 1028EX/M10A6 | – | 10 | | | | | | | | |
| Diaphragm Pilot Operated | 1068EX/3A6 | 3/8" | – | 6,5 | 0,8 | 0,05 | 21 | 50 | –40 | +120 | Art. 4.3 |
| | 1068EX/M10A6 | – | 10 | | | | | | | | |
| | 1068EX/M12A6 | – | 12 | | | | | | | | |
| | 1068EX/4A6 | 1/2" | – | | | | | | | | |
| | 1078EX/M12A6 | – | 12 | 12,5 | 2,2 | | | | | | |
| | 1078EX/4A6 | 1/2" | – | | | | | | | | |
| | 1078EX/5A6 | 5/8" | 16 | | | | | | | | |
| | 1079EX/7A6 | 7/8" | 22 | 16,5 | 5,7 | | | | | | |
| | 1098EX/7A6 | 7/8" | 22 | | | | | | | | |
| | 1099EX/9A6 | 1.1/8" | – | 25,5 | 10 | | | | | | |
| | 1078EX/9A6 | 1.1/8" | – | | | | | | | | |
| 1079EX/11A6 | 1.3/8" | 35 | | | | | | | | | |
| Piston Pilot Operated | 1098EX/9A6 | 1.1/8" | – | 25 | 10 | 0,1 | 21 | 50 | –40 | +130 | Art. 4.3 |
| | 1099EX/11A6 | 1.3/8" | 35 | | | | | | | | |

TABLE 12: Dimensions and weights of NC valves - ATEX conformity for use in EX Zone 2

| Operating Principles | Catalogue Number | Dimensions [mm] | | | | | | Weight [g] | |
|--------------------------|------------------|-----------------|------|----|-----|----|----|------------|------|
| | | H1 | H2 | H3 | L1 | L2 | Q | | |
| Direct Acting | 1028EX/2A6 | 75 | 62,5 | 34 | 125 | 52 | - | 350 | |
| | 1028EX/2A6.E | | | | 125 | | | | |
| | 1028EX/3A6 | | | | 125 | | | | |
| | 1028EX/M10A6 | | | | 125 | | | | |
| Diaphragm Pilot Operated | 1068EX/3A6 | 82 | 69,5 | 40 | 111 | 52 | - | 400 | |
| | 1068EX/M10A6 | | | | 111 | | | 395 | |
| | 1068EX/M12A6 | | | | 127 | | | 420 | |
| | 1068EX/4A6 | | | | 127 | | | 420 | |
| | 1078EX/M12A6 | 91 | 75 | 47 | 127 | | | 45 | 690 |
| | 1078EX/4A6 | | | | 127 | | | | 680 |
| | 1078EX/5A6 | | | | 175 | | | | 775 |
| | 1079EX/7A6 | | | | 190 | | | | 765 |
| | 1098EX/7A6 | 106 | 78 | 50 | 180 | | | 57 | 1170 |
| | 1099EX/9A6 | | | | 216 | | | | 1225 |
| | 1078EX/9A6 | | | | 250 | | | | 2565 |
| | 1079EX/11A6 | 115 | 96 | 72 | 292 | | | 80 | 2620 |
| | 1098EX/9A6 | | | | 235 | | | | 2050 |
| Piston Pilot Operated | 1099EX/11A6 | 157 | 127 | 99 | 277 | 52 | 60 | 2130 | |

Connectors are not included in the boxes and have to be ordered separately



SOLENOID VALVES

2.4 – NORMALLY OPEN SOLENOID VALVES

APPLICATION

The normally open solenoid valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! The solenoid valves illustrated in this chapter cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

A normally open valves (NO) means that:

- when the coil is not energised, the plunger opens the fluid flow
- when the coil is energized, the plunger closes the fluid flow.

The NO solenoid valves are exclusively sold without coil (with the S suffix).

N.B. The NO valves have been designed to work only with direct current coils; therefore, they can be used solely with coils 9120/RD1 (HM3 type – 12 VDC) , 9120/RD2 (HM3 type – 24 VDC) , 9120/RD4 (HM3 type – 48 VDC). For applications with 220/230 VAC power supply, it is mandatory to couple the NO valves with the following components: Coil 9120/RD6 (HM3 types - 220 VRAC) + Connector/Rectifier 9150/R45 or 9150/R90.

NO solenoid valves cannot be coupled with coils series 9110, 9120/RA6, 9160, 9300, 9320 and 9360.

N.B.: the NO valve visually differs from the corresponding NC model by means of a red ring installed below the yellow nut that fastens the coil.

The NO valves are pilot-operated valves (diaphragm or pilot operated). Their operation depends not only on the magnetic field produced by the current flow into the coil, but also on a minimum inlet pressure, which is necessary to:

- open the diaphragm/piston and keep it lifted off the main opening
- close the diaphragm/piston and ensure the tightness on the main opening

Opening/closing of main valve seat is controlled by the diaphragm/piston while opening/closing of pilot seat is controlled by the mobile plunger of the coil.

These valves cannot work with zero differential pressure.

CONSTRUCTION

The main parts of the solenoid valves described in this chapter are constructed with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Austenitic stainless steel EN 10088-2 – 1.4303 for enclosure where the plunger moves
- Ferritic stainless steel EN 10088-3 – 1.4105 for the plunger
- Austenitic stainless steel EN ISO 3506 – A2-70 for tightening screws between body and cover.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for seat gaskets

INSTALLATION

The valves can be installed on the three main branches of a plant (hot gas line, liquid line, and suction line), while respecting the limits of use indicated in TABLES 13 and 14.

TABLES 13 and 14 show the following functional characteristics of a solenoid valve:

- Connection dimensions
- PS: maximum allowable pressure of the refrigerant
- TS: maximum / minimum allowable temperature of the refrigerant
- Kv: discharge factor
- minOPD: minimum Opening Pressure Differential. This is the minimum pressure differential between inlet and outlet at which a pilot-operated solenoid valve can open and stay opened or close and maintain the seal.
- MOPD: maximum Opening Pressure Differential according to AHRI STANDARD 760 : 2014. This is the maximum pressure differential between inlet and outlet at which a solenoid valve can open.

Before connecting the valve to the pipe, it is advisable to make sure that the refrigerating system is clean. In fact, valves with P.T.F.E. gaskets, and particularly piston valves, are sensitive to dirt and debris. Furthermore, check that the flow direction in the pipe corresponds to the arrow stamped on the valve body. All the valves



can be mounted in any position so long as the coil does not point downwards. The brazing of valves with solder connections should be carried out with care, using a low melting point filler material. It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

Before connecting a valve to the electrical system, be sure that the line voltage and frequency correspond to the values marked on the coil.

TRACEABILITY

A laser marking on the valve enclosure of the mobile plunger identifies:

- Pilot-operated piston valves in series 1134N, 1138N, 1140N, 1148N
- Pilot-operated diaphragm valves in series 1164N, 1168N, 1170N, 1178N, up to 1078/5

This laser marking includes the following data: valve code, refrigerants, PS, TS and batch number.

All the other pilot-operated valves (diaphragm and piston) are identified by a plastic label fit on the valve enclosure of the mobile plunger (under the coil when indicated). This label includes the following data: valve code, refrigerants, PS, TS and batch number.

TABLE 13: General characteristics of NO valves with SAE Flare connections

| Operating Principles | Catalogue Number | SAE Flare Connections | Seat size nominal Ø [mm] | Kv Factor [m ³ /h] | Opening Pressure Differential [bar] | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|--------------------------|------------------|-----------------------|--------------------------|-------------------------------|-------------------------------------|-------------------------------|---------|----------|---------|------|---------------------------------------|
| | | | | | min OPD | MOPD coils series 9320 / 9120 | | | min. | max. | |
| | | | | | | RD6 | RD1 RD2 | | | | |
| Diaphragm Pilot Operated | 1164N/3S | 3/8" | 6,5 | 0,8 | 0,05 | 21 | 15 | 50 | -40 | +120 | Art. 4.3 |
| | 1170N/4S | 1/2" | 12,5 | 2,2 | | 30 | 30 | | | | |
| | 1170N/5S | 5/8" | | 2,61 | | | | | | | |
| | 1190N/5S | 5/8" | 16,5 | 3,8 | | | | | | | |
| | 1190N/6S | 3/4" | | 4,8 | | | | | | | |
| Piston Pilot Operated | 1134N/3S | 3/8" | 6,5 | 1,0 | 0,05 | | | 30 | 30 | 50 | -40 |
| | 1140N/4S | 1/2" | 12,5 | 2,4 | 0,07 | | | | | | |
| | 1140N/5S | 5/8" | | 3,0 | | | | | | | |
| | 1150N/5S | 5/8" | 16,5 | 3,8 | | | | | | | |
| | 1150N/6S | 3/4" | | 4,8 | | | | | | | |

TABLE 14: General characteristics of NO valves with ODS connections

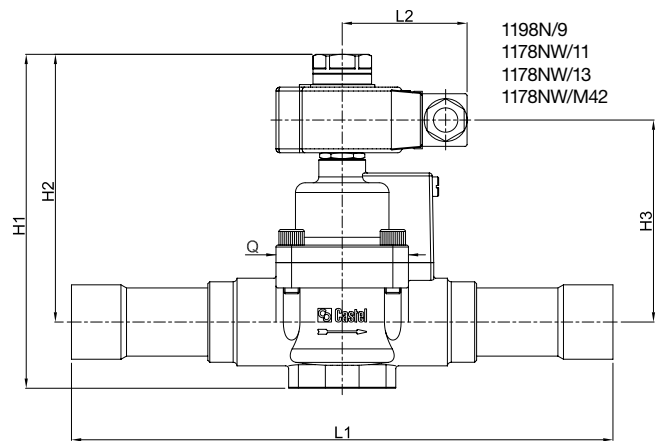
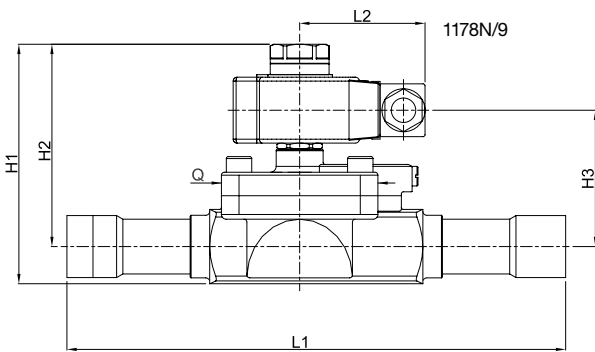
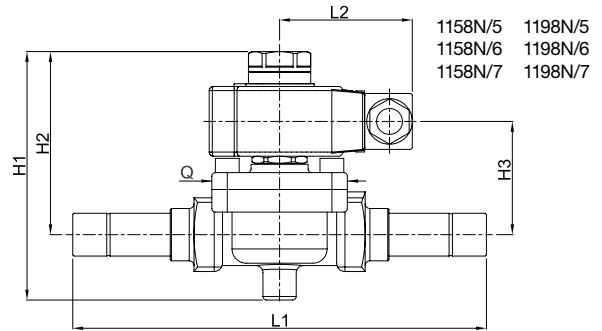
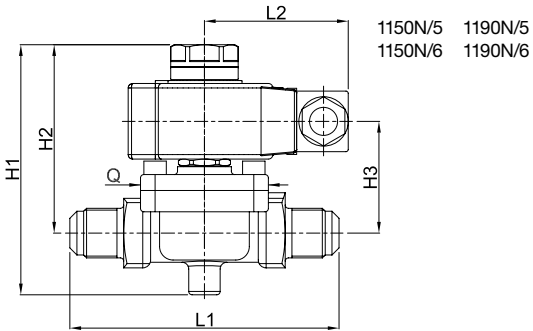
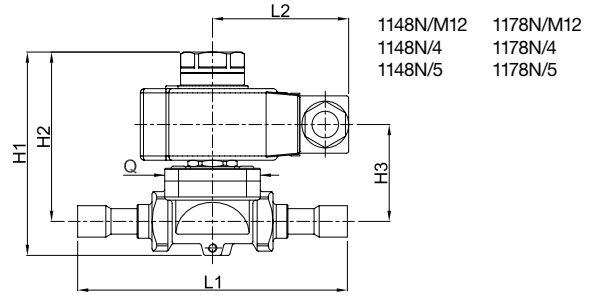
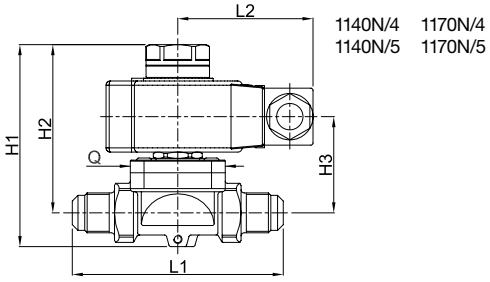
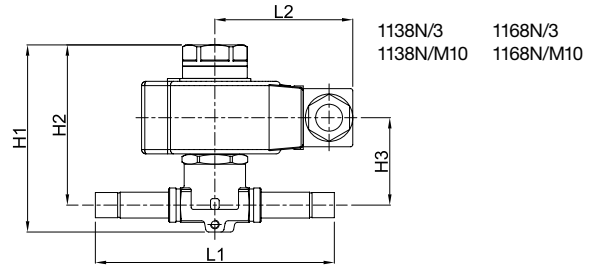
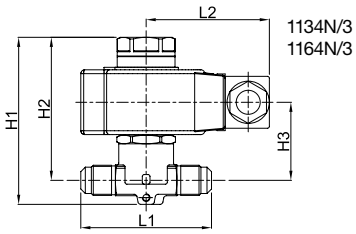
| Operating Principles | Catalogue Number | Connections ODS | | Seat size nominal Ø [mm] | Kv Factor [m3/h] | Opening Pressure Differential [bar] | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | |
|--------------------------|------------------|-----------------|--------|--------------------------|------------------|-------------------------------------|-------------------------------|---------|----------|---------|------|---------------------------------------|------|-----|----|
| | | Ø [in.] | Ø [mm] | | | min OPD | MOPD coils series 9320 / 9120 | | | min. | max. | | | | |
| | | | | | | | RD6 | RD1 RD2 | | | | | | | |
| Diaphragm Pilot Operated | 1168N/3S | 3/8" | – | 6,5 | 0,8 | 0,05 | 21 | 15 | 50 | –40 | +120 | Art. 4.3 | | | |
| | 1168N/M10S | – | 10 | | | | | | | | | | | | |
| | 1178N/M12S | – | 12 | 12,5 | 2,2 | | | | | | | | | | |
| | 1178N/4S | 1/2" | – | | | | | | | | | | | | |
| | 1178N/5S | 5/8" | 16 | 16,5 | 2,61 | | | | | | | | | | |
| | 1198N/5S | 5/8" | 16 | | | | 3,8 | | | | | | | | |
| | 1198N/6S | 3/4" | – | 16,5 | 4,8 | | | | | | | | | | |
| | 1198N/7S | 7/8" | 22 | | | | 5,7 | | | | | | | | |
| 1178N/9S | 1.1/8" | – | 25,5 | 10 | 8 | 8 | | | | | | | | | |
| Piston Pilot Operated | 1138N/3S | 3/8" | – | 6,5 | 1,0 | 0,05 | 30 | 30 | 50 | –40 | +130 | Art. 4.3 | | | |
| | 1138N/M10S | – | 10 | | | | | | | | | | | | |
| | 1148N/M12S | – | 12 | 12,5 | 2,4 | | | | | | | | | | |
| | 1148N/4S | 1/2" | – | | | | | | | | | | | | |
| | 1148N/5S | 5/8" | 16 | 16,5 | 3,0 | | | | | | | | | | |
| | 1158N/5S | 5/8" | 16 | | | | | | | | | | 3,8 | | |
| | 1158N/6S | 3/4" | – | 16,5 | 4,8 | | | | | | | | | | |
| | 1158N/7S | 7/8" | 22 | | | | | | | | | | 5,7 | | |
| | 1198N/9S | 1.1/8" | – | 25 | 10 | | | | | | | | | 0,1 | 16 |
| | 1178NW/11S | 1.3/8" | 35 | 27 | 16 | | | | | | | | | | |
| | 1178NW/13S | 1.5/8" | – | 34 | 25 | | | | | | | | 0,15 | 16 | 16 |
| | 1178NW/M42S | – | 42 | | | | | | | | | | | | |

TABLE 15: Dimensions and weights of NO valves with 9120 coils

| Operating Principles | Catalogue Number | Dimensions [mm] | | | | | | Weight [g] | |
|--------------------------|-----------------------|-----------------|------|------|------|-----|------|------------|------|
| | | H1 | H2 | H3 | L1 | L2 | Q | | |
| Diaphragm Pilot Operated | 1164N/3S | 87 | 74,5 | 40 | 68 | 65 | – | 705 | |
| | 1168N/3S | | | | 111 | | | 705 | |
| | 1168N/M10S | | | | 111 | | | 700 | |
| | 1170N/4S | 96 | 80 | 47 | 100 | | 45 | 1015 | |
| | 1170N/5S | | | | 106 | | | | 1060 |
| | 1178N/M12S | | | | 127 | | | | 995 |
| | 1178N/4S | | | | 127 | | | | 985 |
| | 1178N/5S | | | | 175 | | | | 1080 |
| | 1190N/5S | 111 | 83 | 50 | 120 | | 57 | 1340 | |
| | 1190N/6S | | | | 124 | | | | 1670 |
| | 1198N/5S | | | | 175 | | | | 1300 |
| | 1198N/6S | | | | 175 | | | | 1490 |
| | 1198N/7S | | | | 180 | | | | 1475 |
| | 1178N/9S | 120 | 101 | 72 | 250 | | 80 | 2870 | |
| | Piston Pilot Operated | 1134N/3S | 97,5 | 85 | 50,5 | | 68 | 65 | – |
| 1138N/3S | | 111 | | | | 775 | | | |
| 1138N/M11S | | 111 | | | | 770 | | | |
| 1140N/4S | | 105,5 | 89,5 | 56,5 | 100 | 45 | 1117 | | |
| 1140N/5S | | | | | 106 | | | | 1166 |
| 1148N/M12S | | | | | 127 | | | | 1095 |
| 1148N/4S | | | | | 127 | | | | 1084 |
| 1148N/5S | | | | | 175 | | | | 1188 |
| 1150N/5S | | 126 | 98 | 70 | 120 | 57 | 1462 | | |
| 1150N/6S | | | | | 124 | | | | 1792 |
| 1158N/5S | | | | | 175 | | | | 1422 |
| 1158N/6S | | | | | 175 | | | | 1612 |
| 1158N/7S | | | | | 180 | | | | 1597 |
| 1198N/9S | | 162 | 132 | 99 | 235 | 60 | 2355 | | |
| 1178NW/11S | | 176 | 142 | 110 | 254 | 68 | 3015 | | |
| 1178NW/13S | | 197 | 160 | 128 | 265 | 88 | 3820 | | |
| 1178NW/M42S | | | | | | | | | 3820 |

Connectors are not included in the boxes and have to be ordered separately





SOLENOID VALVES

2.5 – MAGNETIC TOOL

APPLICATION

Castel supplies to its customers the permanent magnet tool code 9900/X91 for the normally closed solenoid valves illustrated in the previous chapters. This tool can be used when brazing the copper connections to the plant pipes: once fit on the valve stem of the mobile plunger, instead of the coil, it allows the protective gas (nitrogen) flow and avoids any damage to the plunger gasket and to the diaphragm.

CONSTRUCTION

The permanent magnet tool code 9900/X91 consists of three anisotropic ferrite rings in an anodized aluminium body.





COILS

POLYHEDRA

COILS

3.1 – COILS AND CONNECTORS

APPLICATION

For solenoid expansion valve (Chapter 1) and NC solenoid valves (Chapter 2), Castel provides its customers with the following new series of coils that use the “FAST LOCK” system:

- **Series 9300** (coil type HF2), interchangeable with coils in series 9100 (coils type HM2) that are out of production. The coils in series 9300 can be used on all the valves produced by Castel that used the coils in series 9100.
- **Series 9320** (coils type HF3) are interchangeable with coils in series 9120 (coils type HM3), that are still in production in direct current and rectified versions. The coils in series 9320 can be used on all the valves produced by Castel that used the coils in series 9120.
- **Series 9360** (coils type HF4) are interchangeable with coils in series 9160 (coils type HM4), that are still in production in direct current version. The coils in series 9360 can be used on all the valves produced by Castel that used the coils in series 9160.

The “FAST LOCK” system (protected by law) guarantees secure fixing, without errors or carelessness, of the coil on the valve, making assembly and disassembly easy and quick. Coils using the “FAST LOCK” system can be assembled on valves, and later disassembled, without the need of additional equipment.

N.B.: the coils equipped with the “FAST LOCK” system cannot be assembled on the normally-open valves produced by Castel.

Furthermore, with regard to the NC solenoid valves, the following types of coils are still available:

- **Series 9110** (coils type CM2)
- **Series 9120** (coils type HM3)
- **Series 9160** (coils type HM4)

For NO solenoid valves (Chapter 2), the choice must fall on the direct current coils in series 9120. For NO solenoid valves with a power supply of 220 VAC, Castel has developed a dedicated 220 V rectified coil (part number 9120/RD6).

Coils in series 9110, 9120, 9300, and 9320 can be coupled with all connectors in series 9150 and 9900 manufactured by Castel. With the exception of connector 9155/R01, the protection rating guaranteed by the coil + connector system is IP65 according to the EN 60529 standard.

Coils in series 9160, 9360 must be used preferably with connector type 9155/R01. The protection rating of the coil + connector 9155/R01 system is IP65/IP68 according to the EN 60529 standard. Alternatively, these coils can be coupled with connectors in series 9150 or 9900. In this case, the protection rating of these systems is IP65.

The coil code 9120/RD6 must be coupled only with connectors/rectifiers codes 9150/R45 or 9150/R90. The protection rating guaranteed by the coil + connector system is IP65 according to the EN 60529 standard.

CONSTRUCTION

In compliance with IEC standard 85, the coils in series 9110, 9120, 9160, 9320 and 9360 have Class F encapsulation, while the coils in series 9300 have Class H encapsulation, while the coils in series 9300 and 9360 have Class H encapsulation, and their production is compliant with standards EN 60730-1 and EN 60730-2-8. The windings are made of copper wire, with insulation class H (180 °C), in compliance with IEC standard 85. The outer casing is made of waterproof, dielectric resins that guarantee reinforced insulation and allow any type of assembly.

All coils have Class I protection ratings against electric contacts. Consequently, their safety requires an efficient ground system. Rubber gaskets assembled on the upper and lower ends of the coils (only on the lower end for coils in series 9300, 9320 and 9360) complete the protection of the windings from humidity.

The terminals of the coils in series 9120, 9160, 9300, 9320 and 9360 consist of two Faston connectors plus a Faston ground connector. Coils in series 9110 are equipped with an encapsulated co-moulded cable 1 m long. All coils in this chapter are designed for continuous use. The solid construction of these coils makes them suitable for use in refrigeration systems operating in heavy-duty environments

APPROVALS

Coils in series 9300 with 110 VAC, 220/230 VAC and 240 VAC power supply are approved by the German registration body, VDE. Coils in series 9110, 9160, 9300 and 9360 with 110 VAC, 220/230 VAC and 240 VAC power supply, and coils in series 9120 and 9320 with 220/230 VAC power supply are manufactured according to the Low Voltage (LV) Directive (2006/95/EC). All coils in this chapter comply with the Electromagnetic Compatibility (EMC) Directive (2004/108/EC).

CONNECTORS

DIN 43650 standardized connectors 9150 represent an effective system for the connection of the coil to the power system, thus ensuring safety also in the presence of moisture. Based on the assembly requirements, these connectors allow you to choose the



orientation of the outer casing with respect to the inner terminal block. The gland nut of the outer casing is suitable for receiving cables with an external diameter of 6 to 9 mm and is equipped with a self-locking device. Three-pole cables with a cross-section greater than or equal to 0.75 mm² are recommended.

The connectors in series 9900 are available with co-moulded cables of different lengths. In these versions, the orientation of the casing cannot be changed with respect to the terminal block. As long as they are used with the gaskets provided, both types ensure IP65 protection rating according to EN 60529.

Castel developed specific connectors, series 9155, suitable for use in refrigeration systems operating in heavy-duty environments, for example:

- exposure to the atmospheric conditions
- rooms with high degree of moisture
- cyclic condensing / evaporation on the valve
- cyclic icing / defrosting on the valve

Based on the assembly requirements, these connectors allow you to choose the side orientation of the outer casing with respect to the inner terminal block. It is not possible to point the exit of the

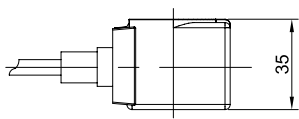
cable upwards. The gland nut of the outer casing is suitable for receiving cables with an external diameter of 6 to 9 mm and is equipped with a self-locking device. It is again recommended that three-pole cables with a cross-section greater than or equal to 0.75 mm² be used. As long as they are used with the gaskets provided, the connectors in series 9155 ensure IP65/IP68 protection rating according to the EN 60529 standard.

Connectors 9150/R45 and 9150/R90 are equipped with a full-wave bridge rectifier plus VDR for protection. Connector 9150/R90 is the version with a 2 m long, co-moulded cable, with remote rectified circuit (with respect to the connector). The VDR (Voltage e-Dependent-Resistor) device is a special type of resistor, mounted in parallel to the windings. Its purpose is to protect the diodes and the coil from any voltage surges generated within the alternating current supply circuit.

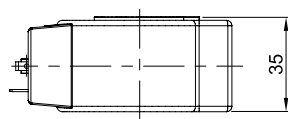
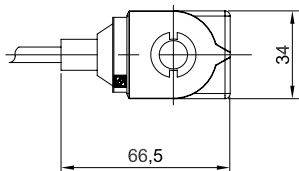
WARNING: connectors 9150/R45 and 9150/R90 must be used only with coil 9120/RD6 (220 V RAC). Incorrect use of these connectors with other types of Castel coils leads to the rapid destruction of the coil.

TABLE 1: General characteristics of coils

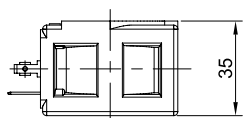
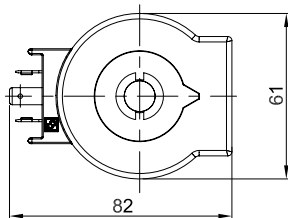
| Catalogue Number | Coil Type | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Insulation class EN 60730 | TA [°C] | | Connection | Connectors | Protection Degree |
|------------------|-----------|--------------|-----------------------|----------------|---------------------------|---------|------|--------------------------------|--|---------------------------------------|
| | | | | | | min. | max. | | | |
| 9110/RA2 | CM2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Three wires cable | - | IP 66 |
| 9110/RA4 | | 110 A.C. | | | | | | | | |
| 9110/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9110/RA7 | | 240 A.C. | +10 / -10 | | | | | | | |
| 9120/RD1 | HM3 | 12 D.C. | +10 / -5 | - | F | -20 | +50 | Terminal block for DIN 43650/A | 9150/R02 9900/X## | IP 65 (with connector) |
| 9120/RD2 | | 24 D.C. | | | | | | | | |
| 9120/RD3 | | 27 D.C. | | | | | | | | |
| 9120/RD4 | | 48 D.C. | | | | | | | | |
| 9120/RD6 | | 220 RAC | | | | | | | 9150/R45 9150/R90 | |
| 9160/RA2 | HM4 | 24 A.C. | +10 / -10 | 50 / 60 | F | -20 | +50 | Terminal block for DIN 43650/A | 9150/R02 9155/R01 9155/R02 9900/X## | IP 65 (with connectors 9150, 9900) |
| 9160/RA4 | | 110 A.C. | | | | | | | | |
| 9160/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9160/RA7 | | 240 A.C. | +10 / -10 | | | | | | | |
| 9160/RD1 | | 12 D.C. | +10 / -5 | - | | | | | | |
| 9160/RD2 | | 24 D.C. | | | | | | | | |
| 9300/RA2 | HF2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Terminal block for DIN 43650/A | 9150/R## 9900/X## | IP 65 (with connector) |
| 9300/RA4 | | 110/120 A.C. | | | | | | | | |
| 9300/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9300/RA7 | | 240 A.C. | +10 / -10 | | | | | | | |
| 9300/RA8 | | 380 A.C. | | | | | | | | |
| 9320/RA6 | HF3 | 220/230 A.C. | +6 / -10 | 50 / 60 | F | -20 | +50 | Terminal block for DIN 43650/A | 9150/R02 9900/X## | IP 65 (with connector) |
| 9320/RD1 | | 12 D.C. | | | | | | | | |
| 9320/RD2 | | 24 D.C. | | | | | | | | |
| 9320/RD3 | | 27 D.C. | | | | | | | | |
| 9320/RD4 | | 48 D.C. | | | | | | | | |
| 9360/RA2 | HF4 | 24 A.C. | +10 / -10 | 50 / 60 | F | -20 | +50 | Terminal block for DIN 43650/A | 9150/R02 9155/R01 9155/R02 9900/X## | IP 65 (with connectors 9150, 9900) |
| 9360/RA4 | | 110 A.C. | | | | | | | | |
| 9360/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9360/RA7 | | 240 A.C. | +10 / -10 | | | | | | | |
| 9360/RD1 | | 12 D.C. | +10 / -5 | - | | | | | | |
| 9360/RD2 | | 24 D.C. | | | | | | | | |



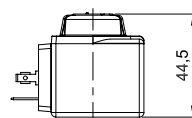
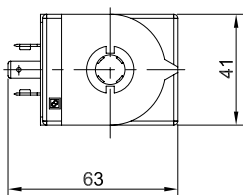
9110 (Type CM2)



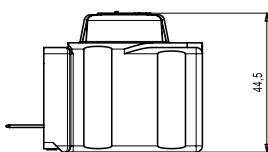
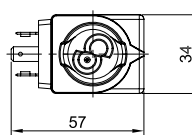
9120 (Type HM3)



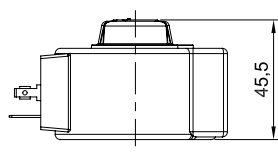
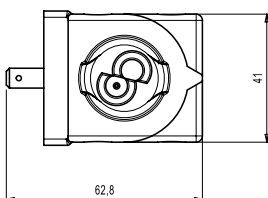
9160 (Type HM4)



9300 (Type HF2)



9360 (Type HF4)



9320 (Type HF3)

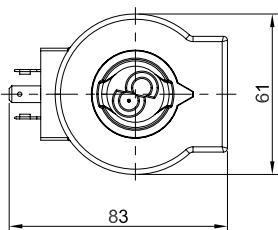
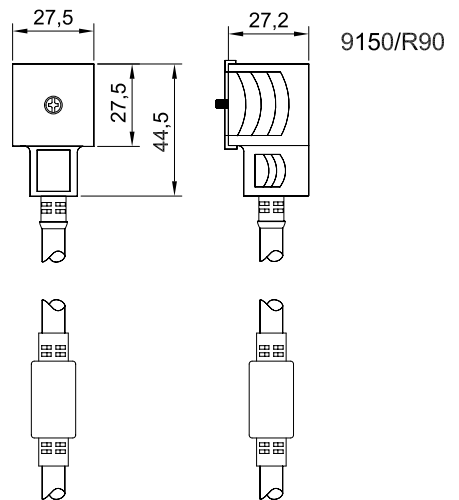
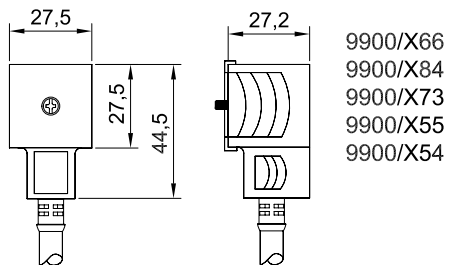
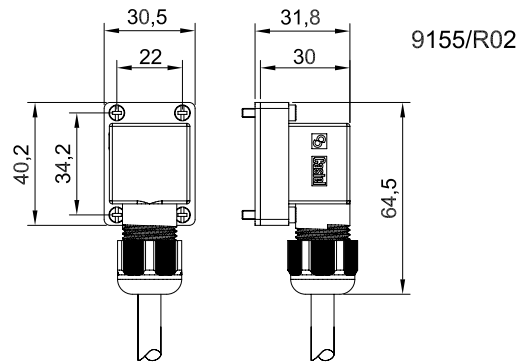
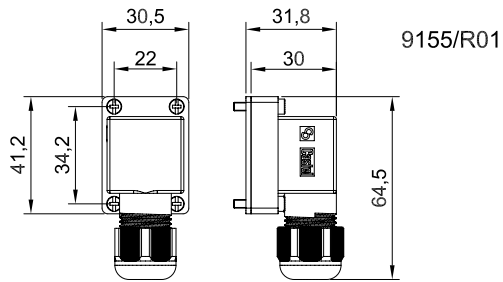
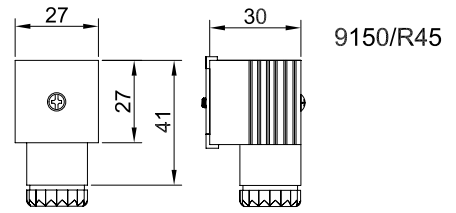
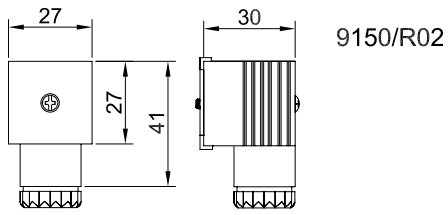


TABLE 2: Consumptions and weights of coils

| Catalogue Number | Coil type | Voltage [V] | Power [W] | Consumption at 20 °C [mA] | | | | | | Weight [g] |
|------------------|-----------|--------------|-----------|---------------------------|---------|------|---------|---------|------|------------|
| | | | | Start | | | Working | | | |
| | | | | 50 [Hz] | 60 [Hz] | D.C. | 50 [Hz] | 60 [Hz] | D.C. | |
| 9110/RA2 | CM2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 230 |
| 9110/RA4 | | 110 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9110/RA6 | | 220/230 A.C. | | 120 | 105 | | 68 | 58 | | |
| 9110/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |
| 9120/RD1 | HM3 | 12 D.C. | 20 | - | - | 1720 | - | - | 1720 | 470 |
| 9120/RD2 | | 24 D.C. | 20 | | | 895 | | | 895 | |
| 9120/RD3 | | 27 D.C. | 20 | | | 800 | | | 800 | |
| 9120/RD4 | | 48 D.C. | 22 | | | 460 | | | 460 | |
| 9120/RD6 | | 220 RAC | 18 | | | 93 | | | 93 | |
| 9160/RA2 | HM4 | 24 A.C. | 8 | 1490 | 1320 | - | 700 | 530 | - | 220 |
| 9160/RA4 | | 110 A.C. | | 330 | 300 | | 156 | 118 | | |
| 9160/RA6 | | 220/230 A.C. | | 162 | 142 | | 76 | 57 | | |
| 9160/RA7 | | 240 A.C. | | 147 | 130 | | 70 | 53 | | |
| 9160/RD1 | | 12 D.C. | 17 | 1300 | 1300 | | | | | |
| 9160/RD2 | | 24 D.C. | 15,5 | 650 | 650 | | | | | |
| 9300/RA2 | HF2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 180 |
| 9300/RA4 | | 110/120 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9300/RA6 | | 220/230 A.C. | | 140 | 128 | | 68 | 58 | | |
| 9300/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |
| 9300/RA8 | | 380 A.C. | | 58 | 51 | | 32 | 23 | | |
| 9320/RA6 | HF3 | 220/230 A.C. | 12 | 190 | 160 | - | 110 | 80 | - | 500 |
| 9320/RD1 | | 12 D.C. | 20 | - | - | 1720 | - | - | 1720 | |
| 9320/RD2 | | 24 D.C. | 20 | | | 895 | | | 895 | |
| 9320/RD3 | | 27 D.C. | 20 | | | 800 | | | 800 | |
| 9320/RD4 | 48 D.C. | 22 | 460 | | | 460 | | | | |
| 9360/RA2 | HF4 | 24 A.C. | 8 | 1490 | 1320 | - | 700 | 530 | - | 240 |
| 9360/RA4 | | 110 A.C. | | 330 | 300 | | 156 | 118 | | |
| 9360/RA6 | | 220/230 A.C. | | 162 | 142 | | 76 | 57 | | |
| 9360/RA7 | | 240 A.C. | | 147 | 130 | | 70 | 53 | | |
| 9360/RD1 | | 12 D.C. | 17 | 1300 | 1300 | | | | | |
| 9360/RD2 | | 24 D.C. | 15,5 | 650 | 650 | | | | | |

TABLE 3: General characteristics of connectors

| Catalogue Number | Supply Voltage [V] | | Cable length [m] | Cable thickness [mm ²] | Standard | Degree of protection | Class of insulation |
|------------------|--------------------|----------|------------------|------------------------------------|-----------|----------------------|--------------------------|
| | Nominal | Maximum | | | | | |
| 9150/R02 | - | - | - | - | - | - | Gruppo C VDE 0110-1 / 89 |
| 9150/R45 | 220 A.C. | 250 A.C. | | | | | |
| 9150/R90 | 220 A.C. | 250 A.C. | | | | | |
| 9900/X66 | - | - | 1 | 3 x 0,75 | DIN 43650 | IP65 EN 60529 | |
| 9900/X84 | | | 1,5 | | | | |
| 9900/X73 | | | 2 | | | | |
| 9900/X55 | | | 3 | | | | |
| 9900/X54 | | | 5 | | | | |
| 9900/X93 | | | 10 | | | | |
| 9901/X41 | | | 15 | | | | |
| 9155/R01 | - | - | - | - | - | IP65/IP68 EN 60529 | |
| 9155/R02 | | | 1 | | | | |



COILS

3.2 – COILS AND CONNECTORS, ATEX – CERTIFIED

APPLICATION

For the normally-closed solenoid valves manufactured in compliance with the ATEX Directive (valves with an “EX” suffix presented in Chapter 2), Castel provides its customers with the following types of coils:

- Series 9100EX (coils type HM2)
- Series 9110EX (coils type CM2)

These coils are classified as Group II, Category 3 equipment according to the ATEX Directive (2014/34/EU). This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” potentially explosive environments according to the definitions in Annex I of Directive 1999/92/EC.

Coils in series 9100EX must be used only with connector type 9150EX/R02. The protection rating of the coil + connector system is IP65 according to the EN 60529 standard.

CONSTRUCTION

The coils in series 9100EX and 9120EX are produced in compliance with European standards EN 60079-0:2009 and 60079-18:2009, which ensure their compliance to the Essential Health and Safety Requirements of Directive 2014/34/EU. The two series of coils are Class F encapsulated and have Class H enamelled copper wire windings, in compliance with IEC standard 85. The outer casing is made of waterproof, dielectric resins that guarantee reinforced insulation and allow any type of assembly.

All coils have Class I protection ratings against electric contacts. Consequently, their safety requires an efficient ground system. Rubber gaskets assembled on the upper and lower ends of the coils complete the protection of the windings from humidity.

The terminals of the coils in series 9100EX consist of two Faston connectors plus a Faston ground connector. Coils in series 9110EX are equipped with a 1 m long power supply cable incorporated in the encapsulated section. The cable has a polyurethane sheath with operating temperature of up to 125 °C and cable insulation in special PVC with an operating temperature of up to 125 °C. All coils in this chapter are suitable for continuous operation. The solid construction of these coils makes them suitable for use in refrigeration systems operating in heavy-duty environments

APPROVALS

Compliance of the coils in series 9100EX to Directive 2014/34/EU is certified by the Italian notified body IMQ, with certificate No. IMQ 13 ATEX 002X (Certified Type Test).

Protection type of the coils in series 9100EX: Ex mc IIC T5 Gc / Ex

mc IIC T100°C Dc IP65.

Compliance of the coils in series 9110EX to Directive 2014/34/EU is certified by the Italian notified body IMQ, with certificate No. IMQ 13 ATEX 001X (Certified Type Test).

Protection type of the coils in series 9110EX: Ex mc IIC T4 Gc / Ex mc IIC T135°C Dc IP65.

Coils in series 9100EX and 9110EX with 110 VAC, 220/230 VAC and 240 VAC voltages are produced in accordance with the Low Voltage Directive (2006/95/EC). All coils in series 9100EX and 9110EX comply with the Electromagnetic Compatibility (EMC) Directive (2004/108/EC).

CONNECTOR

Connector 9150EX/R02 is classified as Group II, Category 3 equipment according to the ATEX Directive (2014/34/EU). This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” potentially explosive environments according to the definitions in Annex I of Directive 1999/92/EC.

The DIN 43650 standardized connector 9150EX/R02 represents an effective system for the connection of the coil to the power system, thus ensuring safety also in the presence of moisture. Based on the assembly requirements, this connector allows you to choose the orientation of the outer casing with respect to the inner terminal block. The gland nut of the outer casing is suitable for receiving cables with an external diameter of 6 to 9 mm and is equipped with a self-locking device. Three-pole cables with a cross-section greater than or equal to 0.75 mm² are recommended. As long as it is used with the gaskets provided, connector 9150EX/R02 ensures IP65 protection rating according to the EN 60529 standard.



TABLE 4: General characteristics of coils ATEX compliance for use in EX Zone 2

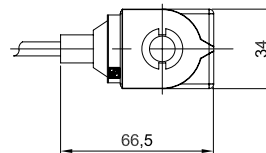
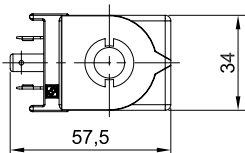
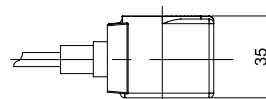
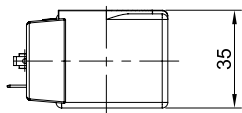
| Catalogue Number | Coil Type | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Insulation class EN 60730 | TA [°C] | | Connection | Connectors | Protection Degree |
|------------------|-----------|--------------|-----------------------|----------------|---------------------------|---------|------|--------------------------------|------------|------------------------|
| | | | | | | min. | max. | | | |
| 9100EX/RA2 | HM2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Terminal block for DIN 43650/A | 9150EX/R02 | IP 65 (with connector) |
| 9100EX/RA4 | | 110 A.C. | | | | | | | | |
| 9100EX/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9100EX/RA7 | | 240 A.C. | | | | | | | | |
| 9110EX/RA2 | CM2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Three wires cable | - | IP 66 |
| 9110EX/RA4 | | 110 A.C. | | | | | | | | |
| 9110EX/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9110EX/RA7 | | 240 A.C. | | | | | | | | |

TABLE 5: Consumptions and weights of coils

| Catalogue Number | Coil type | Voltage [V] | Power [W] | Consumption at 20 °C [mA] | | | | | | Weight [g] |
|------------------|-----------|--------------|-----------|---------------------------|---------|------|---------|---------|------|------------|
| | | | | Start | | | Working | | | |
| | | | | 50 [Hz] | 60 [Hz] | D.C. | 50 [Hz] | 60 [Hz] | D.C. | |
| 9100EX/RA2 | HM2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 230 |
| 9100EX/RA4 | | 110 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9100EX/RA6 | | 220/230 A.C. | | 120 | 105 | | 68 | 58 | | |
| 9100EX/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |
| 9110EX/RA2 | CM2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 230 |
| 9110EX/RA4 | | 110 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9110EX/RA6 | | 220/230 A.C. | | 120 | 105 | | 68 | 58 | | |
| 9110EX/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |

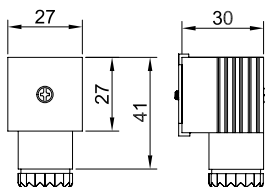
TABLE 6: General characteristics of connectors

| Catalogue Number | Standard | Degree of protection | Class of insulation | Approval |
|------------------|-----------|----------------------|-------------------------|--------------------------------------|
| 9150EX/R02 | DIN 43650 | IP65 EN 60529 | Gruppo CVDE 0110-1 / 89 | ATEX compliance for use in EX Zone 2 |



9100EX (Type HM2)

9120EX (Type CM2)



9150EX/R02

COILS

3.3 – “SMART CONNECTOR” SYSTEM

APPLICATION

The “SMART CONNECTOR” systems series 9910 are formed by coupling a connector in series 9152, equipped with an integrated electronic circuit in the connector, with a specific series 9300 coil designed for the connector. These systems have been designed by Castel to be installed on:

- Normally-closed solenoid valves
- PWM expansion valves

and allow:

- a reduction in energy consumption when fully operational
- a consequent reduction in the operating temperature
- an extension of the coil life
- an increase in the MOPD value

N.B.: Castel does not sell the two parts (coil and connector) that make up a “SMART CONNECTOR” system separately.

CONNECTION CONSTRUCTION

EN 175301-803 (former DIN 43650) standardized connectors 9152 represent an effective system for the connection of the coil to the power system, thus ensuring safety also in the presence of moisture.

Connectors 9152 are available in both the direct current version (with 12 VDC and 24 VDC voltages) and in the alternating current version (with 24 VAC or 220/240 VAC voltages).

The direct current versions are equipped with polarity inversion protection.

The alternating current versions are equipped with a bridge rectifier circuit integrated on the circuit.

All versions, both direct current and alternating current, are equipped with a diode device that guarantees surge protection. All versions have the voltage for use and the wiring diagram printed on the casing. The gland nut of the outer casing is suitable for receiving cables with an external diameter of 6 to 9 mm and is equipped with a self-locking device. It is recommended that three-pole cables with a cross-section greater than or equal to 0.75 mm² be used. There are no versions with co-moulded cables.

Each connector in a “SMART CONNECTOR” system must be used only for the type of coil with which it is coupled in the system. Incorrect use of the connector with other types of coils produced by Castel will quickly damage the coil and the connector.

COIL CONSTRUCTION

Coils in series HF2 (9300) used in the “SMART CONNECTOR”

systems are special coils available in both the direct current version (with 12 VDC and 24 VDC voltages) and rectified current version (with 24 VRAC, 220 VRAC, or 240 VRAC).

These coils are in Class H, in accordance with IEC standard 85 and their production is compliant with standards EN 60730-1 and EN 60730-2-8. The windings are made of enamelled copper wire, with insulation class H (180 °C), in compliance with IEC standard 85. The terminals of the coils consist of two Faston connectors plus a Faston ground connector. The outer casing is made of waterproof, dielectric resins that guarantee reinforced insulation and allow any type of assembly.

They have Class I protection ratings against electric contacts. Consequently, their safety requires an efficient ground system. A rubber gasket assembled on the lower end of the coil completes the protection of the windings from humidity. When coupled with connectors 9152, these coils guarantee an IP65 protection rating according to standard EN 60529.

The coils are designed for continuous use. The solid construction of these coils makes them suitable for use in refrigeration systems operating in heavy-duty environments. The maximum ambient temperature for all coils is 50 °C.

Each coil in a “SMART CONNECTOR” system must be used only in combination with the type of connector with which it is coupled in the system. Incorrect use of the coil with other types of connectors produced by Castel will quickly damage the coil and the connector.

OPERATION

Through the integrated circuit in the connector, and coupling with the specific coil, connectors 9152 are capable of improving the MOPD characteristics of Castel solenoid valves, reducing the power consumption by up to 50% over time, extending the coil life, and decreasing the noise.

The integrated circuit located inside the connector works in different modes based on the power supply voltage. Specifically, there are two main families with different operating logics.

Connectors 9152/RD (direct current) supercharge the dedicated coil 9300 to its maximum allowed power for a short, pre-set interval. This is called the “Boost” time. It generates a greater attraction force on the valve’s magnetic unit, and consequently increases the MOPD value. At the end of the “Boost” phase, during normal operation, connectors 9152/RD maintain the electric consumption of the dedicated coil 9300 at a lower value, from 45% to 55% lower than the power absorbed by the coil. The power reduction occurs by powering the coil with a high-frequency pulsed current (ON/OFF cycles), from 15 to 30 kHz. This frequency is aimed at guaranteeing the minimum magnetic force to keep the valve open



during operation.

Connectors 9152/RA (alternating current) supercharge the coils 9300 for a pre-set interval. This is called the "Boost" time. It generates a greater attraction force on the valve's magnetic unit, and consequently increases the MOPD value. Once this period is over, the electronics remove one phase wave every second one, with an effect comparable to powering the coil with pulsed/rectified current with a frequency half of that of the network. By using this system, you obtain an electric power consumption reduction of the unit to a value from 35% to 45%, while maintaining the minimum magnetic force that allows the valve to be opened. This operating logic makes the "Smart Connector" system powered in alternating current very quiet, reducing the normal noise level, which can be up to 13 dB, to values less than 4 dB based on the valve installation.

Using the afore-mentioned logic, it is possible to significantly reduce the electricity consumption (which can be important considering the system of refrigerator aisles in a supermarket). Also, it leads to a lower operating temperature of the coil and therefore, in conclusion, less wear on the electromechanical drive system. Obviously, these

reductions in consumption are strictly related to the use of the coils. For proper evaluation of the real energy savings, it is necessary to consider the number of coil interventions with respect to the normal power supply time of the valve. If the number of interventions is reduced, the consumption is reduced; if the number of interventions increases, the consumption grows.

As indicated in the paragraph APPLICATION, the "SMART CONNECTOR" systems can also be used with the series of valves PWM 2028 manufactured by Castel, if suitably sized to have opening / closing cycles with a frequency greater than 0.6 seconds.

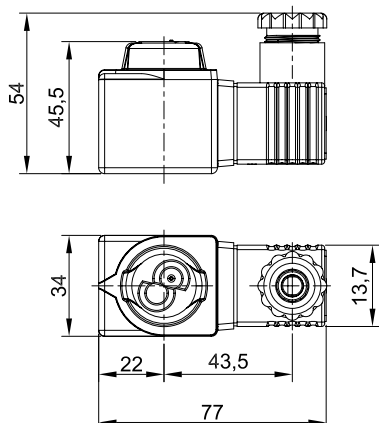
APPROVALS

All connectors and coils in this chapter comply with the Electromagnetic Compatibility (EMC) Directive (2004/108/EC). The connectors with 220/240 VAC voltage and the coils with 220 VRAC and 240 VRAC voltage comply with the Low Voltage Directive (2006/95/EC).

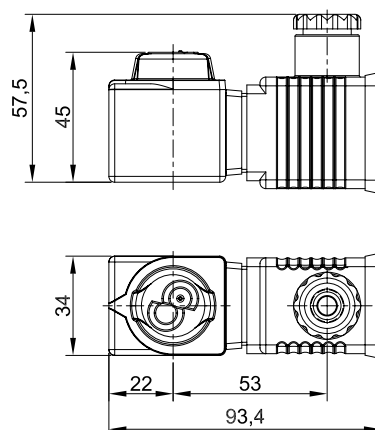
TABELLA 7: General characteristics of systems SMART CONNECTOR

| Catalogue Number | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Working nominal power [W] | Nominal power tolerance [%] | Insulation class IEC 85 | TA [°C] | | Boost Time [msec] | Protection degree |
|------------------|-------------|-----------------------|----------------|---------------------------|-----------------------------|-------------------------|---------|-----|-------------------|-------------------|
| | | | | | | | min | max | | |
| 9910/RD1 (1) | 12 VDC | +/-10 | - | 3 | +/-10 | H | -20 | +50 | 130 | IP65 |
| 9910/RD2 (1) | 24 VDC | | | 5 | | | | | | |
| 9910/RA2 | 24 VAC | +/-10 | 50/60 | 7 | +/-10 | H | -20 | +50 | 200 | IP65 |
| 9910/RA6 | 220 VAC | | | | | | | | | |
| 9910/RA7 | 240 VAC | | | | | | | | | |

(1): Warning if these connectors are supplied via unidirectional direct current or rectified by means of the Graetz bridge, they could not perform a correct cycle of operation but always remain in Boost conditions, leading to fast damage of the coil. For correct operation the kits series 9910/RD MUST be powered by direct current stabilized or rectified.



9910/RD



9910/RA



The background of the entire page is a complex, repeating pattern of blue geometric shapes, primarily triangles and polygons, creating a 3D effect of depth and shadow. The colors range from light sky blue to deep navy blue.

SAFETY DEVICES

P  LYHEDRA

SAFETY DEVICES

4.1 – SAFETY VALVES IN SERIES 3061

GENERAL DESCRIPTION

Safety valves in series 3061 are considered "Safety Accessories" according to the definition provided in Article 2, Point 4 of said Directive and are subject to the classification indicated in Article 4, Point 1.d) of the same Directive. These valves are unbalanced, conventional direct-loaded safety valves. The valve is opened by the thrust from the fluid under pressure below the shutter, when said thrust exceeds, under the calibrated conditions, the opposing force of the spring acting on the shutter.

Valves are identified by means of:

- a model number formed of an alphanumerical code that includes:
 - the family identity (for ex. 3061/3)
 - the type of inlet connection (for ex. C = NPT)
 - the set pressure, expressed in bar, multiplied by 10 (for ex. 200)
- an alphanumerical serial number

CONSTRUCTION

Body: squared, obtained through hot moulding and subsequent machining. It houses the following elements:

- the nozzle with flat sealing seat
- the shutter guide
- the set spring slot
- the threaded seat of the setting adjustment ring nut

In the body, above the shutter guide, a small pressure relief hole is provided through which the spring slot communicates with the exit connection. For this reason, during relief, there is a no gas leak through this orifice.

Material used: EN 12420-CW617N brass

Shutter: obtained through machining from bar stock and fit with gasket, it ensures the required degree of tightness on the valve seat. The gasket is made from modified PTFE (Polytetrafluoroethylene), a material that, during the valve's estimated service life, maintains good strength and does not cause the shutter to stick on the seat. The shutter is properly guided in the body and the guide action cannot fail. There are no glands or retaining rings that hamper its movement.

Material used: EN 12164-CW614N brass

Spring: it opposes the pressure and the fluid dynamic forces, and always ensures closing of the valve following pressure relief. When the shutter has reached the maximum height determined by the mechanical stop, the spring compression does not exceed 80% of the total compression. All the springs are compliant with the compression helical spring requirements defined in EN ISO 4126-7:2013.

Material used: EN 10270-2 - FD steel for springs.

Calibration system: hex-head threaded ring nut to be screwed inside the upper portion of the head, compressing the spring below. When calibration is complete, the position of the ring nut is maintained unchanged by applying to the threaded coupling a high mechanical strength and low viscosity bonding agent. The low viscosity promotes penetration. The calibration system is protected against subsequent tampering by means of a threaded cap nut, screwed on outside the brass body and blocked in place through re-flanging.

SCOPE

Use: protection against possible overpressure of the apparatuses listed below, with regard to the operating conditions for which they have been designed:

- Refrigeration system or heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, or piping.

(reference standard: EN 378-2:2016)

- Simple pressure vessels

(reference Directive: 2009/105/EC)

Fluids: the valves in series 3061 can be used with:

a) Refrigerant fluids in vapour or gaseous state belonging to Group 2:

- HFC (R134a, R404A, R407C, R410A, R507)
- HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, R452A, R513A)
- R744

with reference to Article 13, Para. 1(b) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

b) Refrigerant fluids in vapour or gaseous state belonging to Group 1:

- HFC (R32)
- HFO and HFO/HFC mixture (R1234yf, R452B, R454B)
- HC (R290, R600, R600a, R1270)

with reference to Article 13, Para. 1(a) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

c) Air and nitrogen (reference Directive: 2009/105/EC)

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



MARKING

In compliance with the provisions of Article 19 of Directive 2014/68/EC, the following information is cast on the valve body:

- Manufacturer's mark
- Country of manufacturing
- Indication of flow direction
- Maximum allowable pressure

Again, on the body, the following information is laser marked:

- Valve model
- Serial number
- Set pressure
- Allowable temperature range
- Kd discharge coefficient
- Flow section
- Production date
- CE marking
- Identification number of the notified body involved in the production control phase

DOCUMENTATION

The safety valves in series 3061 are supplied with the following documentation provided in the packaging:

- operating instructions for the user, containing all information useful for safety in terms of assembly, commissioning, use, and maintenance.
- Compliance Statement for the equipment according to Directive 2014/68/EU, required in Article 17 and issued in compliance with Annex IV of the same directive.
- Calibration certificate for the safety valve, printed on the reverse side of the Compliance Statement.

N.B.: on the website: www.castel.it use the "DOWNLOAD" pull-down menu to access the web-page "CERTIFICATION" in the "DOWNLOAD CENTER". On this page, you can download:

- the Compliance Statement / Calibration Certificate for each valve by entering the 7-digit alphanumeric serial number. (SEARCH BY SERIAL NUMBER)
- the general Compliance Statement referring to a specific model of valve 3061 with a specific setting, for ex. 3061/2C250 or 3061/4C420. (SEARCH BY PRODUCT CODE)

VALVE SELECTION

Directive 2014/68/EC requires that pressure equipment, in which permissible limits are reasonably likely to be exceeded, shall be fitted with suitable protection devices, for instance safety devices such as safety valves. Such devices shall prevent pressure from permanently exceeding the maximum allowable pressure (PS) of the equipment they protect. In any case, a short pressure peak limited to 10% of maximum allowable pressure is permitted.

As to the selection and sizing of the suitable protection device, users shall refer to the specific product and sector standards listed below:

- EN ISO 4126-1: 2013: "Safety devices for protection against

excessive pressure – Part 1: Safety valves" indicates the general requirements for safety valves regardless of the fluid for which they were designed.

– EN 378-2:2016 "Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation" provides a general outline of the protection devices to be used in refrigerating systems and their characteristics (Para. 6.2.5) and the criteria for the selection of the device suitable for the type and size of the system component to be protected (Para. 6.2.6).

– EN 13136:2013: + A1 "Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation" highlights the possible causes of overpressure in a system and provides users with the tools for sizing pressure relief devices, among which safety valves.

To select the safety valves in series 3061, please see Chapter 4.3 "Selection Criteria for Safety Valves" in this technical handbook.

Table 3 provides the maximum discharge capacities of safety valves, models 3061/2, 3061/3 and 3061/4, as a function of various refrigerants and varying Pset for the valve, considering T_o = Steam saturation temperature at discharge pressure, P_o .

VALVE INSTALLATION

Safety valves type 3061 guarantee repeatable performance. This means that, after the valves have operated, open/close, the initial setting conditions are maintained. Nevertheless, it is advisable to replace a 3061 valve once it has discharged as during release debris, such as metal shavings or solder impurities, can deposit on the valve gasket. This can inhibit the safety valve from returning to its original conditions.

To calculate the pressure loss in either the upstream line (between vessel and safety valve) or the downstream line (between safety valve and atmosphere) refer to Chapter 4.3 "Selection Criteria for Safety Valves" in this technical handbook.

TABLE 1 : General Characteristics of valves 3061

| Catalogue Number | | 3061/2C | 3061/3C | 3061/4C |
|--|-------------|---|----------|----------|
| Connections | Inlet male | 1/4" NPT | 3/8" NPT | 1/2" NPT |
| | Outlet male | 3/8" G | 1/2" G | 1/2" G |
| Inlet connection wrench torque (min/max) [Nm] | | 15/20 | 17/22 | 25/35 |
| Flow Diameter [mm] | | 7,5 | 7,5 | 7,5 |
| Flow Section [mm ²] | | 44,2 | 44,2 | 44,2 |
| Lift [mm] | | - | - | - |
| Discharge Coefficient "Kd" | | 0,89 | 0,89 | 0,89 |
| PS [bar] | | 70 | | |
| TS [°C] | | - 50 / + 150 | | |
| TA [°C] | | - 40 / + 50 | | |
| Set Pressure Range at atmospheric back pressure Pset [bar] | | 11 / 60 | | |
| Overpressure | | + 10 % of Pset | | |
| Blowdown | | - 15 % of Pset | | |
| Helium tightness | | - 20 % of Pset (11 bar < Pset < 14 bar) | | |
| | | - 15 % of Pset (14,1 bar < Pset < 24 bar) | | |
| | | - 10 % of Pset (24,1 bar < Pset < 60 bar) | | |
| Estimated service life | | 9 years | | |
| Risk Category according to PED Recast | | IV | | |

TABLE 2: Dimensions and Weights of valves 3061

| Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|------------------|-----------------|------|----|----|----|----|------------|
| | Ø D | L | Ch | H1 | H2 | H3 | |
| 3061/2C | 28,5 | 33,5 | 23 | 30 | 61 | 91 | 200 |
| 3061/3C | 28,5 | 33,5 | 23 | 30 | 61 | 91 | 230 |
| 3061/4C | 28,5 | 33,5 | 23 | 35 | 61 | 96 | 260 |

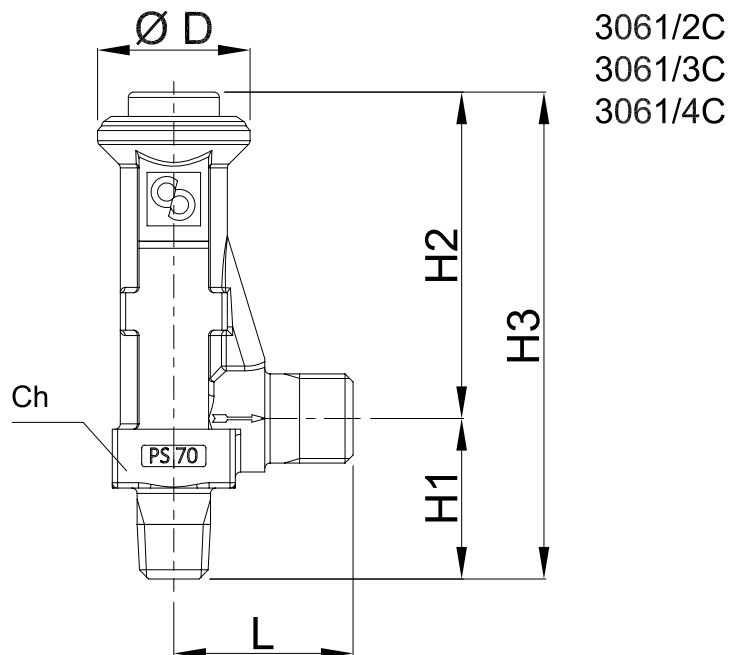


TABLE 3: Maximum discharge capacity of valves 3061

| Pset [bar] | Po [barsass] | R134a | | R32 | | R404A | | R407C | | R410A | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 49,8 | 749 | 15,8 | 574 | 27,0 | 768 | 33,9 | 700 | 16,5 | 671 |
| 12,0 | 14,2 | 53,0 | 815 | 18,6 | 624 | 30,2 | 837 | 36,9 | 761 | 19,4 | 729 |
| 13,0 | 15,3 | 56,0 | 883 | 21,3 | 674 | 33,1 | 908 | 39,7 | 823 | 22,1 | 789 |
| 14,0 | 16,4 | 58,9 | 951 | 23,9 | 724 | 35,9 | 979 | 42,4 | 886 | 24,7 | 849 |
| 15,0 | 17,5 | 61,7 | 1021 | 26,3 | 775 | 38,5 | 1051 | 44,9 | 950 | 27,2 | 909 |
| 16,0 | 18,6 | 64,3 | 1091 | 28,6 | 827 | 41,0 | 1125 | 47,3 | 1014 | 29,5 | 971 |
| 17,0 | 19,7 | 66,8 | 1163 | 30,8 | 879 | 43,4 | 1201 | 49,6 | 1079 | 31,8 | 1033 |
| 18,0 | 20,8 | 69,2 | 1236 | 33,0 | 931 | 45,7 | 1278 | 51,8 | 1145 | 33,9 | 1096 |
| 19,0 | 21,9 | 71,5 | 1311 | 35,0 | 984 | 48,0 | 1357 | 54,0 | 1213 | 36,0 | 1159 |
| 20,0 | 23,0 | 73,7 | 1387 | 37,0 | 1038 | 50,1 | 1439 | 56,0 | 1281 | 37,9 | 1224 |
| 21,0 | 24,1 | 75,9 | 1465 | 38,9 | 1092 | 52,1 | 1522 | 58,0 | 1350 | 39,9 | 1290 |
| 22,0 | 25,2 | 77,9 | 1545 | 40,7 | 1147 | 54,1 | 1608 | 59,9 | 1421 | 41,7 | 1356 |
| 23,0 | 26,3 | 79,9 | 1627 | 42,5 | 1202 | 56,0 | 1698 | 61,7 | 1492 | 43,5 | 1424 |
| 24,0 | 27,4 | 81,9 | 1711 | 44,2 | 1258 | 57,9 | 1790 | 63,4 | 1566 | 45,2 | 1493 |
| 25,0 | 28,5 | 83,7 | 1798 | 45,8 | 1315 | 59,7 | 1887 | 65,2 | 1641 | 46,9 | 1563 |
| 26,0 | 29,6 | 85,6 | 1888 | 47,4 | 1373 | 61,4 | 1988 | 66,8 | 1717 | 48,5 | 1635 |
| 27,0 | 30,7 | 87,3 | 1982 | 49,0 | 1431 | 63,1 | 2096 | 68,4 | 1796 | 50,1 | 1708 |
| 28,0 | 31,8 | 89,0 | 2079 | 50,5 | 1491 | 64,7 | 2211 | 70,0 | 1876 | 51,6 | 1783 |
| 29,0 | 32,9 | 90,7 | 2182 | 52,0 | 1551 | 66,3 | 2336 | 71,5 | 1959 | 53,1 | 1860 |
| 30,0 | 34,0 | 92,3 | 2290 | 53,5 | 1613 | 67,8 | 2475 | 72,9 | 2044 | 54,6 | 1938 |
| 31,0 | 35,1 | 93,9 | 2406 | 54,9 | 1675 | 69,3 | 2637 | 74,4 | 2132 | 56,0 | 2019 |
| 32,0 | 36,2 | 95,4 | 2532 | 56,3 | 1739 | 70,7 | 2845 | 75,7 | 2224 | 57,4 | 2102 |
| 33,0 | 37,3 | 96,9 | 2672 | 57,6 | 1803 | 72,1 | 3294 | 77,1 | 2319 | 58,7 | 2189 |
| 34,0 | 38,4 | 98,3 | 2836 | 58,9 | 1869 | | | 78,4 | 2419 | 60,1 | 2278 |
| 35,0 | 39,5 | 99,2 | 2977 | 60,2 | 1937 | | | 79,7 | 2525 | 61,4 | 2371 |
| 36,0 | 40,6 | 99,5 | 3052 | 61,5 | 2006 | | | 80,9 | 2638 | 62,6 | 2468 |
| 37,0 | 41,7 | 99,7 | 3132 | 62,7 | 2077 | | | 82,1 | 2761 | 63,8 | 2571 |
| 38,0 | 42,8 | | | 63,9 | 2149 | | | 83,2 | 2896 | 65,0 | 2681 |
| 39,0 | 43,9 | | | 65,1 | 2224 | | | 84,3 | 3052 | 66,2 | 2798 |
| 40,0 | 45,0 | | | 66,2 | 2301 | | | 85,3 | 3246 | 67,4 | 2928 |
| 41,0 | 46,1 | | | 67,3 | 2381 | | | 86,1 | 3567 | 68,5 | 3074 |
| 42,0 | 47,2 | | | 68,5 | 2463 | | | | | 69,6 | 3248 |
| 43,0 | 48,3 | | | 69,5 | 2550 | | | | | 70,7 | 3488 |
| 44,0 | 49,4 | | | 70,6 | 2640 | | | | | | |
| 45,0 | 50,5 | | | 71,7 | 2735 | | | | | | |
| 46,0 | 51,6 | | | 72,7 | 2836 | | | | | | |
| 47,0 | 52,7 | | | 73,7 | 2945 | | | | | | |
| 48,0 | 53,8 | | | 74,7 | 3065 | | | | | | |
| 49,0 | 54,9 | | | 75,6 | 3201 | | | | | | |
| 50,0 | 56,0 | | | 76,6 | 3364 | | | | | | |
| 51,0 | 57,1 | | | 77,5 | 3593 | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 3: Maximum discharge capacity of valves 3061

| Pset [bar] | Po [barsass] | R507 | | R448A | | R449A | | R450A | | R452A | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 25,8 | 769 | 31,1 | 707 | 31,0 | 711 | 55,2 | 766 | 28,7 | 776 |
| 12,0 | 14,2 | 28,9 | 838 | 34,1 | 768 | 34,0 | 773 | 58,5 | 836 | 31,8 | 845 |
| 13,0 | 15,3 | 31,9 | 909 | 36,9 | 832 | 36,9 | 836 | 61,7 | 903 | 34,6 | 915 |
| 14,0 | 16,4 | 34,7 | 980 | 39,6 | 896 | 39,5 | 901 | 64,6 | 976 | 37,4 | 986 |
| 15,0 | 17,5 | 37,3 | 1053 | 42,1 | 958 | 42,1 | 966 | 67,5 | 1047 | 39,9 | 1058 |
| 16,0 | 18,6 | 39,8 | 1127 | 44,6 | 1025 | 44,5 | 1031 | 70,1 | 1118 | 42,4 | 1131 |
| 17,0 | 19,7 | 42,2 | 1203 | 46,9 | 1093 | 46,8 | 1098 | 72,7 | 1195 | 44,7 | 1205 |
| 18,0 | 20,8 | 44,5 | 1280 | 49,1 | 1156 | 49,1 | 1166 | 75,2 | 1271 | 47,0 | 1281 |
| 19,0 | 21,9 | 46,8 | 1360 | 51,2 | 1229 | 51,2 | 1235 | 77,5 | 1346 | 49,1 | 1358 |
| 20,0 | 23,0 | 48,9 | 1441 | 53,3 | 1294 | 53,2 | 1305 | 79,8 | 1426 | 51,2 | 1437 |
| 21,0 | 24,1 | 50,9 | 1525 | 55,2 | 1363 | 55,2 | 1376 | 82,0 | 1512 | 53,2 | 1518 |
| 22,0 | 25,2 | 52,9 | 1612 | 57,1 | 1437 | 57,1 | 1449 | 84,1 | 1594 | 55,1 | 1601 |
| 23,0 | 26,3 | 54,8 | 1702 | 58,9 | 1516 | 58,9 | 1523 | 86,2 | 1682 | 57,0 | 1686 |
| 24,0 | 27,4 | 56,7 | 1795 | 60,7 | 1590 | 60,7 | 1599 | 88,1 | 1777 | 58,7 | 1774 |
| 25,0 | 28,5 | 58,5 | 1893 | 62,4 | 1670 | 62,4 | 1677 | 90,1 | 1862 | 60,5 | 1864 |
| 26,0 | 29,6 | 60,2 | 1995 | 64,1 | 1741 | 64,1 | 1757 | 91,9 | 1954 | 62,1 | 1958 |
| 27,0 | 30,7 | 61,9 | 2104 | 65,7 | 1831 | 65,7 | 1838 | 93,7 | 2075 | 63,7 | 2055 |
| 28,0 | 31,8 | 63,5 | 2221 | 67,2 | 1912 | 67,2 | 1923 | 95,4 | 2184 | 65,3 | 2157 |
| 29,0 | 32,9 | 65,1 | 2349 | 68,7 | 1998 | 68,7 | 2009 | 97,1 | 2303 | 66,8 | 2265 |
| 30,0 | 34,0 | 66,6 | 2492 | 70,2 | 2090 | 70,2 | 2099 | 98,8 | 2402 | 68,3 | 2379 |
| 31,0 | 35,1 | 68,1 | 2663 | 71,6 | 2167 | 71,6 | 2192 | 100,3 | 2543 | 69,7 | 2506 |
| 32,0 | 36,2 | 69,6 | 2893 | 73,0 | 2271 | 73,0 | 2292 | 101,9 | 2745 | 68,3 | 6559 |
| 33,0 | 37,3 | | | 74,3 | 2384 | 74,3 | 2390 | | | 72,3 | 2793 |
| 34,0 | 38,4 | | | 75,6 | 2478 | 75,6 | 2508 | | | 73,5 | 2980 |
| 35,0 | 39,5 | | | 76,9 | 2610 | 76,9 | 2629 | | | | |
| 36,0 | 40,6 | | | 78,1 | 2719 | 78,1 | 2760 | | | | |
| 37,0 | 41,7 | | | 79,2 | 2878 | 79,2 | 2909 | | | | |
| 38,0 | 42,8 | | | 80,3 | 3058 | 80,3 | 3090 | | | | |
| 39,0 | 43,9 | | | | | 80,7 | 3884 | | | | |
| 40,0 | 45,0 | | | | | | | | | | |
| 41,0 | 46,1 | | | | | | | | | | |
| 42,0 | 47,2 | | | | | | | | | | |
| 43,0 | 48,3 | | | | | | | | | | |
| 44,0 | 49,4 | | | | | | | | | | |
| 45,0 | 50,5 | | | | | | | | | | |
| 46,0 | 51,6 | | | | | | | | | | |
| 47,0 | 52,7 | | | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 3: Maximum discharge capacity of valves 3061

| Pset [bar] | Po [barsass] | R452B | | R454B | | R513A | | R1234yf | | R1234ze | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 19,1 | 623 | 19,6 | 617 | 47,9 | 780 | 50,2 | 800 | 61,1 | 778 |
| 12,0 | 14,2 | 22,1 | 677 | 22,6 | 671 | 51,3 | 850 | 53,7 | 873 | 64,5 | 847 |
| 13,0 | 15,3 | 24,8 | 732 | 25,3 | 725 | 54,4 | 921 | 56,9 | 947 | 67,7 | 918 |
| 14,0 | 16,4 | 27,4 | 787 | 28,0 | 780 | 57,4 | 994 | 59,9 | 1022 | 70,8 | 991 |
| 15,0 | 17,5 | 29,9 | 843 | 30,5 | 836 | 60,2 | 1067 | 62,9 | 1100 | 73,7 | 1064 |
| 16,0 | 18,6 | 32,3 | 899 | 32,8 | 892 | 62,9 | 1143 | 65,6 | 1179 | 76,5 | 1139 |
| 17,0 | 19,7 | 34,5 | 956 | 35,1 | 948 | 65,4 | 1220 | 68,3 | 1260 | 79,1 | 1216 |
| 18,0 | 20,8 | 36,7 | 1014 | 37,3 | 1005 | 67,9 | 1299 | 70,8 | 1343 | 81,7 | 1295 |
| 19,0 | 21,9 | 38,8 | 1073 | 39,3 | 1063 | 70,3 | 1379 | 73,2 | 1429 | 84,1 | 1375 |
| 20,0 | 23,0 | 40,8 | 1132 | 41,4 | 1122 | 72,5 | 1462 | 75,6 | 1517 | 86,4 | 1458 |
| 21,0 | 24,1 | 42,7 | 1192 | 43,3 | 1182 | 74,7 | 1548 | 77,8 | 1610 | 88,7 | 1543 |
| 22,0 | 25,2 | 44,6 | 1253 | 45,2 | 1242 | 76,8 | 1636 | 80,0 | 1706 | 90,9 | 1631 |
| 23,0 | 26,3 | 46,4 | 1315 | 47,0 | 1303 | 78,9 | 1728 | 82,1 | 1806 | 93,0 | 1722 |
| 24,0 | 27,4 | 48,1 | 1378 | 48,7 | 1366 | 80,8 | 1823 | 84,1 | 1913 | 95,0 | 1817 |
| 25,0 | 28,5 | 49,8 | 1442 | 50,4 | 1429 | 82,7 | 1923 | 86,1 | 2027 | 97,0 | 1916 |
| 26,0 | 29,6 | 51,5 | 1507 | 52,1 | 1493 | 84,6 | 2028 | 88,0 | 2151 | 98,9 | 2021 |
| 27,0 | 30,7 | 53,1 | 1573 | 53,6 | 1559 | 86,4 | 2140 | 89,8 | 2289 | 100,7 | 2133 |
| 28,0 | 31,8 | 54,6 | 1640 | 55,2 | 1625 | 88,1 | 2262 | 91,6 | 2451 | 102,5 | 2254 |
| 29,0 | 32,9 | 56,1 | 1709 | 56,7 | 1693 | 89,8 | 2395 | 93,3 | 2664 | 104,3 | 2387 |
| 30,0 | 34,0 | 57,6 | 1780 | 58,2 | 1763 | 91,4 | 2548 | | | 106,0 | 2539 |
| 31,0 | 35,1 | 59,0 | 1851 | 59,6 | 1834 | 93,0 | 2738 | | | 107,6 | 2728 |
| 32,0 | 36,2 | 60,4 | 1925 | 61,0 | 1907 | 94,5 | 3053 | | | 109,2 | 3060 |
| 33,0 | 37,3 | 61,8 | 2001 | 62,4 | 1981 | | | | | | |
| 34,0 | 38,4 | 63,1 | 2079 | 63,7 | 2058 | | | | | | |
| 35,0 | 39,5 | 64,4 | 2159 | 65,0 | 2138 | | | | | | |
| 36,0 | 40,6 | 65,6 | 2243 | 66,2 | 2219 | | | | | | |
| 37,0 | 41,7 | 66,9 | 2329 | 67,5 | 2304 | | | | | | |
| 38,0 | 42,8 | 68,1 | 2419 | 68,7 | 2393 | | | | | | |
| 39,0 | 43,9 | 69,2 | 2514 | 69,9 | 2486 | | | | | | |
| 40,0 | 45,0 | 70,4 | 2614 | 71,0 | 2583 | | | | | | |
| 41,0 | 46,1 | 71,5 | 2721 | 72,1 | 2687 | | | | | | |
| 42,0 | 47,2 | 72,6 | 2836 | 73,2 | 2799 | | | | | | |
| 43,0 | 48,3 | 73,7 | 2963 | 74,3 | 2922 | | | | | | |
| 44,0 | 49,4 | 74,7 | 3109 | 75,3 | 3059 | | | | | | |
| 45,0 | 50,5 | 75,7 | 3287 | 76,3 | 3222 | | | | | | |
| 46,0 | 51,6 | 76,7 | 3547 | 77,3 | 3438 | | | | | | |
| 47,0 | 52,7 | | | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 3: Maximum discharge capacity of valves 3061

| Pset [bar] | Po [barsass] | R290 | | R600 | | R600a | | R1270 | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 38,1 | 505 | 92,3 | 527 | 78,8 | 540 | 30,2 | 489 |
| 12,0 | 14,2 | 41,6 | 549 | 96,3 | 574 | 82,7 | 588 | 33,5 | 531 |
| 13,0 | 15,3 | 44,9 | 594 | 100,1 | 622 | 86,4 | 636 | 36,7 | 574 |
| 14,0 | 16,4 | 48,0 | 639 | 103,7 | 670 | 89,9 | 686 | 39,8 | 617 |
| 15,0 | 17,5 | 51,0 | 684 | 107,2 | 719 | 93,3 | 737 | 42,7 | 661 |
| 16,0 | 18,6 | 53,8 | 731 | 110,4 | 769 | 96,5 | 788 | 45,4 | 706 |
| 17,0 | 19,7 | 56,5 | 778 | 113,5 | 820 | 99,6 | 841 | 48,1 | 750 |
| 18,0 | 20,8 | 59,2 | 826 | 116,5 | 872 | 102,5 | 895 | 50,6 | 796 |
| 19,0 | 21,9 | 61,7 | 874 | 119,4 | 925 | 105,3 | 950 | 53,0 | 842 |
| 20,0 | 23,0 | 64,1 | 924 | | | 108,0 | 1007 | 55,4 | 889 |
| 21,0 | 24,1 | 66,4 | 974 | | | 110,6 | 1065 | 57,6 | 937 |
| 22,0 | 25,2 | 68,7 | 1026 | | | 113,2 | 1125 | 59,8 | 985 |
| 23,0 | 26,3 | 70,8 | 1078 | | | 115,6 | 1187 | 62,0 | 1034 |
| 24,0 | 27,4 | 73,0 | 1132 | | | 118,0 | 1252 | 64,0 | 1085 |
| 25,0 | 28,5 | 75,0 | 1188 | | | 120,3 | 1320 | 66,0 | 1136 |
| 26,0 | 29,6 | 77,0 | 1245 | | | 122,5 | 1391 | 67,9 | 1188 |
| 27,0 | 30,7 | 78,9 | 1303 | | | 124,7 | 1467 | 69,8 | 1242 |
| 28,0 | 31,8 | 80,8 | 1364 | | | 126,8 | 1549 | 71,7 | 1298 |
| 29,0 | 32,9 | 82,6 | 1427 | | | 128,8 | 1640 | 73,4 | 1354 |
| 30,0 | 34,0 | 84,4 | 1493 | | | 130,8 | 1743 | 75,2 | 1413 |
| 31,0 | 35,1 | 86,2 | 1563 | | | 132,7 | 1873 | 76,9 | 1474 |
| 32,0 | 36,2 | 87,9 | 1636 | | | 134,5 | 2129 | 78,5 | 1537 |
| 33,0 | 37,3 | 89,5 | 1715 | | | | | 80,1 | 1603 |
| 34,0 | 38,4 | 91,1 | 1801 | | | | | 81,7 | 1672 |
| 35,0 | 39,5 | 92,7 | 1898 | | | | | 83,2 | 1746 |
| 36,0 | 40,6 | 94,2 | 2012 | | | | | 84,7 | 1825 |
| 37,0 | 41,7 | 95,7 | 2166 | | | | | 86,2 | 1912 |
| 38,0 | 42,8 | | | | | | | 87,6 | 2011 |
| 39,0 | 43,9 | | | | | | | 89,0 | 2129 |
| 40,0 | 45,0 | | | | | | | 90,4 | 2298 |
| 41,0 | 46,1 | | | | | | | | |
| 42,0 | 47,2 | | | | | | | | |
| 43,0 | 48,3 | | | | | | | | |
| 44,0 | 49,4 | | | | | | | | |
| 45,0 | 50,5 | | | | | | | | |
| 46,0 | 51,6 | | | | | | | | |
| 47,0 | 52,7 | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | |

SAFETY DEVICES

4.2 – SAFETY VALVES IN SERIES 3065

GENERAL DESCRIPTION

Safety valves in series 3065 are considered “Safety Accessories” according to the definition provided in Article 2, Point 4 of said Directive and are subject to the classification indicated in Article 4, Point 1.d) of the same Directive. These valves are unbalanced, conventional direct-loaded safety valves. The valve is opened by the thrust from the fluid under pressure below the shutter, when said thrust exceeds, under the calibrated conditions, the opposing force of the spring acting on the shutter.

Valves are identified by means of:

- a model number formed of an alphanumerical code that includes:
 - the family identity (for ex. 3065/4)
 - the type of inlet connection (for ex. C = NPT)
 - the set pressure, expressed in bar, multiplied by 10 (for ex. 140)
- an alphanumerical serial number

CONSTRUCTION

Body: squared, obtained through hot moulding and subsequent machining. It houses the following elements:

- the nozzle with flat sealing seat
- the shutter guide
- the set spring slot
- the threaded seat of the setting adjustment ring nut

In the body, above the shutter guide, a small pressure relief hole is provided through which the spring slot communicates with the exit connection. For this reason, during relief, there is a no gas leak through this orifice.

Material used: EN 12420-CW617N brass

Shutter: obtained through machining from bar stock and fit with gasket, it ensures the required degree of tightness on the valve seat. The gasket is made from modified PTFE (Polytetrafluoroethylene), a material that, during the valve’s estimated service life, maintains good strength and does not cause the shutter to stick on the seat. The shutter is properly guided in the body and the guide action cannot fail. There are no glands or retaining rings that hamper its movement.

Material used: EN 12164-CW614N brass

Spring: it opposes the pressure and the fluid dynamic forces, and always ensures closing of the valve following pressure relief. When the shutter has reached the maximum height determined by the mechanical stop, the spring compression does not exceed 80% of the total compression. All the springs are compliant with the compression helical spring requirements defined in EN ISO 4126-7:2013.

Material used: EN 10270-2 - FD steel for springs.

Calibration system: hex-head threaded ring nut to be screwed inside the upper portion of the head, compressing the spring below. When calibration is complete, the position of the ring nut is maintained unchanged by applying to the threaded coupling a high mechanical strength and low viscosity bonding agent. The low viscosity promotes penetration. The calibration system is protected against subsequent tampering by means of a threaded cap nut, screwed on outside the brass body and blocked in place through re-flanging.

SCOPE

Use: protection against possible overpressure of the apparatuses listed below, with regard to the operating conditions for which they have been designed:

- Refrigeration system or heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, or piping.

(reference standard: EN 378-2:2016)

- Simple pressure vessels

(reference Directive: 2009/105/EC)

Fluids: the valves in series 3065 can be used with:

d) Refrigerant fluids in vapour or gaseous state belonging to Group 2:

- HFC (R134a, R404A, R407C, R410A, R507)
- HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, R452A, R513A)
- R744

with reference to Article 13, Para. 1(b) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

e) Refrigerant fluids in vapour or gaseous state belonging to Group 1:

- HFC (R32)
- HFO and HFO/HFC mixture (R1234yf, R452B, R454B)
- HC (R290, R600, R600a, R1270)

with reference to Article 13, Para. 1(a) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

f) Air and nitrogen (reference Directive: 2009/105/EC)

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



MARKING

In compliance with the provisions of Article 19 of Directive 2014/68/EC, the following information is cast on the valve body:

- Manufacturer's mark
- Country of manufacturing
- Indication of flow direction
- Maximum allowable pressure

Again, on the body, the following information is laser marked:

- Valve model
- Serial number
- Set pressure
- Allowable temperature range
- Kd discharge coefficient
- Flow section
- Production date
- CE marking
- Identification number of the notified body involved in the production control phase

DOCUMENTATION

The safety valves in series 3065 are supplied with the following documentation provided in the packaging:

- operating instructions for the user, containing all information useful for safety in terms of assembly, commissioning, use, and maintenance.
- Compliance Statement for the equipment according to Directive 2014/68/EU, required in Article 17 and issued in compliance with Annex IV of the same directive.
- Calibration certificate for the safety valve, printed on the reverse side of the Compliance Statement.

N.B.: on the website: www.castel.it use the "DOWNLOAD" pull-down menu to access the web-page "CERTIFICATION" in the "DOWNLOAD CENTER". On this page, you can download:

- the Compliance Statement / Calibration Certificate for each valve by entering the 7-digit alphanumeric serial number. (SEARCH BY SERIAL NUMBER)
- the general Compliance Statement referring to a specific model of valve 3061 with a specific setting, for ex. 3065/4C250 or 3065/6C420. (SEARCH BY PRODUCT CODE)

VALVE SELECTION

Directive 2014/68/EC requires that pressure equipment, in which permissible limits are reasonably likely to be exceeded, shall be fitted with suitable protection devices, for instance safety devices such as safety valves. Such devices shall prevent pressure from permanently exceeding the maximum allowable pressure (PS) of the equipment they protect. In any case, a short pressure peak limited to 10% of maximum allowable pressure is permitted.

As to the selection and sizing of the suitable protection device, users shall refer to the specific product and sector standards listed below:

- EN ISO 4126-1: 2013: "Safety devices for protection against

excessive pressure – Part 1: Safety valves" indicates the general requirements for safety valves regardless of the fluid for which they were designed.

- EN 378-2:2016 "Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation" provides a general outline of the protection devices to be used in refrigerating systems and their characteristics (Para. 6.2.5) and the criteria for the selection of the device suitable for the type and size of the system component to be protected (Para. 6.2.6).

- EN 13136:2013: + A1 "Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation" highlights the possible causes of overpressure in a system and provides users with the tools for sizing pressure relief devices, among which safety valves.

For sizing of the safety valves in series 3065, please see Chapter 4.3 "Selection Criteria for Safety Valves" in this technical handbook. Table 6 provides the maximum discharge capacities of safety valves, models 3065/4 and 3065/6, as a function of various refrigerants and varying Pset for the valve, considering T_o = Steam saturation temperature at discharge pressure, P_o .

VALVE INSTALLATION

Safety valves type 3065 guarantee repeatable performance. This means that, after the valves have operated, open/close, the initial setting conditions are maintained. Nevertheless, it is advisable to replace a 3065 valve once it has discharged as during release debris, such as metal shavings or solder impurities, can deposit on the valve gasket. This can inhibit the safety valve from returning to its original conditions.

To calculate the pressure loss in either the upstream line (between vessel and safety valve) or the downstream line (between safety valve and atmosphere) refer to Chapter 4.3 "Selection Criteria for Safety Valves" in this technical handbook.

TABLE 4 : General Characteristics of valves 3065

| Catalogue Number | | 3065/4C | 3065/6C |
|--|-------------|---|----------|
| Connections | Inlet male | 1/2" NPT | 3/4" NPT |
| | Outlet male | 1" G | 1" G |
| Inlet connection wrench torque (min/max) [Nm] | | 25/35 | 32/45 |
| Flow Diameter [mm] | | 13,0 | 13,0 |
| Flow Section [mm ²] | | 132,7 | 132,7 |
| Lift [mm] | | 6,3 | 6,3 |
| Discharge Coefficient "Kd" | | 0,87 | 0,87 |
| PS [bar] | | 70 | |
| TS [°C] | | - 50 / + 150 | |
| TA [°C] | | - 40 / + 50 | |
| "Set Pressure Range at atmospheric back pressure Pset [bar]" | | 11 / 60 | |
| Overpressure | | + 10 % of Pset | |
| Blowdown | | - 15 % of Pset | |
| Helium tightness | | - 20 % of Pset (11 bar < Pset < 18,5 bar) | |
| | | - 15 % of Pset (18,6 bar < Pset < 31 bar) | |
| | | - 10 % of Pset (31,1 bar < Pset < 60 bar) | |
| Estimated service life | | 9 years | |
| Risk Category according to PED Recast | | IV | |

TABLE 5: Dimensions and Weights of valves 3065

| Catalogue Number | Dimensions [mm] | | | | | | Weight [g] |
|------------------|-----------------|----|----|----|----|-----|------------|
| | Ø D | L | Ch | H1 | H2 | H3 | |
| 3065/4C | 38,5 | 40 | 32 | 40 | 72 | 112 | 520 |
| 3065/6C | 38,5 | 40 | 32 | 40 | 72 | 112 | 520 |

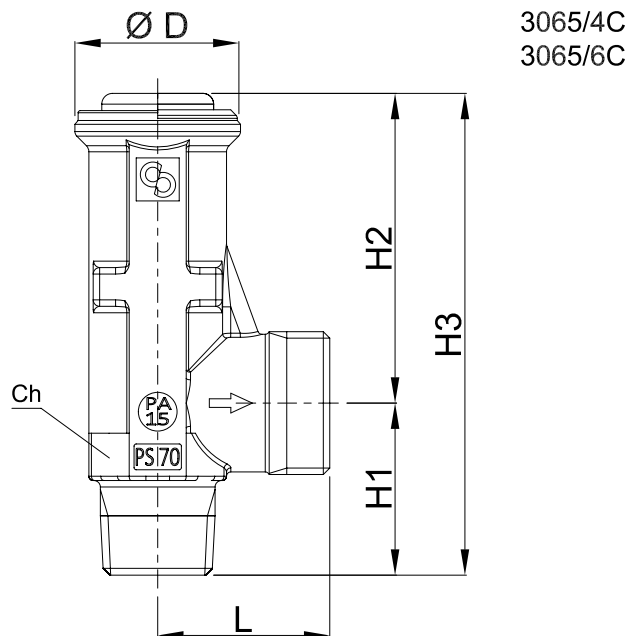


TABLE 6: Maximum discharge capacity of valves 3065

| Pset [bar] | Po [barsass] | R134a | | R32 | | R404A | | R407C | | R410A | |
|------------|--------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 49,8 | 2200 | 15,8 | 1686 | 27,0 | 2257 | 33,9 | 2056 | 16,5 | 1970 |
| 12,0 | 14,2 | 53,0 | 2395 | 18,6 | 1832 | 30,2 | 2460 | 36,9 | 2236 | 19,4 | 2143 |
| 13,0 | 15,3 | 56,0 | 2593 | 21,3 | 1979 | 33,1 | 2666 | 39,7 | 2418 | 22,1 | 2317 |
| 14,0 | 16,4 | 58,9 | 2794 | 23,9 | 2127 | 35,9 | 2875 | 42,4 | 2603 | 24,7 | 2493 |
| 15,0 | 17,5 | 61,7 | 2998 | 26,3 | 2277 | 38,5 | 3088 | 44,9 | 2789 | 27,2 | 2671 |
| 16,0 | 18,6 | 64,3 | 3206 | 28,6 | 2428 | 41,0 | 3306 | 47,3 | 2978 | 29,5 | 2851 |
| 17,0 | 19,7 | 66,8 | 3417 | 30,8 | 2580 | 43,4 | 3528 | 49,6 | 3170 | 31,8 | 3033 |
| 18,0 | 20,8 | 69,2 | 3632 | 33,0 | 2735 | 45,7 | 3755 | 51,8 | 3364 | 33,9 | 3218 |
| 19,0 | 21,9 | 71,5 | 3851 | 35,0 | 2890 | 48,0 | 3987 | 54,0 | 3562 | 36,0 | 3405 |
| 20,0 | 23,0 | 73,7 | 4075 | 37,0 | 3048 | 50,1 | 4226 | 56,0 | 3762 | 37,9 | 3595 |
| 21,0 | 24,1 | 75,9 | 4304 | 38,9 | 3207 | 52,1 | 4471 | 58,0 | 3966 | 39,9 | 3788 |
| 22,0 | 25,2 | 77,9 | 4538 | 40,7 | 3368 | 54,1 | 4724 | 59,9 | 4173 | 41,7 | 3984 |
| 23,0 | 26,3 | 79,9 | 4779 | 42,5 | 3531 | 56,0 | 4986 | 61,7 | 4384 | 43,5 | 4183 |
| 24,0 | 27,4 | 81,9 | 5027 | 44,2 | 3696 | 57,9 | 5258 | 63,4 | 4599 | 45,2 | 4386 |
| 25,0 | 28,5 | 83,7 | 5282 | 45,8 | 3863 | 59,7 | 5542 | 65,2 | 4819 | 46,9 | 4592 |
| 26,0 | 29,6 | 85,6 | 5547 | 47,4 | 4033 | 61,4 | 5840 | 66,8 | 5044 | 48,5 | 4803 |
| 27,0 | 30,7 | 87,3 | 5821 | 49,0 | 4205 | 63,1 | 6156 | 68,4 | 5274 | 50,1 | 5017 |
| 28,0 | 31,8 | 89,0 | 6107 | 50,5 | 4379 | 64,7 | 6494 | 70,0 | 5510 | 51,6 | 5237 |
| 29,0 | 32,9 | 90,7 | 6408 | 52,0 | 4556 | 66,3 | 6861 | 71,5 | 5753 | 53,1 | 5463 |
| 30,0 | 34,0 | 92,3 | 6726 | 53,5 | 4737 | 67,8 | 7270 | 72,9 | 6004 | 54,6 | 5693 |
| 31,0 | 35,1 | 93,9 | 7067 | 54,9 | 4920 | 69,3 | 7747 | 74,4 | 6263 | 56,0 | 5931 |
| 32,0 | 36,2 | 95,4 | 7436 | 56,3 | 5107 | 70,7 | 8358 | 75,7 | 6532 | 57,4 | 6175 |
| 33,0 | 37,3 | 96,9 | 7849 | 57,6 | 5297 | 72,1 | 9674 | 77,1 | 6812 | 58,7 | 6428 |
| 34,0 | 38,4 | 98,3 | 8329 | 58,9 | 5491 | | | 78,4 | 7107 | 60,1 | 6691 |
| 35,0 | 39,5 | 99,2 | 8744 | 60,2 | 5689 | | | 79,7 | 7418 | 61,4 | 6964 |
| 36,0 | 40,6 | 99,5 | 8966 | 61,5 | 5892 | | | 80,9 | 7749 | 62,6 | 7251 |
| 37,0 | 41,7 | 99,7 | 9199 | 62,7 | 6100 | | | 82,1 | 8109 | 63,8 | 7552 |
| 38,0 | 42,8 | | | 63,9 | 6313 | | | 83,2 | 8507 | 65,0 | 7874 |
| 39,0 | 43,9 | | | 65,1 | 6533 | | | 84,3 | 8965 | 66,2 | 8220 |
| 40,0 | 45,0 | | | 66,2 | 6759 | | | 85,3 | 9536 | 67,4 | 8600 |
| 41,0 | 46,1 | | | 67,3 | 6993 | | | 86,1 | 10476 | 68,5 | 9029 |
| 42,0 | 47,2 | | | 68,5 | 7236 | | | | | 69,6 | 9541 |
| 43,0 | 48,3 | | | 69,5 | 7489 | | | | | 70,7 | 10246 |
| 44,0 | 49,4 | | | 70,6 | 7754 | | | | | | |
| 45,0 | 50,5 | | | 71,7 | 8033 | | | | | | |
| 46,0 | 51,6 | | | 72,7 | 8330 | | | | | | |
| 47,0 | 52,7 | | | 73,7 | 8651 | | | | | | |
| 48,0 | 53,8 | | | 74,7 | 9003 | | | | | | |
| 49,0 | 54,9 | | | 75,6 | 9402 | | | | | | |
| 50,0 | 56,0 | | | 76,6 | 9881 | | | | | | |
| 51,0 | 57,1 | | | 77,5 | 10554 | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 6: Maximum discharge capacity of valves 3065

| Pset [bar] | Po [barsass] | R507 | | R448A | | R449A | | R450A | | R452A | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 25,8 | 2260 | 31,1 | 2075 | 31,0 | 2087 | 55,2 | 2250 | 28,7 | 2279 |
| 12,0 | 14,2 | 28,9 | 2463 | 34,1 | 2254 | 34,0 | 2271 | 58,5 | 2456 | 31,8 | 2482 |
| 13,0 | 15,3 | 31,9 | 2669 | 36,9 | 2443 | 36,9 | 2457 | 61,7 | 2653 | 34,6 | 2687 |
| 14,0 | 16,4 | 34,7 | 2879 | 39,6 | 2631 | 39,5 | 2645 | 64,6 | 2867 | 37,4 | 2895 |
| 15,0 | 17,5 | 37,3 | 3093 | 42,1 | 2814 | 42,1 | 2836 | 67,5 | 3075 | 39,9 | 3106 |
| 16,0 | 18,6 | 39,8 | 3311 | 44,6 | 3011 | 44,5 | 3029 | 70,1 | 3284 | 42,4 | 3321 |
| 17,0 | 19,7 | 42,2 | 3533 | 46,9 | 3212 | 46,8 | 3226 | 72,7 | 3510 | 44,7 | 3540 |
| 18,0 | 20,8 | 44,5 | 3761 | 49,1 | 3396 | 49,1 | 3425 | 75,2 | 3735 | 47,0 | 3763 |
| 19,0 | 21,9 | 46,8 | 3994 | 51,2 | 3611 | 51,2 | 3627 | 77,5 | 3953 | 49,1 | 3990 |
| 20,0 | 23,0 | 48,9 | 4234 | 53,3 | 3802 | 53,2 | 3833 | 79,8 | 4187 | 51,2 | 4222 |
| 21,0 | 24,1 | 50,9 | 4481 | 55,2 | 4004 | 55,2 | 4043 | 82,0 | 4441 | 53,2 | 4459 |
| 22,0 | 25,2 | 52,9 | 4735 | 57,1 | 4221 | 57,1 | 4256 | 84,1 | 4681 | 55,1 | 4702 |
| 23,0 | 26,3 | 54,8 | 4999 | 58,9 | 4453 | 58,9 | 4474 | 86,2 | 4939 | 57,0 | 4952 |
| 24,0 | 27,4 | 56,7 | 5273 | 60,7 | 4672 | 60,7 | 4697 | 88,1 | 5218 | 58,7 | 5210 |
| 25,0 | 28,5 | 58,5 | 5559 | 62,4 | 4905 | 62,4 | 4925 | 90,1 | 5470 | 60,5 | 5475 |
| 26,0 | 29,6 | 60,2 | 5860 | 64,1 | 5114 | 64,1 | 5159 | 91,9 | 5740 | 62,1 | 5750 |
| 27,0 | 30,7 | 61,9 | 6180 | 65,7 | 5379 | 65,7 | 5400 | 93,7 | 6094 | 63,7 | 6037 |
| 28,0 | 31,8 | 63,5 | 6523 | 67,2 | 5617 | 67,2 | 5647 | 95,4 | 6415 | 65,3 | 6336 |
| 29,0 | 32,9 | 65,1 | 6899 | 68,7 | 5870 | 68,7 | 5902 | 97,1 | 6766 | 66,8 | 6652 |
| 30,0 | 34,0 | 66,6 | 7321 | 70,2 | 6140 | 70,2 | 6165 | 98,8 | 7056 | 68,3 | 6988 |
| 31,0 | 35,1 | 68,1 | 7821 | 71,6 | 6365 | 71,6 | 6440 | 100,3 | 7471 | 69,7 | 7360 |
| 32,0 | 36,2 | 69,6 | 8498 | 73,0 | 6671 | 73,0 | 6733 | 101,9 | 8061 | 68,3 | 19265 |
| 33,0 | 37,3 | | | 74,3 | 7004 | 74,3 | 7019 | | | 72,3 | 8203 |
| 34,0 | 38,4 | | | 75,6 | 7278 | 75,6 | 7368 | | | 73,5 | 8752 |
| 35,0 | 39,5 | | | 76,9 | 7667 | 76,9 | 7721 | | | | |
| 36,0 | 40,6 | | | 78,1 | 7986 | 78,1 | 8107 | | | | |
| 37,0 | 41,7 | | | 79,2 | 8453 | 79,2 | 8545 | | | | |
| 38,0 | 42,8 | | | 80,3 | 8982 | 80,3 | 9076 | | | | |
| 39,0 | 43,9 | | | | | 80,7 | 11407 | | | | |
| 40,0 | 45,0 | | | | | | | | | | |
| 41,0 | 46,1 | | | | | | | | | | |
| 42,0 | 47,2 | | | | | | | | | | |
| 43,0 | 48,3 | | | | | | | | | | |
| 44,0 | 49,4 | | | | | | | | | | |
| 45,0 | 50,5 | | | | | | | | | | |
| 46,0 | 51,6 | | | | | | | | | | |
| 47,0 | 52,7 | | | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 6: Maximum discharge capacity of valves 3065

| Pset [bar] | Po [barsass] | R452B | | R454B | | R513A | | R1234yf | | R1234ze | |
|------------|--------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 19,1 | 1829 | 19,6 | 1813 | 47,9 | 2290 | 50,2 | 2350 | 61,1 | 2284 |
| 12,0 | 14,2 | 22,1 | 1988 | 22,6 | 1971 | 51,3 | 2496 | 53,7 | 2564 | 64,5 | 2489 |
| 13,0 | 15,3 | 24,8 | 2149 | 25,3 | 2131 | 54,4 | 2705 | 56,9 | 2781 | 67,7 | 2698 |
| 14,0 | 16,4 | 27,4 | 2311 | 28,0 | 2292 | 57,4 | 2918 | 59,9 | 3003 | 70,8 | 2910 |
| 15,0 | 17,5 | 29,9 | 2476 | 30,5 | 2454 | 60,2 | 3135 | 62,9 | 3230 | 73,7 | 3126 |
| 16,0 | 18,6 | 32,3 | 2641 | 32,8 | 2619 | 62,9 | 3357 | 65,6 | 3462 | 76,5 | 3347 |
| 17,0 | 19,7 | 34,5 | 2809 | 35,1 | 2785 | 65,4 | 3583 | 68,3 | 3700 | 79,1 | 3572 |
| 18,0 | 20,8 | 36,7 | 2979 | 37,3 | 2953 | 67,9 | 3815 | 70,8 | 3944 | 81,7 | 3803 |
| 19,0 | 21,9 | 38,8 | 3151 | 39,3 | 3124 | 70,3 | 4052 | 73,2 | 4196 | 84,1 | 4039 |
| 20,0 | 23,0 | 40,8 | 3325 | 41,4 | 3296 | 72,5 | 4296 | 75,6 | 4457 | 86,4 | 4282 |
| 21,0 | 24,1 | 42,7 | 3502 | 43,3 | 3471 | 74,7 | 4547 | 77,8 | 4728 | 88,7 | 4532 |
| 22,0 | 25,2 | 44,6 | 3681 | 45,2 | 3648 | 76,8 | 4806 | 80,0 | 5010 | 90,9 | 4790 |
| 23,0 | 26,3 | 46,4 | 3863 | 47,0 | 3828 | 78,9 | 5075 | 82,1 | 5306 | 93,0 | 5058 |
| 24,0 | 27,4 | 48,1 | 4047 | 48,7 | 4011 | 80,8 | 5355 | 84,1 | 5619 | 95,0 | 5337 |
| 25,0 | 28,5 | 49,8 | 4235 | 50,4 | 4197 | 82,7 | 5648 | 86,1 | 5954 | 97,0 | 5629 |
| 26,0 | 29,6 | 51,5 | 4426 | 52,1 | 4386 | 84,6 | 5958 | 88,0 | 6317 | 98,9 | 5937 |
| 27,0 | 30,7 | 53,1 | 4620 | 53,6 | 4578 | 86,4 | 6287 | 89,8 | 6724 | 100,7 | 6265 |
| 28,0 | 31,8 | 54,6 | 4818 | 55,2 | 4774 | 88,1 | 6643 | 91,6 | 7199 | 102,5 | 6619 |
| 29,0 | 32,9 | 56,1 | 5020 | 56,7 | 4974 | 89,8 | 7035 | 93,3 | 7824 | 104,3 | 7010 |
| 30,0 | 34,0 | 57,6 | 5227 | 58,2 | 5178 | 91,4 | 7485 | | | 106,0 | 7458 |
| 31,0 | 35,1 | 59,0 | 5438 | 59,6 | 5387 | 93,0 | 8042 | | | 107,6 | 8013 |
| 32,0 | 36,2 | 60,4 | 5655 | 61,0 | 5600 | 94,5 | 8967 | | | 109,2 | 8989 |
| 33,0 | 37,3 | 61,8 | 5877 | 62,4 | 5820 | | | | | | |
| 34,0 | 38,4 | 63,1 | 6106 | 63,7 | 6046 | | | | | | |
| 35,0 | 39,5 | 64,4 | 6343 | 65,0 | 6278 | | | | | | |
| 36,0 | 40,6 | 65,6 | 6587 | 66,2 | 6519 | | | | | | |
| 37,0 | 41,7 | 66,9 | 6841 | 67,5 | 6769 | | | | | | |
| 38,0 | 42,8 | 68,1 | 7106 | 68,7 | 7029 | | | | | | |
| 39,0 | 43,9 | 69,2 | 7384 | 69,9 | 7301 | | | | | | |
| 40,0 | 45,0 | 70,4 | 7677 | 71,0 | 7588 | | | | | | |
| 41,0 | 46,1 | 71,5 | 7991 | 72,1 | 7893 | | | | | | |
| 42,0 | 47,2 | 72,6 | 8330 | 73,2 | 8222 | | | | | | |
| 43,0 | 48,3 | 73,7 | 8704 | 74,3 | 8581 | | | | | | |
| 44,0 | 49,4 | 74,7 | 9132 | 75,3 | 8986 | | | | | | |
| 45,0 | 50,5 | 75,7 | 9654 | 76,3 | 9465 | | | | | | |
| 46,0 | 51,6 | 76,7 | 10419 | 77,3 | 10100 | | | | | | |
| 47,0 | 52,7 | | | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | | | |

continue →

TABLE 6: Maximum discharge capacity of valves 3065

| Pset [bar] | Po [barsass] | R290 | | R600 | | R600a | | R1270 | |
|---------------|-----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] | To [°C] | Qm [kg/h] |
| 11,0 | 13,1 | 38,1 | 1483 | 92,3 | 1549 | 78,8 | 1585 | 30,2 | 1436 |
| 12,0 | 14,2 | 41,6 | 1612 | 96,3 | 1686 | 82,7 | 1726 | 33,5 | 1560 |
| 13,0 | 15,3 | 44,9 | 1744 | 100,1 | 1826 | 86,4 | 1869 | 36,7 | 1686 |
| 14,0 | 16,4 | 48,0 | 1876 | 103,7 | 1968 | 89,9 | 2015 | 39,8 | 1814 |
| 15,0 | 17,5 | 51,0 | 2010 | 107,2 | 2112 | 93,3 | 2164 | 42,7 | 1942 |
| 16,0 | 18,6 | 53,8 | 2147 | 110,4 | 2259 | 96,5 | 2315 | 45,4 | 2072 |
| 17,0 | 19,7 | 56,5 | 2285 | 113,5 | 2408 | 99,6 | 2470 | 48,1 | 2204 |
| 18,0 | 20,8 | 59,2 | 2425 | 116,5 | 2561 | 102,5 | 2628 | 50,6 | 2338 |
| 19,0 | 21,9 | 61,7 | 2568 | 119,4 | 2718 | 105,3 | 2790 | 53,0 | 2473 |
| 20,0 | 23,0 | 64,1 | 2714 | | | 108,0 | 2956 | 55,4 | 2611 |
| 21,0 | 24,1 | 66,4 | 2862 | | | 110,6 | 3128 | 57,6 | 2751 |
| 22,0 | 25,2 | 68,7 | 3013 | | | 113,2 | 3304 | 59,8 | 2893 |
| 23,0 | 26,3 | 70,8 | 3168 | | | 115,6 | 3487 | 62,0 | 3038 |
| 24,0 | 27,4 | 73,0 | 3326 | | | 118,0 | 3677 | 64,0 | 3186 |
| 25,0 | 28,5 | 75,0 | 3489 | | | 120,3 | 3877 | 66,0 | 3337 |
| 26,0 | 29,6 | 77,0 | 3656 | | | 122,5 | 4086 | 67,9 | 3491 |
| 27,0 | 30,7 | 78,9 | 3828 | | | 124,7 | 4309 | 69,8 | 3649 |
| 28,0 | 31,8 | 80,8 | 4007 | | | 126,8 | 4550 | 71,7 | 3811 |
| 29,0 | 32,9 | 82,6 | 4192 | | | 128,8 | 4816 | 73,4 | 3978 |
| 30,0 | 34,0 | 84,4 | 4386 | | | 130,8 | 5120 | 75,2 | 4150 |
| 31,0 | 35,1 | 86,2 | 4590 | | | 132,7 | 5502 | 76,9 | 4329 |
| 32,0 | 36,2 | 87,9 | 4806 | | | 134,5 | 6255 | 78,5 | 4514 |
| 33,0 | 37,3 | 89,5 | 5037 | | | | | 80,1 | 4708 |
| 34,0 | 38,4 | 91,1 | 5290 | | | | | 81,7 | 4912 |
| 35,0 | 39,5 | 92,7 | 5574 | | | | | 83,2 | 5129 |
| 36,0 | 40,6 | 94,2 | 5910 | | | | | 84,7 | 5362 |
| 37,0 | 41,7 | 95,7 | 6363 | | | | | 86,2 | 5617 |
| 38,0 | 42,8 | | | | | | | 87,6 | 5906 |
| 39,0 | 43,9 | | | | | | | 89,0 | 6252 |
| 40,0 | 45,0 | | | | | | | 90,4 | 6748 |
| 41,0 | 46,1 | | | | | | | | |
| 42,0 | 47,2 | | | | | | | | |
| 43,0 | 48,3 | | | | | | | | |
| 44,0 | 49,4 | | | | | | | | |
| 45,0 | 50,5 | | | | | | | | |
| 46,0 | 51,6 | | | | | | | | |
| 47,0 | 52,7 | | | | | | | | |
| 48,0 | 53,8 | | | | | | | | |
| 49,0 | 54,9 | | | | | | | | |
| 50,0 | 56,0 | | | | | | | | |
| 51,0 | 57,1 | | | | | | | | |
| 52,0 | 58,2 | | | | | | | | |
| 53,0 | 59,3 | | | | | | | | |
| 54,0 | 60,4 | | | | | | | | |
| 55,0 | 61,5 | | | | | | | | |
| 56,0 | 62,6 | | | | | | | | |
| 57,0 | 63,7 | | | | | | | | |
| 58,0 | 64,8 | | | | | | | | |
| 59,0 | 65,9 | | | | | | | | |
| 60,0 | 67,0 | | | | | | | | |

SAFETY DEVICES

4.3 – SELECTION CRITERIA FOR SAFETY VALVES

CALCULATION OF THE DISCHARGE CAPACITY (REF. EN 13136:2013+A1)

The calculation of the minimum discharge capacity is linked to the system configuration on which the safety valve is installed, and to the cause of the safety valve opening, i.e.:

- **External heat sources** (Para. 6.2.1 - EN 13136:2013+A1). The minimum required discharge capacity is determined by the following formula:

$$Q_{md} = \frac{(3600 \times \phi \times A_{surf})}{h_{vap}} \quad [\text{kg/h}]$$

where:

- ϕ = density of heat flow rate, assumed to be 10 [kW/m²]
- A_{surf} = external surface area of the vessel [m²]
- h_{vap} = latent heat of vaporization of liquid at p_o [kJ/kg] = 1,1 x p_{set} [kJ/kg]
 - If p_o is higher than the saturated pressure of the refrigerant at critical temperature minus 5 °K, then h_{vap} shall be taken at critical temperature minus 5 °K
 - If the temperature at p_o is higher than the saturated temperature (superheated gas), then h_{vap} shall be taken at saturated condition

Note: vessels only containing refrigerant in the gas phase do not produce a continuous mass flow under an external heat impact.

- **Internal heat sources** (Para. 6.2.2 - EN 13136:2013 + A1). The minimum required discharge capacity is determined by the following formula:

$$Q_{md} = \frac{(3600 \times Q_h)}{h_{vap}} \quad [\text{kg/h}]$$

where Q_h = rate of heat production [kW]

- **Increased pressure caused by a positive displacement compressor** (Para. 6.3 - EN 13136:2013+A1). The minimum required discharge capacity is determined by the following formula:

$$Q_{md} = 60 \times V \times n \times \rho_{10} \times \eta_v \quad [\text{kg/h}]$$

where:

- V = theoretical displacement of compressor [m³]
- n = rotational frequency of compressor [min⁻¹]
- ρ_{10} = vapour density of refrigerant, from the saturation curve at a temperature of 10 °C [kg/m³].

Table 7 provides the values of ρ_{10} for:

- traditional HCFC and HFC refrigerants most commonly used
- new HFO and HFC/HFO blend refrigerants
- natural HC fluids
- η_v = volumetric efficiency of the compressor, estimated at suction pressure and discharge pressure equivalent to the safety valve setting.

SIZING OF SAFETY VALVES DESIGNED TO DISCHARGE GAS OR VAPOUR AT CRITICAL FLOW (REF. EN ISO 4126-1: 2013 AND EN 13136 :2013+A1)

Critical flow occurs when the back-pressure p_b (the pressure existing immediately at the outlet of the valve) is lower than or equal to the critical pressure:

$$p_b \leq p_o \times \left| \frac{2}{k+1} \right|^{\frac{k}{k-1}} \quad [\text{bar abs}]$$

where:

- p_o = actual relieving pressure, upstream the valve. It's equal to the set pressure plus overpressure; that is, the pressure increase over the set pressure at which the shutter has its total lift [bar abs]
- k = isentropic exponent of gas or vapour, based on the actual temperature and pressure conditions upstream of the valve during the discharge phase under full glow.

If k is unknown or difficult to determine, it is possible to assume:

$$p_{critical} = 0,5 \times p_o \quad [\text{bar abs}]$$

A valve that discharges to the atmosphere, is under in critical flow conditions.

To calculate the flow rate of a safety valve designed to discharge gas or vapour at critical flow, under specific operating conditions, use the following formulas, provided in Para. 7.2.5.2 of EN 13136:2013+A1.

$$Q_m = 0,2883 \times C \times A \times 0,9 \times K_d \times \sqrt{\frac{p_o}{v_o}} \quad [\text{kg/h}]$$

where:

- Q_m = calculated mass flow rate of safety valve [kg/h]
- A = calculated flow area of the safety valve [mm²]



This formula was used to calculate the maximum discharge flow of the safety valve shown in:

- Table 3 for valves in series 3061
- Table 6 for valves in series 3065

$$\text{If } Q_{md} < Q_m < 1,25 \times Q_{md} \rightarrow Q_{md'} = Q_{md}$$

$$\text{If } Q_m > 1,25 \times Q_{md} \rightarrow Q_{md'} = Q_m / 1,25$$

where:

- $Q_{md'}$ = adjusted discharge capacity of safety valve, used for pressure drop calculation [kg/h]

The flow area A_c is calculated from the adjusted discharge capacity $Q_{md'}$ as follows:

$$A_c = 3,469 \times Q_{md'} / (C \times 0,9 \times K_d) \times \sqrt{\frac{v_o}{p_o}} \text{ [mm}^2\text{]}$$

where:

- K_d = certified discharge ratio of safety valve
- p_o = actual pressure upstream of the safety valve during discharge of the entire flow, see definition above. [bar abs]
- v_o = specific volume of gas or vapour at discharge conditions p_o and T_o , where T_o is the fluid temperature at valve inlet, defined by the user or by the designer [m³/kg]
- C = expansion rate as a function of the k coefficient in the isentropic equation calculated with the following formula:

$$C = 3,948 \times \sqrt{k \times \left| \frac{2}{k+1} \right|^{\frac{(k+1)}{(k-1)}}}$$

for this calculation, the value of k refers to a temperature of 25 °C. (Para. 7.2.3, EN 13136:2013+A1 standard).

Table 7 provides the k and C values for:

- traditional HCFC and HFC refrigerants most commonly used
- new HFO and HFC/HFO blend refrigerants
- natural HC fluids

INSTALLATION OF A SAFETY VALVE (REF. EN 13136:2013+A1)

As far as the installation of safety valves is concerned, remember these basic points:

- Safety valves must be installed near an area of the system where vapours or gases are present and where there is no fluid turbulence. They must be placed in as close to an upright position as possible, with the inlet connector turned downwards.

- Vessels joined by piping, of a diameter deemed by the manufacturer and the user to be adequate, without any stop valves between them, may be considered as a single vessel for the installation of a safety valve.

- The fitting between the valve and the equipment to be protected must be as short as possible. Furthermore, the cross-section of the piping must not be smaller than the valve inlet. In any case, EN 13136:2013+A1 states that the pressure drop between the protected vessel and the safety valve, at discharge capacity, shall not exceed 3% of the setting value, p_o , including any accessory on the line.

- The location selected for installation of the safety valve must consider that valve operation involves the discharge of the refrigerant fluid under pressure, sometimes at high temperature. Where there is the risk of causing injuries to people nearby, exhaust piping must be provided, sized so as to not compromise valve operation. EN 13136:2013+A1 states that this piping must not generate, at discharge capacity, a back-pressure exceeding 10% of pressure p_o , for unbalanced, conventional valves. In the event of multiple valves installed in parallel, it is highly recommended that each valve be fit with a dedicated exhaust line rather than a single manifold for all of the valves. The risk of the latter solution is to create an overpressure in the manifold determined when a valve discharges. This overpressure can modify the operating characteristics of all the other valves installed in parallel.

Pressure losses in the upstream line

To calculate the pressure losses in the upstream line (between vessel and safety valve) refer to Section 7.4 of EN 13136:2013+A1. The upstream pressure loss is given by:

$$\Delta p_{in} = 0,032 \times \left[\frac{A_c}{A_{in}} \times C \times K_{dr} \right]^2 \times \zeta \times p_o \text{ [bar]}$$

where:

- A_c = calculated flow area from the minimum required discharge capacity $Q_{md'}$ [mm²]
- A_{in} = cross-section area of inlet tube to valve [mm²]
- $K_{dr} = K_d \times 0,9$, reduced discharge coefficient
- C = expansion rate as a function of the k coefficient in the isentropic equation for the refrigerant fluid
- ζ = sum of the of pressure loss coefficients ξ_n of the individual components and piping

The coefficients ξ_n refer to:

- pipe element losses, such as fittings and elbows
- valve losses
- losses along the piping

and are listed in standard EN 13136:2013+A1, Table A.4.

To ensure correct operation of safety valve

$$\Delta p_{in} \leq 0,03 \times p_o \text{ [bar]}$$

Pressure losses in the downstream line

To calculate the pressure losses in the downstream line (between safety valve and atmosphere) refer to Section 7.4 of EN 13136:2013+A1.

The downstream pressure loss is given by:

$$\Delta p_{\text{out}} = p_1 - p_0 \quad [\text{bar}]$$

$$p_1 = \sqrt{0,064 \times \zeta \times \left(\frac{A_c}{A_{\text{out}}} \times C \times K_{\text{dr}} \times p_0\right)^2 + p_2^2}$$

[bar abs]

where:

- P_1 = inlet pressure to discharge line [bar abs]
- P_2 = outlet pressure to discharge line, equal to atmospheric pressure [bar abs]
- A_c = calculated flow area from the minimum required discharge capacity Q_{mdr} [mm²]
- A_{out} = cross-section area of valve outlet pipe [mm²]
- $K_{\text{dr}} = K_d \times 0.9$, reduced discharge coefficient
- C = expansion rate as a function of the k coefficient in the isentropic equation for the refrigerant fluid
- p_0 = actual pressure downstream of the safety valve during discharge of the entire flow [bar abs].
- ξ = sum of the of pressure loss coefficients ξ_n of the piping

The coefficients ξ_n refer to:

- pipe element losses, bends
- losses along the piping

and are listed in standard EN 13136:2013+A1, Table A.4..

To ensure correct operation of safety valve

$$\Delta p_{\text{out}} \leq 0,10 \times p_0 \quad [\text{bar}]$$

EXAMPLE 1: Calculation of the flow rate (Q_{md}) and selection of the safety valve (Increased pressure caused by a positive displacement compressor)

Compressor data

| | |
|------------------------|----------|
| – Bore: | 82.5 mm |
| – Stroke: | 69.8 mm |
| – Number of cylinders | 4 |
| – Rotational frequency | 1450 rpm |
| – Clearance | 4% |
| – Refrigerant fluid | R407C |

The theoretical displacement of the compressor is:

$$V = \frac{\pi}{4} \times 0,0825^2 \times 0,0698 \times 4 = 0,00149 \quad [\text{bar}]$$

Maximum allowable pressure of the liquid condenser / receiver:
PS = 25 bar

Set pressure of the safety valve installed on the upper crown of the condenser housing: $p_{\text{set}} = 25$ bar

$$p_0 = p_{\text{set}} \times \left(1 + \frac{10}{100}\right) + 1 = 28,5 \quad [\text{bar abs}]$$

Operating conditions of compressor at the safety valve discharge:

Condensation temperature: +65.2 °C (28.5 bar abs)

Evaporation temperature: +10 °C (6.33 bar abs)

These conditions, defined by the designer, are assumed to be the most unfavourable for the safety valve due to operating faults such as:

- Movement errors
 - Non-operation of automatic safety devices that should have been triggered prior to the safety valve due to failures or other reasons
- For cautionary reasons, ignoring the vapour overheating at the outlet of the evaporator, the volumetric efficiency of compressor is:

$$\eta_v = 1 - 0,04 \times \frac{P_{\text{discharge}}}{P_{\text{suction}}} =$$

$$= 1 - 0,04 \times \frac{28,5}{6,33} = 0,82$$

and the minimum required discharge capacity is:

$$Q_{\text{md}} = 60 \times V \times n \times \rho_{10} \times \eta_v =$$

$$= 60 \times 0,00149 \times 1450 \times 27,45 \times 0,82 = 2918$$

[kg/h]

where $\rho_{10} = 27.45$ [kg/m³], saturated vapour density of R407C at a temperature of 10 °C

Choosing a safety valve in series 3065 its mass flow rate:

$$Q_m = 0,2883 \times C \times A \times 0,9 \times K_d \times \sqrt{\frac{p_0}{v_0}} =$$

$$= 0,2883 \times 2,51 \times 132,7 \times 0,9 \times 0,87 \times \sqrt{\frac{28,5}{0,0069}} =$$

$$= 4832 \quad [\text{kg/h}]$$

where:

- $C = 2.51$, corresponding to k exponent for R407C, equal to 1.14, according to Table 7
 - $K_d = 0.87$, certified discharge ratio of safety valve 3065/4
 - $v_0 = 0.0069$ [m³/kg], specific volume of the saturated vapour upstream of the safety valve during operation.
- This value refers to the following operating conditions upstream of the valve:
- Pressure, $p_0 = 28.5$ [bar abs]
 - Temperature, $T_0 = 65.2$ [°C]

The adjusted discharge capacity of the safety valve, used for pressure drop calculation is:

$$Q_m > 1,25 \times Q_{\text{md}} = 4832 > 1,25 \times 2918 \rightarrow$$

$$\rightarrow Q_{\text{md}'} = 4832 / 1,25 = 3865 \quad [\text{kg/h}]$$

The flow area A_c calculated with the adjusted discharge capacity $Q_{\text{md}'}$ is:

$$A_c = 3,469 \times \frac{Q_{\text{md}'}}{(C \times 0,9 \times K_d)} \times \sqrt{\frac{v_0}{p_0}} =$$

$$= 3,469 \times \frac{3865}{(2,51 \times 0,9 \times 0,87)} \times \sqrt{\frac{0,0069}{28,5}} =$$

$$= 106 \quad [\text{mm}^2]$$

Verification of the system upstream the safety valve

Assuming the valve installed is 3065/4C250, using a steel fitting with the following characteristics:

- $d_{in} = 17$ [mm], fitting inside diameter
- $A_{in} = 227$ [mm²] fitting inside cross-section area
- $L = 60$ [mm], fitting length
- Condenser connection: Flush with the housing and with a sharp edge

The following information is taken from Table A.4 in standard EN 13136:2013+A1:

- $\xi_{1(inlet)} = 0.25$
- $\xi_{2(length)} = \lambda \times L / d_{in} = 0.02 \times 60 / 17 = 0.07$

with $\lambda = 0.02$ for steel pipe

- $\xi_T = \xi_1 + \xi_2 = 0.25 + 0.07 = 0.32$

Between the safety valve and the steel fitting, a shut-off valve type 3064N/44 is installed.

The main characteristics of this valve are:

- $d_R = 13$ [mm], inside valve diameter
- $A_R = 132.7$ [mm²], inside valve cross-section area
- $kv = 10$ [m³/h], valve kv coefficient

The pressure loss coefficient ξ_R of the shut-off valve is given by:

$$\zeta_R = 2,592 \times \left[\frac{132,7}{10} \right]^2 \times 10^{-3} = 0,45$$

Total loss coefficient: $\xi_T + \xi_R = 0,77$

Recalling the previously calculated flow area A_c , the characteristics of safety valve 3065/4 and refrigerant fluid R407C:

- $A_c = 106$ [mm²]
- $K_{dr} = 0.89 \times 0.9 = 0.801$
- $C = 2.51$

The pressure loss is given by:

$$\frac{\Delta p_{in}}{p_o} = 0,032 \times \left[\frac{106}{227} \times 2,51 \times 0,801 \right]^2 \times 0,77 = 0,022$$

The pressure loss value obtained is admissible because it is lower than the value of 0.03 indicated in standard EN 13136:2013+A1.

Verification of system downstream the safety valve

Suppose it is necessary to construct a discharge pipe on safety valve 3065/4C250, using 1" gas pipe with the following characteristics:

- $d_{out} = 30$ [mm], inside pipe diameter
- $A_{out} = 707$ [mm²], inside pipe cross-section area
- $L = 3000$ [mm], pipe length
- 90° elbow with bending radius, R, equal to three times external diameter of pipe

The following information is taken from Table A.4 in standard EN 13136:2013+A1:

- $\xi_{1(elbow)} = 0.25$
- $\xi_{2(length)} = \lambda \times L / d_{out} = 0.02 \times 3000 / 30 = 2$ where $\lambda = 0.02$ for steel pipe

- $\xi_T = \xi_1 + \xi_2 = 0,25 + 2 = 2,25$

The pressure loss is given by:

$$p_1 = \sqrt{0,064 \times 2,25 \times \left(\frac{106}{707} \right) \times 2,51 \times 0,801 \times 28,5} + 1^2 =$$

$$= 3,41 = \frac{\Delta p_{out}}{p_o} = \frac{3,41 - 1}{28,5} = 0,086 \quad [\text{bar}]$$

The pressure loss value obtained is admissible because it is lower than the value of 0.10 indicated in standard EN 13136:2013+A1.

EXAMPLE 2: Calculation of the flow rate (Q_{md}) and selection of the safety valve (Increase in pressure caused by internal heat source)

Data for the liquid receiver

| | |
|--|--------------------|
| Refrigerant fluid | R404A |
| Pressure equipment 300 l liquid receiver | |
| External surface area of the vessel | 3.2 m ² |
| PS of the vessel | 28 bar |

Calculation of the valve discharge pressure is:

$$p_0 = (p_{set} \times 1,1) + 1 = (28 \times 1,1) + 1 = 31,8 \quad [\text{bar abs}]$$

Calculation of the minimum required discharge capacity for the external heat source considering that there are flammable substances in such quantities as to feed a fire near the vessel to be protected.

$$Q_{md} = \frac{(3600 \times \phi \times A_{surf})}{h_{vap}} =$$

$$= \frac{(3600 \times 10 \times 3,2)}{67,28} = 1712 \quad [\text{kg/h}]$$

where:

- ϕ = density of heat flow rate, assumed to be 10 [kW/m²]
- A_{surf} = external surface area of the vessel [m²]
- h_{vap} = latent heat of vaporization of R404A at pressure, p_o [kJ/kg]

Choosing a safety valve in series 3061 its mass flow rate:

$$Q_m = 0,2883 \times C \times A \times 0,9 \times K_d \times \sqrt{\frac{p_o}{v_o}} =$$

$$= 0,2883 \times 2,5 \times 44,2 \times 0,9 \times 0,89 \times \sqrt{\frac{31,8}{0,0042}} =$$

$$= 2220 \quad [\text{kg/h}]$$

where:

- $C = 2.5$, corresponding to k exponent for R404A, equal to 1.12, according to Table 7
- $K_d = 0.89$, certified discharge ratio of safety valve 3061/4
- $v_o = 0.0042$ [m³/kg], specific volume of the saturated vapour upstream of the safety valve during operation.

This value refers to the following operating conditions upstream of the valve:

- Pressure, $p_o = 31,8$ [bar abs]
- Temperature, $T_o = 64,7$ [°C]

The adjusted discharge capacity of the safety valve, used for pressure drop calculation is:

$$Q_m > 1,25 \times Q_{md} = 2220 > 1,25 \times 1712 \rightarrow$$

$$\rightarrow Q_{md'} = 2220 / 1,25 = 1776 \quad [\text{kg/h}]$$

The flow area A_c calculated with the adjusted discharge capacity $Q_{md'}$ is:

$$A_c = 3,469 \times \frac{Q_{md'}}{(C \times 0,9 \times K_d)} \times \sqrt{\frac{v_o}{p_o}} =$$

$$= 3,469 \times \frac{1776}{(2,5 \times 0,9 \times 0,89)} \times \sqrt{\frac{0,0042}{31,8}} =$$

$$= 35,4 \quad [\text{mm}^2]$$

Verification of the system upstream the safety valve

Assuming the valve installed is 3061/4C280, using a steel fitting with the following characteristics:

- $d_{in} = 17$ [mm], fitting inside diameter
- $A_{in} = 227$ [mm²] fitting inside cross-section area
- $L = 60$ [mm], fitting length
- Receiver connection: Flush with the housing and with a sharp edge

The following data is taken from Table A.4:

- $\xi_{1(\text{inlet})} = 0,25$
- $\xi_{2(\text{length})} = \lambda \times L / d_{in} = 0,02 \times 60 / 17 = 0,07$

with $\lambda = 0.02$ for steel pipe

- $\xi_T = \xi_1 + \xi_2 = 0,25 + 0,07 = 0,32$

Between the valve and the fitting, an exchange valve (type 3032N/44) has been installed.

The main characteristics of this valve are:

- $d_R = 13$ [mm], inside valve diameter
- $A_R = 132,7$ [mm²], inside valve cross-section area
- $kv = 3,3$ [m³/h], valve kv coefficient

The pressure loss coefficient ξ_R of the exchange valve is given by:

$$\zeta_R = 2,592 \times \left[\frac{132,7}{3,3} \right]^2 \times 10^{-3} = 4,19$$

Total loss coefficient: $\xi_T + \xi_R = 4,51$

Recalling the previously calculated cross-section, the characteristics of safety valve 3061/4 and refrigerant fluid R404A:

- $A_c = 35,4$ [mm²]
- $K_{dr} = 0,89 \times 0,9 = 0,801$
- $C = 2,50$

The pressure loss is given by:

$$\frac{\Delta p_{in}}{p_o} = 0,032 \times \left[\frac{35,4}{227} \times 2,50 \times 0,801 \right]^2 \times 4,51 =$$

$$= 0,014$$

The pressure loss value obtained is admissible because it is lower than the value of 0.03 indicated in standard EN 13136:2013+A1.

TABLE 7 : Exponent K of the isentropic equation. Expansion coefficient C. Vapour density φ

| | R134a | R32 | R404A | R407C | R410A | R507 | R448A | R449A | R450A | R452A |
|-------------------------|-------|-------|-------|---------|---------|-------|-------|-------|-------|-------|
| Gruppo PED | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| k | 1,12 | 1,24 | 1,12 | 1,14 | 1,17 | 1,10 | 1,14 | 1,14 | 1,11 | 1,11 |
| C | 2,50 | 2,59 | 2,50 | 2,51 | 2,54 | 2,48 | 2,51 | 2,51 | 2,49 | 2,49 |
| 10 [kg/m ³] | 20,23 | 30,23 | 41,66 | 27,45 | 41,92 | 44,03 | 30,63 | 31,11 | 18,49 | 40,62 |
| | R452B | R454B | R513A | R1234yf | R1234ze | R290 | R600 | R600a | R1270 | |
| Gruppo PED | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | |
| k | 1,18 | 1,18 | 1,11 | 1,10 | 1,10 | 1,19 | 1,10 | 1,10 | 1,14 | |
| C | 2,54 | 2,54 | 2,49 | 2,48 | 2,48 | 2,55 | 2,48 | 2,48 | 2,51 | |
| 10 [kg/m ³] | 33,48 | 32,44 | 23,86 | 24,27 | 16,45 | 13,78 | 3,87 | 5,87 | 16,30 | |

SAFETY DEVICES

4.4 – BURSTING DISC DEVICES

GENERAL DESCRIPTION

Bursting disc in series 3070 are considered "Safety Accessories" according to the definition provided in Article 2, Point 4 of said Directive and are subject to the classification indicated in Article 4, Point 1.d) of the same Directive. This device is a pressure relief device that cannot be closed again, in which a bursting disc is sensitive to a positive differential pressure between the upstream and downstream sections. It is designed to burst at a specified pressure.

Bursting discs in series 3070 are identified by means of:

- a model number formed of an alphanumerical code that includes:
 - the family identity (for ex. 3070/44C)
 - the type of connection (C = NPT)
 - the burst pressure, expressed in bar, multiplied by 10 (for ex. 140)
- a serial number for the lot production.

CONSTRUCTION

Bursting disc holder: this is the body of the device; it is manufactured in two halves, screwed together, that hold the burst disc in position. The two body halves are obtained through bar machining. The lower half of the body houses the inlet connection, while the upper half houses the outlet connection and two 1/8" NPT female service ports for installing a gauge or a pressure transducer. If you don't use these ports pay attention to close them with two NPT plugs code 7520/1.

Material used: EN 12164-CW614N brass

Bursting discs: the discs are designed and tested, according to the requirements of EN ISO 4126-2:2003, to burst at a pre-defined pressure. This pressure is called specified burst pressure, and is related to an associated temperature and a burst tolerance. The disc is manufactured from a calibrated gauge of nickel sheet, contained by a copper ring case.

SCOPE

Use: protection against possible overpressure of the apparatuses listed below, with regard to the operating conditions for which they have been designed:

- Refrigeration system or heat pump components, for instance: condensers, liquid receivers, evaporators, liquid accumulators, positive displacement compressor discharge, heat exchangers, oil separators, or piping.
- (reference standard: EN 378-2:2016)

Fluids: the bursting disc devices in series 3070 can be used with:

- a) Refrigerant fluids in vapour or gaseous state belonging to Group 2:
- HFC (R134a, R404A, R407C, R410A, R507)
 - HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, R452A, R513A)
 - R744

with reference to Article 13, Para. 1(b) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

- b) Refrigerant fluids in vapour or gaseous state belonging to Group 1:
- HFC (R32)
 - HFO and HFO/HFC mixture (R1234yf, R452B, R454B)
 - HC (R290, R600, R600a, R1270)

with reference to Article 13, Para. 1(a) of Directive 2014/68/EU (EC Regulation No. 1272/2008).

- c) Air and nitrogen (reference Directive: 2009/105/EC)

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

MARKING

In compliance with the provisions of Article 19 of Directive 2014/68/EC, the following information is reported on the bursting disc holder:

- Manufacturer's mark
- CE marking
- Identification number of the notified body involved in the production control phase
- device model
- Flow section
- Indication of flow direction
- Bursting pressure
- Performance tolerances
- Temperature associated with bursting pressure
- Production date
- Lot number

DOCUMENTATION

The bursting disc devices in series 3070 are supplied with the following documents, provided in the packaging:

- operating instructions for the user, containing all information useful for safety in terms of assembly, commissioning, use, and maintenance.
- Compliance Statement for the equipment according to Directive 2014/68/EU, required in Article 17 and issued in compliance with Annex IV of the same directive.



BURSTING DISC DEVICES SELECTION

Directive 2014/68/EU requires that pressure equipment, in which permissible limits are reasonably likely to be exceeded, shall be fitted with suitable protection devices, for instance safety devices such as bursting disc devices. Such devices shall prevent pressure from permanently exceeding the maximum allowable pressure (PS) of the equipment they protect. In any case, a short pressure peak limited to 10% of maximum allowable pressure is permitted.

The bursting disc safety device 3070 may be used either as sole pressure relief device or in conjunction with a Castel safety valve (types 3061, or 3065). The disc and valve combination prevent refrigerant leakage through the safety valve and the total loss of refrigerant after bursting. The disc and valve combination can be also equipped with a suitable pressure switch to detect if the valve has discharged.

The bursting pressure of a bursting disc is affected by the operating temperature of fluid contained in the equipment to be protected. The specified bursting pressure (P_b), stamped on the body of the bursting disc, is the nominal bursting pressure at the associated temperature of 22 °C. At higher operating temperatures, the nominal bursting pressure is reduced while at lower operating temperatures, the nominal bursting pressure is increased. Refer to table 6 for temperature adjustment factors for P_b .

As to the selection and sizing of the suitable protection device, users shall refer to the specific product and sector standards listed below:

- Standard EN ISO 4126-2: 2003: “Safety devices for protection against excessive pressure – Part 2: Bursting disc safety devices” specifies the design, manufacturing, inspection, testing, certification, marking and packaging requirements for bursting disc safety devices.
- EN ISO 4126-3:2006 Safety devices for protection against excessive pressure – Part 3: Safety valves and bursting disc safety devices in combination” specifies the general requirements for design, application and marking for a product assembled from the in-series combination of a safety valve and bursting disc safety device.
- EN ISO 4126-6: 2003: “Safety devices for protection against excessive pressure – Part 6: Application, selection and installation of bursting disc safety devices” gives guidance on the application, selection and installation of bursting disc safety devices used to protect against overpressure.
- EN 378-2:2016: “Refrigerating systems and heat pumps – safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation” provides a general outline of the protection devices to be used in refrigerating systems and their characteristics (Para. 6.2.5) and the criteria for the selection of the device suitable for the type and size of the system component to be protected (Para. 6.2.6).

- EN 13136:2013 + A1: “Refrigerating systems and heat pumps – Pressure relief devices and their associated piping – Methods for calculation” highlights the possible causes of overpressure in a system and provides users with the tools for sizing pressure relief devices, among which safety valves.

SIZING OF BURSTING DISC DEVICES DESIGNED TO DISCHARGE GAS OR VAPOUR AT CRITICAL FLOW (REF. EN ISO 4126-6:2003)

A bursting disc safety device which discharges to atmosphere works at critical flow. For the definition of critical flow, please see Chapter 4.3.

Bursting disc devices designed to discharge gas or vapour at critical flow must be sized according to the following formula:

$$A_c = 3,469 \times \frac{Q_{md}}{C \times \alpha} \times \sqrt{\frac{v_o}{p_o}} \quad [\text{mm}^2]$$

where:

- A_c = minimum cross-section area of the bursting disc [mm²]
- Q_{md} = minimum required discharge flow rate of the bursting disc [kg/h]
- α = bursting disc coefficient of discharge
- p_o = bursting pressure [bar abs]
- v_o = specific volume of gas or vapour at discharge conditions p_o and T_o , where T_o is the fluid temperature at bursting disc inlet, defined by the user or by the designer [m³/kg]
- C = expansion rate as a function of the k coefficient in the isentropic equation To calculate C and to find the values of k and C for the more common refrigerants, see Chapter 4.3.

EN ISO 4126-6:2003 establishes different values for the coefficient of discharge, “ α ”, depending on the nozzle entry configuration where the bursting disc is mounted. The following cases are demonstrated in the aforesaid Standard, Par. C.2.2.1:

- In case of an internally protruding branch/nozzle: $\alpha = 0.68$
- In case of a flush branch/nozzle whose inlets are not of hydrodynamic configuration: $\alpha = 0.73$
- In case of a flush branch/nozzle with rounded or chamfered inlets: $\alpha = 0.80$

The evaluation of the minimum required discharge capacity of the bursting disc device is closely linked to the type of system where the equipment it protects is installed, with the causes that may cause it to burst, i.e.:

- external heat sources
- internal heat sources
- increased pressure caused by a positive displacement compressor

For the calculation of minimum required discharge capacity in these three cases see Chapter 4.3 “Selection Criteria for Safety Valves” in this technical handbook.

SIZING OF COMBINED SAFETY DEVICES DESIGNED TO DISCHARGE GAS OR VAPOUR AT CRITICAL FLOW (REF. EN ISO 4126-3:2006)

A **combination** is an installation which includes a bursting disc safety device installed at most five pipe diameters before the inlet of a safety valve. The combination of a specific safety valve with a bursting disc device is characterized by a combination discharge capacity coefficient " F_d ". According to EN ISO 4126-3: 2006, this coefficient is the ratio of the average of the discharge coefficients (" K_d ") of the combination, measured in test bench flow rate tests, to the certified discharge coefficient (" K_d ") of the safety valve alone. The same standard also permits, as an alternative to the tests to determine " K_d " of the group, the use of a predefined discharge coefficient (" F_d "), equal to 0.9, a slightly lower value than that which could be obtained from testing. Therefore, to size the combination of a safety valve (3061 or 3065) with a bursting disc safety device (3070), please follow the procedure provided in Chapter 4.3, but multiply the certified coefficient of discharge (" K_d ") by 0.9.

INSTALLATION OF BURSTING DISC DEVICES AND COMBINATIONS

Bursting disc safety device 3070 must never be subjected to a negative pressure differential upstream and downstream of the disc (for example: discharge to the atmosphere and pressure inside the equipment to be protected lower than that of the atmospheric pressure) to avoid damaging or breaking the disk. For this reason, safety device 3070 must always be used along with a cut-off device (such as valve 3064N/44) which can exclude device 3070 any time there is a vacuum in the equipment to be protected.

When the bursting disc discharges it is necessary to replace the entire unit, as safety devices 3070 are sealed components and the bursting disc cannot be replaced.

The maximum operating pressure of the equipment to be protected must not be greater than 75 % of the burst pressure of device 3070 to avoid damages to the disc or leakage. If the operating pressure exceeds 85 % of the burst pressure, safety device 3070 must be replaced immediately.

As far as the installation of bursting disc safety devices and combined devices is concerned, remember these basic points:

- Safety devices must be installed in an area of the system where vapours or gases are present and there is no fluid turbulence.
- Vessels joined by piping, of a diameter deemed by the manufacturer and the user to be adequate, without any stop valves between them, may be considered as a single vessel for the installation of a safety device.
- The fitting between the combined device and the equipment

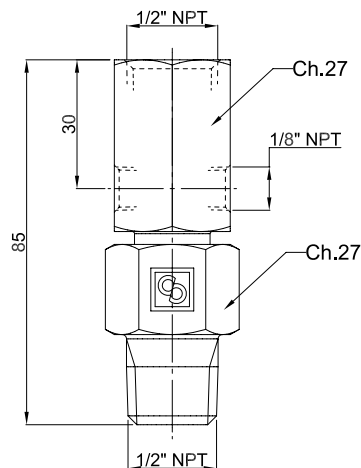
to be protected must be as short as possible. Furthermore, the cross-section of the piping must not be smaller than the valve inlet. In any case, EN 13136:2013 + A1 states that the pressure drop between the protected vessel and the combined device, at discharge capacity, shall not exceed 3% of the pressure setting value, including any accessories in the line.

– The location selected for installation of the safety device must consider that its operation involves the discharge of the refrigerant fluid under pressure, sometimes at high temperature. Where there is the risk of causing injuries to people nearby, exhaust piping must be provided, sized so as to not compromise the operation of the device. When installing combined devices, EN 13136:2013 + A1 requires that this piping must not generate, at discharge capacity, a back-pressure exceeding 10% of the valve setting pressure. In the event of multiple valves installed in parallel, it is highly recommended that each valve be fit with a dedicated exhaust line rather than a single manifold for all of the valves. The risk of the latter solution is to create an overpressure in the manifold determined when a valve discharges. This overpressure can modify the operating characteristics of all the other valves installed in parallel.

To calculate the pressure loss in either the upstream line (between vessel and safety device) or the downstream line (between safety device and atmosphere) refer to Chapter 4.3 "Selection Criteria for Safety Valves" in this technical handbook.

TABLE 8: General characteristics of rupture discs 3070

| | | | |
|---|----------------------|--------------|------|
| Catalogue Number | | 3070/44 | |
| Connections | Inlet male | 1/2" NPT | |
| | Outlet female | 1/2" NPT | |
| | Service | 2 x 1/8" NPT | |
| Inlet connection wrench torque (min/max) [Nm] | | 21/30 | |
| Flow Diameter [mm] | | 12 | |
| Flow Section [mm ²] | | 113 | |
| TS [°C] | | - 50 / + 150 | |
| Bursting Pressure Pb [bar] | | 14,0 | |
| | | 15,0 | |
| | | 16,0 | |
| | | 19,0 | |
| | | 21,0 | |
| | | 23,0 | |
| | | 24,0 | |
| | | 24,8 | |
| | | 25,0 | |
| | | 27,0 | |
| | | 27,5 | |
| | | 28,0 | |
| | | 37,0 | |
| | | 44,0 | |
| | | 47,0 | |
| 50,0 | | | |
| 52,0 | | | |
| Pb tolerance | from 14 up to 19 bar | +/- 15 % | |
| | from 21 up to 44 bar | +/- 10 % | |
| Coincident temperature Ta [°C] | | 22 | |
| Correction factor of Pb for Ta ≠ 22 °C | | -50 °C | 1,13 |
| | | -35 °C | 1,12 |
| | | -25 °C | 1,10 |
| | | -10 °C | 1,03 |
| | | -0 °C | 1,03 |
| | | 22 °C | 1,00 |
| | | 40 °C | 0,99 |
| | | 60 °C | 0,97 |
| | | 80 °C | 0,95 |
| | | 100 °C | 0,94 |
| 150 °C | 0,93 | | |
| Max operating pressure | | 75 % Pb | |
| Risk Category according to PED Recast | | IV | |



SAFETY DEVICES

4.5 – CHANGEOVER VALVES

APPLICATIONS

Changeover valves in series 3032N perform the role of a service valve for a pair of safety valves, allowing the use of one and the exclusion of the other. This device allows the user to work on the isolated valve, for periodic inspection or replacement, while the line is completely operative and the system safety is integral.

N.B.: each safety valve located on the changeover valve must have sufficient capacity to protect the vessel alone.

These valves 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.

Valves models 3032N/32 are supplied with:

- Two female 1/4” NPT threaded connections with swivel nut, Castel code 3039/2
- Two O-Rings for these connections

These components ensure perfect alignment of a pair of safety valves 3061/2.

Valves models 3032N/33 are supplied with:

- Two female 3/8” NPT threaded connections with swivel nut, Castel code 3039/3
- Two O-Rings for these connections

These components ensure perfect alignment of a pair of safety valves code 3061/3.

Valves models 3032N/44 are supplied with:

- Two female 1/2” NPT threaded connections with swivel nut, Castel code 3039/4
- Two O-Rings for these connections

These components ensure perfect alignment of a pair of safety valves code 3061/4.

Valves, models: 3032N/64, 3032N/66, 3032N/88, 3032N/108 not have threaded connections with swivel nuts on the outlet connection. Therefore, safety valves are screwed directly onto the changeover valve.

The valves in series 3032N can be used with the same fluids foreseen for safety valves series 3061 and 3065, specifically:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

CAUTION! Valves in series 3032N cannot be installed on systems that use HCFC (R22)

CONSTRUCTION

Valves in series 3032N are designed so that it is never possible to exclude both safety valves simultaneously. Under working conditions, the shutter must be clamped against one of the two seats of the valve, front port or back port, in order to ensure always full discharge to the corresponding safety valve. Intermediate shutter positions must be avoided in order not to affect the operation of both safety valves. The valve ensures a pressure drop perfectly compatible with the safety valve operation under saturated vapour and superheated vapour discharge conditions.

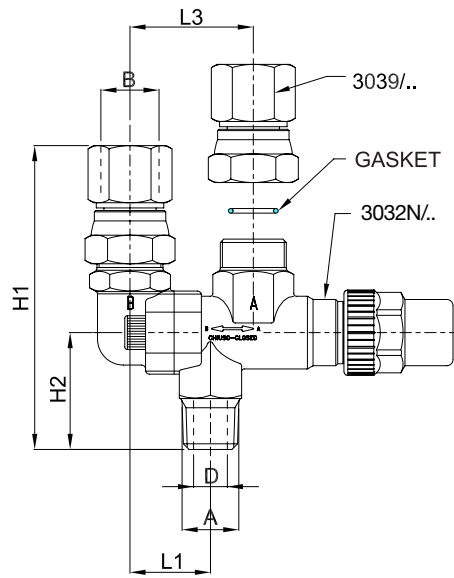
The main parts of the valves in series 3032N are made from the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Steel, with proper surface protection, for the spindle.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets in valves series 3032N
- Glass reinforced PBT for the protective cap that covers the spindle.
- Hot forged steel EN 12420 – CW 617N for the protective cap of the spindle for models from 1” to 1-1/4” NPT.

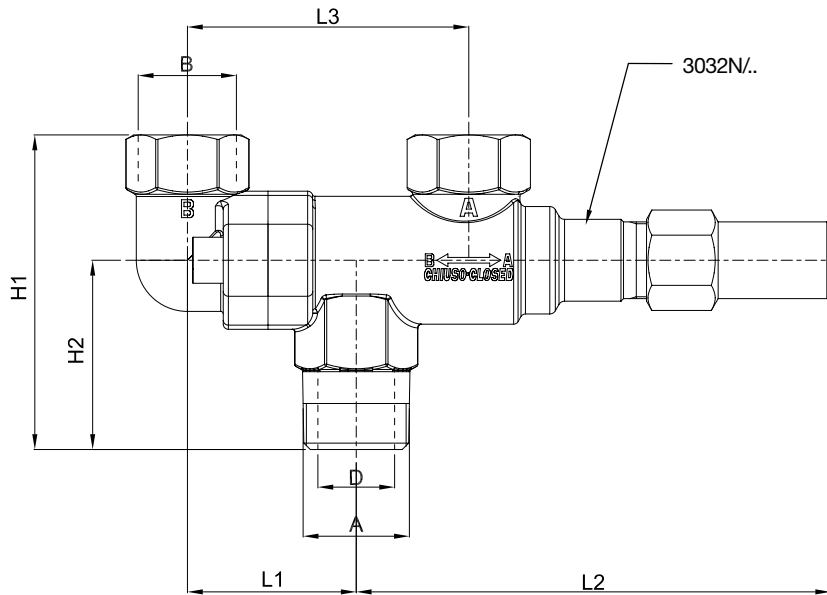


TABLE 9: General characteristics, dimensions and weights of valves 3032N

| Catalogue Number | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Dimensions [mm] | | | | | | | Inlet connection wrench torque (min/max) [Nm] | Weight [g] | Risk Category according to PED Recast | |
|------------------|-------------------------------|----------|---------|------|-----------------|------------|----------|-----|----|----|-----|---|------------|---------------------------------------|---------|
| | | | min | max | D | A | B | H1 | H2 | L1 | L2 | | | | L3 |
| 3032N/32 | 2,5 | 80 | -40 | +150 | 13 | 3/8" NPT | 1/4" NPT | 114 | 42 | 33 | 91 | 50 | 17/22 | 775 | Art 4.3 |
| 3032N/33 | 2,5 | | | | 13 | 3/8" NPT | 3/8" NPT | 114 | 42 | 33 | 91 | 50 | 17/22 | 775 | |
| 3032N/44 | 3,3 | | | | 13 | 1/2" NPT | 1/2" NPT | 117 | 45 | 33 | 91 | 50 | 25/35 | 775 | |
| 3032N/64 | 9,0 | | | | 17,5 | 3/4" NPT | 1/2" NPT | 95 | 52 | 48 | 133 | 80 | 32/45 | 1750 | |
| 3032N/66 | 9,0 | | | | 17,5 | 3/4" NPT | 3/4" NPT | 95 | 52 | 48 | 133 | 80 | 32/45 | 1750 | |
| 3032N/88 | 14,5 | | | | 22,0 | 1" NPT | 1" NPT | 120 | 71 | 66 | 185 | 110 | 50/65 | 3200 | |
| 3032N/108 | 20,0 | | | | 31,0 | 1.1/4" NPT | 1" NPT | 123 | 74 | 66 | 185 | 110 | 60/80 | 3200 | |



3032N/32
3032N/33
3032N/44



3032N/64
3032N/66
3032N/88
3032N/108

SAFETY DEVICES

4.6 – SHUT-OFF VALVES

APPLICATIONS

Please remember that the operation of pressure equipment and pressure assemblies is not covered by Directive 2014/68/EC ; rather, it is regulated by the national legislation of the Member States of the European Union. Therefore, the various Member States have issued laws that call for periodic inspection of pressure equipment and pressure assemblies. Italy issued Ministerial Decree 329 dated 01/12/2004 regarding the provisions for the installation and use of pressure equipment and pressure assemblies that comply with Directive 97/23/EC. Any intervention for periodic inspection or replacement of an installed safety device becomes very difficult if the protected vessel is not equipped with a shut-off valve.

Shut-off valves in series 3064N installed between the protected vessel and the safety valve, allow the device to be disassembled for inspection or replacement without blowing off all the refrigerant fluid from an entire section of the system.

These valves 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.

The valves in series 3064N can be used with the same fluids foreseen for safety valves series 3061 and 3065, specifically:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

CAUTION! Valves in series 3064N cannot be installed on systems that use HCFC (R22)

- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets in valves series 3064N
- Hot forged brass EN 12420 – CW 617N for the protective cap of the spindle

CONSTRUCTION

Valves in series 3064N are supplied by Castel in the open position and the spindle cap protection is sealed with a Castel lead seal. Any operation to close the valve requires causes the tampering with the seal and must be performed exclusively by:

- staff authorized to work on the system
- an operator of a competent inspection body

These persons will be responsible for the subsequent re-opening of the valve and the application of a new cap seal with their own lead seal.

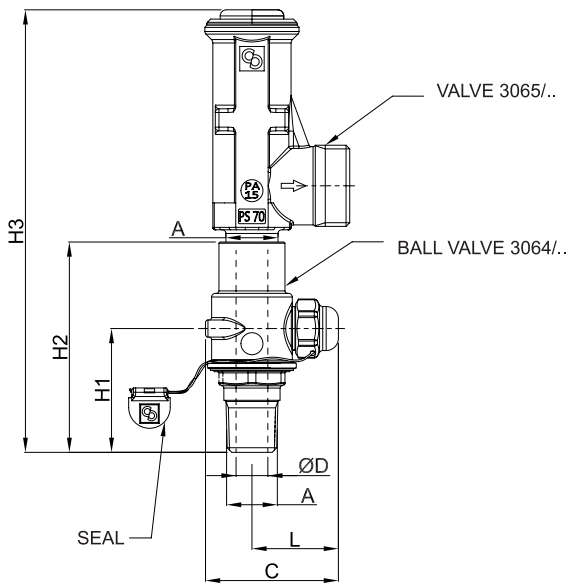
The main parts of the valves in series 3064N are made from the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Hot forged brass EN 12420 – CW 617N, chromium plated, for the ball
- Steel, with proper surface protection, for the spindle.
- P.T.F.E. for the ball seat gaskets

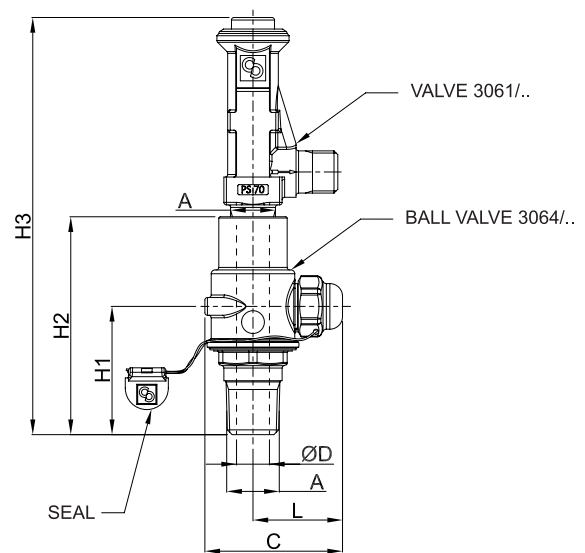


TABLE 10: General characteristics, dimensions and weights of valves series 3064N

| Catalogue Number | Designed for valve | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Dimensions [mm] | | | | | | | Inlet connection wrench torque (min/max) [Nm] | Weight [g] | Risk Category according to PED Recast |
|------------------|--------------------|-------------------------------|----------|---------|------|-----------------|----------|----|----|----|-----|-----|---|------------|---------------------------------------|
| | | | | min | max | Ø D | A | C | L | H1 | H2 | H3 | | | |
| 3064N/22 | 3061/2C | 2,5 | 80 | -40 | +150 | 7 | 1/4" NPT | 47 | 32 | 45 | 74 | 147 | 15/20 | 216 | Art. 4.3 |
| 3064N/33 | 3061/3C | 5 | | | | 10 | 3/8" NPT | 47 | 32 | 45 | 74 | 147 | 17/22 | 208 | |
| 3064N/44 | 3061/4C | 10 | | | | 13 | 1/2" NPT | 54 | 35 | 51 | 86 | 165 | 25/35 | 334 | |
| | 3065/4C | | | | | 188 | | | | | | | | | |
| 3064N/88 | 3030/88C | 20 | | | | 20 | 1" NPT | 78 | 52 | 70 | 119 | 323 | 50/65 | 871 | |



3064N/44 → 3065/4C



3064N/22 → 3061/2C
 3064N/33 → 3061/3C
 3064N/44 → 3061/4C

SAFETY DEVICES

4.7 – FITTING

The fittings in series 3035 allow for the installation of:

- safety valves in series 3061 and 3065
- bursting disc devices in series 3070
- shut-off valves in series 3064N
- changeover valves in series 3032N

near pressure equipment to be protected in the system.

These fittings are designed to be installed in two ways:

- Construct a copper pipe by-pass that connects the pressure equipment to the fitting. Insert the end of the by-pass in the solder connection of the fitting and then perform capillary brazing.
- Drill the inner/outer pipe near the pressure equipment (if possible, it is best to build a collar on the pipe). Put the end of the fitting into this hole and proceed to braze weld.

The fittings in series 3035 are produced by machining brass bars EN 12164-CW614N.

Note: The fitting in series 3035 are excluded from the scope of application of Directive 2014/68/EU as they are piping components.

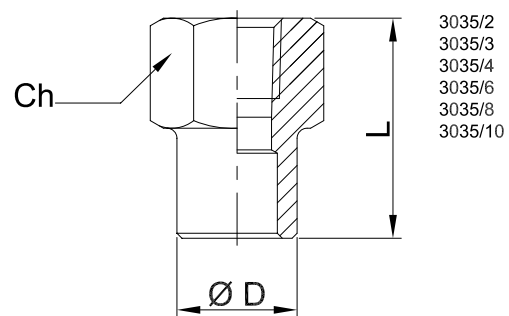
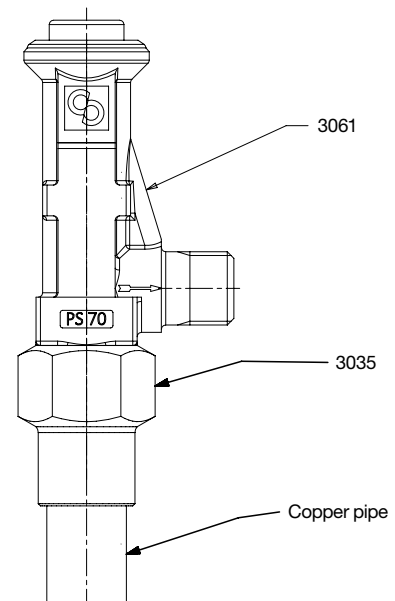
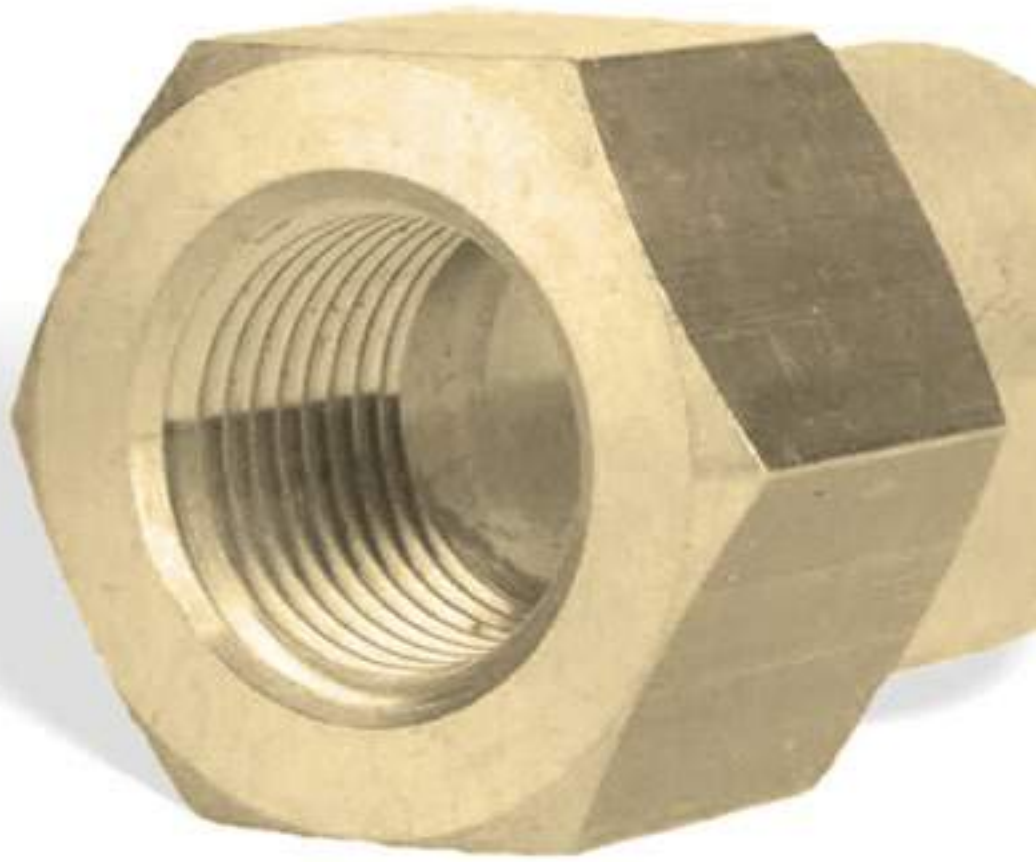


TABLE 11: General characteristics, dimensions and weights of unions 3035

| Catalogue Number | Connections | | PS [bar] | Dimensions | | | Weight [g] |
|------------------|-------------|------------|----------|------------|------|----|------------|
| | NPT | ODS Ø [mm] | | D | L | Ch | |
| 3035/2 | 1/4" | 12 | 150 | 18 | 33 | 21 | 58 |
| 3035/3 | 3/8" | 18 | | 22 | 36,5 | 26 | 90,5 |
| 3035/4 | 1/2" | 22 | | 28 | 44 | 32 | 165 |
| 3035/6 | 3/4" | 28 | | 35 | 51 | 40 | 255 |
| 3035/8 | 1" | 35 | 120 | 42 | 62 | 45 | 364 |
| 3035/10 | 1.1/4" | 42 | | 54 | 67 | 55 | 613 |





CHECK VALVES

P  LYHEDRA

CHECK VALVES

5.1 – HERMETIC CHECK VALVES

APPLICATIONS

The hermetic check valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CONSTRUCTION

These check valves are available in the following two types:

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

To guarantee tightness between body the cover, the valves in series 3112W, 3113W, 3132W, 3133W, 3144W, 3145W, 3184W, 3185W are equipped with laser welds. To guarantee tightness between body the cover, the valves in series 3144NW, 3145NW are equipped with TIG welds.

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

- Brass bar EN 12164 – CW 614N for body and cover of valves in series 3112W, 3113W, 3132W, and 3133W.
- Hot forged brass EN 12420 – CW 617N for body and cover of valves in series 3144W, 3144NW, 3145W, 3145NW, 3184W, and 3185W.
- Copper pipe EN 12735-1 – Cu -DHP for solder connections
- Austenitic stainless steel AISI 302 for the spring
- Laminated glass fibre fabric and PTFE for gasket seals of valves in series 3112W, 3113W, 3132W, and 3133W.
- PTFE for gasket seals of valves in series 3144W, 3144NW, 3145W, 3145NW, 3184W, and 3185W.

INSTALLATION

The valves can be installed in any section of a refrigeration system where it is necessary to avoid the consequences from undesirable flow inversion, with respect for the operating limits and the capacities indicated in Table 1. Table 1 shows the following functional characteristics of a check valve:

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

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

The brazing of valves with solder connections should be carried out with care, using a low melting point filler material (min. 5% Ag). It is not necessary to disassemble the valves before brazing, but it is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the valve.

The allowed operating positions are the following:

- 3144W, 3144NW, 3145W, 3145NW:
 - with the piping axis horizontal and valve cover facing upward or to the side, horizontal.
 - with the piping axis vertical and arrow facing either upward or downward.

Note: valves 3144W, 3144NW, 3145W 3145NW cannot be installed with the valve cover facing downward.

- 3184W, 3185W:
 - with inlet pipe facing downward and valve cover facing upward.
 - with inlet pipe horizontal and outlet pipe vertical or horizontal.

Note: valves 3184W, and 3185W cannot be installed with the valve input facing upward and the valve cover facing downward.

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

CERTIFICATIONS

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



TABLE 1: General characteristics of hermetic check valves, UL approved

| Catalogue Number | Connections | | | Kv Factor [m ³ /h] | Minimum Opening Pressure Differential [bar] | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | |
|------------------|-------------|---------|--------|-------------------------------|---|----------|---------|----------|---------------------------------------|--------|------|----------|
| | SAE Flare | ODS | | | | | min. | max. | | | | |
| | | Ø [in.] | Ø [mm] | | | | | | | | | |
| 3112W/2 | 1/4" | - | - | 0,5 | 0,04 | 50 (1) | -40 | +150 | Art. 4.3 | | | |
| 3112W/3 | 3/8" | | | 1,5 | | | | | | | | |
| 3112W/4 | 1/2" | | | 1,8 | | | | | | | | |
| 3112W/5 | 5/8" | | | 3,3 | | | | | | | | |
| 3112W/6 | 3/4" | | | 5,0 | | | | | | | | |
| 3113W/2 | 1/4" | | | 0,5 | | | | | | 0,30 | | |
| 3113W/3 | 3/8" | | | 1,5 | | | | | | | | |
| 3113W/4 | 1/2" | | | 1,8 | | | | | | | | |
| 3113W/5 | 5/8" | | | 3,3 | | | | | | | | |
| 3113W/6 | 3/4" | | | 5,0 | | | | | | | | |
| 3132W/2 | 1/4" | - | 0,5 | 0,04 | 50 (1) | -40 | +150 | Art. 4.3 | | | | |
| 3132W/3 | 3/8" | - | 1,5 | | | | | | | | | |
| 3132W/M10 | - | 10 | 1,8 | | | | | | | | | |
| 3132W/M12 | - | 12 | | | | | | | | | | |
| 3132W/4 | 1/2" | - | 5,0 | | | | | | | | | |
| 3132W/5 | 5/8" | 16 | 3,3 | | | | | | | | | |
| 3132W/M18 | - | 18 | 5,0 | | | | | | | | | |
| 3132W/6 | 3/4" | - | | | | | | | | | | |
| 3132W/7 | 7/8" | 22 | | | | | | | | | | |
| 3133W/2 | 1/4" | - | 0,5 | | | | | | 0,30 | 50 (1) | -40 | +150 |
| 3133W/3 | 3/8" | - | 1,5 | | | | | | | | | |
| 3133W/M10 | - | 10 | 1,8 | | | | | | | | | |
| 3133W/M12 | - | 12 | | | | | | | | | | |
| 3133W/4 | 1/2" | - | 5,0 | | | | | | | | | |
| 3133W/5 | 5/8" | 16 | 3,3 | | | | | | | | | |
| 3133W/M18 | - | 18 | 5,0 | | | | | | | | | |
| 3133W/6 | 3/4" | - | | | | | | | | | | |
| 3133W/7 | 7/8" | 22 | | | | | | | | | | |
| 3144W/7 | 7/8" | 22 | 8,1 | 0,04 | 50 (2) | -40 | +150 | Art. 4.3 | | | | |
| 3144W/M28 | - | 28 | 10,4 | | | | | | | | | |
| 3144W/9 | 1.1/8" | - | 15,6 | | | | | | | | | |
| 3144NW/11 | 1.3/8" | 35 | | | | | | | | | | |
| 3144NW/13 | 1.5/8" | - | 27,0 | | | | | | | | | |
| 3144NW/M42 | - | 42 | 39,0 | | | | | | | | | |
| 3144NW/17 | 2.1/8" | 54 | | | | | | | | | | |
| 3145W/7 | 7/8" | 22 | | | | | | 8,1 | | | | |
| 3145W/M28 | - | 28 | 10,4 | | | | | 0,3 | 50 (2) | -40 | +150 | Art. 4.3 |
| 3145W/9 | 1.1/8" | - | 15,6 | | | | | | | | | |
| 3145NW/11 | 1.3/8" | 35 | | | | | | | | | | |
| 3145NW/13 | 1.5/8" | - | 27,0 | | | | | | | | | |
| 3145NW/M42 | - | 42 | 39,0 | | | | | | | | | |
| 3145NW/17 | 2.1/8" | 54 | | | | | | | | | | |
| 3184W/7 | 7/8" | 22 | 9,0 | 0,04 | 50 (1) | -40 | +150 | Art. 4.3 | | | | |
| 3184W/M28 | - | 28 | 19,0 | | | | | | | | | |
| 3184W/9 | 1.1/8" | - | 9,0 | | | | | | | | | |
| 3185W/7 | 7/8" | 22 | | | | | | | | | | |
| 3185W/M28 | - | 28 | 19,0 | | | | | | | | | |
| 3185W/9 | 1.1/8" | - | | | | | | | | | | |

(1) : MWP = 600 psi according to UL approval
 (2) : MWP = 650 psi according to UL approval

TABLE 5: Dimensions and weights of hermetic check valves

| Catalogue Number | | Dimensions [mm] | | | | | | Weight [g] | | | | | | |
|------------------|------------|-----------------|-----|-----|-----|-----|----|------------|-----|----|------|-----|-----|------|
| | | L | L1 | D | H | H1 | Ch | | | | | | | |
| 3112W/2 | 3113W/2 | 58 | - | 18 | - | - | 16 | 60 | | | | | | |
| 3112W/3 | 3113W/3 | 70 | | 22 | | | 20 | 100 | | | | | | |
| 3112W/4 | 3113W/4 | 75 | | 24 | | | 22 | 132 | | | | | | |
| 3112W/5 | 3113W/5 | 87 | | 29 | | | 26 | 204 | | | | | | |
| 3112W/6 | 3113W/6 | 100 | | 35 | | | 32 | 330 | | | | | | |
| 3132W/2 | 3133W/2 | 93 | | 18 | | | - | - | - | 65 | | | | |
| 3132W/3 | 3133W/3 | 108 | 22 | 120 | | | | | | | | | | |
| 3132W/M10 | 3133W/M10 | | 133 | 24 | 157 | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 29 | | 220 | | | | | | | | | | |
| 3132W/4 | 3133W/4 | 140 | | 35 | 304 | | | | | | | | | |
| 3132W/5 | 3133W/5 | 165 | | 50 | 96 | 24 | | | | - | 1055 | | | |
| 3132W/M18 | 3133W/M18 | | 201 | | | | | | | | 1062 | | | |
| 3132W/6 | 3133W/6 | | 232 | | | | | | | | 56 | 115 | 29 | 1300 |
| 3144W/7 | 3145W/7 | 170 | - | 67 | 148 | 36 | - | ?? | | | | | | |
| 3144W/M28 | 3145W/M28 | 201 | | | | | | 79 | 167 | 44 | ?? | | | |
| 3144W/9 | 3145W/9 | 255 | | | | | | 111 | 88 | 45 | 146 | 94 | 600 | |
| 3144NW/11 | 3145NW/11 | 232 | | | | | | 149 | 123 | 51 | 196 | 141 | - | |
| 3144NW/13 | 3145NW/13 | 255 | | | | | | | | | | | | 1010 |
| 3144NW/M42 | 3145NW/M42 | 285 | | | | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 285 | | | | | | | | | | | | |
| 3184W/7 | 3185W/7 | 111 | 88 | 45 | 146 | 94 | - | 600 | | | | | | |
| 3184W/M28 | 3185W/M28 | 149 | 123 | 51 | 196 | 141 | - | 1010 | | | | | | |
| 3184W/9 | 3185W/9 | | | | | | | | | | | | | |

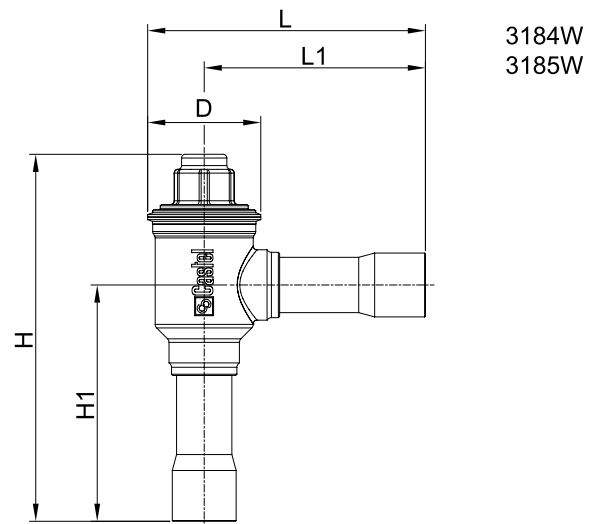
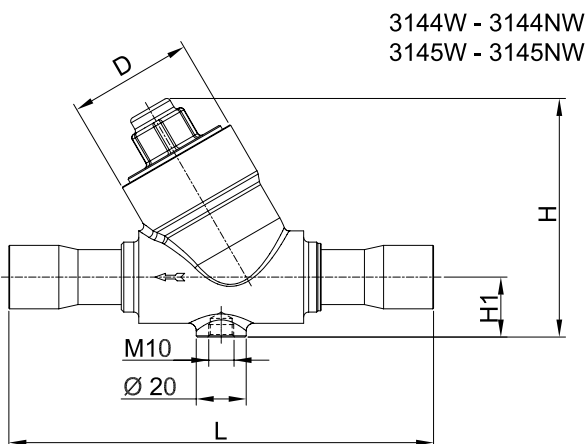
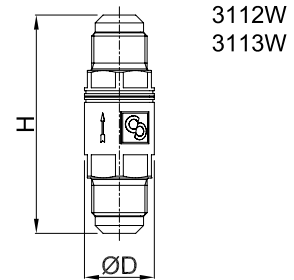
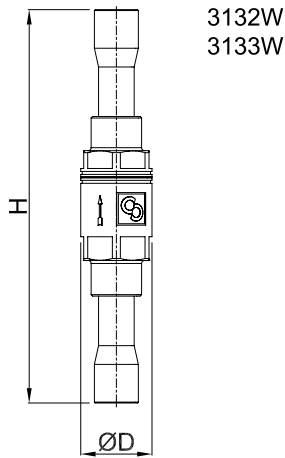


TABLE 3: Refrigerant flow capacity of hermetic check valves in liquid line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|------------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 3112W/2 | 3113W/2 | 8,5 | 12,6 | 6,0 | 8,6 | 8,6 | 5,8 | 6,3 | 7,5 | 7,8 | 7,9 |
| 3112W/3 | 3113W/3 | 25,5 | 37,7 | 17,9 | 25,8 | 25,8 | 17,3 | 18,9 | 22,6 | 23,5 | 23,6 |
| 3112W/4 | 3113W/4 | 30,6 | 45,2 | 21,4 | 31,0 | 30,9 | 20,7 | 22,6 | 27,1 | 28,2 | 28,3 |
| 3112W/5 | 3113W/5 | 56,1 | 82,9 | 39,3 | 56,9 | 56,7 | 38,0 | 41,5 | 49,6 | 51,6 | 51,9 |
| 3112W/6 | 3113W/6 | 85,0 | 125,7 | 59,5 | 86,2 | 85,9 | 57,5 | 62,9 | 75,2 | 78,3 | 78,6 |
| 3132W/2 | 3133W/2 | 8,5 | 12,6 | 6,0 | 8,6 | 8,6 | 5,8 | 6,3 | 7,5 | 7,8 | 7,9 |
| 3132W/3 | 3133W/3 | 25,5 | 37,7 | 17,9 | 25,8 | 25,8 | 17,3 | 18,9 | 22,6 | 23,5 | 23,6 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 30,6 | 45,2 | 21,4 | 31,0 | 30,9 | 20,7 | 22,6 | 27,1 | 28,2 | 28,3 |
| 3132W/4 | 3133W/4 | | | | | | | | | | |
| 3132W/5 | 3133W/5 | 56,1 | 82,9 | 39,3 | 56,9 | 56,7 | 38,0 | 41,5 | 49,6 | 51,6 | 51,9 |
| 3132W/M18 | 3133W/M18 | 85,0 | 125,7 | 59,5 | 86,2 | 85,9 | 57,5 | 62,9 | 75,2 | 78,3 | 78,6 |
| 3132W/6 | 3133W/6 | | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | | |
| 3144W/7 | 3145W/7 | 138 | 204 | 96 | 140 | 139 | 93 | 102 | 122 | 127 | 127 |
| 3144W/M28 | 3145W/M28 | 177 | 261 | 124 | 179 | 179 | 120 | 131 | 156 | 163 | 163 |
| 3144W/9 | 3145W/9 | | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 265 | 392 | 186 | 269 | 268 | 179 | 196 | 235 | 244 | 245 |
| 3144NW/13 | 3145NW/13 | 459 | 679 | 321 | 465 | 464 | 311 | 340 | 406 | 423 | 424 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 663 | 980 | 464 | 672 | 670 | 449 | 491 | 587 | 610 | 613 |
| 3184W/7 | 3185W/7 | 153 | 226 | 107 | 155 | 155 | 104 | 113 | 135 | 141 | 141 |
| 3184W/M28 | 3185W/M28 | 323 | 477 | 226 | 327 | 326 | 219 | 239 | 286 | 297 | 299 |
| 3184W/9 | 3185W/9 | | | | | | | | | | |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 3: Refrigerant flow capacity of hermetic check valves in liquid line [kW]

| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 3112W/2 | 3113W/2 | 8,0 | 6,1 | 10,0 | 10,2 | 7,3 | 10,2 | 12,0 | 10,6 | 10,6 |
| 3112W/3 | 3113W/3 | 23,9 | 18,2 | 30,1 | 30,7 | 21,8 | 30,6 | 35,9 | 31,8 | 31,8 |
| 3112W/4 | 3113W/4 | 28,6 | 21,8 | 36,1 | 36,8 | 26,2 | 36,7 | 43,0 | 38,2 | 38,2 |
| 3112W/5 | 3113W/5 | 52,5 | 40,0 | 66,2 | 67,5 | 48,0 | 67,3 | 78,9 | 70,0 | 70,0 |
| 3112W/6 | 3113W/6 | 79,6 | 60,7 | 100,3 | 102,3 | 72,8 | 101,9 | 119,5 | 106,0 | 106,0 |
| 3132W/2 | 3133W/2 | 8,0 | 6,1 | 10,0 | 10,2 | 7,3 | 10,2 | 12,0 | 10,6 | 10,6 |
| 3132W/3 | 3133W/3 | 23,9 | 18,2 | 30,1 | 30,7 | 21,8 | 30,6 | 35,9 | 31,8 | 31,8 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 28,6 | 21,8 | 36,1 | 36,8 | 26,2 | 36,7 | 43,0 | 38,2 | 38,2 |
| 3132W/4 | 3133W/4 | | | | | | | | | |
| 3132W/5 | 3133W/5 | 52,5 | 40,0 | 66,2 | 67,5 | 48,0 | 67,3 | 78,9 | 70,0 | 70,0 |
| 3132W/M18 | 3133W/M18 | 79,6 | 60,7 | 100,3 | 102,3 | 72,8 | 101,9 | 119,5 | 106,0 | 106,0 |
| 3132W/6 | 3133W/6 | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | |
| 3144W/7 | 3145W/7 | 129 | 98 | 162 | 166 | 118 | 165 | 194 | 172 | 172 |
| 3144W/M28 | 3145W/M28 | 165 | 126 | 209 | 213 | 151 | 212 | 249 | 220 | 220 |
| 3144W/9 | 3145W/9 | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 248 | 189 | 313 | 319 | 227 | 318 | 373 | 331 | 331 |
| 3144NW/13 | 3145NW/13 | 430 | 328 | 541 | 552 | 393 | 550 | 645 | 572 | 572 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 620 | 473 | 782 | 798 | 568 | 795 | 932 | 827 | 827 |
| 3184W/7 | 3185W/7 | 143 | 109 | 180 | 184 | 131 | 183 | 215 | 191 | 191 |
| 3184W/M28 | 3185W/M28 | 302 | 230 | 381 | 389 | 277 | 387 | 454 | 403 | 403 |
| 3184W/9 | 3185W/9 | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 4: Refrigerant flow capacity of hermetic check valves in suction line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|------------|-------|------|-------|-------|-------|------|---------|---------|-------|-------|
| 3112W/2 | 3113W/2 | 0,9 | 2,1 | 1,1 | 1,1 | 1,7 | 1,1 | 0,7 | 0,7 | 1,2 | 1,1 |
| 3112W/3 | 3113W/3 | 2,7 | 6,4 | 3,3 | 3,4 | 5,0 | 3,3 | 2,2 | 2,1 | 3,6 | 3,3 |
| 3112W/4 | 3113W/4 | 3,3 | 7,7 | 4,0 | 4,1 | 5,9 | 4,0 | 2,6 | 2,6 | 4,3 | 4,0 |
| 3112W/5 | 3113W/5 | 6,0 | 14,0 | 7,3 | 7,5 | 10,9 | 7,4 | 4,9 | 4,7 | 7,9 | 7,3 |
| 3112W/6 | 3113W/6 | 9,1 | 21,3 | 11,0 | 11,4 | 16,5 | 11,2 | 7,4 | 7,1 | 12,0 | 11,0 |
| 3132W/2 | 3133W/2 | 0,9 | 2,1 | 1,1 | 1,1 | 1,7 | 1,1 | 0,7 | 0,7 | 1,2 | 1,1 |
| 3132W/3 | 3133W/3 | 2,7 | 6,4 | 3,3 | 3,4 | 5,0 | 3,3 | 2,2 | 2,1 | 3,6 | 3,3 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 3,3 | 7,7 | 4,0 | 4,1 | 5,9 | 4,0 | 2,6 | 2,6 | 4,3 | 4,0 |
| 3132W/4 | 3133W/4 | | | | | | | | | | |
| 3132W/5 | 3133W/5 | 6,0 | 14,0 | 7,3 | 7,5 | 10,9 | 7,4 | 4,9 | 4,7 | 7,9 | 7,3 |
| 3132W/M18 | 3133W/M18 | 9,1 | 21,3 | 11,0 | 11,4 | 16,5 | 11,2 | 7,4 | 7,1 | 12,0 | 11,0 |
| 3132W/6 | 3133W/6 | | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | | |
| 3144W/7 | 3145W/7 | 15 | 34 | 18 | 18 | 27 | 18 | 12 | 12 | 19 | 18 |
| 3144W/M28 | 3145W/M28 | 19 | 44 | 23 | 24 | 34 | 23 | 15 | 15 | 25 | 23 |
| 3144W/9 | 3145W/9 | | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 28 | 66 | 34 | 35 | 51 | 35 | 23 | 22 | 37 | 34 |
| 3144NW/13 | 3145NW/13 | 49 | 115 | 59 | 61 | 89 | 60 | 40 | 38 | 65 | 59 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 71 | 166 | 86 | 89 | 129 | 87 | 57 | 55 | 94 | 86 |
| 3184W/7 | 3185W/7 | 16 | 38 | 20 | 20 | 30 | 20 | 13 | 13 | 22 | 20 |
| 3184W/M28 | 3185W/M28 | 35 | 81 | 42 | 43 | 63 | 42 | 28 | 27 | 46 | 42 |
| 3184W/9 | 3185W/9 | | | | | | | | | | |

continue →

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 4: Refrigerant flow capacity of hermetic check valves in suction line [kW]

| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|------------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 3112W/2 | 3113W/2 | 0,8 | 1,1 | 1,7 | 1,8 | 0,9 | 1,5 | 0,6 | 0,8 | 1,7 |
| 3112W/3 | 3113W/3 | 2,4 | 3,2 | 5,2 | 5,3 | 2,7 | 4,6 | 1,9 | 2,4 | 5,2 |
| 3112W/4 | 3113W/4 | 2,9 | 3,8 | 6,3 | 6,3 | 3,2 | 5,5 | 2,3 | 2,8 | 6,3 |
| 3112W/5 | 3113W/5 | 5,2 | 7,0 | 11,5 | 11,6 | 5,9 | 10,1 | 4,3 | 5,2 | 11,5 |
| 3112W/6 | 3113W/6 | 8,0 | 10,6 | 17,5 | 17,5 | 9,0 | 15,3 | 6,5 | 7,9 | 17,4 |
| 3132W/2 | 3133W/2 | 0,8 | 1,1 | 1,7 | 1,8 | 0,9 | 1,5 | 0,6 | 0,8 | 1,7 |
| 3132W/3 | 3133W/3 | 2,4 | 3,2 | 5,2 | 5,3 | 2,7 | 4,6 | 1,9 | 2,4 | 5,2 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 2,9 | 3,8 | 6,3 | 6,3 | 3,2 | 5,5 | 2,3 | 2,8 | 6,3 |
| 3132W/4 | 3133W/4 | | | | | | | | | |
| 3132W/5 | 3133W/5 | 5,2 | 7,0 | 11,5 | 11,6 | 5,9 | 10,1 | 4,3 | 5,2 | 11,5 |
| 3132W/M18 | 3133W/M18 | 8,0 | 10,6 | 17,5 | 17,5 | 9,0 | 15,3 | 6,5 | 7,9 | 17,4 |
| 3132W/6 | 3133W/6 | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | |
| 3144W/7 | 3145W/7 | 13 | 17 | 28 | 28 | 14 | 25 | 10 | 13 | 28 |
| 3144W/M28 | 3145W/M28 | 17 | 22 | 36 | 36 | 19 | 32 | 13 | 16 | 36 |
| 3144W/9 | 3145W/9 | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 25 | 33 | 54 | 55 | 28 | 48 | 20 | 25 | 54 |
| 3144NW/13 | 3145NW/13 | 43 | 57 | 94 | 95 | 48 | 82 | 35 | 43 | 94 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 62 | 82 | 136 | 137 | 70 | 119 | 50 | 62 | 136 |
| 3184W/7 | 3185W/7 | 14 | 19 | 31 | 32 | 16 | 27 | 12 | 14 | 31 |
| 3184W/M28 | 3185W/M28 | 30 | 40 | 66 | 67 | 34 | 58 | 25 | 30 | 66 |
| 3184W/9 | 3185W/9 | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 5: Refrigerant flow capacity of hermetic check valves in hot gas line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|------------|-------|------|-------|-------|-------|------|---------|---------|-------|-------|
| 3112W/2 | 3113W/2 | 4,3 | 9,1 | 4,8 | 6,0 | 6,8 | 4,8 | 3,3 | 3,4 | 5,9 | 5,4 |
| 3112W/3 | 3113W/3 | 12,8 | 27,2 | 14,4 | 17,9 | 20,4 | 14,3 | 10,0 | 10,3 | 17,7 | 16,2 |
| 3112W/4 | 3113W/4 | 15,3 | 32,7 | 17,3 | 21,4 | 24,5 | 17,2 | 12,0 | 12,3 | 21,2 | 19,4 |
| 3112W/5 | 3113W/5 | 28,1 | 59,9 | 31,7 | 39,3 | 44,9 | 31,5 | 21,9 | 22,6 | 38,9 | 35,6 |
| 3112W/6 | 3113W/6 | 42,5 | 90,8 | 48,0 | 59,5 | 68,0 | 47,7 | 33,2 | 34,3 | 59,0 | 53,9 |
| 3132W/2 | 3133W/2 | 4,3 | 9,1 | 4,8 | 6,0 | 6,8 | 4,8 | 3,3 | 3,4 | 5,9 | 5,4 |
| 3132W/3 | 3133W/3 | 12,8 | 27,2 | 14,4 | 17,9 | 20,4 | 14,3 | 10,0 | 10,3 | 17,7 | 16,2 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 15,3 | 32,7 | 17,3 | 21,4 | 24,5 | 17,2 | 12,0 | 12,3 | 21,2 | 19,4 |
| 3132W/4 | 3133W/4 | | | | | | | | | | |
| 3132W/5 | 3133W/5 | 28,1 | 59,9 | 31,7 | 39,3 | 44,9 | 31,5 | 21,9 | 22,6 | 38,9 | 35,6 |
| 3132W/M18 | 3133W/M18 | 42,5 | 90,8 | 48,0 | 59,5 | 68,0 | 47,7 | 33,2 | 34,3 | 59,0 | 53,9 |
| 3132W/6 | 3133W/6 | | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | | |
| 3144W/7 | 3145W/7 | 69 | 147 | 78 | 96 | 110 | 77 | 54 | 55 | 96 | 87 |
| 3144W/M28 | 3145W/M28 | 88 | 189 | 100 | 124 | 141 | 99 | 69 | 71 | 123 | 112 |
| 3144W/9 | 3145W/9 | | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 133 | 283 | 150 | 186 | 212 | 149 | 104 | 107 | 184 | 168 |
| 3144NW/13 | 3145NW/13 | 230 | 490 | 259 | 321 | 367 | 258 | 179 | 185 | 319 | 291 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 332 | 708 | 374 | 464 | 530 | 372 | 259 | 267 | 460 | 420 |
| 3184W/7 | 3185W/7 | 77 | 163 | 86 | 107 | 122 | 86 | 60 | 62 | 106 | 97 |
| 3184W/M28 | 3185W/M28 | 162 | 345 | 182 | 226 | 258 | 181 | 126 | 130 | 224 | 205 |
| 3184W/9 | 3185W/9 | | | | | | | | | | |

continue →

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 5: Refrigerant flow capacity of hermetic check valves in hot gas line [kW]

| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|------------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 3112W/2 | 3113W/2 | 3,8 | 5,0 | 7,7 | 7,7 | 4,1 | 6,4 | 3,2 | 3,7 | 7,2 |
| 3112W/3 | 3113W/3 | 11,5 | 15,0 | 23,0 | 23,1 | 12,2 | 19,1 | 9,7 | 11,2 | 21,6 |
| 3112W/4 | 3113W/4 | 13,8 | 18,0 | 27,5 | 27,8 | 14,7 | 23,0 | 11,6 | 13,4 | 25,9 |
| 3112W/5 | 3113W/5 | 25,2 | 32,9 | 50,5 | 50,9 | 26,9 | 42,1 | 21,3 | 24,6 | 47,5 |
| 3112W/6 | 3113W/6 | 38,3 | 49,9 | 76,5 | 77,2 | 40,7 | 63,8 | 32,3 | 37,2 | 72,0 |
| 3132W/2 | 3133W/2 | 3,8 | 5,0 | 7,7 | 7,7 | 4,1 | 6,4 | 3,2 | 3,7 | 7,2 |
| 3132W/3 | 3133W/3 | 11,5 | 15,0 | 23,0 | 23,1 | 12,2 | 19,1 | 9,7 | 11,2 | 21,6 |
| 3132W/M10 | 3133W/M10 | | | | | | | | | |
| 3132W/M12 | 3133W/M12 | 13,8 | 18,0 | 27,5 | 27,8 | 14,7 | 23,0 | 11,6 | 13,4 | 25,9 |
| 3132W/4 | 3133W/4 | | | | | | | | | |
| 3132W/5 | 3133W/5 | 25,2 | 32,9 | 50,5 | 50,9 | 26,9 | 42,1 | 21,3 | 24,6 | 47,5 |
| 3132W/M18 | 3133W/M18 | 38,3 | 49,9 | 76,5 | 77,2 | 40,7 | 63,8 | 32,3 | 37,2 | 72,0 |
| 3132W/6 | 3133W/6 | | | | | | | | | |
| 3132W/7 | 3133W/7 | | | | | | | | | |
| 3144W/7 | 3145W/7 | 62 | 81 | 124 | 125 | 66 | 103 | 52 | 60 | 117 |
| 3144W/M28 | 3145W/M28 | 80 | 104 | 159 | 160 | 85 | 133 | 67 | 77 | 150 |
| 3144W/9 | 3145W/9 | | | | | | | | | |
| 3144NW/11 | 3145NW/11 | 119 | 156 | 239 | 241 | 127 | 199 | 101 | 116 | 225 |
| 3144NW/13 | 3145NW/13 | 207 | 269 | 413 | 417 | 220 | 345 | 174 | 201 | 389 |
| 3144NW/M42 | 3145NW/M42 | | | | | | | | | |
| 3144NW/17 | 3145NW/17 | 298 | 389 | 597 | 602 | 317 | 498 | 252 | 290 | 562 |
| 3184W/7 | 3185W/7 | 69 | 90 | 138 | 139 | 73 | 115 | 58 | 67 | 130 |
| 3184W/M28 | 3185W/M28 | 145 | 190 | 291 | 293 | 155 | 242 | 123 | 141 | 274 |
| 3184W/9 | 3185W/9 | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

CHECK VALVES

5.2 – DEMOUNTABLE CHECK VALVES

APPLICATIONS

The demountable check valves are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

CONSTRUCTION

- These check valves are available in the following two types:
- Valve types 3124N (standard spring) with a low opening differential; $\Delta p = 0.04$
- Valve types 3125N (reinforced spring) with a high opening differential; $\Delta p = 0.3$ bar. To be used, for example, with compressors in parallel.

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

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

INSTALLATION

The valves can be installed in any section of a refrigeration system where it is necessary to avoid the consequences from undesirable flow inversion, with respect for the operating limits and the yields indicated in Table 6. Table 6 shows the following functional characteristics of a check valve:

- PS and TS
- Kv factor

- Minimum opening differential pressure at which the valve can open and remain opened.

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

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

The allowed operating positions are the following:

- with the piping axis horizontal and valve cover facing upward or to the side, horizontal.
- With the piping axis vertical and arrow facing either upward or downward.

Note: valves 3124N, 3125N cannot be installed with the valve cover facing downward.

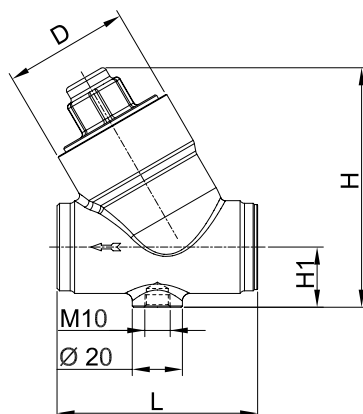


TABLE 6: General characteristics of demountable check valves

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

TABLE 7: Dimensions and weights of demountable check valves

| Catalogue Number | | Dimensions [mm] | | | | Weight [g] |
|------------------|-----------|-----------------|----|----|----|------------|
| | | H | H1 | L | Q | |
| 3124N/M22 | 3125N/M22 | 96 | 24 | 80 | 50 | 855 |
| 3124N/7 | 3125N/7 | | | | | |
| 3124N/M28 | 3125N/M28 | | | | | 867 |
| 3124N/9 | 3125N/9 | | | | | |
| 3124N/11 | 3125N/11 | 115 | 29 | 92 | 56 | 1130 |
| 3124N/13 | 3125N/13 | ?? | ?? | ?? | ?? | ?? |
| 3124N/M42 | 3125N/M42 | ?? | ?? | ?? | ?? | ?? |
| 3124N/17 | 3125N/17 | ?? | ?? | ?? | ?? | ?? |



3124N
3125N

TABLE 8: Refrigerant flow capacity of demountable check valves in liquid line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-----------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 3124N/M22 | 3125N/M22 | 138 | 204 | 96 | 140 | 139 | 93 | 102 | 122 | 127 | 127 |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 177 | 261 | 124 | 179 | 179 | 120 | 131 | 156 | 163 | 163 |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 265 | 392 | 186 | 269 | 268 | 179 | 196 | 235 | 244 | 245 |
| 3124N/13 | 3125N/13 | 459 | 679 | 321 | 465 | 464 | 311 | 340 | 406 | 423 | 424 |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 663 | 980 | 464 | 672 | 670 | 449 | 491 | 587 | 610 | 613 |
| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | |
| 3124N/M22 | 3125N/M22 | 129 | 98 | 162 | 166 | 118 | 165 | 194 | 172 | 172 | |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 165 | 126 | 209 | 213 | 151 | 212 | 249 | 220 | 220 | |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 248 | 189 | 313 | 319 | 227 | 318 | 373 | 331 | 331 | |
| 3124N/13 | 3125N/13 | 430 | 328 | 541 | 552 | 393 | 550 | 645 | 572 | 572 | |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 620 | 473 | 782 | 798 | 568 | 795 | 932 | 827 | 827 | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 9: Refrigerant flow capacity of demountable check valves in suction line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-----------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 3124N/M22 | 3125N/M22 | 15 | 34 | 18 | 18 | 27 | 18 | 12 | 12 | 19 | 18 |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 19 | 44 | 23 | 24 | 34 | 23 | 15 | 15 | 25 | 23 |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 28 | 66 | 34 | 35 | 51 | 35 | 23 | 22 | 37 | 34 |
| 3124N/13 | 3125N/13 | 49 | 115 | 59 | 61 | 89 | 60 | 40 | 38 | 65 | 59 |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 71 | 166 | 86 | 89 | 129 | 87 | 57 | 55 | 94 | 86 |
| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | |
| 3124N/M22 | 3125N/M22 | 13 | 17 | 28 | 28 | 14 | 25 | 10 | 13 | 28 | |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 17 | 22 | 36 | 36 | 19 | 32 | 13 | 16 | 36 | |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 25 | 33 | 54 | 55 | 28 | 48 | 20 | 25 | 54 | |
| 3124N/13 | 3125N/13 | 43 | 57 | 94 | 95 | 48 | 82 | 35 | 43 | 94 | |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 62 | 82 | 136 | 137 | 70 | 119 | 50 | 62 | 136 | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 10: Refrigerant flow capacity of demountable check valves in hot gas line [kW]

| Catalogue Number | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-----------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 3124N/M22 | 3125N/M22 | 69 | 147 | 78 | 96 | 110 | 77 | 54 | 55 | 96 | 87 |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 88 | 189 | 100 | 124 | 141 | 99 | 69 | 71 | 123 | 112 |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 133 | 283 | 150 | 186 | 212 | 149 | 104 | 107 | 184 | 168 |
| 3124N/13 | 3125N/13 | 230 | 490 | 259 | 321 | 367 | 258 | 179 | 185 | 319 | 291 |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 332 | 708 | 374 | 464 | 530 | 372 | 259 | 267 | 460 | 420 |
| Catalogue Number | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | |
| 3124N/M22 | 3125N/M22 | 62 | 81 | 124 | 125 | 66 | 103 | 52 | 60 | 117 | |
| 3124N/7 | 3125N/7 | | | | | | | | | | |
| 3124N/M28 | 3125N/M28 | 80 | 104 | 159 | 160 | 85 | 133 | 67 | 77 | 150 | |
| 3124N/9 | 3125N/9 | | | | | | | | | | |
| 3124N/11 | 3125N/11 | 119 | 156 | 239 | 241 | 127 | 199 | 101 | 116 | 225 | |
| 3124N/13 | 3125N/13 | 207 | 269 | 413 | 417 | 220 | 345 | 174 | 201 | 389 | |
| 3124N/M42 | 3125N/M42 | | | | | | | | | | |
| 3124N/17 | 3125N/17 | 298 | 389 | 597 | 602 | 317 | 498 | 252 | 290 | 562 | |

Standard rating conditions according to AHRI Standard 760-2014

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



The background of the entire page is a complex, repeating geometric pattern of blue triangles and polygons, creating a 3D effect of faceted surfaces. The colors range from light blue to dark blue, with shadows and highlights that give the pattern depth.

REFRIGERATING SYSTEM PROTECTORS

P  LYHEDRA



REFRIGERATING SYSTEM PROTECTORS

DRYING REFRIGERANT FLUIDS

Among contaminating agents that can cause serious damages to refrigerating systems, moisture plays a major role. Its presence, always a possibility in refrigerating systems, is due to many factors:

- Inadequate or insufficient vacuum before refrigerant charging
- Topping up using oil that has been exposed to the humidity in the air
- Refrigerant used for subsequent additions stored in vessels that have not been dried
- Sealing defects, especially in systems not designed for operation at low temperatures

High temperatures combined with humidity give rise to complex phenomena that promote acid formation both in the lubricating oil and the refrigerant. Organic acids of the oils react with metals, promoting the formation of sludge, which are viscous clots consisting of insoluble metal salts and large molecules of polymerized oil. In the long term, in addition to reducing lubrication of the moving parts of the compressor, sludge can clog valves and filters, causing serious damage.

Acids produced by the hydrolysis of the refrigerant (in compressors iron and aluminium act as catalysts) are particularly corrosive, especially hydrofluoric acid. Acids attack metal surfaces with the consequent formation of crystal salts, penalizing the total heat exchange coefficient in the condenser and in the evaporator. In particular, in hermetic and semi-hermetic units, these salts damage the windings of electric motors, cooled by direct contact with the cold gas.

Water solubility in refrigerants in the liquid phase is quite low, especially at low temperatures. Consequently, when water in the system exceeds the very low limits of solubility allowed at low temperature, the excess water turns into ice, and partially or totally blocks expansion valves and capillaries.

Therefore, it is absolutely necessary to equip refrigeration systems with effective filters for drying the fluid.

In terms of concept and construction, the filter driers available on the market consist of two types: loose molecular sieve and solid core.

In the loose molecular sieve type, consisting of non-agglomerating product, the dehydrating mass is pressed using a spring between two metal fine-mesh wires, or two filter separators that can be constructed from various materials.

In solid core driers, the core is made from specifically dosed dehydrating and deacidifying products with binders. Water adsorption combines with the neutralization of acids that may be present in the refrigerant, and with a strong filtering action.

Castel has set up both its hermetic filter product lines based on the latter construction, which eliminates the danger of abrasion during loading and consequent formation of dust, and it allows the filter to be positioned at any location in the system.

It is always advisable to install a humidity indicator downstream from the filter. It will show the refrigerant's moisture content and the degree of efficiency of the filter. Remember, the drying capacity of Castel filters refers to the refrigerant charge and not the refrigeration potential of the system. As a matter of fact, with the same refrigerant potential and the same type of refrigerant fluid, there may be different refrigerant charges based on the type, design and partialization range of the plant, as well as to the operating conditions.

The data shown in the following tables are deduced from the test results of the present Castel production.

It is important to note that, in the event of a high oil level in the circuit (> 5%), the data shown in the tables will be reduced considerably.

REFRIGERATING SYSTEM PROTECTORS

6.1 – LIQUID INDICATORS & MOISTURE/LIQUID INDICATORS

APPLICATIONS

The liquid indicators and moisture/liquid indicators ensure fast, safe inspection of the refrigerant fluid conditions in the liquid circuit in terms of its regular flow and the presence of moisture. They are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants.

These indicators are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

Note: The indicator in series 3680 and 3780N are excluded from the scope of application of Directive 2014/68/EU as they are piping components. These indicators cannot be installed on systems that use HCFC (R22) refrigerant.

OPERATION

The moisture/liquid indicators consist of a sensitive ring element that changes colour, from green to yellow, according to the percent moisture in the system.

The moisture content values that correspond to the “green” colour can be considered admissible for the proper operation of the system. When the sensitive element starts to yellow, “Chartreuse green”, the threshold value has been reached and operating conditions could become difficult. When the sensitive element becomes “yellow”, it’s time to replace the filter dryer.

If the charge and operating conditions of the plant are normal, the refrigerant fluid appears perfectly liquid underneath the “lens” of the indicator. The presence of bubbles indicates that the refrigerant fluid is partially evaporating along the liquid line.

CONSTRUCTION

The liquid indicators in series 38 and moisture/liquid indicators in series 39 are manufactured in a sealed hermetic unit to avoid any

possible refrigerant leaks. The glass “lens”, with suitable gasket, is housed inside the brass body and is fixed in its seat with an edge calking operation. The main parts of these indicators are made from the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Glass for lens
- PTFE for outlet gaskets

Liquid/moisture indicators in series 3680 and 3780N are manufactured with the glass “lens” directly fused onto a steel metallic ring, with proper surface protection. This metallic ring, screwed on the indicator body, is equipped with a gasket of hydrogenated nitrile butadiene (HNBR).

INSTALLATION

At start-up, the colour of the sensitive element may be yellow, due to exposure to air humidity or due to moisture in the circuit. When the moisture of the refrigerant is returned to acceptable levels by the filter drier, the indicator colour turns green again. This is evidence that equilibrium has been re-established. If the yellow colour persists, measures must be taken to eliminate moisture. Only when the sensitive element turns green again, is there evidence that measures adopted were effective.

About 12 hours of system operation are required to achieve equilibrium. In any case, the moisture indication is usually read when the plant is in function and the fluid is flowing

Brazing of the indicators with solder connections should be carried out with care, using a low melting point filler material (min. 5% Ag). Avoid direct contact between the torch flame and the indicator body or glass, which could be damaged and compromise the proper functioning of the indicator.

For indicators in series 3680 and 3780N the ring must be disassembled before brazing. Note: the PS declared in Table 1 for saddle-type indicators in series 3680 and 3780N, refers only to the body plus the ring (with its o-ring), which the customer must tighten to the torque indicated on the product instruction handbook. The aforesaid declaration doesn’t cover any possible leakage or malfunctions due to brazing the body on the copper pipe. The customer is totally responsible for the success of this operation.

APPROVALS

The liquid indicators in series 3810, 3840, and 3850 and the moisture/liquid indicators 3910 3940, and 3950 are approved by the American certification authority, Underwriters Laboratories Inc. These indicators are certified **UL Listed** for the USA with file SA33318, in compliance with American standard UL 207.



TABLE 1: General characteristics of liquid indicators

| Catalogue Number | Type | Connections | | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | |
|------------------|---------------|-------------|---------|--------|----------|--------|-----------|---------|------|---------------------------------------|-----------|-----|------|----------|
| | | SAE Flare | ODS | | for pipe | | | min. | max. | | | | | |
| | | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | | | | | |
| 3810/22 | male - male | 1/4" | - | - | | | 50 (1) | -40 | +120 | Art. 4.3 | | | | |
| 3810/33 | | 3/8" | - | - | | | | | | | | | | |
| 3810/44 | | 1/2" | - | - | | | | | | | | | | |
| 3810/55 | | 5/8" | - | - | | | | | | | | | | |
| 3810/66 | | 3/4" | - | - | | | | | | | | | | |
| 3840/2 | brazing | - | 1/4" | - | | | | | | | 50 (1) | -40 | +120 | Art. 4.3 |
| 3840/3 | | - | 3/8" | - | | | | | | | | | | |
| 3840/M10 | | - | - | 10 | | | | | | | | | | |
| 3840/M12 | | - | - | 12 | | | | | | | | | | |
| 3840/4 | | - | 1/2" | - | - | - | | | | | | | | |
| 3840/5 | | - | 5/8" | 16 | - | - | | | | | | | | |
| 3840/M18 | | - | - | 18 | | | | | | | | | | |
| 3840/6 | | - | 3/4" | - | | | | | | | | | | |
| 3840/7 | | - | 7/8" | 22 | | | | | | | | | | |
| 3840/9 | - | 1.1/8" | - | | | | | | | | | | | |
| 3850/22 | male - female | 1/4" | - | - | | | 50 (1) | -40 | +120 | Art. 4.3 | | | | |
| 3850/33 | | 3/8" | - | - | | | | | | | | | | |
| 3850/44 | | 1/2" | - | - | | | | | | | | | | |
| 3850/55 | | 5/8" | - | - | | | | | | | | | | |
| 3850/66 | | 3/4" | - | - | | | | | | | | | | |
| 3680/7 | saddle type | - | - | - | 7/8" | 22 | | | | | 45 | -40 | +150 | excluded |
| 3680/9 | | - | - | - | 1.1/8" | 28 | | | | | | | | |
| 3680/11 | | - | - | - | 1.3/8" | 35 | | | | | | | | |

(1) : MWP = 500 psi according to UL approval

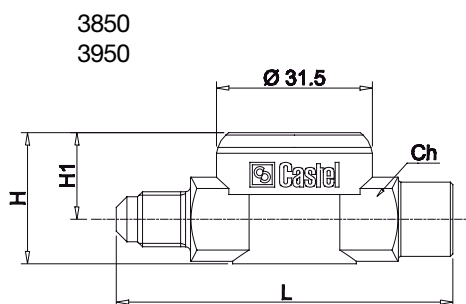
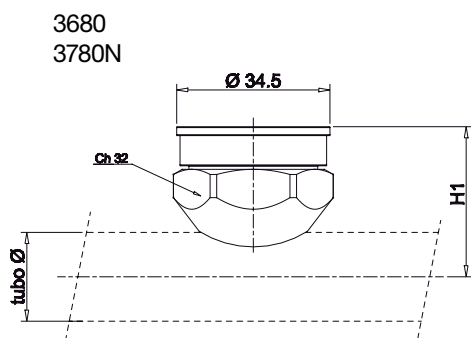
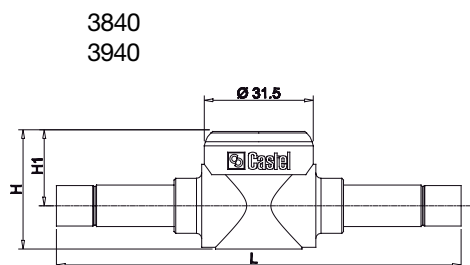
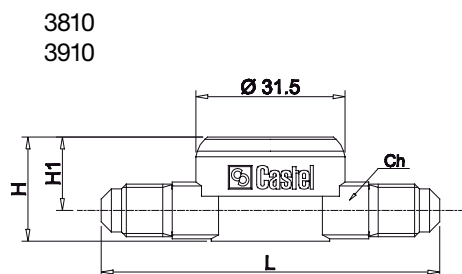
TABLE 2: General characteristics of liquid / moisture indicators

| Catalogue Number | Type | Connections | | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | |
|------------------|---------------|-------------|---------|--------|----------|--------|-----------|---------|------|---------------------------------------|-----------|-----|------|----------|
| | | SAE Flare | ODS | | for pipe | | | min. | max. | | | | | |
| | | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | | | | | |
| 3910/22 | male - male | 1/4" | - | - | | | 50 (1) | -40 | +120 | Art. 4.3 | | | | |
| 3910/33 | | 3/8" | - | - | | | | | | | | | | |
| 3910/44 | | 1/2" | - | - | | | | | | | | | | |
| 3910/55 | | 5/8" | - | - | | | | | | | | | | |
| 3910/66 | | 3/4" | - | - | | | | | | | | | | |
| 3940/2 | brazing | - | 1/4" | - | | | | | | | 50 (1) | -40 | +120 | Art. 4.3 |
| 3940/3 | | - | 3/8" | - | | | | | | | | | | |
| 3940/M10 | | - | - | 10 | | | | | | | | | | |
| 3940/M12 | | - | - | 12 | | | | | | | | | | |
| 3940/4 | | - | 1/2" | - | - | - | | | | | | | | |
| 3940/5 | | - | 5/8" | 16 | - | - | | | | | | | | |
| 3940/M18 | | - | - | 18 | | | | | | | | | | |
| 3940/6 | | - | 3/4" | - | | | | | | | | | | |
| 3940/7 | | - | 7/8" | 22 | | | | | | | | | | |
| 3940/9 | - | 1.1/8" | - | | | | | | | | | | | |
| 3950/22 | male - female | 1/4" | - | - | | | 50 (1) | -40 | +120 | Art. 4.3 | | | | |
| 3950/33 | | 3/8" | - | - | | | | | | | | | | |
| 3950/44 | | 1/2" | - | - | | | | | | | | | | |
| 3950/55 | | 5/8" | - | - | | | | | | | | | | |
| 3950/66 | | 3/4" | - | - | | | | | | | | | | |
| 3780N/5 | saddle type | - | - | - | 5/8" | 16 | | | | | 45 | -40 | +150 | excluded |
| 3780N/M18 | | - | - | - | - | 18 | | | | | | | | |
| 3780N/7 | | - | - | - | 7/8" | 22 | | | | | | | | |
| 3780N/9 | | - | - | - | 1.1/8" | 28 | | | | | | | | |
| 3780N/11 | | - | - | - | 1.3/8" | 35 | | | | | | | | |

(1) : MWP = 500 psi according to UL approval

TABLE 3: Dimensions and weights

| Catalogue Number | | Dimensions [mm] | | | | Weight [g] | | | |
|-------------------|----------------------------|-----------------|------|------|----|------------|-----|-----|-----|
| Liquid Indicators | Moisture Liquid Indicators | H | H1 | L | Ch | | | | |
| 3810/22 | 3910/22 | 22 | 16,5 | 71,5 | 12 | 110 | | | |
| 3810/33 | 3910/33 | 26,5 | 17,5 | 77,5 | 17 | 150 | | | |
| 3810/44 | 3910/44 | 30 | 18,5 | 81,5 | 22 | 196 | | | |
| 3810/55 | 3910/55 | 34 | 21,5 | 89,5 | 24 | 238 | | | |
| 3810/66 | 3910/66 | 37,5 | 23,5 | 90 | 28 | 298 | | | |
| 3840/2 | 3940/2 | 22 | 15,5 | 113 | - | 116 | | | |
| 3840/3 | 3940/3 | 34 | 21,5 | 117 | | - | 185 | | |
| 3840/M10 | 3940/M10 | | | | | | | | |
| 3840/M12 | 3940/M12 | | | | | | | | |
| 3840/4 | 3940/4 | | | | | | | | |
| 3840/5 | 3940/5 | 34 | 21,5 | 131 | | | - | 195 | |
| 3840/M18 | 3940/M18 | | | | | | | | |
| 3840/6 | 3940/6 | 37,5 | 23,5 | 151 | | | | - | 306 |
| 3840/7 | 3940/7 | | | | | | | | |
| 3840/9 | 3940/9 | | | | | | | | |
| 3850/22 | 3950/22 | 26,5 | 17,5 | 68 | 17 | | | | 140 |
| 3850/33 | 3950/33 | 30 | 18,5 | 74 | 22 | 185 | | | |
| 3850/44 | 3950/44 | 34 | 21,5 | 77 | 24 | 231 | | | |
| 3850/55 | 3950/55 | 37,5 | 23,5 | 82 | 28 | 288 | | | |
| 3850/66 | 3950/66 | 43,5 | 26 | 92 | 35 | 517 | | | |
| - | 3780N/5 | - | ?? | - | - | 90 | | | |
| - | 3780N/M18 | | ?? | | | | | | |
| 3680/7 | 3780N/7 | | 33 | | | | | | |
| 3680/9 | 3780N/9 | | 36 | | | | | | |
| 3680/11 | 3780N/11 | | 39,5 | | | | | | |



REFRIGERATING SYSTEM PROTECTORS

6.2 – HERMETIC FILTER DRIERS

APPLICATIONS

The hermetic filters in series 42-43, DF2-DF3 are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These filters have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CONSTRUCTION

Filters in series 42-43: The filter is completely manufactured in steel, with threaded connections, SAE FLARE, in copper-plated steel. The product range also includes types with copper plated solder connections, offering the possibility to solder the copper pipe inside the connections (ODS).

On specific customer request, Castel is also able to supply filters in series 42-43 with connections:

- ORS (O-Ring Seal) according to SAE Standard J 1453.
- ORP (O-Ring Pilot) according to IMACA Standard 305.

Filters in series DF2-DF3: the filter body is made completely from steel with threaded connections, SAE FLARE, made from nickel plated steel. The product range also includes types with copper connections, EN 12735-1 - Cu-DHP, offering the possibility to solder the copper pipe inside the connections (ODS). On specific customer request, Castel can supply filters in series DF2-DF3 with ORS (O-Ring Seal) connections according to SAE Standard J 1453.

Filters in series 42 and DF2: The cartridges are made from moulding a dehydrating filler, made from 80% 3 Å molecular sieves and 20% activated alumina, with a suitable binder. The use of a blend of molecular sieves – activated alumina, grant the cartridges a very high deacidifying capacity maintaining very good moisture adsorption characteristics. The presence of a controlled and defined percentage of activated alumina, lower than the maximum value recommended by ASERCOM, maintains the original concentration of additives in the polyester oil.

Filters in series 43 and DF3: The cartridges are made from moulding a dehydrating filler, made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics.

The manufacturing process allows both products to be compact and strong, making them resistant to impact and abrasion. The cartridge is shaped to offer the incoming fluid maximum possible surface area. The internal cavity is positioned in such a way as to ensure a uniform wall thickness. As a result, the fluid encounters constant resistance, flows linearly, ensuring efficient dehydration and minimum charge loss. The cartridge is chemically inert, not deliquescent, does not react with refrigerating fluids, and is capable of capturing all oil by-products in the circuit. Impurities accumulate in the ring between the metal shell and the cartridge. This prevents the filter from clogging.

APPROVALS

Filters in series 42-43 and DF2-DF3 have been approved by the American certification authority Underwriters Laboratories Inc. Filters in series 42-43 are certified **UL Listed** for the USA with file SA7054, in compliance with American standard UL 207. Filters in series DF2-DF3 are certified **UL-CSA Listed** for the USA and Canada with file SA7054, in compliance with American standard UL 207 and Canadian standard CSA C22.2 No. 140.3-15.

FILTER SELECTION BASED ON REFRIGERANT FLOW CAPACITY

Refrigerant flow capacities shown in Tables 6-7 and Tables 14-15 refer to the following operating conditions according to ARI STANDARD 710-2009:

- Liquid temperature + 30 °C
- Evaporating temperature - 15 °C

Total pressure drop, including inlet and outlet connections, 0.07 bar / 0.14 bar

For different operating conditions apply the following formula:

$$Q = Q_{ref} \times L_1$$

where:

Q = required refrigeration flow capacity [kW]

Q_{ref} = reference refrigeration flow capacity [kW] (see Tables 6-7 and Tables 14-15)

L_1 = flow capacity correction factor in presence of operative temperatures different from reference conditions. (See Table 8)



Castel FILTER-DRYERS
 1/2" NPT
 MWP = 680 PSIG
 T. RANGE = -40/+170°F
 SOLID CORE
 FILTER DRIER
 R22 - R134a - R404A
 R407C - R410A - R507
 Type DF316/4
 3
 PS = 47 bar
 TS = -40/+80 °C
 Lot N. 071
 Made in China

Castel FILTER-DRYERS
 1/2" NPT
 MWP = 680 PSIG
 T. RANGE = -40/+170°F
 SOLID CORE
 FILTER DRIER
 R22 - R134a - R404A
 R407C - R410A - R507
 Type DF316/4
 184
 PS = 47 bar
 TS = -40/+80 °C
 Lot N. 0717
 Made in China

Castel FILTER-DRYERS
 1/2" NPT
 MWP = 680 PSIG
 T. RANGE = -40/+170°F
 SOLID CORE
 FILTER DRIER
 R22 - R134a - R404A
 R407C - R410A - R507
 Type DF316/4
 184
 PS = 47 bar
 TS = -40/+80 °C
 Lot N. 0717
 Made in China

Castel FILTER-DRYERS
 1/2" NPT
 MWP = 680 PSIG
 T. RANGE = -40/+170°F
 SOLID CORE
 FILTER DRIER
 R22 - R134a - R404A
 R407C - R410A - R507
 Type DF316/45
 1845
 PS = 47 bar
 TS = -40/+80 °C
 Lot N. 0717
 Made in China

EXAMPLE

Refrigerant: R404A

Required refrigeration flow capacity: 15 [kW]

Liquid temperature: + 40 [°C]

Evaporating temperature: - 10 [°C]

Set pressure drop: 0.14 [bar]

Filter with 100% molecular sieve cartridge and ODF solder connections

$$Q = Q_{ref} \times L1$$

$$15 = Q_{ref} \times 0.86$$

$$Q_{ref} = 15/0.86 = 17.44 \text{ [kW]}$$

Comparing the reference flow capacity obtained with the values indicated in Table 7, the choice falls on filter model 4305/3S with a flow capacity of 17,9 kW, with a pressure drop of 0.14 bar.

FILTER SELECTION BASED ON DEHYDRATION CAPACITY

System Data:

Refrigerant fluid: R407C

Liquid temperature: + 50 °C

Refrigerant charge: 34 kg

According to ARI STANDARD 710-2009 and DIN 8949:2000, the adsorption capacity of the filter drier is given by:

$$(1,050 - 50) \times 34 / 1,000 = 34 \text{ g of H}_2\text{O}$$

where:

1,050 ppm. = moisture in the refrigerant entering the filter according to ARI STANDARD 710-2004 and DIN 8949:2000

50 ppm. = moisture in the refrigerant flowing out the filter according to ARI STANDARD 710-2004 and DIN 8949:2000

Comparing the adsorption capacity required with the values shown in table 9, filter 4341 should be selected, which has an adsorption capacity at 50 °C of 41,7 g of H₂O.

If the manufacturer indicates the drying capacity of their products in water drops, remembered that:

$$1 \text{ g H}_2\text{O} = 20 \text{ water drops.}$$

In this case, and when a molecular sieve filter dryer is selected, the following result is obtained:

$$34 \times 20 = 680 \text{ water drops.}$$

If moisture exceeds the values specified in ARI STANDARD 710-2009 and DIN 8949:2000, a filter with a greater adsorption capacity must be selected.

TABLE 4: General characteristics of hermetic filter driers. SAE Flare connections

| Catalogue Number | | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------------------|--|-------------------------|--|-----------------------------------|-------------|----------|---------|------|---------------------------------------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | | | | | | min. | max. | |
| 4303/2 | 4203/2 | 032 | 47 | 50 | 1/4" | 45 (1) | -40 | +80 | Art. 4.3 |
| 4303/3 | 4203/3 | 033 | | | 3/8" | | | | |
| 4305/2 | 4205/2 | 052 | 70 | 80 | 1/4" | | | | |
| 4305/3 | 4205/3 | 053 | | | 3/8" | | | | |
| 4308/2 | 4208/2 | 082 | 103 | 130 | 1/4" | | | | |
| 4308/3 | 4208/3 | 083 | | | 3/8" | | | | |
| 4308/4 | 4208/4 | 084 | | | 1/2" | | | | |
| 4316/2 | 4216/2 | 162 | 155 | 250 | 1/4" | | | | |
| 4316/3 | 4216/3 | 163 | | | 3/8" | | | | |
| 4316/4 | 4216/4 | 164 | | | 1/2" | | | | |
| 4316/5 | 4216/5 | 165 | | | 5/8" | | | | |
| 4330/3 | 4230/3 | 303 | 310 | 500 | 3/8" | | | | |
| 4330/4 | 4230/4 | 304 | | | 1/2" | | | | |
| 4330/5 | 4230/5 | 305 | | | 5/8" | | | | |
| 4332/4 | 4232/4 | 304 | 255 | 500 | 1/2" | | | | |
| 4332/5 | 4232/5 | 305 | | | 5/8" | | | | |
| 4341/4 | - | 414 | 330 | 670 | 1/2" | | | | |
| 4341/5 | 4241/5 | 415 | | | 5/8" | | | | |
| 4341/6 | 4241/6 | 416 | | | 3/4" | | | | |
| 4303/2F (2) | - | - | 47 | 50 | 1/4" | | | | |
| 4305/2F (2) | - | - | 70 | 80 | 1/4" | | | | |
| 4308/2F (2) | - | - | 103 | 130 | 1/4" | | | | |
| 4308/3F (2) | - | - | | | 3/8" | | | | |
| 4316/3F (2) | - | - | 155 | 250 | 3/8" | | | | |

(1) : MWP = 435 psi according to UL approval for filters series 4203 , 4205 , 4216 , 4232, 4303 , 4305 , 4316 , 4332
MWP = 400 psi according to UL approval for filters series 4208 , 4230 , 4241, 4308 , 4330 , 4341
(2) : Male-female connections (Inlet female)

TABLE 5: General characteristics of hermetic filter driers. ODS connections

| Catalogue Number | | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------------------|--|-------------------------|--|-----------------------------------|-------------|--------|---------|--------|-----------|---------|------|---------------------------------------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | | | | ODS | | ODM | | | min. | max. | |
| | | | | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | |
| 4303/2S | 4203/2S | 032S | 47 | 50 | 1/4" | – | 3/8" | – | 45 (1) | –40 | +80 | Art. 4.3 |
| 4303/2.5S | – | – | | | 5/16" | – | 3/8" | – | | | | |
| 4303/3S | – | 033S | | | 3/8" | – | 1/2" | – | | | | |
| 4305/2S | 4205/2S | 052S | 70 | 80 | 1/4" | – | 3/8" | – | | | | |
| 4305/3S | 4205/3S | 053S | | | 3/8" | – | 1/2" | – | | | | |
| 4305/M10S | 4205/M10S | – | | | – | 10 | – | 12 | | | | |
| 4308/2S | 4208/2S | 082S | 103 | 130 | 1/4" | – | 3/8" | – | | | | |
| 4308/3S | 4208/3S | 083S | | | 3/8" | – | 1/2" | – | | | | |
| 4308/M10S | 4208/M10S | – | | | – | 10 | – | 12 | | | | |
| 4308/M12S | 4208/M12S | – | | | – | 12 | – | 14 | | | | |
| 4308/4S | 4208/4S | 084S | | | 1/2" | – | 5/8" | 16 | | | | |
| 4316/3S | 4216/3S | 163S | 155 | 250 | 3/8" | – | 1/2" | – | | | | |
| 4316/M10S | 4216/M10S | – | | | – | 10 | – | 12 | | | | |
| 4316/M12S | 4216/M12S | – | | | – | 12 | – | 14 | | | | |
| 4316/4S | 4216/4S | 164S | | | 1/2" | – | 5/8" | 16 | | | | |
| 4316/5S | 4216/5S | 165S | | | 5/8" | 16 | 3/4" | – | | | | |
| 4316/7S | – | 167S | | | 7/8" | – | 1.1/8" | – | | | | |
| 4330/3S | 4230/3S | 303S | 310 | 500 | 3/8" | – | 1/2" | – | | | | |
| 4330/4S | 4230/4S | 304S | | | 1/2" | – | 5/8" | 16 | | | | |
| 4330/5S | 4230/5S | 305S | | | 5/8" | 16 | 3/4" | – | | | | |
| 4330/7S | – | 307S | | | 7/8" | – | 1.1/8" | – | | | | |
| 4330/9S | – | 309S | | | 1.1/8" | – | 1.3/8" | 35 | | | | |
| 4332/4S | 4232/4S | 304S | 255 | 500 | 1/2" | – | 5/8" | 16 | | | | |
| 4332/5S | 4232/5S | 305S | | | 5/8" | 16 | 3/4" | – | | | | |
| 4341/4S | – | 414S | 330 | 670 | 1/2" | – | 5/8" | 16 | | | | |
| 4341/5S | 4241/5S | 415S | | | 5/8" | 16 | 3/4" | – | | | | |
| 4341/6S | 4241/6S | 416S | | | 3/4" | – | 7/8" | – | | | | |
| 4341/7S | 4241/7S | 417S | | | 7/8" | – | 1.1/8" | – | | | | |
| 4375N/4S (2) | 4275N/4S (2) | 754S | 768 | 1340 | 1/2" | – | 5/8" | 16 | | | | |
| 4375N/5S (2) | 4275N/5S (2) | 755S | | | 5/8" | 16 | 3/4" | – | | | | |
| 4375N/6S (2) | 4275N/6S (2) | 756S | | | 3/4" | – | 7/8" | – | | | | |
| 4375N/7S (2) | 4275N/7S (2) | 757S | | | 7/8" | – | 1.1/8" | – | | | | |
| 4375N/9S (2) | 4275N/9S (2) | 759S | | | 1.1/8" | – | 1.3/8" | 35 | | | | |

(1) : MWP = 435 psi according to UL approval for filters series 4203 , 4205 , 4216 , 4232, 4275, 4303 , 4305 , 4316 , 4332
MWP = 400 psi according to UL approval for filters series 4208 , 4230 , 4241, 4308 , 4330 , 4341

(2): not UL approved

TABLE 6: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 4303/2 | 4203/2 | 6,4 | 9,9 | 4,6 | 6,6 | 6,8 | 4,4 | 4,7 | 5,7 | 6,2 | 6,0 |
| 4303/2F | - | 6,4 | 9,9 | 4,6 | 6,6 | 6,8 | 4,4 | 4,7 | 5,7 | 6,2 | 6,0 |
| 4303/2S | 4203/2S | 7,9 | 12,2 | 5,6 | 8,1 | 8,3 | 5,5 | 5,7 | 7,0 | 7,6 | 7,4 |
| 4303/3 | 4203/3 | 14,8 | 22,8 | 10,5 | 15,2 | 15,6 | 10,2 | 10,7 | 13,0 | 14,2 | 13,8 |
| 4303/3S | - | 18,6 | 28,7 | 13,3 | 19,2 | 19,7 | 12,9 | 13,5 | 16,4 | 17,9 | 17,5 |
| 4305/2 | 4205/2 | 6,6 | 10,2 | 4,7 | 6,8 | 7,0 | 4,6 | 4,8 | 5,8 | 6,4 | 6,2 |
| 4305/2F | - | 6,6 | 10,2 | 4,7 | 6,8 | 7,0 | 4,6 | 4,8 | 5,8 | 6,4 | 6,2 |
| 4305/2S | 4205/2S | 8,2 | 12,6 | 5,8 | 8,4 | 8,6 | 5,7 | 5,9 | 7,2 | 7,8 | 7,7 |
| 4305/3 | 4205/3 | 15,2 | 23,5 | 10,9 | 15,7 | 16,1 | 10,5 | 11,0 | 13,4 | 14,6 | 14,3 |
| 4305/3S | 4205/3S | 19,3 | 29,7 | 13,7 | 19,8 | 20,3 | 13,3 | 14,0 | 17,0 | 18,5 | 18,1 |
| 4305/M10S | - | 19,3 | 29,7 | 13,7 | 19,8 | 20,3 | 13,3 | 14,0 | 17,0 | 18,5 | 18,1 |
| 4308/2 | 4208/2 | 6,9 | 10,6 | 4,9 | 7,1 | 7,3 | 4,8 | 5,0 | 6,1 | 6,6 | 6,5 |
| 4308/2F | - | 6,9 | 10,6 | 4,9 | 7,1 | 7,3 | 4,8 | 5,0 | 6,1 | 6,6 | 6,5 |
| 4308/2S | 4208/2S | 8,4 | 13,0 | 6,0 | 8,7 | 8,9 | 5,8 | 6,1 | 7,5 | 8,1 | 7,9 |
| 4308/3 | 4208/3 | 17,9 | 27,6 | 12,8 | 18,4 | 18,9 | 12,4 | 13,0 | 15,8 | 17,2 | 16,8 |
| 4308/3F | - | 17,9 | 27,6 | 12,8 | 18,4 | 18,9 | 12,4 | 13,0 | 15,8 | 17,2 | 16,8 |
| 4308/3S | 4208/3S | 22,6 | 34,9 | 16,2 | 23,3 | 23,9 | 15,7 | 16,4 | 20,0 | 21,8 | 21,2 |
| 4308/M10S | - | 22,6 | 34,9 | 16,2 | 23,3 | 23,9 | 15,7 | 16,4 | 20,0 | 21,8 | 21,2 |
| 4308/M12S | - | 28,7 | 44,3 | 20,5 | 29,6 | 30,3 | 19,9 | 20,8 | 25,4 | 27,6 | 26,9 |
| 4308/4 | 4208/4 | 23,8 | 36,6 | 16,9 | 24,5 | 25,1 | 16,4 | 17,2 | 21,0 | 22,8 | 22,3 |
| 4308/4S | 4208/4S | 28,7 | 44,3 | 20,5 | 29,6 | 30,3 | 19,9 | 20,8 | 25,4 | 27,6 | 26,9 |
| 4316/2 | 4216/2 | 6,9 | 10,6 | 4,9 | 7,1 | 7,3 | 4,8 | 5,0 | 6,1 | 6,6 | 6,5 |
| 4316/3 | 4216/3 | 19,5 | 30,1 | 13,9 | 20,1 | 20,6 | 13,5 | 14,2 | 17,3 | 18,8 | 18,3 |
| 4316/3F | - | 19,5 | 30,1 | 13,9 | 20,1 | 20,6 | 13,5 | 14,2 | 17,3 | 18,8 | 18,3 |
| 4316/3S | 4216/3S | 24,4 | 37,6 | 17,4 | 25,1 | 25,8 | 16,9 | 17,7 | 21,5 | 23,5 | 22,9 |
| 4316/M10S | - | 24,4 | 37,6 | 17,4 | 25,1 | 25,8 | 16,9 | 17,7 | 21,5 | 23,5 | 22,9 |
| 4316/M12S | - | 33,8 | 52,2 | 24,1 | 34,9 | 35,8 | 23,4 | 24,5 | 29,9 | 32,5 | 31,7 |
| 4316/4 | 4216/4 | 28,0 | 43,1 | 19,9 | 28,8 | 29,6 | 19,4 | 20,3 | 24,7 | 26,9 | 26,2 |
| 4316/4S | 4216/4S | 33,8 | 52,2 | 24,1 | 34,9 | 35,8 | 23,4 | 24,5 | 29,9 | 32,5 | 31,7 |
| 4316/5 | 4216/5 | 37,2 | 57,4 | 26,6 | 38,4 | 39,3 | 25,8 | 27,0 | 32,9 | 35,8 | 34,9 |
| 4316/5S | 4216/5S | 44,7 | 68,9 | 31,8 | 46,0 | 47,2 | 30,9 | 32,4 | 39,4 | 43,0 | 41,9 |
| 4316/7S | - | 47,3 | 73,0 | 33,7 | 48,8 | 50,0 | 32,8 | 34,3 | 41,8 | 45,5 | 44,4 |
| 4330/3 | 4230/3 | 21,5 | 33,1 | 15,3 | 22,1 | 22,7 | 14,9 | 15,6 | 19,0 | 20,6 | 20,1 |
| 4330/3S | 4230/3S | 26,9 | 41,4 | 19,2 | 27,7 | 28,4 | 18,6 | 19,5 | 23,7 | 25,8 | 25,2 |
| 4330/4 | 4230/4 | 30,6 | 47,2 | 21,8 | 31,6 | 32,4 | 21,2 | 22,2 | 27,1 | 29,5 | 28,7 |
| 4330/4S | 4230/4S | 37,0 | 57,1 | 26,4 | 38,2 | 39,1 | 25,7 | 26,9 | 32,7 | 35,6 | 34,7 |
| 4330/5 | 4230/5 | 38,4 | 59,2 | 27,4 | 39,6 | 40,6 | 26,6 | 27,9 | 33,9 | 37,0 | 36,0 |
| 4330/5S | 4230/5S | 46,2 | 71,3 | 33,0 | 47,6 | 48,8 | 32,0 | 33,5 | 40,8 | 44,5 | 43,3 |
| 4330/7S | - | 48,8 | 75,2 | 34,8 | 50,3 | 51,6 | 33,8 | 35,4 | 43,1 | 46,9 | 45,8 |
| 4330/9S | - | 48,8 | 75,2 | 34,8 | 50,3 | 51,6 | 33,8 | 35,4 | 43,1 | 46,9 | 45,8 |
| 4332/4 | 4232/4 | 33,3 | 51,3 | 23,7 | 34,3 | 35,2 | 23,1 | 24,1 | 29,4 | 32,0 | 31,2 |
| 4332/4S | 4232/4S | 40,2 | 61,9 | 28,6 | 41,4 | 42,4 | 27,8 | 29,1 | 35,5 | 38,6 | 37,7 |
| 4332/5 | 4232/5 | 39,5 | 60,9 | 28,2 | 40,7 | 41,8 | 27,4 | 28,7 | 34,9 | 38,0 | 37,1 |
| 4332/5S | 4232/5S | 47,8 | 73,7 | 34,1 | 49,2 | 50,5 | 33,1 | 34,6 | 42,2 | 46,0 | 44,8 |
| 4341/4 | - | 34,3 | 52,9 | 24,5 | 35,3 | 36,2 | 23,7 | 24,9 | 30,3 | 33,0 | 32,2 |
| 4341/4S | - | 40,9 | 63,1 | 29,2 | 42,1 | 43,2 | 28,3 | 29,7 | 36,1 | 39,3 | 38,4 |
| 4341/5 | 4241/5 | 40,5 | 62,5 | 28,9 | 41,8 | 42,8 | 28,1 | 29,4 | 35,8 | 39,0 | 38,0 |
| 4341/5S | 4241/5S | 49,1 | 75,6 | 35,0 | 50,6 | 51,8 | 34,0 | 35,6 | 43,3 | 47,2 | 46,0 |
| 4341/6 | 4241/6 | 66,6 | 102,7 | 47,5 | 68,6 | 70,3 | 46,1 | 48,3 | 58,8 | 64,0 | 62,4 |
| 4341/6S | 4241/6S | 66,6 | 102,7 | 47,5 | 68,6 | 70,3 | 46,1 | 48,3 | 58,8 | 64,0 | 62,4 |
| 4341/7S | 4241/7S | 73,5 | 113,4 | 52,5 | 75,8 | 77,7 | 50,9 | 53,3 | 65,0 | 70,7 | 69,0 |
| 4375N/4S | 4275N/4S | 52,9 | 81,6 | 37,7 | 54,5 | 55,9 | 36,6 | 38,4 | 46,7 | 50,9 | 49,6 |
| 4375N/5S | 4275N/5S | 54,0 | 83,3 | 38,5 | 55,7 | 57,1 | 37,4 | 39,2 | 47,7 | 51,9 | 50,7 |
| 4375N/6S | 4275N/6S | 79,9 | 123,2 | 57,0 | 82,3 | 84,4 | 55,3 | 57,9 | 70,6 | 76,8 | 74,9 |
| 4375N/7S | 4275N/7S | 92,0 | 141,8 | 65,6 | 94,8 | 97,2 | 63,7 | 66,7 | 81,2 | 88,5 | 86,3 |
| 4375N/9S | 4275N/9S | 95,6 | 147,5 | 68,2 | 98,6 | 101,1 | 66,2 | 69,4 | 84,5 | 92,0 | 89,7 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier. The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 6: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 4303/2 | 4203/2 | 5,1 | 4,6 | 7,9 | 8,0 | 5,4 | 7,7 | 8,8 | 7,7 | 8,0 |
| 4303/2F | – | 5,1 | 4,6 | 7,9 | 8,0 | 5,4 | 7,7 | 8,8 | 7,7 | 8,0 |
| 4303/2S | 4203/2S | 6,3 | 5,7 | 9,7 | 9,8 | 6,6 | 9,5 | 10,8 | 9,5 | 9,9 |
| 4303/3 | 4203/3 | 11,7 | 10,7 | 18,1 | 18,4 | 12,4 | 17,8 | 20,1 | 17,7 | 18,5 |
| 4303/3S | – | 14,8 | 13,4 | 22,8 | 23,1 | 15,7 | 22,4 | 25,4 | 22,4 | 23,3 |
| 4305/2 | 4205/2 | 5,2 | 4,8 | 8,1 | 8,2 | 5,6 | 8,0 | 9,0 | 7,9 | 8,3 |
| 4305/2F | – | 5,2 | 4,8 | 8,1 | 8,2 | 5,6 | 8,0 | 9,0 | 7,9 | 8,3 |
| 4305/2S | 4205/2S | 6,5 | 5,9 | 10,0 | 10,1 | 6,9 | 9,8 | 11,1 | 9,8 | 10,2 |
| 4305/3 | 4205/3 | 12,1 | 11,0 | 18,6 | 18,9 | 12,8 | 18,3 | 20,8 | 18,3 | 19,0 |
| 4305/3S | 4205/3S | 15,3 | 13,9 | 23,6 | 23,9 | 16,2 | 23,2 | 26,3 | 23,1 | 24,1 |
| 4305/M10S | – | 15,3 | 13,9 | 23,6 | 23,9 | 16,2 | 23,2 | 26,3 | 23,1 | 24,1 |
| 4308/2 | 4208/2 | 5,5 | 5,0 | 8,4 | 8,6 | 5,8 | 8,3 | 9,4 | 8,3 | 8,6 |
| 4308/2F | – | 5,5 | 5,0 | 8,4 | 8,6 | 5,8 | 8,3 | 9,4 | 8,3 | 8,6 |
| 4308/2S | 4208/2S | 6,7 | 6,1 | 10,3 | 10,5 | 7,1 | 10,2 | 11,5 | 10,1 | 10,6 |
| 4308/3 | 4208/3 | 14,2 | 12,9 | 21,9 | 22,2 | 15,0 | 21,5 | 24,4 | 21,5 | 22,4 |
| 4308/3F | – | 14,2 | 12,9 | 21,9 | 22,2 | 15,0 | 21,5 | 24,4 | 21,5 | 22,4 |
| 4308/3S | 4208/3S | 18,0 | 16,4 | 27,7 | 28,2 | 19,0 | 27,3 | 30,9 | 27,2 | 28,3 |
| 4308/M10S | – | 18,0 | 16,4 | 27,7 | 28,2 | 19,0 | 27,3 | 30,9 | 27,2 | 28,3 |
| 4308/M12S | – | 22,8 | 20,7 | 35,1 | 35,7 | 24,1 | 34,6 | 39,2 | 34,5 | 35,9 |
| 4308/4 | 4208/4 | 18,9 | 17,1 | 29,1 | 29,5 | 20,0 | 28,6 | 32,4 | 28,5 | 29,7 |
| 4308/4S | 4208/4S | 22,8 | 20,7 | 35,1 | 35,7 | 24,1 | 34,6 | 39,2 | 34,5 | 35,9 |
| 4316/2 | 4216/2 | 5,5 | 5,0 | 8,4 | 8,6 | 5,8 | 8,3 | 9,4 | 8,3 | 8,6 |
| 4316/3 | 4216/3 | 15,5 | 14,1 | 23,9 | 24,3 | 16,4 | 23,5 | 26,6 | 23,5 | 24,4 |
| 4316/3F | – | 15,5 | 14,1 | 23,9 | 24,3 | 16,4 | 23,5 | 26,6 | 23,5 | 24,4 |
| 4316/3S | 4216/3S | 19,4 | 17,6 | 29,9 | 30,3 | 20,5 | 29,4 | 33,3 | 29,3 | 30,5 |
| 4316/M10S | – | 19,4 | 17,6 | 29,9 | 30,3 | 20,5 | 29,4 | 33,3 | 29,3 | 30,5 |
| 4316/M12S | – | 26,9 | 24,4 | 41,4 | 42,1 | 28,4 | 40,8 | 46,2 | 40,7 | 42,3 |
| 4316/4 | 4216/4 | 22,2 | 20,2 | 34,3 | 34,8 | 23,5 | 33,7 | 38,2 | 33,6 | 35,0 |
| 4316/4S | 4216/4S | 26,9 | 24,4 | 41,4 | 42,1 | 28,4 | 40,8 | 46,2 | 40,7 | 42,3 |
| 4316/5 | 4216/5 | 29,6 | 26,9 | 45,6 | 46,3 | 31,3 | 44,9 | 50,8 | 44,7 | 46,6 |
| 4316/5S | 4216/5S | 35,5 | 32,2 | 54,7 | 55,5 | 37,5 | 53,8 | 60,9 | 53,7 | 55,9 |
| 4316/7S | – | 37,6 | 34,2 | 57,9 | 58,8 | 39,8 | 57,0 | 64,6 | 56,9 | 59,2 |
| 4330/3 | 4230/3 | 17,0 | 15,5 | 26,3 | 26,7 | 18,0 | 25,9 | 29,3 | 25,8 | 26,8 |
| 4330/3S | 4230/3S | 21,3 | 19,4 | 32,9 | 33,4 | 22,6 | 32,4 | 36,7 | 32,3 | 33,6 |
| 4330/4 | 4230/4 | 24,3 | 22,1 | 37,5 | 38,1 | 25,8 | 36,9 | 41,8 | 36,8 | 38,3 |
| 4330/4S | 4230/4S | 29,4 | 26,7 | 45,4 | 46,1 | 31,1 | 44,6 | 50,5 | 44,5 | 46,3 |
| 4330/5 | 4230/5 | 30,5 | 27,7 | 47,1 | 47,8 | 32,3 | 46,3 | 52,4 | 46,2 | 48,1 |
| 4330/5S | 4230/5S | 36,7 | 33,4 | 56,6 | 57,5 | 38,9 | 55,7 | 63,1 | 55,5 | 57,8 |
| 4330/7S | – | 38,7 | 35,2 | 59,7 | 60,6 | 41,0 | 58,8 | 66,6 | 58,6 | 61,0 |
| 4330/9S | – | 38,7 | 35,2 | 59,7 | 60,6 | 41,0 | 58,8 | 66,6 | 58,6 | 61,0 |
| 4332/4 | 4232/4 | 26,4 | 24,0 | 40,8 | 41,4 | 28,0 | 40,1 | 45,4 | 40,0 | 41,6 |
| 4332/4S | 4232/4S | 31,9 | 29,0 | 49,2 | 49,9 | 33,8 | 48,4 | 54,8 | 48,3 | 50,2 |
| 4332/5 | 4232/5 | 31,4 | 28,5 | 48,4 | 49,1 | 33,2 | 47,6 | 53,9 | 47,5 | 49,4 |
| 4332/5S | 4232/5S | 37,9 | 34,5 | 58,5 | 59,4 | 40,2 | 57,6 | 65,2 | 57,4 | 59,8 |
| 4341/4 | – | 27,2 | 24,8 | 42,0 | 42,6 | 28,8 | 41,3 | 46,8 | 41,2 | 42,9 |
| 4341/4S | – | 32,5 | 29,5 | 50,1 | 50,8 | 34,4 | 49,3 | 55,8 | 49,1 | 51,2 |
| 4341/5 | 4241/5 | 32,2 | 29,3 | 49,6 | 50,4 | 34,1 | 48,8 | 55,3 | 48,7 | 50,7 |
| 4341/5S | 4241/5S | 38,9 | 35,4 | 60,1 | 61,0 | 41,2 | 59,1 | 66,9 | 59,0 | 61,4 |
| 4341/6 | 4241/6 | 52,9 | 48,1 | 81,5 | 82,8 | 56,0 | 80,2 | 90,8 | 80,0 | 83,3 |
| 4341/6S | 4241/6S | 52,9 | 48,1 | 81,5 | 82,8 | 56,0 | 80,2 | 90,8 | 80,0 | 83,3 |
| 4341/7S | 4241/7S | 58,4 | 53,1 | 90,1 | 91,4 | 61,8 | 88,6 | 100,3 | 88,4 | 92,0 |
| 4375N/4S | 4275N/4S | 42,0 | 38,2 | 64,8 | 65,8 | 44,5 | 63,8 | 72,2 | 63,6 | 66,2 |
| 4375N/5S | 4275N/5S | 42,9 | 39,0 | 66,1 | 67,1 | 45,4 | 65,1 | 73,7 | 64,9 | 67,6 |
| 4375N/6S | 4275N/6S | 63,4 | 57,7 | 97,8 | 99,3 | 67,2 | 96,2 | 109,0 | 96,0 | 99,9 |
| 4375N/7S | 4275N/7S | 73,0 | 66,4 | 112,6 | 114,3 | 77,3 | 110,8 | 125,5 | 110,5 | 115,0 |
| 4375N/9S | 4275N/9S | 75,9 | 69,0 | 117,1 | 118,9 | 80,4 | 115,3 | 130,5 | 114,9 | 119,6 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier. The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 7: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 4303/2 | 4203/2 | 7,7 | 11,9 | 5,5 | 7,9 | 8,1 | 5,3 | 5,6 | 6,8 | 7,3 | 7,2 |
| 4303/2F | - | 7,7 | 11,9 | 5,5 | 7,9 | 8,1 | 5,3 | 5,6 | 6,8 | 7,3 | 7,2 |
| 4303/2S | 4203/2S | 9,5 | 14,6 | 6,7 | 9,8 | 10,0 | 6,6 | 6,9 | 8,4 | 9,0 | 8,9 |
| 4303/3 | 4203/3 | 17,7 | 27,3 | 12,6 | 18,3 | 18,7 | 12,3 | 12,8 | 15,6 | 16,8 | 16,6 |
| 4303/3S | - | 22,3 | 34,4 | 15,9 | 23,0 | 23,6 | 15,5 | 16,2 | 19,7 | 21,2 | 20,9 |
| 4305/2 | 4205/2 | 7,9 | 12,2 | 5,7 | 8,2 | 8,4 | 5,5 | 5,7 | 7,0 | 7,5 | 7,4 |
| 4305/2F | - | 7,9 | 12,2 | 5,7 | 8,2 | 8,4 | 5,5 | 5,7 | 7,0 | 7,5 | 7,4 |
| 4305/2S | 4205/2S | 10,6 | 16,4 | 7,6 | 10,9 | 11,2 | 7,3 | 7,7 | 9,4 | 10,1 | 10,0 |
| 4305/3 | 4205/3 | 19,8 | 30,5 | 14,1 | 20,4 | 20,9 | 13,7 | 14,4 | 17,5 | 18,8 | 18,6 |
| 4305/3S | 4205/3S | 25,0 | 38,6 | 17,9 | 25,8 | 26,5 | 17,3 | 18,2 | 22,1 | 23,8 | 23,5 |
| 4305/M10S | - | 25,0 | 38,6 | 17,9 | 25,8 | 26,5 | 17,3 | 18,2 | 22,1 | 23,8 | 23,5 |
| 4308/2 | 4208/2 | 8,9 | 13,8 | 6,4 | 9,2 | 9,4 | 6,2 | 6,5 | 7,9 | 8,5 | 8,4 |
| 4308/2F | - | 8,9 | 13,8 | 6,4 | 9,2 | 9,4 | 6,2 | 6,5 | 7,9 | 8,5 | 8,4 |
| 4308/2S | 4208/2S | 11,0 | 16,9 | 7,8 | 11,3 | 11,6 | 7,6 | 8,0 | 9,7 | 10,4 | 10,3 |
| 4308/3 | 4208/3 | 23,2 | 35,8 | 16,6 | 24,0 | 24,6 | 16,1 | 16,9 | 20,5 | 22,1 | 21,8 |
| 4308/3F | - | 23,2 | 35,8 | 16,6 | 24,0 | 24,6 | 16,1 | 16,9 | 20,5 | 22,1 | 21,8 |
| 4308/3S | 4208/3S | 29,4 | 45,4 | 21,0 | 30,3 | 31,1 | 20,4 | 21,4 | 26,0 | 28,0 | 27,6 |
| 4308/M10S | - | 29,4 | 45,4 | 21,0 | 30,3 | 31,1 | 20,4 | 21,4 | 26,0 | 28,0 | 27,6 |
| 4308/M12S | - | 37,3 | 57,5 | 26,6 | 38,5 | 39,4 | 25,8 | 27,1 | 33,0 | 35,5 | 35,0 |
| 4308/4 | 4208/4 | 30,9 | 47,6 | 22,0 | 31,8 | 32,6 | 21,4 | 22,4 | 27,3 | 29,4 | 29,0 |
| 4308/4S | 4208/4S | 37,3 | 57,5 | 26,6 | 38,5 | 39,4 | 25,8 | 27,1 | 33,0 | 35,5 | 35,0 |
| 4316/2 | 4216/2 | 9,3 | 14,3 | 6,6 | 9,6 | 9,8 | 6,4 | 6,7 | 8,2 | 8,8 | 8,7 |
| 4316/3 | 4216/3 | 26,4 | 40,7 | 18,8 | 27,2 | 27,9 | 18,3 | 19,1 | 23,3 | 25,1 | 24,7 |
| 4316/3F | - | 26,4 | 40,7 | 18,8 | 27,2 | 27,9 | 18,3 | 19,1 | 23,3 | 25,1 | 24,7 |
| 4316/3S | 4216/3S | 32,9 | 50,8 | 23,5 | 33,9 | 34,8 | 22,8 | 23,9 | 29,1 | 31,3 | 30,9 |
| 4316/M10S | - | 32,9 | 50,8 | 23,5 | 33,9 | 34,8 | 22,8 | 23,9 | 29,1 | 31,3 | 30,9 |
| 4316/M12S | - | 45,7 | 70,4 | 32,6 | 47,1 | 48,3 | 31,6 | 33,1 | 40,4 | 43,4 | 42,8 |
| 4316/4 | 4216/4 | 37,8 | 58,2 | 26,9 | 38,9 | 39,9 | 26,1 | 27,4 | 33,4 | 35,9 | 35,4 |
| 4316/4S | 4216/4S | 45,7 | 70,4 | 32,6 | 47,1 | 48,3 | 31,6 | 33,1 | 40,4 | 43,4 | 42,8 |
| 4316/5 | 4216/5 | 50,3 | 77,5 | 35,8 | 51,8 | 53,1 | 34,8 | 36,4 | 44,4 | 47,8 | 47,1 |
| 4316/5S | 4216/5S | 60,3 | 93,0 | 43,0 | 62,1 | 63,7 | 41,7 | 43,7 | 53,3 | 57,3 | 56,5 |
| 4316/7S | - | 63,9 | 98,5 | 45,6 | 65,8 | 67,5 | 44,2 | 46,3 | 56,4 | 60,7 | 59,9 |
| 4330/3 | 4230/3 | 29,0 | 44,7 | 20,7 | 29,9 | 30,6 | 20,1 | 21,0 | 25,6 | 27,5 | 27,2 |
| 4330/3S | 4230/3S | 36,3 | 55,9 | 25,9 | 37,4 | 38,3 | 25,1 | 26,3 | 32,0 | 34,5 | 34,0 |
| 4330/4 | 4230/4 | 41,3 | 63,8 | 29,5 | 42,6 | 43,7 | 28,6 | 30,0 | 36,5 | 39,3 | 38,8 |
| 4330/4S | 4230/4S | 50,0 | 77,1 | 35,7 | 51,5 | 52,8 | 34,6 | 36,3 | 44,2 | 47,6 | 46,9 |
| 4330/5 | 4230/5 | 51,9 | 80,0 | 37,0 | 53,5 | 54,8 | 35,9 | 37,6 | 45,8 | 49,3 | 48,6 |
| 4330/5S | 4230/5S | 62,4 | 96,2 | 44,5 | 64,3 | 65,9 | 43,2 | 45,2 | 55,1 | 59,3 | 58,5 |
| 4330/7S | - | 65,9 | 101,6 | 47,0 | 67,9 | 69,6 | 45,6 | 47,8 | 58,2 | 62,6 | 61,8 |
| 4330/9S | - | 65,9 | 101,6 | 47,0 | 67,9 | 69,6 | 45,6 | 47,8 | 58,2 | 62,6 | 61,8 |
| 4332/4 | 4232/4 | 46,6 | 71,9 | 33,2 | 48,0 | 49,2 | 32,3 | 33,8 | 41,2 | 44,3 | 43,7 |
| 4332/4S | 4232/4S | 56,2 | 86,7 | 40,1 | 57,9 | 59,4 | 38,9 | 40,8 | 49,7 | 53,5 | 52,7 |
| 4332/5 | 4232/5 | 55,3 | 85,3 | 39,5 | 57,0 | 58,5 | 38,3 | 40,1 | 48,9 | 52,6 | 51,9 |
| 4332/5S | 4232/5S | 66,9 | 103,1 | 47,7 | 68,9 | 70,7 | 46,3 | 48,5 | 59,1 | 63,6 | 62,7 |
| 4341/4 | - | 51,4 | 79,3 | 36,7 | 53,0 | 54,4 | 35,6 | 37,3 | 45,4 | 48,9 | 48,2 |
| 4341/4S | - | 61,3 | 94,6 | 43,8 | 63,2 | 64,8 | 42,5 | 44,5 | 54,2 | 58,3 | 57,5 |
| 4341/5 | 4241/5 | 60,8 | 93,7 | 43,4 | 62,7 | 64,2 | 42,1 | 44,1 | 53,7 | 57,8 | 57,0 |
| 4341/5S | 4241/5S | 73,6 | 113,5 | 52,5 | 75,8 | 77,8 | 51,0 | 53,4 | 65,0 | 70,0 | 69,0 |
| 4341/6 | 4241/6 | 99,9 | 154,0 | 71,2 | 102,9 | 105,5 | 69,2 | 72,4 | 88,2 | 95,0 | 93,7 |
| 4341/6S | 4241/6S | 99,9 | 154,0 | 71,2 | 102,9 | 105,5 | 69,2 | 72,4 | 88,2 | 95,0 | 93,7 |
| 4341/7S | 4241/7S | 110,3 | 170,1 | 78,7 | 113,7 | 116,6 | 76,4 | 80,0 | 97,4 | 104,9 | 103,5 |
| 4375N/4S | 4275N/4S | 79,4 | 122,4 | 56,6 | 81,8 | 83,9 | 55,0 | 57,6 | 70,1 | 75,5 | 74,4 |
| 4375N/5S | 4275N/5S | 81,0 | 124,9 | 57,8 | 83,5 | 85,6 | 56,1 | 58,8 | 71,6 | 77,0 | 76,0 |
| 4375N/6S | 4275N/6S | 119,8 | 184,7 | 85,4 | 123,5 | 126,6 | 83,0 | 86,9 | 105,8 | 113,9 | 112,4 |
| 4375N/7S | 4275N/7S | 138,0 | 212,7 | 98,4 | 142,2 | 145,8 | 95,5 | 100,0 | 121,9 | 131,2 | 129,4 |
| 4375N/9S | 4275N/9S | 143,5 | 221,2 | 102,3 | 147,8 | 151,6 | 99,3 | 104,0 | 126,7 | 136,4 | 134,5 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier. The maximum refrigerant flow capacities are referred to a total pressure drop of 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 7: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 4303/2 | 4203/2 | 6,1 | 5,6 | 9,4 | 9,6 | 6,5 | 9,3 | 10,5 | 9,3 | 9,6 |
| 4303/2F | – | 6,1 | 5,6 | 9,4 | 9,6 | 6,5 | 9,3 | 10,5 | 9,3 | 9,6 |
| 4303/2S | 4203/2S | 7,6 | 6,8 | 11,6 | 11,8 | 8,0 | 11,4 | 12,9 | 11,4 | 11,8 |
| 4303/3 | 4203/3 | 14,1 | 12,8 | 21,7 | 22,0 | 14,9 | 21,3 | 24,2 | 21,3 | 22,2 |
| 4303/3S | – | 17,8 | 16,1 | 27,4 | 27,8 | 18,8 | 26,9 | 30,5 | 26,8 | 27,9 |
| 4305/2 | 4205/2 | 6,3 | 5,7 | 9,7 | 9,8 | 6,7 | 9,5 | 10,8 | 9,5 | 9,9 |
| 4305/2F | – | 6,3 | 5,7 | 9,7 | 9,8 | 6,7 | 9,5 | 10,8 | 9,5 | 9,9 |
| 4305/2S | 4205/2S | 8,5 | 7,7 | 13,0 | 13,2 | 8,9 | 12,8 | 14,5 | 12,8 | 13,3 |
| 4305/3 | 4205/3 | 15,8 | 14,3 | 24,2 | 24,6 | 16,6 | 23,8 | 27,0 | 23,8 | 24,8 |
| 4305/3S | 4205/3S | 20,0 | 18,1 | 30,7 | 31,1 | 21,0 | 30,2 | 34,2 | 30,1 | 31,3 |
| 4305/M10S | – | 20,0 | 18,1 | 30,7 | 31,1 | 21,0 | 30,2 | 34,2 | 30,1 | 31,3 |
| 4308/2 | 4208/2 | 7,1 | 6,5 | 10,9 | 11,1 | 7,5 | 10,8 | 12,2 | 10,7 | 11,2 |
| 4308/2F | – | 7,1 | 6,5 | 10,9 | 11,1 | 7,5 | 10,8 | 12,2 | 10,7 | 11,2 |
| 4308/2S | 4208/2S | 8,8 | 7,9 | 13,4 | 13,6 | 9,2 | 13,2 | 15,0 | 13,2 | 13,7 |
| 4308/3 | 4208/3 | 18,6 | 16,8 | 28,5 | 28,9 | 19,5 | 28,0 | 31,7 | 27,9 | 29,1 |
| 4308/3F | – | 18,6 | 16,8 | 28,5 | 28,9 | 19,5 | 28,0 | 31,7 | 27,9 | 29,1 |
| 4308/3S | 4208/3S | 23,5 | 21,3 | 36,1 | 36,6 | 24,8 | 35,5 | 40,2 | 35,4 | 36,8 |
| 4308/M10S | – | 23,5 | 21,3 | 36,1 | 36,6 | 24,8 | 35,5 | 40,2 | 35,4 | 36,8 |
| 4308/M12S | – | 29,8 | 26,9 | 45,7 | 46,4 | 31,4 | 45,0 | 50,9 | 44,8 | 46,7 |
| 4308/4 | 4208/4 | 24,6 | 22,3 | 37,8 | 38,4 | 26,0 | 37,2 | 42,1 | 37,1 | 38,6 |
| 4308/4S | 4208/4S | 29,8 | 26,9 | 45,7 | 46,4 | 31,4 | 45,0 | 50,9 | 44,8 | 46,7 |
| 4316/2 | 4216/2 | 7,4 | 6,7 | 11,4 | 11,5 | 7,8 | 11,2 | 12,7 | 11,2 | 11,6 |
| 4316/3 | 4216/3 | 21,0 | 19,0 | 32,3 | 32,8 | 22,2 | 31,8 | 36,0 | 31,7 | 33,0 |
| 4316/3F | – | 21,0 | 19,0 | 32,3 | 32,8 | 22,2 | 31,8 | 36,0 | 31,7 | 33,0 |
| 4316/3S | 4216/3S | 26,3 | 23,8 | 40,3 | 40,9 | 27,7 | 39,7 | 44,9 | 39,6 | 41,2 |
| 4316/M10S | – | 26,3 | 23,8 | 40,3 | 40,9 | 27,7 | 39,7 | 44,9 | 39,6 | 41,2 |
| 4316/M12S | – | 36,5 | 33,0 | 55,9 | 56,8 | 38,4 | 55,0 | 62,3 | 54,9 | 57,1 |
| 4316/4 | 4216/4 | 30,1 | 27,3 | 46,2 | 46,9 | 31,7 | 45,5 | 51,5 | 45,4 | 47,2 |
| 4316/4S | 4216/4S | 36,5 | 33,0 | 55,9 | 56,8 | 38,4 | 55,0 | 62,3 | 54,9 | 57,1 |
| 4316/5 | 4216/5 | 40,1 | 36,3 | 61,6 | 62,5 | 42,3 | 60,6 | 68,6 | 60,4 | 62,9 |
| 4316/5S | 4216/5S | 48,1 | 43,5 | 73,8 | 74,9 | 50,7 | 72,6 | 82,2 | 72,5 | 75,4 |
| 4316/7S | – | 51,0 | 46,1 | 78,2 | 79,4 | 53,7 | 77,0 | 87,1 | 76,8 | 79,9 |
| 4330/3 | 4230/3 | 23,1 | 20,9 | 35,5 | 36,0 | 24,4 | 34,9 | 39,5 | 34,8 | 36,2 |
| 4330/3S | 4230/3S | 29,0 | 26,2 | 44,4 | 45,1 | 30,5 | 43,7 | 49,5 | 43,6 | 45,4 |
| 4330/4 | 4230/4 | 33,0 | 29,8 | 50,6 | 51,4 | 34,8 | 49,8 | 56,4 | 49,7 | 51,7 |
| 4330/4S | 4230/4S | 39,9 | 36,1 | 61,2 | 62,2 | 42,1 | 60,3 | 68,2 | 60,1 | 62,6 |
| 4330/5 | 4230/5 | 41,4 | 37,4 | 63,5 | 64,5 | 43,6 | 62,5 | 70,8 | 62,3 | 64,9 |
| 4330/5S | 4230/5S | 49,8 | 45,0 | 76,4 | 77,6 | 52,5 | 75,2 | 85,1 | 75,0 | 78,0 |
| 4330/7S | – | 52,6 | 47,5 | 80,7 | 81,9 | 55,4 | 79,4 | 89,8 | 79,1 | 82,4 |
| 4330/9S | – | 52,6 | 47,5 | 80,7 | 81,9 | 55,4 | 79,4 | 89,8 | 79,1 | 82,4 |
| 4332/4 | 4232/4 | 37,2 | 33,6 | 57,1 | 57,9 | 39,2 | 56,2 | 63,6 | 56,0 | 58,3 |
| 4332/4S | 4232/4S | 44,9 | 40,6 | 68,9 | 69,9 | 47,3 | 67,8 | 76,7 | 67,6 | 70,3 |
| 4332/5 | 4232/5 | 44,2 | 39,9 | 67,8 | 68,8 | 46,5 | 66,7 | 75,5 | 66,5 | 69,2 |
| 4332/5S | 4232/5S | 53,4 | 48,3 | 81,9 | 83,2 | 56,2 | 80,6 | 91,2 | 80,4 | 83,7 |
| 4341/4 | – | 41,1 | 37,1 | 63,0 | 64,0 | 43,3 | 62,0 | 70,2 | 61,8 | 64,3 |
| 4341/4S | – | 49,0 | 44,3 | 75,1 | 76,3 | 51,6 | 73,9 | 83,7 | 73,7 | 76,7 |
| 4341/5 | 4241/5 | 48,5 | 43,9 | 74,5 | 75,6 | 51,1 | 73,3 | 82,9 | 73,1 | 76,0 |
| 4341/5S | 4241/5S | 58,7 | 53,1 | 90,1 | 91,5 | 61,9 | 88,7 | 100,4 | 88,4 | 92,0 |
| 4341/6 | 4241/6 | 79,7 | 72,1 | 122,3 | 124,1 | 84,0 | 120,3 | 136,2 | 120,0 | 124,9 |
| 4341/6S | 4241/6S | 79,7 | 72,1 | 122,3 | 124,1 | 84,0 | 120,3 | 136,2 | 120,0 | 124,9 |
| 4341/7S | 4241/7S | 88,1 | 79,6 | 135,1 | 137,1 | 92,8 | 132,9 | 150,5 | 132,6 | 138,0 |
| 4375N/4S | 4275N/4S | 63,4 | 57,3 | 97,2 | 98,7 | 66,7 | 95,6 | 108,3 | 95,4 | 99,3 |
| 4375N/5S | 4275N/5S | 64,7 | 58,5 | 99,2 | 100,7 | 68,1 | 97,6 | 110,5 | 97,4 | 101,3 |
| 4375N/6S | 4275N/6S | 95,6 | 86,5 | 146,7 | 148,9 | 100,7 | 144,4 | 163,4 | 144,0 | 149,9 |
| 4375N/7S | 4275N/7S | 110,1 | 99,6 | 169,0 | 171,5 | 116,0 | 166,2 | 188,2 | 165,8 | 172,6 |
| 4375N/9S | 4275N/9S | 114,5 | 103,6 | 175,7 | 178,4 | 120,6 | 172,9 | 195,7 | 172,4 | 179,4 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier. The maximum refrigerant flow capacities are referred to a total pressure drop of 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 8- Correction factors of the refrigeration capacity for temperatures different from standard values

| Refrigerant | Liquid temperature [°C] | Evaporating temperature [°C] | | | | | | | | | | |
|-------------|-------------------------|------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | + 10 | + 5 | 0 | - 5 | - 10 | - 15 | - 20 | - 25 | - 30 | -35 | - 40 |
| R134a | 15 | 1,27 | 1,25 | 1,23 | 1,21 | 1,19 | 1,17 | 1,15 | 1,13 | 1,11 | 1,08 | 1,06 |
| | 20 | 1,21 | 1,19 | 1,18 | 1,15 | 1,13 | 1,11 | 1,09 | 1,07 | 1,05 | 1,03 | 1,01 |
| | 25 | 1,16 | 1,14 | 1,12 | 1,10 | 1,08 | 1,06 | 1,04 | 1,01 | 0,99 | 0,97 | 0,95 |
| | 30 | 1,10 | 1,08 | 1,06 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,89 |
| | 35 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 |
| | 40 | 0,98 | 0,96 | 0,95 | 0,93 | 0,91 | 0,89 | 0,87 | 0,84 | 0,82 | 0,80 | 0,78 |
| | 45 | 0,92 | 0,91 | 0,89 | 0,87 | 0,85 | 0,83 | 0,81 | 0,79 | 0,77 | 0,75 | 0,72 |
| | 50 | 0,87 | 0,85 | 0,83 | 0,81 | 0,79 | 0,77 | 0,75 | 0,73 | 0,71 | 0,69 | 0,67 |
| | 55 | 0,81 | 0,79 | 0,77 | 0,75 | 0,73 | 0,71 | 0,69 | 0,67 | 0,65 | 0,63 | 0,61 |
| R32 | 15 | 1,17 | 1,16 | 1,16 | 1,16 | 1,15 | 1,15 | 1,14 | 1,13 | 1,12 | 1,12 | 1,11 |
| | 20 | 1,12 | 1,12 | 1,11 | 1,11 | 1,10 | 1,10 | 1,09 | 1,08 | 1,08 | 1,07 | 1,06 |
| | 25 | 1,07 | 1,07 | 1,06 | 1,06 | 1,05 | 1,05 | 1,04 | 1,04 | 1,03 | 1,02 | 1,01 |
| | 30 | 1,02 | 1,02 | 1,01 | 1,01 | 1,01 | 1,00 | 0,99 | 0,99 | 0,98 | 0,97 | 0,96 |
| | 35 | 0,97 | 0,97 | 0,96 | 0,96 | 0,96 | 0,95 | 0,94 | 0,94 | 0,93 | 0,92 | 0,91 |
| | 40 | 0,92 | 0,92 | 0,91 | 0,91 | 0,90 | 0,90 | 0,89 | 0,89 | 0,88 | 0,87 | 0,86 |
| | 45 | 0,87 | 0,86 | 0,86 | 0,86 | 0,85 | 0,85 | 0,84 | 0,83 | 0,83 | 0,82 | 0,81 |
| | 50 | 0,81 | 0,81 | 0,81 | 0,80 | 0,80 | 0,79 | 0,79 | 0,78 | 0,77 | 0,77 | 0,76 |
| | 55 | 0,76 | 0,76 | 0,75 | 0,75 | 0,74 | 0,74 | 0,73 | 0,73 | 0,72 | 0,71 | 0,70 |
| R404A | 15 | 1,35 | 1,33 | 1,31 | 1,29 | 1,26 | 1,24 | 1,21 | 1,19 | 1,16 | 1,13 | 1,11 |
| | 20 | 1,27 | 1,25 | 1,23 | 1,21 | 1,18 | 1,16 | 1,13 | 1,11 | 1,08 | 1,06 | 1,03 |
| | 25 | 1,19 | 1,17 | 1,15 | 1,13 | 1,10 | 1,08 | 1,06 | 1,03 | 1,00 | 0,98 | 0,95 |
| | 30 | 1,11 | 1,09 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,87 |
| | 35 | 1,03 | 1,01 | 0,99 | 0,97 | 0,94 | 0,92 | 0,90 | 0,87 | 0,85 | 0,82 | 0,79 |
| | 40 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,84 | 0,81 | 0,79 | 0,76 | 0,74 | 0,71 |
| | 45 | 0,86 | 0,84 | 0,82 | 0,80 | 0,78 | 0,75 | 0,73 | 0,71 | 0,68 | 0,66 | 0,63 |
| | 50 | 0,77 | 0,76 | 0,74 | 0,71 | 0,69 | 0,67 | 0,65 | 0,62 | 0,60 | 0,58 | 0,55 |
| | 55 | 0,69 | 0,67 | 0,65 | 0,63 | 0,61 | 0,58 | 0,56 | 0,54 | 0,52 | 0,49 | 0,47 |
| R407C | 15 | 1,26 | 1,24 | 1,23 | 1,21 | 1,19 | 1,18 | 1,16 | 1,14 | 1,12 | 1,10 | 1,08 |
| | 20 | 1,20 | 1,18 | 1,17 | 1,15 | 1,13 | 1,12 | 1,10 | 1,08 | 1,06 | 1,04 | 1,03 |
| | 25 | 1,14 | 1,12 | 1,11 | 1,09 | 1,08 | 1,06 | 1,04 | 1,02 | 1,01 | 0,99 | 0,97 |
| | 30 | 1,08 | 1,06 | 1,05 | 1,03 | 1,02 | 1,00 | 0,98 | 0,97 | 0,95 | 0,93 | 0,91 |
| | 35 | 1,02 | 1,00 | 0,99 | 0,97 | 0,96 | 0,94 | 0,92 | 0,91 | 0,89 | 0,87 | 0,85 |
| | 40 | 0,96 | 0,94 | 0,93 | 0,91 | 0,90 | 0,88 | 0,86 | 0,85 | 0,83 | 0,81 | 0,79 |
| | 45 | 0,89 | 0,88 | 0,87 | 0,85 | 0,84 | 0,82 | 0,80 | 0,79 | 0,77 | 0,75 | 0,73 |
| | 50 | 0,83 | 0,82 | 0,80 | 0,79 | 0,77 | 0,76 | 0,74 | 0,72 | 0,71 | 0,69 | 0,67 |
| | 55 | 0,77 | 0,76 | 0,74 | 0,73 | 0,71 | 0,70 | 0,68 | 0,66 | 0,65 | 0,63 | 0,61 |
| R410A | 15 | 1,24 | 1,23 | 1,22 | 1,21 | 1,20 | 1,19 | 1,17 | 1,16 | 1,15 | 1,13 | 1,12 |
| | 20 | 1,17 | 1,17 | 1,16 | 1,15 | 1,14 | 1,13 | 1,11 | 1,10 | 1,09 | 1,07 | 1,06 |
| | 25 | 1,11 | 1,10 | 1,09 | 1,08 | 1,07 | 1,06 | 1,05 | 1,04 | 1,02 | 1,01 | 1,00 |
| | 30 | 1,05 | 1,04 | 1,03 | 1,02 | 1,01 | 1,00 | 0,99 | 0,98 | 0,96 | 0,95 | 0,93 |
| | 35 | 0,98 | 0,97 | 0,97 | 0,96 | 0,95 | 0,94 | 0,92 | 0,91 | 0,90 | 0,89 | 0,87 |
| | 40 | 0,92 | 0,91 | 0,90 | 0,89 | 0,88 | 0,87 | 0,86 | 0,85 | 0,83 | 0,82 | 0,81 |
| | 45 | 0,85 | 0,84 | 0,83 | 0,82 | 0,81 | 0,80 | 0,79 | 0,78 | 0,77 | 0,75 | 0,74 |
| | 50 | 0,78 | 0,77 | 0,77 | 0,76 | 0,75 | 0,74 | 0,72 | 0,71 | 0,70 | 0,69 | 0,67 |
| | 55 | 0,71 | 0,70 | 0,69 | 0,69 | 0,68 | 0,67 | 0,65 | 0,64 | 0,63 | 0,62 | 0,61 |

continue →

TABLE 8- Correction factors of the refrigeration capacity for temperatures different from standard values

| Refrigerant | Liquid temperature [°C] | Evaporating temperature [°C] | | | | | | | | | | |
|-------------|-------------------------|------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | + 10 | + 5 | 0 | - 5 | - 10 | - 15 | - 20 | - 25 | - 30 | - 35 | - 40 |
| R507 | 15 | 1,36 | 1,34 | 1,32 | 1,29 | 1,27 | 1,24 | 1,22 | 1,19 | 1,17 | 1,14 | 1,11 |
| | 20 | 1,28 | 1,26 | 1,24 | 1,21 | 1,19 | 1,16 | 1,14 | 1,11 | 1,09 | 1,06 | 1,03 |
| | 25 | 1,20 | 1,18 | 1,15 | 1,13 | 1,11 | 1,08 | 1,06 | 1,03 | 1,00 | 0,98 | 0,95 |
| | 30 | 1,11 | 1,09 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,92 | 0,90 | 0,87 |
| | 35 | 1,03 | 1,01 | 0,99 | 0,96 | 0,94 | 0,92 | 0,89 | 0,87 | 0,84 | 0,82 | 0,79 |
| | 40 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 | 0,73 | 0,71 |
| | 45 | 0,86 | 0,84 | 0,82 | 0,79 | 0,77 | 0,75 | 0,72 | 0,70 | 0,67 | 0,65 | 0,62 |
| | 50 | 0,77 | 0,75 | 0,73 | 0,71 | 0,68 | 0,66 | 0,64 | 0,61 | 0,59 | 0,56 | 0,54 |
| | | | | | | | | | | | | |
| R1234yf | 15 | 1,36 | 1,33 | 1,30 | 1,27 | 1,24 | 1,21 | 1,18 | 1,15 | 1,12 | 1,09 | 1,06 |
| | 20 | 1,29 | 1,26 | 1,23 | 1,20 | 1,17 | 1,14 | 1,11 | 1,08 | 1,05 | 1,02 | 0,99 |
| | 25 | 1,22 | 1,19 | 1,16 | 1,13 | 1,10 | 1,07 | 1,04 | 1,01 | 0,98 | 0,95 | 0,92 |
| | 30 | 1,14 | 1,12 | 1,09 | 1,06 | 1,03 | 1,00 | 0,97 | 0,94 | 0,91 | 0,88 | 0,85 |
| | 35 | 1,07 | 1,04 | 1,02 | 0,99 | 0,96 | 0,93 | 0,90 | 0,87 | 0,84 | 0,81 | 0,78 |
| | 40 | 1,00 | 0,97 | 0,94 | 0,91 | 0,89 | 0,86 | 0,83 | 0,80 | 0,77 | 0,74 | 0,71 |
| | 45 | 0,93 | 0,90 | 0,87 | 0,84 | 0,81 | 0,78 | 0,76 | 0,73 | 0,70 | 0,67 | 0,64 |
| | 50 | 0,85 | 0,82 | 0,80 | 0,77 | 0,74 | 0,71 | 0,68 | 0,66 | 0,63 | 0,60 | 0,57 |
| | | | | | | | | | | | | |
| R1234ze | 15 | 1,31 | 1,29 | 1,26 | 1,23 | 1,21 | 1,18 | 1,15 | 1,13 | 1,10 | 1,07 | 1,04 |
| | 20 | 1,25 | 1,23 | 1,20 | 1,17 | 1,15 | 1,12 | 1,09 | 1,07 | 1,04 | 1,01 | 0,98 |
| | 25 | 1,19 | 1,16 | 1,14 | 1,11 | 1,09 | 1,06 | 1,03 | 1,01 | 0,98 | 0,95 | 0,93 |
| | 30 | 1,13 | 1,10 | 1,08 | 1,05 | 1,03 | 1,00 | 0,97 | 0,95 | 0,92 | 0,89 | 0,87 |
| | 35 | 1,07 | 1,04 | 1,02 | 0,99 | 0,97 | 0,94 | 0,91 | 0,89 | 0,86 | 0,83 | 0,81 |
| | 40 | 1,01 | 0,98 | 0,96 | 0,93 | 0,91 | 0,88 | 0,85 | 0,83 | 0,80 | 0,77 | 0,75 |
| | 45 | 0,95 | 0,92 | 0,90 | 0,87 | 0,84 | 0,82 | 0,79 | 0,77 | 0,74 | 0,71 | 0,69 |
| | 50 | 0,88 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 | 0,73 | 0,71 | 0,68 | 0,65 | 0,63 |
| | | | | | | | | | | | | |
| R448A | 15 | 1,27 | 1,26 | 1,24 | 1,22 | 1,21 | 1,19 | 1,17 | 1,15 | 1,13 | 1,11 | 1,09 |
| | 20 | 1,21 | 1,19 | 1,18 | 1,16 | 1,14 | 1,13 | 1,11 | 1,09 | 1,07 | 1,05 | 1,03 |
| | 25 | 1,15 | 1,13 | 1,12 | 1,10 | 1,08 | 1,06 | 1,04 | 1,03 | 1,01 | 0,99 | 0,97 |
| | 30 | 1,08 | 1,07 | 1,05 | 1,03 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,91 |
| | 35 | 1,02 | 1,00 | 0,99 | 0,97 | 0,95 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 |
| | 40 | 0,95 | 0,94 | 0,92 | 0,91 | 0,89 | 0,87 | 0,85 | 0,84 | 0,82 | 0,80 | 0,78 |
| | 45 | 0,89 | 0,87 | 0,86 | 0,84 | 0,82 | 0,81 | 0,79 | 0,77 | 0,75 | 0,73 | 0,71 |
| | 50 | 0,82 | 0,80 | 0,79 | 0,77 | 0,76 | 0,74 | 0,72 | 0,71 | 0,69 | 0,67 | 0,65 |
| | | | | | | | | | | | | |
| R449A | 15 | 1,28 | 1,26 | 1,24 | 1,23 | 1,21 | 1,19 | 1,17 | 1,15 | 1,13 | 1,11 | 1,09 |
| | 20 | 1,21 | 1,20 | 1,18 | 1,16 | 1,15 | 1,13 | 1,11 | 1,09 | 1,07 | 1,05 | 1,03 |
| | 25 | 1,15 | 1,13 | 1,12 | 1,10 | 1,08 | 1,06 | 1,05 | 1,03 | 1,01 | 0,99 | 0,97 |
| | 30 | 1,08 | 1,07 | 1,05 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,90 |
| | 35 | 1,02 | 1,00 | 0,99 | 0,97 | 0,95 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 |
| | 40 | 0,95 | 0,94 | 0,92 | 0,90 | 0,89 | 0,87 | 0,85 | 0,83 | 0,81 | 0,80 | 0,78 |
| | 45 | 0,89 | 0,87 | 0,85 | 0,84 | 0,82 | 0,80 | 0,79 | 0,77 | 0,75 | 0,73 | 0,71 |
| | 50 | 0,82 | 0,80 | 0,79 | 0,77 | 0,75 | 0,74 | 0,72 | 0,70 | 0,68 | 0,66 | 0,65 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

continue →

TABLE 8- Correction factors of the refrigeration capacity for temperatures different from standard values

| Refrigerant | Liquid temperature [°C] | Evaporating temperature [°C] | | | | | | | | | | |
|-------------|-------------------------|------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | + 10 | + 5 | 0 | - 5 | - 10 | - 15 | - 20 | - 25 | - 30 | -35 | - 40 |
| R450A | 15 | 1,30 | 1,27 | 1,25 | 1,23 | 1,20 | 1,18 | 1,15 | 1,13 | 1,10 | 1,08 | 1,05 |
| | 20 | 1,24 | 1,21 | 1,19 | 1,17 | 1,14 | 1,12 | 1,09 | 1,07 | 1,04 | 1,02 | 0,99 |
| | 25 | 1,18 | 1,15 | 1,13 | 1,11 | 1,08 | 1,06 | 1,03 | 1,01 | 0,99 | 0,96 | 0,94 |
| | 30 | 1,12 | 1,09 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 |
| | 35 | 1,06 | 1,03 | 1,01 | 0,99 | 0,96 | 0,94 | 0,92 | 0,89 | 0,87 | 0,84 | 0,82 |
| | 40 | 1,00 | 0,97 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 |
| | 45 | 0,93 | 0,91 | 0,89 | 0,87 | 0,84 | 0,82 | 0,80 | 0,77 | 0,75 | 0,73 | 0,70 |
| | 50 | 0,87 | 0,85 | 0,83 | 0,81 | 0,78 | 0,76 | 0,74 | 0,71 | 0,69 | 0,67 | 0,64 |
| | 55 | 0,81 | 0,79 | 0,77 | 0,75 | 0,72 | 0,70 | 0,68 | 0,65 | 0,63 | 0,61 | 0,58 |
| R452A | 15 | 1,33 | 1,31 | 1,29 | 1,27 | 1,24 | 1,22 | 1,19 | 1,17 | 1,14 | 1,11 | 1,09 |
| | 20 | 1,26 | 1,24 | 1,22 | 1,19 | 1,17 | 1,14 | 1,12 | 1,09 | 1,07 | 1,04 | 1,01 |
| | 25 | 1,19 | 1,17 | 1,14 | 1,12 | 1,10 | 1,07 | 1,05 | 1,02 | 1,00 | 0,97 | 0,94 |
| | 30 | 1,11 | 1,09 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,92 | 0,90 | 0,87 |
| | 35 | 1,04 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 | 0,85 | 0,83 | 0,80 |
| | 40 | 0,97 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 | 0,73 |
| | 45 | 0,90 | 0,87 | 0,85 | 0,83 | 0,81 | 0,78 | 0,76 | 0,73 | 0,71 | 0,68 | 0,66 |
| | 50 | 0,82 | 0,80 | 0,78 | 0,76 | 0,73 | 0,71 | 0,69 | 0,66 | 0,64 | 0,61 | 0,59 |
| | 55 | 0,75 | 0,73 | 0,71 | 0,69 | 0,66 | 0,64 | 0,62 | 0,59 | 0,57 | 0,54 | 0,52 |
| R452B | 15 | 1,21 | 1,20 | 1,19 | 1,18 | 1,18 | 1,17 | 1,16 | 1,14 | 1,13 | 1,12 | 1,11 |
| | 20 | 1,15 | 1,15 | 1,14 | 1,13 | 1,12 | 1,11 | 1,10 | 1,09 | 1,08 | 1,07 | 1,05 |
| | 25 | 1,10 | 1,09 | 1,08 | 1,08 | 1,07 | 1,06 | 1,05 | 1,03 | 1,02 | 1,01 | 1,00 |
| | 30 | 1,04 | 1,03 | 1,03 | 1,02 | 1,01 | 1,00 | 0,99 | 0,98 | 0,97 | 0,96 | 0,94 |
| | 35 | 0,98 | 0,98 | 0,97 | 0,96 | 0,95 | 0,94 | 0,93 | 0,92 | 0,91 | 0,90 | 0,89 |
| | 40 | 0,92 | 0,92 | 0,91 | 0,90 | 0,89 | 0,88 | 0,87 | 0,86 | 0,85 | 0,84 | 0,83 |
| | 45 | 0,87 | 0,86 | 0,85 | 0,84 | 0,84 | 0,83 | 0,82 | 0,81 | 0,79 | 0,78 | 0,77 |
| | 50 | 0,80 | 0,80 | 0,79 | 0,78 | 0,77 | 0,77 | 0,76 | 0,75 | 0,73 | 0,72 | 0,71 |
| | 55 | 0,74 | 0,74 | 0,73 | 0,72 | 0,71 | 0,70 | 0,69 | 0,68 | 0,67 | 0,66 | 0,65 |
| R454B | 15 | 1,21 | 1,20 | 1,19 | 1,18 | 1,17 | 1,16 | 1,15 | 1,14 | 1,13 | 1,12 | 1,11 |
| | 20 | 1,15 | 1,15 | 1,14 | 1,13 | 1,12 | 1,11 | 1,10 | 1,09 | 1,08 | 1,06 | 1,05 |
| | 25 | 1,10 | 1,09 | 1,08 | 1,07 | 1,07 | 1,06 | 1,05 | 1,03 | 1,02 | 1,01 | 1,00 |
| | 30 | 1,04 | 1,03 | 1,03 | 1,02 | 1,01 | 1,00 | 0,99 | 0,98 | 0,97 | 0,96 | 0,94 |
| | 35 | 0,98 | 0,98 | 0,97 | 0,96 | 0,95 | 0,94 | 0,93 | 0,92 | 0,91 | 0,90 | 0,89 |
| | 40 | 0,93 | 0,92 | 0,91 | 0,90 | 0,90 | 0,89 | 0,88 | 0,87 | 0,85 | 0,84 | 0,83 |
| | 45 | 0,87 | 0,86 | 0,85 | 0,85 | 0,84 | 0,83 | 0,82 | 0,81 | 0,80 | 0,79 | 0,77 |
| | 50 | 0,81 | 0,80 | 0,79 | 0,79 | 0,78 | 0,77 | 0,76 | 0,75 | 0,74 | 0,73 | 0,71 |
| | 55 | 0,75 | 0,74 | 0,73 | 0,73 | 0,72 | 0,71 | 0,70 | 0,69 | 0,68 | 0,67 | 0,65 |
| R513A | 15 | 1,32 | 1,29 | 1,27 | 1,24 | 1,22 | 1,19 | 1,17 | 1,14 | 1,12 | 1,09 | 1,06 |
| | 20 | 1,25 | 1,23 | 1,20 | 1,18 | 1,15 | 1,13 | 1,10 | 1,08 | 1,05 | 1,03 | 1,00 |
| | 25 | 1,19 | 1,16 | 1,14 | 1,12 | 1,09 | 1,07 | 1,04 | 1,01 | 0,99 | 0,96 | 0,94 |
| | 30 | 1,12 | 1,10 | 1,07 | 1,05 | 1,03 | 1,00 | 0,97 | 0,95 | 0,92 | 0,90 | 0,87 |
| | 35 | 1,06 | 1,03 | 1,01 | 0,98 | 0,96 | 0,94 | 0,91 | 0,89 | 0,86 | 0,83 | 0,81 |
| | 40 | 0,99 | 0,97 | 0,94 | 0,92 | 0,89 | 0,87 | 0,85 | 0,82 | 0,79 | 0,77 | 0,74 |
| | 45 | 0,92 | 0,90 | 0,88 | 0,85 | 0,83 | 0,80 | 0,78 | 0,75 | 0,73 | 0,71 | 0,68 |
| | 50 | 0,86 | 0,83 | 0,81 | 0,79 | 0,76 | 0,74 | 0,71 | 0,69 | 0,66 | 0,64 | 0,62 |
| | 55 | 0,79 | 0,77 | 0,74 | 0,72 | 0,70 | 0,67 | 0,65 | 0,62 | 0,60 | 0,57 | 0,55 |

continue →

TABLE 8- Correction factors of the refrigeration capacity for temperatures different from standard values

| Refrigerant | Liquid temperature [°C] | Evaporating temperature [°C] | | | | | | | | | | |
|-------------|-------------------------|------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | + 10 | + 5 | 0 | - 5 | - 10 | - 15 | - 20 | - 25 | - 30 | - 35 | - 40 |
| R290 | 15 | 1,27 | 1,25 | 1,23 | 1,21 | 1,19 | 1,17 | 1,15 | 1,13 | 1,11 | 1,09 | 1,06 |
| | 20 | 1,22 | 1,20 | 1,18 | 1,16 | 1,14 | 1,11 | 1,09 | 1,07 | 1,05 | 1,03 | 1,01 |
| | 25 | 1,16 | 1,14 | 1,12 | 1,10 | 1,08 | 1,06 | 1,04 | 1,02 | 0,99 | 0,97 | 0,95 |
| | 30 | 1,10 | 1,08 | 1,06 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,89 |
| | 35 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 |
| | 40 | 0,98 | 0,96 | 0,94 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 | 0,82 | 0,80 | 0,78 |
| | 45 | 0,92 | 0,90 | 0,88 | 0,86 | 0,84 | 0,82 | 0,80 | 0,78 | 0,76 | 0,74 | 0,72 |
| | 50 | 0,86 | 0,84 | 0,82 | 0,80 | 0,78 | 0,76 | 0,74 | 0,72 | 0,70 | 0,68 | 0,66 |
| | 55 | 0,80 | 0,78 | 0,76 | 0,74 | 0,72 | 0,70 | 0,68 | 0,66 | 0,64 | 0,62 | 0,60 |
| | | | | | | | | | | | | |
| R600 | 15 | 1,27 | 1,24 | 1,22 | 1,19 | 1,17 | 1,14 | 1,12 | 1,09 | 1,07 | 1,04 | 1,02 |
| | 20 | 1,22 | 1,19 | 1,17 | 1,14 | 1,12 | 1,09 | 1,07 | 1,05 | 1,02 | 1,00 | 0,97 |
| | 25 | 1,17 | 1,15 | 1,12 | 1,10 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 |
| | 30 | 1,12 | 1,10 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 |
| | 35 | 1,07 | 1,05 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 |
| | 40 | 1,02 | 1,00 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,79 |
| | 45 | 0,98 | 0,95 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,79 | 0,76 | 0,74 |
| | 50 | 0,93 | 0,90 | 0,88 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 | 0,74 | 0,71 | 0,69 |
| | 55 | 0,88 | 0,85 | 0,83 | 0,81 | 0,78 | 0,76 | 0,74 | 0,71 | 0,69 | 0,67 | 0,64 |
| | | | | | | | | | | | | |
| R600a | 15 | 1,29 | 1,26 | 1,23 | 1,21 | 1,18 | 1,16 | 1,13 | 1,11 | 1,08 | 1,06 | 1,03 |
| | 20 | 1,23 | 1,21 | 1,18 | 1,16 | 1,13 | 1,11 | 1,08 | 1,05 | 1,03 | 1,00 | 0,98 |
| | 25 | 1,18 | 1,16 | 1,13 | 1,10 | 1,08 | 1,05 | 1,03 | 1,00 | 0,98 | 0,95 | 0,93 |
| | 30 | 1,13 | 1,10 | 1,08 | 1,05 | 1,03 | 1,00 | 0,97 | 0,95 | 0,92 | 0,90 | 0,87 |
| | 35 | 1,07 | 1,05 | 1,02 | 1,00 | 0,97 | 0,95 | 0,92 | 0,90 | 0,87 | 0,85 | 0,82 |
| | 40 | 1,02 | 0,99 | 0,97 | 0,94 | 0,92 | 0,89 | 0,87 | 0,84 | 0,82 | 0,79 | 0,77 |
| | 45 | 0,97 | 0,94 | 0,92 | 0,89 | 0,87 | 0,84 | 0,82 | 0,79 | 0,77 | 0,74 | 0,72 |
| | 50 | 0,91 | 0,89 | 0,86 | 0,84 | 0,81 | 0,79 | 0,76 | 0,74 | 0,71 | 0,69 | 0,66 |
| | 55 | 0,86 | 0,83 | 0,81 | 0,78 | 0,76 | 0,73 | 0,71 | 0,68 | 0,66 | 0,64 | 0,61 |
| | | | | | | | | | | | | |
| R1270 | 15 | 1,25 | 1,23 | 1,22 | 1,20 | 1,18 | 1,17 | 1,15 | 1,13 | 1,11 | 1,09 | 1,07 |
| | 20 | 1,19 | 1,18 | 1,16 | 1,15 | 1,13 | 1,11 | 1,09 | 1,08 | 1,06 | 1,04 | 1,02 |
| | 25 | 1,14 | 1,12 | 1,11 | 1,09 | 1,07 | 1,06 | 1,04 | 1,02 | 1,00 | 0,98 | 0,96 |
| | 30 | 1,08 | 1,07 | 1,05 | 1,03 | 1,02 | 1,00 | 0,98 | 0,96 | 0,95 | 0,93 | 0,91 |
| | 35 | 1,02 | 1,01 | 0,99 | 0,98 | 0,96 | 0,94 | 0,93 | 0,91 | 0,89 | 0,87 | 0,85 |
| | 40 | 0,97 | 0,95 | 0,94 | 0,92 | 0,90 | 0,89 | 0,87 | 0,85 | 0,83 | 0,82 | 0,80 |
| | 45 | 0,91 | 0,89 | 0,88 | 0,86 | 0,85 | 0,83 | 0,81 | 0,79 | 0,78 | 0,76 | 0,74 |
| | 50 | 0,85 | 0,83 | 0,82 | 0,80 | 0,79 | 0,77 | 0,75 | 0,74 | 0,72 | 0,70 | 0,68 |
| | 55 | 0,79 | 0,77 | 0,76 | 0,74 | 0,73 | 0,71 | 0,69 | 0,68 | 0,66 | 0,64 | 0,62 |

TABLE 9: Water capacity and dehydratable charge of filters with core 100% molecular sieves

| Catalogue Number | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|------------------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|
| | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| 4303/2 | 4,9 | 5,0 | 4,0 | 4,3 | 5,3 | 5,4 | 4,3 | 4,6 | 4,2 | 4,6 | 3,2 | 3,5 | 4,5 | 4,9 | 3,4 | 3,8 |
| 4303/2F | | | | | | | | | | | | | | | | |
| 4303/2S | | | | | | | | | | | | | | | | |
| 4303/3 | | | | | | | | | | | | | | | | |
| 4303/3S | | | | | | | | | | | | | | | | |
| 4305/2 | 7,7 | 7,9 | 6,3 | 6,9 | 8,3 | 8,5 | 6,8 | 7,4 | 6,7 | 7,3 | 5,1 | 5,6 | 7,2 | 7,8 | 5,5 | 6,0 |
| 4305/2F | | | | | | | | | | | | | | | | |
| 4305/2S | | | | | | | | | | | | | | | | |
| 4305/3 | | | | | | | | | | | | | | | | |
| 4305/3S | | | | | | | | | | | | | | | | |
| 4305/M10S | | | | | | | | | | | | | | | | |
| 4308/2 | 12,9 | 13,2 | 10,6 | 11,5 | 13,9 | 14,2 | 11,4 | 12,4 | 11,1 | 12,2 | 8,5 | 9,3 | 11,9 | 13,1 | 9,1 | 10,0 |
| 4308/2F | | | | | | | | | | | | | | | | |
| 4308/2S | | | | | | | | | | | | | | | | |
| 4308/3 | | | | | | | | | | | | | | | | |
| 4308/3F | | | | | | | | | | | | | | | | |
| 4308/3S | | | | | | | | | | | | | | | | |
| 4308/M10S | | | | | | | | | | | | | | | | |
| 4308/M12S | | | | | | | | | | | | | | | | |
| 4308/4 | | | | | | | | | | | | | | | | |
| 4308/4S | | | | | | | | | | | | | | | | |
| 4316/2 | | | | | | | | | | | | | | | | |
| 4316/3 | | | | | | | | | | | | | | | | |
| 4316/3F | | | | | | | | | | | | | | | | |
| 4316/3S | | | | | | | | | | | | | | | | |
| 4316/M10S | | | | | | | | | | | | | | | | |
| 4316/M12S | | | | | | | | | | | | | | | | |
| 4316/4 | | | | | | | | | | | | | | | | |
| 4316/4S | | | | | | | | | | | | | | | | |
| 4316/5 | | | | | | | | | | | | | | | | |
| 4316/5S | | | | | | | | | | | | | | | | |
| 4316/7S | | | | | | | | | | | | | | | | |
| 4330/3 | 50,4 | 51,5 | 41,3 | 44,9 | 54,2 | 55,3 | 44,3 | 48,4 | 43,5 | 47,8 | 33,2 | 36,2 | 46,7 | 51,4 | 35,7 | 38,9 |
| 4330/3S | | | | | | | | | | | | | | | | |
| 4330/4 | | | | | | | | | | | | | | | | |
| 4330/4S | | | | | | | | | | | | | | | | |
| 4330/5 | | | | | | | | | | | | | | | | |
| 4330/5S | | | | | | | | | | | | | | | | |
| 4330/7S | | | | | | | | | | | | | | | | |
| 4330/9S | | | | | | | | | | | | | | | | |
| 4332/4 | 46,6 | 47,6 | 38,2 | 41,5 | 50,1 | 51,2 | 41,1 | 44,6 | 40,2 | 44,2 | 30,7 | 33,4 | 43,2 | 47,5 | 33,0 | 35,9 |
| 4332/4S | | | | | | | | | | | | | | | | |
| 4332/5 | | | | | | | | | | | | | | | | |
| 4332/5S | | | | | | | | | | | | | | | | |
| 4341/4 | 63,3 | 64,7 | 51,8 | 56,4 | 68,1 | 69,6 | 55,7 | 60,6 | 54,6 | 60,1 | 41,7 | 45,4 | 58,7 | 64,6 | 44,8 | 48,8 |
| 4341/4S | | | | | | | | | | | | | | | | |
| 4341/5 | | | | | | | | | | | | | | | | |
| 4341/5S | | | | | | | | | | | | | | | | |
| 4341/6 | | | | | | | | | | | | | | | | |
| 4341/6S | | | | | | | | | | | | | | | | |
| 4341/7S | | | | | | | | | | | | | | | | |
| 4375N/4S | 126,6 | 129,4 | 103,7 | 112,8 | 136,1 | 139,1 | 111,5 | 121,3 | 109,2 | 120,2 | 83,5 | 90,8 | 117,4 | 129,2 | 89,8 | 97,6 |
| 4375N/5S | | | | | | | | | | | | | | | | |
| 4375N/6S | | | | | | | | | | | | | | | | |
| 4375N/7S | | | | | | | | | | | | | | | | |
| 4375N/9S | | | | | | | | | | | | | | | | |

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:

- Liquid temperatures: 24 °C and 52 °C
- Equilibrium point dryness, EPD: 60 ppm for R22
- Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

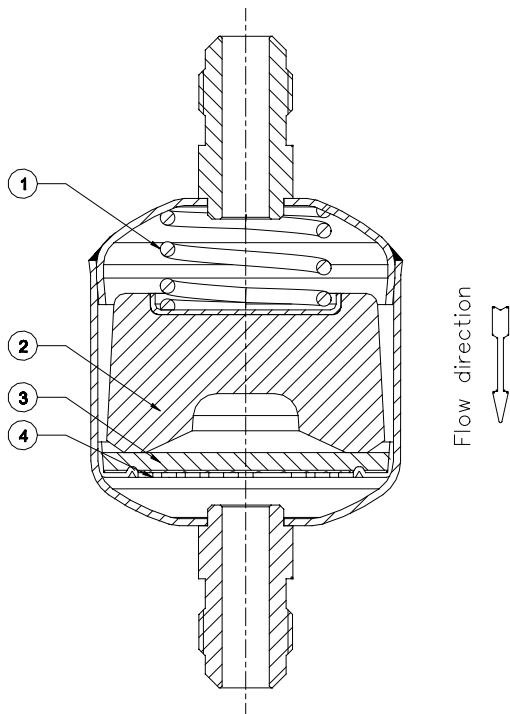
TABLE 10: Water capacity and dehydratable charge of filters with core 80% molecular sieves + 20% activated alumina

| Catalogue Number | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|------------------|--|---------------|-------|-------|--|---------------|-------|-------|--|---------------|-------|-------|--|---------------|-------|-------|
| | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| 4203/2 | 4,2 | 4,3 | 3,4 | 3,7 | 4,5 | 4,6 | 3,7 | 3,9 | 3,6 | 3,9 | 2,7 | 3,0 | 3,8 | 4,2 | 2,9 | 3,2 |
| 4203/2S | | | | | | | | | | | | | | | | |
| 4203/3 | | | | | | | | | | | | | | | | |
| 4205/2 | 6,5 | 6,7 | 5,4 | 5,9 | 7,0 | 7,2 | 5,8 | 6,3 | 5,7 | 6,2 | 4,3 | 4,8 | 6,1 | 6,7 | 4,7 | 5,1 |
| 4205/2S | | | | | | | | | | | | | | | | |
| 4205/3 | | | | | | | | | | | | | | | | |
| 4205/3S | | | | | | | | | | | | | | | | |
| 4208/2 | 11,0 | 11,2 | 9,0 | 9,8 | 11,8 | 12,1 | 9,7 | 10,5 | 9,4 | 10,4 | 7,2 | 7,9 | 10,1 | 11,2 | 7,8 | 8,5 |
| 4208/2S | | | | | | | | | | | | | | | | |
| 4208/3 | | | | | | | | | | | | | | | | |
| 4208/3S | | | | | | | | | | | | | | | | |
| 4208/4 | | | | | | | | | | | | | | | | |
| 4208/4S | | | | | | | | | | | | | | | | |
| 4216/2 | 21,4 | 21,8 | 17,5 | 19,1 | 23,0 | 23,5 | 18,8 | 20,6 | 18,4 | 20,3 | 14,1 | 15,4 | 19,8 | 21,8 | 15,2 | 16,5 |
| 4216/3 | | | | | | | | | | | | | | | | |
| 4216/3S | | | | | | | | | | | | | | | | |
| 4216/4 | | | | | | | | | | | | | | | | |
| 4216/4S | | | | | | | | | | | | | | | | |
| 4216/5 | | | | | | | | | | | | | | | | |
| 4216/5S | | | | | | | | | | | | | | | | |
| 4230/3 | 42,8 | 43,8 | 35,1 | 38,2 | 46,1 | 47,0 | 37,7 | 41,1 | 37,0 | 40,6 | 28,2 | 30,8 | 39,7 | 43,7 | 30,3 | 33,1 |
| 4230/3S | | | | | | | | | | | | | | | | |
| 4230/4 | | | | | | | | | | | | | | | | |
| 4230/4S | | | | | | | | | | | | | | | | |
| 4230/5 | | | | | | | | | | | | | | | | |
| 4230/5S | | | | | | | | | | | | | | | | |
| 4232/4 | 39,6 | 40,5 | 32,5 | 35,3 | 42,6 | 43,5 | 34,9 | 37,9 | 34,2 | 37,6 | 26,1 | 28,4 | 36,7 | 40,4 | 28,1 | 30,5 |
| 4232/4S | | | | | | | | | | | | | | | | |
| 4232/5 | | | | | | | | | | | | | | | | |
| 4232/5S | | | | | | | | | | | | | | | | |
| 4241/5 | 53,8 | 55,0 | 44,0 | 47,9 | 57,9 | 59,1 | 47,3 | 51,5 | 46,4 | 51,1 | 35,4 | 38,6 | 49,9 | 54,9 | 38,1 | 41,5 |
| 4241/5S | | | | | | | | | | | | | | | | |
| 4241/6 | | | | | | | | | | | | | | | | |
| 4241/6S | | | | | | | | | | | | | | | | |
| 4241/7S | | | | | | | | | | | | | | | | |
| 4275N/4S | 107,6 | 110,0 | 88,1 | 95,9 | 115,7 | 118,3 | 94,7 | 103,1 | 92,8 | 102,2 | 71,0 | 77,2 | 99,8 | 109,9 | 76,3 | 83,0 |
| 4275N/5S | | | | | | | | | | | | | | | | |
| 4275N/6S | | | | | | | | | | | | | | | | |
| 4275N/7S | | | | | | | | | | | | | | | | |
| 4275N/9S | | | | | | | | | | | | | | | | |

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:
 - Liquid temperatures: 24 °C and 52 °C
 - Equilibrium point dryness, EPD: 60 ppm for R22
 - Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

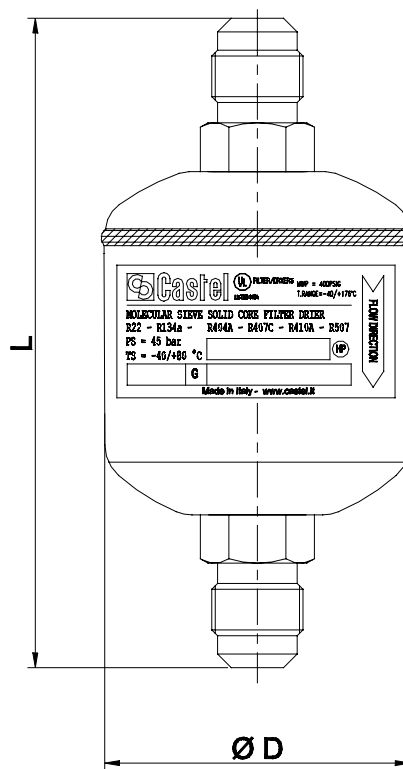
TABLE 11: Dimensions and weights of hermetic filters

| Catalogue Number | | Connections | | | Dimensions [mm] | | Weight [g] |
|------------------|----------|-------------|---------|--------|-----------------|------|------------|
| | | SAE Flare | ODS | | Ø D | L | |
| | | | Ø [in.] | Ø [mm] | | | |
| 4303/2 | 4203/2 | 1/4" | - | - | 52 | 103 | 240 |
| 4303/2F | - | 1/4" | - | - | | 92 | 230 |
| 4303/2S | 4203/2S | - | 1/4" | - | | 94 | 220 |
| 4303/3 | 4203/3 | 3/8" | - | - | | 111 | 235 |
| 4303/3S | - | - | 3/8" | - | | 96 | 220 |
| 4305/2 | 4205/2 | 1/4" | - | - | | 119 | 275 |
| 4305/2F | - | 1/4" | - | - | | 109 | |
| 4305/2S | 4205/2S | - | 1/4" | - | | 110 | 260 |
| 4305/3 | 4205/3 | 3/8" | - | - | | 127 | 295 |
| 4305/3S | 4205/3S | - | 3/8" | - | | 112 | 260 |
| 4305/M10S | - | - | - | 10 | | | |
| 4308/2 | 4208/2 | 1/4" | - | - | | 146 | 380 |
| 4308/2F | - | 1/4" | - | - | | 135 | |
| 4308/2S | 4208/2S | - | 1/4" | - | | 137 | 345 |
| 4308/3 | 4208/3 | 3/8" | - | - | | 154 | 395 |
| 4308/3F | - | 3/8" | - | - | | 142 | 380 |
| 4308/3S | 4208/3S | - | 3/8" | - | | 139 | 345 |
| 4308/M10S | - | - | - | 10 | | | |
| 4308/M12S | - | - | - | 12 | | 146 | 380 |
| 4308/4 | 4208/4 | 1/2" | - | - | | 162 | 430 |
| 4308/4S | 4208/4S | - | 1/2" | - | | 146 | 380 |
| 4316/2 | 4216/2 | 1/4" | - | - | | 158 | 635 |
| 4316/3 | 4216/3 | 3/8" | - | - | | 166 | 690 |
| 4316/3F | - | 3/8" | - | - | | 154 | 680 |
| 4316/3S | 4216/3S | - | 3/8" | - | | 151 | 620 |
| 4316/M10S | - | - | - | 10 | | | 630 |
| 4316/M12S | - | - | - | 12 | | 158 | 640 |
| 4316/4 | 4216/4 | 1/2" | - | - | | 174 | 680 |
| 4316/4S | 4216/4S | - | 1/2" | - | 158 | 640 | |
| 4316/5 | 4216/5 | 5/8" | - | - | 183 | 740 | |
| 4316/5S | 4216/5S | - | 5/8" | 16 | 166 | 640 | |
| 4316/7S | - | - | 7/8" | - | 171 | 650 | |
| 4330/3 | 4230/3 | 3/8" | - | - | 245 | 1380 | |
| 4330/3S | 4230/3S | - | 3/8" | - | 230 | 1240 | |
| 4330/4 | 4230/4 | 1/2" | - | - | 253 | 1360 | |
| 4330/4S | 4230/4S | - | 1/2" | - | 237 | 1280 | |
| 4330/5 | 4230/5 | 5/8" | - | - | 262 | 1480 | |
| 4330/5S | 4230/5S | - | 5/8" | 16 | 245 | 1370 | |
| 4330/7S | - | - | 7/8" | - | 250 | 1420 | |
| 4330/9S | - | - | 1.1/8" | - | 250 | 1450 | |
| 4332/4 | 4232/4 | 1/2" | - | - | 187 | 1300 | |
| 4332/4S | 4232/4S | - | 1/2" | - | 173 | 1200 | |
| 4332/5 | 4232/5 | 5/8" | - | - | 196 | 1320 | |
| 4332/5S | 4232/5S | - | 5/8" | 16 | 179 | 1250 | |
| 4341/4 | - | 1/2" | - | - | 222 | 1560 | |
| 4341/4S | - | - | 1/2" | - | 208 | 1450 | |
| 4341/5 | 4241/5 | 5/8" | - | - | 231 | 1580 | |
| 4341/5S | 4241/5S | - | 5/8" | 16 | 214 | 1470 | |
| 4341/6 | 4241/6 | 3/4" | - | - | 232 | 1640 | |
| 4341/6S | 4241/6S | - | 3/4" | - | 219 | 1560 | |
| 4341/7S | 4241/7S | - | 7/8" | - | | 1600 | |
| 4375N/4S | 4275N/4S | - | 1/2" | - | 387 | 2540 | |
| 4375N/5S | 4275N/5S | - | 5/8" | 16 | 393 | 2640 | |
| 4375N/6S | 4275N/6S | - | 3/4" | - | 398 | 2820 | |
| 4375N/7S | 4275N/7S | - | 7/8" | - | | 2900 | |
| 4375N/9S | 4275N/9S | - | 1.1/8" | - | | 3050 | |

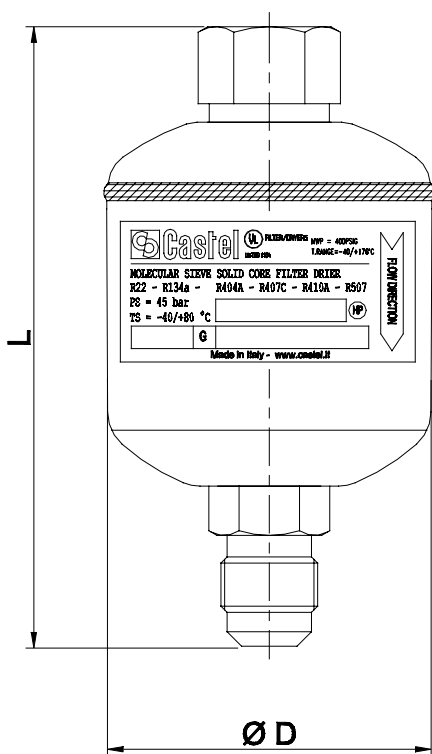


Solid core dehydrator

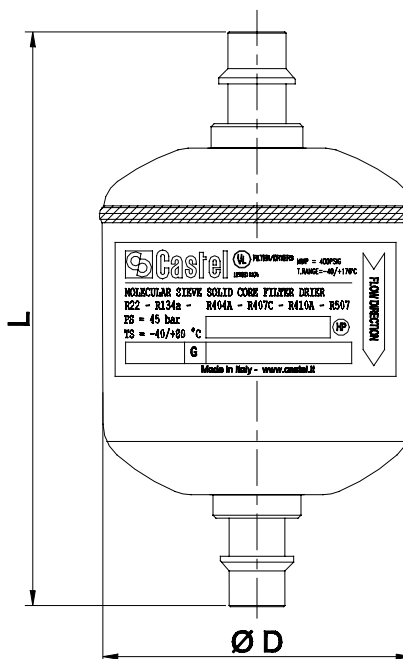
- 1 - Spring
- 2 - Bock
- 3 - Felt
- 4 - Stainless steel mesh



Male connections



**Male - female connections
(female - in)**



Solder connections

TABLE 12: General characteristics of hermetic filter driers. SAE Flare connections

| Catalogue Number | | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------------------|--|-------------------------|--|-----------------------------------|-------------|----------|---------|------|---------------------------------------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | | | | | | min. | max. | |
| DF303/2 | DF203/2 | 032 | 58 | 50 | 1/4" | 50 (1) | - 40 | + 80 | Art. 4.3 |
| DF303/3 | DF203/3 | 033 | | | 3/8" | | | | |
| DF305/2 | DF205/2 | 052 | 104 | 80 | 1/4" | | | | |
| DF305/3 | DF205/3 | 053 | | | 3/8" | | | | |
| DF308/2 | DF208/2 | 082 | 141 | 130 | 1/4" | | | | |
| DF308/3 | DF208/3 | 083 | | | 3/8" | | | | |
| DF308/4 | DF208/4 | 084 | | | 1/2" | | | | |
| DF316/2 | DF216/2 | 162 | 183 | 250 | 1/4" | | | | |
| DF316/3 | DF216/3 | 163 | | | 3/8" | | | | |
| DF316/4 | DF216/4 | 164 | | | 1/2" | | | | |
| DF316/5 | DF216/5 | 165 | | | 5/8" | | | | |
| DF330/3 | DF230/3 | 303 | 345 | 500 | 3/8" | | | | |
| DF330/4 | DF230/4 | 304 | | | 1/2" | | | | |
| DF330/5 | DF230/5 | 305 | | | 5/8" | | | | |
| DF330/6 | - | 306 | | | 3/4" | | | | |
| DF341/4 | - | 414 | 384 | 670 | 1/2" | | | | |
| DF341/5 | DF241/5 | 415 | | | 5/8" | | | | |
| DF341/6 | DF241/6 | 416 | | | 3/4" | | | | |
| DF303/2F (2) | - | - | 58 | 50 | 1/4" | 50 (1) | - 40 | + 80 | Art. 4.3 |
| DF305/2F (2) | - | - | 104 | 80 | 1/4" | | | | |
| DF308/2F (2) | - | - | 141 | 130 | 1/4" | | | | |
| DF308/3F (2) | - | - | | | 3/8" | | | | |
| DF316/3F (2) | - | - | 183 | 250 | 3/8" | | | | |

(1) : MWP = 680 psi according to UL approval
 (2) : Male-female connections (Inlet female)

TABLE 13: General characteristics of hermetic filter driers. ODS connections

| Catalogue Number | | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|-------------------------|--|-----------------------------------|-------------|--------|----------|---------|------|---------------------------------------|----------|----------|------|-----|----|------|---|----------|----------|------|------|---|------------|------------|---|---|----|----------|----------|------|-----|-----|------|---|----------|----------|------|------|---|------------|------------|---|---|----|------------|------------|---|---|----|----------|----------|------|------|---|----------|----------|------|-----|-----|------|---|------------|------------|---|---|----|------------|------------|---|---|----|----------|----------|------|------|---|----------|----------|------|------|----|----------|----------|------|------|---|----------|----------|------|-----|-----|------|---|----------|----------|------|------|---|----------|----------|------|------|----|----------|---|------|------|---|----------|----------|------|------|---|----------|----------|------|--------|---|----------|---|------|-----|-----|------|---|----------|----------|------|------|----|----------|----------|------|------|---|----------|----------|------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | | | | ODS | | | min. | max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | Ø [in.] | Ø [mm] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF303/2S | DF203/2S | 032S | 58 | 50 | 1/4" | – | 50 (1) | –40 | +80 | Art. 4.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF303/3S | DF203/3S | 033S | | | 3/8" | – | | | | | DF305/2S | DF205/2S | 052S | 104 | 80 | 1/4" | – | DF305/3S | DF205/3S | 053S | 3/8" | – | DF305/M10S | DF205/M10S | – | – | 10 | DF308/2S | DF208/2S | 082S | 141 | 130 | 1/4" | – | DF308/3S | DF208/3S | 083S | 3/8" | – | DF308/M10S | DF208/M10S | – | – | 10 | DF308/M12S | DF208/M12S | – | – | 12 | DF308/4S | DF208/4S | 084S | 1/2" | – | DF316/3S | DF216/3S | 163S | 183 | 250 | 3/8" | – | DF316/M10S | DF216/M10S | – | – | 10 | DF316/M12S | DF216/M12S | – | – | 12 | DF316/4S | DF216/4S | 164S | 1/2" | – | DF316/5S | DF216/5S | 165S | 5/8" | 16 | DF316/7S | DF216/7S | 167S | 7/8" | – | DF330/3S | DF230/3S | 303S | 345 | 500 | 3/8" | – | DF330/4S | DF230/4S | 304S | 1/2" | – | DF330/5S | DF230/5S | 305S | 5/8" | 16 | DF330/6S | – | 306S | 3/4" | – | DF330/7S | DF230/7S | 307S | 7/8" | – | DF330/9S | DF230/9S | 309S | 1.1/8" | – | DF341/4S | – | 414S | 384 | 670 | 1/2" | – | DF341/5S | DF241/5S | 415S | 5/8" | 16 | DF341/6S | DF241/6S | 416S | 3/4" | – | DF341/7S | DF241/7S | 417S |
| DF305/2S | DF205/2S | 052S | 104 | 80 | 1/4" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF305/3S | DF205/3S | 053S | | | 3/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF305/M10S | DF205/M10S | – | | | – | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF308/2S | DF208/2S | 082S | 141 | 130 | 1/4" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF308/3S | DF208/3S | 083S | | | 3/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF308/M10S | DF208/M10S | – | | | – | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF308/M12S | DF208/M12S | – | | | – | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF308/4S | DF208/4S | 084S | | | 1/2" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/3S | DF216/3S | 163S | 183 | 250 | 3/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/M10S | DF216/M10S | – | | | – | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/M12S | DF216/M12S | – | | | – | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/4S | DF216/4S | 164S | | | 1/2" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/5S | DF216/5S | 165S | | | 5/8" | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF316/7S | DF216/7S | 167S | | | 7/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/3S | DF230/3S | 303S | 345 | 500 | 3/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/4S | DF230/4S | 304S | | | 1/2" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/5S | DF230/5S | 305S | | | 5/8" | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/6S | – | 306S | | | 3/4" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/7S | DF230/7S | 307S | | | 7/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF330/9S | DF230/9S | 309S | | | 1.1/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF341/4S | – | 414S | 384 | 670 | 1/2" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF341/5S | DF241/5S | 415S | | | 5/8" | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF341/6S | DF241/6S | 416S | | | 3/4" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DF341/7S | DF241/7S | 417S | | | 7/8" | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(1) : MWP = 680 psi according to UL approval

TABLE 14: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| DF303/2 | DF203/2 | 7,2 | 11,0 | 5,1 | 7,4 | 7,6 | 5,0 | 5,2 | 6,3 | 6,8 | 6,7 |
| DF303/2F | – | 7,2 | 11,0 | 5,1 | 7,4 | 7,6 | 5,0 | 5,2 | 6,3 | 6,8 | 6,7 |
| DF303/2S | DF203/2S | 9,3 | 14,3 | 6,6 | 9,5 | 9,8 | 6,4 | 6,7 | 8,2 | 8,8 | 8,7 |
| DF303/3 | DF203/3 | 16,8 | 25,9 | 12,0 | 17,3 | 17,7 | 11,6 | 12,2 | 14,8 | 16,0 | 15,7 |
| DF303/3S | – | 17,1 | 26,4 | 12,2 | 17,7 | 18,1 | 11,9 | 12,4 | 15,1 | 16,3 | 16,1 |
| DF305/2 | DF205/2 | 7,5 | 11,6 | 5,4 | 7,7 | 7,9 | 5,2 | 5,5 | 6,6 | 7,2 | 7,1 |
| DF305/2F | – | 7,5 | 11,6 | 5,4 | 7,7 | 7,9 | 5,2 | 5,5 | 6,6 | 7,2 | 7,1 |
| DF305/2S | DF205/2S | 11,6 | 18,0 | 8,3 | 12,0 | 12,3 | 8,1 | 8,4 | 10,3 | 11,1 | 10,9 |
| DF305/3 | DF205/3 | 17,5 | 27,0 | 12,5 | 18,0 | 18,5 | 12,1 | 12,7 | 15,5 | 16,7 | 16,4 |
| DF305/3S | DF205/3S | 18,2 | 28,0 | 12,9 | 18,7 | 19,2 | 12,6 | 13,2 | 16,0 | 17,3 | 17,0 |
| DF305/M10S | – | 18,2 | 28,0 | 12,9 | 18,7 | 19,2 | 12,6 | 13,2 | 16,0 | 17,3 | 17,0 |
| DF308/2 | DF208/2 | 7,3 | 11,3 | 5,2 | 7,6 | 7,8 | 5,1 | 5,3 | 6,5 | 7,0 | 6,9 |
| DF308/2F | – | 7,3 | 11,3 | 5,2 | 7,6 | 7,8 | 5,1 | 5,3 | 6,5 | 7,0 | 6,9 |
| DF308/2S | DF208/2S | 11,2 | 17,3 | 8,0 | 11,5 | 11,8 | 7,7 | 8,1 | 9,9 | 10,6 | 10,5 |
| DF308/3 | DF208/3 | 19,4 | 30,0 | 13,9 | 20,0 | 20,5 | 13,5 | 14,1 | 17,2 | 18,5 | 18,2 |
| DF308/3F | – | 19,4 | 30,0 | 13,9 | 20,0 | 20,5 | 13,5 | 14,1 | 17,2 | 18,5 | 18,2 |
| DF308/3S | DF208/3S | 19,9 | 30,7 | 14,2 | 20,5 | 21,0 | 13,8 | 14,4 | 17,6 | 18,9 | 18,7 |
| DF308/M10S | – | 19,9 | 30,7 | 14,2 | 20,5 | 21,0 | 13,8 | 14,4 | 17,6 | 18,9 | 18,7 |
| DF308/M12S | – | 24,9 | 38,5 | 17,8 | 25,7 | 26,4 | 17,3 | 18,1 | 22,0 | 23,7 | 23,4 |
| DF308/4 | DF208/4 | 23,6 | 36,3 | 16,8 | 24,3 | 24,9 | 16,3 | 17,1 | 20,8 | 22,4 | 22,1 |
| DF308/4S | DF208/4S | 24,9 | 38,5 | 17,8 | 25,7 | 26,4 | 17,3 | 18,1 | 22,0 | 23,7 | 23,4 |
| DF316/2 | DF216/2 | 8,3 | 12,7 | 5,9 | 8,5 | 8,7 | 5,7 | 6,0 | 7,3 | 7,8 | 7,7 |
| DF316/3 | DF216/3 | 19,5 | 30,1 | 13,9 | 20,1 | 20,6 | 13,5 | 14,2 | 17,3 | 18,6 | 18,3 |
| DF316/3F | – | 19,5 | 30,1 | 13,9 | 20,1 | 20,6 | 13,5 | 14,2 | 17,3 | 18,6 | 18,3 |
| DF316/3S | DF216/3S | 21,5 | 33,1 | 15,3 | 22,1 | 22,7 | 14,9 | 15,6 | 19,0 | 20,4 | 20,1 |
| DF316/M10S | – | 21,5 | 33,1 | 15,3 | 22,1 | 22,7 | 14,9 | 15,6 | 19,0 | 20,4 | 20,1 |
| DF316/M12S | – | 29,7 | 45,8 | 21,2 | 30,6 | 31,4 | 20,6 | 21,5 | 26,2 | 28,3 | 27,9 |
| DF316/4 | DF216/4 | 25,2 | 38,9 | 18,0 | 26,0 | 26,6 | 17,5 | 18,3 | 22,3 | 24,0 | 23,7 |
| DF316/4S | DF216/4S | 29,7 | 45,8 | 21,2 | 30,6 | 31,4 | 20,6 | 21,5 | 26,2 | 28,3 | 27,9 |
| DF316/5 | DF216/5 | 33,7 | 51,9 | 24,0 | 34,7 | 35,6 | 23,3 | 24,4 | 29,7 | 32,0 | 31,6 |
| DF316/5S | DF216/5S | 35,3 | 54,4 | 25,2 | 36,4 | 37,3 | 24,4 | 25,6 | 31,2 | 33,6 | 33,1 |
| DF316/7S | – | 45,4 | 70,0 | 32,4 | 46,8 | 48,0 | 31,4 | 32,9 | 40,1 | 43,2 | 42,6 |
| DF330/3 | DF230/3 | 20,4 | 31,5 | 14,6 | 21,1 | 21,6 | 14,2 | 14,8 | 18,1 | 19,4 | 19,2 |
| DF330/3S | DF230/3S | 22,2 | 34,2 | 15,8 | 22,9 | 23,4 | 15,4 | 16,1 | 19,6 | 21,1 | 20,8 |
| DF330/4 | DF230/4 | 28,7 | 44,3 | 20,5 | 29,6 | 30,3 | 19,9 | 20,8 | 25,4 | 27,3 | 26,9 |
| DF330/4S | DF230/4S | 37,1 | 57,3 | 26,5 | 38,3 | 39,2 | 25,7 | 26,9 | 32,8 | 35,3 | 34,8 |
| DF330/5 | DF230/5 | 37,2 | 57,4 | 26,6 | 38,4 | 39,3 | 25,8 | 27,0 | 32,9 | 35,4 | 34,9 |
| DF330/5S | DF230/5S | 43,6 | 67,2 | 31,1 | 44,9 | 46,0 | 30,2 | 31,6 | 38,5 | 41,4 | 40,9 |
| DF330/6 | – | 40,5 | 62,5 | 28,9 | 41,8 | 42,8 | 28,1 | 29,4 | 35,8 | 38,5 | 38,0 |
| DF330/6S | – | 46,4 | 71,5 | 33,1 | 47,8 | 49,0 | 32,1 | 33,6 | 41,0 | 44,1 | 43,5 |
| DF330/7S | – | 50,1 | 77,2 | 35,7 | 51,6 | 52,9 | 34,7 | 36,3 | 44,2 | 47,6 | 47,0 |
| DF330/9S | – | 50,1 | 77,2 | 35,7 | 51,6 | 52,9 | 34,7 | 36,3 | 44,2 | 47,6 | 47,0 |
| DF341/4 | – | 36,5 | 56,3 | 26,0 | 37,6 | 38,6 | 25,3 | 26,5 | 32,2 | 34,7 | 34,2 |
| DF341/4S | – | 38,1 | 58,7 | 27,1 | 39,2 | 40,2 | 26,4 | 27,6 | 33,6 | 36,2 | 35,7 |
| DF341/5 | DF241/5 | 42,2 | 65,0 | 30,1 | 43,5 | 44,6 | 29,2 | 30,6 | 37,3 | 40,1 | 39,6 |
| DF341/5S | DF241/5S | 49,1 | 75,6 | 35,0 | 50,6 | 51,8 | 34,0 | 35,6 | 43,3 | 46,7 | 46,0 |
| DF341/6 | DF241/6 | 66,6 | 102,7 | 47,5 | 68,6 | 70,3 | 46,1 | 48,3 | 58,8 | 63,3 | 62,4 |
| DF341/6S | DF241/6S | 66,6 | 102,7 | 47,5 | 68,6 | 70,3 | 46,1 | 48,3 | 58,8 | 63,3 | 62,4 |
| DF341/7S | DF241/7S | 71,1 | 109,6 | 50,7 | 73,2 | 75,1 | 49,2 | 51,5 | 62,8 | 67,6 | 66,7 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8



TABLE 14: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|------|------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| DF303/2 | DF203/2 | 5,7 | 5,2 | 8,8 | 8,9 | 6,0 | 8,6 | 9,8 | 8,6 | 8,9 |
| DF303/2F | – | 5,7 | 5,2 | 8,8 | 8,9 | 6,0 | 8,6 | 9,8 | 8,6 | 8,9 |
| DF303/2S | DF203/2S | 7,4 | 6,7 | 11,3 | 11,5 | 7,8 | 11,2 | 12,6 | 11,1 | 11,6 |
| DF303/3 | DF203/3 | 13,4 | 12,1 | 20,6 | 20,9 | 14,1 | 20,2 | 22,9 | 20,2 | 21,0 |
| DF303/3S | – | 13,7 | 12,4 | 21,0 | 21,3 | 14,4 | 20,7 | 23,4 | 20,6 | 21,4 |
| DF305/2 | DF205/2 | 6,0 | 5,4 | 9,2 | 9,3 | 6,3 | 9,1 | 10,3 | 9,0 | 9,4 |
| DF305/2F | – | 6,0 | 5,4 | 9,2 | 9,3 | 6,3 | 9,1 | 10,3 | 9,0 | 9,4 |
| DF305/2S | DF205/2S | 9,3 | 8,4 | 14,3 | 14,5 | 9,8 | 14,0 | 15,9 | 14,0 | 14,6 |
| DF305/3 | DF205/3 | 14,0 | 12,6 | 21,4 | 21,8 | 14,7 | 21,1 | 23,9 | 21,0 | 21,9 |
| DF305/3S | DF205/3S | 14,5 | 13,1 | 22,2 | 22,6 | 15,3 | 21,9 | 24,8 | 21,8 | 22,7 |
| DF305/M10S | – | 14,5 | 13,1 | 22,2 | 22,6 | 15,3 | 21,9 | 24,8 | 21,8 | 22,7 |
| DF308/2 | DF208/2 | 5,9 | 5,3 | 9,0 | 9,1 | 6,2 | 8,8 | 10,0 | 8,8 | 9,2 |
| DF308/2F | – | 5,9 | 5,3 | 9,0 | 9,1 | 6,2 | 8,8 | 10,0 | 8,8 | 9,2 |
| DF308/2S | DF208/2S | 8,9 | 8,1 | 13,7 | 13,9 | 9,4 | 13,5 | 15,3 | 13,4 | 14,0 |
| DF308/3 | DF208/3 | 15,5 | 14,0 | 23,8 | 24,2 | 16,3 | 23,4 | 26,5 | 23,4 | 24,3 |
| DF308/3F | – | 15,5 | 14,0 | 23,8 | 24,2 | 16,3 | 23,4 | 26,5 | 23,4 | 24,3 |
| DF308/3S | DF208/3S | 15,9 | 14,4 | 24,4 | 24,7 | 16,7 | 24,0 | 27,1 | 23,9 | 24,9 |
| DF308/M10S | – | 15,9 | 14,4 | 24,4 | 24,7 | 16,7 | 24,0 | 27,1 | 23,9 | 24,9 |
| DF308/M12S | – | 19,9 | 18,0 | 30,5 | 31,0 | 21,0 | 30,1 | 34,0 | 30,0 | 31,2 |
| DF308/4 | DF208/4 | 18,8 | 17,0 | 28,9 | 29,3 | 19,8 | 28,4 | 32,2 | 28,3 | 29,5 |
| DF308/4S | DF208/4S | 19,9 | 18,0 | 30,5 | 31,0 | 21,0 | 30,1 | 34,0 | 30,0 | 31,2 |
| DF316/2 | DF216/2 | 6,6 | 6,0 | 10,1 | 10,3 | 6,9 | 9,9 | 11,3 | 9,9 | 10,3 |
| DF316/3 | DF216/3 | 15,6 | 14,1 | 23,9 | 24,3 | 16,4 | 23,5 | 26,6 | 23,5 | 24,4 |
| DF316/3F | – | 15,6 | 14,1 | 23,9 | 24,3 | 16,4 | 23,5 | 26,6 | 23,5 | 24,4 |
| DF316/3S | DF216/3S | 17,1 | 15,5 | 26,3 | 26,7 | 18,0 | 25,9 | 29,3 | 25,8 | 26,8 |
| DF316/M10S | – | 17,1 | 15,5 | 26,3 | 26,7 | 18,0 | 25,9 | 29,3 | 25,8 | 26,8 |
| DF316/M12S | – | 23,7 | 21,4 | 36,4 | 36,9 | 25,0 | 35,8 | 40,5 | 35,7 | 37,2 |
| DF316/4 | DF216/4 | 20,1 | 18,2 | 30,9 | 31,4 | 21,2 | 30,4 | 34,4 | 30,3 | 31,5 |
| DF316/4S | DF216/4S | 23,7 | 21,4 | 36,4 | 36,9 | 25,0 | 35,8 | 40,5 | 35,7 | 37,2 |
| DF316/5 | DF216/5 | 26,9 | 24,3 | 41,2 | 41,8 | 28,3 | 40,6 | 45,9 | 40,4 | 42,1 |
| DF316/5S | DF216/5S | 28,2 | 25,5 | 43,2 | 43,9 | 29,7 | 42,5 | 48,2 | 42,4 | 44,2 |
| DF316/7S | – | 36,2 | 32,8 | 55,6 | 56,4 | 38,2 | 54,7 | 61,9 | 54,5 | 56,8 |
| DF330/3 | DF230/3 | 16,3 | 14,8 | 25,0 | 25,4 | 17,2 | 24,6 | 27,9 | 24,6 | 25,6 |
| DF330/3S | DF230/3S | 17,7 | 16,0 | 27,2 | 27,6 | 18,7 | 26,7 | 30,3 | 26,7 | 27,8 |
| DF330/4 | DF230/4 | 22,9 | 20,7 | 35,1 | 35,7 | 24,1 | 34,6 | 39,2 | 34,5 | 35,9 |
| DF330/4S | DF230/4S | 29,6 | 26,8 | 45,5 | 46,2 | 31,2 | 44,8 | 50,7 | 44,6 | 46,5 |
| DF330/5 | DF230/5 | 29,7 | 26,9 | 45,6 | 46,3 | 31,3 | 44,9 | 50,8 | 44,7 | 46,6 |
| DF330/5S | DF230/5S | 34,8 | 31,4 | 53,3 | 54,2 | 36,6 | 52,5 | 59,4 | 52,3 | 54,5 |
| DF330/6 | – | 32,4 | 29,3 | 49,6 | 50,4 | 34,1 | 48,8 | 55,3 | 48,7 | 50,7 |
| DF330/6S | – | 37,0 | 33,5 | 56,8 | 57,7 | 39,0 | 55,9 | 63,3 | 55,8 | 58,0 |
| DF330/7S | – | 40,0 | 36,1 | 61,3 | 62,2 | 42,1 | 60,3 | 68,3 | 60,2 | 62,6 |
| DF330/9S | – | 40,0 | 36,1 | 61,3 | 62,2 | 42,1 | 60,3 | 68,3 | 60,2 | 62,6 |
| DF341/4 | – | 29,1 | 26,3 | 44,7 | 45,4 | 30,7 | 44,0 | 49,8 | 43,9 | 45,7 |
| DF341/4S | – | 30,4 | 27,5 | 46,6 | 47,3 | 32,0 | 45,9 | 51,9 | 45,7 | 47,6 |
| DF341/5 | DF241/5 | 33,7 | 30,5 | 51,7 | 52,4 | 35,5 | 50,8 | 57,5 | 50,7 | 52,8 |
| DF341/5S | DF241/5S | 39,2 | 35,4 | 60,1 | 61,0 | 41,2 | 59,1 | 66,9 | 59,0 | 61,4 |
| DF341/6 | DF241/6 | 53,1 | 48,1 | 81,5 | 82,8 | 56,0 | 80,2 | 90,8 | 80,0 | 83,3 |
| DF341/6S | DF241/6S | 53,1 | 48,1 | 81,5 | 82,8 | 56,0 | 80,2 | 90,8 | 80,0 | 83,3 |
| DF341/7S | DF241/7S | 56,7 | 51,3 | 87,0 | 88,4 | 59,8 | 85,6 | 97,0 | 85,4 | 88,9 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 15: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| DF303/2 | DF203/2 | 8,6 | 13,2 | 6,1 | 8,8 | 9,1 | 5,9 | 6,2 | 7,6 | 8,2 | 8,0 |
| DF303/2F | – | 8,6 | 13,2 | 6,1 | 8,8 | 9,1 | 5,9 | 6,2 | 7,6 | 8,2 | 8,0 |
| DF303/2S | DF203/2S | 11,1 | 17,1 | 7,9 | 11,5 | 11,7 | 7,7 | 8,1 | 9,8 | 10,6 | 10,4 |
| DF303/3 | DF203/3 | 20,1 | 31,1 | 14,4 | 20,8 | 21,3 | 13,9 | 14,6 | 17,8 | 19,1 | 18,9 |
| DF303/3S | – | 20,6 | 31,7 | 14,7 | 21,2 | 21,7 | 14,2 | 14,9 | 18,2 | 19,6 | 19,3 |
| DF305/2 | DF205/2 | 9,0 | 13,9 | 6,4 | 9,3 | 9,5 | 6,2 | 6,5 | 8,0 | 8,6 | 8,5 |
| DF305/2F | – | 9,0 | 13,9 | 6,4 | 9,3 | 9,5 | 6,2 | 6,5 | 8,0 | 8,6 | 8,5 |
| DF305/2S | DF205/2S | 15,1 | 23,3 | 10,8 | 15,6 | 16,0 | 10,5 | 11,0 | 13,4 | 14,4 | 14,2 |
| DF305/3 | DF205/3 | 22,8 | 35,1 | 16,2 | 23,5 | 24,1 | 15,8 | 16,5 | 20,1 | 21,7 | 21,4 |
| DF305/3S | DF205/3S | 23,6 | 36,4 | 16,8 | 24,3 | 24,9 | 16,3 | 17,1 | 20,8 | 22,4 | 22,1 |
| DF305/M10S | – | 23,6 | 36,4 | 16,8 | 24,3 | 24,9 | 16,3 | 17,1 | 20,8 | 22,4 | 22,1 |
| DF308/2 | DF208/2 | 9,5 | 14,7 | 6,8 | 9,8 | 10,1 | 6,6 | 6,9 | 8,4 | 9,1 | 8,9 |
| DF308/2F | – | 9,5 | 14,7 | 6,8 | 9,8 | 10,1 | 6,6 | 6,9 | 8,4 | 9,1 | 8,9 |
| DF308/2S | DF208/2S | 14,5 | 22,4 | 10,4 | 15,0 | 15,4 | 10,1 | 10,5 | 12,8 | 13,8 | 13,6 |
| DF308/3 | DF208/3 | 25,3 | 39,0 | 18,0 | 26,0 | 26,7 | 17,5 | 18,3 | 22,3 | 24,0 | 23,7 |
| DF308/3F | – | 25,3 | 39,0 | 18,0 | 26,0 | 26,7 | 17,5 | 18,3 | 22,3 | 24,0 | 23,7 |
| DF308/3S | DF208/3S | 25,9 | 39,9 | 18,4 | 26,7 | 27,3 | 17,9 | 18,8 | 22,9 | 24,6 | 24,3 |
| DF308/M10S | – | 25,9 | 39,9 | 18,4 | 26,7 | 27,3 | 17,9 | 18,8 | 22,9 | 24,6 | 24,3 |
| DF308/M12S | – | 32,4 | 50,0 | 23,1 | 33,4 | 34,3 | 22,5 | 23,5 | 28,6 | 30,8 | 30,4 |
| DF308/4 | DF208/4 | 30,6 | 47,2 | 21,9 | 31,6 | 32,4 | 21,2 | 22,2 | 27,1 | 29,1 | 28,7 |
| DF308/4S | DF208/4S | 32,4 | 50,0 | 23,1 | 33,4 | 34,3 | 22,5 | 23,5 | 28,6 | 30,8 | 30,4 |
| DF316/2 | DF216/2 | 11,1 | 17,2 | 7,9 | 11,5 | 11,8 | 7,7 | 8,1 | 9,8 | 10,6 | 10,4 |
| DF316/3 | DF216/3 | 26,4 | 40,7 | 18,8 | 27,2 | 27,9 | 18,3 | 19,1 | 23,3 | 25,1 | 24,7 |
| DF316/3F | – | 26,4 | 40,7 | 18,8 | 27,2 | 27,9 | 18,3 | 19,1 | 23,3 | 25,1 | 24,7 |
| DF316/3S | DF216/3S | 29,0 | 44,7 | 20,7 | 29,9 | 30,6 | 20,1 | 21,0 | 25,6 | 27,5 | 27,2 |
| DF316/M10S | – | 29,0 | 44,7 | 20,7 | 29,9 | 30,6 | 20,1 | 21,0 | 25,6 | 27,5 | 27,2 |
| DF316/M12S | – | 40,1 | 61,8 | 28,6 | 41,3 | 42,4 | 27,8 | 29,1 | 35,4 | 38,1 | 37,6 |
| DF316/4 | DF216/4 | 34,0 | 52,5 | 24,3 | 35,1 | 36,0 | 23,6 | 24,7 | 30,1 | 32,4 | 31,9 |
| DF316/4S | DF216/4S | 40,1 | 61,8 | 28,6 | 41,3 | 42,4 | 27,8 | 29,1 | 35,4 | 38,1 | 37,6 |
| DF316/5 | DF216/5 | 45,4 | 70,1 | 32,4 | 46,8 | 48,0 | 31,5 | 32,9 | 40,1 | 43,2 | 42,6 |
| DF316/5S | DF216/5S | 47,7 | 73,5 | 34,0 | 49,1 | 50,4 | 33,0 | 34,6 | 42,1 | 45,3 | 44,7 |
| DF316/7S | – | 61,3 | 94,5 | 43,7 | 63,1 | 64,8 | 42,4 | 44,4 | 54,1 | 58,3 | 57,5 |
| DF330/3 | DF230/3 | 27,6 | 42,6 | 19,7 | 28,4 | 29,2 | 19,1 | 20,0 | 24,4 | 26,3 | 25,9 |
| DF330/3S | DF230/3S | 30,0 | 46,2 | 21,4 | 30,9 | 31,7 | 20,7 | 21,7 | 26,5 | 28,5 | 28,1 |
| DF330/4 | DF230/4 | 38,7 | 59,7 | 27,6 | 39,9 | 40,9 | 26,8 | 28,1 | 34,2 | 36,8 | 36,3 |
| DF330/4S | DF230/4S | 50,1 | 77,3 | 35,8 | 51,7 | 53,0 | 34,7 | 36,4 | 44,3 | 47,7 | 47,0 |
| DF330/5 | DF230/5 | 50,3 | 77,5 | 35,8 | 51,8 | 53,1 | 34,8 | 36,4 | 44,4 | 47,8 | 47,1 |
| DF330/5S | DF230/5S | 58,8 | 90,7 | 41,9 | 60,6 | 62,1 | 40,7 | 42,6 | 51,9 | 55,9 | 55,1 |
| DF330/6 | – | 54,7 | 84,4 | 39,0 | 56,4 | 57,8 | 37,9 | 39,7 | 48,3 | 52,0 | 51,3 |
| DF330/6S | – | 62,6 | 96,6 | 44,7 | 64,6 | 66,2 | 43,4 | 45,4 | 55,3 | 59,6 | 58,7 |
| DF330/7S | – | 67,6 | 104,2 | 48,2 | 69,7 | 71,4 | 46,8 | 49,0 | 59,7 | 64,3 | 63,4 |
| DF330/9S | – | 67,6 | 104,2 | 48,2 | 69,7 | 71,4 | 46,8 | 49,0 | 59,7 | 64,3 | 63,4 |
| DF341/4 | – | 54,7 | 84,4 | 39,0 | 56,4 | 57,8 | 37,9 | 39,7 | 48,4 | 52,1 | 51,3 |
| DF341/4S | – | 57,1 | 88,0 | 40,7 | 58,8 | 60,3 | 39,5 | 41,4 | 50,4 | 54,3 | 53,5 |
| DF341/5 | DF241/5 | 63,3 | 97,6 | 45,1 | 65,2 | 66,9 | 43,8 | 45,9 | 55,9 | 60,2 | 59,3 |
| DF341/5S | DF241/5S | 73,6 | 113,5 | 52,5 | 75,8 | 77,8 | 51,0 | 53,4 | 65,0 | 70,0 | 69,0 |
| DF341/6 | DF241/6 | 99,9 | 154,0 | 71,2 | 102,9 | 105,5 | 69,2 | 72,4 | 88,2 | 95,0 | 93,7 |
| DF341/6S | DF241/6S | 99,9 | 154,0 | 71,2 | 102,9 | 105,5 | 69,2 | 72,4 | 88,2 | 95,0 | 93,7 |
| DF341/7S | DF241/7S | 106,6 | 164,4 | 76,0 | 109,9 | 112,6 | 73,8 | 77,3 | 94,2 | 101,4 | 100,0 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 15: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|-----------------------|--|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 100% molecular sieves | 80% molecular sieves + 20% activated alumina | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| DF303/2 | DF203/2 | 6,9 | 6,2 | 10,5 | 10,7 | 7,2 | 10,3 | 11,7 | 10,3 | 10,7 |
| DF303/2F | – | 6,9 | 6,2 | 10,5 | 10,7 | 7,2 | 10,3 | 11,7 | 10,3 | 10,7 |
| DF303/2S | DF203/2S | 8,9 | 8,0 | 13,6 | 13,8 | 9,3 | 13,4 | 15,2 | 13,4 | 13,9 |
| DF303/3 | DF203/3 | 16,1 | 14,5 | 24,7 | 25,0 | 16,9 | 24,3 | 27,5 | 24,2 | 25,2 |
| DF303/3S | – | 16,4 | 14,9 | 25,2 | 25,6 | 17,3 | 24,8 | 28,1 | 24,7 | 25,7 |
| DF305/2 | DF205/2 | 7,2 | 6,5 | 11,1 | 11,2 | 7,6 | 10,9 | 12,3 | 10,8 | 11,3 |
| DF305/2F | – | 7,2 | 6,5 | 11,1 | 11,2 | 7,6 | 10,9 | 12,3 | 10,8 | 11,3 |
| DF305/2S | DF205/2S | 12,1 | 10,9 | 18,5 | 18,8 | 12,7 | 18,2 | 20,7 | 18,2 | 18,9 |
| DF305/3 | DF205/3 | 18,2 | 16,4 | 27,9 | 28,3 | 19,1 | 27,4 | 31,1 | 27,4 | 28,5 |
| DF305/3S | DF205/3S | 18,8 | 17,0 | 28,9 | 29,3 | 19,8 | 28,4 | 32,2 | 28,4 | 29,5 |
| DF305/M10S | – | 18,8 | 17,0 | 28,9 | 29,3 | 19,8 | 28,4 | 32,2 | 28,4 | 29,5 |
| DF308/2 | DF208/2 | 7,6 | 6,9 | 11,7 | 11,9 | 8,0 | 11,5 | 13,0 | 11,5 | 11,9 |
| DF308/2F | – | 7,6 | 6,9 | 11,7 | 11,9 | 8,0 | 11,5 | 13,0 | 11,5 | 11,9 |
| DF308/2S | DF208/2S | 11,6 | 10,5 | 17,8 | 18,1 | 12,2 | 17,5 | 19,8 | 17,5 | 18,2 |
| DF308/3 | DF208/3 | 20,2 | 18,2 | 30,9 | 31,4 | 21,2 | 30,5 | 34,5 | 30,4 | 31,6 |
| DF308/3F | – | 20,2 | 18,2 | 30,9 | 31,4 | 21,2 | 30,5 | 34,5 | 30,4 | 31,6 |
| DF308/3S | DF208/3S | 20,6 | 18,7 | 31,7 | 32,2 | 21,7 | 31,2 | 35,3 | 31,1 | 32,4 |
| DF308/M10S | – | 20,6 | 18,7 | 31,7 | 32,2 | 21,7 | 31,2 | 35,3 | 31,1 | 32,4 |
| DF308/M12S | – | 25,9 | 23,4 | 39,7 | 40,3 | 27,3 | 39,1 | 44,2 | 39,0 | 40,6 |
| DF308/4 | DF208/4 | 24,5 | 22,1 | 37,5 | 38,1 | 25,8 | 36,9 | 41,8 | 36,8 | 38,3 |
| DF308/4S | DF208/4S | 25,9 | 23,4 | 39,7 | 40,3 | 27,3 | 39,1 | 44,2 | 39,0 | 40,6 |
| DF316/2 | DF216/2 | 8,9 | 8,0 | 13,6 | 13,9 | 9,4 | 13,4 | 15,2 | 13,4 | 13,9 |
| DF316/3 | DF216/3 | 21,0 | 19,0 | 32,3 | 32,8 | 22,2 | 31,8 | 36,0 | 31,7 | 33,0 |
| DF316/3F | – | 21,0 | 19,0 | 32,3 | 32,8 | 22,2 | 31,8 | 36,0 | 31,7 | 33,0 |
| DF316/3S | DF216/3S | 23,1 | 20,9 | 35,5 | 36,0 | 24,4 | 34,9 | 39,5 | 34,8 | 36,2 |
| DF316/M10S | – | 23,1 | 20,9 | 35,5 | 36,0 | 24,4 | 34,9 | 39,5 | 34,8 | 36,2 |
| DF316/M12S | – | 32,0 | 29,0 | 49,1 | 49,9 | 33,7 | 48,3 | 54,7 | 48,2 | 50,2 |
| DF316/4 | DF216/4 | 27,2 | 24,6 | 41,7 | 42,3 | 28,6 | 41,0 | 46,4 | 40,9 | 42,6 |
| DF316/4S | DF216/4S | 32,0 | 29,0 | 49,1 | 49,9 | 33,7 | 48,3 | 54,7 | 48,2 | 50,2 |
| DF316/5 | DF216/5 | 36,3 | 32,8 | 55,6 | 56,5 | 38,2 | 54,7 | 62,0 | 54,6 | 56,8 |
| DF316/5S | DF216/5S | 38,0 | 34,4 | 58,4 | 59,3 | 40,1 | 57,4 | 65,0 | 57,3 | 59,6 |
| DF316/7S | – | 48,9 | 44,2 | 75,0 | 76,2 | 51,5 | 73,8 | 83,6 | 73,6 | 76,6 |
| DF330/3 | DF230/3 | 22,0 | 19,9 | 33,8 | 34,3 | 23,2 | 33,3 | 37,7 | 33,2 | 34,5 |
| DF330/3S | DF230/3S | 23,9 | 21,6 | 36,7 | 37,2 | 25,2 | 36,1 | 40,9 | 36,0 | 37,5 |
| DF330/4 | DF230/4 | 30,9 | 28,0 | 47,5 | 48,2 | 32,6 | 46,7 | 52,9 | 46,6 | 48,5 |
| DF330/4S | DF230/4S | 40,0 | 36,2 | 61,4 | 62,3 | 42,2 | 60,4 | 68,4 | 60,3 | 62,7 |
| DF330/5 | DF230/5 | 40,1 | 36,3 | 61,6 | 62,5 | 42,3 | 60,6 | 68,6 | 60,4 | 62,9 |
| DF330/5S | DF230/5S | 46,9 | 42,5 | 72,0 | 73,1 | 49,4 | 70,9 | 80,2 | 70,7 | 73,6 |
| DF330/6 | – | 43,7 | 39,5 | 67,0 | 68,0 | 46,0 | 65,9 | 74,6 | 65,8 | 68,4 |
| DF330/6S | – | 50,0 | 45,2 | 76,7 | 77,9 | 52,7 | 75,5 | 85,5 | 75,3 | 78,4 |
| DF330/7S | – | 54,0 | 48,8 | 82,8 | 84,0 | 56,8 | 81,4 | 92,2 | 81,2 | 84,5 |
| DF330/9S | – | 54,0 | 48,8 | 82,8 | 84,0 | 56,8 | 81,4 | 92,2 | 81,2 | 84,5 |
| DF341/4 | – | 43,7 | 39,5 | 67,0 | 68,1 | 46,0 | 66,0 | 74,7 | 65,8 | 68,5 |
| DF341/4S | – | 45,6 | 41,2 | 69,9 | 71,0 | 48,0 | 68,8 | 77,9 | 68,6 | 71,4 |
| DF341/5 | DF241/5 | 50,5 | 45,7 | 77,5 | 78,7 | 53,2 | 76,2 | 86,3 | 76,0 | 79,1 |
| DF341/5S | DF241/5S | 58,7 | 53,1 | 90,1 | 91,5 | 61,9 | 88,7 | 100,4 | 88,4 | 92,0 |
| DF341/6 | DF241/6 | 79,7 | 72,1 | 122,3 | 124,1 | 84,0 | 120,3 | 136,2 | 120,0 | 124,9 |
| DF341/6S | DF241/6S | 79,7 | 72,1 | 122,3 | 124,1 | 84,0 | 120,3 | 136,2 | 120,0 | 124,9 |
| DF341/7S | DF241/7S | 85,1 | 77,0 | 130,5 | 132,5 | 89,6 | 128,5 | 145,4 | 128,1 | 133,3 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 16: Water capacity and dehydratable charge of filters with core 100% molecular sieves

| Catalogue Number | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|------------------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|
| | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| DF303/2 | 5,6 | 5,7 | 4,6 | 5,0 | 6,0 | 6,1 | 4,9 | 5,4 | 4,8 | 5,3 | 3,7 | 4,0 | 5,2 | 5,7 | 4,0 | 4,3 |
| DF303/2F | | | | | | | | | | | | | | | | |
| DF303/2S | | | | | | | | | | | | | | | | |
| DF303/3 | | | | | | | | | | | | | | | | |
| DF303/3S | | | | | | | | | | | | | | | | |
| DF305/2 | 15,8 | 16,1 | 12,9 | 14,1 | 17,0 | 17,3 | 13,9 | 15,2 | 13,6 | 15,0 | 10,4 | 11,3 | 14,6 | 16,1 | 11,2 | 12,2 |
| DF305/2F | | | | | | | | | | | | | | | | |
| DF305/2S | | | | | | | | | | | | | | | | |
| DF305/3 | | | | | | | | | | | | | | | | |
| DF305/3S | | | | | | | | | | | | | | | | |
| DF305/M10S | | | | | | | | | | | | | | | | |
| DF308/2 | 22,8 | 23,3 | 18,6 | 20,3 | 24,5 | 25,1 | 20,0 | 21,8 | 19,6 | 21,6 | 15,0 | 16,3 | 21,1 | 23,2 | 16,1 | 17,5 |
| DF308/2F | | | | | | | | | | | | | | | | |
| DF308/2S | | | | | | | | | | | | | | | | |
| DF308/3 | | | | | | | | | | | | | | | | |
| DF308/3F | | | | | | | | | | | | | | | | |
| DF308/3S | | | | | | | | | | | | | | | | |
| DF308/M10S | | | | | | | | | | | | | | | | |
| DF308/M12S | | | | | | | | | | | | | | | | |
| DF308/4 | | | | | | | | | | | | | | | | |
| DF308/4S | | | | | | | | | | | | | | | | |
| DF316/2 | 30,4 | 31,0 | 24,9 | 27,1 | 32,7 | 33,3 | 26,8 | 29,1 | 26,2 | 28,8 | 20,0 | 21,8 | 28,2 | 31,0 | 21,5 | 23,4 |
| DF316/3 | | | | | | | | | | | | | | | | |
| DF316/3F | | | | | | | | | | | | | | | | |
| DF316/3S | | | | | | | | | | | | | | | | |
| DF316/M10S | | | | | | | | | | | | | | | | |
| DF316/M12S | | | | | | | | | | | | | | | | |
| DF316/4 | | | | | | | | | | | | | | | | |
| DF316/v | | | | | | | | | | | | | | | | |
| DF316/5 | | | | | | | | | | | | | | | | |
| DF316/5S | | | | | | | | | | | | | | | | |
| DF316/7S | | | | | | | | | | | | | | | | |
| DF316/9S | | | | | | | | | | | | | | | | |
| DF330/3 | 72,1 | 73,7 | 59,0 | 64,3 | 77,5 | 79,2 | 63,4 | 69,1 | 62,2 | 68,4 | 47,5 | 51,7 | 66,9 | 73,5 | 51,1 | 55,6 |
| DF330/3S | | | | | | | | | | | | | | | | |
| DF330/4 | | | | | | | | | | | | | | | | |
| DF330/4S | | | | | | | | | | | | | | | | |
| DF330/5 | | | | | | | | | | | | | | | | |
| DF330/5S | | | | | | | | | | | | | | | | |
| DF330/6 | | | | | | | | | | | | | | | | |
| DF330/6S | | | | | | | | | | | | | | | | |
| DF330/7S | | | | | | | | | | | | | | | | |
| DF330/9S | | | | | | | | | | | | | | | | |
| DF341/4 | 103,2 | 105,5 | 84,5 | 92,0 | 111,0 | 113,4 | 90,9 | 98,9 | 89,0 | 98,0 | 68,1 | 74,1 | 95,7 | 105,4 | 73,2 | 79,7 |
| DF341/4S | | | | | | | | | | | | | | | | |
| DF341/5 | | | | | | | | | | | | | | | | |
| DF341/5S | | | | | | | | | | | | | | | | |
| DF341/6 | | | | | | | | | | | | | | | | |
| DF341/6S | | | | | | | | | | | | | | | | |
| DF341/7S | | | | | | | | | | | | | | | | |

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:
 - Liquid temperatures: 24 °C and 52 °C
 - Equilibrium point dryness, EPD: 60 ppm for R22
 - Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

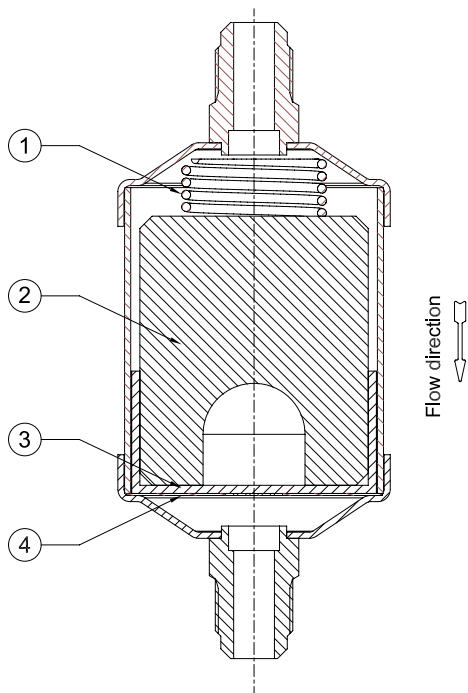
TABLE 17: Water capacity and dehydratable charge of filters with core 80% molecular sieves + 20% activated alumina

| Catalogue Number | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|------------------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|
| | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| DF203/2 | 4,8 | 4,9 | 3,9 | 4,3 | 5,2 | 5,3 | 4,2 | 4,6 | 4,1 | 4,5 | 3,1 | 3,4 | 4,4 | 4,8 | 3,3 | 3,7 |
| DF203/2S | | | | | | | | | | | | | | | | |
| DF203/3 | | | | | | | | | | | | | | | | |
| DF203/3S | | | | | | | | | | | | | | | | |
| DF205/2 | 13,4 | 13,7 | 11,0 | 12,0 | 14,4 | 14,7 | 11,8 | 12,9 | 11,6 | 12,7 | 8,8 | 9,6 | 12,5 | 13,7 | 9,5 | 10,3 |
| DF205/2S | | | | | | | | | | | | | | | | |
| DF205/3 | | | | | | | | | | | | | | | | |
| DF205/3S | | | | | | | | | | | | | | | | |
| DF205/M10S | | | | | | | | | | | | | | | | |
| DF208/2 | 19,4 | 19,8 | 15,8 | 17,3 | 20,9 | 21,3 | 17,0 | 18,6 | 16,7 | 18,4 | 12,8 | 13,9 | 18,0 | 19,8 | 13,8 | 14,9 |
| DF208/2S | | | | | | | | | | | | | | | | |
| DF208/3 | | | | | | | | | | | | | | | | |
| DF208/3S | | | | | | | | | | | | | | | | |
| DF208/M10S | | | | | | | | | | | | | | | | |
| DF208/M12S | | | | | | | | | | | | | | | | |
| DF208/4 | | | | | | | | | | | | | | | | |
| DF208/4S | | | | | | | | | | | | | | | | |
| DF216/2 | 25,8 | 26,4 | 21,1 | 23,0 | 27,7 | 28,4 | 22,7 | 24,7 | 22,3 | 24,5 | 17,0 | 18,5 | 24,0 | 26,3 | 18,3 | 19,9 |
| DF216/3 | | | | | | | | | | | | | | | | |
| DF216/3S | | | | | | | | | | | | | | | | |
| DF216/M10S | | | | | | | | | | | | | | | | |
| DF216/M12S | | | | | | | | | | | | | | | | |
| DF216/4 | | | | | | | | | | | | | | | | |
| DF216/4S | | | | | | | | | | | | | | | | |
| DF216/5 | | | | | | | | | | | | | | | | |
| DF216/5S | | | | | | | | | | | | | | | | |
| DF216/7S | | | | | | | | | | | | | | | | |
| DF216/9S | | | | | | | | | | | | | | | | |
| DF230/3 | 61,3 | 62,6 | 50,2 | 54,6 | 65,9 | 67,3 | 54,0 | 58,7 | 52,9 | 58,2 | 40,4 | 44,0 | 56,9 | 62,6 | 43,4 | 47,3 |
| DF230/3S | | | | | | | | | | | | | | | | |
| DF230/4 | | | | | | | | | | | | | | | | |
| DF230/4S | | | | | | | | | | | | | | | | |
| DF230/5 | | | | | | | | | | | | | | | | |
| DF230/5S | | | | | | | | | | | | | | | | |
| DF230/7S | | | | | | | | | | | | | | | | |
| DF230/9S | | | | | | | | | | | | | | | | |
| DF241/5 | 87,7 | 89,6 | 71,8 | 78,2 | 94,3 | 96,3 | 77,2 | 84,1 | 75,7 | 83,3 | 57,9 | 62,9 | 81,4 | 89,6 | 62,3 | 67,6 |
| DF241/5S | | | | | | | | | | | | | | | | |
| DF241/6 | | | | | | | | | | | | | | | | |
| DF241/6S | | | | | | | | | | | | | | | | |
| DF241/7S | | | | | | | | | | | | | | | | |

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:
 - Liquid temperatures: 24 °C and 52 °C
 - Equilibrium point dryness, EPD: 60 ppm for R22
 - Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

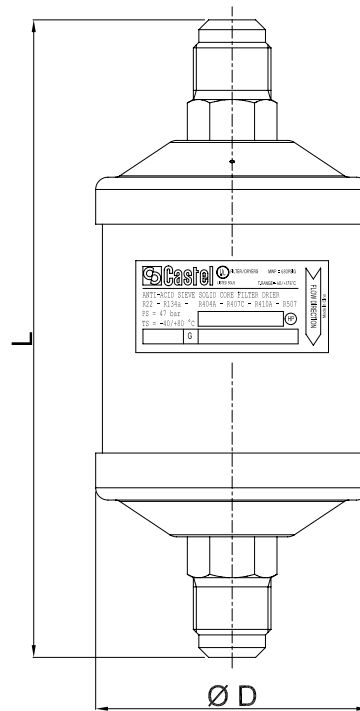
TABLE 18: Dimensions and weights of hermetic filters

| Catalogue Number | | Connections | | | Dimensions [mm] | | Weight [g] |
|------------------|------------|-------------|---------|--------|-----------------|-----|------------|
| | | SAE Flare | ODS | | Ø D | L | |
| | | | Ø [in.] | Ø [mm] | | | |
| DF303/2 | DF203/2 | 1/4" | - | - | 42 | 109 | 168 |
| DF303/2F | - | 1/4" | - | - | | 101 | 168 |
| DF303/2S | DF203/2S | - | 1/4" | - | | 101 | 152 |
| DF303/3 | DF203/3 | 3/8" | - | - | | 119 | 202 |
| DF303/3S | - | - | 3/8" | - | | 105 | 186 |
| DF305/2 | DF205/2 | 1/4" | - | - | 64 | 120 | 420 |
| DF305/2F | - | 1/4" | - | - | | 112 | 420 |
| DF305/2S | DF205/2S | - | 1/4" | - | | 112 | 406 |
| DF305/3 | DF205/3 | 3/8" | - | - | | 130 | 450 |
| DF305/3S | DF205/3S | - | 3/8" | - | | 116 | 414 |
| DF305/M10S | DF205/M10S | - | - | 10 | 120 | 414 | |
| DF308/2 | DF208/2 | 1/4" | - | - | 64 | 141 | 526 |
| DF308/2F | - | 1/4" | - | - | | 133 | 526 |
| DF308/2S | DF208/2S | - | 1/4" | - | | 133 | 502 |
| DF308/3 | DF208/3 | 3/8" | - | - | | 151 | 556 |
| DF308/3F | - | 3/8" | - | - | | 140 | 556 |
| DF308/3S | DF208/3S | - | 3/8" | - | | 137 | 514 |
| DF308/M10S | DF208/M10S | - | - | 10 | | 141 | 520 |
| DF308/M12S | DF208/M12S | - | - | 12 | | 141 | 520 |
| DF308/4 | DF208/4 | 1/2" | - | - | | 156 | 578 |
| DF308/4S | DF208/4S | - | 1/2" | - | | 137 | 514 |
| DF316/2 | DF216/2 | 1/4" | - | - | 64 | 161 | 635 |
| DF316/3 | DF216/3 | 3/8" | - | - | | 171 | 648 |
| DF316/3F | - | 3/8" | - | - | | 160 | 648 |
| DF316/3S | DF216/3S | - | 3/8" | - | | 157 | 616 |
| DF316/M10S | DF216/M10S | - | - | 10 | | 161 | 616 |
| DF316/M12S | DF216/M12S | - | - | 12 | | 161 | 616 |
| DF316/4 | DF216/4 | 1/2" | - | - | | 176 | 684 |
| DF316/4S | DF216/4S | - | 1/2" | - | | 157 | 626 |
| DF316/5 | DF216/5 | 5/8" | - | - | | 186 | 748 |
| DF316/5S | DF216/5S | - | 5/8" | 16 | | 163 | 628 |
| DF316/7S | - | - | 7/8" | - | 177 | 650 | |
| DF316/9S | - | - | 1.1/8" | - | 177 | 650 | |
| DF330/3 | DF230/3 | 3/8" | - | - | 76 | 244 | 1490 |
| DF330/3S | DF230/3S | - | 3/8" | - | | 230 | 1450 |
| DF330/4 | DF230/4 | 1/2" | - | - | | 249 | 1504 |
| DF330/4S | DF230/4S | - | 1/2" | - | | 230 | 1450 |
| DF330/5 | DF230/5 | 5/8" | - | - | | 259 | 1568 |
| DF330/5S | DF230/5S | - | 5/8" | 16 | | 236 | 1500 |
| DF330/7S | - | - | 7/8" | - | | 250 | 1482 |
| DF330/9S | - | - | 1.1/8" | - | | 258 | 1366 |
| DF341/4 | - | 1/2" | - | - | | 89 | 254 |
| DF341/4S | - | - | 1/2" | - | 235 | | 1775 |
| DF341/5 | DF241/5 | 5/8" | - | - | 264 | | 1976 |
| DF341/5S | DF241/5S | - | 5/8" | 16 | 241 | | 1886 |
| DF341/6 | DF241/6 | 3/4" | - | - | 273 | | 2076 |
| DF341/6S | DF241/6S | - | 3/4" | - | 247 | | 1914 |
| DF341/7S | DF241/7S | - | 7/8" | - | 255 | | 1890 |

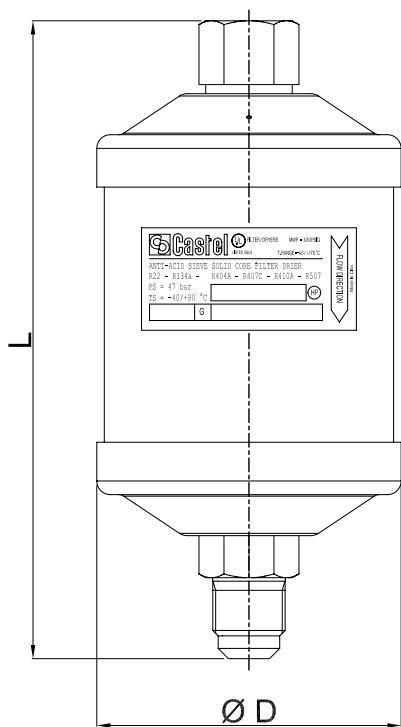


Solid core dehydrator

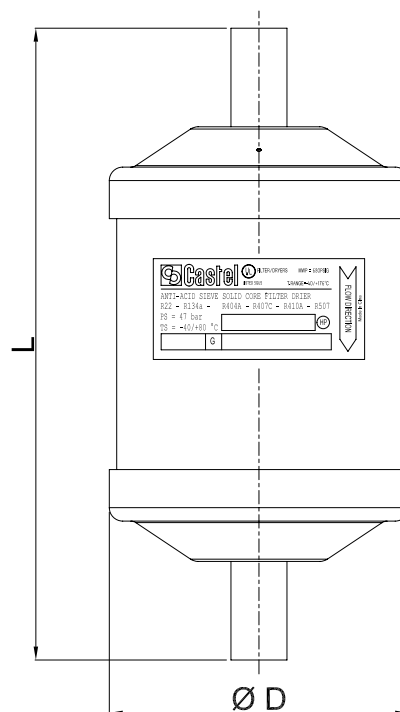
- 1 - Spring
- 2 - Bock
- 3 - Felt
- 4 - Stainless steel mesh



Male connections



Male - female connection
(female in)



Solder connection

REFRIGERATING SYSTEM PROTECTORS

6.3 – HERMETIC FILTER DRIERS, ATEX – CERTIFIED

APPLICATIONS

The “ATEX-Certified” filters are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

The filters with an “EX” suffix (4303EX, 4305EX, 4308EX, 4316EX, 4330EX and 4375EX) comply with the European Standard EN 80079-36:2016 and EN 80079-37:2016 and, therefore, comply with the ESR of Directive 2014/34/EU – ATEX. This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” risk of explosion, according to the definition in Annex I of Directive 1999/92/EC.

They can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

For different operating conditions apply the following formula:

$$Q = Q_{ref} \times L_1$$

where:

Q = required refrigeration flow capacity [kW]

Q_{ref} = reference refrigeration flow capacity [kW] (see Table 20)

L_1 = flow capacity correction factor in presence of operative temperatures different from reference conditions. (See Table 8)

CONSTRUCTION

The filter body is made completely from steel with copper plated solder connections, offering the possibility to solder the copper pipe inside the connections (ODS).

The cartridges are made from moulding a dehydrating filler made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics.

FILTER SELECTION BASED ON REFRIGERANT FLOW CAPACITY

Refrigerant flow capacities shown in Table 20 refer to the following operating conditions according to ARI STANDARD 710-2009:

- Liquid temperature + 30 °C
- Evaporating temperature - 15 °C

Total pressure drop, including inlet and outlet connections, 0.07 bar / 0.14 bar



TABLE 19: General characteristics of hermetic filter driers - ATEX Certified

| Catalogue Number | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------------------|--|-----------------------------------|-------------|--------|---------|--------|----------|---------|------|---------------------------------------|
| | | | | ODS | | ODM | | | min. | max. | |
| | | | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | |
| 4303EX/2S | 032S | 47 | 50 | 1/4" | - | 3/8" | - | 45 | -40 | +80 | Art. 4.3 |
| 4305EX/3S | 053S | 70 | 80 | 3/8" | - | 1/2" | - | | | | |
| 4305EX/M10S | - | | | - | 10 | - | 12 | | | | |
| 4308EX/3S | 083S | 103 | 130 | 3/8" | - | 1/2" | - | | | | |
| 4308EX/M10S | - | | | - | 10 | - | 12 | | | | |
| 4308EX/M12S | - | | | - | 12 | - | 14 | | | | |
| 4308EX/4S | 084S | | | 1/2" | - | 5/8" | 16 | | | | |
| 4316EX/3S | 163S | | | 3/8" | - | 1/2" | - | | | | |
| 4316EX/M10S | - | 155 | 250 | - | 10 | - | 12 | | | | |
| 4316EX/M12S | - | | | - | 12 | - | 14 | | | | |
| 4316EX/4S | 164S | | | 1/2" | - | 5/8" | 16 | | | | |
| 4316EX/5S | 165S | | | 5/8" | 16 | 3/4" | - | | | | |
| 4330EX/4S | 304S | | | 1/2" | - | 5/8" | 16 | | | | |
| 4330EX/5S | 305S | 310 | 500 | 5/8" | 16 | 3/4" | - | | | | |
| 4330EX/7S | 307S | | | 7/8" | - | 1.1/8" | - | | | | |
| 4330EX/9S | 309S | | | 1.1/8" | - | 1.3/8" | 35 | | | | |
| 4375EX/7S | 757S | | | 7/8" | - | 1.1/8" | - | | | | |
| 4375EX/9S | 759S | 600 | 1340 | 1.1/8" | - | 1.3/8" | 35 | | | | 24 |

TABLE 20: Refrigerant flow capacity of filter driers - ATEX Certified

| Catalogue Number | Pressure drop 0,07 bar (1) [kW] | | | | | | | | Pressure drop 0,14 bar (1) [kW] | | | | | | | |
|------------------|---------------------------------|---------|-------|-------|-------|-------|-------|-------|---------------------------------|---------|-------|-------|-------|-------|-------|-------|
| | R32 | R1234yf | R452B | R454B | R290 | R600 | R600a | R1270 | R32 | R1234yf | R452B | R454B | R290 | R600 | R600a | R1270 |
| 4303EX/2S | 12,2 | 5,7 | 9,7 | 9,8 | 9,5 | 10,8 | 9,5 | 9,9 | 14,6 | 6,9 | 11,6 | 11,8 | 11,4 | 12,9 | 11,4 | 11,8 |
| 4305EX/3S | 29,7 | 14,0 | 23,6 | 23,9 | 23,2 | 26,3 | 23,1 | 24,1 | 38,6 | 18,2 | 30,7 | 31,1 | 30,2 | 34,2 | 30,1 | 31,3 |
| 4305EX/M10S | 29,7 | 14,0 | 23,6 | 23,9 | 23,2 | 26,3 | 23,1 | 24,1 | 38,6 | 18,2 | 30,7 | 31,1 | 30,2 | 34,2 | 30,1 | 31,3 |
| 4308EX/3S | 34,9 | 16,4 | 27,7 | 28,2 | 27,3 | 30,9 | 27,2 | 28,3 | 45,4 | 21,4 | 36,1 | 36,6 | 35,5 | 40,2 | 35,4 | 36,8 |
| 4308EX/M10S | 34,9 | 16,4 | 27,7 | 28,2 | 27,3 | 30,9 | 27,2 | 28,3 | 45,4 | 21,4 | 36,1 | 36,6 | 35,5 | 40,2 | 35,4 | 36,8 |
| 4308EX/M12S | 44,3 | 20,8 | 35,1 | 35,7 | 34,6 | 39,2 | 34,5 | 35,9 | 57,5 | 27,1 | 45,7 | 46,4 | 45,0 | 50,9 | 44,8 | 46,7 |
| 4308EX/4S | 44,3 | 20,8 | 35,1 | 35,7 | 34,6 | 39,2 | 34,5 | 35,9 | 57,5 | 27,1 | 45,7 | 46,4 | 45,0 | 50,9 | 44,8 | 46,7 |
| 4316EX/3S | 37,6 | 17,7 | 29,9 | 30,3 | 29,4 | 33,3 | 29,3 | 30,5 | 50,8 | 23,9 | 40,3 | 40,9 | 39,7 | 44,9 | 39,6 | 41,2 |
| 4316EX/M10S | 37,6 | 17,7 | 29,9 | 30,3 | 29,4 | 33,3 | 29,3 | 30,5 | 50,8 | 23,9 | 40,3 | 40,9 | 39,7 | 44,9 | 39,6 | 41,2 |
| 4316EX/M12S | 52,2 | 24,5 | 41,4 | 42,1 | 40,8 | 46,2 | 40,7 | 42,3 | 70,4 | 33,1 | 55,9 | 56,8 | 55,0 | 62,3 | 54,9 | 57,1 |
| 4316EX/4S | 52,2 | 24,5 | 41,4 | 42,1 | 40,8 | 46,2 | 40,7 | 42,3 | 70,4 | 33,1 | 55,9 | 56,8 | 55,0 | 62,3 | 54,9 | 57,1 |
| 4316EX/5S | 68,9 | 32,4 | 54,7 | 55,5 | 53,8 | 60,9 | 53,7 | 55,9 | 93,0 | 43,7 | 73,8 | 74,9 | 72,6 | 82,2 | 72,5 | 75,4 |
| 4330EX/4S | 57,1 | 26,9 | 45,4 | 46,1 | 44,6 | 50,5 | 44,5 | 46,3 | 77,1 | 36,3 | 61,2 | 62,2 | 60,3 | 68,2 | 60,1 | 62,6 |
| 4330EX/5S | 71,3 | 33,5 | 56,6 | 57,5 | 55,7 | 63,1 | 55,5 | 57,8 | 96,2 | 45,2 | 76,4 | 77,6 | 75,2 | 85,1 | 75,0 | 78,0 |
| 4330EX/7S | 75,2 | 35,4 | 59,7 | 60,6 | 58,8 | 66,6 | 58,6 | 61,0 | 101,6 | 47,8 | 80,7 | 81,9 | 79,4 | 89,8 | 79,1 | 82,4 |
| 4330EX/9S | 75,2 | 35,4 | 59,7 | 60,6 | 58,8 | 66,6 | 58,6 | 61,0 | 101,6 | 47,8 | 80,7 | 81,9 | 79,4 | 89,8 | 79,1 | 82,4 |
| 4375EX/7S | 141,8 | 66,7 | 112,6 | 114,3 | 110,8 | 125,5 | 110,5 | 115,0 | 212,7 | 100,0 | 169,0 | 171,5 | 166,2 | 188,2 | 165,8 | 172,6 |
| 4375EX/9S | 147,5 | 69,4 | 117,1 | 118,9 | 115,3 | 130,5 | 114,9 | 119,6 | 221,2 | 104,0 | 175,7 | 178,4 | 172,9 | 195,7 | 172,4 | 179,4 |

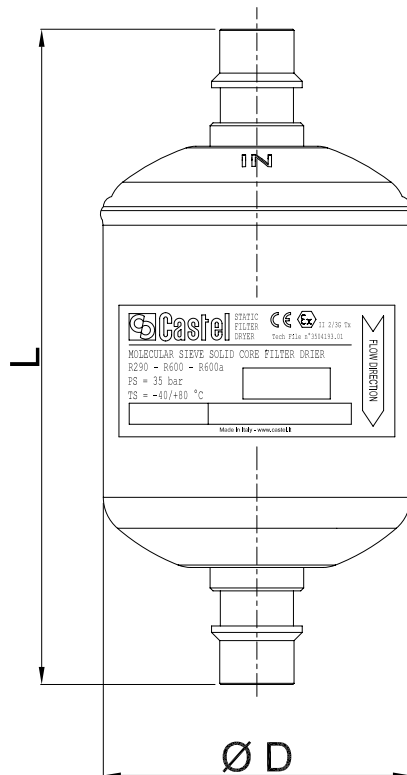
(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 21: Dimensions and weights of filter driers - ATEX Certified

| Catalogue Number | Connections | | | Dimensions [mm] | | Weight [g] |
|------------------|-------------|---------|--------|-----------------|------|------------|
| | SAE Flare | ODS | | Ø D | L | |
| | | Ø [in.] | Ø [mm] | | | |
| 4303EX/2S | - | 1/4" | - | 52 | 94 | 220 |
| 4305EX/3S | - | 3/8" | - | | 112 | 260 |
| 4305EX/M10S | - | - | 10 | | 139 | 345 |
| 4308EX/3S | - | 3/8" | - | | | |
| 4308EX/M10S | - | - | 10 | | 146 | 380 |
| 4308EX/M12S | - | - | 12 | | | |
| 4308EX/4S | - | 1/2" | - | | 146 | 380 |
| 4316EX/3S | - | 3/8" | - | | 73 | 151 |
| 4316EX/M10S | - | - | 10 | 630 | | |
| 4316EX/M12S | - | - | 12 | 158 | | 640 |
| 4316EX/4S | - | 1/2" | - | 158 | | 640 |
| 4316EX/5S | - | 5/8" | 16 | 166 | | 640 |
| 4330EX/4S | - | 1/2" | - | 237 | | 1280 |
| 4330EX/5S | - | 5/8" | 16 | 245 | | 1370 |
| 4330EX/7S | - | 7/8" | - | 250 | | 1420 |
| 4330EX/9S | - | 1.1/8" | - | 250 | 1450 | |
| 4375EX/7S | - | 7/8" | - | 91 | 398 | 2900 |
| 4375EX/9S | - | 1.1/8" | - | | 398 | 3050 |



- 4303EX
- 4305EX
- 4308EX
- 4316EX
- 4330EX
- 4375EX

REFRIGERATING SYSTEM PROTECTORS

6.4 – HERMETIC FILTER DRIERS WITH MOISTURE INDICATOR

APPLICATIONS

The hermetic filter driers with moisture indicator in series DI2XXN - DI3XXN are considered "Pressure Vessels" according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These filters have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

These filters cannot be installed on systems that use HCFC (R22) refrigerant.

CONSTRUCTION

The filters in series DI2XXN - DI3XXN are drying filters for the liquid line with a moisture/liquid indicator brazed directly onto the outlet of the filter. This unit reduces the amount of field brazing required and the potential risk for refrigerant fluid leaks. The indicators ensure fast safe inspection of the conditions of the refrigerant fluid in the circuit regarding regular flow and the presence of moisture. The filter is completely manufactured in steel, with threaded SAE FLARE or ODS soldered connections in copper. The indicator is manufactured with the glass "lens" directly fused onto a steel metallic ring, with proper surface protection.

The cartridges are made from moulding a dehydrating filler made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics. The manufacturing process allows the product to be compact and strong, making it resistant to impact and abrasion.

OPERATION

The moisture/liquid indicators consist of a sensitive ring element that changes colour, from green to yellow, according to the percent moisture in the system.

The moisture content values that correspond to the "green" colour can be considered admissible for the proper operation of the system. When the sensitive element starts to yellow, "Chartreuse green", the threshold value has been reached and operating conditions could become difficult. When the sensitive element becomes "yellow", it's time to replace the filter dryer.

If the charge and operating conditions of the plant are normal, the refrigerant fluid appears perfectly liquid underneath the "lens" of the indicator. The presence of bubbles indicates that the refrigerant fluid is partially evaporating along the liquid line.

INSTALLATION

At start-up, the colour of the sensitive element may be yellow, due to exposure to air humidity or due to moisture in the circuit. When the moisture of the refrigerant is returned to acceptable levels by the filter drier, the indicator colour turns green again. This is evidence that equilibrium has been re-established. If the yellow colour persists, measures must be taken to eliminate moisture. Only when the sensitive element turns green again, is there evidence that measures adopted were effective. About 12 hours of system operation are required to achieve equilibrium. In any case, the moisture indication is usually read when the plant is in function and the fluid is flowing

Brazing of the filter/indicator with solder connections should be carried out with care, using a low melting point filler material (min. 5% Ag). Avoid direct contact between the torch flame and the indicator body or glass, which could be damaged and compromise the proper functioning of the indicator.

APPROVALS

Filters in series DI2XXN - DI3XXN have been approved by the American certification authority Underwriters Laboratories Inc. Filters in series DB3 are certified **UL-CSA** Listed for the USA and Canada with file SA7054, in compliance with American Standard UL 207 and Canadian Standard CSA C22.2 No. 140.3-15.



Castel

UL[®] LISTED 5005 FILTER/DRYERS
MWP=680PSIG
T.RANGE=-40/+176°F

**SOLID CORE
FILTER DRIER**

R134a - R404A - R407C -
R410A - R507 - R290

DI316N/4 164

PS = 47 bar
TS = -40/+80°C

V



Lot N. 4519

Made in China

FLOW DIRECTION



TABLE 22: General characteristics of filter driers with moisture indicator. SAE Flare connections

| Catalogue Number | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------------------|--|-----------------------------------|-------------|-----------|---------|------|---------------------------------------|
| | | | | | | min. | max. | |
| DI305N/2 | 052 | 104 | 80 | 1/4" | 50 (1) | -40 | +80 | Art. 4.3 |
| DI305N/3 | 053 | | | 3/8" | | | | |
| DI308N/2 | 082 | 141 | 130 | 1/4" | | | | |
| DI308N/3 | 083 | | | 3/8" | | | | |
| DI308N/4 | 084 | | | 1/2" | | | | |
| DI316N/2 | 162 | 183 | 250 | 1/4" | | | | |
| DI316N/3 | 163 | | | 3/8" | | | | |
| DI316N/4 | 164 | | | 1/2" | | | | |
| DI316N/5 | 165 | | | 5/8" | | | | |
| DI330N/3 | 303 | 345 | 500 | 3/8" | | | | |
| DI330N/4 | 304 | | | 1/2" | | | | |
| DI330N/5 | 305 | | | 5/8" | | | | |
| DI330N/6 | 306 | | | 3/4" | | | | |
| DI341N/5 | 415 | 384 | 670 | 5/8" | | | | |
| DI341N/6 | 416 | | | 3/4" | | | | |

(1) : MWP = 680 psi according to UL approval

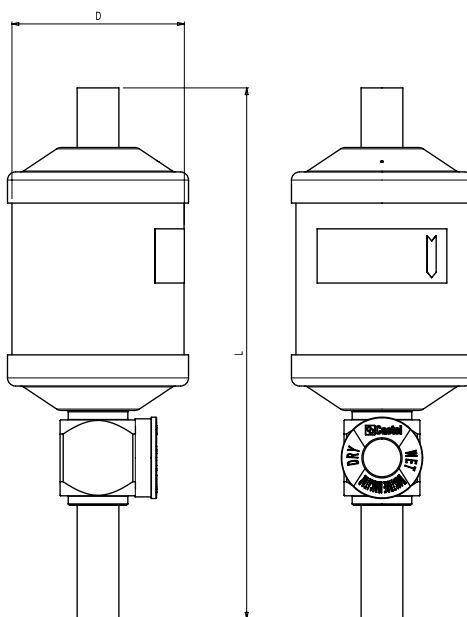
TABLE 23: General characteristics of filter driers with moisture indicator. ODS connections

| Catalogue Number | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------------------|--|-----------------------------------|-------------|--------|-----------|---------|------|---------------------------------------|
| | | | | ODS | | | min. | max. | |
| | | | | Ø [in.] | Ø [mm] | | | | |
| DI305N/2S | 052S | 104 | 80 | 1/4" | - | 50 (1) | -40 | +80 | Art. 4.3 |
| DI305N/3S | 053S | | | 3/8" | - | | | | |
| DI305N/M10S | - | | | - | 10 | | | | |
| DI308N/2S | 082S | 141 | 130 | 1/4" | - | | | | |
| DI308N/3S | 083S | | | 3/8" | - | | | | |
| DI308N/M10S | - | | | - | 10 | | | | |
| DI308N/M12S | - | | | - | 12 | | | | |
| DI308N/4S | 084S | 183 | 250 | 1/2" | - | | | | |
| DI316N/3S | 163S | | | 3/8" | - | | | | |
| DI316N/M10S | - | | | - | 10 | | | | |
| DI316N/M12S | - | | | - | 12 | | | | |
| DI316N/4S | 164S | | | 1/2" | - | | | | |
| DI316N/5S | 165S | | | 5/8" | 16 | | | | |
| DI316N/7S | 167S | 345 | 500 | 7/8" | - | | | | |
| DI330N/3S | 303S | | | 3/8" | - | | | | |
| DI330N/4S | 304S | | | 1/2" | - | | | | |
| DI330N/5S | 305S | | | 5/8" | 16 | | | | |
| DI330N/6S | 306S | | | 3/4" | - | | | | |
| DI330N/7S | 307S | | | 7/8" | - | | | | |
| DI341N/4S | 414S | | | 384 | 670 | 1/2" | - | | |
| DI341N/5S | 415S | 5/8" | 16 | | | | | | |
| DI341N/6S | 416S | 3/4" | - | | | | | | |
| DI341N/7S | 417S | 7/8" | - | | | | | | |

(1) : MWP = 680 psi according to UL approval

TABLE 24: Dimensions and weights of filters with moisture indicator

| Catalogue Number | Connections | | | Dimensions [mm] | | Weight [g] |
|------------------|-------------|---------|--------|-----------------|-----|------------|
| | SAE Flare | ODS | | Ø D | L | |
| | | Ø [in.] | Ø [mm] | | | |
| DI305N/2 | 1/4" | - | - | 64 | 155 | 650 |
| DI305N/2S | - | 1/4" | - | | 166 | 650 |
| DI305N/3 | 3/8" | - | - | | 165 | 680 |
| DI305N/3S | - | 3/8" | - | | 169 | 655 |
| DI305N/M10S | - | - | 10 | | 171 | |
| DI308N/2 | 1/4" | - | - | 64 | 176 | 760 |
| DI308N/2S | - | 1/4" | - | | 187 | 750 |
| DI308N/3 | 3/8" | - | - | | 186 | 790 |
| DI308N/3S | - | 3/8" | - | | 190 | 755 |
| DI308N/M10S | - | - | 10 | | 192 | 750 |
| DI308N/M12S | - | - | 12 | | 196 | 765 |
| DI308N/4 | 1/2" | - | - | | 191 | 810 |
| DI308N/4S | - | 1/2" | - | 194 | 770 | |
| DI316N/2 | 1/4" | - | - | 64 | 196 | |
| DI316N/3 | 3/8" | - | - | | 206 | 880 |
| DI316N/3S | - | 3/8" | - | | 210 | 860 |
| DI316N/M10S | - | - | 10 | | 212 | |
| DI316N/M12S | - | - | 12 | | 216 | |
| DI316N/4 | 1/2" | - | - | | 211 | |
| DI316N/4S | - | 1/2" | - | | 214 | 870 |
| DI316N/5 | 5/8" | - | - | | 221 | |
| DI316N/5S | - | 5/8" | 16 | | 221 | |
| DI316N/7S | - | 7/8" | - | | 250 | |
| DI330N/3 | 3/8" | - | - | | 76 | 278 |
| DI330N/3S | - | 3/8" | - | 282 | | |
| DI330N/4 | 1/2" | - | - | 283 | | |
| DI330N/4S | - | 1/2" | - | 286 | | |
| DI330N/5 | 5/8" | - | - | 293 | | |
| DI330N/5S | - | 5/8" | 16 | 293 | | |
| DI330N/6 | 3/4" | - | - | 319 | | |
| DI330N/6S | - | 3/4" | - | 316 | | |
| DI330N/7S | - | 7/8" | - | 321 | | |
| DI341N/4 | 1/2" | - | - | 89 | | 287 |
| DI341N/4S | - | 1/2" | - | | 290 | |
| DI341N/5 | 5/8" | - | - | | 297 | |
| DI341N/5S | - | 5/8" | 16 | | 297 | |
| DI341N/6 | 3/4" | - | - | | 323 | |
| DI341N/6S | - | 3/4" | - | | 320 | |
| DI341N/7S | - | 7/8" | - | | 325 | |



REFRIGERATING SYSTEM PROTECTORS

6.5 – BI-FLOW HERMETIC FILTER DRIERS

APPLICATIONS

The hermetic filters in series DB3 are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These filters have been developed by Castel to be installed on the liquid line of air conditioning systems with reverse-cycle, heat pumps, and refrigeration plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CONSTRUCTION

The filter body is made completely from steel with threaded connections, SAE FLARE, made from nickel plated steel. The product range also includes types with copper connections, EN 12735-1 - Cu-DHP; offering the possibility to solder the copper pipe inside the connections (ODS). Bi-flow filters have two built-in check valves, inserted inside on both sides of the filter, which ensure that the refrigerant liquid always flows correctly from the outside of the cartridge to its core, regardless of the flow direction. Thus, all dirt particles in the circuit are trapped by the filter, regardless of the flow direction.

The cartridges are made from moulding a dehydrating filler made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics. The manufacturing process allows both products to be compact and strong, making them resistant to impact and abrasion. The cartridges are symmetrical and are designed to offer the maximum possible surface area to the incoming fluid, while the core hole guarantees a uniform wall thickness. As a result, the fluid encounters constant resistance, flows linearly, ensuring efficient dehydration and minimum charge loss. The cartridge is chemically inert, not deliquescent, does not react with refrigerating fluids, and is capable of capturing all oil by-products in the circuit.

When building heat pump systems or air conditioning systems with reverse-cycle, the use of bi-flow filter driers eliminates the need

for external check valves and reduces external piping and brazing.

FILTER SELECTION BASED ON REFRIGERANT FLOW CAPACITY

Refrigerant flow capacities shown in Tables 27-28 refer to the following operating conditions according to ARI STANDARD 710-2009:

- Liquid temperature + 30 °C
- Evaporating temperature - 15 °C

Total pressure drop, including inlet and outlet connections, 0.07 bar / 0.14 bar

For different operating conditions apply the following formula:

$$Q = Q_{ref} \times L_1$$

where:

Q = required refrigeration flow capacity [kW]

Q_{ref} = reference refrigeration flow capacity [kW] (see Tables 27-28)

L₁ = flow capacity correction factor in presence of operative temperatures different from reference conditions. (See Table 8)

APPROVALS

Filters in series DB3 have been approved by the American certification authority Underwriters Laboratories Inc. Filters in series DB3 are certified **UL-CSA** Listed for the USA and Canada with file SA7054, in compliance with American Standard UL 207 and Canadian Standard CSA C22.2 No. 140.3-15.



TABLE 25: General characteristics of bi-flow hermetic filter driers. SAE Flare connections

| Catalogue Number | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------------------|-------------------------|--|-----------------------------------|-------------|----------|---------|------|---------------------------------------|
| | | | | | | min. | max. | |
| 100% molecular sieves | | | | | | | | |
| DB305/2 | 052 | 47 | 80 | 1/4" | 50 (1) | -40 | +80 | Art. 4.3 |
| DB308/3 | 083 | 78 | 130 | 3/8" | | | | |
| DB308/4 | 084 | | | 1/2" | | | | |
| DB316/3 | 163 | 134 | 250 | 3/8" | | | | |
| DB316/4 | 164 | | | 1/2" | | | | |
| DB316/5 | 165 | | | 5/8" | | | | |
| DB330/5 | 305 | 274 | 500 | 5/8" | | | | |

(1) : MWP = 680 psi according to UL approval

TABLE 26: General characteristics of hermetic bi-flow filter driers. ODS connections

| Catalogue Number | International Reference | Block Filtering Surface [cm ²] | Nominal Volume [cm ³] | Connections | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|-----------------------|-------------------------|--|-----------------------------------|-------------|--------|----------|---------|------|---------------------------------------|
| | | | | ODS | | | min. | max. | |
| | | | | Ø [in.] | Ø [mm] | | | | |
| 100% molecular sieves | | | | | | | | | |
| DB305/2S | 052S | 47 | 80 | 1/4" | - | 50 (1) | -40 | +80 | Art. 4.3 |
| DB308/3S | 083S | 78 | 130 | 3/8" | - | | | | |
| DB308/4S | 084S | | | 1/2" | - | | | | |
| DB316/3S | 163S | 134 | 250 | 3/8" | - | | | | |
| DB316/4S | 164S | | | 1/2" | - | | | | |
| DB316/5S | 165S | | | 5/8" | 16 | | | | |
| DB316/7S | 167S | | | 7/8" | - | | | | |
| DB330/5S | 305S | 274 | 500 | 5/8" | 16 | | | | |
| DB330/7S | 307S | | | 7/8" | - | | | | |
| DB330/9S | 309S | | | 1.1/8" | - | | | | |

(1) : MWP = 680 psi according to UL approval

TABLE 27: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | | |
|------------------|--------------|------|-------|-------|-------|------|---------|---------|-------|-------|
| | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| DB305/2 | 5,3 | 8,2 | 3,8 | 5,5 | 5,6 | 3,7 | 3,9 | 4,7 | 5,1 | 5,0 |
| DB305/2S | 8,3 | 12,9 | 6,0 | 8,6 | 8,8 | 5,8 | 6,1 | 7,4 | 7,9 | 7,8 |
| DB308/3 | 11,3 | 17,4 | 8,0 | 11,6 | 11,9 | 7,8 | 8,2 | 10,0 | 10,7 | 10,6 |
| DB308/3S | 12,6 | 19,4 | 9,0 | 12,9 | 13,3 | 8,7 | 9,1 | 11,1 | 11,9 | 11,8 |
| DB308/4 | 15,2 | 23,5 | 10,9 | 15,7 | 16,1 | 10,5 | 11,0 | 13,4 | 14,5 | 14,3 |
| DB308/4S | 17,0 | 26,2 | 12,1 | 17,5 | 17,9 | 11,7 | 12,3 | 15,0 | 16,1 | 15,9 |
| DB316/3 | 15,7 | 24,2 | 11,2 | 16,2 | 16,6 | 10,9 | 11,4 | 13,9 | 14,9 | 14,7 |
| DB316/3S | 17,6 | 27,1 | 12,6 | 18,1 | 18,6 | 12,2 | 12,8 | 15,6 | 16,7 | 16,5 |
| DB316/4 | 26,0 | 40,0 | 18,5 | 26,7 | 27,4 | 18,0 | 18,8 | 22,9 | 24,7 | 24,3 |
| DB316/4S | 27,9 | 43,0 | 19,9 | 28,7 | 29,5 | 19,3 | 20,2 | 24,6 | 26,5 | 26,1 |
| DB316/5 | 31,9 | 49,2 | 22,8 | 32,9 | 33,7 | 22,1 | 23,1 | 28,2 | 30,3 | 29,9 |
| DB316/5S | 34,3 | 52,9 | 24,5 | 35,3 | 36,2 | 23,7 | 24,9 | 30,3 | 32,6 | 32,2 |
| DB316/7S | 37,7 | 58,1 | 26,9 | 38,8 | 39,8 | 26,1 | 27,3 | 33,3 | 35,8 | 35,3 |
| DB330/5 | 34,0 | 52,5 | 24,3 | 35,1 | 35,9 | 23,6 | 24,7 | 30,1 | 32,4 | 31,9 |
| DB330/5S | 36,7 | 56,6 | 26,2 | 37,8 | 38,8 | 25,4 | 26,6 | 32,4 | 34,9 | 34,4 |
| DB330/7S | 40,3 | 62,2 | 28,8 | 41,6 | 42,6 | 27,9 | 29,3 | 35,6 | 38,4 | 37,8 |
| DB330/9S | 43,1 | 66,5 | 30,7 | 44,4 | 45,5 | 29,8 | 31,3 | 38,1 | 41,0 | 40,4 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 27: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| | R450A | R452A | R452B | R454B | R515A | R290 | R600 | R600a | R1270 |
| DB305/2 | 4,2 | 3,8 | 6,5 | 6,6 | 4,5 | 6,4 | 7,3 | 6,4 | 6,7 |
| DB305/2S | 6,7 | 6,0 | 10,2 | 10,4 | 7,0 | 10,1 | 11,4 | 10,0 | 10,4 |
| DB308/3 | 9,0 | 8,1 | 13,8 | 14,0 | 9,5 | 13,6 | 15,4 | 13,6 | 14,1 |
| DB308/3S | 10,0 | 9,1 | 15,4 | 15,6 | 10,6 | 15,1 | 17,1 | 15,1 | 15,7 |
| DB308/4 | 12,2 | 11,0 | 18,6 | 18,9 | 12,8 | 18,3 | 20,8 | 18,3 | 19,0 |
| DB308/4S | 13,5 | 12,2 | 20,8 | 21,1 | 14,3 | 20,4 | 23,1 | 20,4 | 21,2 |
| DB316/3 | 12,5 | 11,3 | 19,2 | 19,5 | 13,2 | 18,9 | 21,4 | 18,9 | 19,6 |
| DB316/3S | 14,1 | 12,7 | 21,6 | 21,9 | 14,8 | 21,2 | 24,0 | 21,2 | 22,0 |
| DB316/4 | 20,7 | 18,7 | 31,8 | 32,3 | 21,8 | 31,3 | 35,4 | 31,2 | 32,5 |
| DB316/4S | 22,3 | 20,1 | 34,1 | 34,7 | 23,4 | 33,6 | 38,0 | 33,5 | 34,9 |
| DB316/5 | 25,5 | 23,0 | 39,1 | 39,7 | 26,8 | 38,5 | 43,5 | 38,3 | 39,9 |
| DB316/5S | 27,4 | 24,8 | 42,0 | 42,6 | 28,8 | 41,3 | 46,8 | 41,2 | 42,9 |
| DB316/7S | 30,1 | 27,2 | 46,2 | 46,9 | 31,7 | 45,4 | 51,4 | 45,3 | 47,1 |
| DB330/5 | 27,2 | 24,6 | 41,7 | 42,3 | 28,6 | 41,0 | 46,4 | 40,9 | 42,6 |
| DB330/5S | 29,3 | 26,5 | 44,9 | 45,6 | 30,8 | 44,2 | 50,0 | 44,1 | 45,9 |
| DB330/7S | 32,2 | 29,1 | 49,4 | 50,2 | 33,9 | 48,6 | 55,0 | 48,5 | 50,5 |
| DB330/9S | 34,4 | 31,1 | 52,8 | 53,6 | 36,2 | 51,9 | 58,8 | 51,8 | 53,9 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 28: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | | |
|------------------|--------------|------|-------|-------|-------|------|---------|---------|-------|-------|
| | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| DB305/2 | 6,6 | 10,3 | 4,7 | 6,9 | 7,0 | 4,6 | 4,8 | 5,9 | 6,3 | 6,2 |
| DB305/2S | 10,4 | 16,1 | 7,4 | 10,7 | 11,0 | 7,2 | 7,6 | 9,2 | 9,9 | 9,8 |
| DB308/3 | 14,1 | 21,7 | 10,1 | 14,5 | 14,9 | 9,8 | 10,2 | 12,5 | 13,4 | 13,2 |
| DB308/3S | 15,7 | 24,2 | 11,2 | 16,2 | 16,6 | 10,9 | 11,4 | 13,9 | 14,9 | 14,7 |
| DB308/4 | 19,0 | 29,3 | 13,6 | 19,6 | 20,1 | 13,2 | 13,8 | 16,8 | 18,1 | 17,8 |
| DB308/4S | 21,2 | 32,7 | 15,1 | 21,9 | 22,4 | 14,7 | 15,4 | 18,7 | 20,2 | 19,9 |
| DB316/3 | 19,6 | 30,3 | 14,0 | 20,2 | 20,7 | 13,6 | 14,2 | 17,3 | 18,7 | 18,4 |
| DB316/3S | 22,0 | 33,9 | 15,7 | 22,7 | 23,3 | 15,2 | 16,0 | 19,4 | 20,9 | 20,6 |
| DB316/4 | 32,4 | 50,0 | 23,1 | 33,4 | 34,3 | 22,5 | 23,5 | 28,7 | 30,8 | 30,4 |
| DB316/4S | 34,8 | 53,7 | 24,9 | 35,9 | 36,8 | 24,1 | 25,3 | 30,8 | 33,1 | 32,7 |
| DB316/5 | 39,9 | 61,5 | 28,4 | 41,1 | 42,2 | 27,6 | 28,9 | 35,2 | 37,9 | 37,4 |
| DB316/5S | 42,9 | 66,1 | 30,6 | 44,2 | 45,3 | 29,7 | 31,1 | 37,9 | 40,8 | 40,2 |
| DB316/7S | 47,1 | 72,6 | 33,6 | 48,5 | 49,8 | 32,6 | 34,2 | 41,6 | 44,8 | 44,2 |
| DB330/5 | 42,5 | 65,6 | 30,3 | 43,8 | 44,9 | 29,4 | 30,8 | 37,6 | 40,4 | 39,9 |
| DB330/5S | 45,9 | 70,7 | 32,7 | 47,3 | 48,5 | 31,8 | 33,3 | 40,5 | 43,6 | 43,0 |
| DB330/7S | 50,4 | 77,8 | 36,0 | 52,0 | 53,3 | 34,9 | 36,6 | 44,6 | 48,0 | 47,3 |
| DB330/9S | 53,9 | 83,1 | 38,4 | 55,5 | 56,9 | 37,3 | 39,1 | 47,6 | 51,2 | 50,5 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 28: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| DB305/2 | 5,3 | 4,8 | 8,1 | 8,3 | 5,6 | 8,0 | 9,1 | 8,0 | 8,3 |
| DB305/2S | 8,3 | 7,5 | 12,8 | 13,0 | 8,8 | 12,6 | 14,2 | 12,5 | 13,0 |
| DB308/3 | 11,3 | 10,2 | 17,3 | 17,5 | 11,9 | 17,0 | 19,2 | 16,9 | 17,6 |
| DB308/3S | 12,5 | 11,3 | 19,2 | 19,5 | 13,2 | 18,9 | 21,4 | 18,9 | 19,6 |
| DB308/4 | 15,2 | 13,7 | 23,3 | 23,7 | 16,0 | 22,9 | 26,0 | 22,9 | 23,8 |
| DB308/4S | 16,9 | 15,3 | 26,0 | 26,4 | 17,8 | 25,6 | 28,9 | 25,5 | 26,5 |
| DB316/3 | 15,7 | 14,2 | 24,0 | 24,4 | 16,5 | 23,6 | 26,8 | 23,6 | 24,5 |
| DB316/3S | 17,6 | 15,9 | 27,0 | 27,4 | 18,5 | 26,5 | 30,0 | 26,4 | 27,5 |
| DB316/4 | 25,9 | 23,4 | 39,7 | 40,3 | 27,3 | 39,1 | 44,3 | 39,0 | 40,6 |
| DB316/4S | 27,8 | 25,2 | 42,7 | 43,3 | 29,3 | 42,0 | 47,5 | 41,9 | 43,6 |
| DB316/5 | 31,8 | 28,8 | 48,9 | 49,6 | 33,5 | 48,1 | 54,4 | 47,9 | 49,9 |
| DB316/5S | 34,2 | 30,9 | 52,5 | 53,3 | 36,0 | 51,7 | 58,5 | 51,5 | 53,6 |
| DB316/7S | 37,6 | 34,0 | 57,7 | 58,6 | 39,6 | 56,8 | 64,3 | 56,6 | 58,9 |
| DB330/5 | 33,9 | 30,7 | 52,1 | 52,9 | 35,8 | 51,2 | 58,0 | 51,1 | 53,2 |
| DB330/5S | 36,6 | 33,1 | 56,2 | 57,0 | 38,6 | 55,3 | 62,6 | 55,1 | 57,4 |
| DB330/7S | 40,3 | 36,4 | 61,8 | 62,7 | 42,4 | 60,8 | 68,8 | 60,6 | 63,1 |
| DB330/9S | 43,0 | 38,9 | 66,0 | 67,0 | 45,3 | 64,9 | 73,5 | 64,7 | 67,4 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar, inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

NOTE: for temperatures different from standard values use correction factors L1 listed on TABLE 8

TABLE 29: Water capacity and dehydratable charge of hermetic bi-flow filter driers

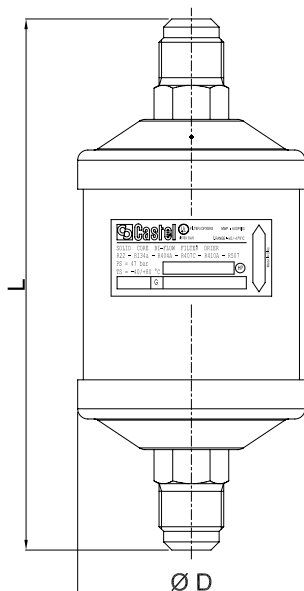
| Catalogue Number | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|------------------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|---------------------------------------|------------|-------|-------|---|------------|-------|-------|
| | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| | DB305/2 | 6,4 | 6,5 | 5,2 | 5,7 | 6,9 | 7,0 | 5,6 | 6,1 | 5,5 | 6,1 | 4,2 | 4,6 | 5,9 | 6,6 | 4,5 |
| DB305/2S | | | | | | | | | | | | | | | | |
| DB308/3 | | | | | | | | | | | | | | | | |
| DB308/3S | 11,4 | 11,6 | 9,3 | 10,1 | 12,3 | 12,5 | 10,0 | 10,9 | 9,8 | 10,8 | 7,5 | 8,2 | 10,5 | 11,6 | 8,1 | 8,8 |
| DB308/4 | | | | | | | | | | | | | | | | |
| DB308/4S | | | | | | | | | | | | | | | | |
| DB316/3 | | | | | | | | | | | | | | | | |
| DB316/3S | | | | | | | | | | | | | | | | |
| DB316/4 | | | | | | | | | | | | | | | | |
| DB316/4S | 24,7 | 25,3 | 20,3 | 22,1 | 26,6 | 27,2 | 21,8 | 23,8 | 21,3 | 23,5 | 16,3 | 17,8 | 22,9 | 25,3 | 17,5 | 19,1 |
| DB316/5 | | | | | | | | | | | | | | | | |
| DB316/5S | | | | | | | | | | | | | | | | |
| DB316/7S | | | | | | | | | | | | | | | | |
| DB330/5 | | | | | | | | | | | | | | | | |
| DB330/5S | 51,3 | 52,4 | 42,0 | 45,7 | 55,2 | 56,3 | 45,2 | 49,1 | 44,2 | 48,7 | 33,8 | 36,8 | 47,5 | 52,4 | 36,3 | 39,6 |
| DB330/7S | | | | | | | | | | | | | | | | |
| DB330/9S | | | | | | | | | | | | | | | | |

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:

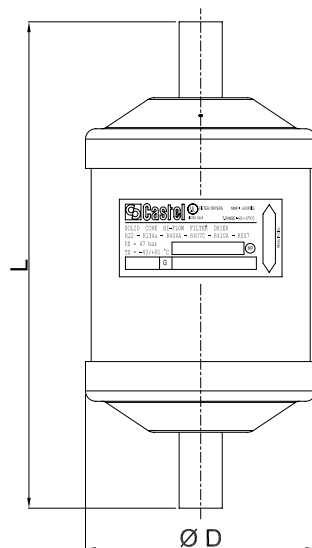
- Liquid temperatures: 24 °C and 52 °C
- Equilibrium point dryness, EPD: 60 ppm for R22
- Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

TABLE 30: Dimensions and weights of bi-flow filters

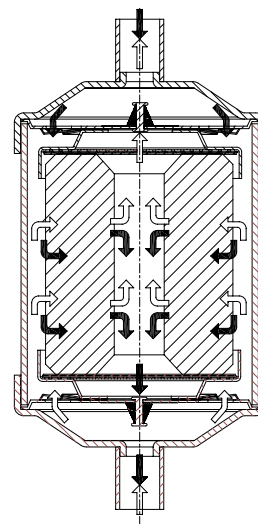
| Catalogue Number | Connections | | | Dimensions [mm] | | Weight [g] |
|------------------|-------------|---------|--------|-----------------|-----|------------|
| | SAE Flare | ODS | | Ø D | L | |
| | | Ø [in.] | Ø [mm] | | | |
| DB305/2 | 1/4" | - | - | 64 | 121 | 480 |
| DB305/2S | - | 1/4" | - | | 113 | 460 |
| DB308/3 | 3/8" | - | - | 64 | 152 | 600 |
| DB308/3S | - | 3/8" | - | | 138 | 560 |
| DB308/4 | 1/2" | - | - | | 157 | 630 |
| DB308/4S | - | 1/2" | - | | 138 | 570 |
| DB316/3 | 3/8" | - | - | 64 | 171 | 1000 |
| DB316/3S | - | 3/8" | - | | 157 | 970 |
| DB316/4 | 1/2" | - | - | | 176 | 1050 |
| DB316/4S | - | 1/2" | - | | 157 | 990 |
| DB316/5 | 5/8" | - | - | | 186 | 1100 |
| DB316/5S | - | 5/8" | 16 | | 163 | 1000 |
| DB316/7S | - | 7/8" | - | | 177 | 1030 |
| DB330/5 | 5/8" | - | - | | 76 | 260 |
| DB330/5S | - | 5/8" | 16 | 237 | | 1500 |
| DB330/7S | - | 7/8" | - | 251 | | 1550 |
| DB330/9S | - | 1.1/8" | - | 259 | | 1590 |



Male connections



Solder connections



REFRIGERATING SYSTEM PROTECTORS

6.6 – REPLACEABLE SOLID CORE FILTER DRIERS

APPLICATIONS

The replaceable filter driers in series 4411/XXAF and 4412/XXAF are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These filters have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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

In the case of filters with two cartridges, the fluid passage takes place in parallel. As a result, the pressure drop does not increase in proportion with the number of cartridges. A large ring area between the cartridge and the inner surface of the filter allows for the accumulation of solid particles and prevents clogging. Before leaving the filter, the refrigerant fluid must pass through the mesh sieve in which cartridges are mounted. This eliminates the danger that small particles of drying material be dragged into circulation. Furthermore, at the filter outlet, a plastic cup, the edge of which closely adheres to the inner surface of the filter, prevents dirt from reaching the outlet connection during normal operation and cartridge change.

CONSTRUCTION

Filter shells: these are built with an aluminium cover, zinc plated screws, and the steel body is equipped with brazing connections machined from a steel bar EN 10025 S355JR.

They are sold in the following two configurations:

- Codes with an “A” suffix, equipped with 1/4” NPT threaded cover for mounting an access fitting with valve core (for example G9150/R05)
- Codes with a “B” suffix, equipped with blind cover

Cartridges 4490, type A and type B: are made from moulding a

dehydrating filler, made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics.

Cartridges 4490, type AA and type AB: are made from moulding a dehydrating filler, made from 80% 3 Å molecular sieves and 20% activated alumina, with a suitable binder. The use of a blend of molecular sieves – activated alumina, grant the cartridges a very high deacidifying capacity maintaining very good moisture adsorption characteristics.

The presence of a controlled and defined percentage of activated alumina, lower than the maximum value recommended by ASERCOM, maintains the original concentration of additives in the polyester oil.

The cartridges have volume of 48 cubic inches (equivalent to about 800 cm³), have a hollow cylinder shape and are of the same size as the corresponding products of the main international brands. Consequently they are interchangeable. The hollow cylinder shape provides a large surface area to the fluid which to cross it in a radial direction. As a result, drying is highly efficient with a minimum loss of charge.

CARTRIDGE REPLACEMENT

Cartridges must be ordered separately from the filter. They are supplied in individual packages, which are hermetically sealed in metal containers. This type of packaging is suitable for long-term storage of the cartridge.

Each cartridge is supplied with two synthetic gaskets to be used as a seal between the two cartridges and between the cartridge and its covers.

If the filter is installed in a system without a by-pass, the cartridge replacement must be done following these instructions:

- 1 Close the valve on the liquid outlet line.
 - 2 Start the compressor and its auxiliaries in order to transfer the refrigerant charge to the high pressure side of the plant (liquid vessel);
 - 3 Stop the compressor at a sufficiently high suction pressure above atmospheric pressure;
 - 4 Close the service valve on the suction side of the compressor.
- NOTE: if during the transfer of the refrigerant to the high-pressure side of the plant, the discharge pressures reach values that are too high (the condenser is flooded due to insufficient capacity of the liquid vessel), shut off the valve on the suction side of the compressor and immediately stop the compressor.
- 5 Quickly replace the filter cartridge. During preparation for



installation of the new cartridge, wrap the filter in a clean rag. The slight over-pressure in the filter and the technician's skill will prevent air from getting into the plant.

6 The cleanliness of the inside of the body is guaranteed by the scraping effect of the cup, which is characteristic of Castel filters. If it is assumed that air has entered the plant during filter cartridge replacement, put the low-pressure side of the plant under vacuum. Always do this to the circuit involved in the operation.

7 Open the valve on the liquid outlet line.

8 Slowly open the compressor's suction valve and start the compressor and its auxiliaries.

9 Top the charge up, if necessary.

APPROVALS

Filters in series 4411/XXF and 4412/XXF have been approved by the American certification authority Underwriters Laboratories Inc. with file SA7054, in compliance with American standard UL 207.

TABLE 31: General characteristics of filter driers with replaceable solid core

| Catalogue Number | Core Cat. Number | Number of Cores | Core Filtering Surface [cm ²] | Nominal Volume | | Connections | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|--|-----------------|---|----------------|--------------------|-------------|--------|--------|-----------|---------|------|---------------------------------------|
| | | | | [cu.in.] | [cm ³] | ODS | | W | | min. | max. | |
| Theaded cover | | | | | | Ø [in.] | Ø [mm] | Ø [mm] | | | | |
| 4411/5AF | 4490/A 4490/B 4490/AA 4490/AB | 1 | 420 | 48 | 800 | 5/8" | 16 | 21,3 | 50 (1) | -40 | +80 | II |
| 4411/7AF | | | | | | 7/8" | 22 | 26,9 | | | | |
| 4411/9AF | | | | | | 1.1/8" | - | 33,7 | | | | |
| 4411/11AF | | | | | | 1.3/8" | 35 | 42,4 | | | | |
| 4411/13AF | | | | | | 1.5/8" | - | 48,3 | | | | |
| 4411/M42AF | | | | | | - | 42 | 48,3 | | | | |
| 4411/17AF | | | | | | 2.1/8" | 54 | 60,3 | | | | |
| 4412/7AF | | 2 | 840 | 96 | 1600 | 7/8" | 22 | 26,9 | | | | |
| 4412/9AF | | | | | | 1.1/8" | - | 33,7 | | | | |
| 4412/11AF | | | | | | 1.3/8" | 35 | 42,4 | | | | |
| 4412/M42AF | - | | | | | 42 | 48,3 | | | | | |
| 4412/17AF | 2.1/8" | | | | | 54 | 60,3 | | | | | |

(1) : MWP = 470 psi according to UL approval

TABLE 32: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|------|---------|---------|-------|-------|
| | R134a | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 4411/5AF | 83 | 59 | 85 | 87 | 57 | 60 | 73 | 78 | 77 |
| 4411/7AF | 145 | 103 | 149 | 153 | 100 | 105 | 128 | 138 | 136 |
| 4411/9AF | 198 | 141 | 204 | 209 | 137 | 144 | 175 | 188 | 186 |
| 4411/11AF | 231 | 165 | 238 | 244 | 160 | 168 | 204 | 220 | 217 |
| 4411/13AF | 248 | 177 | 255 | 262 | 171 | 180 | 219 | 235 | 232 |
| 4411/M42AF | 248 | 177 | 255 | 262 | 171 | 180 | 219 | 235 | 232 |
| 4411/17AF | 248 | 177 | 255 | 262 | 171 | 180 | 219 | 235 | 232 |
| 4412/7AF | 145 | 103 | 149 | 153 | 100 | 105 | 128 | 138 | 136 |
| 4412/9AF | 224 | 160 | 231 | 236 | 155 | 162 | 198 | 213 | 210 |
| 4412/11AF | 304 | 216 | 313 | 321 | 210 | 220 | 268 | 289 | 285 |
| 4412/13AF | 331 | 236 | 341 | 350 | 229 | 240 | 292 | 315 | 310 |
| 4412/M42AF | 331 | 236 | 341 | 350 | 229 | 240 | 292 | 315 | 310 |
| 4412/17AF | 331 | 236 | 341 | 350 | 229 | 240 | 292 | 315 | 310 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

TABLE 32: Refrigerant flow capacity with pressure drop 0,07 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 4411/5AF | 66 | 60 | 101 | 103 | 69 | 99 | 113 | 99 | 103 |
| 4411/7AF | 116 | 105 | 177 | 180 | 122 | 175 | 198 | 174 | 181 |
| 4411/9AF | 158 | 143 | 243 | 246 | 167 | 239 | 270 | 238 | 248 |
| 4411/11AF | 184 | 167 | 283 | 287 | 194 | 278 | 315 | 278 | 289 |
| 4411/13AF | 198 | 179 | 303 | 308 | 208 | 298 | 338 | 298 | 310 |
| 4411/M42AF | 198 | 179 | 303 | 308 | 208 | 298 | 338 | 298 | 310 |
| 4411/17AF | 198 | 179 | 303 | 308 | 208 | 298 | 338 | 298 | 310 |
| 4412/7AF | 116 | 105 | 177 | 180 | 122 | 175 | 198 | 174 | 181 |
| 4412/9AF | 179 | 162 | 274 | 278 | 188 | 270 | 305 | 269 | 280 |
| 4412/11AF | 242 | 219 | 372 | 377 | 255 | 366 | 414 | 365 | 380 |
| 4412/13AF | 264 | 239 | 405 | 412 | 278 | 399 | 452 | 398 | 414 |
| 4412/M42AF | 264 | 239 | 405 | 412 | 278 | 399 | 452 | 398 | 414 |
| 4412/17AF | 264 | 239 | 405 | 412 | 278 | 399 | 452 | 398 | 414 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

TABLE 33: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|------|---------|---------|-------|-------|
| | R134a | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 4411/5AF | 99 | 71 | 102 | 105 | 69 | 72 | 87 | 94 | 93 |
| 4411/7AF | 188 | 134 | 194 | 199 | 130 | 137 | 166 | 179 | 177 |
| 4411/9AF | 257 | 184 | 265 | 272 | 178 | 187 | 227 | 245 | 241 |
| 4411/11AF | 300 | 214 | 310 | 317 | 208 | 218 | 265 | 286 | 282 |
| 4411/13AF | 322 | 230 | 332 | 340 | 223 | 233 | 284 | 306 | 302 |
| 4411/M42AF | 322 | 230 | 332 | 340 | 223 | 233 | 284 | 306 | 302 |
| 4411/17AF | 322 | 230 | 332 | 340 | 223 | 233 | 284 | 306 | 302 |
| 4412/7AF | 188 | 134 | 194 | 199 | 130 | 137 | 166 | 179 | 177 |
| 4412/9AF | 291 | 207 | 300 | 307 | 201 | 211 | 257 | 277 | 273 |
| 4412/11AF | 395 | 281 | 407 | 417 | 273 | 286 | 349 | 375 | 370 |
| 4412/13AF | 447 | 319 | 461 | 472 | 309 | 324 | 395 | 425 | 419 |
| 4412/M42AF | 447 | 319 | 461 | 472 | 309 | 324 | 395 | 425 | 419 |
| 4412/17AF | 447 | 319 | 461 | 472 | 309 | 324 | 395 | 425 | 419 |

continue →

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

TABLE 33: Refrigerant flow capacity with pressure drop 0,14 bar (1) [kW]

| Catalogue Number | Refrigerants | | | | | | | | |
|------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 4411/5AF | 79 | 71 | 121 | 123 | 83 | 119 | 135 | 119 | 124 |
| 4411/7AF | 150 | 136 | 231 | 234 | 158 | 227 | 257 | 226 | 236 |
| 4411/9AF | 206 | 186 | 315 | 320 | 216 | 310 | 351 | 309 | 322 |
| 4411/11AF | 240 | 217 | 368 | 373 | 253 | 362 | 410 | 361 | 376 |
| 4411/13AF | 257 | 232 | 394 | 400 | 271 | 388 | 439 | 387 | 403 |
| 4411/M42AF | 257 | 232 | 394 | 400 | 271 | 388 | 439 | 387 | 403 |
| 4411/17AF | 257 | 232 | 394 | 400 | 271 | 388 | 439 | 387 | 403 |
| 4412/7AF | 150 | 136 | 231 | 234 | 158 | 227 | 257 | 226 | 236 |
| 4412/9AF | 232 | 210 | 356 | 362 | 245 | 351 | 397 | 350 | 364 |
| 4412/11AF | 315 | 285 | 483 | 491 | 332 | 475 | 538 | 474 | 494 |
| 4412/13AF | 357 | 323 | 547 | 556 | 376 | 539 | 610 | 537 | 559 |
| 4412/M42AF | 357 | 323 | 547 | 556 | 376 | 539 | 610 | 537 | 559 |
| 4412/17AF | 357 | 323 | 547 | 556 | 376 | 539 | 610 | 537 | 559 |

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

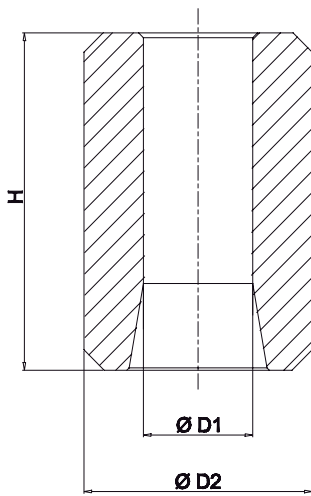
TABLE 34: General characteristics, dimensions and weights of solid cores

| Catalogue Number | Batch characteristic | Filtering Surface [cm ²] | Nominal Volume | | Dimensions [mm] | | | Weight [g] |
|------------------|---|--------------------------------------|----------------|--------------------|-----------------|------|-----|------------|
| | | | [cu.in] | [cm ³] | Ø D1 | Ø D2 | H | |
| 4490/A (1) | High moisture adsorption (100% molecular sieve) | 420 | 48 | 800 | 50 | 94 | 140 | 730 |
| 4490/B (2) | | | | | | | | |
| 4490/AA (1) | Moisture and acid adsorption (80% molecular sieve + 20% activated alumina) | 420 | 48 | 800 | 50 | 94 | 140 | 730 |
| 4490/AB (2) | | | | | | | | |
| 4491/A (3) | High moisture adsorption (100% molecular sieve) | 630 | 100 | 1600 | 53 | 122 | 165 | 1560 |
| 4491/AA (3) | | | | | | | | |

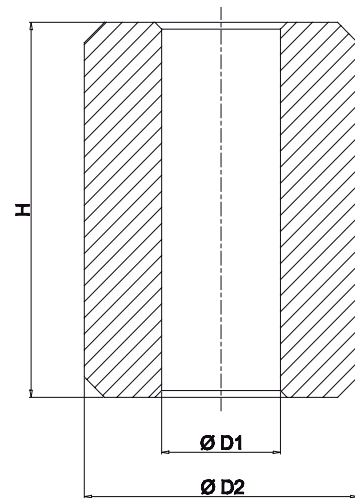
(1): Supplied with cover gaskets as spare part, either for Castel filters or for competitors ones

(2): Supplied without cover gasket as part part

(3): Supplied with cover gasket as spare part



4490



4491

TABLE 35: Water capacity and dehydratable charge of one solid core

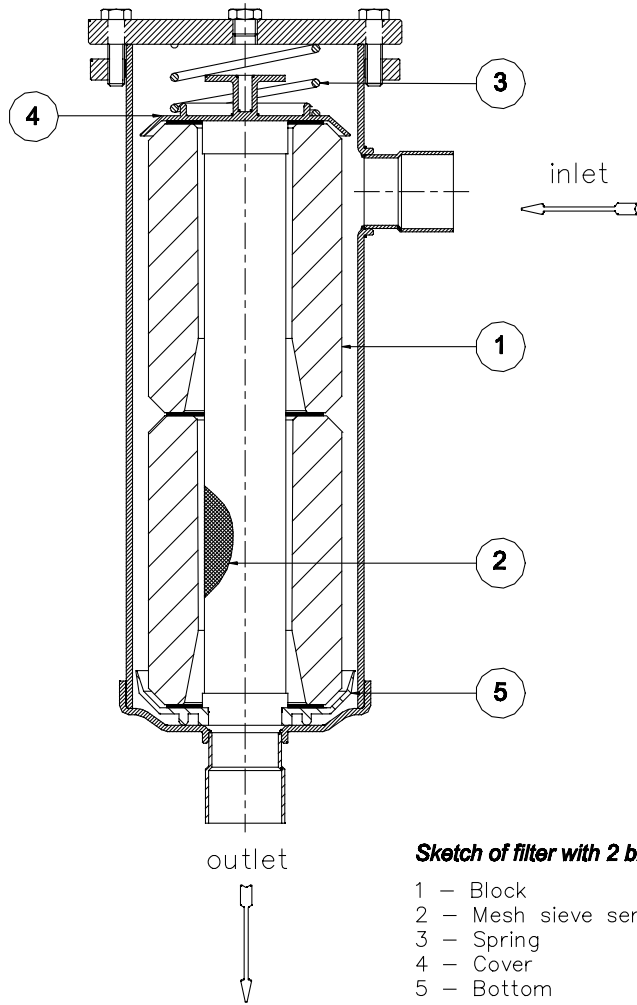
| Catalogue Number | Nominal Volume | | Water Capacity at + 24 °C (1) [g H2O] | | | | Dehydratable Charge at + 24 °C [kg refrigerant] | | | |
|--------------------|----------------|-------|--|------------|-------|-------|--|------------|-------|-------|
| | [cu. in] | [cm3] | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| 4490/A 4490/B | 48 | 800 | 82 | 84 | 67 | 73 | 88 | 90 | 72 | 79 |
| 4490/AA 4490/AB | | | 70 | 71 | 57 | 62 | 75 | 77 | 61 | 67 |
| 4491/A | 100 | 1600 | 216 | 220 | 177 | 192 | 232 | 237 | 190 | 207 |
| 4491/AA | | | 183 | 187 | 150 | 163 | 197 | 201 | 161 | 176 |

| Catalogue Number | Nominal Volume | | Water Capacity at + 52 °C (1) [g H2O] | | | | Dehydratable Charge at + 52 °C [kg refrigerant] | | | |
|--------------------|----------------|-------|--|------------|-------|-------|--|------------|-------|-------|
| | [cu. in] | [cm3] | R134a | R404A R507 | R407C | R410A | R134a | R404A R507 | R407C | R410A |
| 4490/A 4490/B | 48 | 800 | 71 | 78 | 54 | 59 | 76 | 84 | 58 | 63 |
| 4490/AA 4490/AB | | | 60 | 66 | 46 | 50 | 65 | 71 | 50 | 54 |
| 4491/A | 100 | 1600 | 186 | 205 | 142 | 155 | 200 | 220 | 153 | 166 |
| 4491/AA | | | 158 | 174 | 121 | 131 | 170 | 187 | 130 | 141 |

- (1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2009 and DIN 8949:2000:
- Liquid temperatures: 24 °C and 52 °C
 - Equilibrium point dryness, EPD: 60 ppm for R22
 - Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507

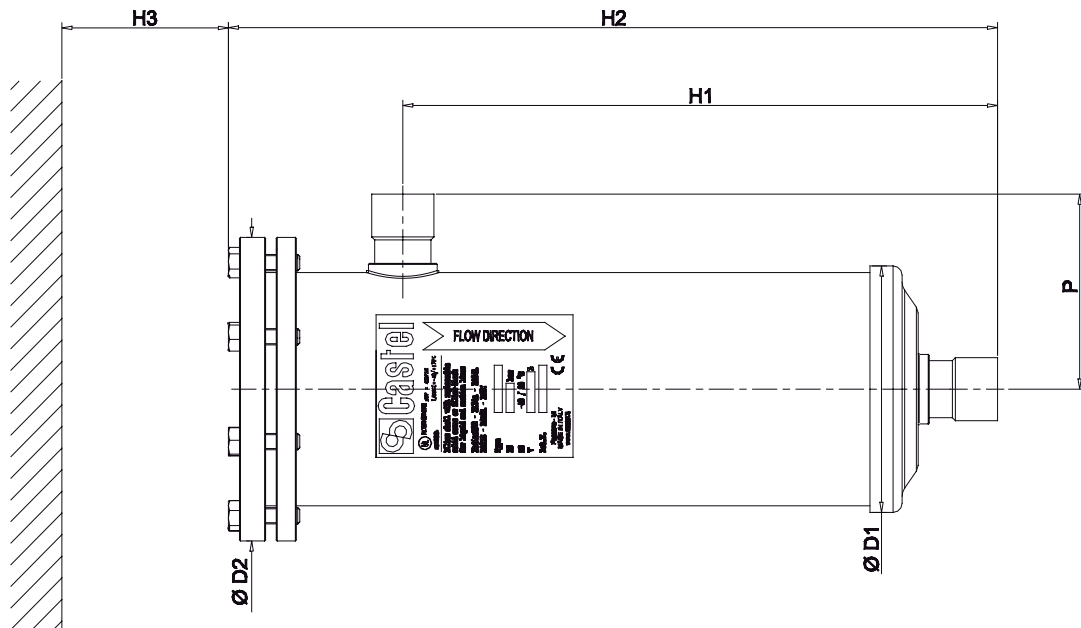
TABLE 36: Dimensions and weights of filters with steel connections

| Catalogue Number | Connections | | | Dimensions [mm] | | | | | | Weight [g] | | | |
|------------------|-------------|--------|--------|-----------------|------|-----|-----|-----|------|------------|-----|-----|------|
| | ODS | | W | Ø D1 | Ø D2 | H1 | H2 | H3 | P | | | | |
| | Ø [in.] | Ø [mm] | Ø [mm] | | | | | | | | | | |
| 4411/5AF | 5/8" | 16 | 21,3 | 121 | 149 | 144 | 231 | 185 | 90 | 3810 | | | |
| 4411/7AF | 7/8" | 22 | 26,9 | | | 150 | 237 | | 95 | 3860 | | | |
| 4411/9AF | 1.1/8" | - | 33,7 | | | 155 | 242 | | 100 | 3920 | | | |
| 4411/11AF | 1.3/8" | 35 | 42,4 | | | 167 | 254 | | 112 | 4050 | | | |
| 4411/13AF | 1.5/8" | - | 48,3 | | | 158 | 245 | | 103 | 4190 | | | |
| 4411/M42AF | - | 42 | 48,3 | | | 185 | 285 | | 103 | 4150 | | | |
| 4411/17AF | 2.1/8" | 54 | 60,3 | | | 292 | 379 | 95 | 5280 | | | | |
| 4412/7AF | 7/8" | 22 | 26,9 | | | 324 | 384 | 100 | 5320 | | | | |
| 4412/9AF | 1.1/8" | - | 33,7 | | | | | | | 297 | 384 | 112 | 5380 |
| 4412/11AF | 1.3/8" | 35 | 42,4 | | | | | | | 309 | 396 | 103 | 5400 |
| 4412/13AF | 1.5/8" | - | 48,3 | | | | | | | 300 | 387 | 103 | 5400 |
| 4412/M42AF | - | 42 | 48,3 | | | | | | | | | | |
| 4412/17AF | 2.1/8" | 54 | 60,3 | | | | | | | | | | |



Sketch of filter with 2 blocks

- 1 – Block
- 2 – Mesh sieve serving as block support
- 3 – Spring
- 4 – Cover
- 5 – Bottom



REFRIGERATING SYSTEM PROTECTORS

6.7 – REPLACEABLE MECHANICAL CARTRIDGE FILTERS

APPLICATIONS

The replaceable mechanical filters in series 4411/XXCF are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These filters have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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

Good filtering of the refrigerant on the low-pressure side of the system is an absolute guarantee of protection for the compressor. System cleanliness is ensured by micro filtering cores, which filter out every kind of impurities derived from manufacture and assembly of the refrigerating system

CONSTRUCTION

Filter shells: these are built with an aluminium cover, stainless steel screws, and the steel body is equipped with brazing connections machined from a steel bar EN 10025 S355JR.

They are sold only in the configuration of codes with a “C” suffix, equipped with 1/4” NPT threaded cover for mounting access fitting with valve core kit G9150/R05 included in the supply.

Cartridge 4495: characterized by a large filter surface, these consist of metal mesh fabric with a controlled porosity filter sieve insert, which can retain solid particles to 20 microns. At both ends, soft felt gaskets ensure perfect seal with the plastic cups.

APPROVALS

Filters in series 4411/XXCF have been approved by the American certification authority Underwriters Laboratories Inc. with file SA7054, in compliance with American standard UL 207.

TABLE 37: General characteristics of mechanical block filters

| Catalogue Number | Number of Cores | Filtering block | | Connections | | | PS [bar] | TS [°C] | | TA [°C] | | Risk Category according to PED Recast |
|------------------|-----------------|-----------------|--------------------------------------|-------------|--------|------|-----------|---------|------|---------|------|---------------------------------------|
| | | Cat. Number | Filtering Surface [cm ²] | ODS | | W | | min. | max. | min. | max. | |
| | | | | Ø [in.] | Ø [mm] | | | | | | | |
| 4411/57CF | 1 | 4495/C | 820 | 5/8" | 16 | 21,3 | 50 (1) | -40 | +80 | -20 | +50 | II |
| 4411/7CF | | | | 7/8" | 22 | 26,9 | | | | | | |
| 4411/9CF | | | | 1.1/8" | – | 33,7 | | | | | | |
| 4411/11CF | | | | 1.3/8" | 35 | 42,4 | | | | | | |
| 4411/13CF | | | | 1.5/8" | – | 48,3 | | | | | | |
| 4411/M42CF | | | | – | 42 | 48,3 | | | | | | |
| 4411/17CF | | | | 2.1/8" | 54 | 60,3 | | | | | | |

(1) : MWP = 470 psi according to UL approval



Castel

Pressure: 400 - 1000 bar
Flow: 1000 - 100000 l/min

Filter with replaceable
and easy to filter block,
inlet and suction lines

FD - HC - HFD - HC

Flow: 100000 l/min
Pressure: 400 bar
Temperature: -40/+80 °C
L 100
MS-0154W

1270 CE

FLOW DIRECTION

Castel

Pressure: 400 - 1000 bar
Flow: 1000 - 100000 l/min

Filter with replaceable
and easy to filter block,
inlet and suction lines

HFD - HC

Flow: 100000 l/min
Pressure: 400 bar
Temperature: -40/+80 °C
L 100
MS-0154W

1270 CE

FLOW DIRECTION

TABLE 38: Refrigerant flow capacity of filtering block 4495/C [kW]

| Refrigerants | Evaporating Temperature [°C] | Pressure drop [bar] | Catalogue Number | | | | | | |
|--------------|------------------------------|---------------------|------------------|----------|----------|-----------|-----------|------------|-----------|
| | | | 4411/50F | 4411/70F | 4411/90F | 4411/110F | 4411/130F | 4411/M420F | 4411/170F |
| R134a | 4,4 | 0,14 | 9,9 | 22,8 | 40,6 | 54,2 | 61,6 | 61,6 | 83,3 |
| | -6,7 | 0,10 | 6,6 | 15,2 | 26,7 | 35,7 | 41,1 | 41,1 | 54,8 |
| | -18 | 0,07 | 4,3 | 9,8 | 16,9 | 22,6 | 26,5 | 26,5 | 34,7 |
| | -29 | 0,03 | 2,2 | 4,8 | 8,1 | 10,9 | 13,0 | 13,0 | 16,7 |
| R32 | 4,4 | 0,21 | 24,1 | 56,1 | 101,2 | 135,2 | 151,2 | 151,2 | 207,6 |
| | -6,7 | 0,14 | 16,4 | 38,0 | 67,7 | 90,4 | 102,6 | 102,6 | 138,8 |
| | -18 | 0,10 | 11,4 | 26,2 | 45,9 | 61,3 | 70,6 | 70,6 | 94,1 |
| | -29 | 0,07 | 7,7 | 17,6 | 30,4 | 40,6 | 47,4 | 47,4 | 62,3 |
| | -40 | 0,03 | 4,0 | 9,0 | 15,2 | 20,2 | 24,3 | 24,3 | 31,1 |
| R404A | 4,4 | 0,21 | 13,8 | 32,3 | 58,9 | 78,7 | 87,2 | 87,2 | 120,8 |
| | -6,7 | 0,14 | 9,1 | 21,1 | 37,8 | 50,4 | 56,8 | 56,8 | 77,4 |
| | -18 | 0,10 | 6,1 | 14,1 | 25,0 | 33,4 | 38,1 | 38,1 | 51,3 |
| | -29 | 0,07 | 3,9 | 9,0 | 15,7 | 20,9 | 24,3 | 24,3 | 32,2 |
| | -40 | 0,03 | 1,9 | 4,4 | 7,4 | 9,9 | 11,8 | 11,8 | 15,2 |
| R407C | 4,4 | 0,21 | 14,7 | 34,2 | 61,6 | 82,2 | 92,1 | 92,1 | 126,3 |
| | -6,7 | 0,14 | 9,7 | 22,3 | 39,6 | 52,9 | 60,2 | 60,2 | 81,2 |
| | -18 | 0,10 | 6,4 | 14,7 | 25,7 | 34,3 | 39,7 | 39,7 | 52,7 |
| | -29 | 0,07 | 4,1 | 9,4 | 16,2 | 21,7 | 25,4 | 25,4 | 33,3 |
| | -40 | 0,03 | 2,1 | 4,6 | 7,7 | 10,3 | 12,5 | 12,5 | 15,9 |
| R410A | 4,4 | 0,21 | 18,7 | 43,8 | 79,5 | 106,2 | 118,0 | 118,0 | 163,1 |
| | -6,7 | 0,14 | 12,7 | 29,4 | 52,6 | 70,2 | 79,2 | 79,2 | 107,8 |
| | -18 | 0,10 | 8,6 | 19,9 | 35,2 | 47,0 | 53,7 | 53,7 | 72,1 |
| | -29 | 0,07 | 5,8 | 13,2 | 23,0 | 30,7 | 35,6 | 35,6 | 47,1 |
| | -40 | 0,03 | 3,0 | 6,7 | 11,3 | 15,1 | 18,0 | 18,0 | 23,2 |

continue →

| Standard rating conditions according to AHRI Standard 730-2013 | | | | | | | | | |
|--|--------|-------|-------|-------|-------|-----------|-------|-------|-------|
| Condensing temperature | 100 °F | | | | | (37,8 °C) | | | |
| Liquid temperature | 90 °F | | | | | (32,3 °C) | | | |
| Subcooling | 10 °R | | | | | (5,5 °K) | | | |
| Evaporating temperature | 40 °F | | | | | (4,4 °C) | | | |
| Temperature leaving evaporator | 50 °F | | | | | (9,9 °C) | | | |
| Evaporator superheating | 10 °R | | | | | (5,5 °K) | | | |
| Temperature entering filter | 65 °F | | | | | (18,3 °C) | | | |
| Suction superheating | 15 °R | | | | | (8,4 °K) | | | |
| Discharge temperature | 150 °F | | | | | (65,5 °C) | | | |
| Correction factor x condensing temperature ≠ T rif. 37,8 °C | | | | | | | | | |
| Condensing temperature | 20 °C | 25 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C | 60 °C |
| Correction factor | 0,84 | 0,87 | 0,92 | 0,97 | 1,02 | 1,07 | 1,13 | 1,19 | 1,25 |

TABLE 38: Refrigerant flow capacity of filtering block 4495/C [kW]

| Refrigerants | Evaporating Temperature [°C] | Pressure drop [bar] | Catalogue Number | | | | | | |
|--------------|------------------------------|---------------------|------------------|----------|----------|-----------|-----------|------------|-----------|
| | | | 4411/50F | 4411/70F | 4411/90F | 4411/110F | 4411/130F | 4411/M420F | 4411/170F |
| | | | | | | | | | |
| R507 | 4,4 | 0,21 | 13,2 | 30,9 | 56,2 | 75,1 | 83,3 | 83,3 | 115,3 |
| | -6,7 | 0,14 | 8,7 | 20,2 | 36,2 | 48,3 | 54,5 | 54,5 | 74,2 |
| | -18 | 0,10 | 5,8 | 13,3 | 23,6 | 31,5 | 36,0 | 36,0 | 48,4 |
| | -29 | 0,07 | 3,8 | 8,6 | 14,9 | 20,0 | 23,2 | 23,2 | 30,6 |
| | -40 | 0,03 | 1,9 | 4,2 | 7,1 | 9,5 | 11,4 | 11,4 | 14,7 |
| R1234ze | 4,4 | 0,21 | 10,0 | 23,2 | 41,5 | 55,4 | 62,7 | 62,7 | 85,1 |
| | -6,7 | 0,14 | 6,4 | 14,8 | 25,9 | 34,6 | 39,8 | 39,8 | 53,2 |
| | -18 | 0,10 | 4,1 | 9,5 | 16,4 | 21,8 | 25,5 | 25,5 | 33,5 |
| | -29 | 0,07 | 2,6 | 5,9 | 10,0 | 13,3 | 15,8 | 15,8 | 20,4 |
| | -40 | 0,03 | 1,2 | 2,8 | 4,6 | 6,1 | 7,5 | 7,5 | 9,4 |
| R1234yf | 4,4 | 0,21 | 10,4 | 24,2 | 43,5 | 43,5 | 65,2 | 65,2 | 89,2 |
| | -6,7 | 0,14 | 6,7 | 15,5 | 27,4 | 27,4 | 41,7 | 41,7 | 56,2 |
| | -18 | 0,10 | 4,4 | 10,0 | 17,4 | 17,4 | 26,9 | 26,9 | 35,7 |
| | -29 | 0,07 | 2,8 | 6,3 | 10,8 | 10,8 | 17,0 | 17,0 | 22,2 |
| | -40 | 0,03 | 1,3 | 3,0 | 5,0 | 5,0 | 8,1 | 8,1 | 10,3 |
| R448A | 4,4 | 0,21 | 14,6 | 34,1 | 61,6 | 82,3 | 92,0 | 92,0 | 126,4 |
| | -6,7 | 0,14 | 9,7 | 22,3 | 39,7 | 53,0 | 60,2 | 60,2 | 81,5 |
| | -18 | 0,10 | 6,4 | 14,8 | 25,9 | 34,6 | 39,9 | 39,9 | 53,1 |
| | -29 | 0,07 | 4,2 | 9,5 | 16,4 | 22,0 | 25,7 | 25,7 | 33,7 |
| | -40 | 0,03 | 2,1 | 4,7 | 7,8 | 10,5 | 12,6 | 12,6 | 16,1 |
| R449A | 4,4 | 0,21 | 14,5 | 33,8 | 61,2 | 81,7 | 91,3 | 91,3 | 125,4 |
| | -6,7 | 0,14 | 9,6 | 22,2 | 39,4 | 52,7 | 59,8 | 59,8 | 80,9 |
| | -18 | 0,10 | 6,4 | 14,6 | 25,7 | 34,3 | 39,5 | 39,5 | 52,7 |
| | -29 | 0,07 | 4,1 | 9,4 | 16,3 | 21,8 | 25,5 | 25,5 | 33,4 |
| | -40 | 0,03 | 2,1 | 4,6 | 7,8 | 10,4 | 12,5 | 12,5 | 16,0 |

continue →

| Standard rating conditions according to AHRI Standard 730-2013 | | | | | | | | | |
|--|--------|-------|-------|-------|-------|-----------|-------|-------|-------|
| Condensing temperature | 100 °F | | | | | (37,8 °C) | | | |
| Liquid temperature | 90 °F | | | | | (32,3 °C) | | | |
| Subcooling | 10 °R | | | | | (5,5 °K) | | | |
| Evaporating temperature | 40 °F | | | | | (4,4 °C) | | | |
| Temperature leaving evaporator | 50 °F | | | | | (9,9 °C) | | | |
| Evaporator superheating | 10 °R | | | | | (5,5 °K) | | | |
| Temperature entering filter | 65 °F | | | | | (18,3 °C) | | | |
| Suction superheating | 15 °R | | | | | (8,4 °K) | | | |
| Discharge temperature | 150 °F | | | | | (65,5 °C) | | | |
| Correction factor x condensing temperature = T rif. 37,8 °C | | | | | | | | | |
| Condensing temperature | 20 °C | 25 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C | 60 °C |
| Correction factor | 0,84 | 0,87 | 0,92 | 0,97 | 1,02 | 1,07 | 1,13 | 1,19 | 1,25 |

TABLE 38: Refrigerant flow capacity of filtering block 4495/C [kW]

| Refrigerants | Evaporating Temperature [°C] | Pressure drop [bar] | Catalogue Number | | | | | | |
|--------------|------------------------------|---------------------|------------------|----------|----------|-----------|-----------|------------|-----------|
| | | | 4411/50F | 4411/70F | 4411/90F | 4411/110F | 4411/130F | 4411/M420F | 4411/170F |
| | | | | | | | | | |
| R450A | 4,4 | 0,21 | 10,9 | 25,3 | 45,3 | 60,4 | 68,2 | 68,2 | 92,8 |
| | -6,7 | 0,14 | 7,0 | 16,2 | 28,5 | 38,0 | 43,6 | 43,6 | 58,3 |
| | -18 | 0,10 | 4,6 | 10,4 | 18,1 | 24,1 | 28,1 | 28,1 | 37,1 |
| | -29 | 0,07 | 2,9 | 6,5 | 11,1 | 14,8 | 17,6 | 17,6 | 22,8 |
| | -40 | 0,03 | 1,4 | 3,1 | 5,2 | 6,9 | 8,4 | 8,4 | 10,6 |
| R452A | 4,4 | 0,21 | 12,8 | 29,9 | 54,4 | 72,6 | 80,7 | 80,7 | 111,5 |
| | -6,7 | 0,14 | 8,4 | 19,4 | 34,8 | 46,5 | 52,4 | 52,4 | 71,4 |
| | -18 | 0,10 | 5,5 | 12,8 | 22,5 | 30,1 | 34,5 | 34,5 | 46,2 |
| | -29 | 0,07 | 3,6 | 8,2 | 14,2 | 18,9 | 22,0 | 22,0 | 29,1 |
| | -40 | 0,03 | 1,8 | 4,0 | 6,7 | 9,0 | 10,7 | 10,7 | 13,8 |
| R452B | 4,4 | 0,21 | 19,0 | 44,3 | 80,1 | 107,0 | 119,4 | 119,4 | 164,3 |
| | -6,7 | 0,14 | 12,5 | 28,9 | 51,5 | 68,8 | 78,0 | 78,0 | 105,6 |
| | -18 | 0,10 | 8,4 | 19,2 | 33,7 | 45,0 | 51,8 | 51,8 | 69,1 |
| | -29 | 0,07 | 5,5 | 12,5 | 21,6 | 28,8 | 33,7 | 33,7 | 44,3 |
| | -40 | 0,03 | 2,8 | 6,2 | 10,5 | 14,0 | 16,8 | 16,8 | 21,4 |
| R454B | 4,4 | 0,21 | 19,4 | 45,2 | 81,8 | 109,2 | 121,8 | 121,8 | 167,7 |
| | -6,7 | 0,14 | 12,8 | 29,5 | 52,6 | 70,2 | 79,6 | 79,6 | 107,9 |
| | -18 | 0,10 | 8,5 | 19,6 | 34,4 | 45,9 | 52,9 | 52,9 | 70,5 |
| | -29 | 0,07 | 5,6 | 12,8 | 22,0 | 29,4 | 34,4 | 34,4 | 45,2 |
| | -40 | 0,03 | 2,8 | 6,4 | 10,7 | 14,3 | 17,1 | 17,1 | 21,9 |
| R513A | 4,4 | 0,21 | 11,4 | 26,4 | 47,5 | 63,4 | 71,2 | 71,2 | 97,3 |
| | -6,7 | 0,14 | 7,4 | 17,0 | 30,0 | 40,1 | 45,8 | 45,8 | 61,6 |
| | -18 | 0,10 | 4,8 | 11,0 | 19,2 | 25,6 | 29,6 | 29,6 | 39,3 |
| | -29 | 0,07 | 3,1 | 6,9 | 11,9 | 15,9 | 18,7 | 18,7 | 24,4 |
| | -40 | 0,03 | 1,5 | 3,3 | 5,5 | 7,4 | 8,9 | 8,9 | 11,4 |

continue →

| Standard rating conditions according to AHRI Standard 730-2013 | | | | | | | | | |
|--|--------|-------|-------|-------|-------|-----------|-------|-------|-------|
| Condensing temperature | 100 °F | | | | | (37,8 °C) | | | |
| Liquid temperature | 90 °F | | | | | (32,3 °C) | | | |
| Subcooling | 10 °R | | | | | (5,5 °K) | | | |
| Evaporating temperature | 40 °F | | | | | (4,4 °C) | | | |
| Temperature leaving evaporator | 50 °F | | | | | (9,9 °C) | | | |
| Evaporator superheating | 10 °R | | | | | (5,5 °K) | | | |
| Temperature entering filter | 65 °F | | | | | (18,3 °C) | | | |
| Suction superheating | 15 °R | | | | | (8,4 °K) | | | |
| Discharge temperature | 150 °F | | | | | (65,5 °C) | | | |
| Correction factor x condensing temperature = T rif. 37,8 °C | | | | | | | | | |
| Condensing temperature | 20 °C | 25 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C | 60 °C |
| Correction factor | 0,84 | 0,87 | 0,92 | 0,97 | 1,02 | 1,07 | 1,13 | 1,19 | 1,25 |

TABLE 38: Refrigerant flow capacity of filtering block 4495/C [kW]

| Refrigerants | Evaporating Temperature [°C] | Pressure drop [bar] | Catalogue Number | | | | | | |
|--------------|------------------------------|---------------------|------------------|----------|----------|-----------|-----------|------------|-----------|
| | | | 4411/50F | 4411/70F | 4411/90F | 4411/110F | 4411/130F | 4411/M420F | 4411/170F |
| | | | R290 | 4,4 | 0,21 | 19,1 | 44,2 | 78,7 | 105,0 |
| | -6,7 | 0,14 | 12,8 | 29,4 | 51,6 | 68,9 | 79,3 | 79,3 | 105,7 |
| | -18 | 0,10 | 8,7 | 19,8 | 34,2 | 45,7 | 53,4 | 53,4 | 70,2 |
| | -29 | 0,07 | 5,8 | 13,0 | 22,2 | 29,7 | 35,2 | 35,2 | 45,5 |
| | -40 | 0,03 | 2,9 | 6,5 | 10,8 | 14,5 | 17,6 | 17,6 | 22,2 |
| R600 | 4,4 | 0,14 | 8,9 | 20,1 | 34,6 | 46,2 | 54,3 | 54,3 | 71,0 |
| | -6,7 | 0,10 | 5,9 | 13,4 | 22,7 | 30,3 | 36,1 | 36,1 | 46,5 |
| | -18 | 0,07 | 3,8 | 8,4 | 14,1 | 18,8 | 22,7 | 22,7 | 28,8 |
| | -29 | 0,03 | 1,9 | 4,2 | 6,8 | 9,0 | 11,2 | 11,2 | 13,8 |
| R600a | 4,4 | 0,14 | 9,9 | 22,6 | 39,2 | 52,3 | 60,9 | 60,9 | 80,4 |
| | -6,7 | 0,10 | 6,6 | 15,0 | 25,7 | 34,3 | 40,5 | 40,5 | 52,7 |
| | -18 | 0,07 | 4,3 | 9,6 | 16,2 | 21,7 | 26,0 | 26,0 | 33,3 |
| | -29 | 0,03 | 2,1 | 4,8 | 7,8 | 10,4 | 12,9 | 12,9 | 16,0 |
| R1270 | 4,4 | 0,21 | 21,1 | 48,8 | 68,0 | 87,1 | 131,5 | 131,5 | 178,5 |
| | -6,7 | 0,14 | 14,2 | 32,7 | 45,2 | 57,6 | 88,3 | 88,3 | 118,1 |
| | -18 | 0,10 | 9,8 | 22,3 | 30,5 | 38,7 | 60,1 | 60,1 | 79,3 |
| | -29 | 0,07 | 6,5 | 14,8 | 20,1 | 25,4 | 40,0 | 40,0 | 52,0 |
| | -40 | 0,03 | 3,4 | 7,5 | 10,1 | 12,6 | 20,3 | 20,3 | 25,8 |

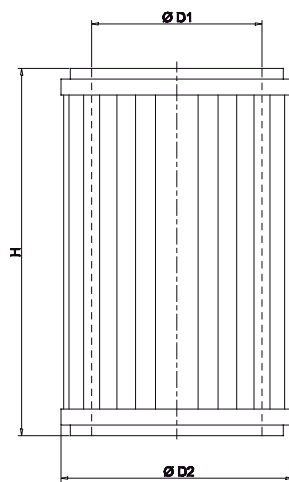
| Standard rating conditions according to AHRI Standard 730-2013 | | | | | | | | | |
|--|--------|-------|-------|-------|-------|-----------|-------|-------|-------|
| Condensing temperature | 100 °F | | | | | (37,8 °C) | | | |
| Liquid temperature | 90 °F | | | | | (32,3 °C) | | | |
| Subcooling | 10 °R | | | | | (5,5 °K) | | | |
| Evaporating temperature | 40 °F | | | | | (4,4 °C) | | | |
| Temperature leaving evaporator | 50 °F | | | | | (9,9 °C) | | | |
| Evaporator superheating | 10 °R | | | | | (5,5 °K) | | | |
| Temperature entering filter | 65 °F | | | | | (18,3 °C) | | | |
| Suction superheating | 15 °R | | | | | (8,4 °K) | | | |
| Discharge temperature | 150 °F | | | | | (65,5 °C) | | | |
| Correction factor x condensing temperature = T rif. 37,8 °C | | | | | | | | | |
| Condensing temperature | 20 °C | 25 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C | 60 °C |
| Correction factor | 0,84 | 0,87 | 0,92 | 0,97 | 1,02 | 1,07 | 1,13 | 1,19 | 1,25 |

TABLE 39: Dimensions and weights of filters

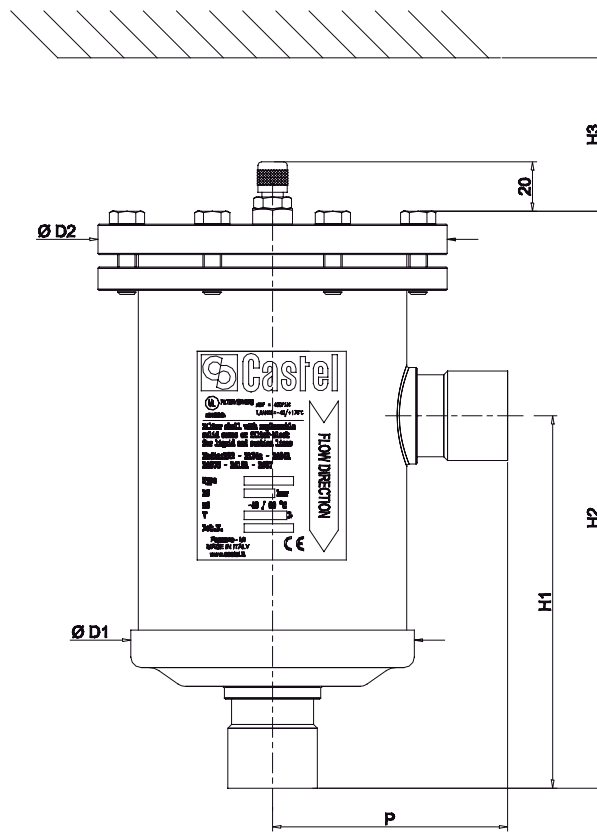
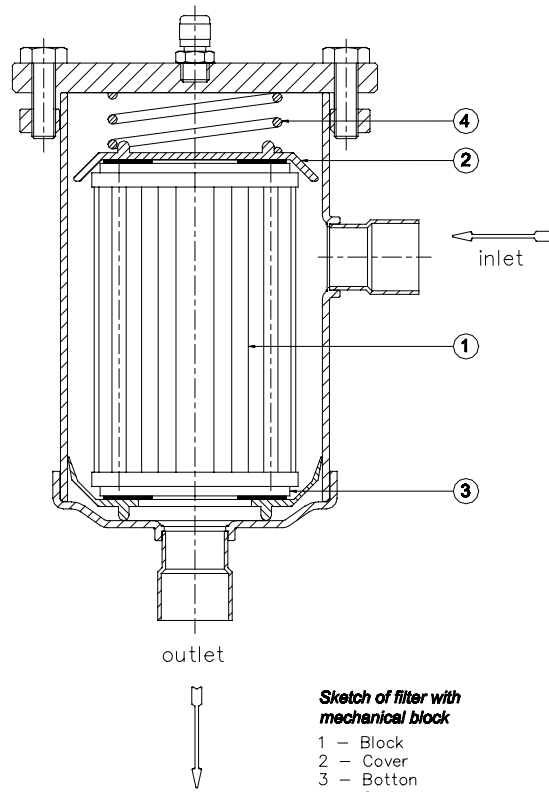
| Catalogue Number | Connections | | | Dimensions [mm] | | | | | | Weight [g] |
|------------------|-------------|--------|--------|-----------------|------|-----|-----|-----|-----|------------|
| | ODS | | W | Ø D1 | Ø D2 | H1 | H2 | H3 | P | |
| | Ø [in.] | Ø [mm] | Ø [mm] | | | | | | | |
| 4411/5CF | 5/8" | 16 | 21,3 | 121 | 149 | 150 | 237 | 185 | 95 | 3810 |
| 4411/7CF | 7/8" | 22 | 26,9 | | | | | | | 3860 |
| 4411/9CF | 1.1/8" | - | 33,7 | | | | | | | 3920 |
| 4411/11CF | 1.3/8" | 35 | 42,4 | | | 155 | 242 | | 100 | 4050 |
| 4411/13CF | 1.5/8" | - | 48,3 | | | 167 | 254 | | | 112 |
| 4411/M42CF | - | 42 | 48,3 | | | 158 | 245 | | 103 | 4150 |
| 4411/17CF | 2.1/8" | 54 | 60,3 | | | | | | | |

TABLE 40: General characteristic, dimensions and weights of mechanical block

| Catalogue Number | Filtering Surface | | Dimensions [mm] | | | Weight [g] |
|------------------|-------------------|-------|-----------------|------|-----|------------|
| | [sq.in] | [cm2] | Ø D1 | Ø D2 | H | |
| 4495/C | 127 | 820 | 60 | 87 | 138 | 480 |



4491
4496



REFRIGERATING SYSTEM PROTECTORS

6.8 – HERMETIC STRAINERS

APPLICATIONS

The hermetic strainers in series 45 are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These strainers have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CONSTRUCTION

The strainers is completely manufactured in steel, with threaded connections, SAE FLARE, in copper-plated steel. The product range also includes types with copper plated solder connections, offering the possibility to solder the copper pipe inside the connections (ODS).

Inside the strainers there is a screen basket, with large filter surface, made of austenitic stainless steel AISI 304. The mesh filters are not inspectable and therefore cannot be cleaned.

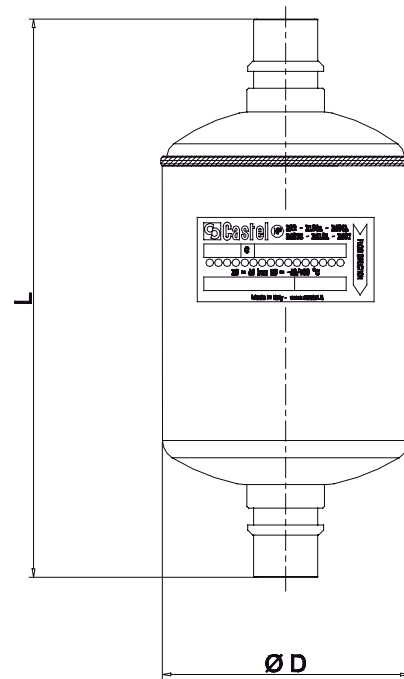
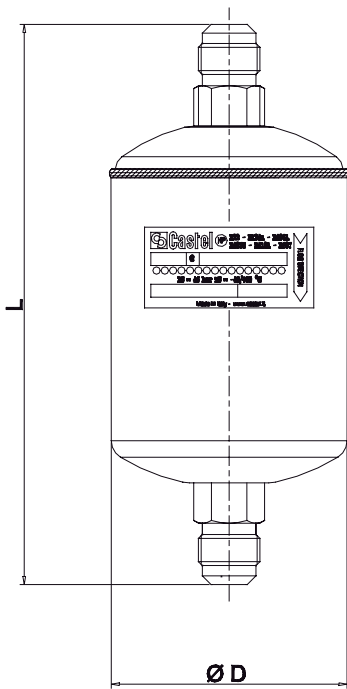
TABLE 41: General characteristics of strainers

| Catalogue Number | Filtering Surface [cm ²] | Useful Passage Surface [%] | Mesh Opening [mm] | Connections | | | | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | | | |
|------------------|--------------------------------------|----------------------------|-------------------|-------------|---------|--------|---------|-------------------------------|----------|---------|------|---------------------------------------|----------|-----|-----|-----|----|-----|
| | | | | SAE Flare | ODS | | ODM | | | min. | max. | | | | | | | |
| | | | | | Ø [in.] | Ø [mm] | Ø [in.] | | | | | | Ø [mm] | | | | | |
| 4510/3 | 58 | 36,6 | 0,166 | 3/8" | – | – | – | – | 2,4 | 45 | –40 | +80 | Art. 4.3 | | | | | |
| 4510/4 | 142 | | | 1/2" | – | – | – | – | | | | | | 3,2 | | | | |
| 4520/2 | 58 | | | – | 1/4" | – | 3/8" | – | | | | | | | 2,4 | | | |
| 4520/3 | | | | – | 3/8" | – | 1/2" | – | | | | | | | | | | |
| 4520/M10 | | | | – | – | 10 | – | 12 | | | | | | | | 3,4 | | |
| 4520/M12 | | | | – | – | 12 | – | 14 | | | | | | | | | | |
| 4520/4 | | | | – | 1/2" | – | 5/8" | 16 | | | | | | | | | | |
| 4520/5 | | | | – | 5/8" | 16 | 3/4" | – | | | | | | | | | | |
| 4520/M18 | | | | 142 | – | – | 18 | – | | | | | | | | | 22 | 8,0 |



TABLE 42: Dimensions and weights of strainers

| Catalogue Number | Dimensions [mm] | | Weight [g] |
|------------------|-----------------|-----|------------|
| | Ø D | L | |
| 4510/3 | 52 | 110 | 195 |
| 4510/4 | 76 | 174 | 515 |
| 4520/2 | 52 | 109 | 195 |
| 4520/3 | | | |
| 4520/M10 | | | |
| 4520/M12 | | | |
| 4520/4 | | | |
| 4520/5 | 76 | 170 | 245 |
| 4520/M18 | 76 | 170 | 495 |



REFRIGERATING SYSTEM PROTECTORS

6.9 – INSPECTABLE STRAINERS

APPLICATIONS

The inspectable strainers in series 4720N are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These strainers have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

These filters cannot be installed on systems that use HCFC (R22) refrigerant.

of the filter.

The allowed operating positions are the following:

- With horizontal piping axis, removable cover facing downward.
- With vertical piping axis, arrow and removable cover facing downward.

NOTE: strainers in series 4720N cannot be installed with the cover facing upward, in order to avoid that the dirt accumulated return into the plant when the filter is inspected/cleaned.

CONSTRUCTION

The main parts of the inspectionable mesh filters are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for body and cover
- Austenitic stainless steel AISI 304 for the mesh filter
- Unsintered PTFE for the sealing gasket of the mesh filter
- Hydrogenate nitrile rubber (HNBR) for outlet seal gaskets
- Copper tube EN 12735-1 – Cu-DHP for solder connections

INSTALLATION

The inspectional strainers can be installed on all branches of a refrigeration plant where it is necessary to avoid the accumulation of dirt and sludge inside a highly delicate component.

Table 43 shows the following operational characteristics of an inspectionable mesh filter:

- PS
- TS
- Kv factor

Copper connections: The brazing of filters with solder connections should be carried out with care, using a low melting point filler material (min.5 Ag). It is not necessary to disassemble the filters. However, avoid direct contact between the torch flame and the body, which could be damaged and compromise the proper functioning



TABLE 43: General characteristics of inspectable strainer

| Catalogue Number | Filtering Surface [cm ²] | Useful Passage Surface [%] | Mesh Opening [mm] | Connections | | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast | | | | | |
|------------------|--------------------------------------|----------------------------|-------------------|-------------|--------|-------------------------------|----------|---------|------|---------------------------------------|----------|----|-----|------|----------|
| | | | | ODS | | | | min. | max. | | | | | | |
| | | | | Ø [in.] | Ø [mm] | | | | | | | | | | |
| 4720N/3 | 13 | 26 | 0,1 | 3/8" | - | 2,0 | 50 | -40 | +150 | Art. 4.3 | | | | | |
| 4720N/M10 | | | | - | 10 | | | | | | | | | | |
| 4720N/M12 | | | | - | 12 | 2,5 | | | | | | | | | |
| 4720N/4 | | | | 1/2" | - | | | | | | | | | | |
| 4720N/5 | | | | 5/8" | 16 | 3,0 | | | | | | | | | |
| 4720N/M18 | 18 | | 26 | 0,2 | - | 18 | | | | | 6,0 | 50 | -40 | +150 | Art. 4.3 |
| 4720N/6 | | | | | 3/4" | - | | | | | | | | | |
| 4720N/7 | | | | | 7/8" | 22 | | | | | | | | | |
| 4720N/M28 | | | | | - | 28 | | | | | | | | | |
| 4720N/9 | | | | | 1.1/8" | - | | | | | | | | | |
| 4720N/11 | 31 | 26 | | 0,2 | 1.3/8" | 35 | 7,0 | 50 | -40 | +150 | Art. 4.3 | | | | |
| 4720N/13 | 46 | | | | 1.5/8" | - | 10,0 | | | | | | | | |
| 4720N/M42 | | | | | - | 42 | | | | | | | | | |
| 4720N/17 | | | | | 60 | 2.1/8" | 54 | | | | | | | | |

TABLE 44: Refrigerant flow capacity of inspectable strainers in liquid line [kW]

| Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 4720N/3 | 34,0 | 50,3 | 23,8 | 34,5 | 34,3 | 23,0 | 25,2 | 30,1 | 31,3 | 31,4 |
| 4720N/M10 | | | | | | | | | | |
| 4720N/M12 | 42,5 | 62,8 | 29,8 | 43,1 | 42,9 | 28,8 | 31,5 | 37,6 | 39,1 | 39,3 |
| 4720N/4 | | | | | | | | | | |
| 4720N/5 | 51,0 | 75,4 | 35,7 | 51,7 | 51,5 | 34,5 | 37,7 | 45,1 | 47,0 | 47,2 |
| 4720N/M18 | 102,0 | 150,8 | 71,4 | 103,4 | 103,0 | 69,0 | 75,5 | 90,2 | 93,9 | 94,3 |
| 4720N/6 | | | | | | | | | | |
| 4720N/7 | | | | | | | | | | |
| 4720N/M28 | | | | | | | | | | |
| 4720N/9 | | | | | | | | | | |
| 4720N/11 | 119 | 176 | 83 | 121 | 120 | 81 | 88 | 105 | 110 | 110 |
| 4720N/13 | 170 | 251 | 119 | 172 | 172 | 115 | 126 | 150 | 157 | 157 |
| 4720N/M42 | | | | | | | | | | |
| 4720N/17 | 255 | 377 | 179 | 258 | 258 | 173 | 189 | 226 | 235 | 236 |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 44: Refrigerant flow capacity of inspectable strainers in liquid line [kW]

| Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4720N/3 | 31,8 | 24,3 | 40,1 | 40,9 | 29,1 | 40,8 | 47,8 | 42,4 | 42,4 |
| 4720N/M10 | | | | | | | | | |
| 4720N/M12 | 39,8 | 30,3 | 50,1 | 51,2 | 36,4 | 51,0 | 59,8 | 53,0 | 53,0 |
| 4720N/4 | | | | | | | | | |
| 4720N/5 | 47,7 | 36,4 | 60,2 | 61,4 | 43,7 | 61,1 | 71,7 | 63,6 | 63,6 |
| 4720N/M18 | 95,5 | 72,8 | 120,3 | 122,8 | 87,4 | 122,3 | 143,4 | 127,2 | 127,2 |
| 4720N/6 | | | | | | | | | |
| 4720N/7 | | | | | | | | | |
| 4720N/M28 | | | | | | | | | |
| 4720N/9 | | | | | | | | | |
| 4720N/11 | 111 | 85 | 140 | 143 | 102 | 143 | 167 | 148 | 148 |
| 4720N/13 | 159 | 121 | 201 | 205 | 146 | 204 | 239 | 212 | 212 |
| 4720N/M42 | | | | | | | | | |
| 4720N/17 | 239 | 182 | 301 | 307 | 218 | 306 | 359 | 318 | 318 |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 45: Refrigerant flow capacity of inspectable strainers in suction line [kW]

| Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-------|------|-------|-------|-------|------|---------|---------|-------|-------|
| 4720N/3 | 3,6 | 8,5 | 4,4 | 4,5 | 6,6 | 4,5 | 2,9 | 2,8 | 4,8 | 4,4 |
| 4720N/M10 | | | | | | | | | | |
| 4720N/M12 | 4,6 | 10,6 | 5,5 | 5,7 | 8,3 | 5,6 | 3,7 | 3,6 | 6,0 | 5,5 |
| 4720N/4 | | | | | | | | | | |
| 4720N/5 | 5,5 | 12,8 | 6,6 | 6,8 | 9,9 | 6,7 | 4,4 | 4,3 | 7,2 | 6,6 |
| 4720N/M18 | 10,9 | 25,5 | 13,2 | 13,6 | 19,8 | 13,4 | 8,8 | 8,5 | 14,4 | 13,2 |
| 4720N/6 | | | | | | | | | | |
| 4720N/7 | | | | | | | | | | |
| 4720N/M28 | | | | | | | | | | |
| 4720N/9 | | | | | | | | | | |
| 4720N/11 | 13 | 30 | 15 | 16 | 23 | 16 | 10 | 10 | 17 | 15 |
| 4720N/13 | 18 | 43 | 22 | 23 | 33 | 22 | 15 | 14 | 24 | 22 |
| 4720N/M42 | | | | | | | | | | |
| 4720N/17 | 27 | 64 | 33 | 34 | 50 | 33 | 22 | 21 | 36 | 33 |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 45: Refrigerant flow capacity of inspectable strainers in suction line [kW]

| Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 4720N/3 | 3,2 | 4,2 | 7,0 | 7,0 | 3,6 | 6,1 | 2,6 | 3,2 | 7,0 |
| 4720N/M10 | | | | | | | | | |
| 4720N/M12 | 4,0 | 5,3 | 8,7 | 8,8 | 4,5 | 7,6 | 3,2 | 4,0 | 8,7 |
| 4720N/4 | | | | | | | | | |
| 4720N/5 | 4,8 | 6,3 | 10,5 | 10,5 | 5,4 | 9,2 | 3,9 | 4,7 | 10,4 |
| 4720N/M18 | 9,5 | 12,7 | 20,9 | 21,0 | 10,7 | 18,3 | 7,7 | 9,5 | 20,9 |
| 4720N/6 | | | | | | | | | |
| 4720N/7 | | | | | | | | | |
| 4720N/M28 | | | | | | | | | |
| 4720N/9 | | | | | | | | | |
| 4720N/11 | 11 | 15 | 24 | 25 | 13 | 21 | 9 | 11 | 24 |
| 4720N/13 | 16 | 21 | 35 | 35 | 18 | 31 | 13 | 16 | 35 |
| 4720N/M42 | | | | | | | | | |
| 4720N/17 | 24 | 32 | 52 | 53 | 27 | 46 | 19 | 24 | 52 |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 46: Refrigerant flow capacity of inspectable strainers in hot gas line [kW]

| Catalogue Number | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
|------------------|-------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| 4720N/3 | 17,0 | 36,3 | 19,2 | 23,8 | 27,2 | 19,1 | 13,3 | 13,7 | 23,6 | 21,6 |
| 4720N/M10 | | | | | | | | | | |
| 4720N/M12 | 21,3 | 45,4 | 24,0 | 29,8 | 34,0 | 23,9 | 16,6 | 17,1 | 29,5 | 27,0 |
| 4720N/4 | | | | | | | | | | |
| 4720N/5 | 25,5 | 54,5 | 28,8 | 35,7 | 40,8 | 28,6 | 19,9 | 20,6 | 35,4 | 32,3 |
| 4720N/M18 | 51,0 | 109,0 | 57,6 | 71,4 | 81,6 | 57,2 | 39,8 | 41,1 | 70,8 | 64,7 |
| 4720N/6 | | | | | | | | | | |
| 4720N/7 | | | | | | | | | | |
| 4720N/M28 | | | | | | | | | | |
| 4720N/9 | | | | | | | | | | |
| 4720N/11 | 60 | 127 | 67 | 83 | 95 | 67 | 46 | 48 | 83 | 75 |
| 4720N/13 | 85 | 182 | 96 | 119 | 136 | 95 | 66 | 69 | 118 | 108 |
| 4720N/M42 | | | | | | | | | | |
| 4720N/17 | 128 | 272 | 144 | 179 | 204 | 143 | 100 | 103 | 177 | 162 |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

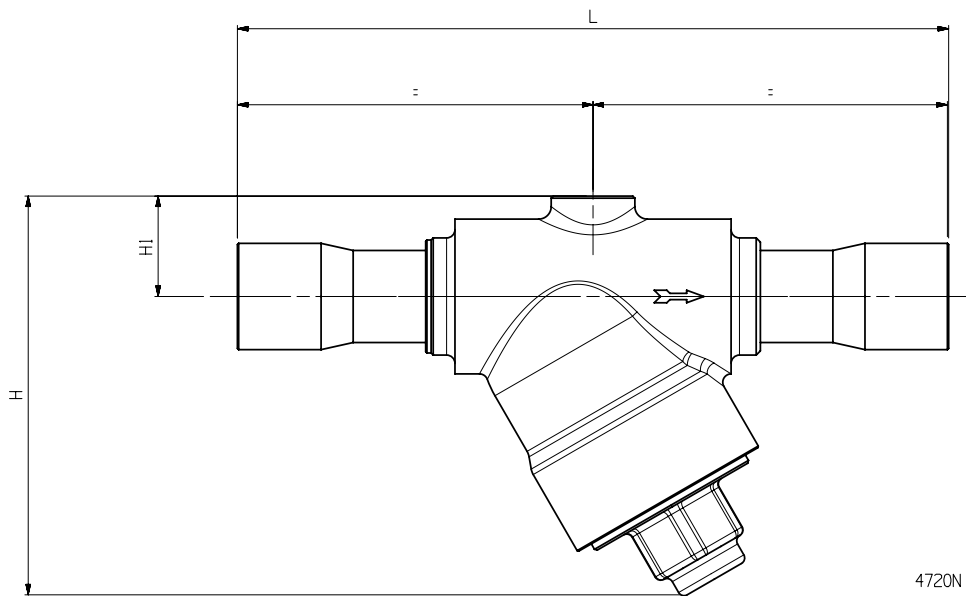
TABLE 46: Refrigerant flow capacity of inspectable strainers in hot gas line [kW]

| Catalogue Number | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
|------------------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 4720N/3 | 15,3 | 20,0 | 30,6 | 30,9 | 16,3 | 25,5 | 12,9 | 14,9 | 28,8 |
| 4720N/M10 | | | | | | | | | |
| 4720N/M12 | 19,1 | 25,0 | 38,3 | 38,6 | 20,4 | 31,9 | 16,2 | 18,6 | 36,0 |
| 4720N/4 | | | | | | | | | |
| 4720N/5 | 23,0 | 29,9 | 45,9 | 46,3 | 24,4 | 38,3 | 19,4 | 22,3 | 43,2 |
| 4720N/M18 | 45,9 | 59,9 | 91,8 | 92,6 | 48,8 | 76,6 | 38,8 | 44,6 | 86,4 |
| 4720N/6 | | | | | | | | | |
| 4720N/7 | | | | | | | | | |
| 4720N/M28 | | | | | | | | | |
| 4720N/9 | | | | | | | | | |
| 4720N/11 | 54 | 70 | 107 | 108 | 57 | 89 | 45 | 52 | 101 |
| 4720N/13 | 77 | 100 | 153 | 154 | 81 | 128 | 65 | 74 | 144 |
| 4720N/M42 | | | | | | | | | |
| 4720N/17 | 115 | 150 | 230 | 231 | 122 | 191 | 97 | 112 | 216 |

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 47: Dimensions and weights of inspectable strainers

| Catalogue Number | Dimensions [mm] | | | | Weight [g] | |
|------------------|-----------------|----|-----|----|------------|------|
| | H | H1 | L | Q | | |
| 4720N/3 | 55,5 | 19 | 134 | 16 | 505 | |
| 4720N/M10 | | | | | | 500 |
| 4720N/M12 | | | | | | 510 |
| 4720N/4 | | | | | 136 | 510 |
| 4720N/5 | 74,5 | 19 | 148 | 16 | 510 | |
| 4720N/M18 | 95,5 | 24 | 164 | 24 | 980 | |
| 4720N/6 | | | | | | 980 |
| 4720N/7 | | | | | 170 | 1000 |
| 4720N/M28 | | | | | | 1080 |
| 4720N/9 | | | | | 201 | 108 |
| 4720N/11 | 115 | 29 | 208 | 24 | 1400 | |
| 4720N/13 | 148 | 36 | 241 | 32 | 3400 | |
| 4720N/M42 | | | | | 3400 | |
| 4720N/17 | 166 | 44 | 285 | 32 | 5500 | |







OIL CONTROL SYSTEMS

P  LYHEDRA



OIL CONTROL SYSTEMS

A proper oil control system is essential to ensure compressor lubrication and energy efficient cooling. If accurately selected and installed, an oil control system protects the compressors both from low and high oil levels and avoids expensive replacements of compressors. An excessive amount of oil in a refrigerating system could lead to oil slugging to the compressor. This could damage the compressor as a liquid refrigerant slugging.

Removing or reducing the amount of oil entering the discharge line increases the yield of the refrigeration plant.

Large quantities of oil in a refrigeration or air conditioning system reduce the efficiency of the system.

For instance:

- Oil coating on the condenser and evaporator walls reduces the heat transfer
- Slugged oil volume displaces refrigerant fluid in the system mass flow. Since oil has no refrigerating power, it does not contribute to the system yield

The products shown in this handbook can be used in two control systems:

- Single compressor system
- Low pressure oil control system

The single compressor system has a simple oil control system. The compressor discharge is piped to the inlet of the oil separator and the outlet of the oil separator is piped to the condenser. A check valve is normally fitted between the oil separator and the condenser. An oil return line is connected from the oil separator to the compressor crankcase through an oil strainer. When the oil level in the separator increases, a float valve opens and feeds to the crankcase a small amount of oil at the discharge pressure. When the oil level in the separator drops, the float valve closes avoiding the hot gas to by pass to the crankcase.

To ensure the proper operation of the separator and the oil supply to the crankcase, it's a good practise to install a liquid indicator between the separator and the crankcase.

The low-pressure oil control system is normally used for a parallel multi- compressor system. The common discharge header is piped to the inlet of the oil separator and the outlet of the oil separator is piped to the condenser. A check valve is generally fitted between the oil separator and condenser. An oil return line is connected from the oil separator to the top valve of the oil reservoir. A vent line connects the suction line to the oil reservoir by using a calibrated pressure relief valve in order to reduce the pressure in the reservoir. This calibrated pressure relief valve, mounted on the top header of the reservoir, keeps the reservoir at a set pressure (above the suction line). The valve housed at the bottom of the oil reservoir is piped to the electronic oil level regulator mounted on the compressor crankcases.

A strainer should be fitted upstream of each oil level regulator in order to remove oil impurities.

These regulators open to feed oil as the oil level drops and close as the oil level rises to the set level, by checking the oil level in the compressor crankcases.

It is recognized as best practice to fit:

- A liquid indicator between separator and reservoir to check the correct operation of the separator
- A liquid indicator before each level regulator to check the oil feed to the regulator

OIL CONTROL SYSTEMS

7.1 – ELECTRONIC OIL LEVEL REGULATORS

APPLICATIONS

The electronic oil level regulators series 5650 are considered “Pressure Vessels” according to the definition provided in Article 2, Point 2 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.a) and 3 of the same Directive.

These regulators have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

The oil regulators ensure monitoring and control of the oil level in the crankcases of both alternative reciprocating and scroll compressors. Specifically, these regulators are employed to resolve the problem of incorrect oil distribution in multiple compressor plants.

CONSTRUCTION

The regulator 5650 is made up of an anodized aluminium machined body in which several holes and the injection seat allow the oil proper flow. The oil supply connection and the integrated solenoid valve armature are made from stainless steel.

In the body of the regulator there are:

- The electronic control unit board protected by a plastic cover that guarantees a degree of protection IP65. This board is connected to the outside of the body by two EN 175301-803 industrial standard Form C micro-connectors.

- The sight glass for visual control of the oil level

There are two symmetric versions of the electronic regulator:

- Version 5650/R with oil supply on the left side and sight glass on the right.
- Version 5650/L with the oil supply on the right side and the sight glass on the left.

On both sides of the regulator two membranes, related to four LED indicator lights, show the operation condition of the regulator. The regulator aluminium body, thanks to its geometry, is able to minimize refrigerant emulsion and foaming phenomena, so, during the oil injection phase, the correct level detection is always guaranteed.

The specific construction of the regulator makes it capable of

minimizing emulsion and foaming phenomena of the refrigerant. Thus, during the oil injection phase, the correct level detection is always guaranteed.

OPERATION

The electronic regulators series 5650 checks the compressor oil level by using a combination of opto-electronic sensors. The level optical detection is based on light refraction phenomena since the light refraction is different if the glass prism is immersed in a liquid or in a gas.

The oil level control and relative alarm condition is governed by electronic control unit that can maintain the desired level by managing the number of “injection” and “waiting” cycles by operating the solenoid valve.

When a low level is detected, the electronic control unit commands the integrated solenoid valve. Incremental cycles inject oil into the compressor crankcase. Furthermore, the electronic control unit is equipped with an alarm relay capable of generating a cut-off signal for the compressor. Under normal operating conditions, this relay is energized. Otherwise, if the level remains low even after a specific number of injection cycles, an alarm signal is generated by switching OFF the relay.

PLEASE NOTE:

Under alarm condition, the injection cycles continue: the electronic control unit continues to command the integrated solenoid valve. If the opto-electric sensors detect that a correct oil level is again reached, the alarm is automatically reset and the regulator returns under normal operating conditions.

On both side of the regulator there are four LEDs that provide information about the operating conditions of the regulator. Specifically:

- “POWER” LED - GREEN

Remains always on when the regulator is correctly powered.

- “OIL GOOD” LED - GREEN

Remains on and steady when the oil level is correct.

Blinks when the level is low, but the injection cycles are not still active.

Off during active injection cycles.

- “OIL FILLING” LED - YELLOW

Off when the level measured is correct.

Blinks during the injection cycles with the solenoid valve open.

Remains on and steady during the injection cycles with the solenoid valve closed.

- “ALARM” LED - RED

Remains on and steady when the electronic controller triggers the alarm signal.



Off during the normal operating condition.

INSTALLATION

The electronic regulator series 5650 must be horizontally assembled in order to guarantee a correct level detection. The coil, supplied in the regulator packaging, must be upwards oriented with a tolerance of +/- 1 degree from the vertical axis.

The regulator 5650 cannot be directly coupled (without an adapter) to the compressor crankcase. This connection must always be performed using one of the following adapters, sold separately:

- 5690/X11: two-flange adapter with length of 83 mm; the first flange is fixed and the second is mobile.
- 5690/X12: adapter with mobile flange and 1.1/8" – 12 UNF threaded end.
- 5690/X13: adapter with mobile flange and 1.1/8" – 18 UNEF threaded end.
- 5690/X14: adapter mobile flange and 3/4" NPT threaded end.
- 5690/X15: two-flange adapter with length of 53 mm; the first flange is fixed and the second is mobile.
- 5690/X16: adapter, with mobile flange and 1.1/4" – 12 UNF swivel threaded end (rotalock).

Table X shows the correspondence between these adapter kits and the compressor models of several manufacturers.

During installation of the electronic regulator series 5650, make sure of:

- The gasket is fit between the adapter and the regulator and that it is well lubricated.
- The adapter fixing screws are tightened to the torque indicated in the instructions.
- The gaskets under the micro-connectors (power supply and alarms relay) are correctly positioned.
- The screw of the and micro-connectors are tightened to the torque indicated in the instructions.
- The gaskets under the coil connector is correctly positioned and the coil connector is tightened to the torque indicated on the instructions.
- The electric connections are performed according to the wiring diagram on the instructions and on the front of the regulator.
- Upstream of the oil supply connection a filter series 45 or 47 should be installed.

After the installation of the electronic regulator series 5650, make sure that the system has been correctly installed by performing a tightness test.

Before powering the system, check the oil level in the regulator and in the compressor crankcase: it should be slightly above the sight-glass centre line.

WIRING AND ELECTRIC CONNECTIONS

Wiring is performed using two co-moulded cables with DIN connectors to guarantee IP65 protection degree. One cable is used for power supply and the other cable is used for the alarm cut-off signals.

The cables length is 3 meters and the kit must be purchased separately (part. number 9901/X26). The kit is supplied with gaskets and fixing screws.

Electronic oil level regulator has two EN175301-803-C (9.4mm pitch) connectors on top.

During the alarm condition, the relay is switched OFF and the circuit is closed between contacts 1 (NC) and 3 (COM). During normal operation, the relay is switched ON and therefore the circuit is closed between contacts 2 (NO) and 3 (COM) (see the diagram).

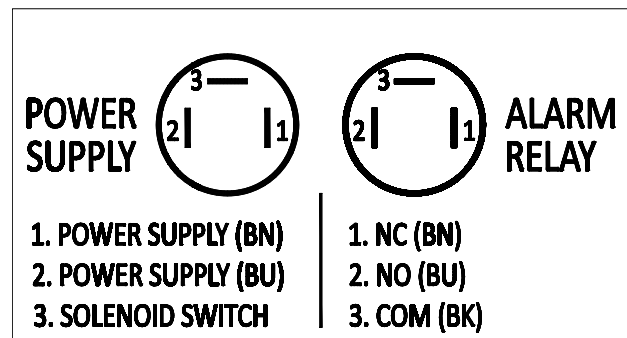


TABLE 1: General characteristics of electronic oil level regulators

| Part number | Version | Connections | | Cables kit (1) | Opening Pressure Differential [bar] | | PS [bar] | TS [°C] | | Weight [g] | Risk Category according to PED Recast |
|-------------|---------|--|-----------|----------------|-------------------------------------|-----|----------|---------|------|------------|---------------------------------------|
| | | Adapters | Oil inlet | | Min | Max | | Min | Max | | |
| | | (1) | SAE FLARE | | | | | | | | |
| 5650/RA2 | Right | 5690/X11 5690/X12 5690/X13 5690/X14 | 3/8" | 9901/X26 | 2 | 30 | 50 | -30 | +130 | 990 | Art. 4.3 |
| 5650/RA6 | | | | | | | | | | | |
| 5650/LA2 | Left | | | | | | | | | | |
| 5650/LA6 | | | | | | | | | | | |

Note:

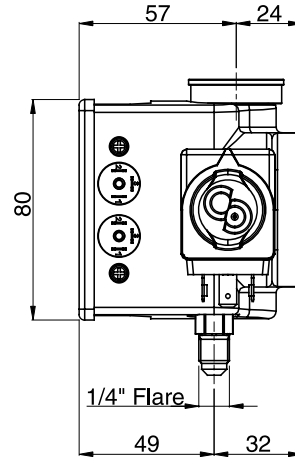
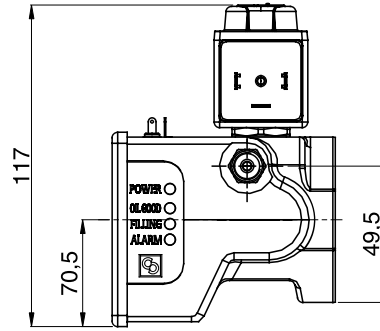
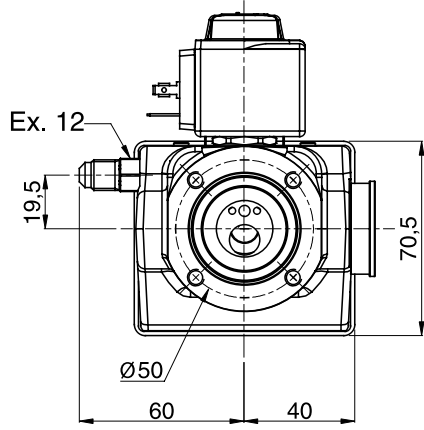
(1) To be ordered separately

TABLE 2: Electrical characteristics

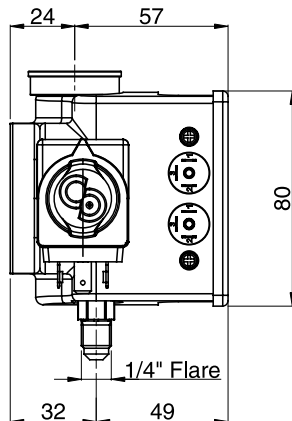
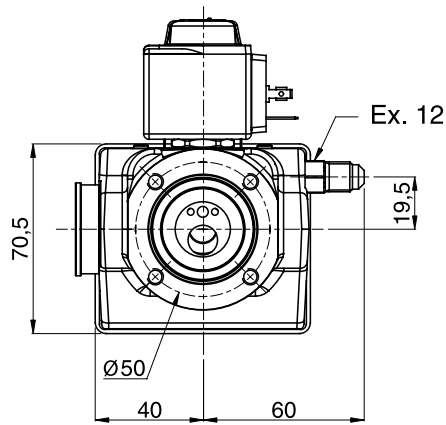
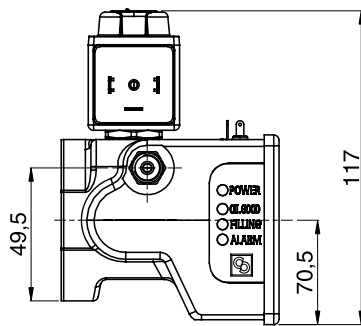
| Part number | Voltage [V] | Voltage Tolerance [%] | Frequency [Hz] | Coil (1) | | | | | Degree of protection | Alarm contact | |
|-------------|-------------|-----------------------|----------------|----------|---------------------------|-----------|--------------------------------|---------|----------------------|-----------------|-------------|
| | | | | Tipo | Insulation class EN 60730 | Power [W] | Coil consumption at 20 °C [mA] | | | Admissible load | Max voltage |
| | | | | | | | Start | Working | | | |
| 5650/RA2 | 24 A.C. | +10/-10 | 50/60 | 9300/RA2 | H | 8 | 920 | 527 | IP 65 | 3A | 250 V |
| 5650/RA6 | 220 A.C. | +10/-10 | 50/60 | 9300/RA6 | H | 8 | 120 | 68 | | | |
| 5650/LA2 | 24 A.C. | +10/-10 | 50/60 | 9300/RA2 | H | 8 | 920 | 527 | | | |
| 5650/LA6 | 220 A.C. | +10/-10 | 50/60 | 9300/RA6 | H | 8 | 120 | 68 | | | |

Note:

(1) Enclosed into the package



5650/R



5650/L

TABLE 3: Cables kit characteristics

| Part number | Use | | Degree of protection | Cable length [m] |
|-------------|-----|--------------------|----------------------|------------------|
| 9901/X26 | A | Power supply cable | IP 67 | 3 |
| | B | Coil cable | | |
| | C | Alarms cable | | |

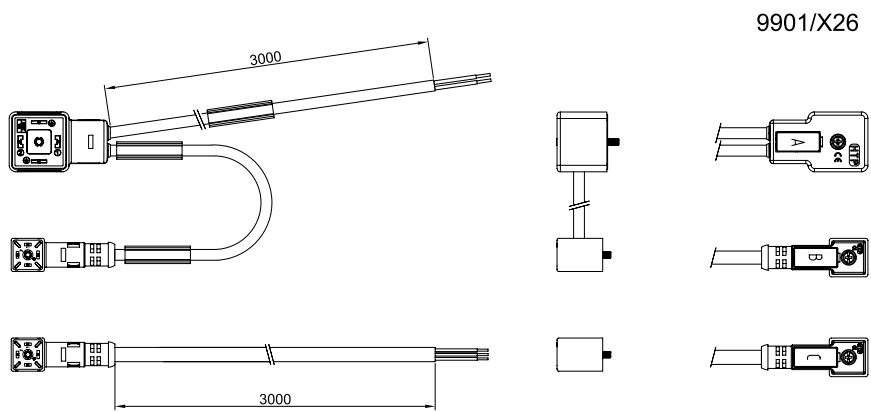
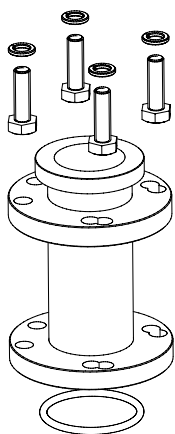
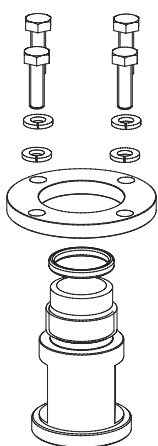


TABLE 4: Adapters characteristics and their use

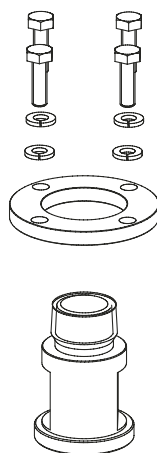
| Adapter | | Compressors | |
|------------------|---|---------------|--|
| Catalogue Number | Connections | Manufacturer | Model number |
| 5690/X11 | Flanged with: 3 screws, distance between 1.7/8" 4 screws, distance between 50 mm L = 83 mm | Arctic Circle | G2; G4; G6 |
| | | Bitzer | 4NC...4VC; 6D; 6E; 2H; 2T; 4H; 4T; 4P; 4G; 4H; 4J; 6F; 6G; 6H; 6J; S4 ; S6 |
| | | Bock | HA3...HA5; HG3...HG5; HG7; AM; F; O series |
| | | Carrier | EA; ER; 6E; OBE; OBCC |
| | | Copeland | D2; D3; D4; D6; 4CC; 6CC; 4M; 6M; ZBH; DK; DL; DN ;DM |
| | | Dorin | H2; H32; H34; H4; K5; Y6; 2S |
| | | Frascold | Tutti |
| | | Trane | M; R |
| | | PrestCold | P2; P3; P4; P6 |
| 5690/X12 | Threaded 1-1,8" - 12 UNF | Copeland | DK; DL; DN; ZR; ZZ; HA; KA; EA; 3A; LA; ER; 3R |
| | | Tecumseh | P; R; S; PA; RA; SA; CK; CM; CH; CG |
| | | PrestCold | Pk; PL (depend on size/model) |
| 5690/X13 | Threaded 1 - 1,8" - 18 UNEF | Bitzer | 2CC...2KC; 4CC...4FC; ESH; 4KTC series |
| | | Bock | HA(12,22,34); HG (12,22,34); HAX(12,22,34); HGX (12,22,34); EX Series |
| | | Dorin | H1; K100.....K400; SCC series |
| | | Tecumseh | TAG; TAH |
| | | PrestCold | PK; PL |
| | | ManEurope | Tutti |
| 5690/X14 | Threaded 3/4" - 14 NPT | Bitzer | ZL; ZM |
| | | Trane | K series |
| | | Copeland | ZB; ZF; ZS; ZO; ZOD |
| 5690/X15 | Flanged with: 3 screws, distance between 1.7/8" 4 screws, distance between 50 mm L = 53 mm | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| 5690/X16 | Rotolock 1.1/4" - 12 UNF | | |
| | | | |



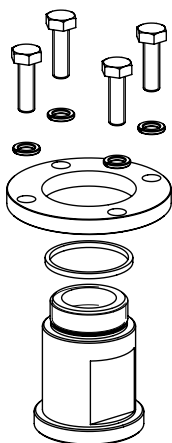
5690/X11
5690/X15



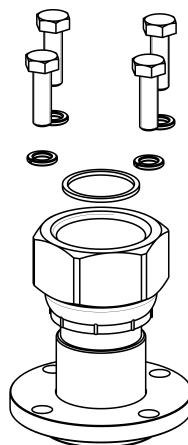
5690/X12



5690/X14



5690/X13



5690/X16

OIL CONTROL SYSTEMS

7.2 – OIL RESERVOIR PRESSURE VALVES

APPLICATIONS

The oil reservoir pressure valves in series 3150W are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CONSTRUCTION

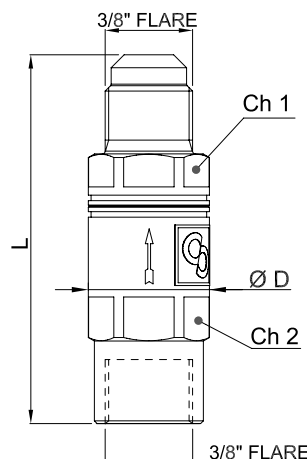
Castel manufactures four oil reservoirs pressure relief valves with different pressures. A higher-pressure differential will increase the oil flow rate from the oil reservoir back to the compressor crankcase. The selection of the model must consider both the individual compressor crankcase pressures as well as the differential pressure range of the oil regulators.

The main components of the valves are made with the following materials:

- Hot forged brass EN 12164 – CW 614N for body and cover valves series 3150W are equipped with laser welds between the body and the cover to ensure that the product is hermetically sealed.
- Austenitic stainless steel AISI 302 for the spring
- Laminated glass fibre fabric and PTFE for gasket seat seals

INSTALLATION

These valves are used to relieve pressure in the oil reservoir while maintaining a positive pressure differential between the reservoir and the compressor crankcase. This positive pressure ensures adequate oil supply to the oil level regulator. The calibrated pressure relief valve is mounted directly on the 3/8” SAE Flare connection of the reservoir and is piped to the suction line.



3150W/X01
3150W/X02
3150W/X03

TABLE 5: General characteristics of oil reservoir pressure valves

| Catalogue Number | SAE Flare Connections | | Kv Factor [m ³ /h] | Pressure Differential [bar] | PS [bar] | TS [°C] | | Dimensions and weights | | | | | Risk Category according to PED Recast |
|------------------|-----------------------|---------|-------------------------------|-----------------------------|----------|---------|------|------------------------|----|-----|-----|-----|---------------------------------------|
| | IN | OUT | | | | min. | max. | D | L | Ch1 | Ch2 | [g] | |
| 3150W/X01 | 3/8"- F | 3/8"- M | 1,6 | 0,35 | 50 | -40 | +150 | 22 | 67 | 20 | 20 | 152 | Art. 4.3 |
| 3150W/X02 | | | | 1,4 | 80 | | | | | | | | |
| 3150W/X03 | | | | 3 | | | | | | | | | |



OIL CONTROL SYSTEMS

7.3 – OIL INDICATORS

APPLICATIONS

The oil indicators are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

The indicators in series 38 provide control of the regular return of oil to the compressor crankcase. They are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

Note: The indicators in series 3680 are excluded from the scope of application of Directive 2014/68/EU as they are piping components. These indicators cannot be installed on systems that use HCFC (R22) refrigerant.

CONSTRUCTION

Indicators series 38 are manufactured in a total hermetic construction to avoid any possible oil leak. The glass “lens”, with suitable gasket, is housed inside the brass body and is fixed in its seat with a reflanging operation.

The main parts of these indicators are made from the following materials:

- Hot forged brass EN 12420 – CW 617N for the body
- Copper tube EN 12735-1 – Cu-DHP for solder connections
- Glass for lens
- PTFE for outlet gaskets

The indicators in series 3680 are manufactured with the glass “lens” directly melted onto a steel ring, with proper surface protection, screwed on to the indicator body. Inside the ring, which is supplied with a hydrogenated nitrile butadiene (HNBR) gasket, is a Nylon ball, kept in position in front of the spy glass by a metal mesh disk. The presence of the Nylon ball in the spy glass facilitates immediate reading of the oil level.

INSTALLATION

The brazing of indicators with solder connections in series 38 should be carried out with care, using a low melting point filler material. Avoid direct contact between the torch flame and the indicator body or glass, which could be damaged and compromise the proper functioning of the indicator.

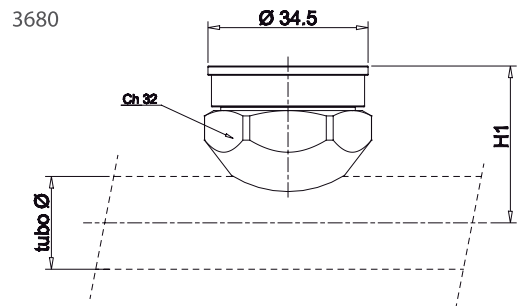
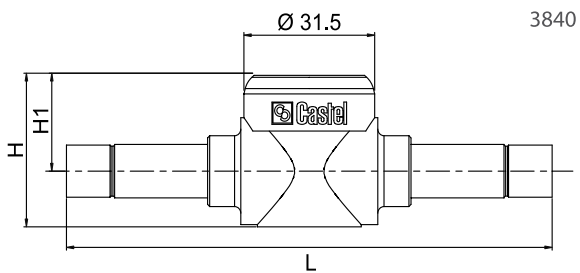
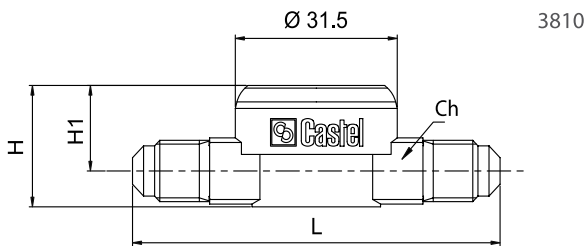
For indicators in series 3680 the ring must be disassembled before brazing.

Note: the PS declared in Table 6 for indicators in series 3680, refers only to the body plus the ring (with its o-ring), which the customer must tighten to the torque indicated on the product instruction manual. The aforesaid declaration doesn't cover any possible leakage or malfunctions due to brazing the body on the copper pipe. The customer is totally responsible for the success of this operation.



TABLE 6: General characteristics of liquid indicators

| Catalogue Number | Type | Connections | | | | | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|----------------|-------------|---------|--------|----------|--------|----------|---------|------|---------------------------------------|
| | | SAE Flare | ODS | | for pipe | | | min. | max. | |
| | | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | |
| 3810/22 | male male | 1/4" | - | - | | | 50 | -40 | +120 | Art. 4.3 |
| 3810/33 | | 3/8" | - | - | | | | | | |
| 3810/44 | | 1/2" | - | - | | | | | | |
| 3840/2 | brazing | - | 1/4" | - | - | - | 50 | -40 | +120 | |
| 3840/3 | | - | 3/8" | - | | | | | | |
| 3840/M10 | | - | - | 10 | | | | | | |
| 3840/M12 | | - | - | 12 | | | | | | |
| 3840/4 | | - | 1/2" | - | | | | | | |
| 3680/7 | saddle type | | | | 7/8" | 22 | | | | esclusi excluded |
| 3680/9 | | | | | 1.1/8" | 28 | | | | |
| 3680/11 | | | | | 1.3/8" | 35 | | | | |



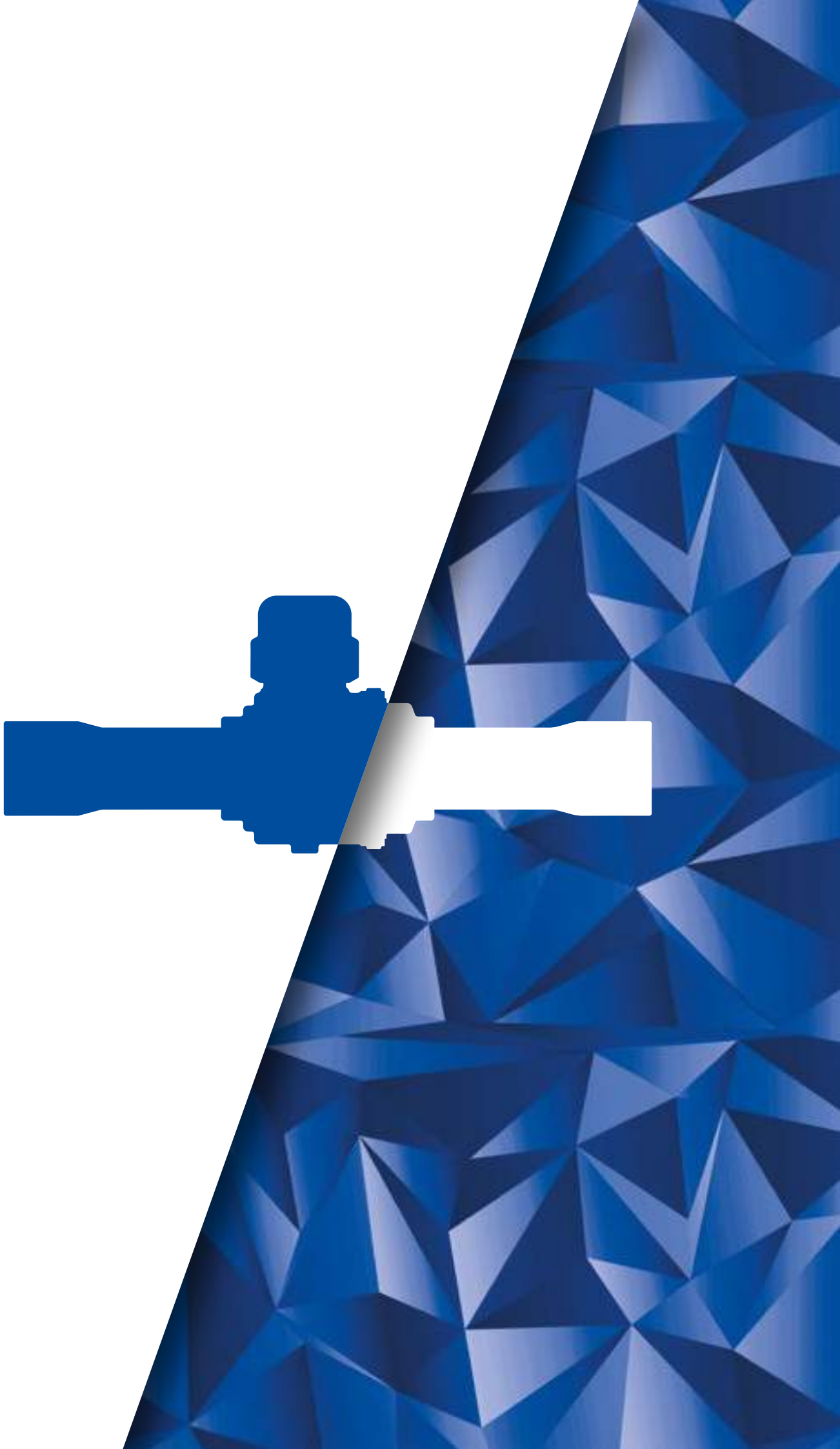
OIL CONTROL SYSTEMS

7.4 – STRAINERS

See: Chapter 6 - Paragraphs 6.8 and 6.9

7.5 – NORMALLY CLOSED SOLENOID VALVES

See: Chapter 2 - Paragraph 2.2



VALVES

POLYHEDRA

VALVES

8.1 – VALVES WITH SCREW SHUTTER

APPLICATIONS

The valves with screw shutter are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

HERMETIC VALVES

The hermetic valves are two-way shut-off valves with:

- SAE flare connections for types 6010N
- SAE flare / ODS connections for types 6012N

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

- Hot forged brass EN 12420 – CW 617N for the body.
- Steel, with proper surface protection, or brass for the spindle
- Hydrogenated nitrile butadiene rubber (HNBR) and aramid fibres for packing gland seal.
- Glass-reinforced PBT for the protective cap that covers the spindle.

RECEIVER VALVES

The receiver valves are two-way valves with square connections, SAE flare / ODS, types 6110N and 6120N.

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

- Hot forged brass EN 12420 – CW 617N for the body.
- Steel, with proper surface protection, for the spindle.
- Hydrogenated nitrile butadiene rubber (HNBR) and aramid fibres for packing gland seal.
- Glass-reinforced PBT for the protective cap that covers the spindle.

CAPPED VALVES

The capped valves are two-way shut-off valves with ODS connections, types 6420N.

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

- Hot forged brass EN 12420 – CW 617N for the body
- Steel, with proper surface protection, for the spindle.
- Hydrogenated nitrile butadiene rubber (HNBR) and aramid fibres for packing gland seal.
- Glass-reinforced PBT for the protective cap that covers the spindle.

The brazing of capped valves should be carried out with care, using a low melting point filler material. It is necessary to remove the spindle assembly, including the packing gland before brazing the body. It is important to avoid direct contact between the torch flame and the body, which could be damaged and compromise the proper functioning of the valves.



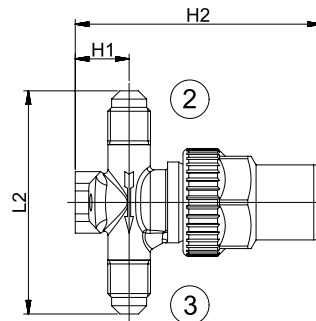
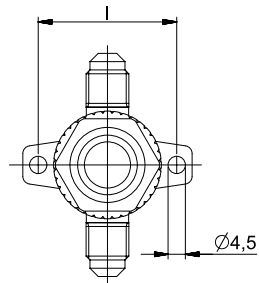
TABLE 1 General characteristics of valves for hermetic systems

| Catalogue Number | Connections | | | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|------|-----------|-------------------------------|----------|---------|------|---------------------------------------|
| | IN | | OUT | | | min. | max. | |
| | SAE Flare | ODS | SAE Flare | | | | | |
| 6010N/2 | 1/4" | – | 1/4" | 0,27 | 50 | -40 | +150 | Art. 4.3 |
| 6012N/22 | – | 1/4" | 1/4" | | | | | |

TABLE 2: Dimensions and weights of valves for hermetic systems

| Catalogue Number | Dimensions [mm] | | | | | Weight [g] |
|------------------|-----------------|----|----|----|------|------------|
| | H1 | H2 | l | L1 | L2 | |
| 6010N/2 | 14 | 66 | 36 | – | 58 | 160 |
| 6012N/22 | | | | 29 | 55,5 | 145 |

6010N



6012N

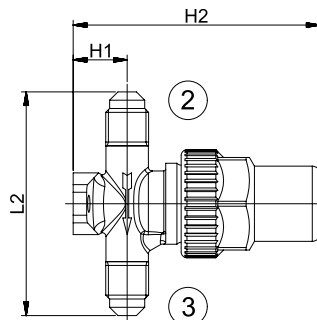
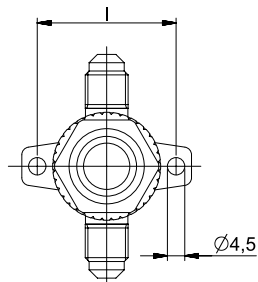


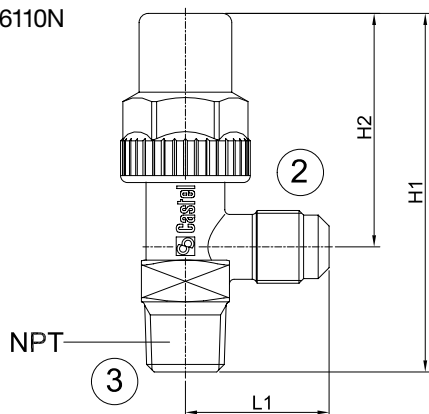
TABLE 3: General characteristics of receiver valves

| Catalogue Number | Connections | | | | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|------|-----------|------|-------------------------------|----------|---------|------|---------------------------------------|
| | IN | | OUT | | | | min. | max. | |
| | SAE Flare | NPT | SAE Flare | NPT | | | | | |
| 6110N/22 | – | 1/4" | 1/4" | – | 0,44 | 50 | -40 | +150 | Art. 4.3 |
| 6110N/X15 | 1/4" F | – | 1/4" | – | | | | | |
| 6110N/23 | – | 3/8" | 1/4" | – | 0,45 | | | | |
| 6110N/32 | – | 1/4" | 3/8" | – | | | | | |
| 6110N/33 | – | 3/8" | 3/8" | – | 1,35 | | | | |
| 6110N/X13 | 3/8" F | – | 3/8" | – | | | | | |
| 6110N/43 | – | 3/8" | 1/2" | – | 2,40 | | | | |
| 6110N/44 | – | 1/2" | 1/2" | – | 3,40 | | | | |
| 6120N/22 | 1/4" | – | – | 1/4" | 0,44 | | | | |
| 6120N/23 | 1/4" | – | – | 3/8" | 0,45 | | | | |
| 6120N/32 | 3/8" | – | – | 1/4" | 1,35 | | | | |
| 6120N/33 | 3/8" | – | – | 3/8" | | | | | |
| 6120N/43 | 1/2" | – | – | 3/8" | 2,40 | | | | |
| 6120N/44 | 1/2" | – | – | 1/2" | 3,40 | | | | |

TABLE 4: Dimensions and weights of receiver valves

| Catalogue Number | Dimensions [mm] | | | | Weight [g] | | | | | | | |
|------------------|-----------------|------|------|----|------------|------|-----|-----|-----|-----|------|-----|
| | H1 | H2 | L1 | L2 | | | | | | | | |
| 6110N/22 | 72 | 48 | 27,5 | – | 110 | | | | | | | |
| 6110N/X15 | 83 | | 29 | | – | 130 | | | | | | |
| 6110N/23 | 77 | | | | | 31 | – | 135 | | | | |
| 6110N/32 | | 50 | – | | | | | 130 | | | | |
| 6110N/33 | | | | | | 87 | | – | 140 | | | |
| 6110N/X13 | 88 | 34,5 | | | | | | | – | 175 | | |
| 6110N/43 | | | | | | 55,5 | | | | – | 220 | |
| 6110N/44 | 92 | – | | | | | | | | | 235 | |
| 6120N/22 | 27,5 | | | | | 72 | | | | | 48 | 110 |
| 6120N/23 | 30 | | | | | | | | | | 77 | 50 |
| 6120N/32 | | | | 80 | | 50 | | | | | 135 | |
| 6120N/33 | | | | | 93 | | | | | | 55,5 | 140 |
| 6120N/43 | 33 | | | – | | | 225 | | | | | |
| 6120N/44 | | | 33 | | – | | 305 | | | | | |

6110N



6120N

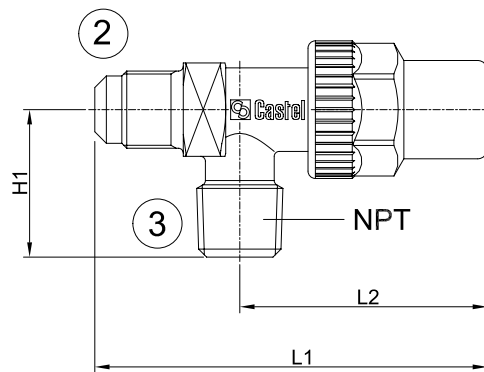
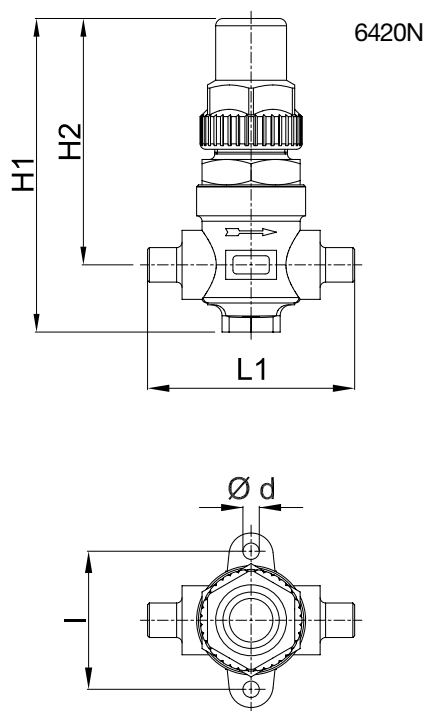


TABLE 5: General characteristics of capped valves

| Catalogue Number | Connections | | | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|------|-----------|-------------------------------|----------|---------|------|---------------------------------------|
| | IN | OUT | | | | min. | max. | |
| | ODS | ODS | SAE Flare | | | | | |
| 6420N/2 | 1/4" | 1/4" | - | 0,40 | 50 | -40 | +130 | Art. 4.3 |
| 6420N/3 | 3/8" | 3/8" | | 1,00 | | | | |
| 6420N/3S3 | 3/8" | - | 3/8" | | | | | |
| 6420N/4 | 1/2" | 1/2" | - | 1,45 | | | | |

TABLE 6: Dimensions and weights of capped valves

| Catalogue Number | Dimensions [mm] | | | | | Weight [g] |
|------------------|-----------------|----|------|-----|----|------------|
| | H1 | H2 | L1 | d | l | |
| 6420N/2 | 85,5 | 67 | 57 | 4,5 | 38 | 300 |
| 6420N/3 | | | 61 | | | 305 |
| 6420N/3S3 | | | 67,5 | | | |
| 6420N/4 | | | 70 | | | |



8.2 – TWO-WAYS VALVES WITH BALL SHUTTER

APPLICATIONS

The 2-ways valves with ball shutter in series 6570N, 6571N are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

CONSTRUCTION

The specific design of 2-ways valves with ball shutter:

- ensures the internal pressure equilibrium when the valve is closed,
- permits the two-directional flow of the refrigerant
- prevents any risk of ejection or explosion of the spindle.

The electric welding of the body and the spindle gaskets ensure perfect hermetic seal of the valve.

These valves are available in the following two series:

- 6570N (full port) and 6571N (reduced port) without access fitting.
- 6570N/xxA (full port) and 6571N/xxA (reduced port) with access fitting. The valves are equipped with mechanism 8395/A3 and cap 8392/A.

The main parts are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for the body and the protective cap of the spindle
- Hot forged brass EN 12420 – CW 617N, chromium plated, for the ball
- Copper pipe EN 12735-1 – Cu -DHP for solder connections
- Steel, with proper surface protection, for the spindle.
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for the ball seat gaskets

INSTALLATION

The 2-ways valves with ball shutter can be installed in all sections of a refrigerating system, in compliance with the limits and capacities indicated in Table 7. Table 7 shows the following functional characteristics of a valve with ball shutter.

- PS
- TS
- Kv factor

Brazing of the valves with ball shutter with solder connections should be carried out with care, using a low melting point filler material (min. 5% Ag). It is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the entire valve.

CERTIFICATIONS

Valves with ball shutter in series 6570N, 6571N have been approved by the American certification authority, Underwriters Laboratories Inc. These taps are **UL Listed** certified for the USA with file SA33319, in compliance with American standard UL 207.

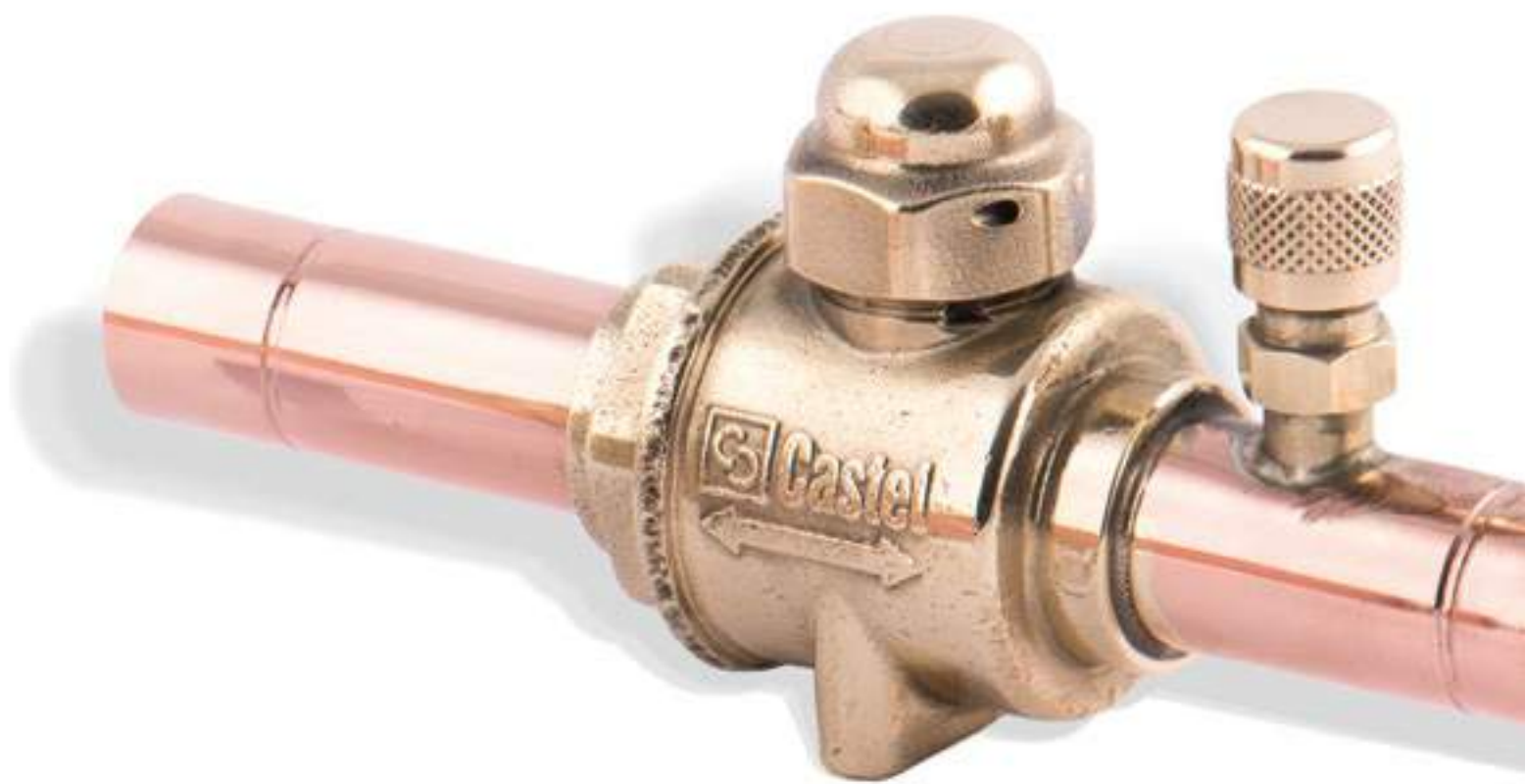


TABLE 7: General characteristics of ball valves, UL approved

| Catalogue Number | | Connections | | Ball Port Ø [mm] | Kv Factor [m ³ /h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------------|---------------------|-------------|--------|------------------|-------------------------------|------------------|---------|------|---------------------------------------|
| without access fitting | with access fitting | ODS | | | | | min. | max. | |
| | | Ø [in.] | Ø [mm] | | | | | | |
| 6570N/M6 | 6570N/M6A | – | 6 | 10 | 0,8 | 50 (1) (2) | -40 | +150 | Art. 4.3 |
| 6570N/2 | 6570N/2A | 1/4" | – | | 3 | | | | |
| 6570N/3 | 6570N/3A | 3/8" | – | | | | | | |
| 6570N/M10 | 6570N/M10A | – | 10 | | | | | | |
| 6570N/M12 | 6570N/M12A | – | 12 | | | | | | |
| 6570N/4 | 6570N/4A | 1/2" | – | | 15 | | | | |
| 6571N/5 | – | 5/8" | 16 | | | | | | |
| 6570N/M15 | 6570N/M15A | – | 15 | | | | | | |
| 6570N/5 | 6570N/5A | 5/8" | 16 | | | | | | |
| 6570N/M18 | 6570N/M18A | – | 18 | | | | | | |
| 6570N/6 | 6570N/6A | 3/4" | – | 19 | | | | | |
| 6571N/7 | – | 7/8" | 22 | | | | | | |
| 6570N/7 | 6570N/7A | 7/8" | 22 | | 25 | | | | |
| 6571N/M28 | – | – | 28 | | | | | | |
| 6571N/9 | – | 1.1/8" | – | 32 | | | | | |
| 6570N/M28 | 6570N/M28A | – | 28 | | | | | | |
| 6570N/9 | 6570N/9A | 1.1/8" | – | | 38 | | | | |
| 6571N/11 | – | 1.3/8" | 35 | 50 | | | | | |
| 6570N/11 | 6570N/11A | 1.3/8" | 35 | | 60 | | | | 380 |
| 6570N/13 | 6570N/13A | 1.5/8" | – | 73 | | | | | |
| 6570N/M42 | 6570N/M42A | – | 42 | | | | | | |
| 6570N/17 | 6570N/17A | 2.1/8" | 54 | | 82 | 710 | | | |
| 6570N/M64 | 6570N/M64A | – | 64 | | | | | | |
| – | 6570N/21A | 2.5/8" | – | | 82 | 710 | | | |
| | 6570N/24A | 3" | 76 | | | | | | |
| | 6570N/25A | 3.1/8" | 80 | | | | | | |
| | 6570N/28A | 3.1/2" | 89 | | | | | | |
| | 6570N/29A | 3.5/8" | 92 | | | | | | |

(1) : MWP = 600 psi for 6570N/.. according to UL approval
 (2) : MWP = 435 psi for 6571N/.. according to UL approval

TABLE 8: Refrigerant flow capacity of ball valves in liquid line [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|------------------------|---------------------|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| without access fitting | with access fitting | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6570N/M6 | 6570N/M6A | 13,6 | 20,1 | 9,5 | 13,8 | 13,7 | 9,2 | 10,1 | 12,0 | 12,5 | 12,6 |
| 6570N/2 | 6570N/2A | | | | | | | | | | |
| 6570N/3 | 6570N/3A | 51 | 75 | 36 | 52 | 52 | 35 | 38 | 45 | 47 | 47 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 85 | 126 | 60 | 86 | 86 | 58 | 63 | 75 | 78 | 79 |
| 6570N/4 | 6570N/4A | | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 289 | 427 | 202 | 293 | 292 | 196 | 214 | 256 | 266 | 267 |
| 6570N/5 | 6570N/5A | | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | | |
| 6571N/7 | – | | | | | | | | | | |
| 6570N/7 | 6570N/7A | 493 | 729 | 345 | 500 | 498 | 334 | 365 | 436 | 454 | 456 |
| 6571N/M28 | – | | | | | | | | | | |
| 6571N/9 | – | | | | | | | | | | |
| 6570N/M28 | 6570N/M28A | 867 | 1282 | 607 | 879 | 876 | 587 | 642 | 767 | 798 | 802 |
| 6570N/9 | 6570N/9A | | | | | | | | | | |
| 6571N/11 | – | | | | | | | | | | |
| 6570N/11 | 6570N/11A | 1462 | 2161 | 1023 | 1482 | 1477 | 989 | 1082 | 1293 | 1346 | 1352 |
| 6570N/13 | 6570N/13A | 1989 | 2940 | 1392 | 2016 | 2009 | 1346 | 1472 | 1760 | 1831 | 1839 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | | |
| 6570N/17 | 6570N/17A | 3638 | 5378 | 2547 | 3687 | 3674 | 2461 | 2692 | 3219 | 3349 | 3364 |
| 6570N/M64 | 6570N/M64A | 6460 | 9549 | 4522 | 6547 | 6525 | 4370 | 4780 | 5715 | 5947 | 5974 |
| | 6570N/21A | | | | | | | | | | |
| | 6570N/24A | 9350 | 13822 | 6545 | 9477 | 9444 | 6325 | 6919 | 8272 | 8608 | 8646 |
| | 6570N/25A | | | | | | | | | | |
| | 6570N/28A | 12070 | 17842 | 8449 | 12233 | 12191 | 8165 | 8932 | 10678 | 11112 | 11161 |
| | 6570N/29A | | | | | | | | | | |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 8: Refrigerant flow capacity of ball valves in liquid line [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|------------------------|---------------------|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| without access fitting | with access fitting | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 6570N/M6 | 6570N/M6A | 12,7 | 9,7 | 16,0 | 16,4 | 11,6 | 16,3 | 19,1 | 17,0 | 17,0 |
| 6570N/2 | 6570N/2A | | | | | | | | | |
| 6570N/3 | 6570N/3A | 48 | 36 | 60 | 61 | 44 | 61 | 72 | 64 | 64 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 80 | 61 | 100 | 102 | 73 | 102 | 120 | 106 | 106 |
| 6570N/4 | 6570N/4A | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 270 | 206 | 341 | 348 | 248 | 346 | 406 | 360 | 360 |
| 6570N/5 | 6570N/5A | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | |
| 6571N/7 | – | 461 | 352 | 581 | 593 | 422 | 591 | 693 | 615 | 615 |
| 6570N/7 | 6570N/7A | | | | | | | | | |
| 6571N/M28 | – | | | | | | | | | |
| 6571N/9 | – | 811 | 619 | 1023 | 1043 | 743 | 1039 | 1219 | 1081 | 1081 |
| 6570N/M28 | 6570N/M28A | | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | |
| 6571N/11 | – | 1368 | 1043 | 1724 | 1760 | 1252 | 1753 | 2055 | 1823 | 1823 |
| 6570N/11 | 6570N/11A | | | | | | | | | |
| 6570N/13 | 6570N/13A | 1861 | 1419 | 2346 | 2394 | 1704 | 2384 | 2796 | 2480 | 2480 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | |
| 6570N/17 | 6570N/17A | 3405 | 2596 | 4291 | 4378 | 3116 | 4361 | 5115 | 4537 | 4537 |
| 6570N/M64 | 6570N/M64A | 6046 | 4609 | 7619 | 7775 | 5533 | 7744 | 9082 | 8056 | 8056 |
| – | 6570N/21A | | | | | | | | | |
| – | 6570N/24A | 8751 | 6672 | 11028 | 11253 | 8008 | 11209 | 13145 | 11660 | 11660 |
| – | 6570N/25A | | | | | | | | | |
| – | 6570N/28A | 11296 | 8612 | 14236 | 14527 | 10338 | 14470 | 16969 | 15052 | 15052 |
| – | 6570N/29A | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 9: Refrigerant flow capacity of ball valves in suction line [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|------------------------|---------------------|--------------|------|-------|-------|-------|------|---------|---------|-------|-------|
| without access fitting | with access fitting | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6570N/M6 | 6570N/M6A | 1,5 | 3,4 | 1,8 | 1,8 | 2,6 | 1,8 | 1,2 | 1,1 | 1,9 | 1,8 |
| 6570N/2 | 6570N/2A | | | | | | | | | | |
| 6570N/3 | 6570N/3A | 5,5 | 12,8 | 6,6 | 6,8 | 9,9 | 6,7 | 4,4 | 4,3 | 7,2 | 6,6 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 9,1 | 21,3 | 11,0 | 11,4 | 16,5 | 11,2 | 7,4 | 7,1 | 12,0 | 11,0 |
| 6570N/4 | 6570N/4A | | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | | | | | | | | | | |
| 6570N/5 | 6570N/5A | 31 | 72 | 37 | 39 | 56 | 38 | 25 | 24 | 41 | 37 |
| 6570N/M18 | 6570N/M18A | | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | | |
| 6571N/7 | – | | | | | | | | | | |
| 6570N/7 | 6570N/7A | 53 | 123 | 64 | 66 | 96 | 65 | 43 | 41 | 70 | 64 |
| 6571N/M28 | – | | | | | | | | | | |
| 6571N/9 | – | | | | | | | | | | |
| 6570N/M28 | 6570N/M28A | | | | | | | | | | |
| 6570N/9 | 6570N/9A | 93 | 217 | 112 | 116 | 168 | 114 | 75 | 72 | 122 | 112 |
| 6571N/11 | – | | | | | | | | | | |
| 6570N/11 | 6570N/11A | 157 | 366 | 189 | 195 | 284 | 192 | 126 | 122 | 206 | 189 |
| 6570N/13 | 6570N/13A | 213 | 497 | 257 | 266 | 386 | 261 | 172 | 166 | 281 | 257 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | | |
| 6570N/17 | 6570N/17A | 389 | 910 | 471 | 486 | 706 | 477 | 315 | 304 | 514 | 471 |
| 6570N/M64 | 6570N/M64A | 692 | 1615 | 836 | 863 | 1254 | 847 | 559 | 540 | 912 | 836 |
| | 6570N/21A | | | | | | | | | | |
| | 6570N/24A | 1001 | 2338 | 1210 | 1249 | 1815 | 1227 | 809 | 781 | 1320 | 1210 |
| | 6570N/25A | | | | | | | | | | |
| | 6570N/28A | 1292 | 3018 | 1562 | 1612 | 2343 | 1583 | 1044 | 1008 | 1704 | 1562 |
| | 6570N/29A | | | | | | | | | | |

continue →

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 9: Refrigerant flow capacity of ball valves in suction line [kW]

| Catalogue Number | | Refrigerants | | | | | | | | |
|------------------------|---------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| without access fitting | with access fitting | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 6570N/M6 | 6570N/M6A | 1,3 | 1,7 | 2,8 | 2,8 | 1,4 | 2,4 | 1,0 | 1,3 | 2,8 |
| 6570N/2 | 6570N/2A | | | | | | | | | |
| 6570N/3 | 6570N/3A | 4,8 | 6,3 | 10,5 | 10,5 | 5,4 | 9,2 | 3,9 | 4,7 | 10,4 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 8,0 | 10,6 | 17,5 | 17,5 | 9,0 | 15,3 | 6,5 | 7,9 | 17,4 |
| 6570N/4 | 6570N/4A | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 27 | 36 | 59 | 60 | 30 | 52 | 22 | 27 | 59 |
| 6570N/5 | 6570N/5A | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | |
| 6571N/7 | – | 46 | 61 | 101 | 102 | 52 | 88 | 37 | 46 | 101 |
| 6570N/7 | 6570N/7A | | | | | | | | | |
| 6571N/M28 | – | | | | | | | | | |
| 6571N/9 | – | 81 | 108 | 178 | 179 | 91 | 156 | 66 | 81 | 177 |
| 6570N/M28 | 6570N/M28A | | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | |
| 6571N/11 | – | 137 | 181 | 300 | 301 | 154 | 262 | 111 | 136 | 299 |
| 6570N/11 | 6570N/11A | | | | | | | | | |
| 6570N/13 | 6570N/13A | 186 | 247 | 408 | 410 | 209 | 357 | 151 | 185 | 407 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | |
| 6570N/17 | 6570N/17A | 340 | 452 | 747 | 749 | 383 | 653 | 276 | 338 | 745 |
| 6570N/M64 | 6570N/M64A | 604 | 802 | 1326 | 1330 | 680 | 1159 | 490 | 600 | 1322 |
| – | 6570N/21A | | | | | | | | | |
| – | 6570N/24A | 875 | 1161 | 1920 | 1925 | 985 | 1678 | 710 | 869 | 1914 |
| – | 6570N/25A | | | | | | | | | |
| – | 6570N/28A | 1129 | 1498 | 2478 | 2485 | 1271 | 2166 | 916 | 1122 | 2471 |
| – | 6570N/29A | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 10: Refrigerant flow capacity of ball valves in hot gas line [kW]

| Catalogue Number | | Refrigerants | | | | | | | | | |
|------------------------|---------------------|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| without access fitting | with access fitting | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6570N/M6 | 6570N/M6A | 6,8 | 14,5 | 7,7 | 9,5 | 10,9 | 7,6 | 5,3 | 5,5 | 9,4 | 8,6 |
| 6570N/2 | 6570N/2A | | | | | | | | | | |
| 6570N/3 | 6570N/3A | 26 | 54 | 29 | 36 | 41 | 29 | 20 | 21 | 35 | 32 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 43 | 91 | 48 | 60 | 68 | 48 | 33 | 34 | 59 | 54 |
| 6570N/4 | 6570N/4A | | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 145 | 309 | 163 | 202 | 231 | 162 | 113 | 116 | 201 | 183 |
| 6570N/5 | 6570N/5A | | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | | |
| 6571N/7 | – | | | | | | | | | | |
| 6570N/7 | 6570N/7A | 247 | 527 | 278 | 345 | 394 | 277 | 193 | 199 | 342 | 313 |
| 6571N/M28 | – | | | | | | | | | | |
| 6571N/9 | – | | | | | | | | | | |
| 6570N/M28 | 6570N/M28A | 434 | 926 | 490 | 607 | 694 | 487 | 339 | 349 | 602 | 550 |
| 6570N/9 | 6570N/9A | | | | | | | | | | |
| 6571N/11 | – | | | | | | | | | | |
| 6570N/11 | 6570N/11A | 731 | 1562 | 826 | 1023 | 1170 | 820 | 571 | 589 | 1015 | 927 |
| 6570N/13 | 6570N/13A | 995 | 2125 | 1123 | 1392 | 1591 | 1116 | 777 | 801 | 1381 | 1261 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | | |
| 6570N/17 | 6570N/17A | 1819 | 3886 | 2054 | 2547 | 2910 | 2042 | 1421 | 1466 | 2525 | 2307 |
| 6570N/M64 | 6570N/M64A | 3230 | 6901 | 3648 | 4522 | 5168 | 3625 | 2523 | 2603 | 4484 | 4096 |
| | 6570N/21A | | | | | | | | | | |
| | 6570N/24A | | | | | | | | | | |
| | 6570N/25A | | | | | | | | | | |
| | 6570N/28A | | | | | | | | | | |
| – | 6570N/29A | 6035 | 12894 | 6816 | 8449 | 9656 | 6773 | 4714 | 4864 | 8378 | 7654 |

continue →

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 10: Refrigerant flow capacity of ball valves in hot gas line [kW]

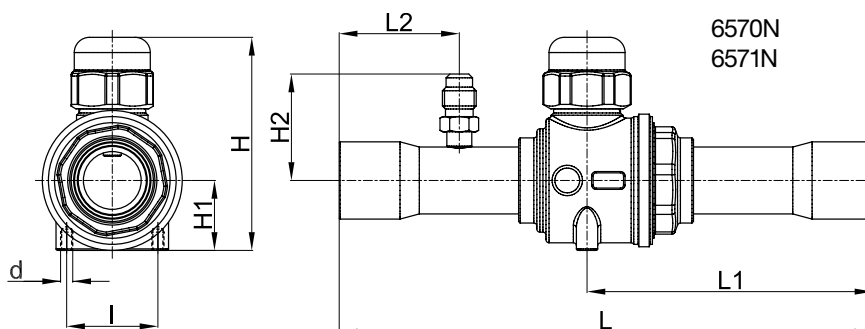
| Catalogue Number | | Refrigerants | | | | | | | | |
|------------------------|---------------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| without access fitting | with access fitting | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 6570N/M6 | 6570N/M6A | 6,1 | 8,0 | 12,2 | 12,3 | 6,5 | 10,2 | 5,2 | 6,0 | 11,5 |
| 6570N/2 | 6570N/2A | | | | | | | | | |
| 6570N/3 | 6570N/3A | 23 | 30 | 46 | 46 | 24 | 38 | 19 | 22 | 43 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | 38 | 50 | 77 | 77 | 41 | 64 | 32 | 37 | 72 |
| 6570N/4 | 6570N/4A | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 130 | 170 | 260 | 262 | 138 | 217 | 110 | 126 | 245 |
| 6570N/5 | 6570N/5A | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | |
| 6571N/7 | – | 222 | 289 | 444 | 447 | 236 | 370 | 187 | 216 | 418 |
| 6570N/7 | 6570N/7A | | | | | | | | | |
| 6571N/M28 | – | | | | | | | | | |
| 6571N/9 | – | 390 | 509 | 780 | 787 | 415 | 651 | 329 | 379 | 734 |
| 6570N/M28 | 6570N/M28A | | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | |
| 6571N/11 | – | 658 | 858 | 1316 | 1327 | 700 | 1097 | 556 | 640 | 1238 |
| 6570N/11 | 6570N/11A | | | | | | | | | |
| 6570N/13 | 6570N/13A | 895 | 1168 | 1790 | 1805 | 952 | 1493 | 756 | 870 | 1685 |
| 6570N/M42 | 6570N/M42A | | | | | | | | | |
| 6570N/17 | 6570N/17A | 1637 | 2136 | 3274 | 3302 | 1742 | 2731 | 1382 | 1592 | 3082 |
| 6570N/M64 | 6570N/M64A | 2907 | 3792 | 5814 | 5863 | 3093 | 4849 | 2455 | 2827 | 5472 |
| | 6570N/21A | | | | | | | | | |
| | 6570N/24A | 4208 | 5489 | 8415 | 8487 | 4477 | 7018 | 3553 | 4092 | 7920 |
| | 6570N/25A | | | | | | | | | |
| | 6570N/28A | 5432 | 7086 | 10863 | 10955 | 5779 | 9060 | 4587 | 5282 | 10224 |
| | 6570N/29A | | | | | | | | | |

Standard rating conditions according to AHRI Standard 760-2014

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

TABLE 11: Dimensions and weights of ball valves

| Catalogue Number | | Dimensions [mm] | | | | | | | Weight [g] | | | | | | | | | |
|------------------|------------|-----------------|----|-----|-----|------|-----|------|------------|-------|----|----|-------|-------|------|----|----|-------|
| | | H | H1 | H2 | L | L1 | L2 | l | | d | | | | | | | | |
| 6570N/M6 | 6570N/M6A | 48 | 15 | 29 | 121 | 65 | 25 | 18 | M4 | 198 | | | | | | | | |
| 6570N/2 | 6570N/2A | | | | | | | | | 201 | | | | | | | | |
| 6570N/3 | 6570N/3A | | | | | | | | | | | | | | | | | |
| 6570N/M10 | 6570N/M10A | | | - | 138 | 73,5 | - | | | 208 | | | | | | | | |
| 6570N/M12 | 6570N/M12A | | | | | | | | | | | | | | | | | |
| 6570N/4 | 6570N/4A | | | | | | | | | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | 55 | 19 | 32 | 139 | 73 | 30 | 25,5 | M4 | 311 | | | | | | | | |
| 6570N/5 | 6570N/5A | | | | | | | | | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | - | 175 | 90,5 | - | | | 360 | | | | | | | | |
| 6571N/7 | - | | | | | | | | | | | | | | | | | |
| 6570N/7 | 6570N/7A | 70 | 23 | 34 | 175 | 94 | 40 | 30 | M6 | 570 | | | | | | | | |
| 6571N/M28 | - | | | 206 | 109 | - | 601 | | | | | | | | | | | |
| 6571N/9 | - | | | | | | | | | | | | | | | | | |
| 6570N/M28 | 6570N/M28A | 79 | 27 | 37 | 204 | 109 | 45 | 30 | M6 | 708 | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | | | | | | | | | |
| 6571N/11 | - | | | - | 245 | 130 | - | | | 840 | | | | | | | | |
| 6570N/11 | 6570N/11A | | | | | | | | | | | | | | | | | |
| 6570N/13 | 6570N/13A | 127 | 44 | 45 | 239 | 126 | 48 | 30 | M6 | 1518 | | | | | | | | |
| 6570N/M42 | 6570N/M42A | | | | | | | | | | | | | | | | | |
| 6570N/17 | 6570N/17A | 148 | 54 | 53 | 275 | 149 | 58 | 30 | M6 | 2470 | | | | | | | | |
| 6570N/M64 | 6570N/M64A | 150 | 55 | 57 | 343 | 186 | 68 | 75 | M8 | 4360 | | | | | | | | |
| - | 6570N/21A | | | | | | | | | 186,5 | 70 | 64 | 365,5 | 196,5 | 69 | 89 | M8 | 6000 |
| - | 6570N/24A | | | | | | | | | | | | | | | | | 6240 |
| - | 6570N/25A | | | | | | | | | 10735 | | | | | | | | |
| - | 6570N/28A | | | | | | | | | 195 | 75 | 68 | 373 | 197,5 | 70,5 | 75 | M8 | 10790 |
| - | 6570N/29A | 12789 | | | | | | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | - | - | 12807 | | | | | | | | |



8.3 – THREE-WAYS MANUAL VALVES WITH BALL SHUTTER

APPLICATIONS

The 3-ways manual valves in series 6690N and 6690NB are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

– actuators of other brands at disposal on the market using specific flanged adapters between the two parts. To find the adapter to be used with Castel or other brands actuators, refer to the specific Castel brochure.

The actuator can be mounted on the valve in four different positions, oriented at 90° to each other. The 3-way ball valves can be mounted in any orientation and any limitations on their mounting must be found on the instructions of the actuator itself.

The brazing of 3-way valves should be carried out with care, using a low melting point filler material (min. 5% Ag). It is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the entire valve.

CONSTRUCTION

The specific design of 3-ways valves with ball shutter prevents any risk of ejection or explosion of the spindle. The electric welding of the body and the spindle gaskets ensure perfect hermetic seal of the valve.

The main parts are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for all the parts of the body and the protective cap of the spindle
- Hot forged brass EN 12420 – CW 617N, chromium plated, for the ball
- Copper pipe EN 12735-1 – Cu -DHP for solder connections
- Stainless steel EN 10088-3 – 1.4305 for spindles
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for the ball seat gaskets

INSTALLATION

The 3-way ball valves in series 6690N and 6690NB act as changeover valves, not allowing for bi-direction flow of the refrigerant fluid. The input is always in the centre position, and the two outputs in the lateral positions. These valves can be coupled with:

- Castel actuators in series 9700, 9720 and 9730



TABLE 12: General characteristics of 3-way manual valves

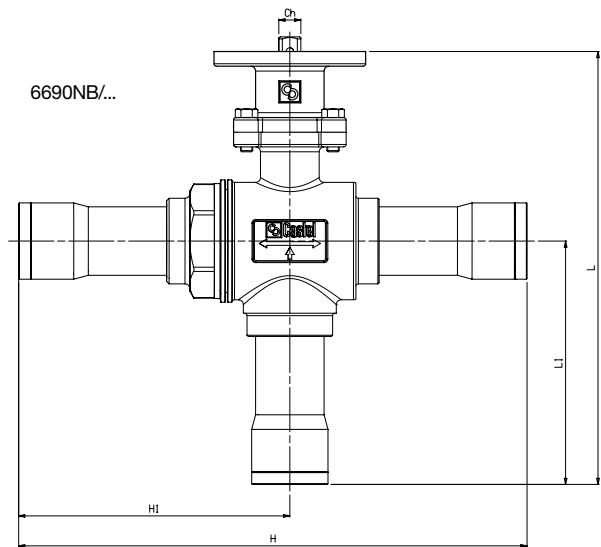
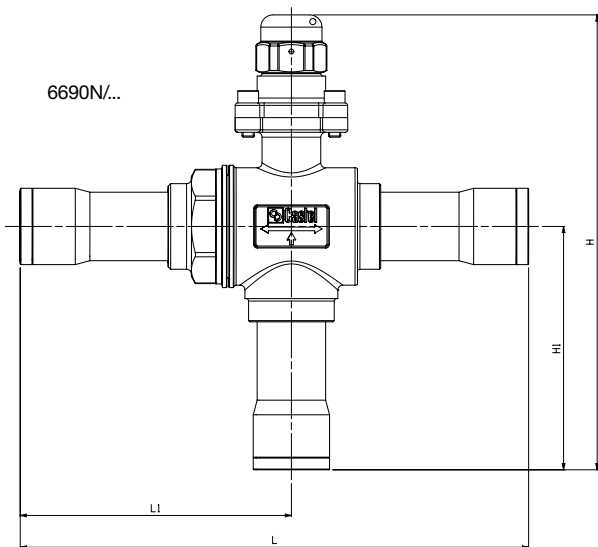
| Catalogue Number | Connections | | Ball Port Ø [mm] | Kv Factor [m3/h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|--------|------------------|------------------|----------|---------|------|---------------------------------------|
| | ODS | | | | | min. | max. | |
| | Ø [in.] | Ø [mm] | | | | | | |
| 6690N/7 | 7/8" | 22 | 19 | 10,7 | 50 | -40 | +150 | Art. 4.3 |
| 6690N/M28 | - | 28 | 24 | 15,9 | | | | |
| 6690N/9 | 1.1/8" | - | 24 | | | | | |
| 6690N/11 | 1.3/8" | 35 | 28 | 20,3 | | | | II |
| 6690N/13 | 1.5/8" | - | 37 | 38,5 | | | | |
| 6690N/M42 | - | 42 | 37 | | | | | |

TABLE 13: General characteristics of 3-way valves to be motorized

| Catalogue Number | Connections | | Ball Port Ø [mm] | Kv Factor [m3/h] | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|--------|------------------|------------------|----------|---------|------|---------------------------------------|
| | ODS | | | | | min. | max. | |
| | Ø [in.] | Ø [mm] | | | | | | |
| 6690NB/7 | 7/8" | 22 | 19 | 10,7 | 50 | -40 | +150 | Art. 4.3 |
| 6690NB/M28 | - | 28 | 24 | 15,9 | | | | |
| 6690NB/9 | 1.1/8" | - | 24 | | | | | |
| 6690NB/11 | 1.3/8" | 35 | 28 | 20,3 | | | | II |
| 6690NB/13 | 1.5/8" | - | 37 | 38,5 | | | | |
| 6690NB/M42 | - | 42 | 37 | | | | | |

TABLE 14: Dimensions and weights of 3-ways valves

| Catalogue Number | Figure | Dimensions [mm] | | | | | Weight [g] |
|------------------|--------|-----------------|-----|-----|-----|----|------------|
| | | H | H1 | L | L1 | Ch | |
| 6690N/7 | 1 | 165 | 82 | 172 | 94 | 9 | 1210 |
| 6690N/M28 | | 186 | 100 | 208 | 111 | | 1540 |
| 6690N/9 | | 186 | | | | | 1540 |
| 6690N/11 | | 203 | 103 | 211 | 113 | 11 | 2117 |
| 6690N/13 | | 226 | 121 | 240 | 127 | | 3447 |
| 6690N/M42 | | 226 | | | | | 3447 |
| 6690NB/7 | 2 | 156 | 82 | 172 | 94 | 9 | 1210 |
| 6690NB/M28 | | 177 | 100 | 208 | 111 | | 1540 |
| 6690NB/9 | | 177 | | | | | 1540 |
| 6690NB/11 | | 186 | 103 | 211 | 113 | 11 | 2117 |
| 6690NB/13 | | 209 | 121 | 240 | 127 | | 3447 |
| 6690NB/M42 | | 209 | | | | | 3447 |



8.4 – THREE-WAYS MOTORIZED VALVES WITH BALL SHUTTER

APPLICATIONS

The 3-ways motorized valves in series 6690NM are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These valves have been developed by Castel for all those commercial refrigeration systems and civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

CAUTION! These valves cannot be installed on systems that use HCFC (R22) refrigerant.

CONSTRUCTION

The specific design of 3-ways valves with ball shutter prevents any risk of ejection or explosion of the spindle. The electric welding of the body and the spindle gaskets ensure perfect hermetic seal of the valve.

These valves are sold including the actuator and the relative adapter, in versions with suffix A2 (24 VAC) or suffix A6 (230 VAC).

The main parts are made with the following materials:

- Hot forged brass EN 12420 – CW 617N for all the parts of the body and the protective cap of the spindle
- Hot forged brass EN 12420 – CW 617N, chromium plated, for the ball
- Copper pipe EN 12735-1 – Cu -DHP for solder connections
- Stainless steel EN 10088-3 – 1.4305 for spindles
- Hydrogenated nitrile butadiene rubber (HNBR) for outlet seal gaskets
- P.T.F.E. for the ball seat gaskets

INSTALLATION

The 3-way ball valves in series 6690NM act as changeover valves, not allowing for bi-direction flow of the refrigerant fluid. The input is always in the centre position, and the two outputs in the lateral positions. These valves are coupled with

the Castel actuators in series 9700, 9720 and 9730 using proper flanged adapters between the two parts.

The actuator can be mounted on the valve:

- In four different positions, oriented at 90° to each other.
- With horizontal output connections and vertical input connection, facing downward.
- With vertical output connections and horizontal input connection.

The actuator can never be mounted on the valve:

- Upside-down, oriented facing downward
- Vertically, with the cable oriented upwards

Once the valve / actuator has been coupled, remote movement of the valve is possible. In the event power is cut-off, the valve can be operated manually, excluding the actuator with a release clutch.

All of the actuators can be equipped with auxiliary contacts in series 9750, sold separately.

The brazing of 3-way valves should be carried out with care, using a low melting point filler material (min. 5% Ag). It is important to avoid direct contact between the torch flame and the valve body, which could be damaged and compromise the proper functioning of the entire valve.



TABLE 15: Mechanical characteristics of 3-ways motorized valves

| Catalogue Number | Voltage [V] | Connections | | Ball Port Ø [mm] | Kv Factor [m ³ /h] | Torque [Nm] | Running Time [sec] | Rotation Angle | PS [bar] | TS [°C] | | Risk Category according to PED Recast |
|------------------|-------------|-------------|--------|------------------|-------------------------------|-------------|--------------------|----------------|----------|---------|------|---------------------------------------|
| | | ODS | | | | | | | | min. | max. | |
| | | Ø [in.] | Ø [mm] | | | | | | | | | |
| 6690NM/7A2 | 24V | 7/8" | 22 | 19 | 11 | 10 | 60 | 90° | 50 | -40 | +150 | Art. 4.3 |
| 6690NM/7A6 | 230V | | | | | | | | | | | |
| 6690NM/M28A2 | 24V | - | 28 | 24 | 16 | | | | | | | |
| 6690NM/M28A6 | 230V | | | | | | | | | | | |
| 6690NM/9A2 | 24V | 1.1/8" | - | 24 | 16 | | | | | | | |
| 6690NM/9A6 | 230V | | | | | | | | | | | |
| 6690NM/11A2 | 24V | 1.3/8" | 35 | 28 | 20,5 | 30 | 120 | | | | | II |
| 6690NM/11A6 | 230V | | | | | | | | | | | |
| 6690NM/13A2 | 24V | 1.5/8" | - | 37 | 39 | | | | | | | |
| 6690NM/13A6 | 230V | | | | | | | | | | | |
| 6690NM/M42A2 | 24V | - | 42 | 37 | 39 | | | | | | | |
| 6690NM/M42A6 | 230V | | | | | | | | | | | |

TABLE 16: Electrical characteristics of 3-ways motorized valves

| Catalogue Number | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Active Power [W] | | Apparent Power [VA] | | Cable 1 m | Wiring Connections | | Protection Degree |
|------------------|-------------|-----------------------|----------------|------------------|------------|---------------------|------------|--------------------------|---------------------------------------|-----------------------------|-------------------|
| | | | | Operation | Standstill | Operation | Standstill | | Switching output 2 point (Open/Close) | Continuous output (0 - 10V) | |
| | | | | | | | | | | | |
| 6690M/7A2 | 24 A.C. | +20 / -20 | 50 / 60 | 4,8 | 1,5 | 8,7 | 3 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/7A6 | 230 A.C. | +15 / -15 | 50 / 60 | 2,9 | 0,5 | 5,6 | 5,1 | 3 x 0,75 mm ² | YES | NO | IP 43 |
| 6690M/M28A2 | 24 A.C. | +20 / -20 | 50 / 60 | 4,8 | 1,5 | 8,7 | 3 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/M28A6 | 230 A.C. | +15 / -15 | 50 / 60 | 2,9 | 0,5 | 5,6 | 5,1 | 3 x 0,75 mm ² | YES | NO | IP 43 |
| 6690M/9A2 | 24 A.C. | +20 / -20 | 50 / 60 | 4,8 | 1,5 | 8,7 | 3 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/9A6 | 230 A.C. | +15 / -15 | 50 / 60 | 2,9 | 0,5 | 5,6 | 5,1 | 3 x 0,75 mm ² | YES | NO | IP 43 |
| 6690M/11A2 | 24 A.C. | +20 / -20 | 50 / 60 | 2,4 | 0,26 | 4,3 | 0,48 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/11A6 | 230 A.C. | +15 / -15 | 50 / 60 | 3,7 | 1,1 | 4,7 | 2,7 | 3 x 0,75 mm ² | YES | NO | IP 43 |
| 6690M/13A2 | 24 A.C. | +20 / -20 | 50 / 60 | 2,4 | 0,26 | 4,3 | 0,48 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/13A6 | 230 A.C. | +15 / -15 | 50 / 60 | 3,7 | 1,1 | 4,7 | 2,7 | 3 x 0,75 mm ² | YES | NO | IP 43 |
| 6690M/M42A2 | 24 A.C. | +20 / -20 | 50 / 60 | 2,4 | 0,26 | 4,3 | 0,48 | 5 x 0,5 mm ² | YES | YES | IP 54 |
| | 24 D.C. | +20 / -20 | - | | | | | | | | |
| 6690M/M42A6 | 230 A.C. | +15 / -15 | 50 / 60 | 3,7 | 1,1 | 4,7 | 2,7 | 3 x 0,75 mm ² | YES | NO | IP 43 |

TABLE 17: Refrigerant flow capacity of 3-way valves in liquid line [kW]

| Catalogue Number | | | Refrigerants | | | | | | | | | |
|------------------|------------|--------------|--------------|-----|-------|-------|-------|------|---------|---------|-------|-------|
| | | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 182 | 269 | 127 | 184 | 184 | 123 | 135 | 161 | 167 | 168 |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 270 | 400 | 189 | 274 | 273 | 183 | 200 | 239 | 249 | 250 |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 345 | 510 | 242 | 350 | 349 | 233 | 255 | 305 | 318 | 319 |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 655 | 968 | 458 | 663 | 661 | 443 | 484 | 579 | 603 | 605 |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | | |

| Catalogue Number | | | Refrigerants | | | | | | | | |
|------------------|------------|--------------|--------------|-------|-------|-------|-------|------|------|-------|-------|
| | | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 170 | 130 | 215 | 219 | 156 | 218 | 256 | 227 | 227 |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 253 | 193 | 319 | 325 | 232 | 324 | 380 | 337 | 337 |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 323 | 246 | 407 | 415 | 296 | 414 | 485 | 430 | 430 |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 613 | 467 | 772 | 788 | 561 | 785 | 920 | 816 | 816 |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | |

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 18: Refrigerant flow capacity of 3-way valves in suction line [kW]

| Catalogue Number | | | Refrigerants | | | | | | | | | |
|------------------|------------|--------------|--------------|-----|-------|-------|-------|------|---------|---------|-------|-------|
| | | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 19 | 45 | 24 | 24 | 35 | 24 | 16 | 15 | 26 | 24 |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 29 | 68 | 35 | 36 | 52 | 35 | 23 | 23 | 38 | 35 |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 37 | 86 | 45 | 46 | 67 | 45 | 30 | 29 | 49 | 45 |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 70 | 164 | 85 | 87 | 127 | 86 | 57 | 55 | 92 | 85 |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | | |

| Catalogue Number | | | Refrigerants | | | | | | | | | |
|------------------|------------|--------------|--------------|-------|-------|-------|-------|------|------|-------|-------|--|
| | | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 17 | 23 | 37 | 37 | 19 | 33 | 14 | 17 | 37 | |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 25 | 34 | 55 | 56 | 28 | 48 | 21 | 25 | 55 | |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 32 | 43 | 71 | 71 | 36 | 62 | 26 | 32 | 71 | |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 61 | 81 | 134 | 135 | 69 | 117 | 50 | 61 | 134 | |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | | |

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 19: Refrigerant flow capacity of 3-way valves in hot gas line [kW]

| Catalogue Number | | | Refrigerants | | | | | | | | | |
|------------------|------------|--------------|--------------|-------|-------|-------|-------|------|---------|---------|-------|-------|
| | | | R134a | R32 | R404A | R407C | R410A | R507 | R1234yf | R1234ze | R448A | R449A |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 91 | 194 | 103 | 127 | 146 | 102 | 71 | 73 | 126 | 115 |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 135 | 289 | 153 | 189 | 216 | 152 | 106 | 109 | 188 | 171 |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 173 | 369 | 195 | 242 | 276 | 194 | 135 | 139 | 240 | 219 |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 327 | 699 | 370 | 458 | 524 | 367 | 256 | 264 | 454 | 415 |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | | |
| Catalogue Number | | | | | | | | | | | | |
| | | | R450A | R452A | R452B | R454B | R513A | R290 | R600 | R600a | R1270 | |
| 6690N/7 | 6690NB/7 | 6690NM/7A# | 82 | 107 | 164 | 165 | 87 | 137 | 69 | 80 | 154 | |
| 6690N/M28 | 6690NB/M28 | 6690NM/M28A# | 122 | 159 | 243 | 245 | 129 | 203 | 103 | 118 | 229 | |
| 6690N/9 | 6690NB/9 | 6690NM/9A# | | | | | | | | | | |
| 6690N/11 | 6690NB/11 | 6690NM/11A# | 155 | 203 | 311 | 313 | 165 | 259 | 131 | 151 | 292 | |
| 6690N/13 | 6690NB/13 | 6690NM/13A# | 295 | 384 | 589 | 594 | 313 | 491 | 249 | 286 | 554 | |
| 6690N/M42 | 6690NB/M42 | 6690NM/M42A# | | | | | | | | | | |

| Standard rating conditions according to AHRI Standard 760-2014 | | |
|--|--------|-----------|
| Condensing temperature | 110 °F | (43,3 °C) |
| Liquid temperature | 100 °F | (37,8 °C) |
| Subcooling | 10 °R | (5,5 °K) |
| Evaporating temperature | 40 °F | (4,4 °C) |
| Evaporator superheating | 10 °R | (5,5 °K) |
| Suction line temperature | 65 °F | (18,3 °C) |
| Suction superheating | 15 °R | (8,4 °K) |
| Discharge temperature | 160 °F | (71,1 °C) |

TABLE 20: Dimensions and weights of 3-ways valves

| Catalogue Number | Figure | Dimensions [mm] | | | | | | Weight [g] |
|------------------|--------|-----------------|-----|--------|-----|-----|----|------------|
| | | H | H1 | H2 (1) | L | L1 | Ch | |
| 6690NM/7A2 | 3 | 188 | 82 | 246 | 172 | 94 | 6 | 2,6 |
| 6690NM/7A6 | 4 | 210 | | 246 | | | | 2,7 |
| 6690NM/M28A2 | 3 | 210 | 100 | 268 | 208 | 111 | | 3,5 |
| 6690NM/M28A6 | 4 | 231 | | 268 | | | | 3,6 |
| 6690NM/9A2 | 3 | 210 | 100 | 268 | 208 | 111 | | 3,5 |
| 6690NM/9A6 | 4 | 231 | | 268 | | | | 3,6 |
| 6690NM/11A2 | 4 | 240 | 103 | 273 | 211 | 113 | 10 | 4,2 |
| 6690NM/11A6 | 4 | | | | | | | 4,3 |
| 6690NM/13A2 | 4 | 263 | 121 | 293 | 240 | 127 | | 5,2 |
| 6690NM/13A6 | 4 | | | | | | | 5,3 |
| 6690NM/M42A2 | 4 | 263 | 121 | 296 | 240 | 127 | | 5,2 |
| 6690NM/M42A6 | 4 | | | | | | | 5,3 |

(1): total height with optional auxiliary contact

Fig. 1

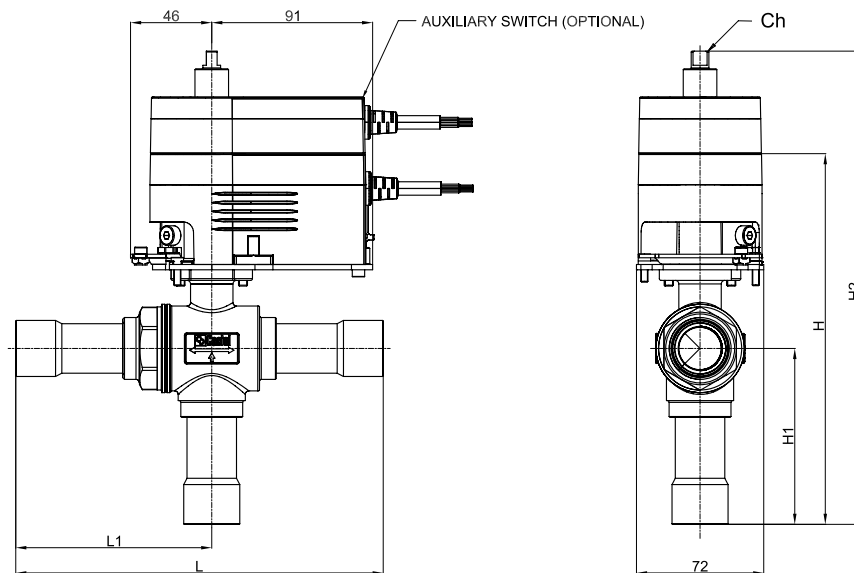
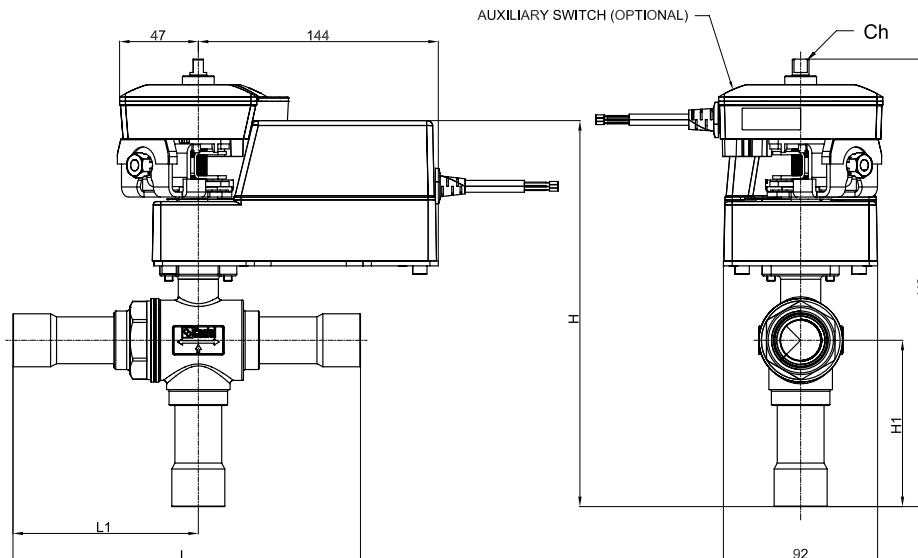


Fig. 2



APPLICATIONS

The actuators in series 9700, 9720, 9730 and 9740 can be assembled using suitable flanged connections (to be purchased separately) to:

- 2-way valves with ball shutter in series 6570N and 6571N
- 3-way manual valves with ball shutter in series 6690N and 6690NB

Once this coupling has been performed, the valves can be opened or closed remotely. Alternatively, the actuator can be excluded and the valve operated manually.

The actuators in series 9700 and 9720 are also included in the package of 3-way motorized valve with ball shutter in series 6690NM.

CONSTRUCTION

Actuators in series 9700 and 9720: Casing in two parts of self-extinguishing synthetic material, lower part black, upper part blue. The upper part of the casing holds the actual motor (step or synchronous) and all control and cut-out electronics based on the torque. The lower part of the casing holds the gear reducer, which requires no maintenance, and the self-centring fixing system for the spindle.

Note: If the casing is opened and tampered with, any and all the guarantees by Castel will be null and void. In the event of a power outage to the actuator, the gear reducer can be disengaged using the specific lever or a button to permit manual use of the valve.

Actuators in series 9730: Casing in two parts of self-extinguishing synthetic black material with light gray cover. Inside the enclosure is contained the actual motor (step-by-step), the gear reducer, which requires no maintenance, and all control and cut-out electronics based on the torque.

Note: If the casing is opened and tampered with, any and all the guarantees by Castel will be null and void. In the event of a power outage to the actuator, the gear reducer can be disengaged using the specific lever to permit manual use of the valve.

Actuators in series 9740: Casing in two parts of self-extinguishing synthetic material, lower part black, upper part red. The upper part of the casing holds the actual motor (step or synchronous) and all control and cut-out electronics based on the torque. The lower part of the casing holds the gear reducer, which requires no maintenance, and the star fixing system for the spindle.

Note: If the casing is opened and tampered with, any and all the guarantees by Castel will be null and void. In the event of a power outage to the actuator, the gear reducer can be disengaged using the emergency manual override, under the position round indicator.

The actuators in series 9700, 9720 and 9730 have a maximum rotational angle of 95°, allowed by the mechanical construction. Models 9700/RA6, 9720/RA2, 9720/RA6, 9730RA2, and 9730/RA6 are factory set for a maximum stroke of 90°. In model 9700/RA2, the maximum stroke of 90° must be set by the customer, following the instructions. The actuators in series 9740 have a maximum rotational angle of 90°, allowed by the mechanical construction and the maximum stroke must be set by the customer, following the instructions.

The housings of actuators 9700/RA6 and 9720/RA6 have an IP43 protection rating according to EN 60529, and a Class II electric shock protection rating according to EN 60730-1. In the event of outdoor installation, it is recommended that the actuators be protected from the weather.

The housings of actuators 9700/RA2, 9720/RA2, 9730/RA2 and 9730/RA6 have an IP54 protection rating according to EN 60529, and a Class III electric shock protection rating according to EN 60730-1. In the event of outdoor installation, it is recommended that the actuators be protected from the weather.

The housings of actuators 9740 have an IP66 protection rating according to EN 60529, and a Class II electric shock protection rating according to EN 60730-1.

To install the actuators on the valves and cable them, follow the instructions provided in the package.

CERTIFICATIONS

Actuator powered with 230 VAC are compliant with the Low Voltage Directive, 2006/95/EC.

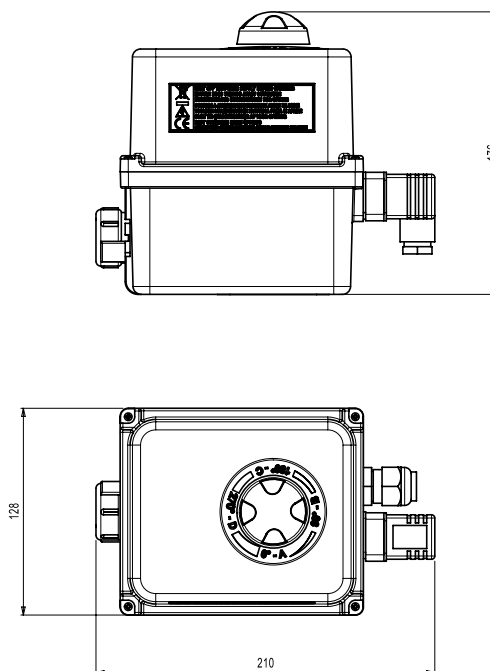
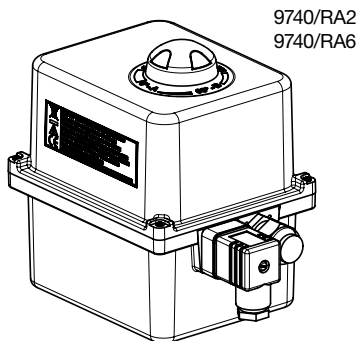
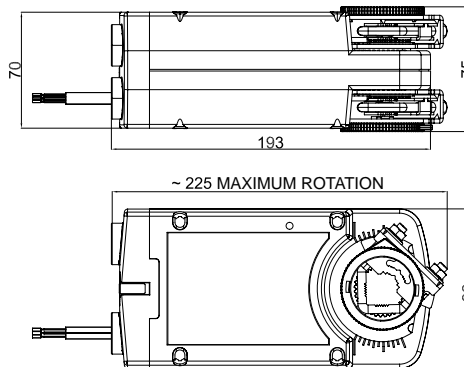
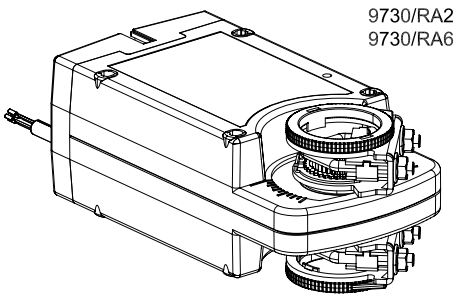
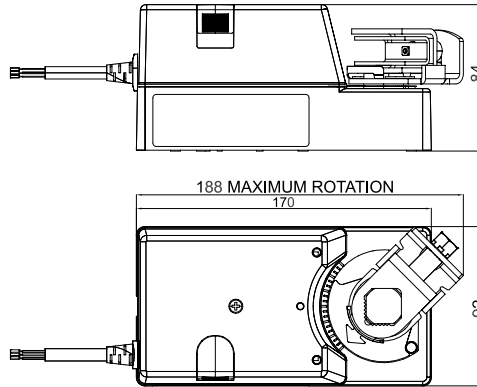
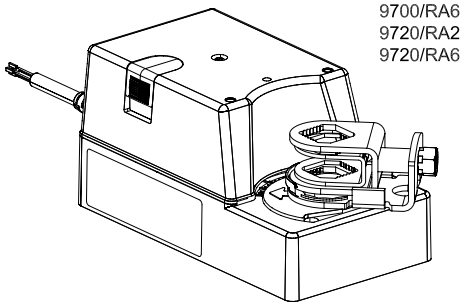
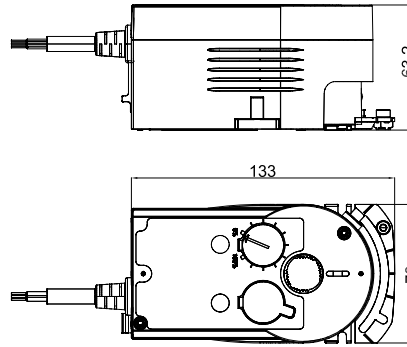
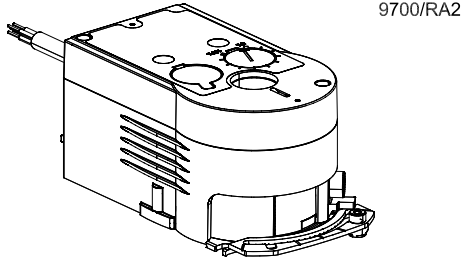
All actuators in this chapter comply with the Electromagnetic Compatibility (EMC) Directive (2004/108/EC).

The American certification authority Underwriters Laboratories Inc. has approved the actuators in series 9740.

TABLE 21: General characteristics of actuators

| Catalogue Number | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Active Power [W] | | Apparent Power [VA] | |
|------------------|-------------|-----------------------|----------------|------------------|------------|---------------------|------------|
| | | | | Operation | Standstill | Operation | Standstill |
| 9700/RA2 | 24 A.C. | +20 / -20 | 50 / 60 | 4,8 | 1,5 | 8,7 | 3 |
| | 24 D.C. | +20 / -20 | - | | | | |
| 9700/RA6 | 230 A.C. | +15 / -15 | 50 / 60 | 2,9 | 0,5 | 5,6 | 5,1 |
| 9720/RA2 | 24 A.C. | +20 / -20 | 50 / 60 | 2,4 | 0,26 | 4,3 | 0,48 |
| | 24 D.C. | +20 / -20 | - | | | | |
| 9720/RA6 | 230 A.C. | +15 / -15 | 50 / 60 | 3,7 | 1,1 | 4,7 | 2,7 |
| 9730/RA2 | 24 A.C. | +20 / -20 | 50 / 60 | 13,5 | 1,5 | 16,5 | ND |
| | 24 D.C. | +20 / -20 | - | | | | |
| 9730/RA6 | 230 A.C. | +15 / -15 | 50 / 60 | 13 | 2,0 | 20 | ND |
| 9740/RA2 | 24 A.C. | +20 / -20 | 50 / 60 | 45 | ND | 60 | ND |
| | 24 D.C. | +20 / -20 | - | | | | |
| 9740/RA6 | 230 A.C. | +10 / -10 | 50 / 60 | 45 | ND | 60 | ND |
| | 230 D.C. | +10 / -10 | - | | | | |

| Catalogue Number | Torque [Nm] | Running Time [sec] | Rotation Angle | Wiring Connections | | Auxiliary switches | Protection Degree | TA [°C] | |
|------------------|-------------|--------------------|----------------|--|-----------------------------|----------------------|-------------------|---------|------|
| | | | | Switching output 2 point (Open/ Close) | Continuous output (0 - 10V) | | | min. | max. |
| 9700/RA2 | 10 | 60 | 90 | YES | YES | external see tab. 22 | IP 54 | -20 | +50 |
| 9700/RA6 | | | | YES | NO | | IP 43 | | |
| 9720/RA2 | 30 | 120 | | YES | YES | external see tab. 22 | IP 54 | | |
| 9720/RA6 | | | | YES | NO | | IP 43 | | |
| 9730/RA2 | 60 | 150 | | NO | YES | ND | IP 54 | -30 | +50 |
| 9730/RA6 | | | | YES | NO | | IP 54 | | |
| 9740/RA2 | 100 | 120 | | NO | YES | internal | IP 66 | -10 | 55 |
| 9740/RA6 | | | | YES | NO | | IP 66 | | |



APPLICATIONS

Auxiliary contacts in series 9750 are accessories to be used with actuators in series 9700 and 9720. They are double switching contacts and can be set to any position between 0° and 90°. No auxiliary contacts are at disposal for actuators in series 9730. Actuators in series 9740 have internal auxiliary contacts.

CONSTRUCTION

Casing in two parts of self-extinguishing synthetic material, lower part black, upper part yellow.

Note: If the casing is opened and tampered with, any and all the guarantees by Castel will be null and void.

Functional limits of the contacts: admissible load 5A, voltage 250 VAC.

Contact 9750/X01 has an IP54 protection rating according to EN 60529, and a Type 1C classification for automatic operation according to EN 60730-1.

Contact 9750/X02 has an IP40 protection rating according to EN 60529, and a Type 1C classification for automatic operation according to EN 60730-1.

In the event of outdoor installation, it is recommended that the contacts be protected from the weather.

OPERATION

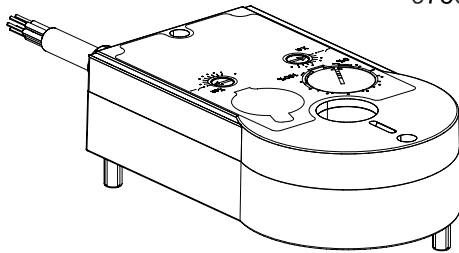
To install the contacts on the actuators and cable them, follow the instructions provided in the package carefully. The settings for the switching positions must be performed using the two trimmers present on the yellow cover (see the instructions).



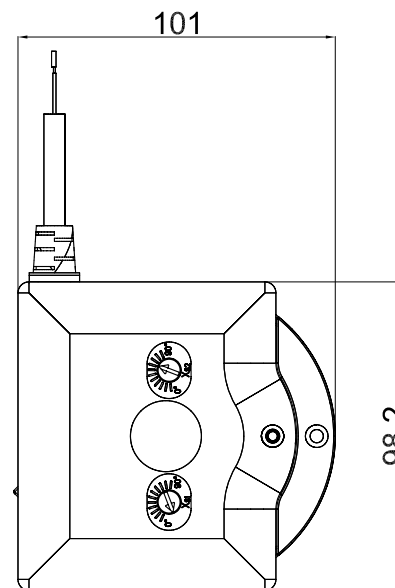
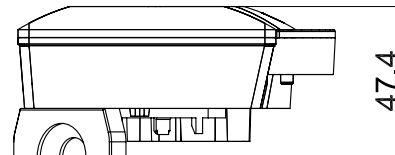
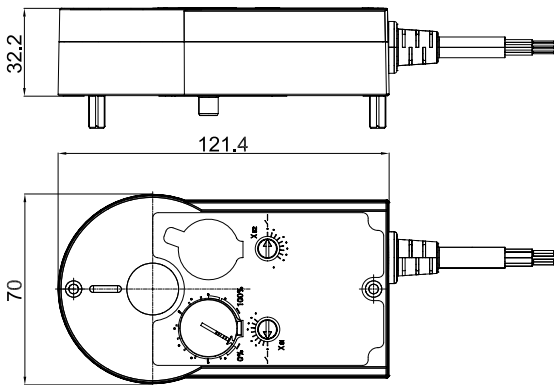
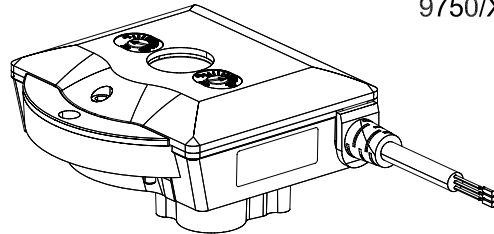
TABLE 22: General characteristics of auxiliary switches

| Catalogue Number | Designed for actuator | Contact type | Admissible load | Voltage Range | Cable | Protection Degree | TA [°C] | |
|------------------|----------------------------------|--------------|-----------------|---------------|--------------------------------|-------------------|---------|------|
| | | | | | | | min. | max. |
| 9750/X01 | 9700/RA2 | Doppio | 5(2) A | 24 ÷ 230 V | 6 x 0,5 mm ² 1 m | IP 54 | -20 | +50 |
| 9750/X02 | 9700/RA6 9720/RA2 9720/RA6 | | | | | IP 40 | | |

9750/X01



9750/X02



APPLICATIONS

Castel has constructed the flange adapters in series 9901 for coupling the actuators CASTEL (by SAUTER) in series 9700, 9720, 9730 and 9740 to the ball valves in series 6570N, 6571N. All these actuators allow the transformation from a manual to a motorized ball valves.

CONSTRUCTION

The main parts of the adapters are manufactured with the following materials:

- Hot forged brass EN 12420 – CW 617N for lug and round flange
- Stainless steel AISI 303 for the swivel ring
- Stainless steel AISI 303 for the spindle
- Stainless steel AISI 304 for the motor plate
- Stainless steel for all screws

OPERATION

To assemble the adapter on the valve and then the actuator to the adapter, carefully follow:

- the instruction sheet in the adapter packaging
- the instruction sheet in the actuator packaging

Table 29 indicate for each ball valve and for the main two voltages (24V or 230 VAC):

- the actuator that must be assembled
- the auxiliary switches, if necessary, that must be chosen
- the Castel adapter that must be selected to mate the valve with the above actuator

Then the customers can use this table as a guidebook when choosing components (actuator, auxiliary contacts, and adapter) when they need to motorize a ball valve.



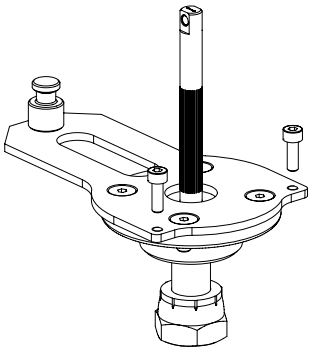
TABLE 23: Coupling schemes: valve + actuator + adapter + switches

| Ball Valve Catalogue No | | Torque [Nm] | Voltage [V] | Actuator Catalogue No | Adapter Catalogue No | Auxiliary switches Catalogue No | | | | |
|-------------------------|------------|-------------|-------------|-----------------------|----------------------|---------------------------------|----------|----------|----------|----------|
| 6570N/M6 | 6570N/M6A | 10 | 24 | 9700/RA2 | 9901/X58 | 9750/X01 | | | | |
| 6570N/3 | 6570N/3A | | | | | | | | | |
| 6570N/M10 | 6570N/M10A | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | | | | | | | | | |
| 6570N/4 | 6570N/4A | | | | | | | | | |
| 6571N/5 | – | | | | | | | | | |
| 6570N/M15 | 6570N/M15A | | | | | | | | | |
| 6570N/5 | 6570N/5A | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | |
| 6571N/7 | – | | | | | | | | | |
| 6570N/7 | 6570N/7A | 10 | 24 | 9700/RA2 | 9901/X60 | 9750/X01 | | | | |
| 6571N/M28 | – | | | | | | | | | |
| 6571N/9 | – | | | | | | | | | |
| 6570N/M28 | 6570N/M28A | | | | | | 230 | 9700/RA6 | 9901/X57 | 9750/X02 |
| 6570N/9 | 6570N/9A | | | | | | | | | |
| 6571N/11 | – | | | | | | | | | |
| 6570N/11 | 6570N/11A | 30 | 24 | 9720/RA2 | 9901/X75 | 9750/X02 | | | | |
| 6570N/13 | 6570N/13A | | | | | | 230 | 9720/RA6 | | |
| 6570N/M42 | 6570N/M42A | | | | | | | | | |
| 6570N/17 | 6570N/17A | 60 | 24 | 9730/RA2 | 9901/X76 | – | | | | |
| | | | | 230 | | | 9730/RA6 | | | |
| 6570N/M64 | 6570N/M64A | 100 | 24 | 9740/RA2 | 9901/X70 | – | | | | |
| – | 6570N/21A | | | | 230 | | 9740/RA6 | 9901/X71 | | |
| | 6570N/24A | | | | | | | | | |
| | 6570N/25A | | | | | | | 9901/X72 | | |
| | 6570N/28A | | | | | | | | | |
| | 6570N/29A | | | | | | | | | |

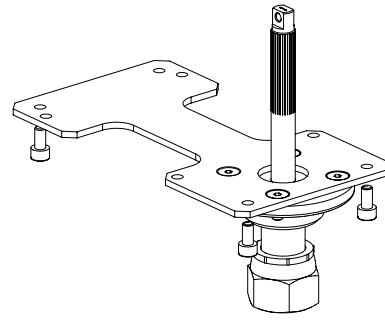
TABLE 24: Dimensions of ball valves with actuator

| Ball Valve Catalogue No | | Actuator Catalogue No | H | H1 | H2 (1) | L | L1 | I | d | Ch | Figure |
|-------------------------|------------|-----------------------|-----|----|--------|-----|------|------|----|----|--------|
| 6570N/3 | 6570N/3A | 9700/RA2 | 147 | 15 | 179 | 121 | 65 | 18 | M4 | 6 | 1 |
| 6570N/M10 | 6570N/M10A | | | | | | | | | | |
| 6570N/M12 | 6570N/M12A | | | | | | | | | | |
| 6570N/4 | 6570N/4A | | | | | | | | | | |
| 6571N/5 | - | | | | | 138 | 73,5 | | | | |
| 6570N/M15 | 6570N/M15A | | 154 | 19 | 186 | 139 | 73 | 25,5 | | | |
| 6570N/5 | 6570N/5A | | | | | | | | | | |
| 6570N/M18 | 6570N/M18A | | | | | | | | | | |
| 6570N/6 | 6570N/6A | | | | | | | | | | |
| 6571N/7 | - | | | | | 175 | 90,5 | | | | |
| 6570N/7 | 6570N/7A | | 167 | 23 | 199 | 175 | 94 | 30 | | | |
| 6571N/M28 | - | | | | | 206 | 109 | | | | |
| 6571N/9 | - | | | | | 204 | 109 | | | | |
| 6570N/M28 | 6570N/M28A | | | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | | |
| 6571N/11 | - | 24 | 130 | | | | | | | | |
| 6570N/7 | 6570N/7A | 9700/RA6 | 188 | 23 | 210 | 175 | 94 | 30 | M4 | 6 | 2 |
| 6571N/M28 | - | | | | | 206 | 109 | | | | |
| 6571N/9 | - | | | | | 204 | 109 | | | | |
| 6570N/M28 | 6570N/M28A | | | | | | | | | | |
| 6570N/9 | 6570N/9A | | | | | | | | | | |
| 6571N/11 | - | 24 | 130 | | | | | | | | |
| 6570N/11 | 6570N/11A | 9720/RA2-RA6 | 212 | 32 | 233 | 213 | 114 | 42 | M6 | 6 | 2 |
| 6570N/13 | 6570N/13A | | 225 | 39 | 247 | 242 | 129 | | | | |
| 6570N/M42 | 6570N/M42A | | | | | | | | | | |
| 6570N/17 | 6570N/17A | 9730/RA2-RA6 | 238 | 49 | - | 281 | 153 | 55 | M6 | 20 | 3 |
| 6570N/M64 | 6570N/M64A | 9740/RA2-RA6 | 330 | 55 | - | 343 | 186 | 75 | M8 | - | 4 |
| - | 6570N/21A | | 357 | 70 | - | 365 | 197 | 89 | M8 | - | |
| - | 6570N/24A | | | | | | | | | | |
| - | 6570N/25A | | | | | | | | | | |
| - | 6570N/28A | | | | | | | | | | |
| - | 6570N/29A | 366 | 75 | - | 373 | 198 | 75 | M8 | - | | |

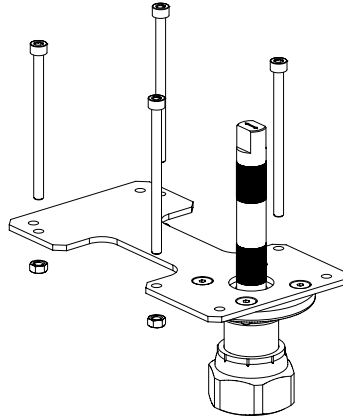
(1): total height with optional auxiliary contact



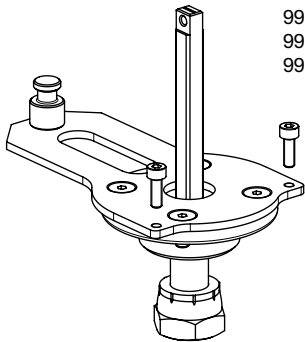
9901/X21
9901/X27
9901/X30



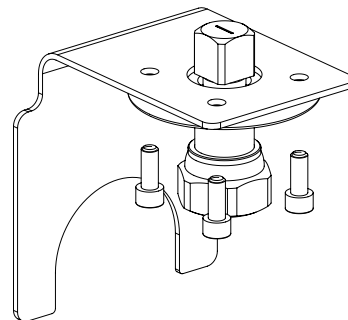
9901/X22
9901/X23
9901/X28
9901/X38



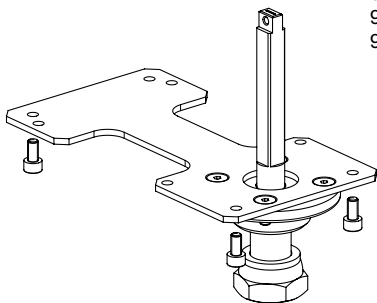
9901/X37
9901/X39
9901/X40



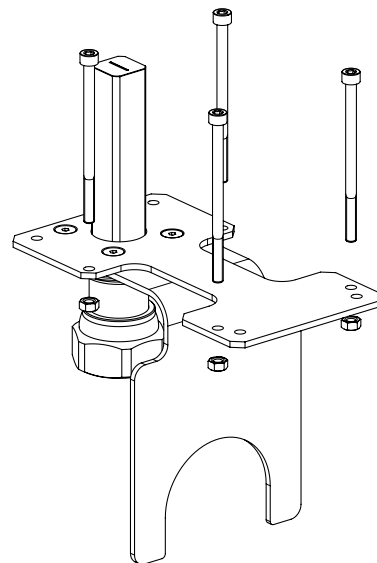
9901/X58
9901/X60
9901/X73



9901/X70
9901/X71
9901/X72



9901/X57
9901/X74
9901/X75



9901/X76

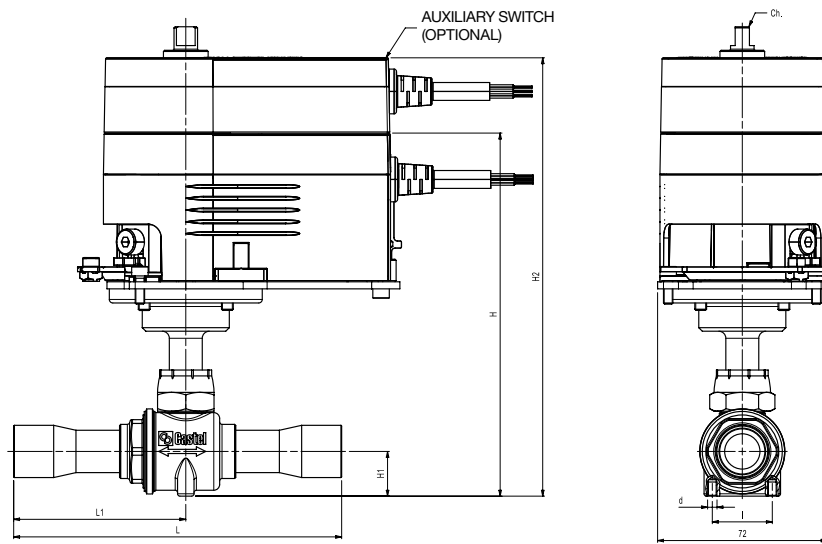


FIGURA 1

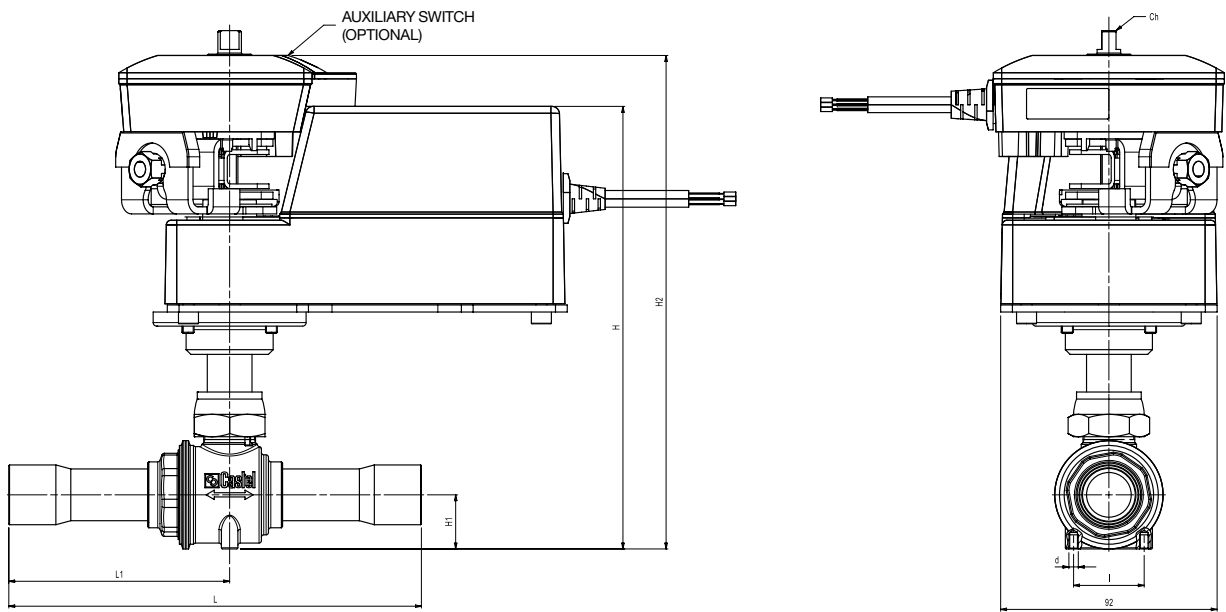


FIGURA 1

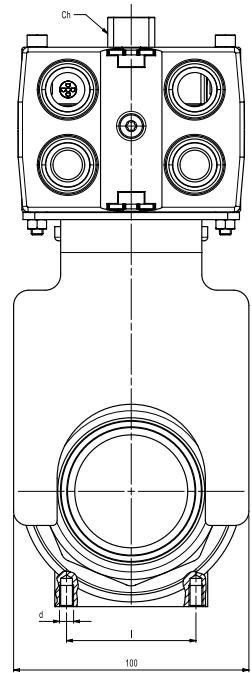
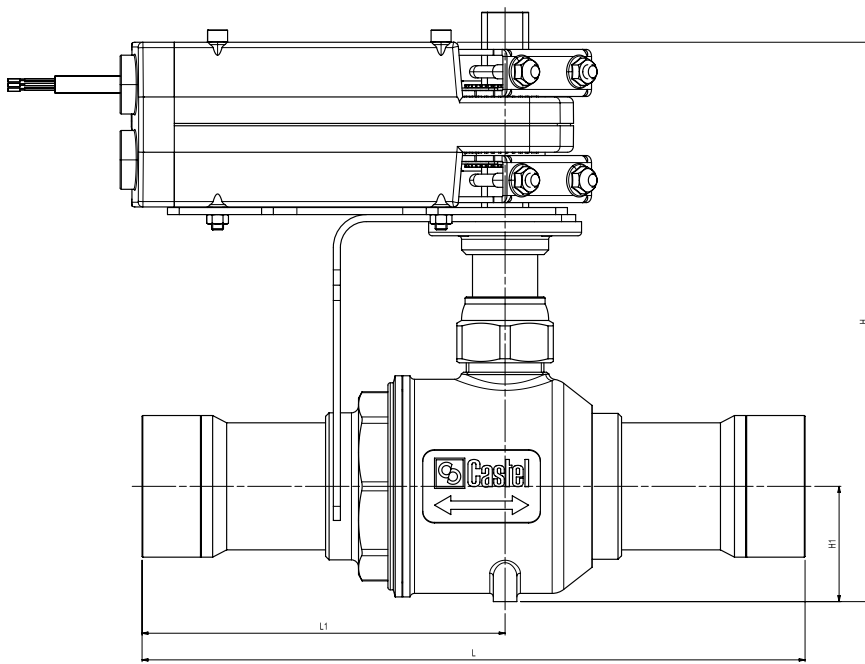


FIGURA 3

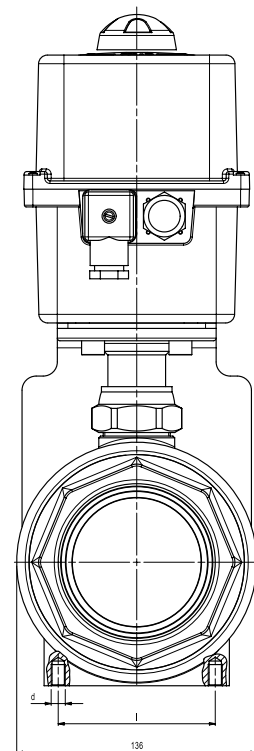
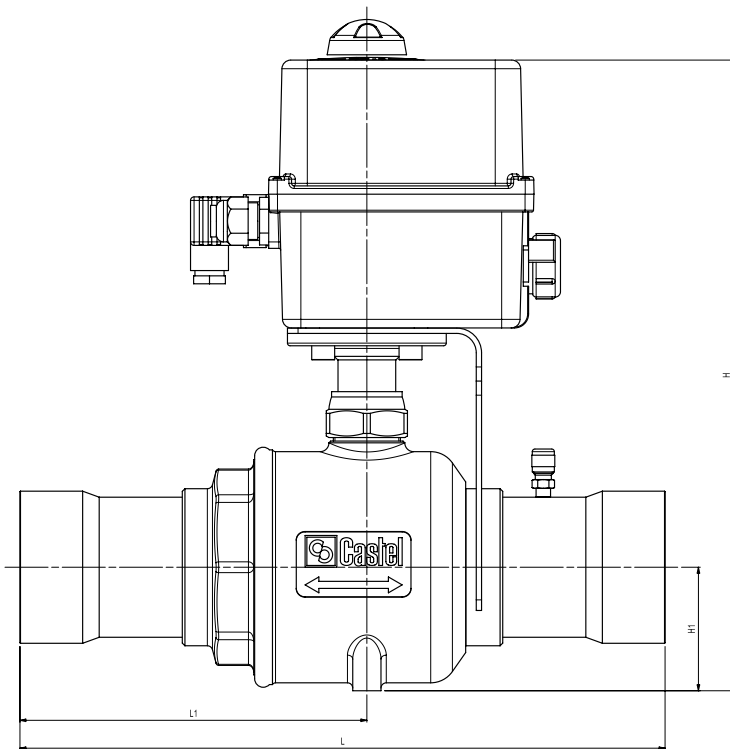
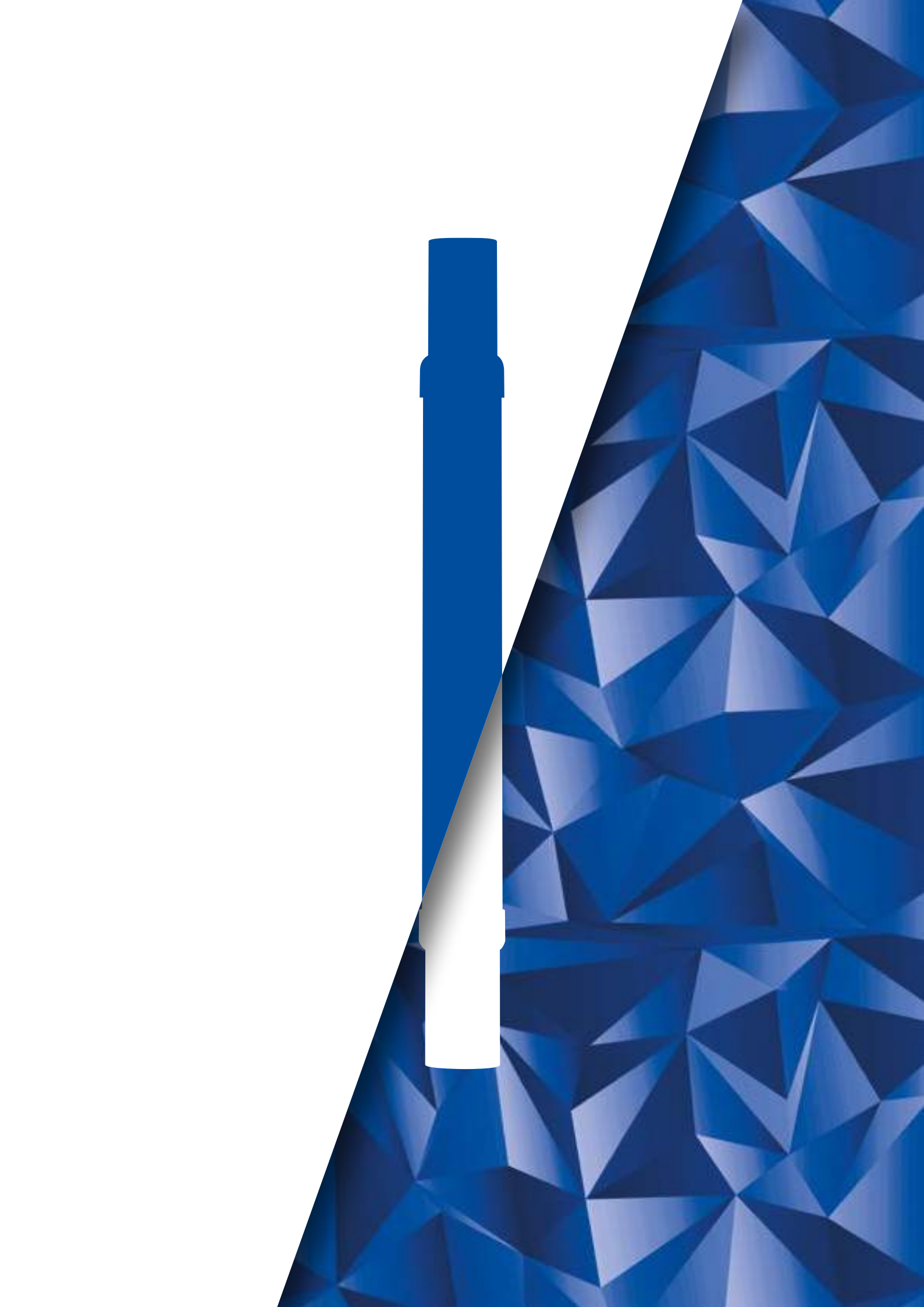


FIGURA 4



The background of the entire page is a complex, repeating pattern of blue geometric shapes, primarily triangles and polygons, creating a faceted, crystalline effect. The colors range from deep navy blue to lighter, almost white highlights, giving it a three-dimensional appearance.

PIPING ACCESSORIES

P  LYHEDRA

PIPING ACCESSORIES

9.1 – VIBRATION ABSORBERS

APPLICATIONS

The vibration absorbers in series 7690N are considered “Pressure Accessories” according to the definition provided in Article 2, Point 5 of the Directive 2014/68/EU (PED Recast) and are subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

These products are designed for installation on commercial refrigerating systems and on civil and industrial air conditioning plants. The function of this item is to avoid the transmission of compressor’s vibrations to the refrigerating system pipes. They can also compensate small thermal expansion of the piping.

The vibration absorbers can be installed on systems that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

vibrations, the refrigerant line should be anchored at the vibration absorber end, as shown in Fig. 2 and 3.

Castel vibration absorbers can be installed vertically too, because they are designed to avoid the retention of condensation in the wavy area near to the connections. There are no issues when employing them at temperatures below 0°C.

Vibration absorbers are not designed to absorb axial or torsional stress. Care should be taken to allow sufficient space to avoid compression or tension, after installation.

High-speed refrigerant fluid can produce vibrations and noise phenomena. In this case, it is recommended that a larger size vibration absorber be installed

The connection of the vibration absorbers to the piping is normally performed by brazing. The specific design and construction of vibration absorbers allows the installer to perform this operation without special protection to prevent overheating, generated in this phase.

It is given that best installation calls for the vibration absorber to be linear. A misalignment from the axis of no more than 3% of the length of the corrugated hose is allowed.

WARNING! Ensure a gap corresponding to the 2% of the total length of the vibration absorber to compensate any extensions due to possible thermal expansion.

CONSTRUCTION

The main union between various parts are TIG welded (figure 1). This solution makes the vibration absorbers particularly resistant to the overheating during connection to the piping.

The main parts of vibration absorbers are manufactured with the following materials:

- Stainless steel EN 10088-1 – 1.4305/1.4301 for connections
- Stainless steel EN 10028-7 – 1.4541/1.4404 for corrugate flexible
- Stainless steel EN 10028-7 – 1.4301 for net holder
- Stainless steel EN 10088-3 – 1.4301/1.406 for wire “braid”

INSTALLATION

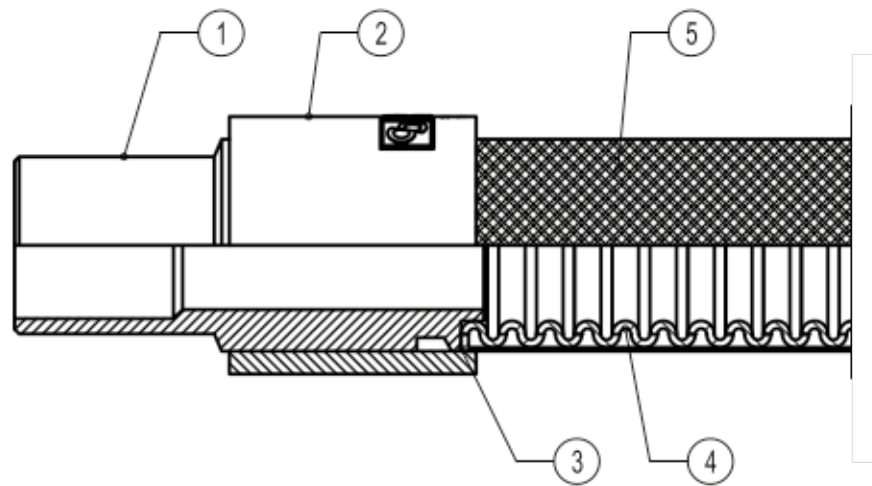
The vibration absorbers can be installed both on suction and discharge lines, as close as possible to the compressor. They are not designed to compensate possible piping misalignment.

Vibration absorbers should be installed perpendicularly to the direction of vibration. In the case of vertical and horizontal vibrations, two vibrations absorbers should be used perpendicular to each other, as shown in Fig. 2 and 3. For the maximum absorption of



TABLE 1: General characteristics of vibration absorbers

| Catalogue Nr. | Connections | | Length [mm] | Weight [g] | Working pressure (PS), depending on fluid temperature [bar] | | | Risk Category according to PED Recast | | | |
|---------------|-------------|--------|----------------|------------|---|----------|---------|---------------------------------------|--|--|----|
| | ODS | | | | -80 / +100 °C | + 120 °C | +140 °C | | | | |
| | [mm] | [inch] | | | | | | | | | |
| 7690N/3 | - | 3/8 | 230 | 91 | 50 | 49 | 48 | Art. 4.3 | | | |
| 7690N/M10 | 10 | - | | 98 | | | | | | | |
| 7690N/M12 | 12 | - | | 122 | | | | | | | |
| 7690N/4 | - | 1/2 | | 120 | | | | | | | |
| 7690N/M15 | 15 | - | 255 | 190 | | | | | | | |
| 7690N/5 | 16 | 5/8 | | 200 | | | | | | | |
| 7690N/M18 | 18 | - | | 180 | | | | | | | |
| 7690N/6 | - | 3/4 | | 180 | | | | | | | |
| 7690N/7 | 22 | 7/8 | 290 | 317 | | | | | | | |
| 7690N/M28 | 28 | - | 330 | 380 | | | | | | | |
| 7690N/9 | - | 1.1/8 | | 416 | | | | | | | |
| 7690N/11 | 35 | 1.3/8 | 375 | 846 | | | | | | | |
| 7690N/13 | - | 1.5/8 | 430 | 1088 | | | | | | | |
| 7690N/M42 | 42 | - | | 1200 | | | | | | | |
| 7690N/17 | 54 | 2.1/8 | | 510 | | | | 2060 | | | |
| | | | | | | | | | | | II |



- 1 - STEEL CONNECTION
- 2 - NET HOLDER
- 3 - CORRUGATED FLEXIBLE WELDING
- 4 - CORRUGATED FLEXIBLE
- 5 - STAINLESS STEEL WIRE BRAID

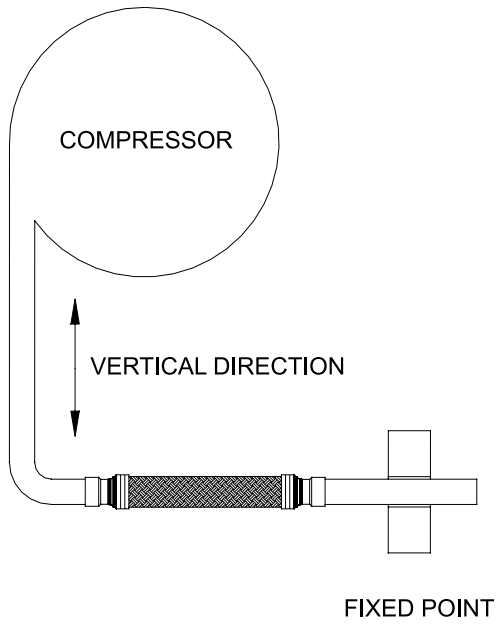


Fig. 2

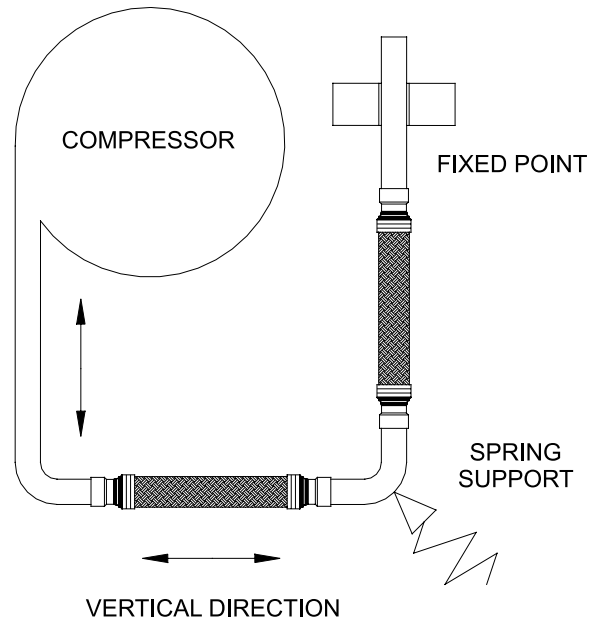
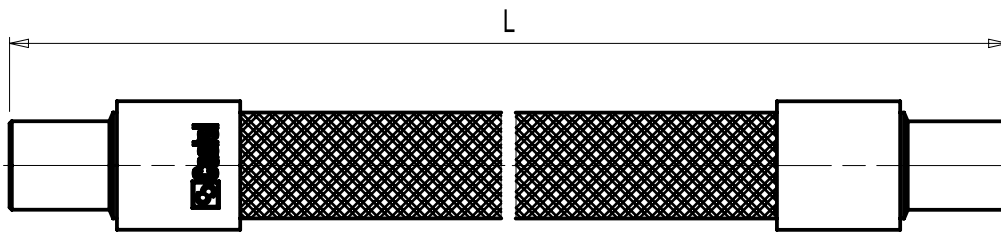


Fig. 3



PIPING ACCESSORIES

9.2 – THREADED BRASS FITTINGS

APPLICATIONS

The threaded brass fittings are excluded from the scope of application of Directive 2014/68/EU, as specified in Guidelines 1/8 and 1/9, because they are piping components.

These fittings are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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.

the following materials:

- Hot forged brass EN 12420 – CW 617N for bushes and flanges.
- Aramid fibres for flange gaskets.

OPERATION

The sealing system between the end of a male connection and a union in series 7010, 7020 and 7030 requires a special flaring of the end of copper pipe, the so-called flared connection.

The sealing system between the end of a male connection and a Flare-ODS adapter allows avoiding flaring the end of the copper pipe (national laws of some European countries do not accept this operation) as the end of the copper pipe is brazed into the adapter joint. We wish to remind our customers that perfect seal of the male connector / Flare-ODS adapter can only be ensured using the appropriate tapered gasket, 7580, supplied with the adapter.

The flange joints in series 7630 consist of two brass bushes for brazing to the copper pipes. Once this connection has been made, the joint seal is ensured by the compression of a gasket between the bushes. This compression occurs when the four flange screws are tightened.

CONSTRUCTION

All nuts from series 7010 to series 7050, and all the elbows, T and cross fittings, from series 7210 to series 7410, are manufactured with hot forged brass EN 12420 – CW 617N.

All straight fittings, from series 7110 to series 7170, and all plugs, from series 7510 to series 7520, are machined from brass bars EN 12164 – CW 614N.

Caps in series 7560 and tapered gaskets in series 7580 are from copper Cu – ETP UNI 5649.

The main parts of the flanged joints in series 7630 are made with

TABLE 2: General characteristics of flange joints

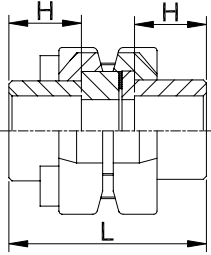
| | Catalogue Number | Connections | | PS [bar] | TS [°C] | | Dimensions [mm] | | Wrench torque min/max [Nm] | Weight [g] |
|---|------------------|-------------|--------|----------|---------|------|-----------------|------|----------------------------|------------|
| | | ODS | | | min | max | H | L | | |
| | | Ø [in.] | Ø [mm] | | | | | | | |
|  | 7630/7 | 7/8" | – | 45 | -40 | +130 | 22 | 63 | 20/24 | 612 |
| | 7630/9 | 1.1/8" | – | | | | 23 | | | 490 |
| | 7630/11 | 1.3/8" | 35 | | | | 24 | | | 1100 |
| | 7630/13 | 1.5/8" | – | | | | 42/50 | 1412 | | |
| | 7630/M42 | – | 42 | | | | | | | |
| | 7630/17 | 2.1/8" | 54 | | | | 25 | 71 | 68/80 | 2020 |

TABLE 3: General characteristics of unions

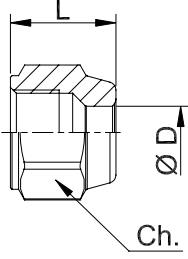
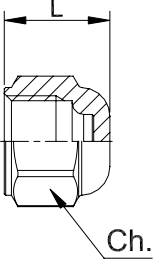
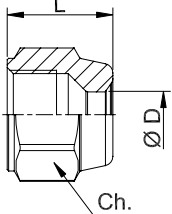
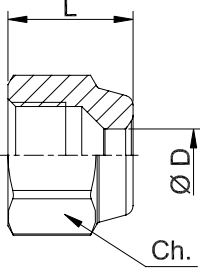
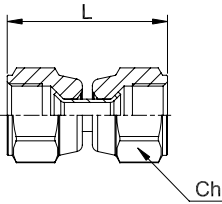
| | Catalogue Number | International Reference | SAE Flare | Copper pipe | | PS [bar] | Dimensions [mm] | | | Wrench torque min / max [Nm] | Weight [g] |
|---|------------------|-------------------------|-----------|-------------|--------|----------|-----------------|------|----|------------------------------|------------|
| | | | | Ø [in.] | Ø [mm] | | Ø D | L | Ch | | |
| | | | | | | | | | | | |
| SAE-Flare nuts (inch tubing) | | | | | | | | | | | |
|  | 7010/22 | NS4-4 | 1/4" | 1/4" | 6 | 50 | 6,5 | 15,5 | 17 | 11 / 14 | 19 |
| | 7010/33 | NS4-6 | 3/8" | 3/8" | – | | 9,7 | 19,5 | 22 | 20 / 25 | 36 |
| | 7010/44 | NS4-8 | 1/2" | 1/2" | – | | 13 | 22,5 | 25 | 34 / 47 | 50 |
| | 7010/55 | NS4-10 | 5/8" | 5/8" | 16 | | 16,2 | 25 | 28 | 54 / 75 | 66 |
| | 7010/66 | NS4-12 | 3/4" | 3/4" | – | | 19,4 | 29,5 | 33 | 68 / 71 | 99 |
| | 7010/77 | NS4-14 | 7/8" | 7/8" | 22 | | 22,5 | 36,5 | 41 | 90 / 120 | 194 |
| | 7010/88 | NS4-16 | 1" | 1" | – | | 25,6 | | | 120 / 150 | 150 |
| SAE-Flare cap nuts | | | | | | | | | | | |
|  | 7020/20 (1) | N5-4 CAP NUT | 1/4" | blind | blind | 120 | – | 15 | 16 | 8,5 / 11,5 | 16 |
| | 7020/X02 (1) | N5-5 CAP NUT | 5/16" | blind | blind | 120 | – | 19,5 | 22 | 20 / 25 | 41 |
| | 7020/30 | N5-6 CAP NUT | 3/8" | blind | blind | 120 | – | 22,5 | 25 | 34 / 47 | 60 |
| | 7020/40 | N5-8 CAP NUT | 1/2" | blind | blind | 120 | – | 25 | 28 | 54 / 75 | 71 |
| SAE-Flare reducing nuts (inch tubing) | | | | | | | | | | | |
|  | 7020/32 | NRS4-64 | 3/8" | 1/4" | 6 | 50 | 6,5 | 19,5 | 22 | 20 / 25 | 38 |
| | 7020/43 | NRS4-86 | 1/2" | 3/8" | – | | 9,7 | 22,5 | 25 | 34 / 47 | 52 |
| | 7020/54 | NRS4-108 | 5/8" | 1/2" | – | | 13 | 25 | 28 | 54 / 75 | 71 |
| | 7020/65 | NRS4-1210 | 3/4" | 5/8" | 16 | | 16,2 | 29,5 | 33 | 68 / 71 | 104 |
| | 7020/87 | NRS4-1614 | 1" | 7/8" | 22 | | 22,5 | 36,5 | 41 | 120 / 150 | 160 |

TABLE 3: General characteristics of unions

| | Catalogue Number | International Reference | SAE Flare | Copper pipe | | PS [bar] | Dimensions [mm] | | | Wrench torque min / max [Nm] | Weight [g] | |
|--|---------------------|-------------------------|-----------|-------------|--------|----------|-----------------|------|------|------------------------------|------------|---------|
| | | | | Ø [in.] | Ø [mm] | | Ø D | L | Ch | | | |
| | | | | | | | | | | | | |
| SAE-Flare nuts (metric tubing) | | | | | | | | | | | | |
|  | 7030/2M5 | - | 1/4" | - | 5 | 50 | 5,2 | 15,5 | 17 | 11 / 14 | 19 | |
| | 7030/3M8 | | 3/8" | | 8 | | 8,2 | 19,5 | 22 | 20 / 25 | 35 | |
| | 7030/3M10 | | | | 10 | | 10,2 | | 36 | | | |
| | 7030/4M10 | | | | 10 | | 10,2 | | 22,5 | | 25 | 34 / 47 |
| | 7030/4M12 | | 12 | | 12,2 | | 51 | | | | | |
| | 7030/X04 (2) | | 12 | | 12,5 | | 19,5 | 46 | | | | |
| | 7030/4M14 | | 5/8" | | 14 | | 14,2 | 22,5 | 25 | 28 | 54 / 75 | 48 |
| | 7030/5M12 | | | | 12 | | 12,2 | 71 | | | | |
| | 7030/5M14 | | | | 14 | | 14,2 | 69 | | | | |
| | 7030/6M14 | | 3/4" | | 14 | | 14,2 | 29,5 | 33 | 68 / 71 | 107 | |
| | 7030/6M18 | | | | 18 | | 18,2 | | | | 102 | |
| | SAE-Flare twin nuts | | | | | | | | | | | |
|  | 7050/2 | US4-4 | 1/4" | - | - | 50 | - | 32 | 17 | 11 / 14 | 39 | |
| | 7050/3 | US4-6 | 3/8" | | | | | 40 | 22 | 20 / 25 | 75 | |
| | 7050/4 | US4-8 | 1/2" | | | | | 46 | 25 | 34 / 47 | 105 | |
| | 7050/5 | US4-10 | 5/8" | | | | | 51 | 28 | 54 / 75 | 140 | |

(1): copper gasket doesn't need
 (2) shortened

TABLE 4: General characteristics of unions

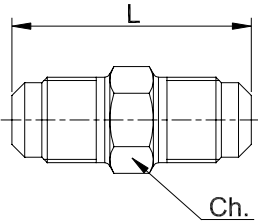
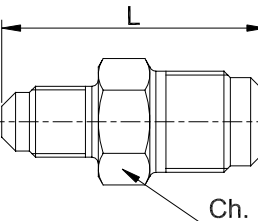
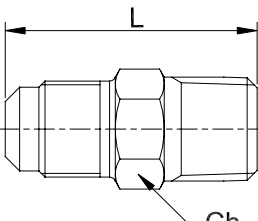
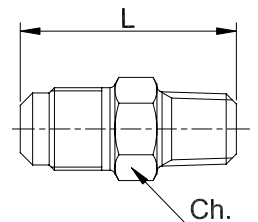
| | Catalogue Number | International Reference | Connections | | PS [bar] | Dimensions [mm] | | Weight [g] |
|---|------------------|-------------------------|-------------|------|----------|-----------------|----|------------|
| | | | SAE Flare | NPT | | L | Ch | |
| SAE-Flare unions | | | | | | | | |
|  | 7110/2 | U2-4 | 1/4" | - | 120 | 38 | 12 | 23 |
| | 7110/3 | U2-6 | 3/8" | | | 44 | 17 | 46 |
| | 7110/4 | U2-8 | 1/2" | | | 50 | 20 | 73 |
| | 7110/5 | U2-10 | 5/8" | | | 58 | 23 | 113 |
| | 7110/6 | U2-12 | 3/4" | | | 63 | 27 | 164 |
| | 7110/8 | U2-16 | 1" | | | 72 | 36 | 304 |
| Reducing SAE-Flare unions | | | | | | | | |
|  | 7120/23 | UR2-64 | 1/4" x 3/8" | - | 120 | 42 | 17 | 38 |
| | 7120/24 | UR2-84 | 1/4" x 1/2" | | | 45 | 20 | 58 |
| | 7120/34 | UR2-86 | 3/8" x 1/2" | | | 48 | | 66 |
| | 7120/35 | UR2-106 | 3/8" x 5/8" | | | 52 | 23 | 89 |
| | 7120/45 | UR2-108 | 1/2" x 5/8" | | | 54 | 23 | 98 |
| | 7120/46 | UR2-128 | 1/2" x 3/4" | | | 57,5 | 27 | 136 |
| | 7120/56 | UR2-1210 | 5/8" x 3/4" | | | 61,5 | 27 | 150 |
| SAE Flare / NPT unions | | | | | | | | |
|  | 7130/2 | U1-4B | 1/4" | 1/4" | 120 | 38,1 | 14 | 32 |
| | 7130/3 | U1-6C | 3/8" | 3/8" | | 41,2 | 17 | 48 |
| | 7130/4 | U1-8D | 1/2" | 1/2" | | 49,8 | 22 | 92 |
| | 7130/6 | U1-12F | 3/4" | 3/4" | | 57,6 | 27 | 152 |
| | 7130/8 | U1-16H | 1" | 1" | | 68 | 36 | 277 |
| SAE Flare / NPT reducing unions | | | | | | | | |
|  | 7140/21 | U1-4A | 1/4" | 1/8" | 120 | 32,9 | 12 | 20 |
| | 7140/32 | U1-6B | 3/8" | 1/4" | | 41,1 | 17 | 39 |
| | 7140/34 | U1-6D | 3/8" | 1/2" | | 45,8 | 22 | 77 |
| | 7140/43 | U1-8C | 1/2" | 3/8" | | 45,2 | 20 | 63 |
| | 7140/54 | U1-10D | 5/8" | 1/2" | | 53,8 | 23 | 102 |

TABLE 5: General characteristics of unions

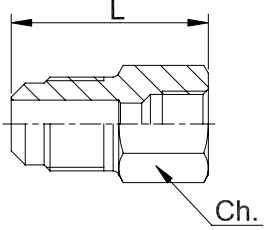
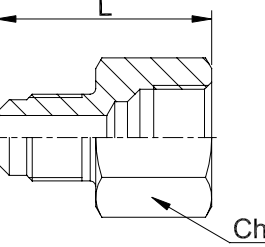
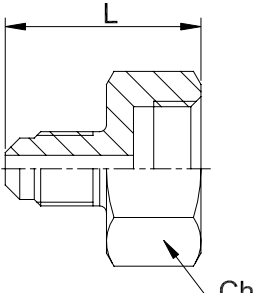
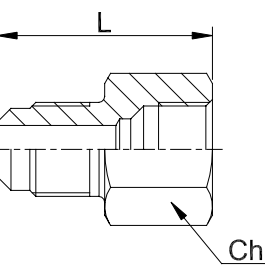
| | Catalogue Number | International Reference | Connections | | | | | | PS [bar] | Dimensions [mm] | | Weight [g] | |
|---|------------------|-------------------------|-------------|----------------------------------|--------|-----|---------|--------|----------|-----------------|----|------------|----|
| | | | SAE Flare | | NPT | GAS | ODS | | | L | Ch | | |
| | | | m | f | | | Ø [in.] | Ø [mm] | | | | | |
| Male/female reducing unions (reduced female) | | | | | | | | | | | | | |
|  | 7150/21 | U3-4A | 1/4" | – | 1/8" f | | | | | 29 | 14 | 21 | |
| | 7150/32 | UR3-46 | 3/8" | 1/4" | | | | | | 33 | 17 | 38 | |
| | 7150/42 | UR3-48 | 1/2" | 1/4" | | | | | | 35 | 22 | 75 | |
| | 7150/43 | UR3-68 | 1/2" | 3/8" | | – | – | – | 120 | 38 | 22 | 66 | |
| | 7150/54 | UR3-810 | 5/8" | 1/2" | | | | | | 45 | 25 | 99 | |
| | 7150/64 | UR3-812 | 3/4" | 1/2" | | | | | | 46,5 | 27 | 132 | |
| | 7150/65 | UR3-1012 | 3/4" | 5/8" | | | | | | 49,5 | 30 | 157 | |
| Male/female reducing unions (reduced male) | | | | | | | | | | | | | |
|  | 7150/X29 | – | – | 1/4" | 1/8" | | | | | 24 | 17 | 24 | |
| | 7150/X27 | – | – | 1/4" | 1/4" | | | | | 30 | 17 | 35 | |
| | 7150/23 | UR3-64 | 1/4" | 3/8" | | | | | | 33 | 22 | 49 | |
| | 7150/24 | UR3-84 | 1/4" | 1/2" | | | | | | 36 | 25 | 66 | |
| | 7150/34 | UR3-86 | 3/8" | 1/2" | | – | – | – | 120 | 39 | | 74 | |
| | 7150/45 | UR3-108 | 1/2" | 5/8" | | | | | | 44 | 30 | 125 | |
| | 7150/46 | UR3-128 | 1/2" | 3/4" | | | | | | 45 | 34 | 142 | |
| | 7150/56 | UR3-1210 | 5/8" | 3/4" | | | | | | 49 | 34 | 157 | |
| Cylinder adaptors | | | | | | | | | | | | | |
|  | 7154/2 | | 1/4" | 20 – 14 left thread, female | | | | | | 25 | 46 | | |
| | 7156/2 | | 1/4" | W 21,8 – 14 right thread, female | | | | 45 | 29 | 27 | 52 | | |
| Male/female unions | | | | | | | | | | | | | |
|  | 7160/2 | | 1/4" | 1/4" | | | | | | 30,5 | 17 | 31 | |
| | 7160/3 | | 3/8" | 3/8" | | – | – | – | – | 45 | 36 | 22 | 57 |
| | 7160/4 | | 1/2" | 1/2" | | | | | | | 41 | 25 | 84 |

TABLE 5: General characteristics of unions

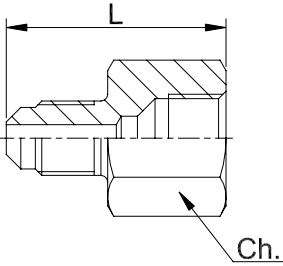
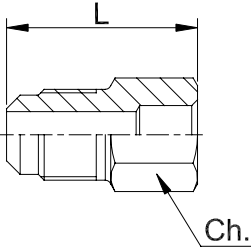
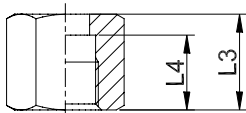

| | Catalogue Number | International Reference | Connections | | | | | | PS [bar] | Dimensions [mm] | | Weight [g] |
|---|------------------|-------------------------|-------------|------|-----|---------|---------|--------|----------|-----------------|----|------------|
| | | | SAE Flare | | NPT | GAS | ODS | | | L | Ch | |
| | | | m | f | | | Ø [in.] | Ø [mm] | | | | |
| Unions SAE-Flare to BSP | | | | | | | | | | | | |
|  | 7164/2 | | 1/4" | - | | G1/4" f | | | 45 | 32,5 | 20 | 45 |
| | 7166/2 | - | - | 1/4" | | G1/4" m | | | | 32 | 17 | 25 |
| Male SAE-Flare/solder unions | | | | | | | | | | | | |
|  | 7170/22 | US3-44 | 1/4" | | | | 1/4" | - | 120 | 26,5 | 12 | 17 |
| | 7170/2M8 | - | | | | | - | 8 | | | | |
| | 7170/33 | US3-66 | 3/8" | | | | 3/8" | - | | 33 | 17 | 39 |
| | 7170/3M8 | - | | | | | - | 8 | | | | |
| | 7170/3M10 | - | | | | | - | 10 | | | | |
| | 7170/34 | US3-68 | 1/2" | | | | 1/2" | - | | 35 | 20 | 53 |
| | 7170/44 | US3-88 | | | | | - | 12 | | | | |
| | 7170/4M12 | - | 5/8" | | | | 5/8" | 16 | | 42 | 23 | 82 |
| | 7170/55 | US3-1010 | | | | | - | 18 | | | | |
| | 7170/6M18 | - | 3/4" | | | | 5/8" | 16 | | 45,5 | 27 | 123 |
| | 7170/65 | US3-1210 | | | | | 7/8" | 22 | | | | |
| | 7170/87 | US3-1614 | | | | | | | | | | |

TABLE 6: General characteristics of unions

| | Catalogue Number | Item Position | Connections | | | PS [bar] | Dimensions [mm] | | | | | Wrench torque min / max [Nm] | Weight [g] |
|---|------------------|---------------|-------------|---------|--------|----------|-----------------|------|------|---------|-----|------------------------------|------------|
| | | | SAE Flare | ODS | | | L1 | L2 | L3 | L4 | Ch | | |
| | | | | Ø [in.] | Ø [mm] | | | | | | | | |
| Flare / ODS adapters | | | | | | | | | | | | | |
| <p>POS.1</p>  <p>POS.2</p>  <p>POS.3</p>  | 9901/X11 | 1 | 1/4" | - | 6 | 120 | - | - | 16 | 12,5 | 17 | 11 / 14 | 274 |
| | | 2 | | | | | 21 | 3,5 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X12 | 1 | 3/8" | - | 10 | | - | - | 18,5 | 14,7 | 22 | 20 / 25 | 393 |
| | | 2 | | | | | 23,5 | 4 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X13 | 1 | 1/2" | - | 12 | | - | - | 21 | 17 | 27 | 34 / 47 | 672 |
| | | 2 | | | | | 26 | 4,5 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X14 | 1 | 5/8" | 5/8" | 16 | | - | - | 22,5 | 18 | 30 | 54 / 75 | 511 |
| | | 2 | | | | | 27,5 | 5 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X15 | 1 | 3/4" | - | 18 | | - | - | 25 | 20 | 36 | 68 / 71 | 806 |
| | | 2 | | | | | 30 | 5 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X16 | 1 | 1/4" | 1/4" | - | | - | - | 16 | 12,5 | 17 | 11 / 14 | 274 |
| | | 2 | | | | | 21 | 3,5 | - | - | - | - | |
| | | 3 | | | | | - | | | | | | |
| | 9901/X17 | 1 | 3/8" | 3/8" | - | | - | - | 18,5 | 14,7 | 22 | 20 / 25 | 383 |
| 2 | | 23,5 | | | | 4 | - | - | - | - | | | |
| 3 | | - | | | | | | | | | | | |
| 9901/X18 | 1 | 1/2" | 1/2" | - | - | - | 21 | 17 | 27 | 34 / 47 | 672 | | |
| | 2 | | | | 26 | 4,5 | - | - | - | - | | | |
| | 3 | | | | - | | | | | | | | |
| 9901/X19 | 1 | 3/4" | 3/4" | - | - | - | 25 | 20 | 36 | 68 / 71 | 806 | | |
| | 2 | | | | 30 | 5 | - | - | - | - | | | |
| | 3 | | | | - | | | | | | | | |
| 9900/-- | 1 | 1/4" | - | - | - | - | 16 | 12,5 | 17 | 11 / 14 | 23 | | |
| | 1 | 3/8" | - | - | - | - | 18,5 | 14,7 | 22 | 20 / 25 | 39 | | |
| | 1 | 1/2" | - | - | - | - | 21 | 17 | 27 | 34 / 47 | 67 | | |
| | 1 | 5/8" | - | - | - | - | 22,5 | 18 | 30 | 54 / 75 | 83 | | |
| | 1 | 3/4" | - | - | - | - | 25 | 20 | 36 | 68 / 71 | 129 | | |

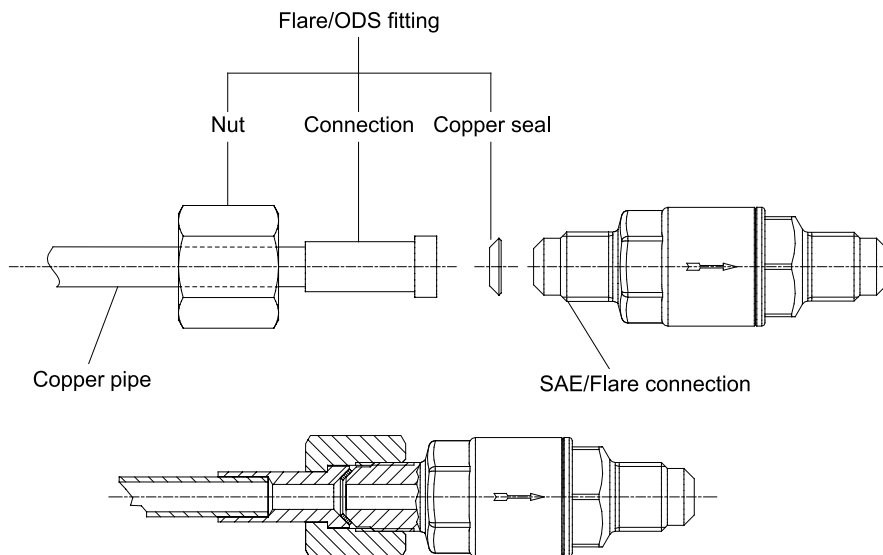


TABLE 7: General characteristics of unions

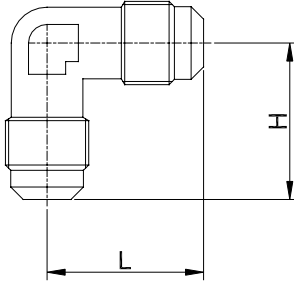
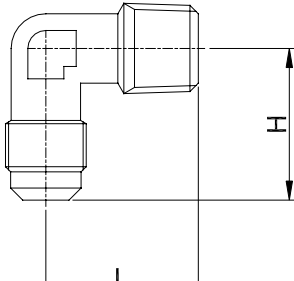
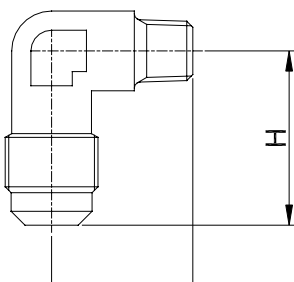
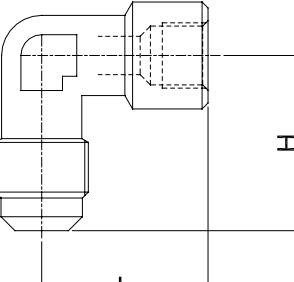
| | Catalogue Number | International Reference | Connections | | | PS [bar] | Dimensions [mm] | | Weight [g] |
|---|------------------|-------------------------|-------------|------|------|----------|-----------------|------|------------|
| | | | SAE Flare | | NPT | | H | L | |
| | | | m | f | | | | | |
| SAE-Flare elbows | | | | | | | | | |
|  | 7210/2 | E2-4 | 1/4" | | | 120 | 24,5 | 24,5 | 24 |
| | 7210/3 | E2-6 | 3/8" | | | | 29,5 | 29,5 | 60 |
| | 7210/4 | E2-8 | 1/2" | - | - | | 32,5 | 32,5 | 80 |
| | 7210/5 | E2-10 | 5/8" | | | | 36 | 36 | 116 |
| | 7210/6 | E2-12 | 3/4" | | | | 42,5 | 42,5 | 192 |
| SAE-Flare / NPT elbows | | | | | | | | | |
|  | 7220/2 | E1-4B | 1/4" | | 1/4" | 120 | 26 | 24 | 33 |
| | 7220/3 | E1-6C | 3/8" | | 3/8" | | 29,5 | 28,5 | 54 |
| | 7220/4 | E1-8D | 1/2" | | 1/2" | | 32,5 | 32 | 91 |
| | 7220/6 | E1-12F | 3/4" | | 3/4" | | 42,5 | 39,5 | 183 |
| SAE-Flare / reduced NPT elbows | | | | | | | | | |
|  | 7230/21 | E1-4A | 1/4" | | 1/8" | 120 | 24,5 | 23,5 | 25 |
| | 7230/32 | E1-6B | 3/8" | | 1/4" | | 29,5 | 29,5 | 46 |
| | 7230/43 | E1-8C | 1/2" | | 3/8" | | 32,5 | 31 | 97 |
| | 7230/54 | E1-10D | 5/8" | | 1/2" | | 36 | 35 | 112 |
| Male/female SAE-Flare elbows | | | | | | | | | |
|  | 7240/2 | | 1/4" | 1/4" | | 120 | 28,5 | 28 | 56 |
| | 7240/3 | - | 3/8" | 3/8" | - | | 32 | 31 | 80 |
| | 7240/4 | | 1/2" | 1/2" | | | 39,5 | 38 | 200 |

TABLE 8: General characteristics of unions

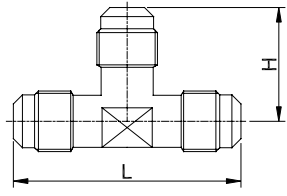
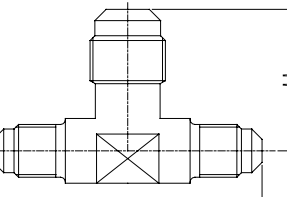
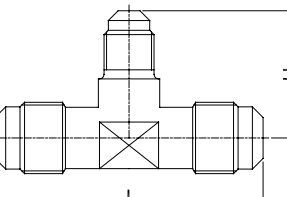
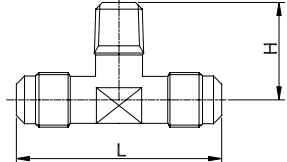
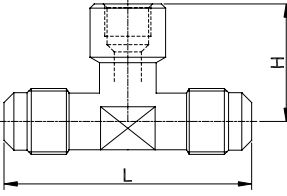
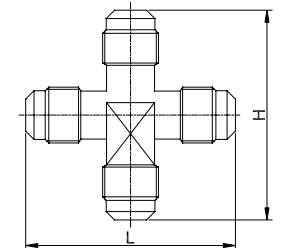
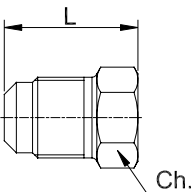
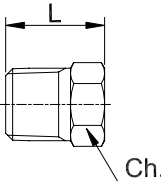
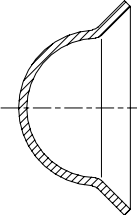

| | Catalogue Number | International Reference | Connections | | | | | PS [bar] | Dimensions [mm] | | Weight [g] |
|---|------------------|-------------------------|-------------|------|------|------|---------|----------|-----------------|----|------------|
| | | | SAE Flare | | | | NPT (3) | | H | L | |
| | | | (1) | (2) | (3) | (4) | | | | | |
| SAE-Flare TEE | | | | | | | | | | | |
|  | 7310/2 | T2-4 | 1/4" | 1/4" | 1/4" | - | - | 120 | 23,5 | 47 | 35 |
| | 7310/3 | T2-6 | 3/8" | 3/8" | 3/8" | | | | 29 | 58 | 70 |
| | 7310/4 | T2-8 | 1/2" | 1/2" | 1/2" | | | | 31,5 | 63 | 98 |
| | 7310/5 | T2-10 | 5/8" | 5/8" | 5/8" | | | | 36 | 72 | 150 |
| | 7310/6 | T2-12 | 3/4" | 3/4" | 3/4" | | | | 41,5 | 83 | 235 |
| SAE-Flare reducing TEE (reduced side connections) | | | | | | | | | | | |
|  | 7320/223 | TR2-46 | 1/4" | 1/4" | 3/8" | - | - | 120 | 29 | 56 | 77 |
| | 7320/334 | TR2-68 | 3/8" | 3/8" | 1/2" | | | | 32,5 | 63 | 95 |
| | 7320/445 | TR2-810 | 1/2" | 1/2" | 5/8" | | | | 38 | 72 | 153 |
| | 7320/556 | TR2-1012 | 5/8" | 5/8" | 3/4" | | | | 41,5 | 83 | 228 |
| SAE-Flare reducing TEE (reduced central connection) | | | | | | | | | | | |
|  | 7320/332 | TR2-64 | 3/8" | 3/8" | 1/4" | - | - | 120 | 28 | 58 | 77 |
| | 7320/443 | TR2-86 | 1/2" | 1/2" | 3/8" | | | | 32,5 | 63 | 101 |
| | 7320/554 | TR2-108 | 5/8" | 5/8" | 1/2" | | | | 38 | 72 | 149 |
| | 7320/665 | TR2-1210 | 3/4" | 3/4" | 5/8" | | | | 41,5 | 83 | 232 |
| SAE-Flare / NPT TEE (taper central connection) | | | | | | | | | | | |
|  | 7330/221 | T1-4A | 1/4" | 1/4" | - | - | 1/8" | 120 | 21 | 47 | 33 |
| | 7330/222 | T1-4B | 1/4" | 1/4" | | | 1/4" | | 24 | 51 | 45 |
| | 7330/332 | T1-6B | 3/8" | 3/8" | | | 1/4" | | 28 | 58 | 65 |
| Male/female SAE-Flare TEE (female central connection) | | | | | | | | | | | |
|  | 7340/222 | T6-4 | 1/4" | 1/4" | 1/4" | - | - | 120 | 27,5 | 56 | 73 |
| SAE-Flare cross | | | | | | | | | | | |
|  | 7410/2 | C1-4 | 1/4" | 1/4" | 1/4" | 1/4" | - | 120 | 52 | 52 | 72 |

TABLE 9: General characteristics of unions

| | Catalogue Number | International Reference | Connections | | PS [bar] | Dimensions [mm] | | Wrench torque min/max [Nm] | Weight [g] | |
|---|------------------|-------------------------|-------------|------|----------|-----------------|----|----------------------------|------------|----|
| | | | SAE Flare | NPT | | L | Ch | | | |
| | | | | | | | | | | |
| SAE-Flare plugs | | | | | | | | | | |
|  | 7510/2 | P2-4 | 1/4" | - | 120 | 23 | 12 | 11 / 14 | 19 | |
| | 7510/3 | P2-6 | 3/8" | | | | 26 | 17 | 20 / 25 | 40 |
| | 7510/4 | P2-8 | 1/2" | | | | 30 | 20 | 34 / 47 | 67 |
| NPT plugs | | | | | | | | | | |
|  | 7520/1 | 121-B-02 | - | 1/8" | 120 | 15,9 | 12 | 10 / 13 | 12 | |
| | 7520/2 | 121-B-04 | | 1/4" | | 23,1 | 14 | 15 / 20 | 27 | |
| | 7520/3 | 121-B-06 | | 3/8" | | 23,2 | 17 | 17 / 22 | 43 | |
| | 7520/4 | 121-B-08 | | 1/2" | | 29,8 | 22 | 25 / 35 | 87 | |
| | 7520/6 | 121-B-12 | | 3/4" | | 32,1 | 27 | 30 / 40 | 149 | |
| | 7520/8 | 121-B-16 | | 1" | | 39 | 34 | 60 / 80 | 279 | |
| Copper seal caps | | | | | | | | | | |
|  | 7560/2 | B1-4 | 1/4" | - | 50 | - | - | - | 0,5 | |
| | 7560/3 | B1-6 | 3/8" | | | | | | 1,1 | |
| | 7560/4 | B1-8 | 1/2" | | | | | | 2,5 | |
| | 7560/5 | B1-10 | 5/8" | | | | | | 2,6 | |
| | 7560/6 | B1-12 | 3/4" | | | | | | 3,7 | |
| | 7560/7 | B1-14 | 7/8" | | | | | | 5,3 | |
| Copper gaskets | | | | | | | | | | |
|  | 7580/2 (1) | B2-4 | 1/4" | - | 120 | - | - | - | 0,3 | |
| | 7580/3 (1) | B2-6 | 3/8" | | | | | | 0,6 | |
| | 7580/4 (1) | B2-8 | 1/2" | | | | | | 0,8 | |
| | 7580/5 (1) | B2-10 | 5/8" | | | | | | 1,2 | |
| | 7580/6 (1) | B2-12 | 3/4" | | | | | | 1,4 | |
| | 7581/2 (2) | B2-4 | 1/4" | | | | | | 0,2 | |
| | 7581/3 (2) | B2-6 | 3/8" | | | | | | 0,4 | |
| | 7581/4 (2) | B2-8 | 1/2" | | | | | | 0,6 | |
| | 7581/5 (2) | B2-10 | 5/8" | | | | | | 1,0 | |
| | 7581/6 (2) | B2-12 | 3/4" | | | | | | 1,2 | |

(1) Nominal thickness 1 mm
 (2) Nominal thickness 0,5 mm

PIPING ACCESSORIES

9.3 – ACCESS FITTINGS AND VALVE CORE

APPLICATIONS

The access fittings are excluded from the scope of application of Directive 2014/68/EU, as specified in Guidelines 1/8 and 1/9, because they are piping components.

The valve core is considered “Pressure Accessory” according to the definition provided in Article 2, Point 5 of said Directive and is subject to the classification indicated in Article 4, Points 1.c) and 3 of the same Directive.

The access fittings and the valve core are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants that use the following refrigerant fluids:

- HFC (R134a, R32, R404A, R407C, R410A, R507)
- HFO, HFO/HFC mixtures (R1234yf, R1234ze, R448A, R449A, R450A, R452A, R452B, R454B, R513A)
- HC (R290, R600, R600a, R1270)

belonging to Group 1 and 2, as defined in Article 13, Chapter 1, Point (a) and (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

The access fittings allow creating a loading or draining point rapidly and with a minimum expense. After completion of the filling or draining operations, use of the cap and gasket (p/n 8392/A or 8391/A) prevents any refrigerant leakage.

For special customer requirements, the cap 8392/A can be replaced by a blind union p/n 7020/20. The latter solution requires that the union be tightened using a torque wrench to $8.5 \div 11.5$ Nm. **Note: it is not necessary to use a copper gasket between union 7020/20 and the filling connector chosen.**

For systems using refrigerant fluid R410A, Castel has developed three specific filling connectors with 5/16” SAE-Flare connection (p/n 8350/X09, 8351/X05 and 8351/X07) that must be used with the following parts:

- Valve core, p/n 8395/A3
- Blind union, p/n 7020/X02

This solution for R410A requires to the union to be tightened with a torque wrench to $8.5 \div 11.5$ Nm. **Note: also in this case, it is not necessary to use a copper gasket between union 7020/X02 and the filling connector chosen.**

If a component other than the two blind unions in series 7020 must be tightened on the access fittings (for example a pressure gauge), a tapered gasket with tang (p/n 8580/2) must be positioned between the component and the chosen access fitting.

The access fittings have different shapes and sizes, according

to varying customer requirements. For all access fittings, the valve core seat is manufactured according to the ARI STANDARD 720:1997.

After tightening the valve core inside the access fitting with the dedicated wrench, p/n 8390/A, to the indicated torque, the refrigerant passage, filling or draining is obtained simply by activating the needle on the valve core.

CONSTRUCTION

The straight fittings are machined by hexagonal brass bar EN 12164 – CW 614N.

The T and cross fittings are hot forged in brass EN 12420 – CW 617N.

Cap 8391/A is moulded Nylon.

Caps 8392/A and 8392/B are machined from hexagonal brass bar EN 12164 – CW 614N, with chloroprene rubber (CR) gasket.

Valve core 8395/A3 is equipped with hydrogenated nitrile rubber (HNBR) gaskets

The tapered gasket with tang, 8580/2, is manufactured from copper Cu - ETP UNI 5649.



TABLE 10: General characteristics of access fittings

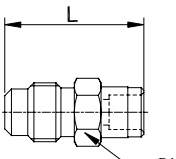
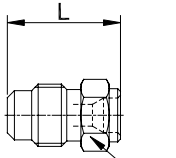
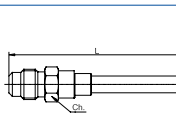
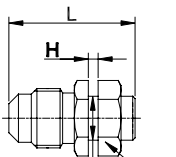
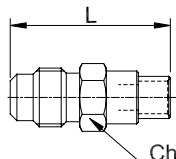
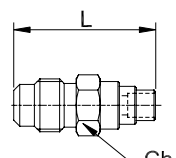
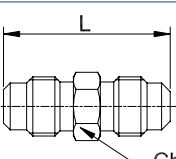
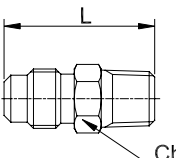
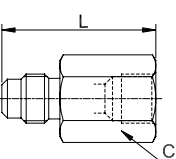
| Drawing | Part number | Connections | | | | | | | | PS [bar] | Dimensions [mm] | | | | Weight [g] |
|---|-------------|-------------|------|------|------|---------|--------|-----------------------|--------------|----------|-----------------|----|-----|-----|------------|
| | | SAE Flare | | | NPT | ODS | | IDS | | | L | Ch | D | H | |
| | | Valve core | m | f | | Ø [in.] | Ø [mm] | Ø [in.] | Ø [mm] | | | | | | |
| Straight access fittings | | | | | | | | | | | | | | | |
|  | 8350/22 | 1/4" | - | - | - | 1/4" | - | 3/8" | - | 120 | 26 | 11 | - | - | 12 |
| | 8350/X10 | 1/4" | - | - | - | 1/4" | - | - | 10 | | 26 | 11 | - | - | 12 |
|  | 8350/X01 | 1/4" | - | - | - | - | 6 | - | - | 120 | 20 | 11 | - | - | 10 |
|  | 8350/X03 | 1/4" | - | - | - | - | - | - | 6 | 120 | 90 | 11 | - | - | 23 |
| | 8350/X06 | 1/4" | - | - | - | - | - | 1/4" | - | | 126 | 11 | - | - | 28 |
| | 8350/X07 | 1/4" | - | - | - | - | - | 1/4" | - | | 326 | 11 | - | - | 58 |
| | 8350/X12 | 1/4" | - | - | - | - | - | - | 6 | | 180 | 11 | - | - | |
|  | 8350/X09 | 5/16" | - | - | - | 1/4" | - | - | - | 50 | 27 | 14 | 9,4 | 2,1 | 19 |
|  | 8351/2 | 1/4" | - | - | - | - | 6 | - | 8 - 10 | 120 | 30 | 11 | - | - | 13 |
| | 8351/X04 | 1/4" | - | - | - | - | - | - | 6 | | 26 | 11 | - | - | 11 |
| | 8351/X05 | 5/16" | - | - | - | - | - | 3/8" | 7 | | 27 | 14 | - | - | 18 |
| | 8351/X07 | 5/16" | - | - | - | - | - | 3/8" | 6 | | 27 | 14 | - | - | 19 |
|  | 8351/X01 | 1/4" | - | - | - | - | 1/8" | - | 6 | 120 | 36 | 11 | - | - | 13 |
| | 8351/X02 | 1/4" | - | - | - | - | 5 | 1/4" 5/16" 3/8" | - | | 26 | 11 | - | - | 11 |
| | 8351/X06 | 1/4" | - | - | - | - | - | - | 6 8 10 | | 28 | 11 | - | - | 13 |
|  | 8352/22 | 1/4" | 1/4" | - | - | - | - | - | - | 120 | 31 | 11 | - | - | 15 |
|  | 8354/21 | 1/4" | - | - | 1/8" | - | - | - | - | 120 | 28 | 11 | - | - | 13 |
| | 8354/22 | 1/4" | - | - | 1/4" | - | - | - | - | | 33 | 14 | - | - | 25 |
| | 8354/23 | 1/4" | - | - | 3/8" | - | - | - | - | | 38 | 17 | - | - | 41 |
|  | 8362/22 | 1/4" | - | 1/4" | - | - | - | - | - | 120 | 35 | 17 | - | - | 42 |

TABLE 11: General characteristics of access fittings

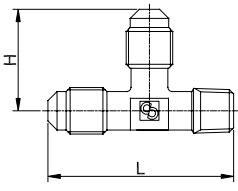
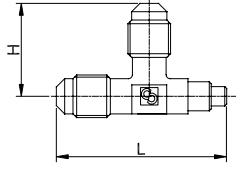
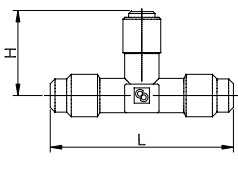
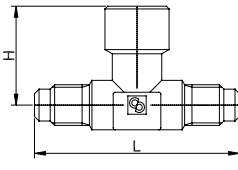
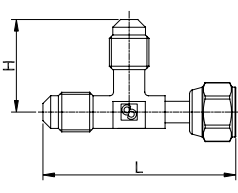
| Drawing | Part number | Connections | | | | | PS [bar] | Dimensions [mm] | | | Wrench torque min / max [Nm] | Weight [g] | Note |
|---|-------------|-------------|------|------|---------|--------|----------|-----------------|----|------|------------------------------|------------|--|
| | | SAE Flare | | NPT | IDS | | | L | Ch | H | | | |
| | | m | f | | Ø [in.] | Ø [mm] | | | | | | | |
| TEE access fittings | | | | | | | | | | | | | |
|  | 8380/122 | 1/4" | - | 1/8" | - | - | 120 | 45 | - | 24 | - | 31 | The valve core may be installed on each of the two 1/4" SAE Flare male connections |
| | 8380/222 | 1/4" | - | 1/4" | - | - | | 49,5 | - | 25,5 | - | 44 | |
|  | 8380/X01 | 1/4" | - | - | - | 6 | 120 | 43 | - | 24 | - | 28 | |
|  | 8380/X02 | 1/4" | - | - | - | 7 | 120 | 48 | - | 22 | - | 33 | |
|  | 8380/X09 | 1/4" | 1/4" | - | - | - | 120 | 56 | - | 27 | - | 70 | |
| TEE access fittings with swivel nuts | | | | | | | | | | | | | |
|  | 8380/X06 | 1/4" | 1/4" | - | - | - | 45 | 50 | - | 24 | 11/14 | 47 | With valve-core opening device on female connection. The valve core may be installed on each of the two 1/4" SAE Flare connections |
| | 8380/X08 | 1/4" | 1/4" | - | - | - | 45 | 49 | 17 | 24 | 11/14 | 49 | The valve core may be installed on each of the two 1/4" SAE Flare male connections |

TABLE 12: General characteristics of access fittings

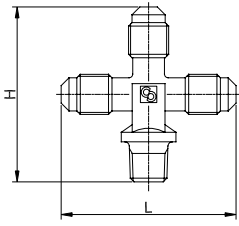
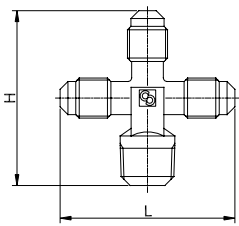
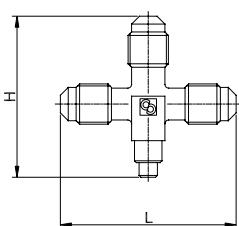
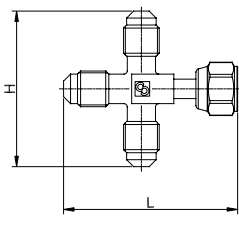
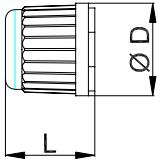
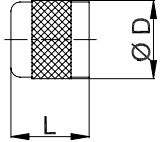
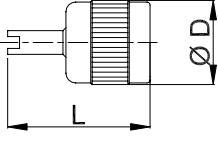
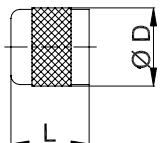
| Drawing | Part number | Connections | | | | | PS [bar] | Dimensions [mm] | | | Wrench torque min / max [Nm] | Weight [g] | Note |
|---|-------------|-------------|------|------|---------|--------|----------|-----------------|----|----|------------------------------|------------|--|
| | | SAE Flare | | NPT | IDS | | | L | Ch | H | | | |
| | | m | f | | Ø [in.] | Ø [mm] | | | | | | | |
| Cross access fittings | | | | | | | | | | | | | |
|  | 8382/1222 | 1/4" | - | 1/8" | - | - | 120 | 48 | - | 50 | - | 49 | |
|  | 8382/X02 | 1/4" | - | 1/4" | - | - | 120 | 48 | - | 50 | - | 53 | The valve core may be installed on each of the three 1/4" SAE Flare male connections |
|  | 8382/X01 | 1/4" | - | - | - | 7-10 | 120 | 48 | - | 47 | - | 47 | |
| | 8382/X03 | 1/4" | - | - | - | 6 | | 48 | - | 44 | - | 42 | |
| Cross access fittings with swivel nut | | | | | | | | | | | | | |
|  | 8382/X04 | 1/4" | 1/4" | - | - | - | 45 | 50 | 17 | 46 | 11/14 | 35 | With valve-core opening device on female connection. The valve core may be installed on each of the three 1/4" SAE Flare connections |

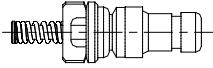
TABLE 13: General characteristics of caps with gasket

| Drawing | Part number | Connections | | PS [bar] | TS [°C] | | Dimensions [mm] | | Weight [g] |
|---|-------------|-------------|-------|----------|---------|------|-----------------|----|------------|
| | | SAE Flare | | | min | max | L | D | |
|  | 8391/A | - | 1/4" | 35 | -20 | +100 | 14 | 14 | 1 |
|  | 8392/A | - | 1/4" | 80 | -20 | +100 | 13 | 13 | 7 |
|  | 8392/B (1) | - | 1/4" | 80 | -20 | +100 | 22 | 13 | 7 |
|  | 8393/A | - | 5/16" | 80 | -20 | +100 | 22 | 13 | 7 |

Note:

- (1) La chiave serve per il montaggio del meccanismo.
- (1) The key needs to remove the valve core

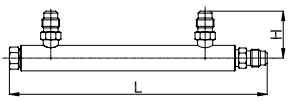
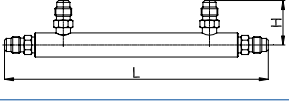
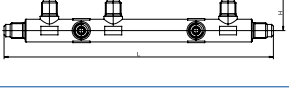
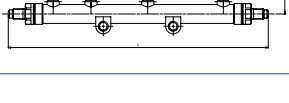
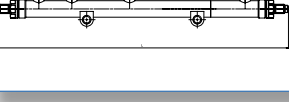
TABLE 14: General characteristics of valve cores

| Drawing | Part number | Spring | Gaskets | | Refrigerant Fluids | Max Static Pressure [bar] | Operating Pressure [bar] | Operating Temperature [°C] | | Peak Temperature (1) [°C] | Dimensions [mm] | | Wrench torque min / max (2) [Nm] | Weight [g] |
|---|-------------|---------|---------|------|------------------------------|---------------------------|--------------------------|----------------------------|------|---------------------------|-----------------|-------------------------|----------------------------------|------------|
| | | | body | seat | | | | min | max | | L | D | | |
|  | 8395/A3 | outside | HNBR | HNBR | HFC (3) HFO (4) HC (5) | 140 | 50 | -25 | +130 | 150 | 16,3 | 5,2x 0,705 V0.071 | 0,4/0,5 Nm | 0,7 |

Note:

- (1) permitted value for shot period
- (2) To remove the valve core use the key code 8390/A
- (3) R134a, R32, R404A, R407C, R410A, R507
- (4) R1234yf, R1234ze, R448A, R449A, R450A, R452A
- (5) R290, R600, R600a

TABLE 15: General characteristics of manifolds with access fittings

| Drawing | Part number | Connections | PS [bar] | Dimensions [mm] | | Weight [g] | Note |
|---|-------------|-------------|-------------|-----------------|----|---------------|----------------------|
| | | SAE Flare | | L | H | | |
|  | 9900/X87 | 1/4" | 45 | 162 | 30 | 36 | N° 3 access fittings |
|  | 9900/X47 | 1/4" | 45 | 175 | 30 | 216 | N° 4 access fittings |
|  | 9900/X81 | 1/4" | 45 | 190 | 25 | 343 | N° 7 access fittings |
|  | 9901/X43 | 1/4" | 120 | 275 | 49 | 650 | N° 6 access fittings |
|  | 9901/X44 | 1/4" | 120 | 335 | 49 | 851 | N° 6 access fittings |



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