

BLUE H♥RT

Multi source engines for flexible supply of heating and cooling

CONFIDENTIAL

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The **Blue Heart** Powered by Sound

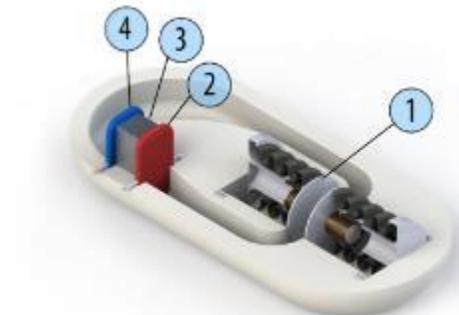
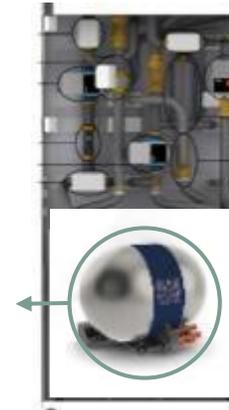
The Solution

"Since 1913 no new technique was introduced for heating or cooling"

"Finally, after more than 100y a better technique arrived"



BLUE HEART engine replaces the cold circuit. Focus on residential & chance for Industry



1 - Electric drive: Pressure wave inside 50 bar helium
3 - Regenerator
2 & 4 - Internal heat exchangers

- BlueHeart replaces the refrigerant circuit with a thermo-acoustic engine
- Uses **sound waves** to create a temperature difference
- Superior performance without harmful refrigerants

More info: <https://youtu.be/p1Tp2IznYso>



The challenge

The Situation:

- Different sources and output needs different Compressors and refrigerants.
- F-gases for compression technique are banned in the EU - Jan. '27! for HP's & Jan '29 for Airco.
- Compressors efficiency is optimized for special Power output, flows and DeltaTs.

The solution:

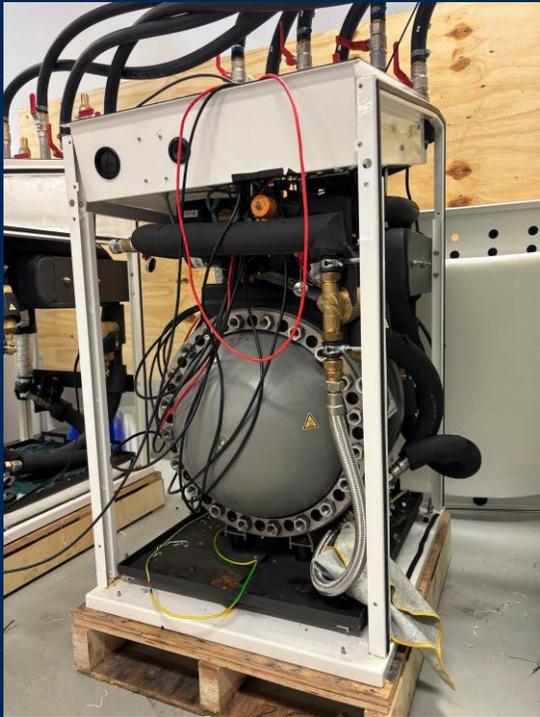
- With Blue Heart no refrigerants are needed.
- Efficiency stays (almost) equal for:
 - Different power output
 - Different flows
 - Different deltaT's
- No flammability risks
- Low noise.
- No **restrictions** on the max. and min. Temperature
- Very fast reaction time (seconds)



The Solution

Hence

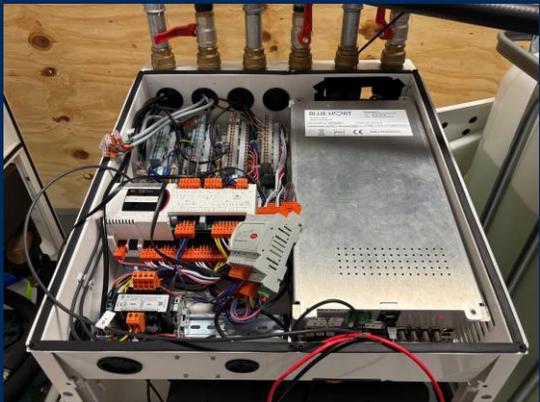
- Ideal for multi source (Geo, LT district, Air, PVT, ... etc.)
- Ideal for multi supply
- Ideal for shifting fast between different modes, sources and supply
- Ideal for controlling temp.
- Ideal for less isolated / controlled surroundings
- Ideal where propane can't go (flammability)



What are we offering

- Flexible and fast responding hardware to heat and cool
- Modulating system 1-8kW output
- Cascade till at least 10 units x 6-8kW output.

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BLUE H RT

Technology for a better planet



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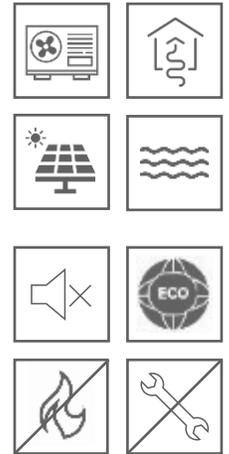
Appendix



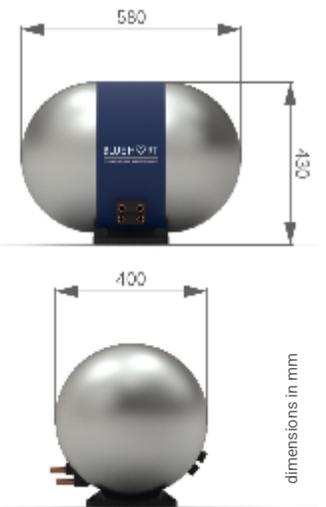
Specification Summary



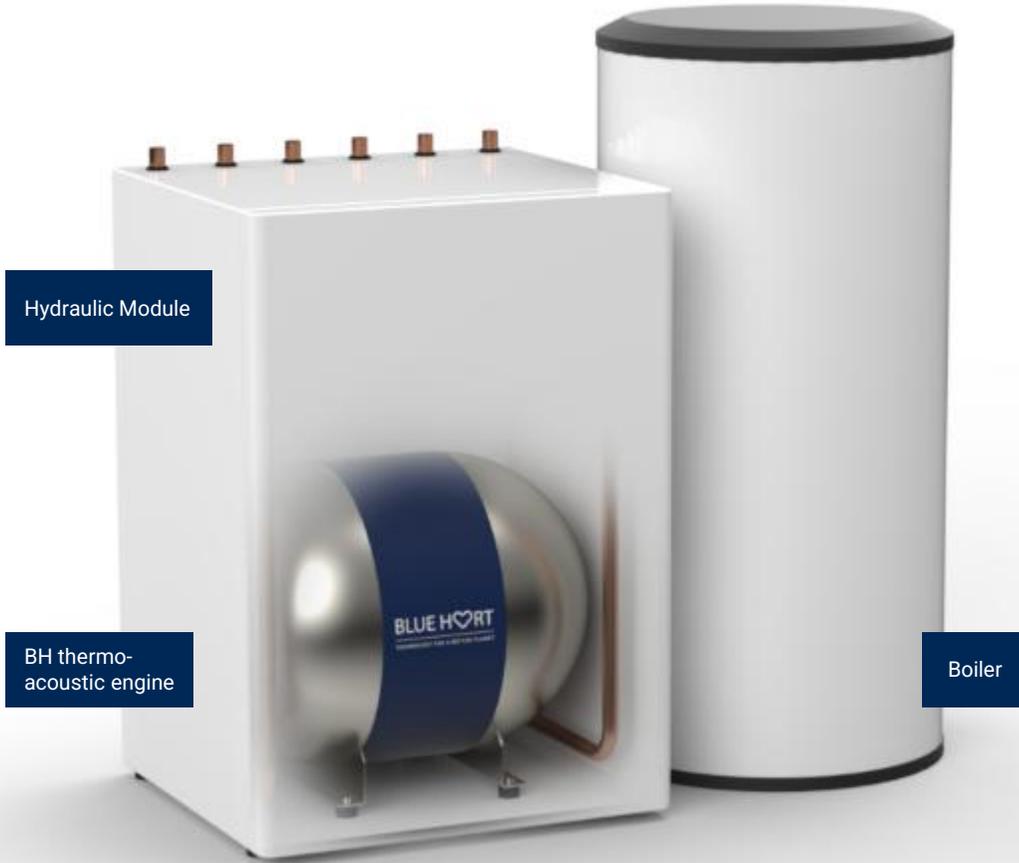
- ❑ **Wide operating envelope** enables wide source compatibility
- ❑ **Simplified controls** and **plug and play installation**
- ❑ **Quiet operation** gives indoor installation flexibility
- ❑ **Safe, non-flammable, non-toxic, zero-GWP** Helium working gas
- ❑ **Long lifetime** (exp. 20 years)
- ❑ **Maintenance free**



- ❑ **Place of installation:** Inside / Outside
- ❑ **Source compatibility:** Air / PVT / Ground / Water
- ❑ **Source brine(s):** Water / Detoxified Ethylene Glycol
- ❑ **Supported applications:** Space Heating / DHW / Cooling
- ❑ **Working gas:** Helium
- ❑ **Nominal pressure:** 60 bar
- ❑ **Weight:** 60 kg



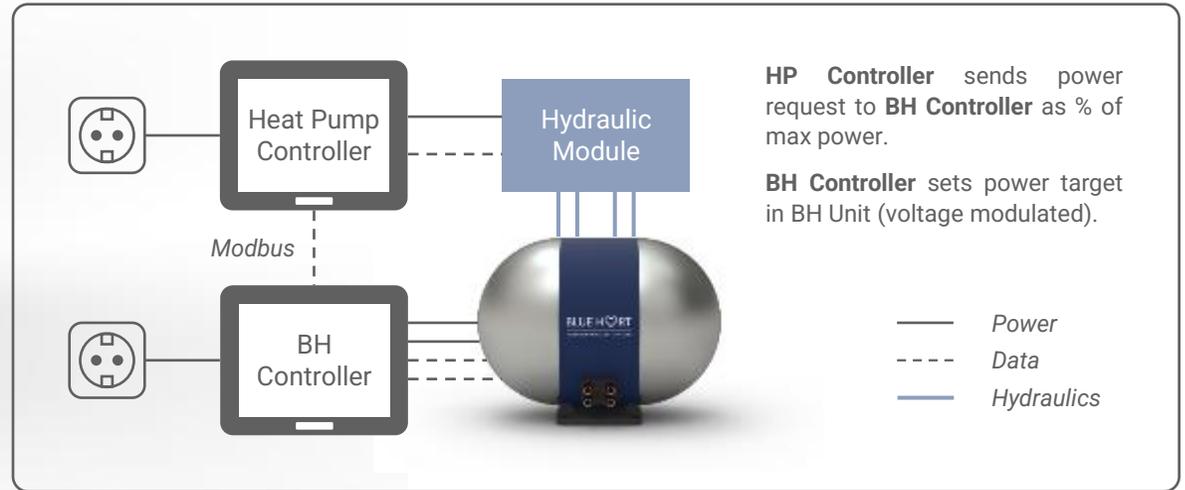
Heat Pump with BlueHeart Inside



BlueHeart Unit Interfaces



Controller Overview



Integrating at Customer



BlueHeart can work with the widest range of temperatures

Now designed for below. With engineering and bit of R&D temperatures can go to 200C

BlueHeart handles:

- Input temperatures from -25°C to +50°C
- Output temperatures from 0°C to +80°C

