

# HEART

Holistic Energy and  
Architectural Retrofit Toolkit

Technical systems

Claudio Del Pero



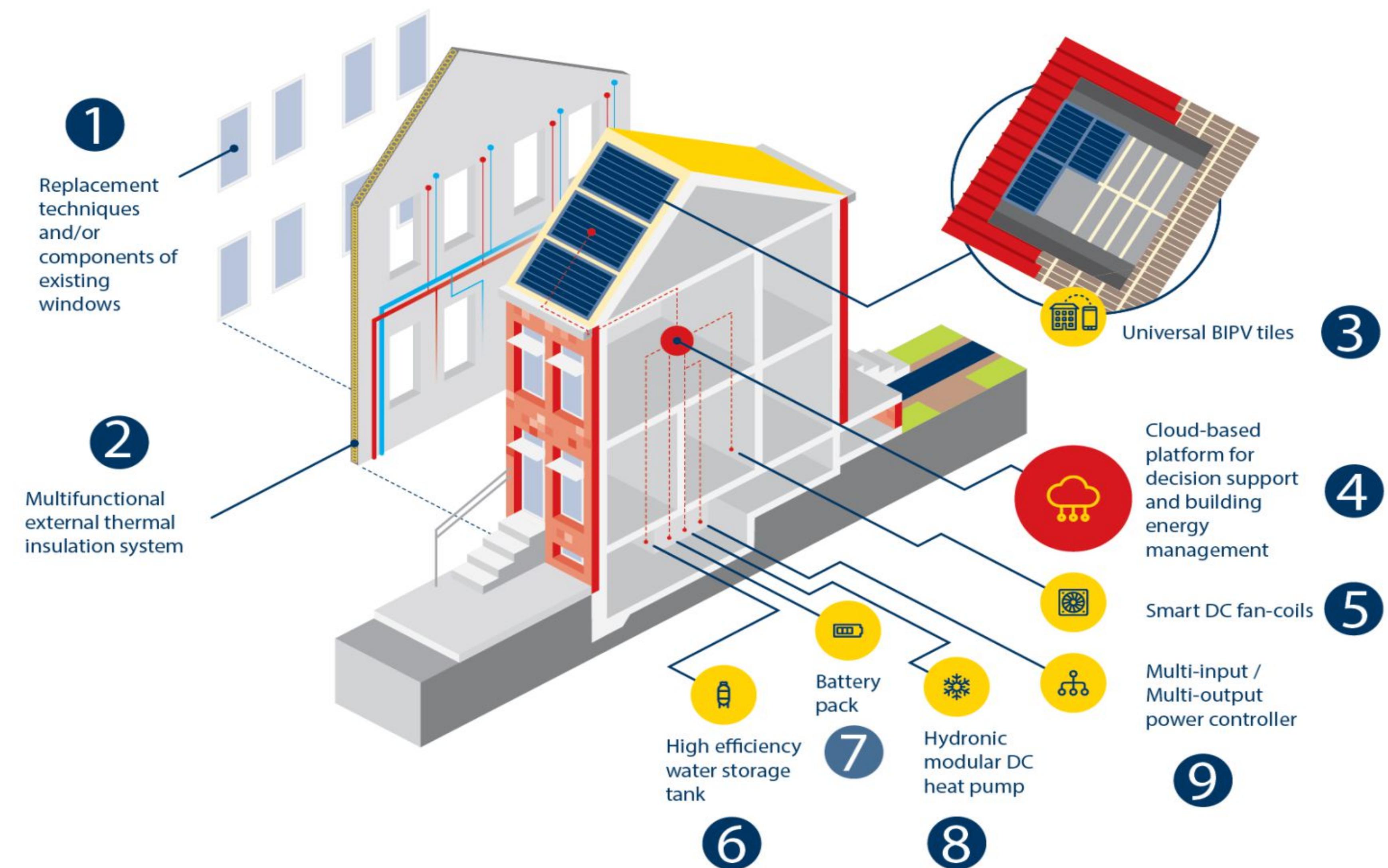
HEART

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# HEART Toolkit

- 1) Retrofit components/techniques for existing windows;
- 2) Multifunctional external thermal insulation;
- 3) Universal PV tiles;
- 4) Cloud-platform;
- 5) DC Smart fan coils;
- 6) Thermal storage;
- 7) Battery pack;
- 8) DC heat pump;
- 9) Multi-Input/Multi-Output converter (MIMO);



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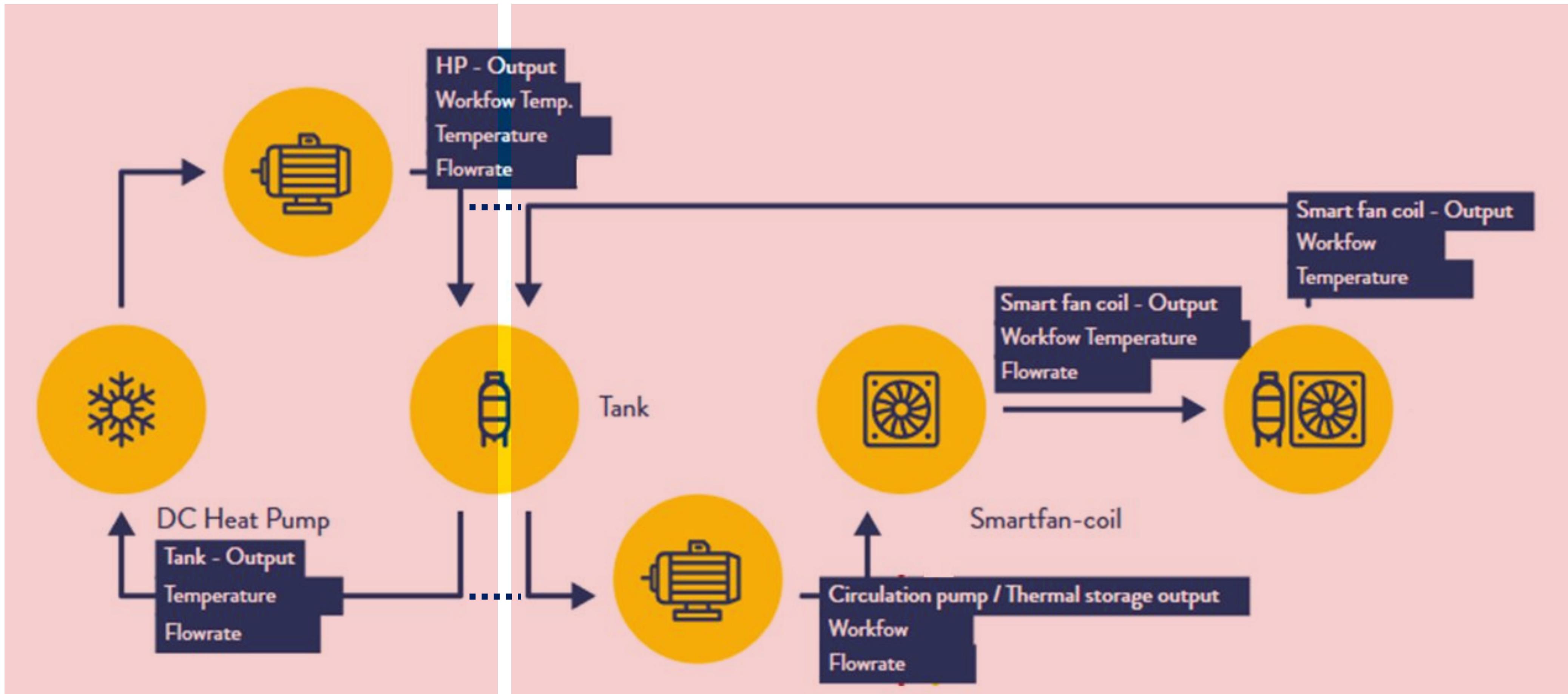


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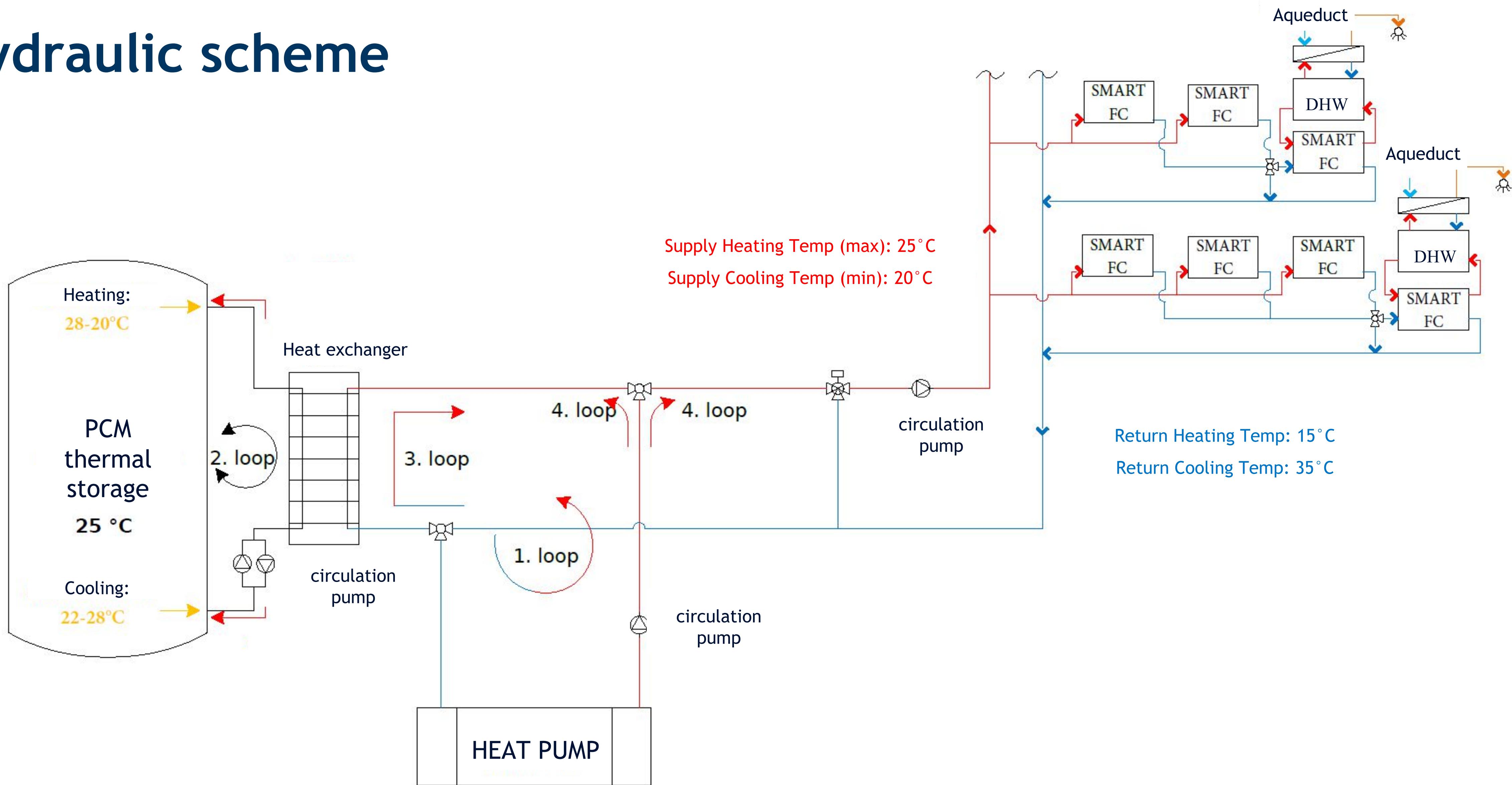


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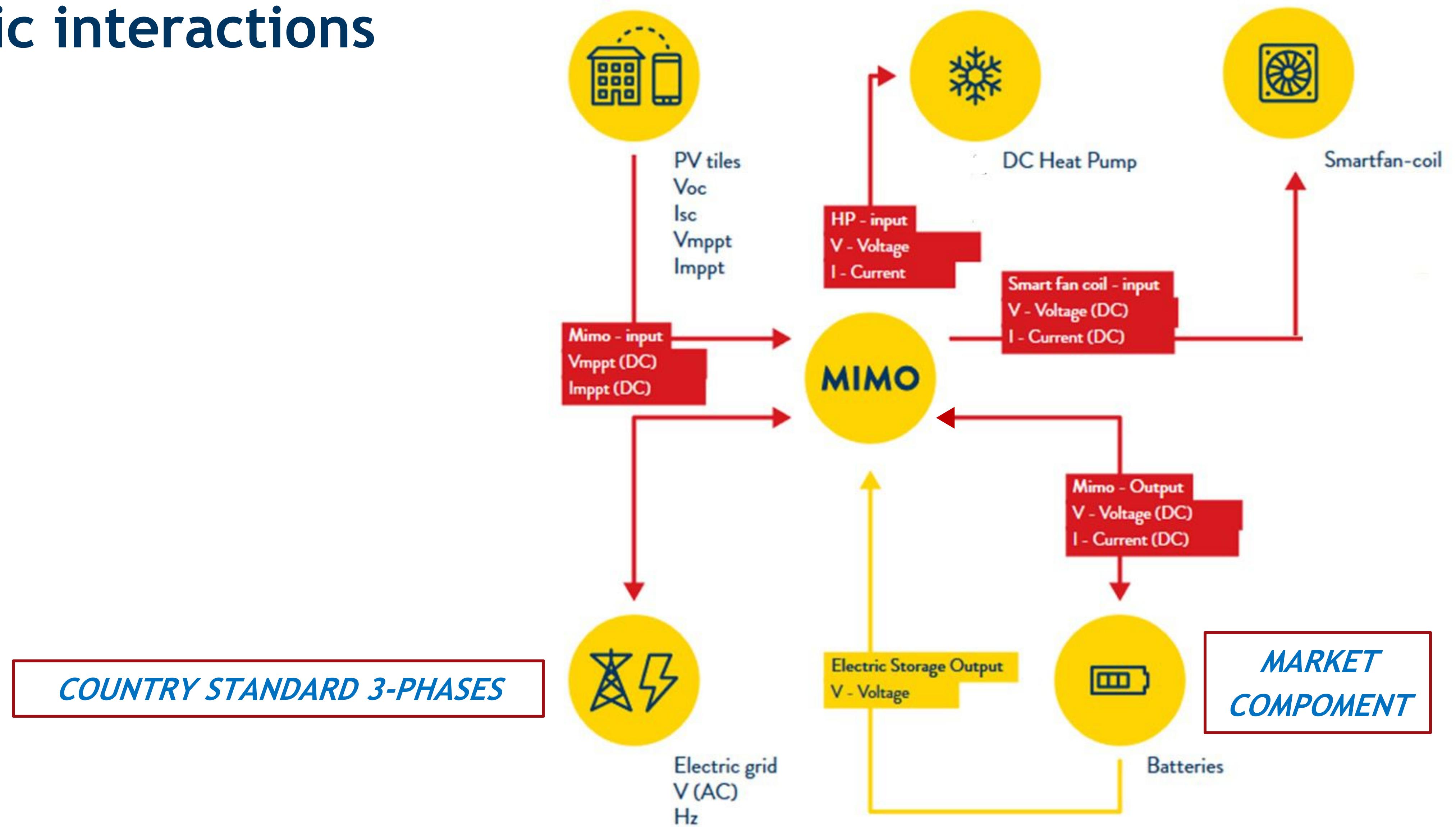
# Hydraulic loops



# Hydraulic scheme



# Electric interactions



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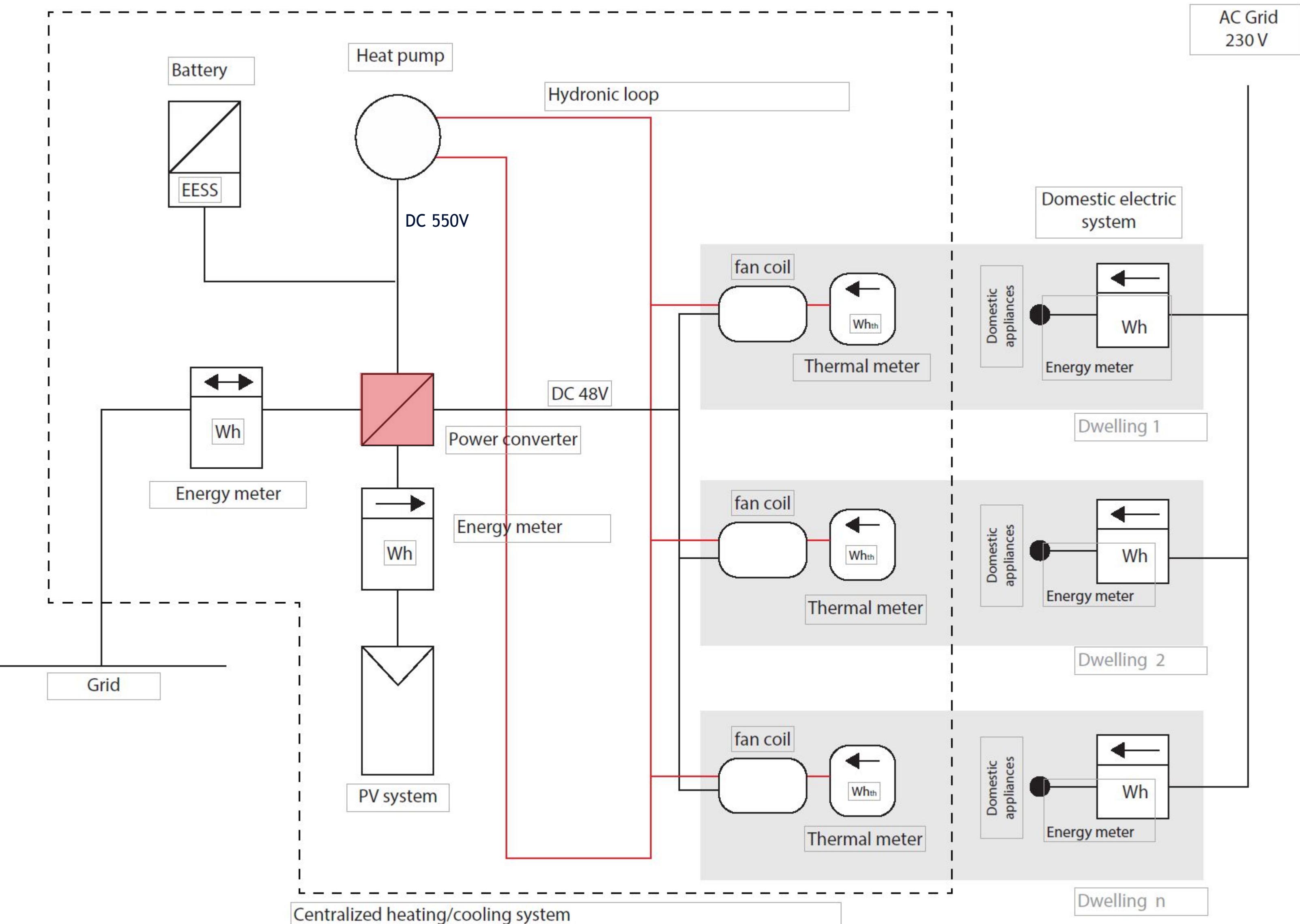


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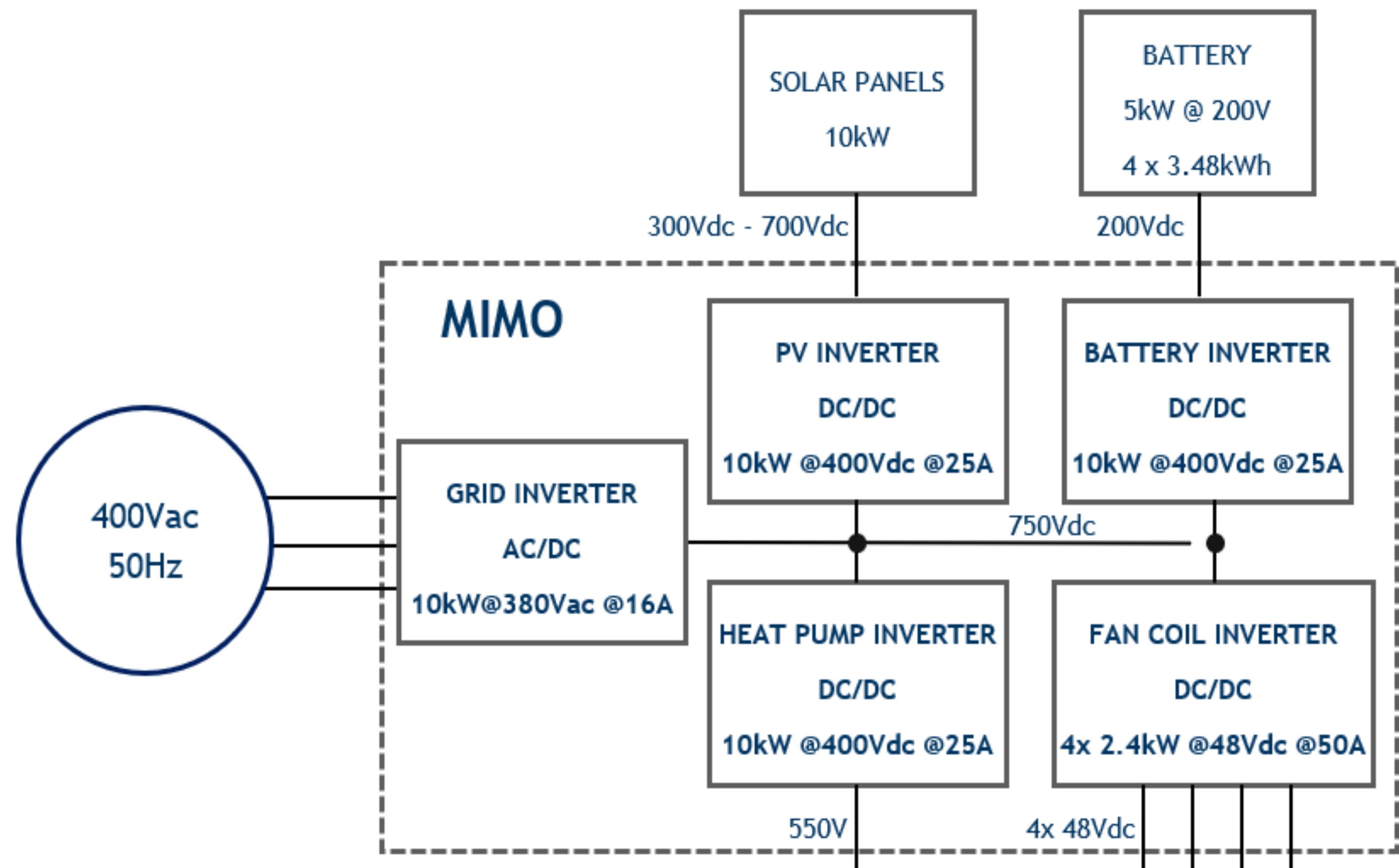
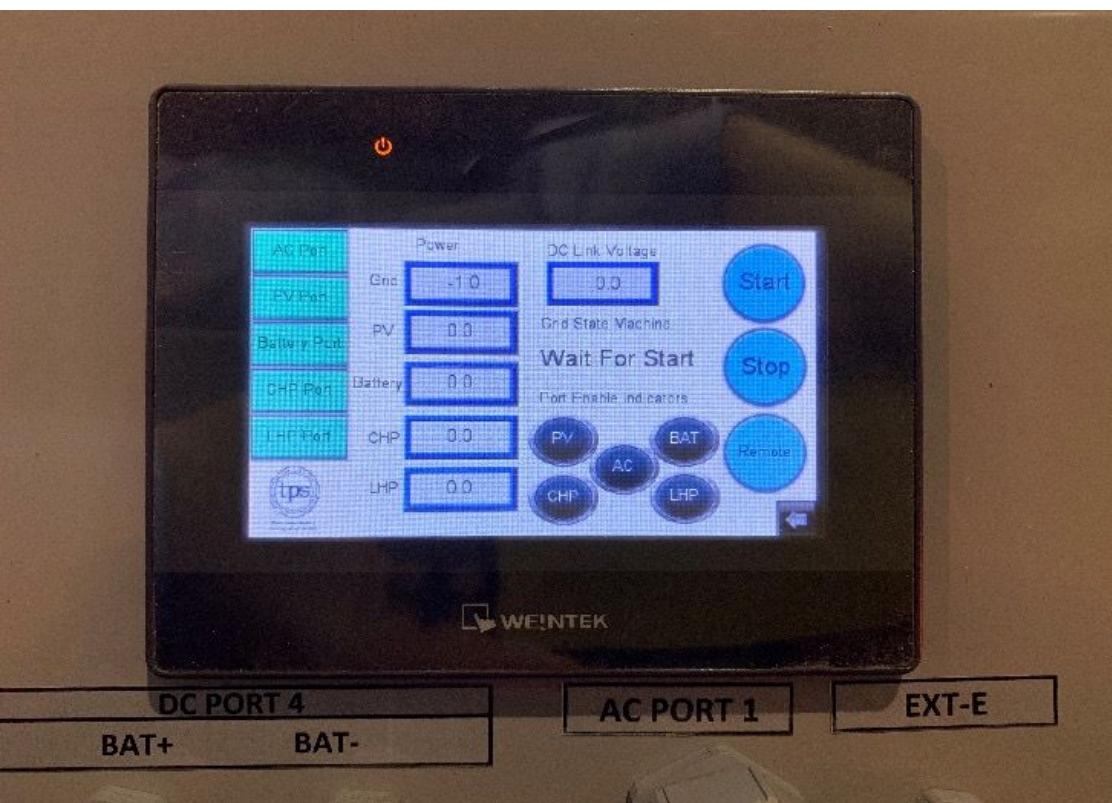
# Electric scheme

## Main elements:

- Grid connection (230V or 400V AC)
- Battery charger
- PV inverter
- 48V DC connection
- 550V DC connection



# MIMO Converter



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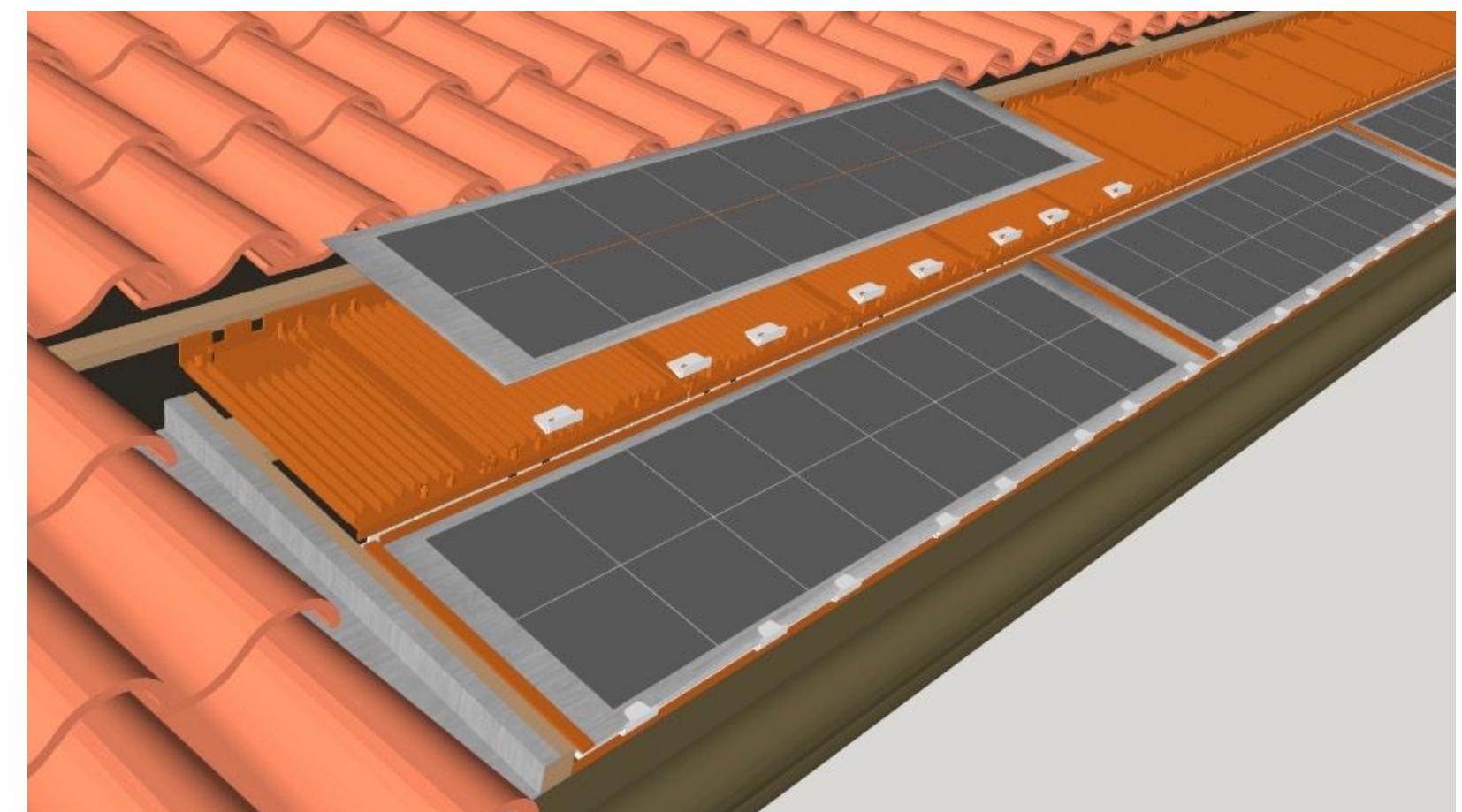
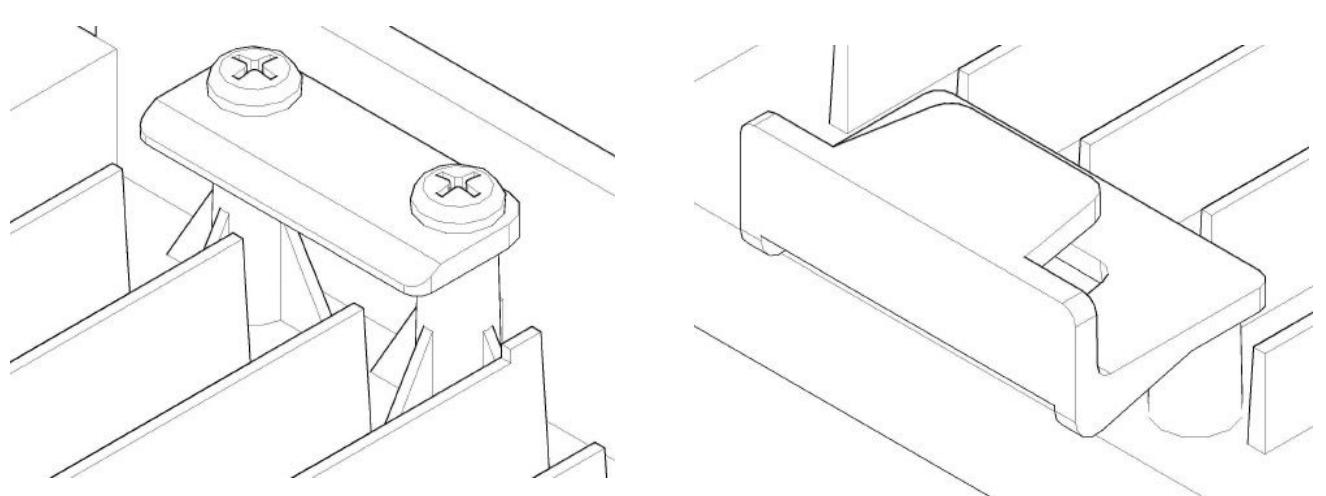
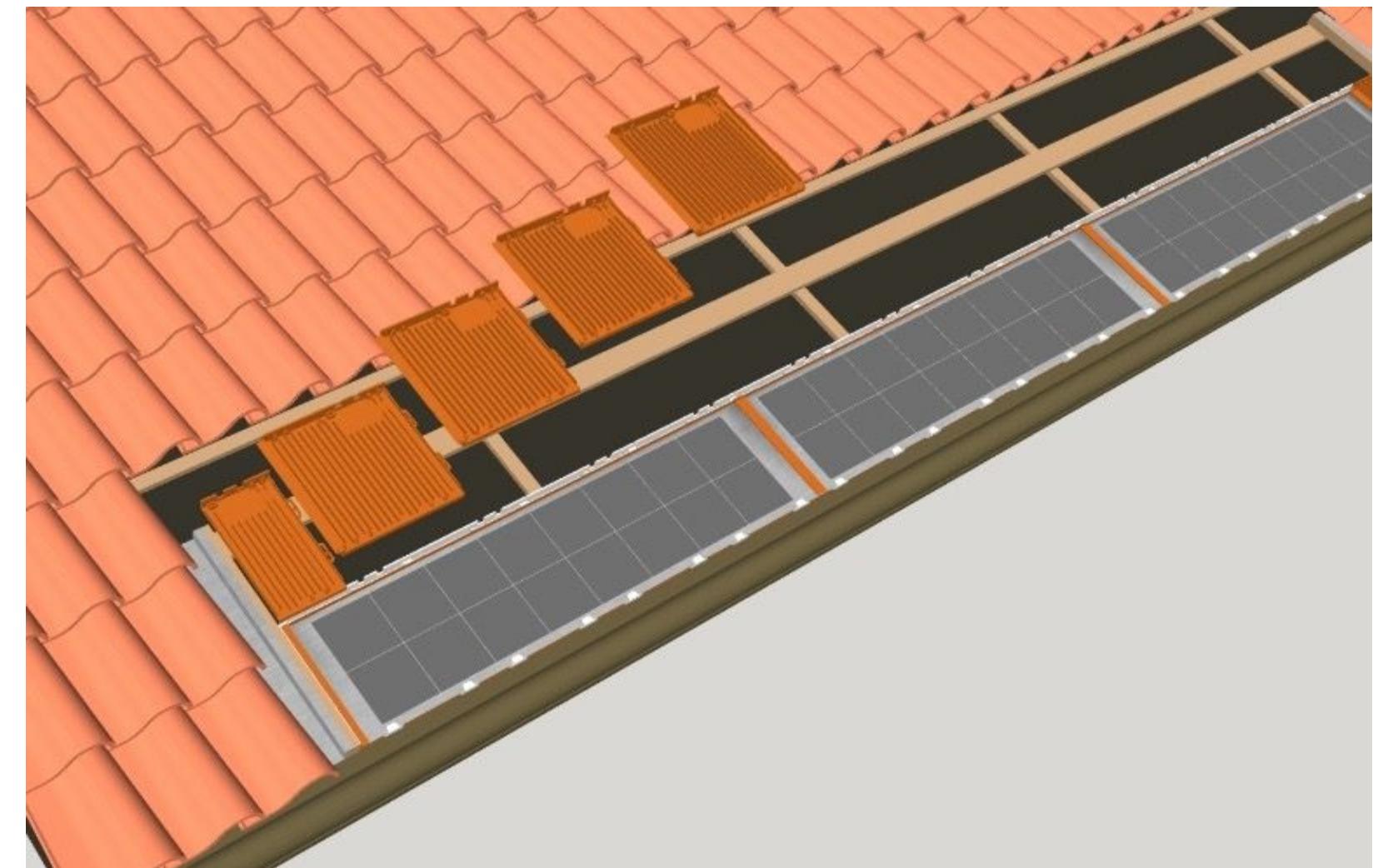
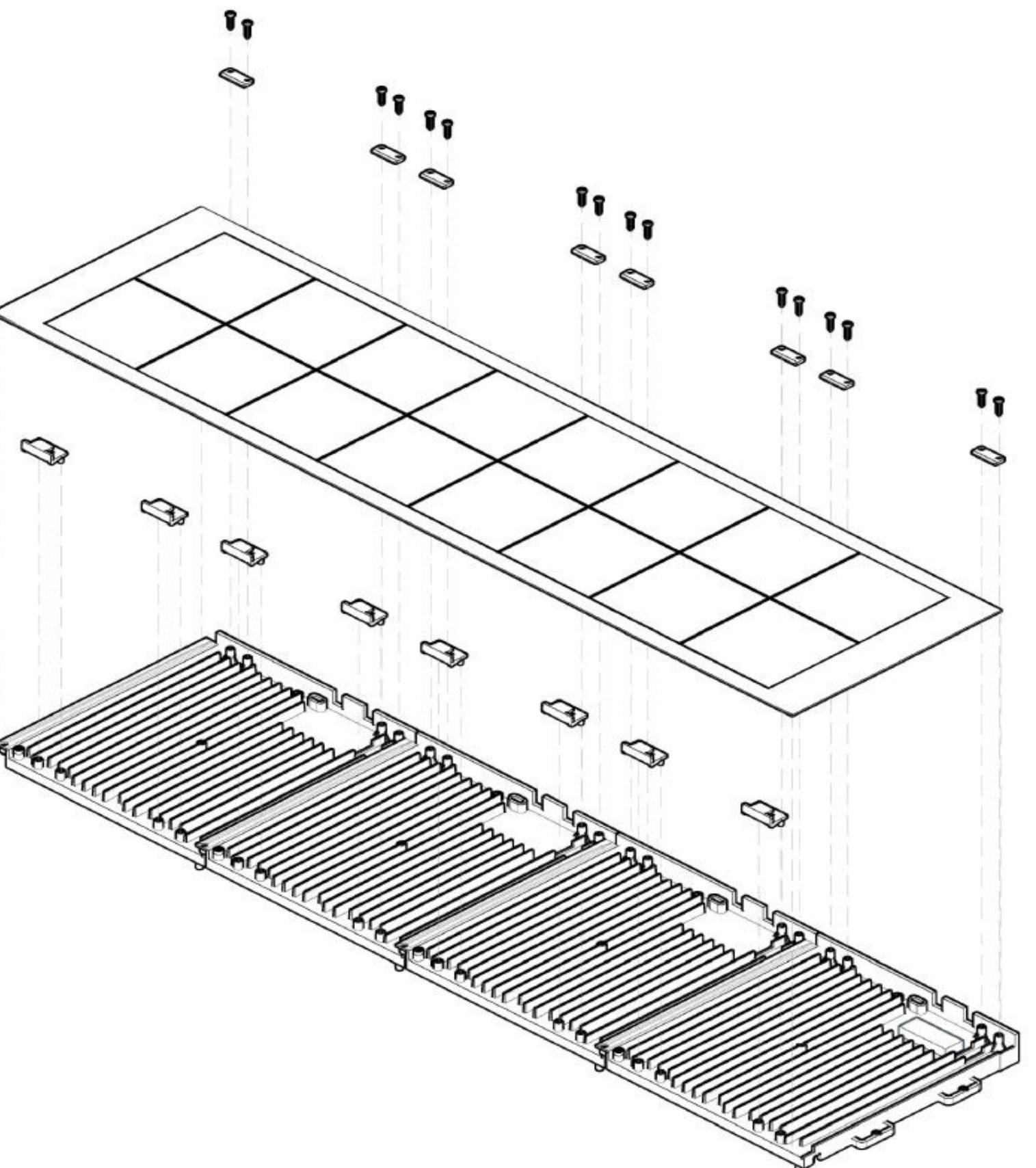
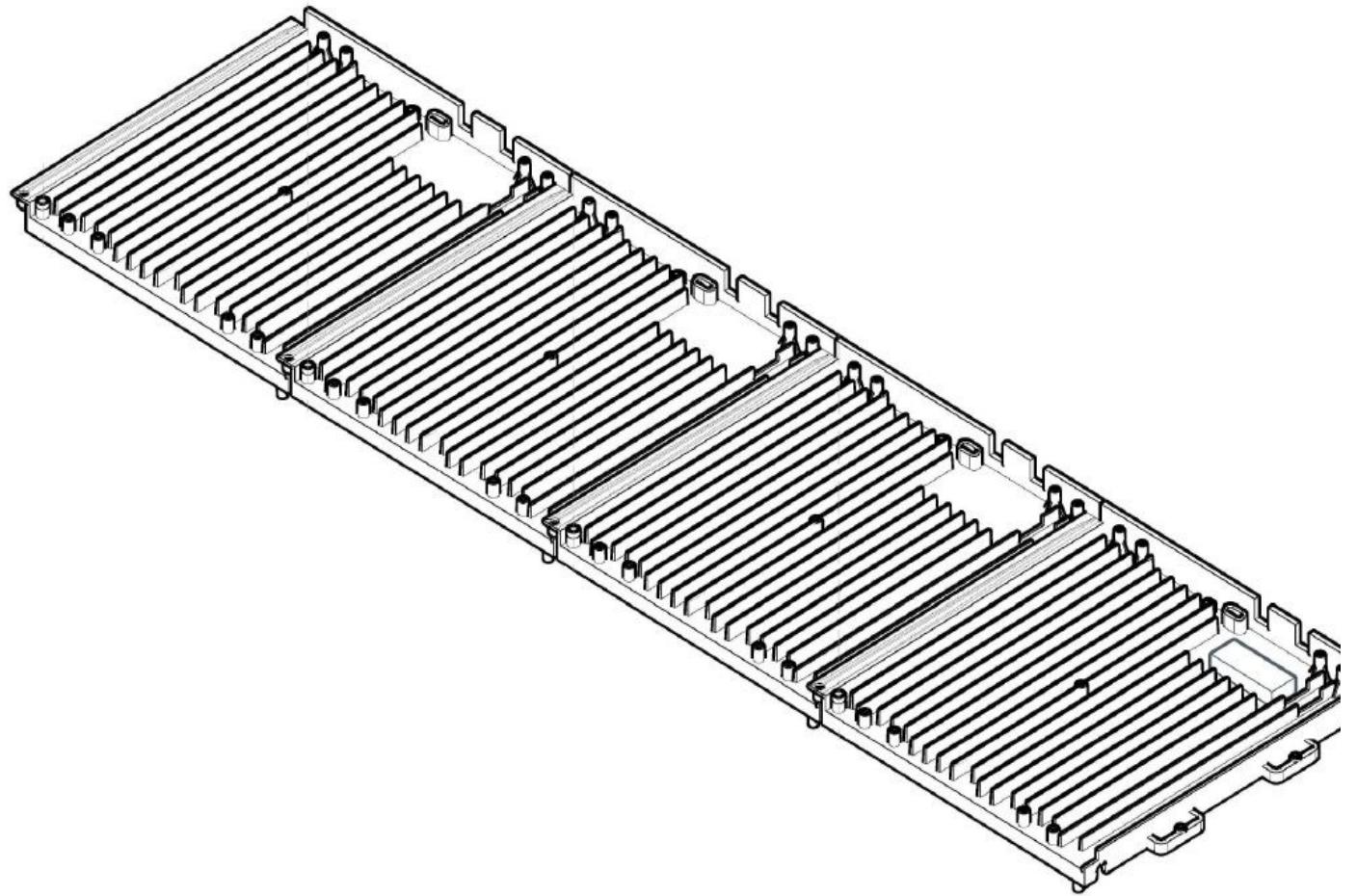


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# PV Tiles



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# PV Tiles



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# DC Heat Pump

Nominal thermal power of each module: 15-20 kW

Power: DC 550 V

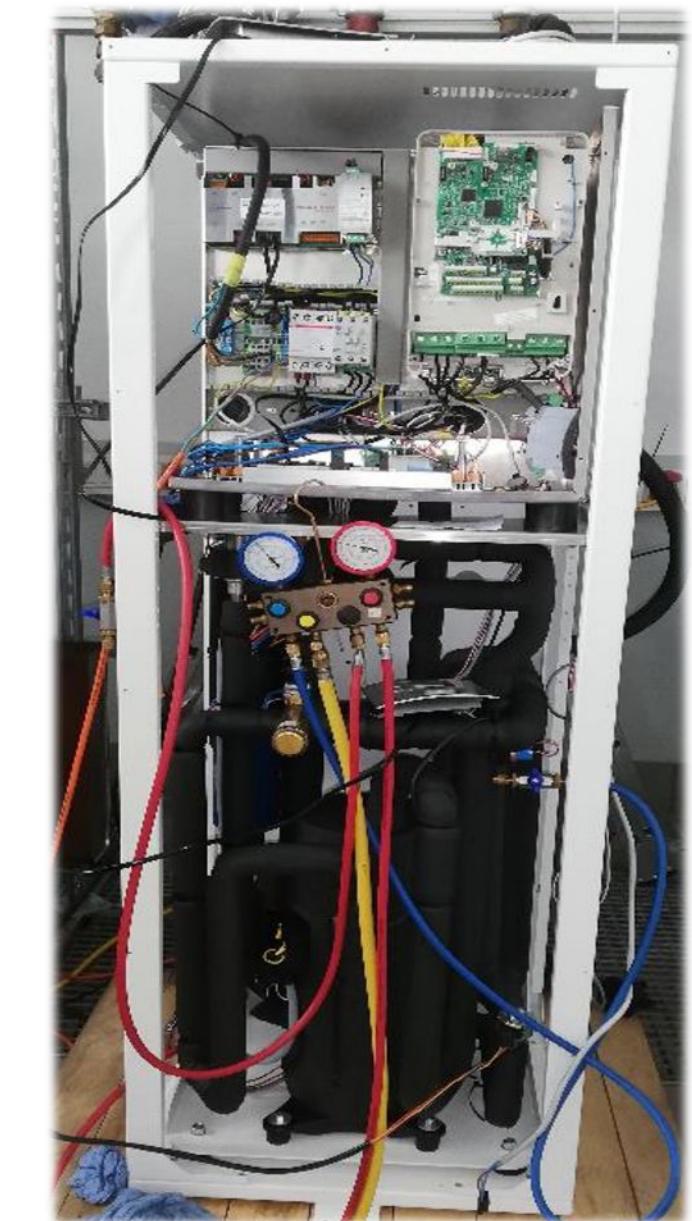
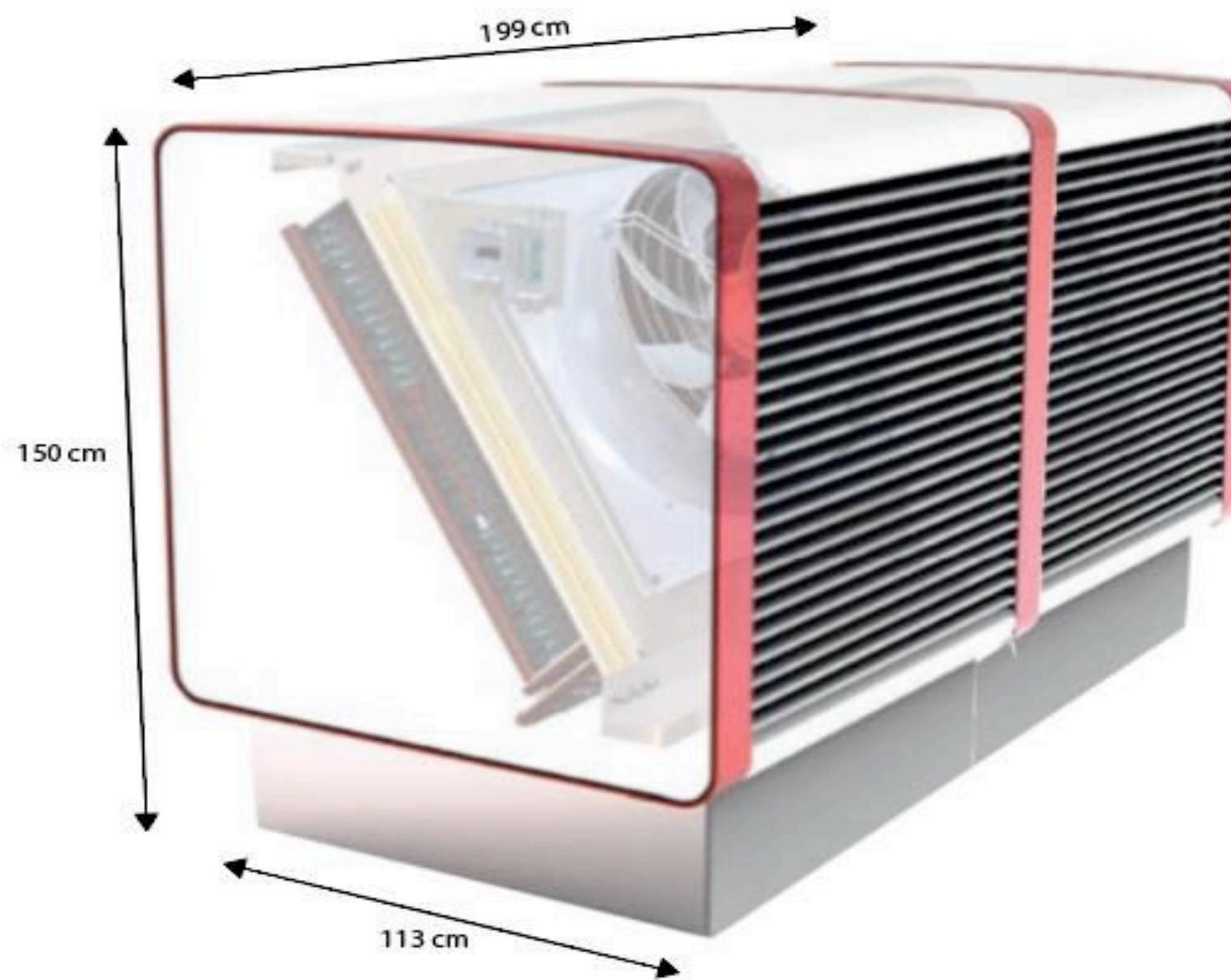
Type of HP: separated internal and external units

Low sound emission

Optimized design of the air heat exchanger

Modulating fans

High COP at low temperatures



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# DC Heat Pump



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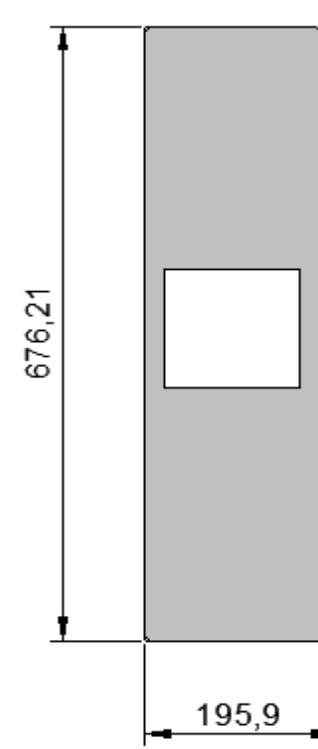
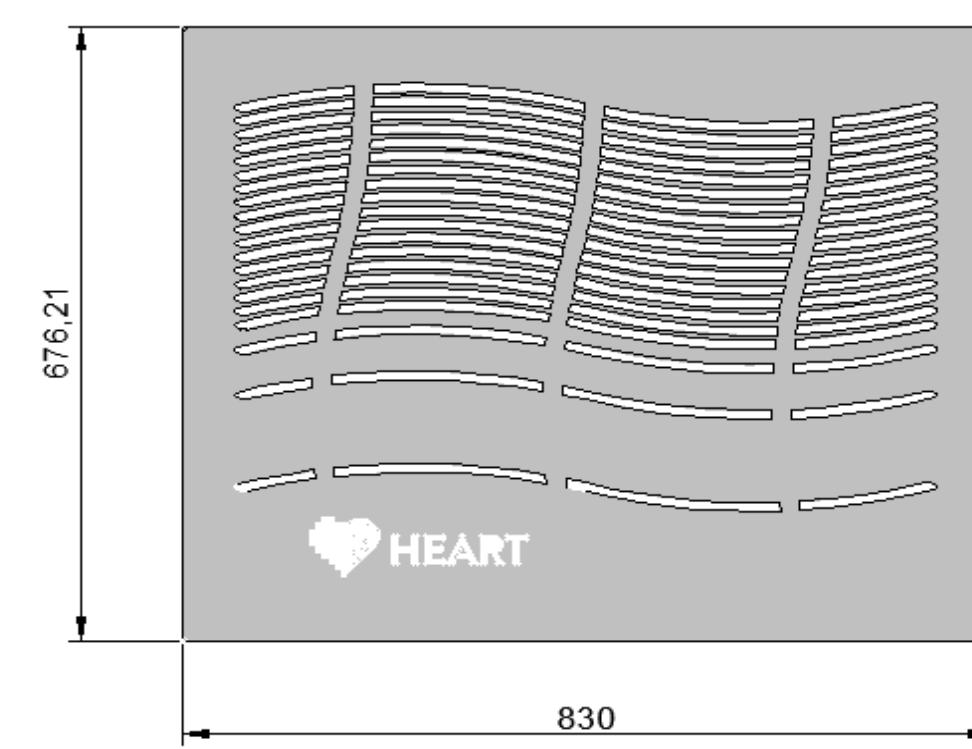
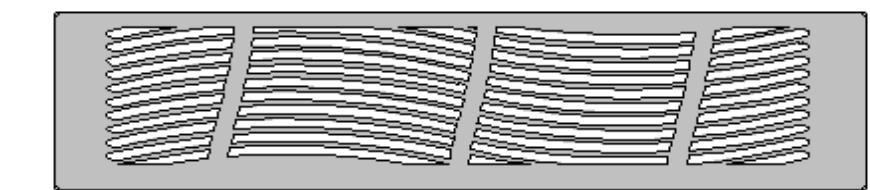
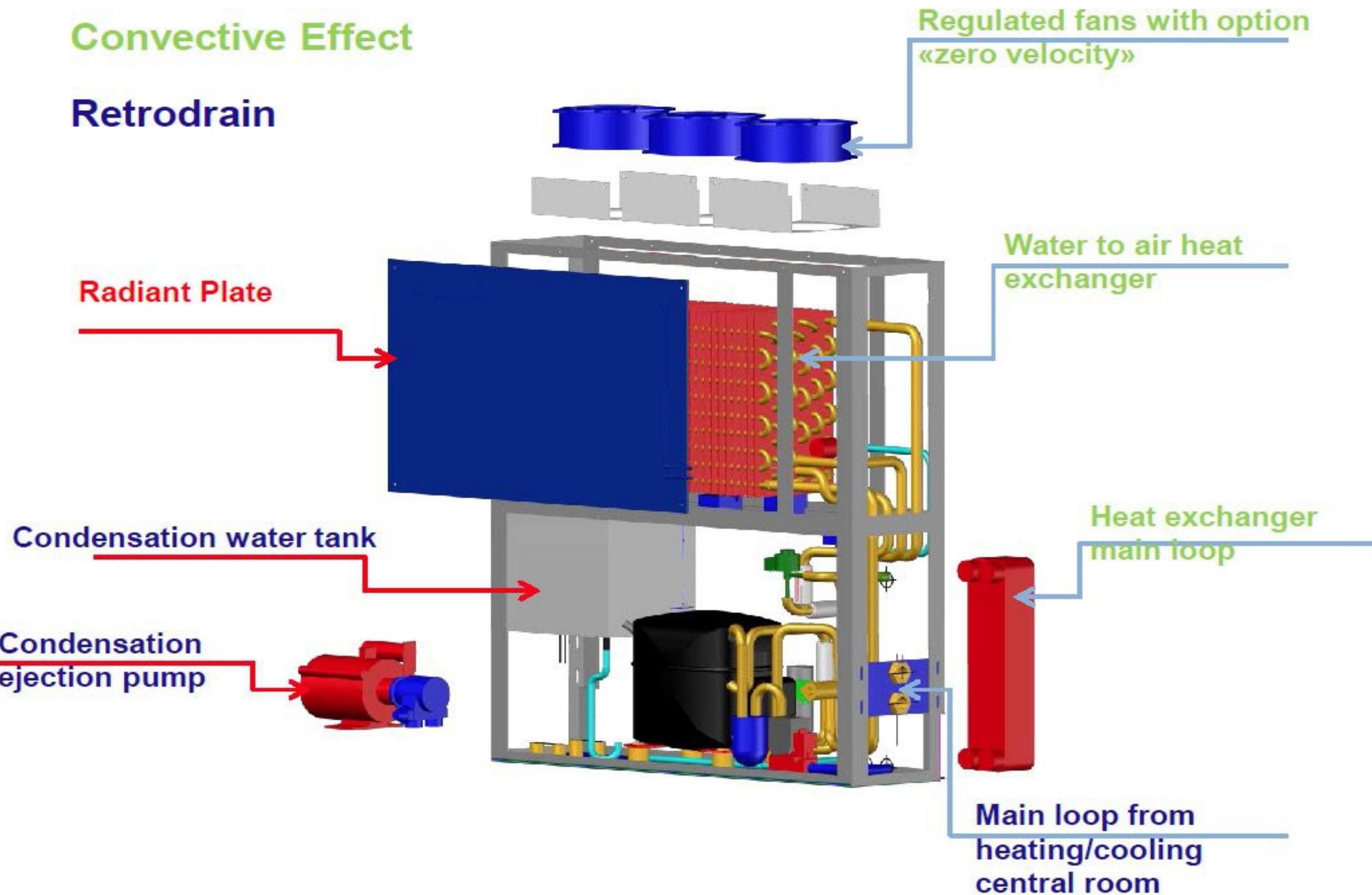


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# Smart fan coil



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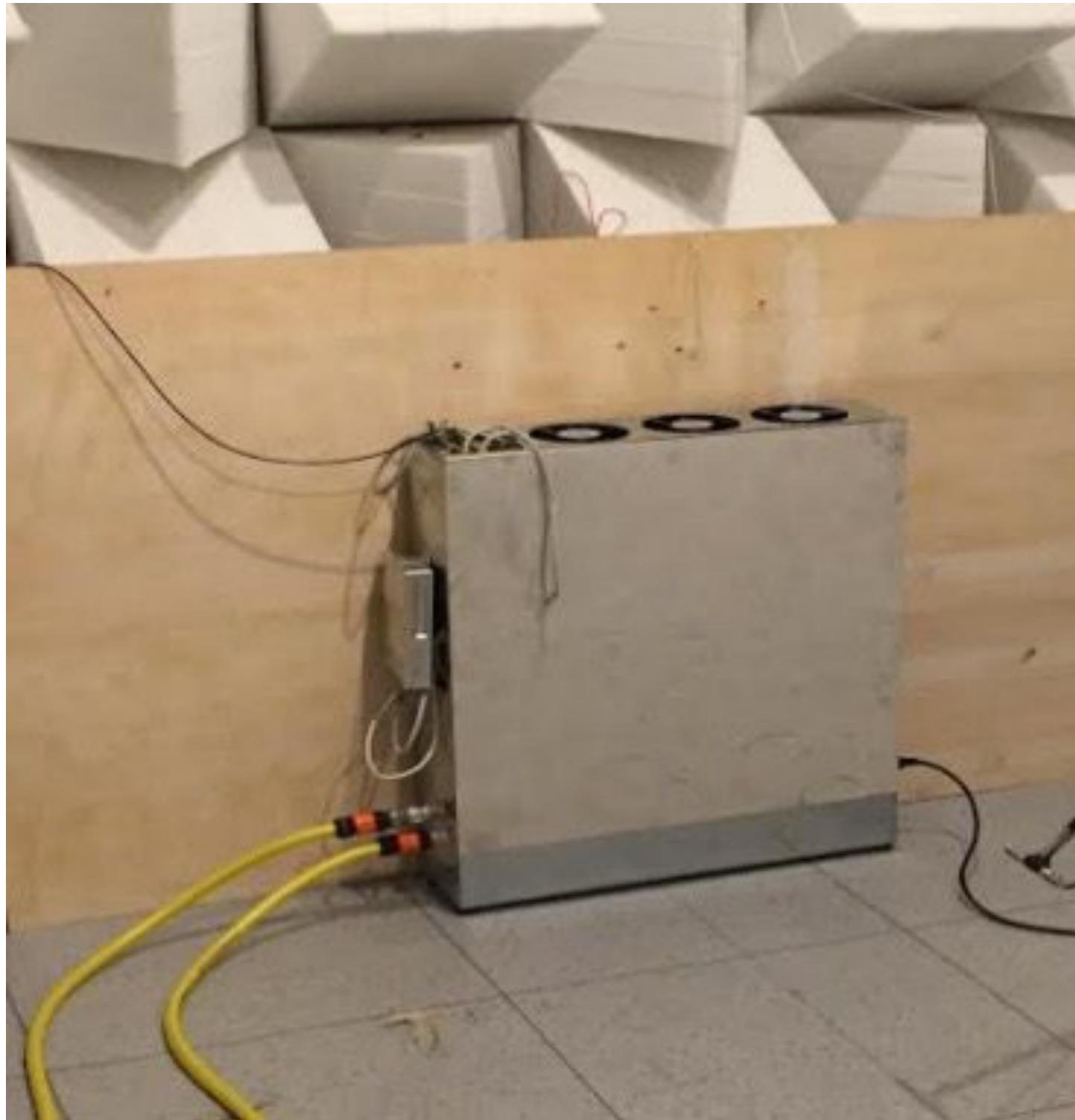
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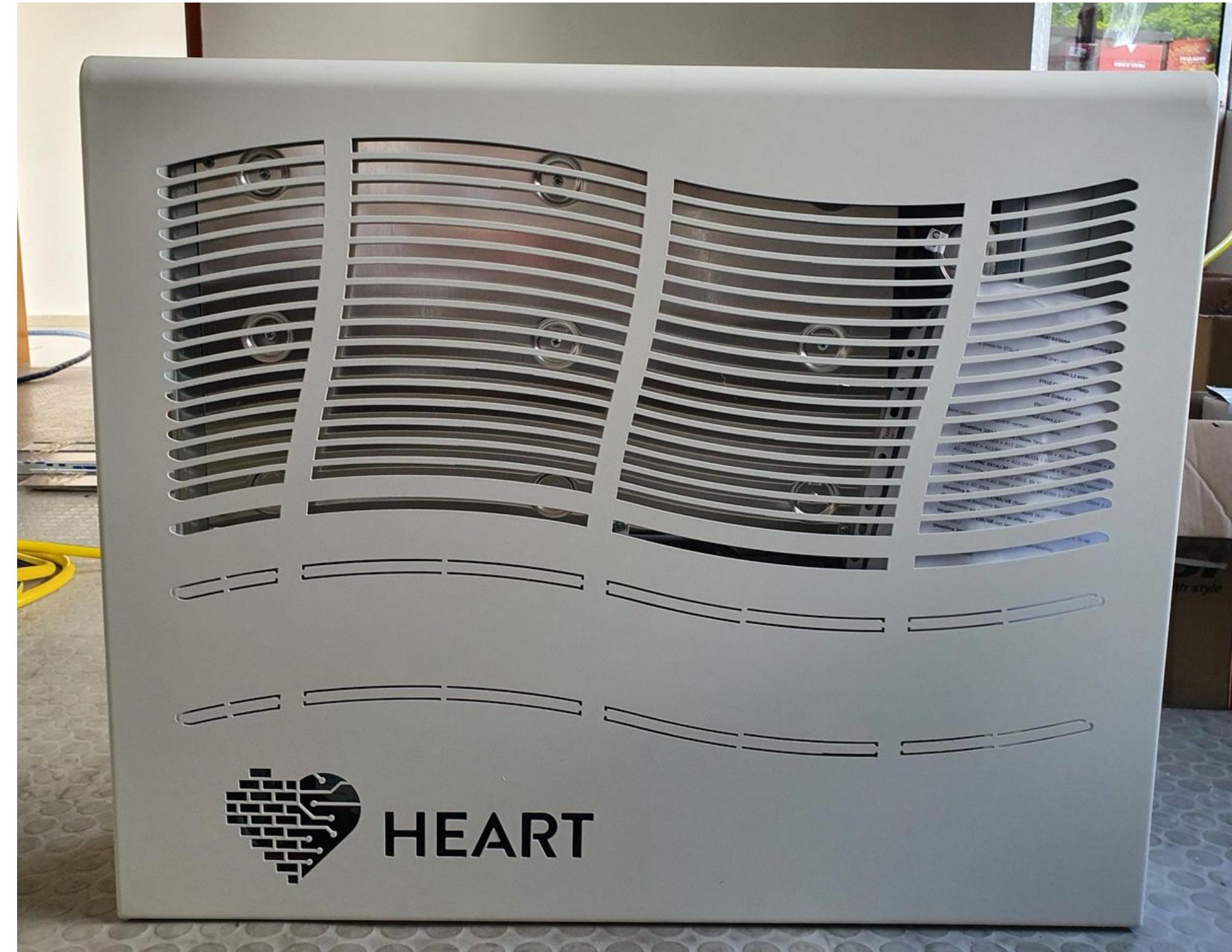
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# Smart fan coil and domestic hot water boilers

## Prototypes testing



Smart fan coil



Smart fan coil with HEART cover



Smart domestic hot  
water boiler



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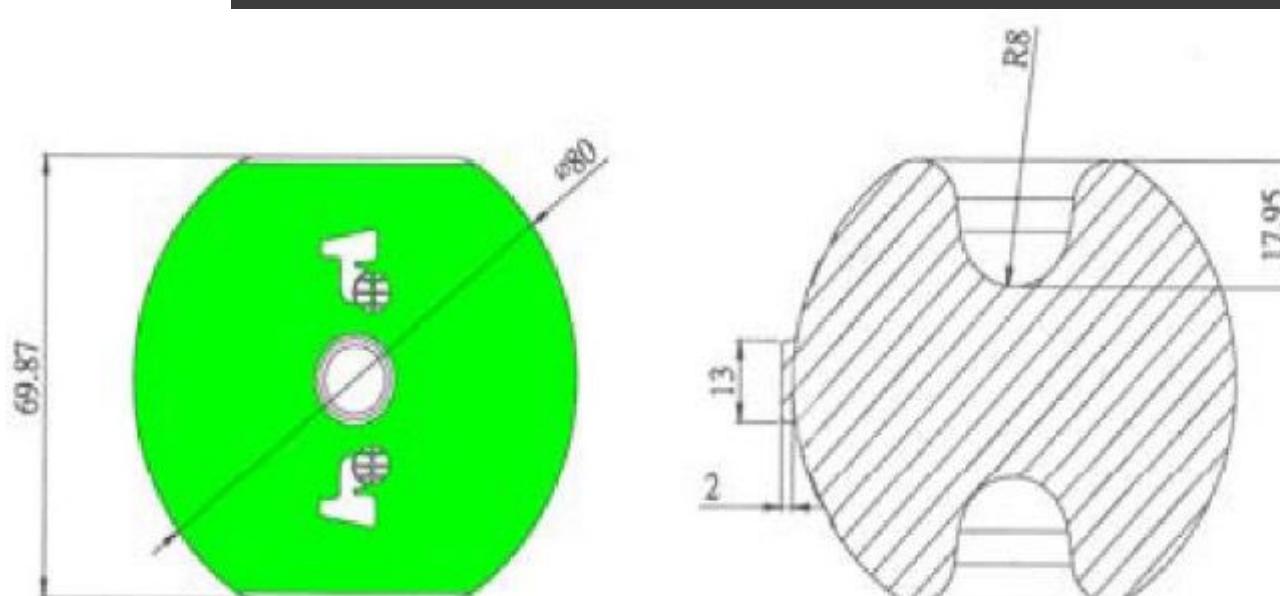
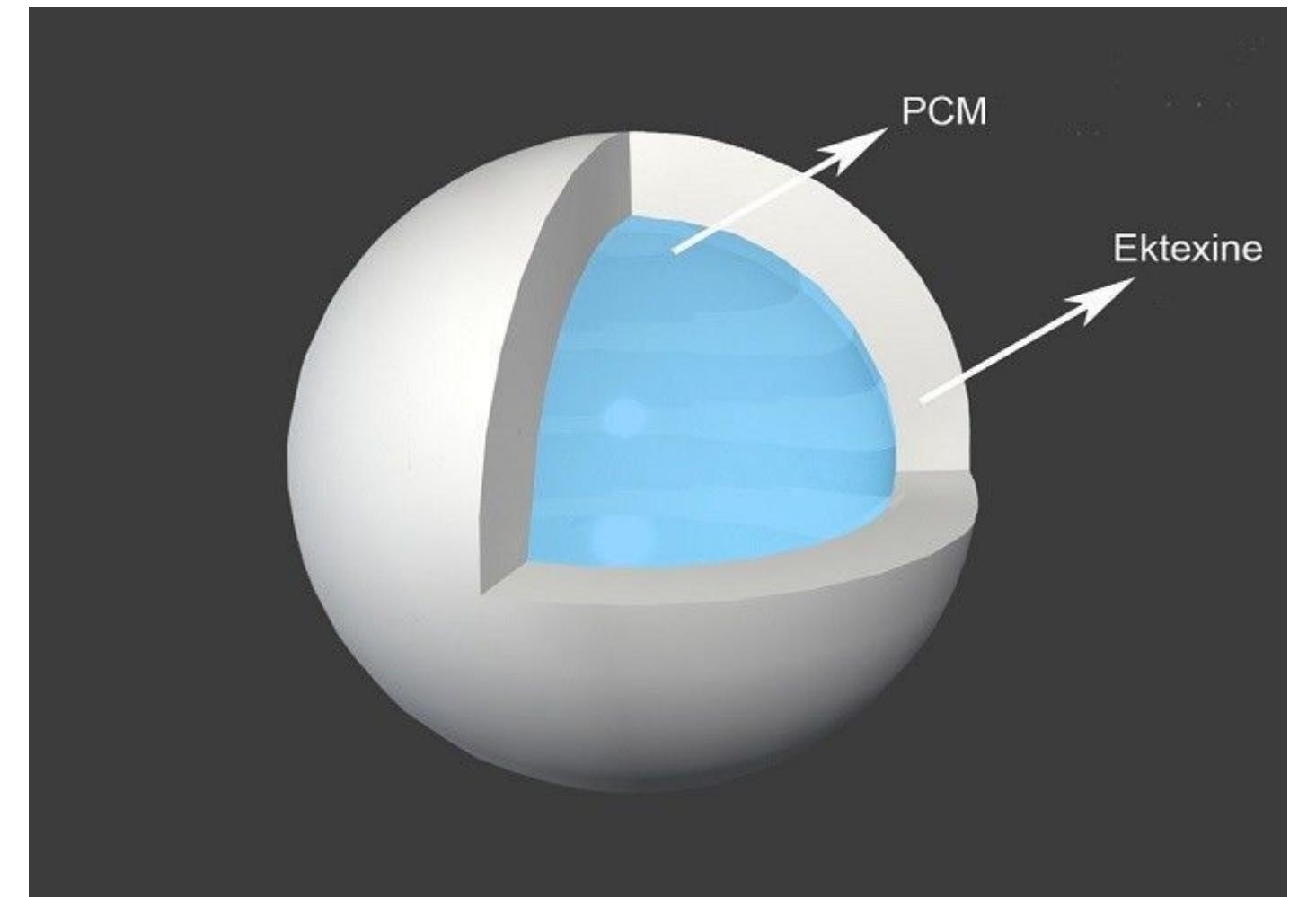
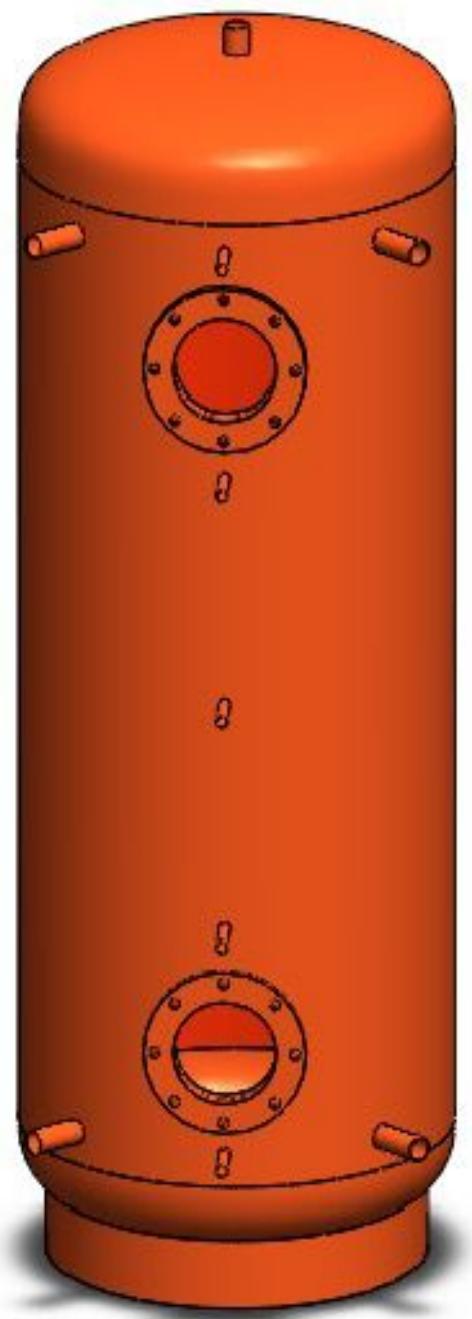
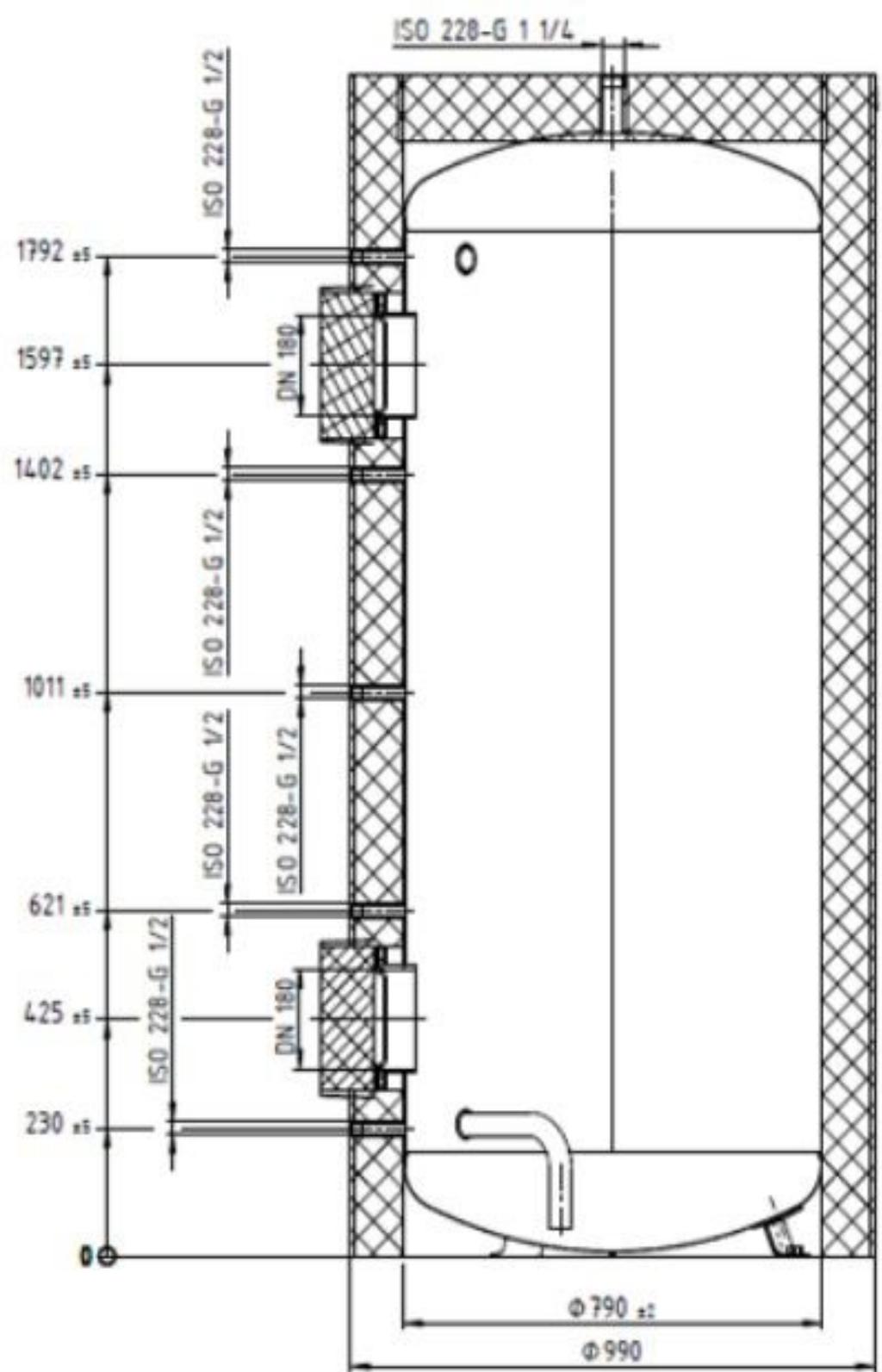
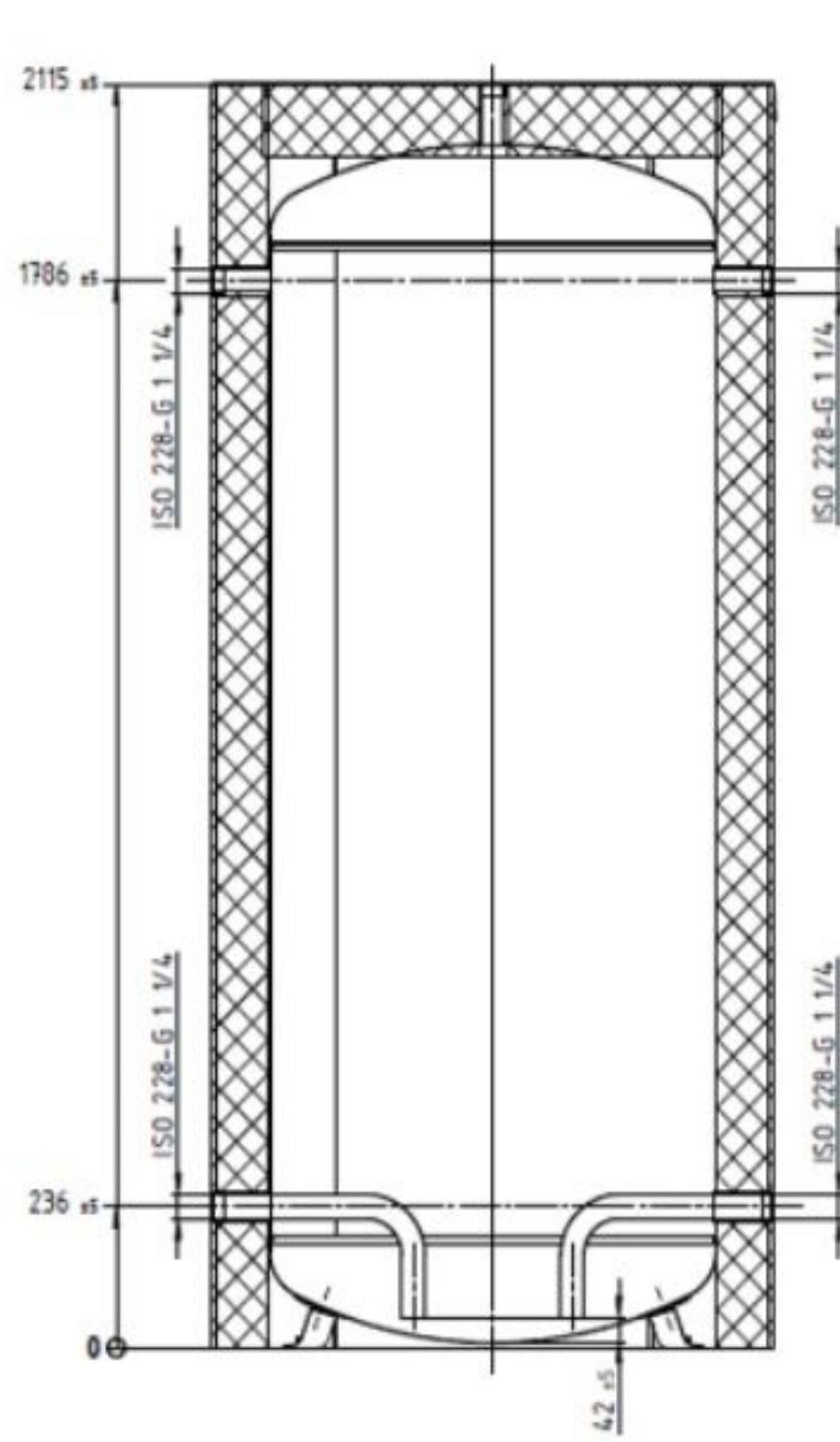


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# PCM Energy Storage



Sensible and latent storage to reduce required space



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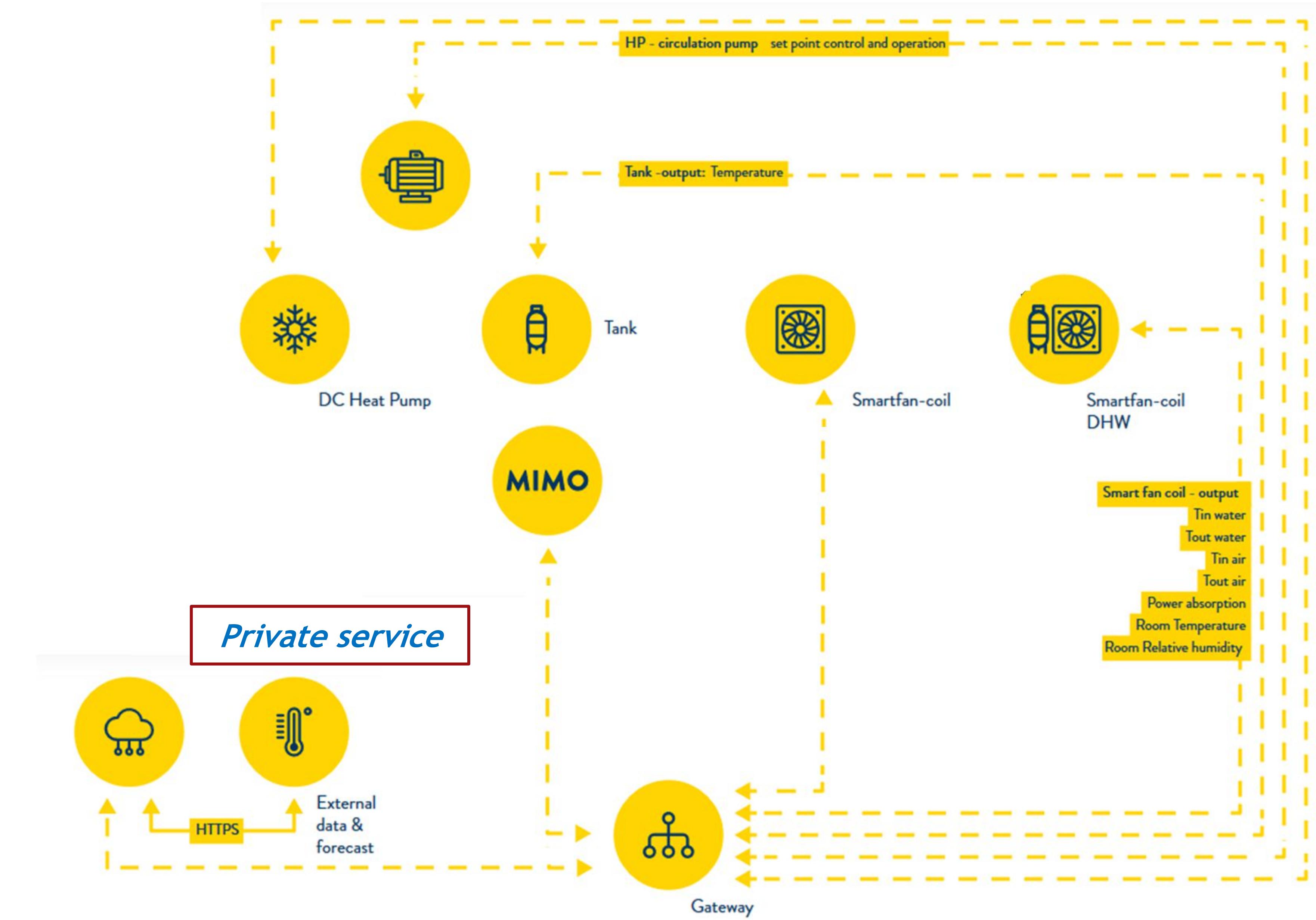


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# ICT interactions



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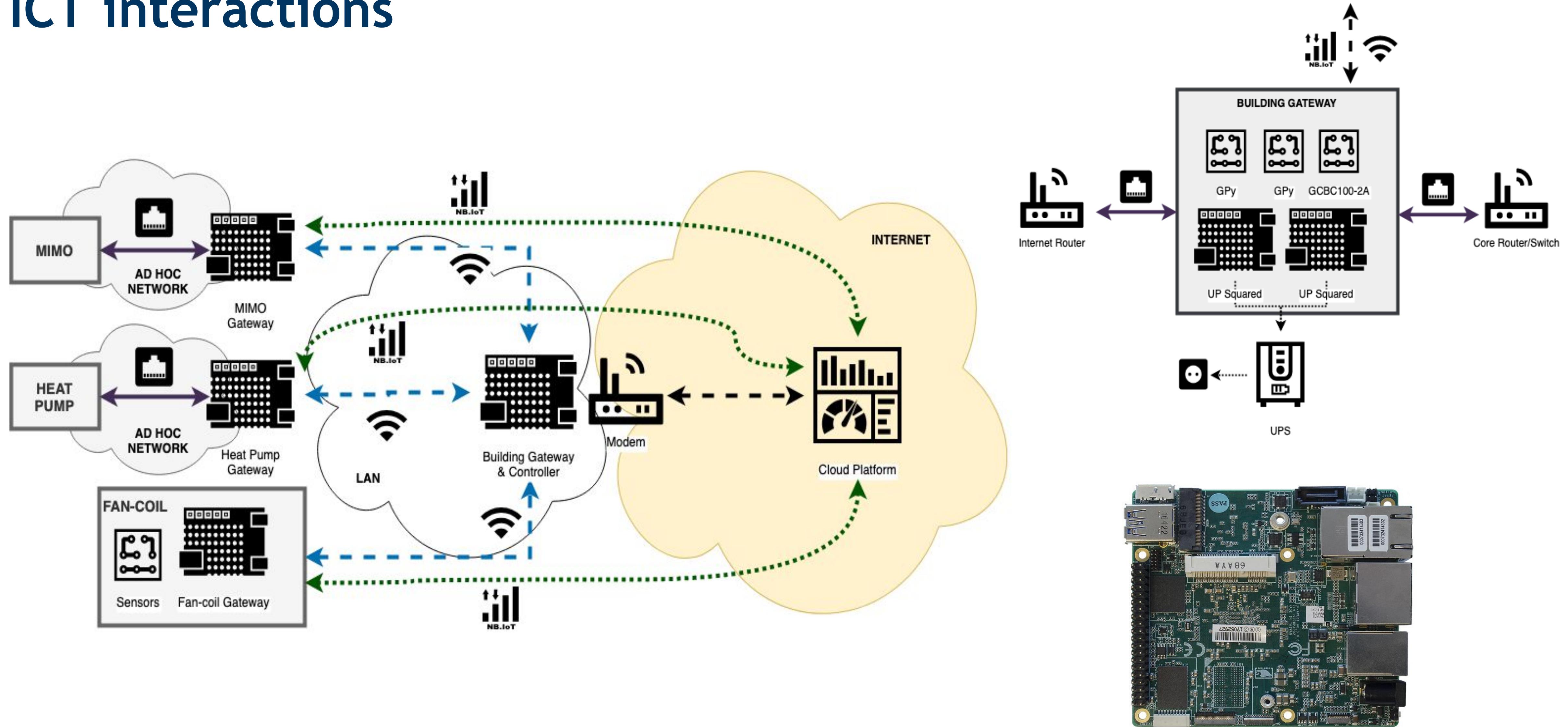


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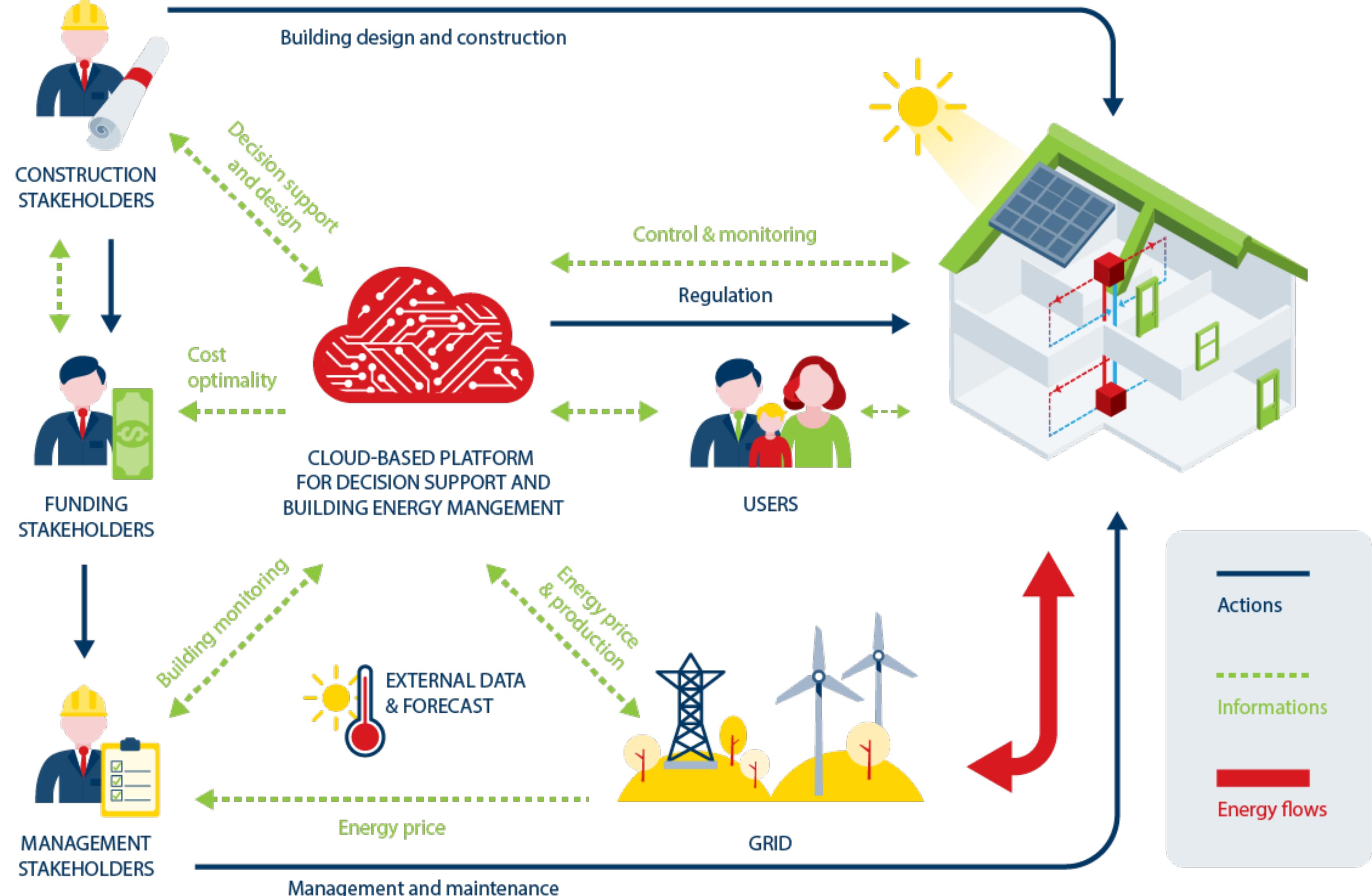


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# ICT interactions



# HEART Cloud- Platform



# Thanks for your attention



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