

# HVAC

## AIR-TO-WATER AND WATER-TO-WATER SOLUTIONS STATIONARY COLLECTIVE HOUSING HEATING AND COOLING

### POSSIBLE SOLUTIONS



### DESIGN OF THE SYSTEM (ACCORDING TO EN 378 GUIDANCE)

#### R-454C

- Air-to-water heat pump
- Water-to-water heat pump
- Reversible monobloc

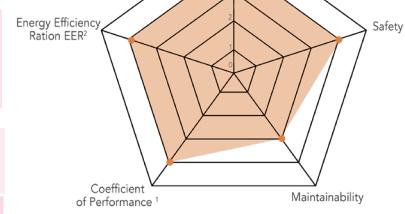
#### R-290

- Air-to-water heat pump
- Water-to-water heat pump
- Reversible monobloc

#### R-744 (CO<sub>2</sub>)

- Centralized domestic hot-water heat pump

#### R-454C



#### Class III

In technical room or open range (Full cooling piping)

Refrigerant type (HFC/HFO/HC/Inorganic)	HFC/HFO
GWP (according to F-Gas UE/2024/573)	146
Safety classification Lower Flammability Level LFL	A2L - 0.293 kg/m <sup>3</sup>
Classification (according to Pressure Equipment Directive PED)	1
F-gas quotas	Applicable
Specific regulatory constraints	++
Maintenance complexity (training, safety, tooling, Personal Protection Equipment PPE ..)	Training is mandatory Specific tooling PPE
Coefficient of Performance COP (theoretical) <sup>1</sup>	7.8
Energy Efficiency Ratio EER (theoretical) <sup>2</sup>	5.7
Technology readiness (prototyping, field test, availability)	Available

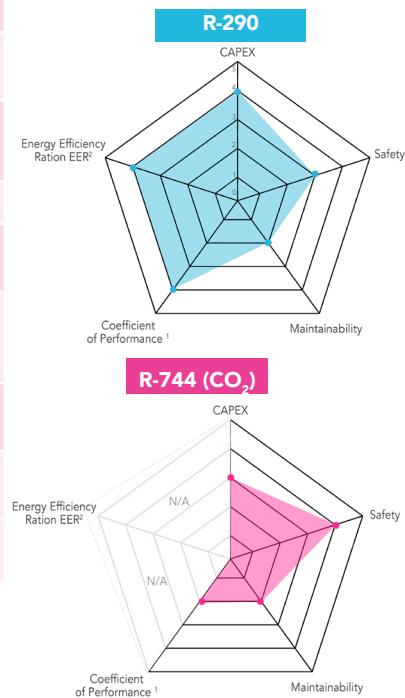
<sup>1</sup> Air-to-water HFC/HFO and HC solutions : Tk = 36°C - To = 2°C - SC = 5K - SR = 3K - Isentropic efficiency = 100%  
CO<sub>2</sub> : gas-cooler inlet pressure = 75barA - Gas-cooler outlet temperature = 30°C - To = 2°C - SC = 5K - Isentropic efficiency = 100% - Transcritical CO2 with ejector

<sup>2</sup> Air-to-water HFC/HFO and HC solutions : Tk = 45°C - To = 5°C - SC = 5K - SR = 3K - Isentropic efficiency = 100%

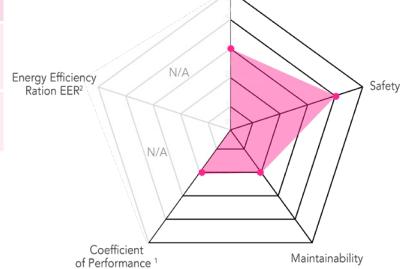
### CONCLUSION

**Class III** : R-290 is widely used, but appears to be the best long-term refrigerant to reversible monoblock heat pumps. R-290 units are installed outdoor for safety reasons, in accordance with EN 378 guidance, also to reduce costs related to indoor commissioning in technical rooms (ATEX equipment, detection, ventilation etc.)

Absorption systems may eventually be of an interest, when using waste heat.



#### R-290



#### R-744 (CO<sub>2</sub>)

