



Promouvoir  
une attitude  
responsable

## 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)

##### Class III

In technical room or open range (Full cooling piping)

##### Refrigerant type (HFC/HFO/HC/Inorganic)

##### GWP (according to F-Gas UE/2024/573)

##### Safety classification Lower Flammability Level LFL

##### Classification (according to Pressure Equipment Directive PED)

##### F-gas quotas

##### Specific regulatory constraints

##### Maintenance complexity (training, safety, tooling, Personal Protection Equipment PPE ..)

##### Coefficient of Performance COP (theoretical) <sup>1</sup>

##### Energy Efficiency Ratio EER (theoretical) <sup>2</sup>

##### Technology readiness (prototyping, field test, availability)

#### R-454C

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

HFC/HFO

146

A2L - 0.293 kg/m<sup>3</sup>

1

Applicable

++

Training is mandatory  
Specific tooling  
PPE

7.8

5.7

Available

#### R-290

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

HC

0.02

A3 - 0.038 kg/m<sup>3</sup>

1

Non-applicable

+++

Training is mandatory  
Specific tooling  
PPE

7.9

5.7

Available

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

Centralized  
domestic hot-water  
heat pump

Inorganic

1

A1

2

Non-applicable

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Training is mandatory  
Specific tooling  
PPE

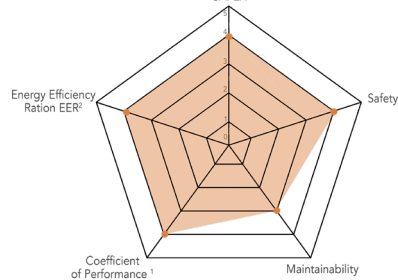
6.8

Not applicable

Available

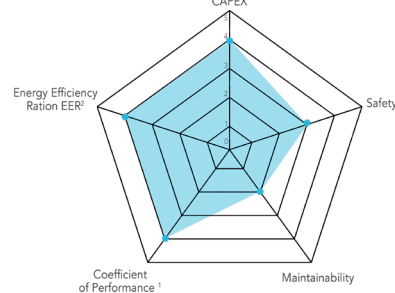
#### R-454C

CAPEX



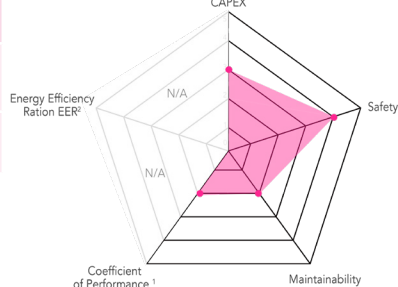
#### R-290

CAPEX



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

CAPEX



#### 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.