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MITSUBISHI HEAVY INDUSTRIES GROUP

Q-ton Air to Water

Air to Water Heat Pump Utilising Natural Refrigerant C02

ATMOsphere AUSTRALIA

Business Case for Natural Refrigerants

02/05/17 - Sydney

MITSUBISHI HEAVY INDUSTRIES AIR CONDITIONING

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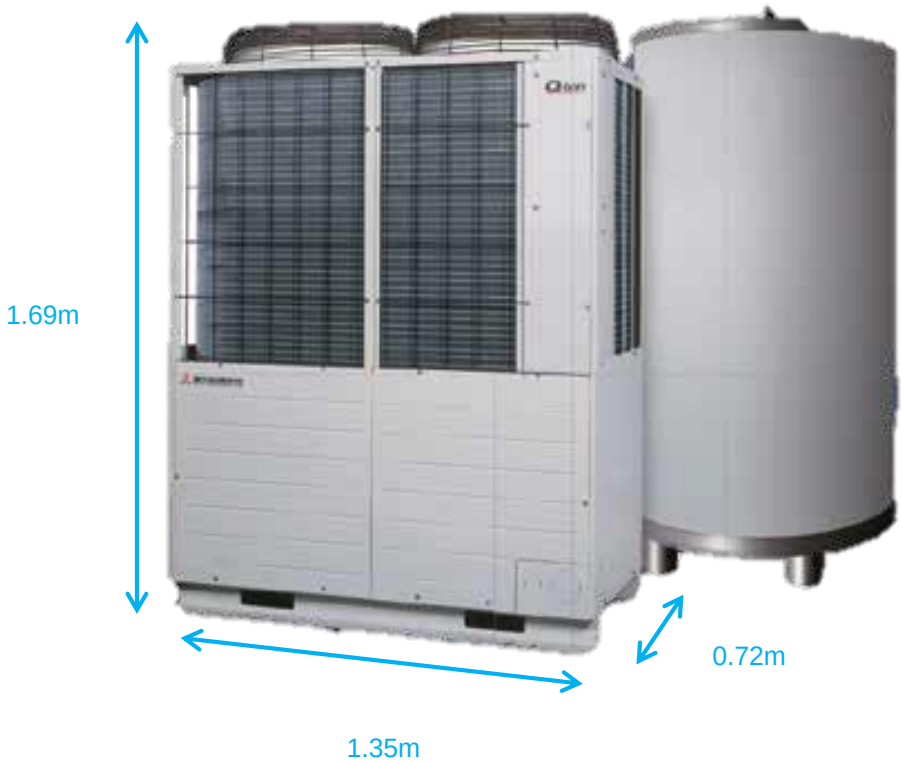
Q-ton Dimensions



1) Product Outline – ESA-30E-25

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AIR CONDITIONING

WaterMark™
Pending

- Hot water supply is settable from 60oC to 90oC and achievable down to minus 25oC ambient temperature
- CO2 natural refrigerant : R744. GWP : 1 ODP : 0
- Modular installation, from 30Kw up to 480Kw (1~16 units)
- 5,000 litre to 120,000 litre configurations
- Suitable for retrofit or new build project
- Q-ton operates like a boiler, with no heating backup requirement

High Performance

-25°C → 90°C
under extreme low outdoor temperature
hot water supply

-7°C → 100%
down to -7°C
can keep 100% capacity

Ecology

COP : 4.3!
COP = Capacity (kW) / Power consumption (kW)
the industry's top level

2) General Product Features

- The COP at intermediate season reaches 4.3, which is the highest level in the industry (16oC ambient, 17oC feed water & water outlet temperature setting of 65oC)
- No output capacity reduction down to -7°C (maintains 30Kw capacity)
- In-built inverter water pump securing a constant water off temperature
- Remote Monitoring system which assists in identifying and correcting performance and or maintenance issues
- Super quiet operation – 52dB(A) at 1m
- CO2 heat pumps are an established method of hot water heating in Japan
  ♦Tried and tested technology
- Over 5 million heat pump systems have been installed in Japan [at 2010]
  ♦Established pedigree of performance [Eco-cute]
- To produce 90°C hot water at -7°C ambient, Q-Ton consumes 64% less energy (COP=2.8) than an electric water heater
  ♦ Reduced energy bills and carbon emissions
- History of proven engineering in advanced inverter drive technologies
- User friendly and comprehensive touch screen control panel.

3) Product Efficiency Comparisons

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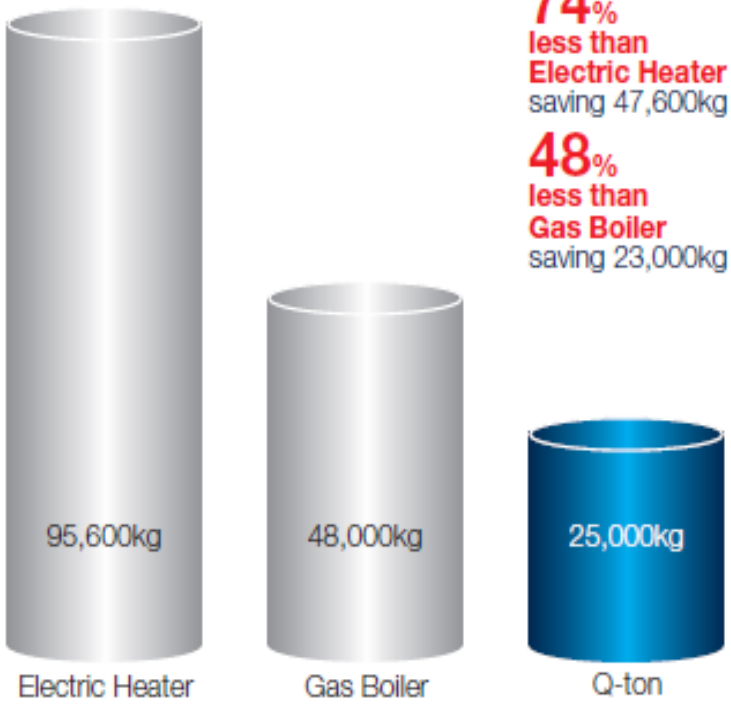
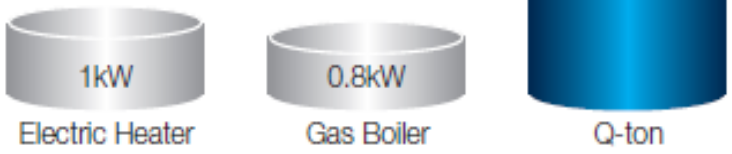
Annual CO_2 emission



74%
less than
Electric Heater
saving 47,600kg

48%
less than
Gas Boiler
saving 23,000kg

Energy produced per kW consumed



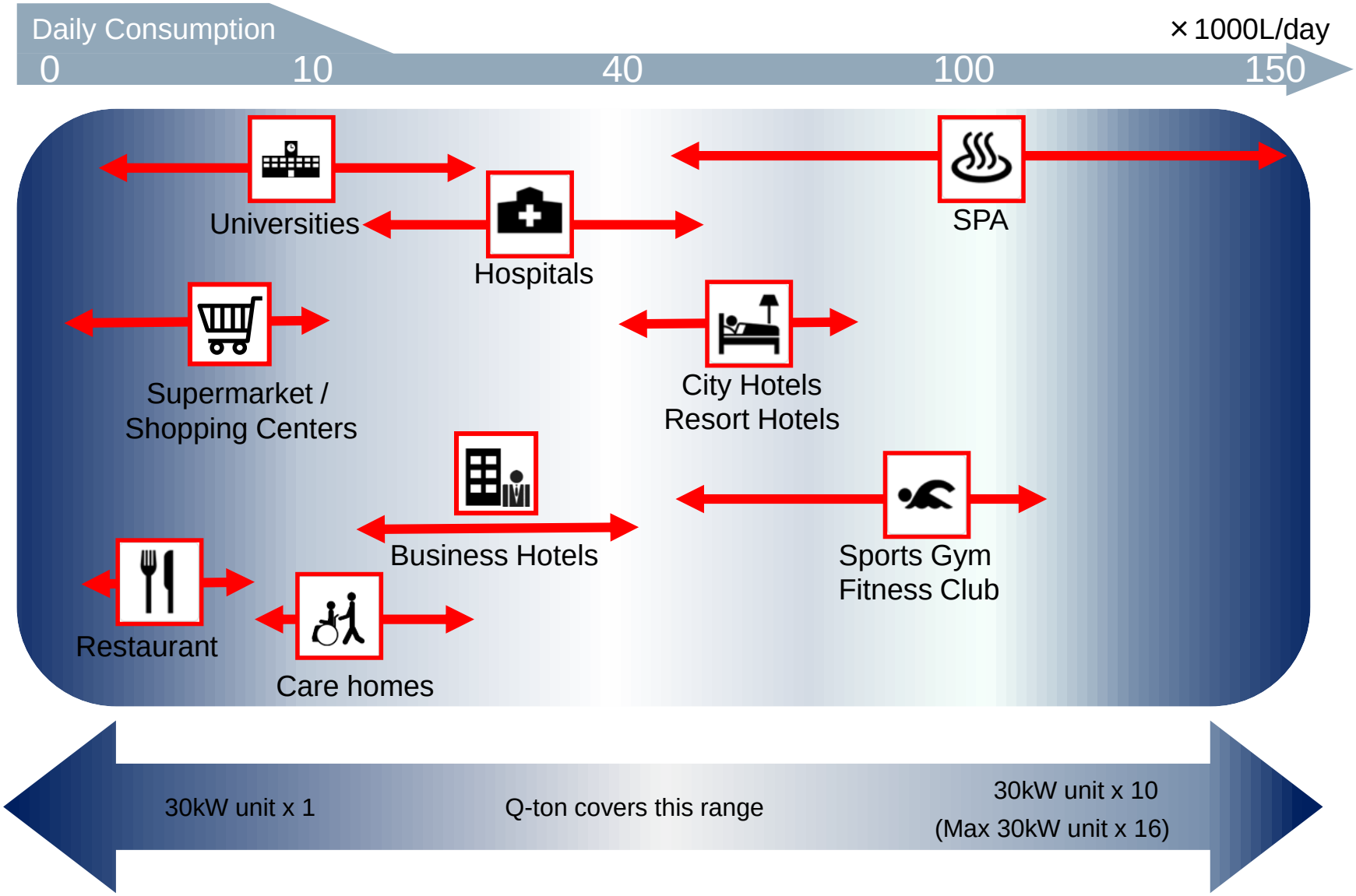
500%
more efficient than
Electric Heater

600%
more efficient than
Gas Boiler

Operation conditions: senior care home, 80 persons, 8,000L/day, 60°C conversion

Q-ton will contribute to reduce carbon emissions for any organisation associated with a Carbon Reduction Commitment (CRC) scheme. Further savings are expected as the electricity becomes greener with the decarbonisation of the grid.

4) Commercial Applications



5) Beneficial Applications / Strategy

- New commercial build installations - minimum draw of 5,000 liters/day
- Hybrid application to gas boiler installation (Boiler becomes the back-up)
- Energy conscious commercial projects
- Where project compliance to a minimum energy consumption is required
- Hydronic underfloor heating for specific project applications

- Promote product information activities at applicable AU/NZ Industry events
- Promote product sales via new & existing experienced sales channels
- Create Q-ton micro-site for information sharing
- Contact to Architects, Consultants and the like to promote product
- Generate CPD courses for industry professionals
- Provide product information training to designated clients/organisations
- Provide technical training courses to applicable trade contracting companies
- Promote parts replacement maintenance package at POS

6) 2 Stage Compressor Features

- Q-ton uses the World's FIRST 2 stage patented CO_2 inverter compressor
- CO_2 + two stage scroll-rotary compressor = Outstanding seasonal efficiency; 400% (water supply at 65°C)

Reason for high efficiency

Scroll + rotary compressor

Two-stage compressor
By combination of two systems, high efficiency has been achieved in all operation conditions.

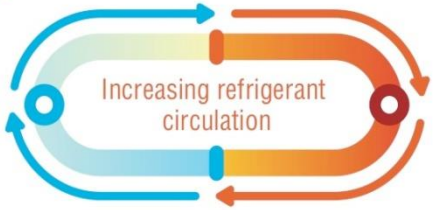
Scroll system advanced at high pressure ratio

×

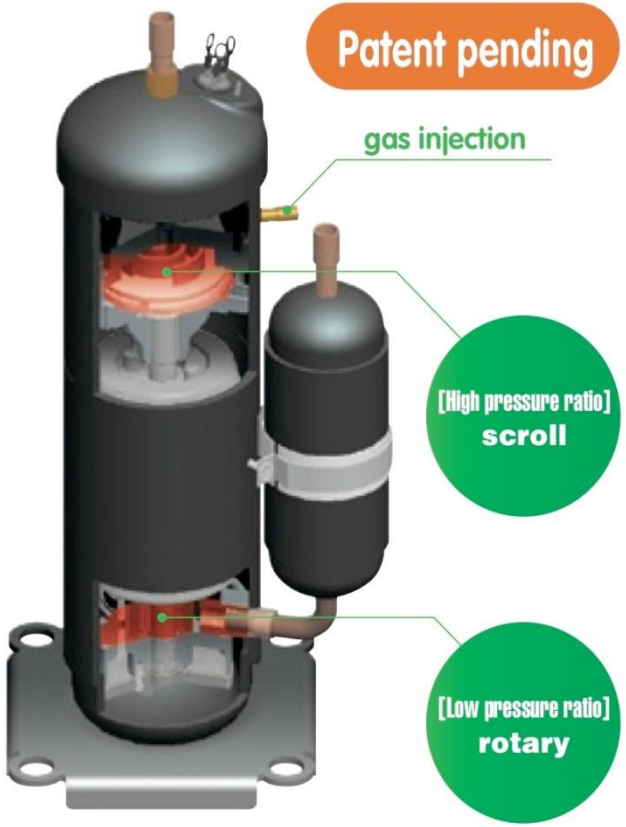
Rotary system advanced at low pressure ratio

Intermediate pressure gas injection configuration

By increasing refrigerant circulation, high efficiency in low temperature can be achieved.

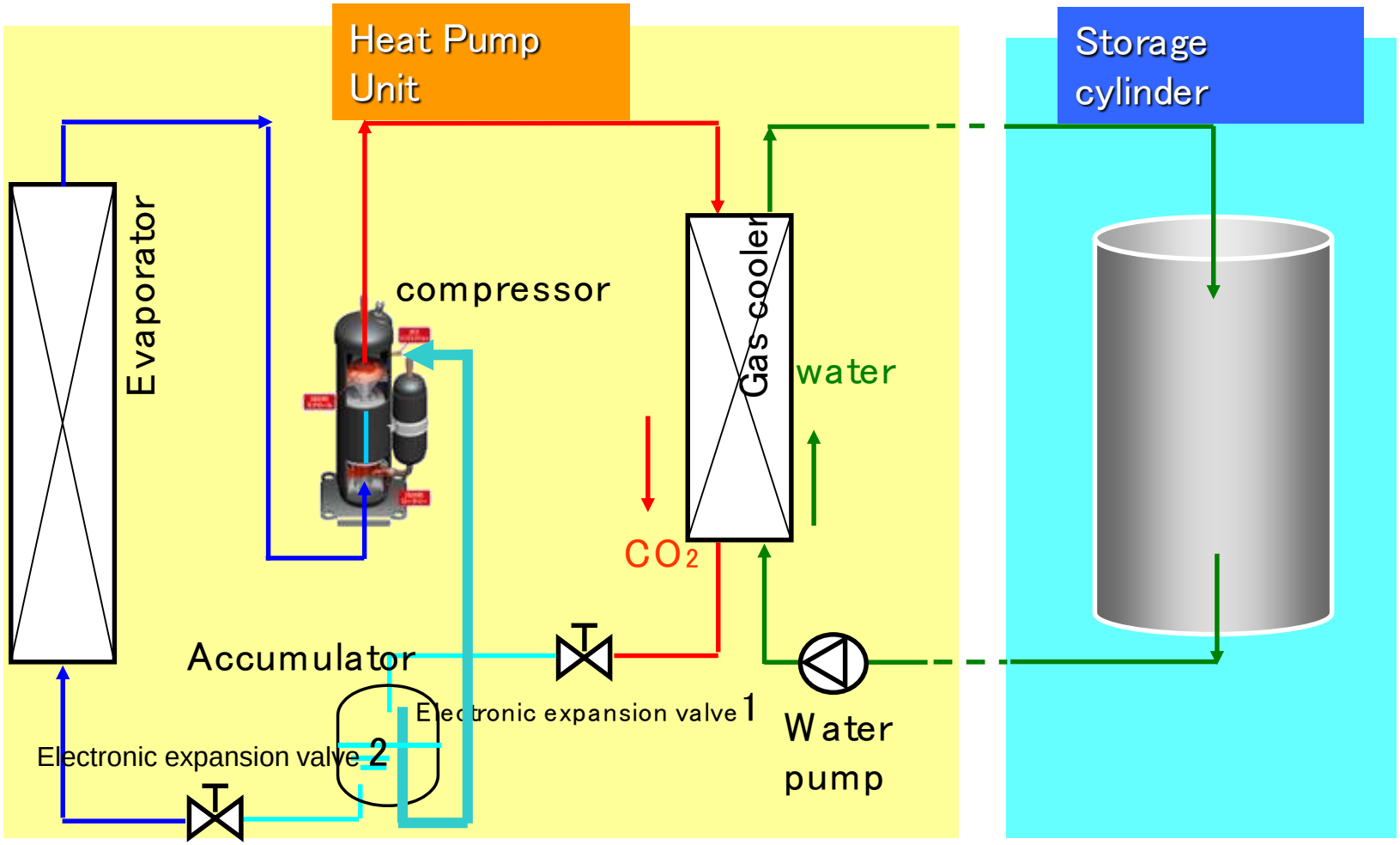


Patent pending

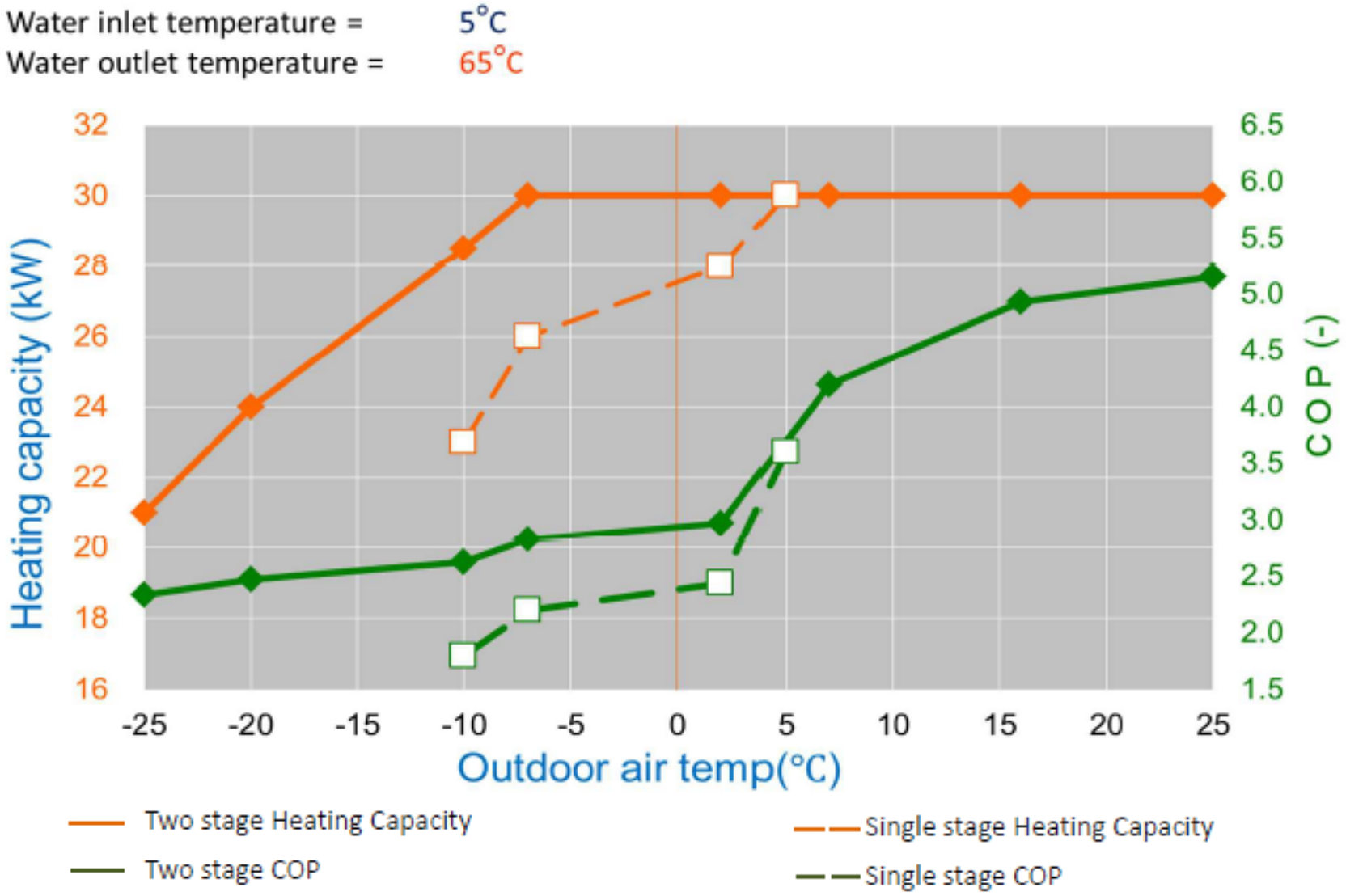


7) Two-stage Compressor & Intermediate Gas Injection Configuration

By adopting a new type CO2 two-stage compressor and a gas injection configuration, powerful heating capacity is achieved under the low outdoor ambient condition .

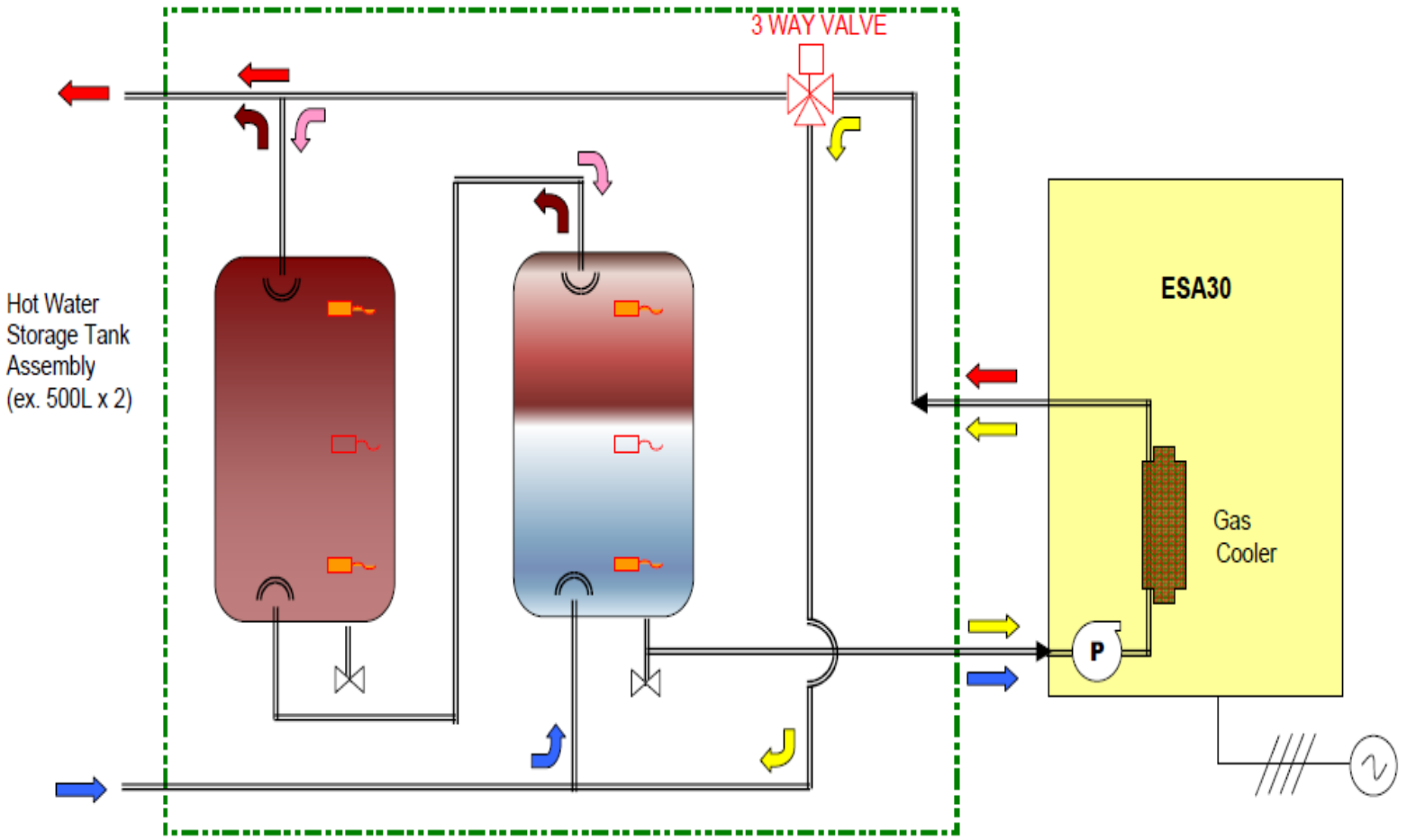


8) Improved COP Performance

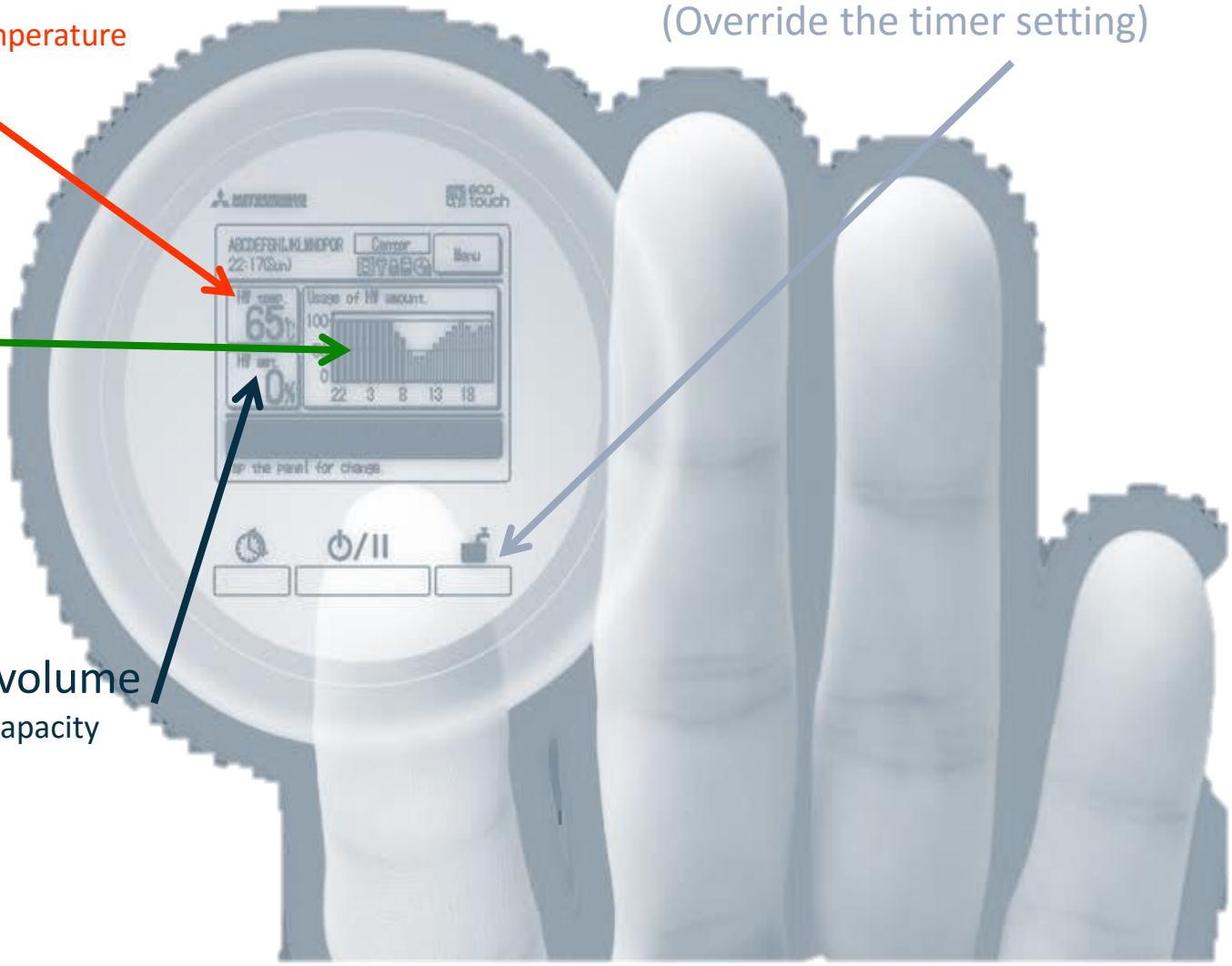


9) Specific Installation Example – Modular Water Tanks

(2) Tank assembly (piping diagram for modular tanks)



10) Comprehensive Touch Screen Controller



11) Global Q-ton Installation Locations

- Japan
- China
- Korea
- United Kingdom
- The Netherlands
- Germany
- France
- Spain
- Italy
- Croatia

11a) Installation Example - Hotel Retrofit

- System composition
  Q-ton x 2 units. Closed tanks - 2 x 1,000L

- Purpose of use
  DHW supplies to 250 persons and utilizes the existing boilers to deliver the central heating

11b) Installation Example - Hotel Retrofit

- **System composition**
  2 x Q-ton units,
  Closed tanks 2 x 3,000L and 5 x 4,000L

- **Purpose of use**
  DHW is provided to 200 rooms and the existing boiler is kept for back up

11c) Installation Example – Hospital Retrofit

- **System composition**
  4 x Q-ton units feeding 4 locations on site
- **Purpose of use**
  DHW supply to 6 horizontal tanks. 2 vertical tanks. Total hot water storage capacity 13,600L

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