ENGINEERING TOMORROW

Accelerate **refrigerant transition** and turn down **climate impact**

Danfoss' product portfolio for low-GWP (Global Warming Potential) refrigerants enables you to build climate friendly and sustainable solutions while saving money on price increases or government taxes.
Update May 2022.

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Danfoss and
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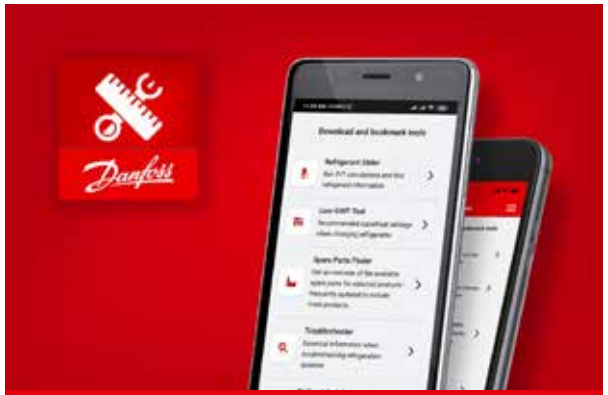
Sustainable solutions are in the best interests of all stakeholders in our industry. Sustainability safeguards long-term investments and ensures compliance with Corporate Social Responsibility. Today, when talking about refrigerants and long-term sustainability, Danfoss considers three main parameters that must be aligned to accomplish a real sustainable balance: **affordability, safety, and environment.** In order to enable the market to achieve these CO_2 eq reduction targets, Danfoss is actively working on **solutions for alternative refrigerants** with a pragmatic approach, keeping system efficiency, costs and safety in mind. The company offers **a wide range of products and solutions for low-GWP** synthetic and natural refrigerants for both refrigeration and air-conditioning applications.

Refrigerant tools:

Transition center >



Ref Tool >

CoolSelector®2 >

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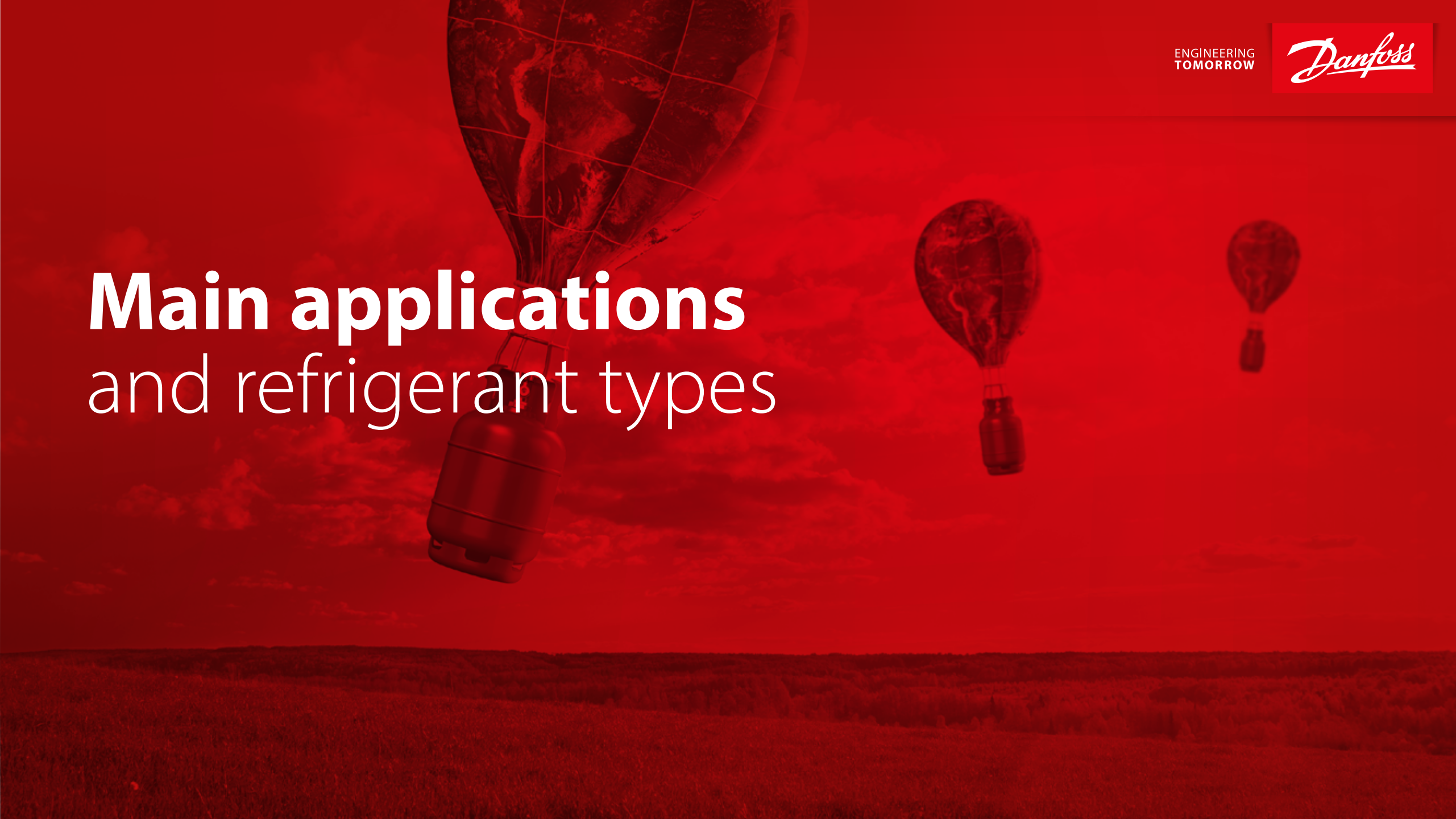


Main applications
and refrigerant types

Main applications and refrigerant types

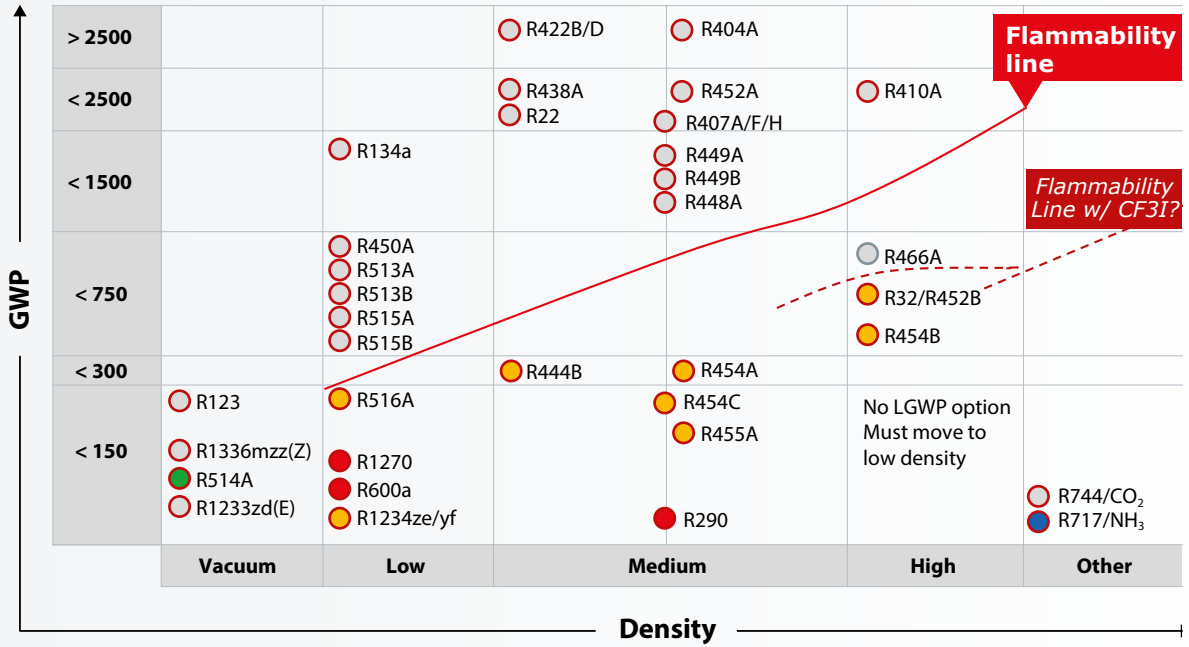
GWP values are decreasing due to phase downs and energy efficiency demands (MEPS) are increasing.

HVAC-R professionals will focus on using components that allow for the lowest possible charge and on technologies with the best cost/performance ratio for a given refrigerant type.

Choosing a refrigerant is no simple task; it depends on the timing of regional regulations as well as applied standards and building codes. In recent years, the situation has been further complicated by significant price rises and a shortage of fluorinated refrigerants. But the drive to refrigerant transition means new, more efficient solutions are entering the market. However the transition accelerates.

Main refrigerants at play
A complex picture in continuous evolution

GWP versus density (pressure) of the main refrigerant groups



Legend

- A1 – Non-flammable
- A2L – Mildly flammable
- A3 – Highly flammable
- B1 – Toxic – non-flammable
- B2L – Toxic – less flammable
- On the market
- Not yet on the market

Source: Danfoss

Chillers

Depending on their size and the compressor technology they use, chillers operate with low to high pressure refrigerants and are divided into two categories: low/medium (L/M) and medium/high (M/H) pressure.

L/M chillers transitioning from R123 can stay non-flammable using HCFO solutions like R1233zd. But this refrigerant is banned in some countries because even though its ozone depletion potential (ODP) is very low, it is still above zero. R134a applications have non-flammable, A1 solutions with GWP less than 640, such as HFO blends R513A, R450A and R515B. A2L classified refrigerants need to be accepted according to applied safety standards and building codes. GWP level can come very close to zero using the pure HFO R1234ze. We expect industry professionals will adopt this ultra-low GWP refrigerant as a long-term solution for these kinds of systems.

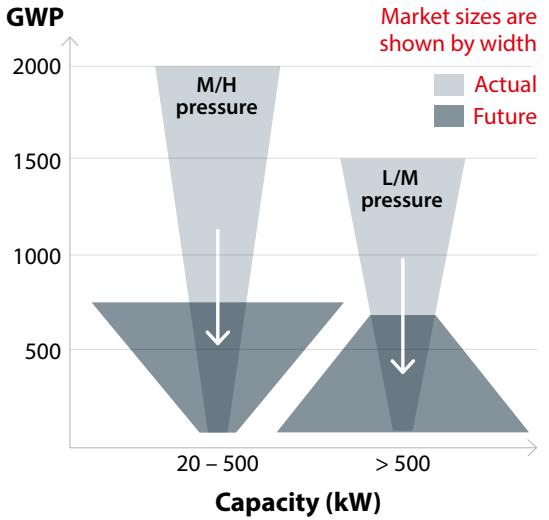
For **M/H pressure chillers**, there is no ideal non-flammable alternative for incumbent refrigerants such as R410A. Instead, industry professionals must accept A2L or even A3 solutions like R290. A2L alternatives are in the 500 – 700 GWP range like R32/R452B/R454B.

Their use should be acceptable for systems installed outdoors or in machine rooms, but their placement must always follow local safety standards and building codes. We foresee that the high density/ pressure refrigerant choice will fall into two groups: the majority with a GWP around 500 – 750 and a smaller but still significant group applying A3 refrigerants like R290.

In the longer term, we will likely experience lower GWP levels in the main market. It is dependent on refrigerant availability and cost. The F-gas phase-down has so far caused high GWP-related price increases.

Market transition and GWP level per Chiller size

Most of the M/H Chillers will use refrigerants with a GWP around 750, and most L/M chillers will use ultra-low GWP refrigerants.



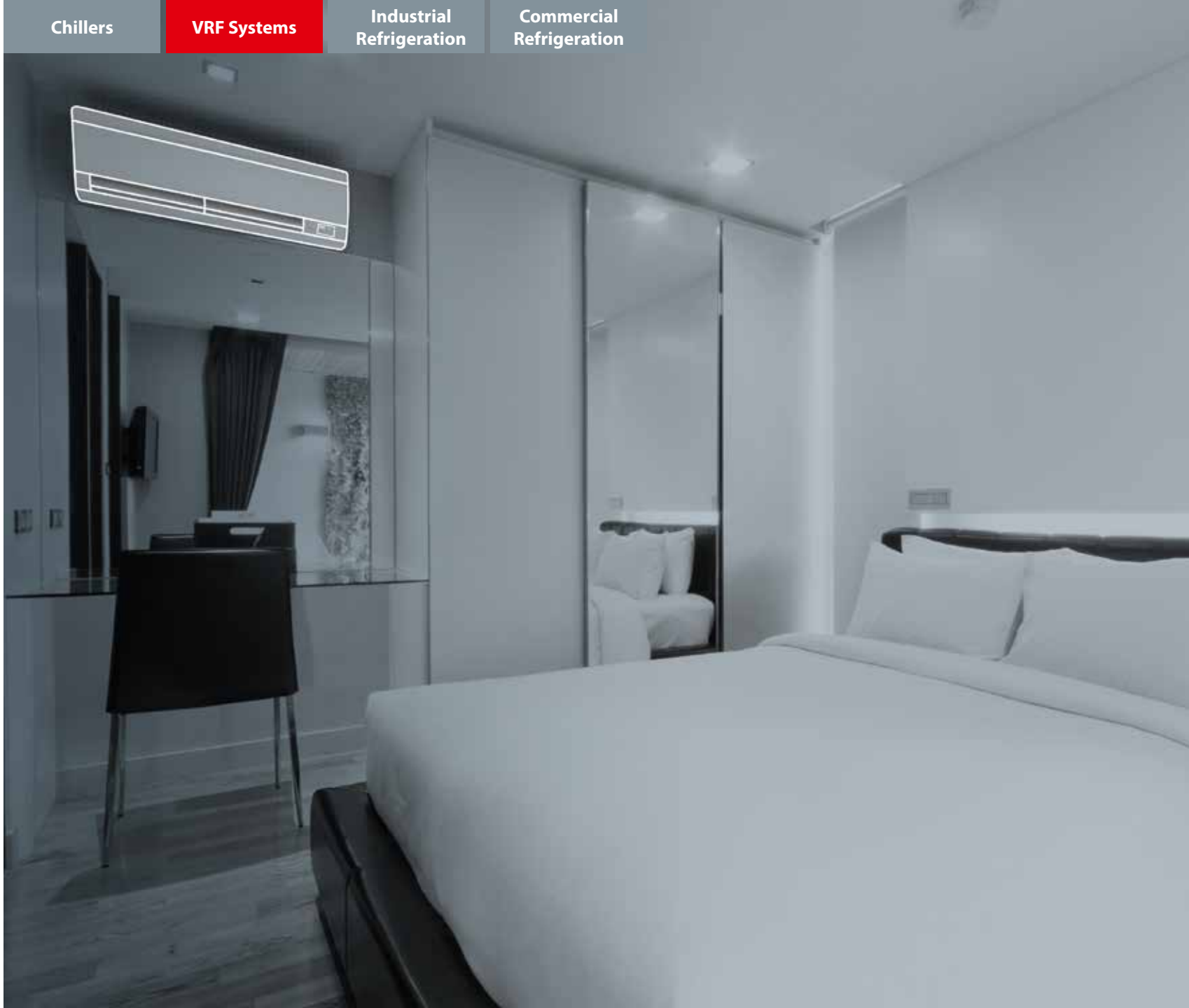
VRF systems

VRF systems use a relatively large amount of refrigerant per unit, compared to ducted systems, due to their decentralized evaporators and subsequent piping.

Minimizing piping size requires medium to high density refrigerants where the only alternatives to R410A are A2L refrigerants such as R32 or R452B/ R454B.

We are following the development of R466A—a new A1-R410A replacement that uses the iodine-based molecule CF3I.

Innovative indirect alternative refrigerants are under constant development – water-based systems are an obvious choice and even CO_2 has been proposed.



Industrial Refrigeration

From a glance, Industrial Refrigeration seems to be an easy sector regarding low GWP refrigerants, but we still see potential safety pitfalls as well as room for innovation.

Ammonia has continued to be the dominant refrigerant for Industrial Refrigeration applications over the years. The main reason for that, is it's excellent thermodynamic properties. Further it's a natural refrigerant and it has minimal impact on the environment. Both the Ozone Depletion Potential (ODP) and the Global Warming potential (GWP) are 0 which is excellent. The costs are relatively low and it's widely available. NH3 is categorized as toxic and flammable. This means that specific design requirements are needed and some specific design and safety standards have to be followed. In order to mitigate risks, there is a growing interest for innovative ways to reduce charge sizes, for example when combining NH3 with CO2. In some cases CO2 takes on the role of thermal carrier.

Commercial Refrigeration

Commercial Refrigeration applications are very diverse regarding systems types and refrigerants used. It includes cold rooms, glass door merchandizers, and display and islands cabinets, either in centralized or plug-ins –hermetic or autonomous cooling circuits with condensing units.

Commercial Refrigeration applications are grouped into three main categories.

1. Hermetically sealed applications

2. Condensing units

3. Centralized DX systems

Market transition and GWP levels for Commercial Refrigeration applications

1. Hermetic
Most of the market will use refrigerants with a GWP below 150

2. CU's
Most of the market will use refrigerants with GWP around 1500, then lower

3. Centralized Systems
Most of the market will use ultra low GWP refrigerants

Commercial Refrigeration

1. Hermetically sealed applications

Hermetically sealed applications today use various refrigerants with GWP up to 4000. They are suited for using low GWP refrigerants, which are safe due to their low charge amounts.

Many of these systems already use hydrocarbons like R600a and R290 and the EU phasedown has required GWP values below 150 since 2016. The new IEC 60335-2-89 standard allows up to 500g of A3 refrigerant and up to 1,2 kg of A2L refrigerant—depending on the room size.

Commercial Refrigeration

2. Condensing units

Condensing units have a refrigerant charge that is typically between 1 and 20 kg and safety on flammability is imperative as many of these systems can be accessed by the public.

High GWP refrigerants like R404A have been used for many years, but new alternative A1-classified HFCs like R452A have a GWP of less than 60% of R404A . Nevertheless, the impact of higher compressor discharge temperatures on the operating envelope and the impact of refrigerant glide on cooling performance present new challenges. We believe that most of the market will quickly move to an average GWP level of around 1500, like R448A and R449A, before slowly seeking for more, lower -GWP solutions like CO_2, R290 (Hydrocarbons), or lower GWP HFO Blends.

Commercial Refrigeration

3. Centralized DX systems

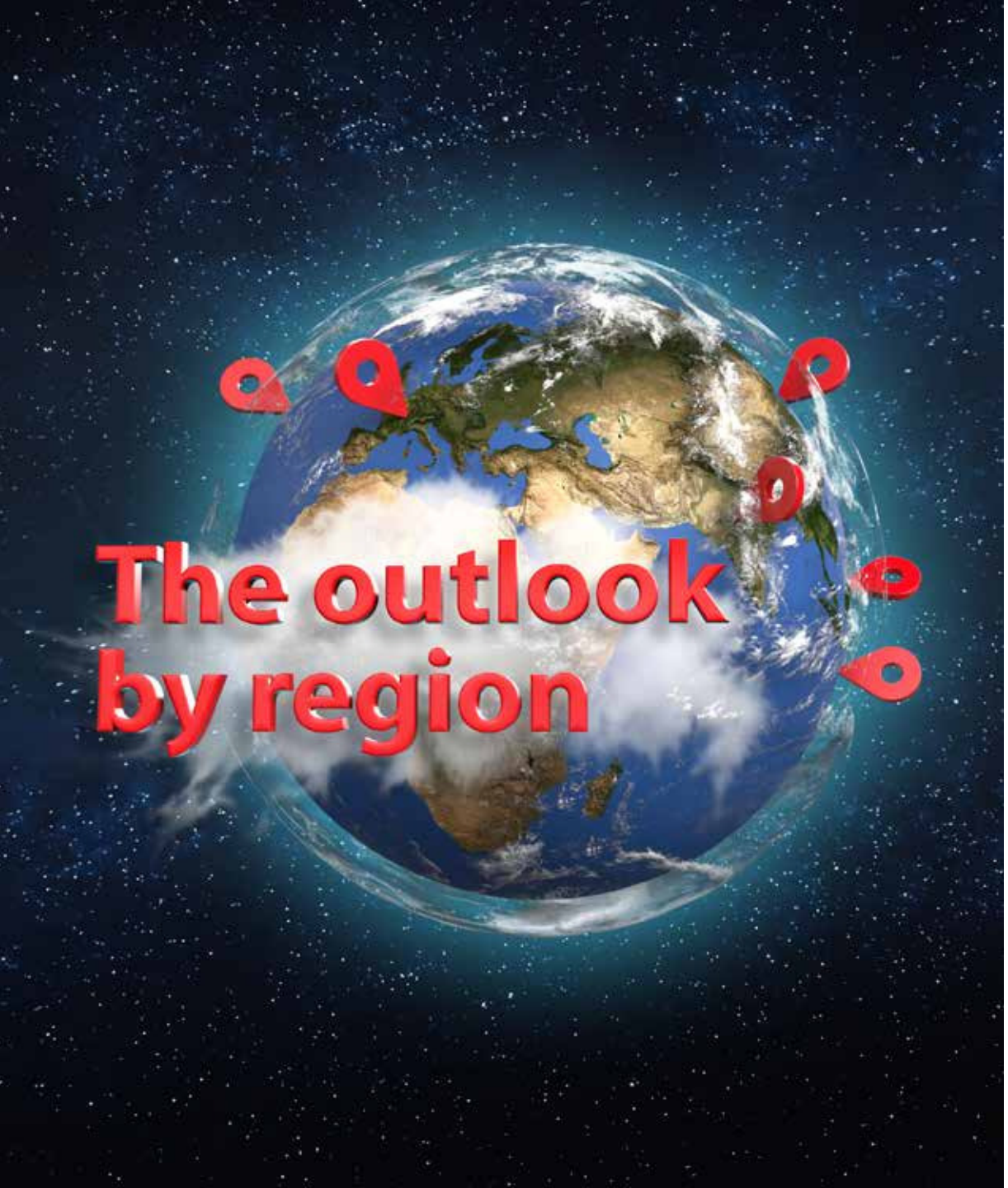
Centralized DX systems are by farthe highest refrigerant-consuming applications due to their large charge sizes and high leakage rates. In the EU phasedown, they are estimated to use more than 40% of the baseline amount of refrigerant recommended by the phasedown. During the last ten years, CO_2 has become a viable refrigerant and can be used in different system setups:

Transcritical systems where CO_2 is used in all circuits (MT and LT). CO_2 transcritical systems have also been driving the development of integrated heating and cooling systems, linking the refrigerant choice to the type of system.

Indirect systems where a chiller-like rack using HFCs, HCs, or NH_3 cools the CO_2 in a receiver, which is then circulated in the MT circuit, cooling the MT circuit. LT is also covered by CO_2 and condenses either directly to the chiller on top or the CO_2 MT circuit.

Cascade systems where CO_2 is used only in the LT circuit and cascaded into the MT circuit which uses HFC. This type of system still uses around 80% of the HFC refrigerant used in a conventional system.

Geographical location affects the energy efficiencyofanysystemduetooutdoorambient temperature. Transcritical CO_2 systems have been known to be extraordinary sensitive to outdoor temperatures. However, the latest developments with ejector technologies have seriously increased CO_2 system efficiency even in very warm climates, and we are now seeing a market breakthrough which will gain momentum in the coming years.



The tendency of the industry is to move increasingly toward natural refrigerant solutions when it is technologically safe & economically feasible. Synthetic refrigerants are still likely to play an important role in both the refrigeration and air conditioning, where the trend is also moving toward new low-GWP substances that cause a minimal environmental impact.

CO_2 (R744)

- The CO_2's GWP value equal to 1.
- Lends itself well to **food retail applications,** where the impact, in case of leaks, is minimal and where its thermodynamic properties make it the ideal media for heat recovery.
- Transcritical CO_2 cycles reject a large proportion of the cycle heat at high temperatures which makes it suitable for **heat pumps.**
- In **industrial refrigeration,** CO_2 provides a means to reduce the charge of Ammonia, increasing the efficiency and decreasing the footprint of freezing equipment.
- In **transport refrigeration** and electronics cooling, CO_2 provides a non-flammable, environmentally benign solution.

Ammonia (NH_3 - R717)

- GWP and ODP (Ozone Depletion Potential) equal to zero, cost (per kg) considerably lower than the cost of HFCs.
- Ammonia is one of the most **energy efficient** refrigerants in applications ranging from high to low temperatures. With the increasing focus on energy consumption, ammonia is a sustainable choice for the future. Ammonia has better **heat transfer properties** than most of chemical refrigerants and therefore plant construction and operating costs will be lower.

Hydrocarbons (R290, R600)

- Provides high energy-efficiency, good volumetric capacity and large operating envelopes compared to HFCs.
- The flammability limits the use to **small systems** and **chillers.**
- Allows for very low evaporating temperatures without overheating the compressor when used in heat pumps (with HFCs you need to supplement with an electrical heating element for the really cold days or more expensive vapor / liquid injection cycles).

Medium GWP HFC / HFO blends

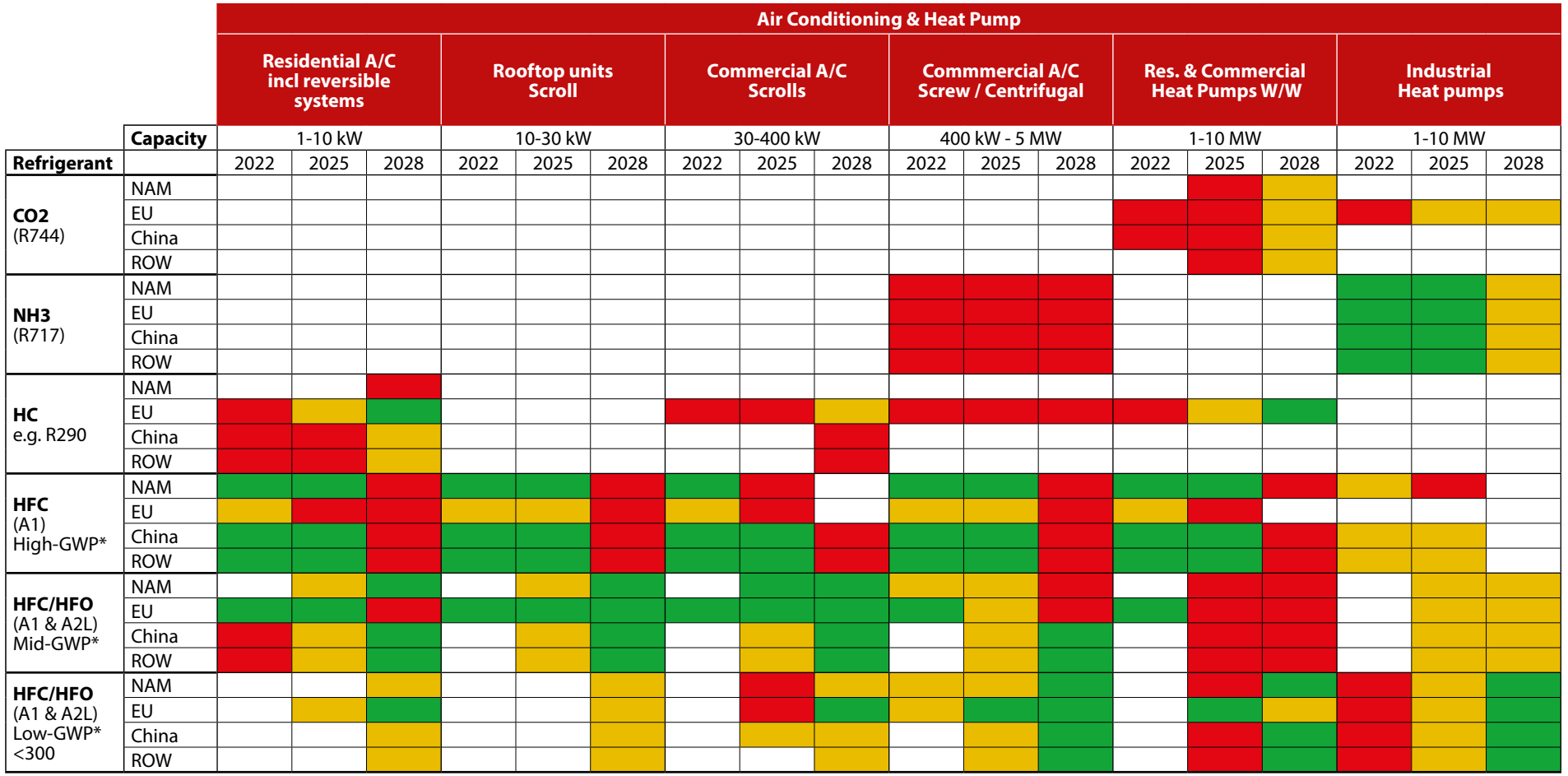
- A transitional solution that can be used in retrofitting high-GWP HFC systems. Medium GWP solutions, <1500, and non-flammable are particularly indicated where indoor system charge can be an issue and alternative system architecture too expensive.

Mildly flammable HFC & HFO

- The low GWP and low flammability makes these refrigerants suitable for **relatively large systems.**
- Especially interesting for **air conditioning** where there is a lack of non-flammable (A1) natural alternatives.

Status May 2022

Global trends by region



Source: Danfoss, January 2020.

* GWP classification is somewhat dependent on current solution & operating pressure baseline.
General guidance: High > 1000, Mid 300–1000, Low < 300.

Main refrigerant
Regular use
Limited use and only niche applications
Not applicable or unclear situation

Status May 2022

Global trends by region

		Refrigeration														
		Domestic-Household Refrigeration			Light Commercial Refrigeration			Condensing Units			Centralised Commercial racks (Supermarkets)			Industrial Refrigeration		
	Capacity	50-300 W			0.15 - 5 kW			3-20 kW			20-500 kW			1-10 MW		
Refrigerant		2022	2025	2028	2022	2025	2028	2022	2025	2028	2022	2025	2028	2022	2025	2028
CO2 (R744)	NAM															
	EU															
	China															
	ROW															
NH3 (R717)	NAM														**	**
	EU														**	**
	China															**
	ROW															**
HC e.g. R290	NAM															
	EU															
	China															
	ROW															
HFC (A1)	NAM															
	EU															
	China															
	ROW															
HFC/HFO (GWP< 150) (A2L)	NAM															
	EU															
	China															
	ROW															

** Ammonia/CO_2 cascades will dominate industrial refrigeration

Main refrigerant
Regular use
Limited use and only niche applications
Not applicable or unclear situation

Source: Danfoss, January 2020.

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Product overview

Products for refrigerants with a GWP <2500

Products for refrigerants
with a GWP <2500

Compressors and Condensing units

Electronic controllers

Expansion devices (electric and mechanical)

Heat Exchangers

Regulating valves

Other valves

Sensors and switches

Systems protectors

Products for refrigerants with a GWP <2500

Compressors and condensing units

Product	Product description	Pressure [bar]	Refrigerants																												
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Compressors for air conditioning																															
DSH / DCJ / DSF / DSG	Scrolls with IDVs for air conditioning			●(5)				●(2)				●									●(2)		●(2)				●(5)		
HLJ / SH	Scrolls for air conditioning											●																		
PSH	Scrolls heating optimized											●																		
SY / SZ	Scrolls for air conditioning					●				●																●				
VZH	Inverter scrolls for air conditioning											●									●*		●*							
TT, TG, VTT, VTX	Turbocor oil-free centrifugal compressors				●	●																				●	●			
Compressors for refrigeration																															
MTZ	Maneurop reciprocating compressor for medium temp.					●			●	●						●	●			●				●	●*	●				
NTZ	Maneurop reciprocating compressor for low temp.																			●										
MLZ	Scroll compressor for medium temperature					●			●							●	●			●				●*	●*	●				
LLZ	Scroll compressor for low temperature															●	●			●				●*	●*					
PL/TL/DL/FR/NL/SC/GS/ B/U/L/P/X/S	Light Commercial AC Compressors for LBP/MBP			●		●	●			●							●(1)		●(1)	●						●				
SLV, NLV, DLV	Variable speed reciprocating compressor for LBP/MBP						●																							
BD	Light Commercial AC/DC compressors for mobile cooling			●		●	●																							
Condensing units																															
Optyma™	Condensing Units for medium temperature refrigeration			●*		●	●		●	●						●	●			●				●(4)	●(4)	●				
Optyma™	Condensing Units for low temperature refrigeration						●													●										
Optyma™ **Slim Pack**, Optyma™ **Plus**	Condensing Units for medium temperature refrigeration			●		●			●							●	●			●				●	●	●				●*
Optyma™ **Slim Pack**, Optyma™ **Plus**	Condensing Units for low temperature refrigeration															●(3)	●(3)			●				●	●					
Optyma™ **Plus INVERTER**	Condensing Units for medium temperature refrigeration								●							●	●													
Optyma™ **iCO$_2$**																													●*	

* Qualification in progress
(1) Models and map restrictions might apply – contact Danfoss
(2) Only DSH for R452B/4B and DSF for R32
(3) Optyma™ **Plus** only
(4) Light commercial only
(5) Only DSG for R1234ze and R515B

For any refrigerants not listed and for the detailed information per product, please contact Danfoss or check in Coolselector: **coolselector.danfoss.com**

Products for refrigerants with a GWP <2500

Electronic controllers

Product	Product description	Pressure [bar]	Refrigerants																											
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Electronic controllers [1]																														
AK-PC 781A/783A	Advanced pack controllers		●		●	●	●	●	●	●		●		●		●**	●**			●**		●				●		●	●
AK-PC 351/551 651	Standard pack controllers				●**	●	●	●	●	●		●		●		●**	●**			●**						●		●	●
AK-PC 572/772A/782A	Advanced pack controllers																											●	
AK-CC 55	Case controller for electronic expansion valves				●**	●	●	●	●	●		●		●		●**	●**			●**						●		●	●
AK-CC 550/750A					●**	●	●	●	●	●		●		●		●**	●**			●**						●		●	●
AK-CC 250/350/450	Case controller for thermostatic expansion valves						●	●	●																			●	●
EKC 326A	CO_2 gas pressure controllers																											●	
MCX	Programmable controllers		●	●	●	●	●	●	●	●	●	●		●		●	●		●	●	●		●			●		●	●
EIM 336/365	Electronic superheat controllers		●	●	●	●	●	●	●	●	●	●		●		●	●	●	●	●	●		●		●(1)	●(1)	●(1)	●	
EKE 1A, EKE 1B, EKE 1C (1V), EKF			●	●	●	●	●	●	●	●	●	●	●(1)	●	●(1)	●	●	●	●	●	●	●(1)	●	●(1)	●(1)	●(1)	●(1)	●	
EKC 313	Cascade injection with CO_2		●		●		●	●	●						●					●	●							●	●
EKC 315A	Superheat controllers					●	●	●	●(4)	●		●		●														●	●
EKC 361	Temperature controllers		●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)	●(3)
EKE 347	Liquid level controllers		●		●			●	●						●					●	●							●	●
EKE 400	Evaporator controller		●	●	●	●	●	●	●	●	●	●	●(2)	●	●(2)	●	●	●	●	●	●	●(2)	●	●(2)		●		●	
ERC IIx / ETC, ERC (VSD)	For commercial refrigeration		●	●	●	●	●	●	●						●	●	●		●	●	●				●	●	●	●	●

** Only in the latest versions of the controller software
(1) Parameters for other refrigerants can be entered manually. please refer to refrigerant constants for ADAP-KOOL
(2) Can be defined by the user
(3) EKC 361 is not a refrigerant dependent controller and can as such be used across all refrigerants.
Observe the valves selected along with EKC 361, may be restricted to a limited number of refrigerants.
(4) Approved for R407A only

For any refrigerants not listed and for the detailed information per product, please contact Danfoss or check in Coolselector: **coolselector.danfoss.com**

Products for refrigerants with a GWP <2500

Expansion devices
(electric and mechanical)

Product	Product description	Pressure [bar]	Refrigerants																												
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Electronic expansion valves																															
AKV 15/20	Electronic expansion valves	28 – 46				●			●(1)	●(1)	●	●	●(1)	●(1)		●(1)	●(1)	●	●(1)	●(1)						●(1)	●	●***	
AKVA		42				●			●	●		●	●	●		●	●	●	●	●						●		●	●
AKVP/PS		90	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
ETS 5M					●	●	●	●		●		●								●	●	●	●	●	●	●	●		
ETS 6		47		●		●	●(2)	●		●	●	●				●	●	●		●	●	●	●	●	●	●			
ETS 8M							●	●		●		●									●								
ETS 12100 C-Colibri®		50		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
ETS C 250-400		34			●	●			●	●	●	●	●	●		●	●	●	●	●						●	●		
ETS 175-250-400L	Manifold Electronic expansion valves				●	●																				●			
Thermostatic expansion valves																															
TU	Stainless steel	45.5						●				●																●	
TU		34		●	●	●	●		●	●						●	●			●		●		●	●	●			
TC		45.5		●	●	●	●	●	●	●		●				●	●			●		●		●	●	●			
T2/TE2	Thermostatic expansion valves	34		●		●			●	●	●					●	●			●		●		●	●	●		●	
TD1		34				●	●(2)			●						●*	●*			●*					●	●			
TG/TGE		46			●	●	●(2)	●	●	●		●									●*		●			●			
TE5-TE55		28		●		●			●	●						●	●			●				●	●	●			
TEA	Industrial thermostatic exp. valves																												●

* Qualification in progress
*** Except AKV20 with media temperature constantly below 0 °C
(1) Available for solder versions, the flare versions in progress
(2) Approved for R290 only

For any refrigerants not listed and for the detailed information per product, please contact Danfoss or check in Coolselector: **coolselector.danfoss.com**

Products for refrigerants with a GWP <2500

Regulating valves

Product	Product description	Pressure [bar]	Refrigerants																											
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Electronic pressure & temperature regulating valves																														
CCM	Electric regulating valves	90				●																						●	
CCMT		140				●																						●	
CTM	Multi Ejector	140																										●	
CTR	3-Way Heat Reclaim Valve	140																										●	
KVS	Electronic suction modulating valves	45.5/34			●	●			●	●		●	●	●		●	●		●	●						●			
KVS C			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
ICM	Industrial motorized regulating valves	52/65			●	●			●	●		●																●	●
ICMTS	High pressure industrial motorized regulating valves	140						●																				●	
Mechanical pressure & temperature regulating valves																														
KVD	Receiver pressure regulators			●	●	●	●		●	●	●		●	●		●	●	●	●	●				●	●	●	●		
KVC	Capacity regulators			●	●	●	●		●	●	●		●	●		●	●	●	●	●				●	●	●	●		
KVL	Crankcase pressure regulators			●(1)	●(1)	●	●(1)		●	●	●		●	●		●	●	●	●	●				●(1)	●(1)	●	●		
KVP	Evaporating pressure regulators			●(1)	●(1)	●	●(1)		●	●	●		●	●		●	●	●	●	●				●(1)	●(1)	●	●		
KVR	Condensing pressure regulators			●(1)	●(1)	●	●(1)		●	●	●		●	●		●	●	●	●	●				●(1)	●(1)	●	●		
CPCE	Hot gas bypass regulating valves				●	●	●		●	●	●					●	●	●	●	●				●	●	●	●		
CVC / CVP	Pilot valve for ICS	65			●	●			●	●		●																●	●
ICS	Mechanical pressure regulators	52/65			●	●	●(2)		●	●		●																●	●
REG-S	Flexline™ regulating valves	52				●	●	●	●	●		●													●			●	●

(1) NRV (E) and GBC (E) series for flammable refrigerants; KVL, KVP, KVR size 12-22 only
(2) Only R600A

For any refrigerants not listed and for the detailed information per product, please contact Danfoss or check in Coolselector: **coolselector.danfoss.com**

Products for refrigerants with a GWP <2500

Other valves and Heat Exchangers

Product	Product description	Pressure [bar]	Refrigerants																										
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Solenoid valves																													
EVR v2	Allround solenoid valves	32 - 45.2		●	●(1)	●	●(1)	●(1)	●	●	●	●	●	●	●	●	●	●	●	●	●(1)	●(1)	●(1)	●(1)	●(1)	●	●		
EVRA/T	Solenoid valves	42				●			●	●		●																	●
EVUL	Fully-hermetic solenoid valves	90		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
ICLX	Flexline™ solenoid valves	52				●		●	●	●		●																●	●
Valve stations																													
ICF	Flexline™ valve stations	52/65				●			●	●		●																●	●
Water regulating valves – pressure operated																													
WVFX	Pressure operated water valves			●		●	●		●	●	●	●	●	●		●	●	●	●	●				●	●	●	●	●	●
WVO				●		●	●		●	●	●		●	●		●	●	●	●	●				●	●	●	●	●	●
WVS						●	●		●	●		●	●	●		●	●		●	●						●			●
Heat exchangers																													
BPHE	Brazed Plate heat exchangers		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
MPHE	Micro Plate heat exchangers		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
MCHE	Micro Channel heat exchangers			●	●	●	●	●	●	●		●			●	●	●	●	●	●	●		●			●			
SWPHE	Semi-Welded Plate heat exchangers																												●

(1) EVR v2 2 to 22 with solder connection and without manual stem

For any refrigerants not listed and for the detailed information per product, please contact Danfoss or check in Coolselector: **coolselector.danfoss.com**

Products for refrigerants with a GWP <2500

Sensors and switches

Product	Product description	Pressure [bar]	Refrigerants																											
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Sensors & transmitters																														
AKS	Pressure sensors with 4 – 20 mA, volt., and ratiometric outputs	100	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
AKS 4100	Liquid level sensors	100							●	●		●																	●	●
MBS 8200	Pressure sensors with 4 – 20 mA, and ratiometric outputs	160	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
AKS Temperature	Sensors with Pt1000, Pt 1000 and thermistor elements		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
DGS	Gas detecting sensors			●	●	●	●[1]	●	●	●		●		●		●	●			●	●	●	●	●	●	●		●		
DST P110	Pressure Sensor with Ratiometric output and diagnostic capabilities	50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Switches																														
AKS 38	Electro-mechanical float switches	28			●			●	●			●									●		●		●			●	●	
KP	Pressure switches	46		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●	●			●
RT						●			●	●			●	●																●
CKB		140																										●		
MP	Differential pressure switches					●	●	●	●	●	●		●	●		●	●	●	●	●		●		●	●	●	●			●
RT						●			●	●			●	●																●
ACB	Cartridge pressure controls	45	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
CCB		165																										●		

[1] R290 only

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Products for refrigerants with a GWP <2500

Systems protectors

Product	Product description	Pressure [bar]	Refrigerants																											
			R1233zd (E)	R1234yf	R1234ze (E)	R134a	R290, R600a	R32	R407A R407F	R407C	R407H	R410A	R422B	R422D	R444B	R448A	R449A	R449B	R450A	R452A	R452B	R454A	R454B	R454C	R455A	R513A	R515B	R744 (CO_2)	R717 (NH_3)
Check valves																														
NRV	Piston check valves	49		●	●	●	●(2)	●(2)	●	●	●	●				●	●	●	●	●	●(2)	●(2)	●(2)	●(2)	●(2)	●	●	90 bar	
NRVA		40				●	●(4)	●	●	●		●																	●
CHV-X	Flexline™ check valves	52/65				●	●		●	●		●																●	●
OFC	Check & stop valve for oil free applications	23			●	●																				●	●		
SCA-X	Flexline™ check & stop valves	52/65				●	●		●	●		●																●	●
Filters & driers																														
DCR	Filter drier with repleacable solid core	28/46	●			●			●	●	●	●				●	●	●	●	●						●			
DCRE	Filter drier with repleacable solid core for flammables	50		●	●			●							●						●	●	●	●	●				
DMC / DCC	Receiver filter driers	42	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
DML / DCL	Liquid line filter driers	46	●	●	●	●	●(1)	●(1)	●	●	●	●	●	●	●(1)	●	●	●	●(1)	●	●(1)	●(1)	●(1)	●(1)	●(1)	●	●		
DMB / DCB	Bi-flow filter driers	46	●	●	●	●	●(1)	●(1)	●	●	●	●	●	●	●(1)	●	●	●	●(1)	●	●(1)	●(1)	●(1)	●(1)	●(1)	●	●		
DAS	Burn-out filter driers	35	●	●	●	●	●(1)	●(1)	●	●	●	●	●	●	●(1)	●	●	●	●(1)	●	●(1)	●(1)	●(1)	●(1)	●(1)	●	●		
DMT	Filter driers for transcritical applications	140																										●	
DMSC	Filter drier for subcritical applications	52																										●	
Sight glasses																														
SG	Sight glasses for low pressures	35				●			●	●		●				●	●		●	●						●			
SGP	Sight glasses for high pressures	52	●	●	●	●	●(3)	●(3)	●	●	●	●				●	●	●	●	●	●(3)	●(3)	●(3)	●(3)	●(3)	●	●	●	
Shut-off valves																														
GBC	Shut-off ball valves	45/49		●	●	●		●(2)	●	●	●	●				●	●	●	●	●	●(2)	●(2)	●(2)	●(2)	●(2)	●	●	90/140 bar	
GBCH / GBCT		90/140																										●	
BML	Shut-off diaphragm valves	28		●	●	●	●(3)			●	●							●	●							●	●		
SNV / SVA	Gauge valves / Flexline™ stop valves	52/65			●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●

(1) Filter Driers with connection sizes below 25 mm for solder version (copper/cu-plated)
(2) NRV (E) and GBC (E) series for flammable refrigerants; KVL, KVP, KVR size 12-22 only
(3) Available for solder versions, the flare versions in progress
(4) Only R600A

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ENGINEERING TOMORROW

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Get a complete overview of the refrigerants landscape, and learn about the various regulations and their impact on the industry. Take a deep dive into our white paper, download useful digital tools, and get the latest information on our portfolio of products that are qualified for use with alternative refrigerants.

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