

Chillventa Specialist Forums 2024

Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**





Shift your perspective

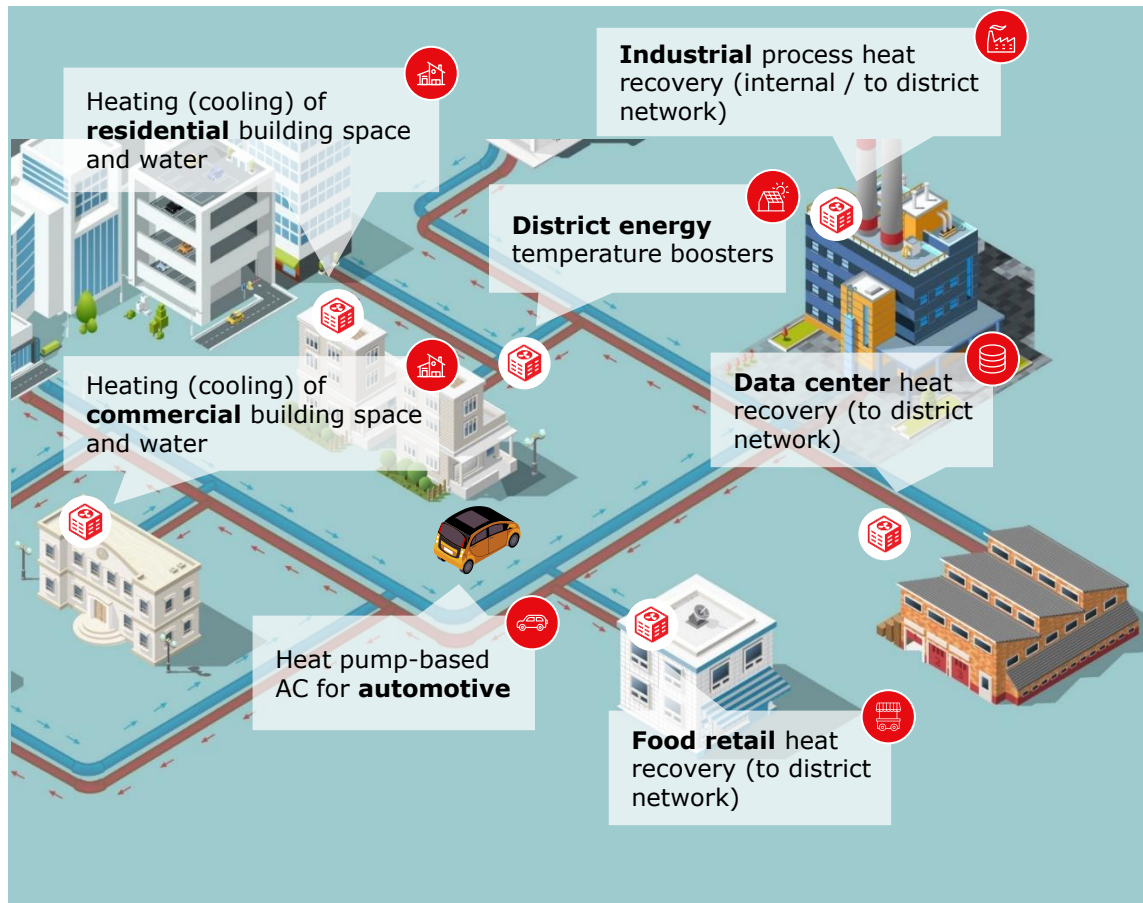
**Danfoss Heat Pump Solutions:
enabling a sustainable future**



Mathieu Canal

Heat Pump Solution Director

Heat pumps to play a crucial role to enable heat recovery and decarbonization in urban environments



HEAT PUMP TAKEAWAYS



Adoption and applications

- Global market to grow by +10% p.a. until 2030 – Heat pumps' potential to reduce emissions in **buildings** by 50%
- Food, chemicals, and paper to become the largest **industrial** adopters of heat pumps – Regulators forcing to decarbonize process heat.



Regulatory and regional drives

- Growth especially in **Europe in commercial & industrial segment**, likely followed later by North America
- Accelerating shift towards **natural refrigerants** (cfr. Kigali Agreement) especially in Europe region.



Market landscape





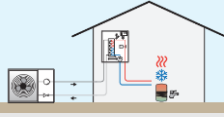
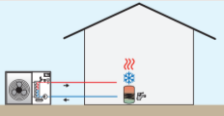
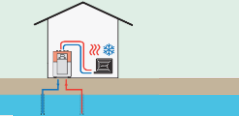
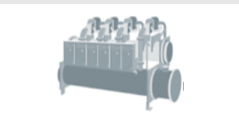

- System **connectivity**, flexibility and integration with renewables/storage to become increasingly important

Danfoss EU refrigerant vision

Refrigerant per application



R1234ze <10GWP
R516A/R454C/R455A <150GWP
R32/R454B <750GWP

	Type of System 	Current situation 	Long Term vision 	Comments 
	A/W Residential Split	R410A/R32	R290 (up to 6kW (3TR)). Alternative: HFO blends	<ul style="list-style-type: none"> Most likely replaced by Monoblock (at least in New build)
	A/W Monoblock <ul style="list-style-type: none"> Residential Light Comm.(up to 200kW) 	R410A /R290	R290	<ul style="list-style-type: none"> Modular architecture >200kW or risk assessment to go beyond the 5kg limit up to 10kg.
	B-W/W Monoblock <ul style="list-style-type: none"> Residential Light Comm. 	R410A /R452B	R290 Alternative: HFO blends	<ul style="list-style-type: none"> Refrigerant Charge >10kW is an issue. <i>Ventilated enclosure will allow the use of R290 but at a higher applied cost.</i>
	Heat Recovery HP <ul style="list-style-type: none"> Supermarket/Data Center etc... 	R134a /R1234ze	R1234ze/CO2 Alternative: HCs (R600a)	<ul style="list-style-type: none"> R1234ze is performing at high temp. <i>CO2 would be a viable option when certain conditions are met.</i>
	Industrial HP <ul style="list-style-type: none"> Process Heating/District Heating 	<100°C: R717/HFO/R744 >100°C: HC/HFO	<100°C: R744/R600a/R717 Alternative: HFO (R1234ze) >100°C: HCs (R600) Alternative: HFO (R1233zd)	<ul style="list-style-type: none"> <100°C: CO2 will play a part vs R717 & HFO (in District Heating for example). >100°C: <i>Solutions up to 130°C are achievable with HCs (R600) & HFO (R1233zd)</i>



Commercial Heating **R290 and smart hydronics ready**



VZN



H62/118



AS-CX06



ETS 8M/C &
EKE EKF



STF



DCL/DML
DCR



EVR



NRV



ACB



DST P110



EKS/AKS



GR290



R290 Solutions for Chillers & Heat Pumps

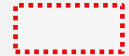
Redesign for a new generation of systems



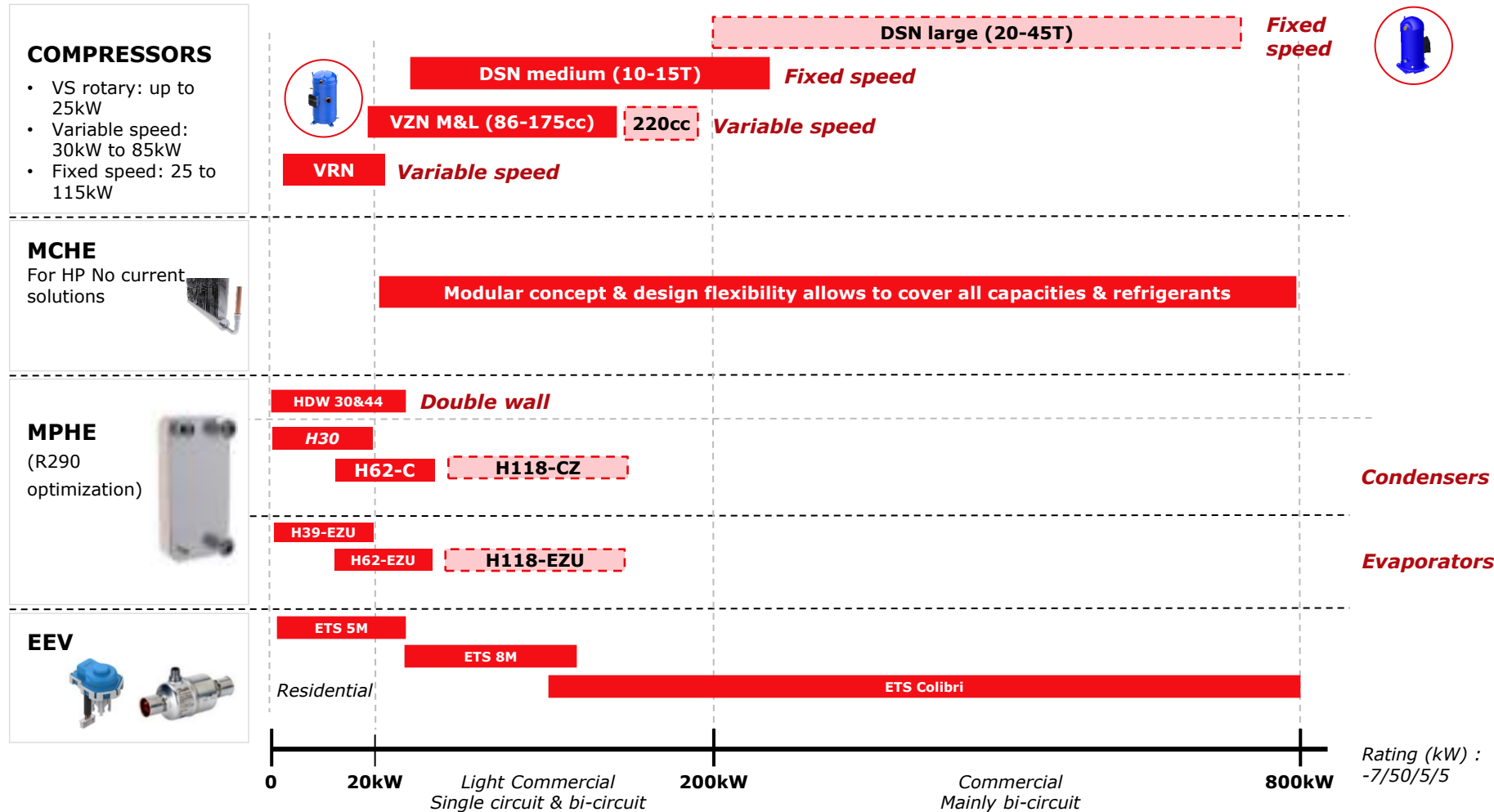
Available



In development



In roadmap



Electronics & Sensors Options

Alsmart Controller platform & HP software



Gas detector & pressure sensors

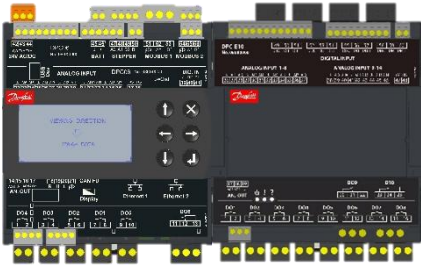


Inverter drive & SH controller



Danfoss **R290** Commercial HP

Highlight of key products – Electronics & software solutions



COMPLETE MODULAR CONTROL PLATFORM:

HW modules and SW toolchain flexible to support various applications and easy service



Highlight



- High performance processor
- Embedded connectivity
- HW Modularity
- SW Application Tools Suite
- Cybersecurity IEC 62443

Strategy



- Scalable HW concept for multiple segments and applications
- Easy integration with Cloud Service
- Tested SW libraries and applications

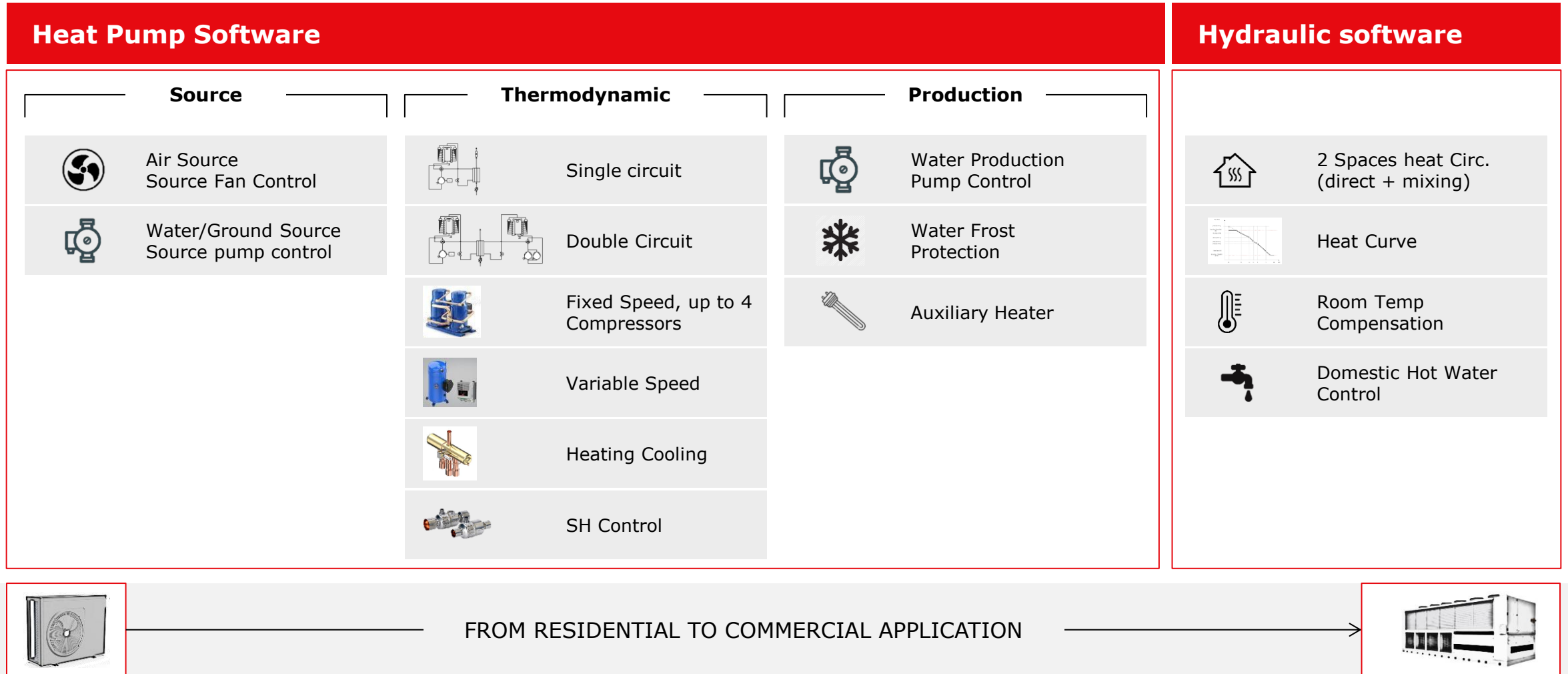
Concept



- Full optoisolated system
- Embedded Ethernet and USB-C
- Enhanced I/O with modular concept
- Standard Programming languages IEC 61131-3

New hydronic Heat pump software

Overview



Danfoss **R290** Commercial HP

Highlight of key products – VZN & DSN Ranges



APPLICATION:

- Comfort heating & Cooling (A/W Chiller & HP)
- AHU / RTU
- Process chiller



KEY CHARACTERISTICS:

- R290: up to 80°C (176°F) water supply
- Single (Hybrid tandem investigated)



VALUE PROPOSITION

- The natural successor of VZH platform for comfort applications enabling an easy retrofit of multi-family boilers by AWHF

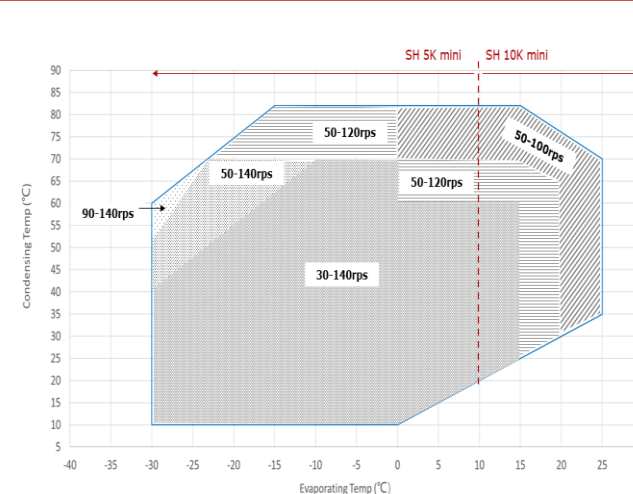


DATA

Polynomials	In Coolselector
3D files & Drawings	Available
Release	Released VZN086/104/140/175



- High slenderness scroll (efficiency++)
- Large capacity modulation 30-140rps
- Orbital disk
- POE oil



VZN086 : 34 kW (10TR)

VZN104 : 40 kW (11TR)

VZN140 : 34 kW (10TR)

VZN175 : 68 kW (19TR)

VZN220 : 88 kW (25TR)



Heating Capacity -7/50/5/5 140rps
Rating (TR) : 19/122 @140rps

Danfoss R290 Commercial HP

Highlight of key products – Heat Exchangers range

0.0xx = Channel volume (L)

4 options with varying cost, performance, compactness, refrigerant charge and ease of compliance to safety standard



Single Wall (+ deaerator)



H30



H62

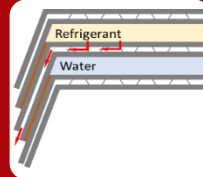
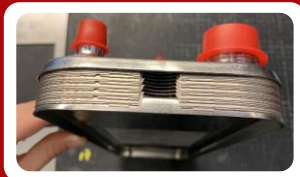


H118



Standard
(& low charge variant
in residential)

Double Wall



HDW30

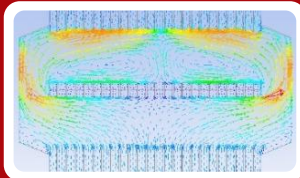


HDW44



Compliance
made easy

Mixing chamber (+ deaerator)



H39 EZU



H62 EZU

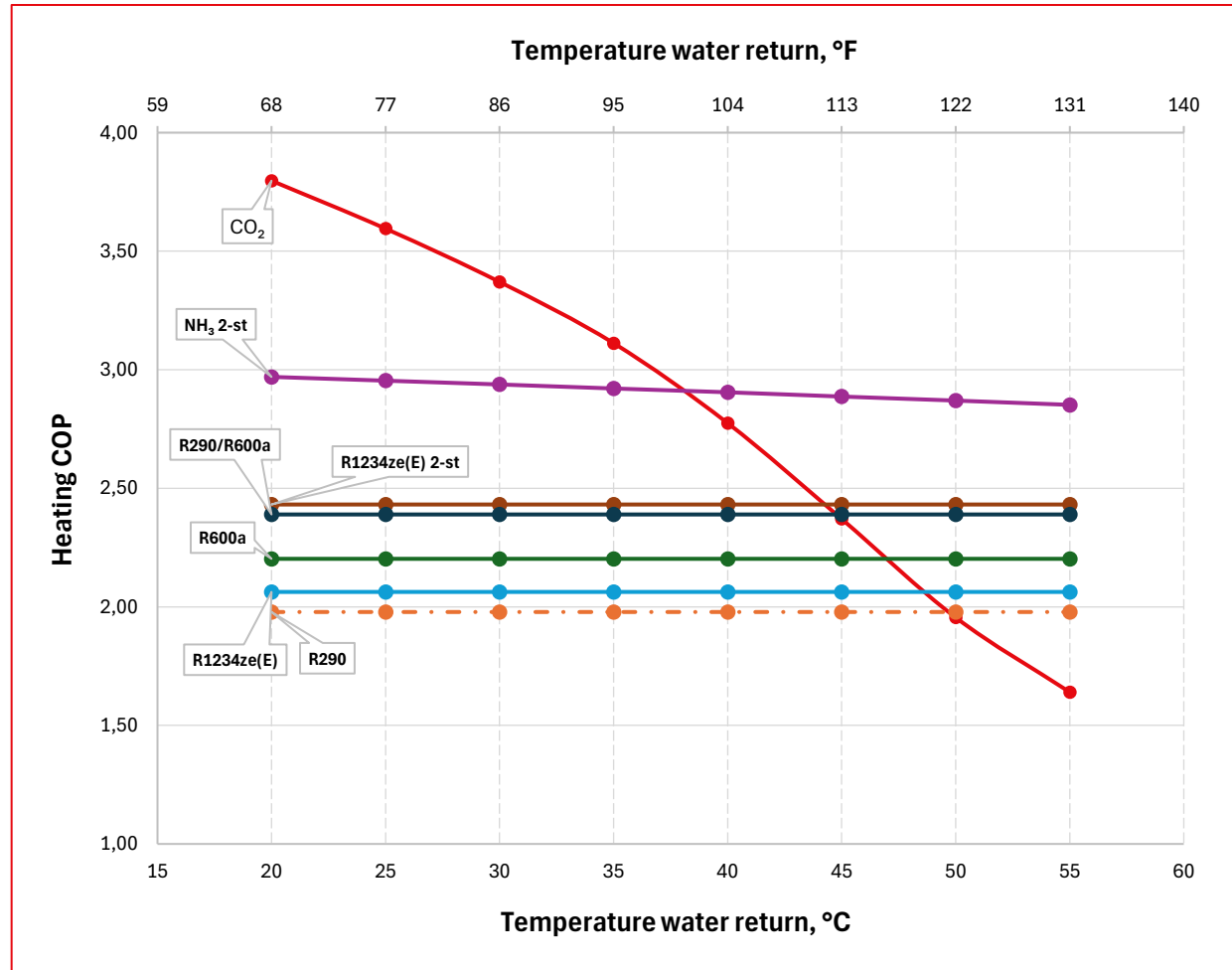


Best performance
compromise between
evaporator and
condenser designs
Ideal for reversible
W/W systems

Residential

Commercial

Where to apply **CO₂** in a HP context?



Basic assumptions:

- Fixed water supply at 80°C.



Key take aways



- ✓ **CO₂ is extremely sensitive to water return temperatures, 2-3% loss of COP per 1 K water return difference**
- ✓ **In a HP context, CO₂ may be a viable solution for:**
 - ✓ **Domestic hot water production**
 - ✓ **Building where DHW load is predominant over comfort load.**

CO₂ Solutions for Heat Pumps

Redesign for a new generation of systems

Available

In development

In roadmap

Compressors

- Semi hermetic reciprocals
- Variable speed options



MPHE (CO₂ gas cooler)



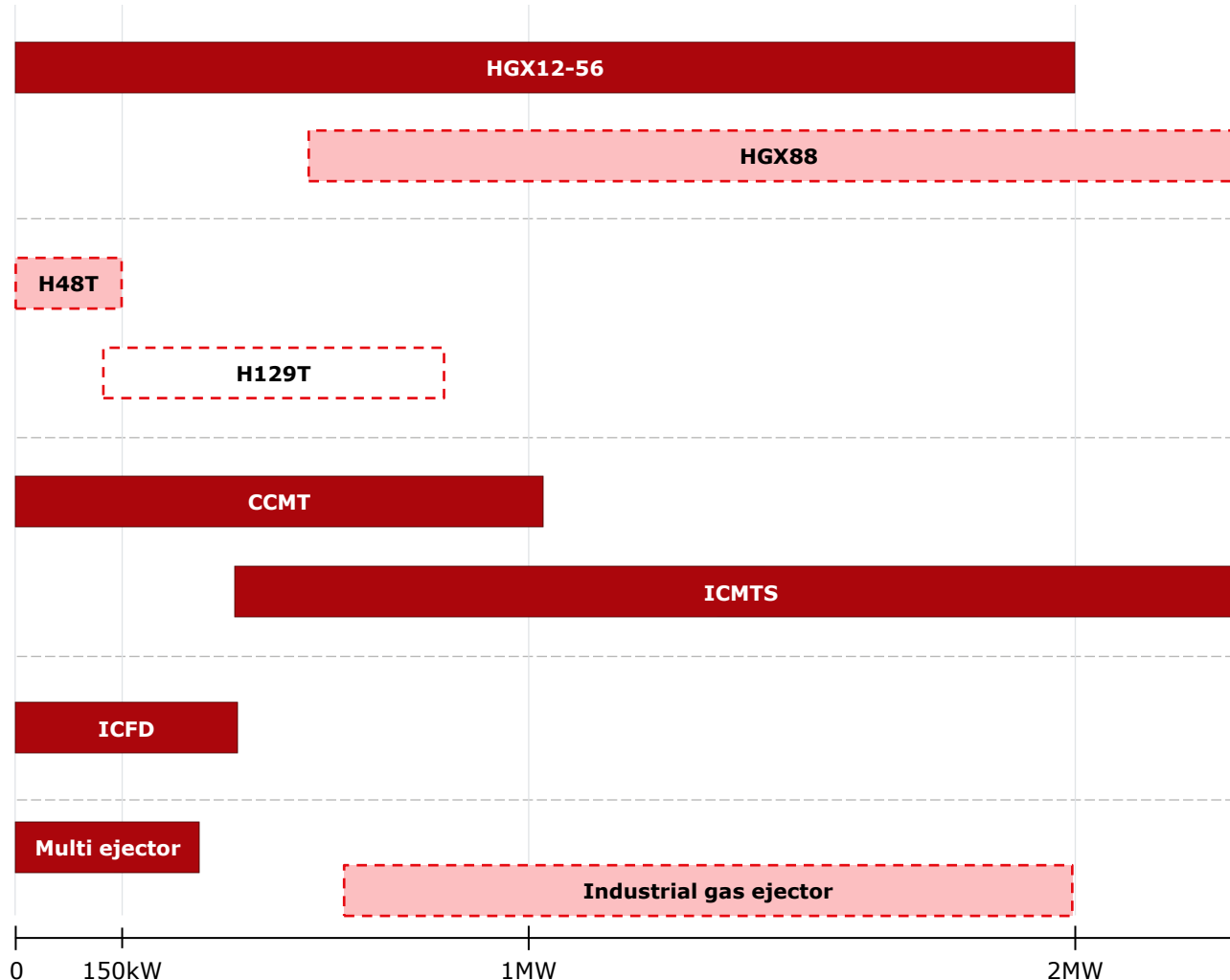
HPV/GBV /EEV



Defrost float valve



Ejector



Electronics & Sensors Options



**Alsmart Controller
platform & HP
software**



**SH evaporator
controller
including defrost
EKE400**



**Danfoss
Drive FC102**



DGS CO₂ sensor

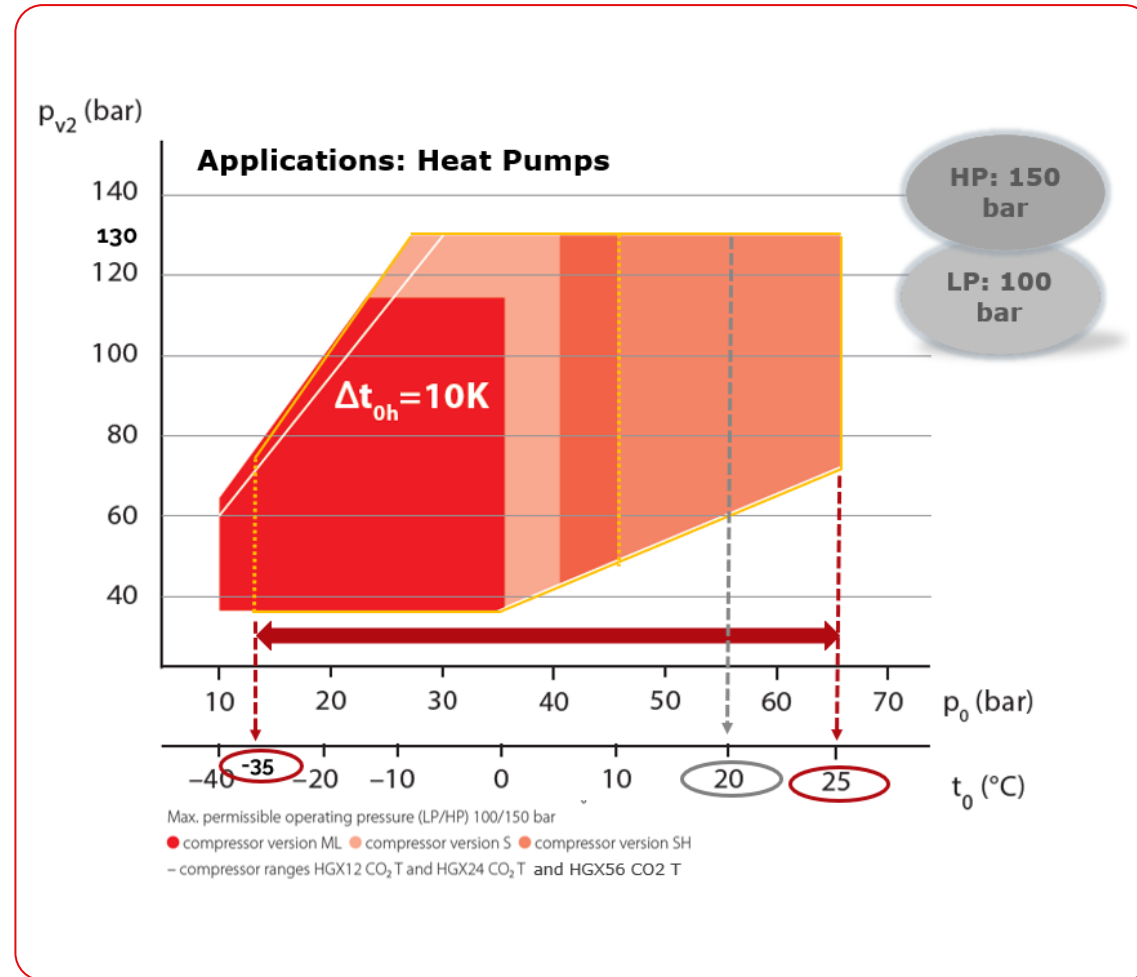


**AKS2050 pressure
transmitter**

Rating (kW): +5/ GC: 25°C, Trans: 110bar /10K

Features with Danfoss Bock CO₂ compressors

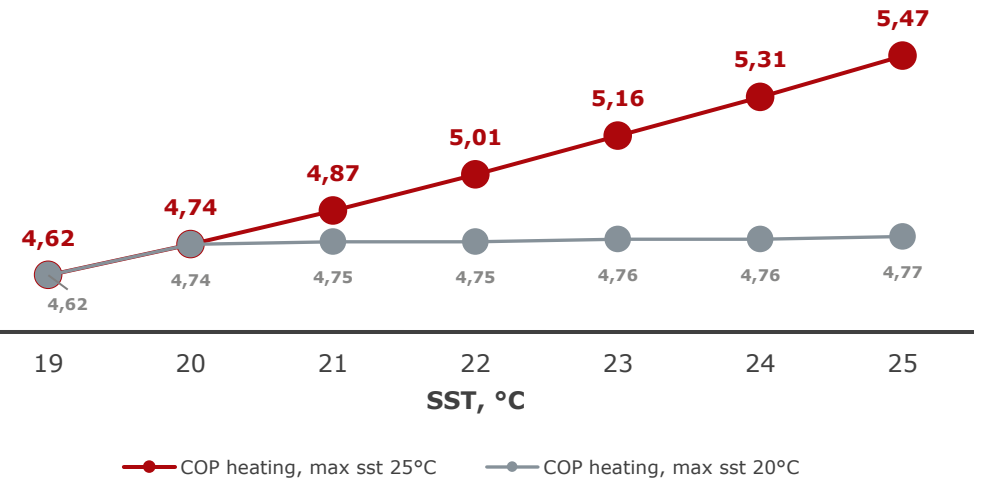
Valid for W/W systems and heat recovery applications.



Max. SST 25°C vs. 20°C



Compressor COP



Danfoss BOCK® / HGX46 / 345-4 SH CO₂ T

Operating conditions: tgs_{out}=40°C (104°F), toh = 10K (18 R), SST/Evaporating temp.

COP improvement of up to 15% for higher SST with 25°C



Chillventa Specialist Forums 2024

Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**

