TICA®

TICA SNG LLC

www.tica.pro

Technology license of MAYEKAWA (Japan)

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

5.0
Highest energy efficiency ratio
★ ★ ★

80kW
Largest heating capacity
★ ★ ★

Japanese original design
★ ★ ★

Established in 1991

TICA is a professional enterprise specialized in R&D, manufacturing, sales and services of environment cleaning and thermal energy utilization.

TICA is a national high-tech enterprise, a single leading enterprise cultivated by the Ministry of Industry and Information Technology, a national brand cultivation enterprise of the Ministry of Industry and Information Technology, and a vice chairman member of China Refrigeration and Air-conditioning Industry Association. It has a national-recognized enterprise technology center, an enterprise academician workstation, and a post-doctoral research workstation. Its projects cover Beijing Bird's Nest Stadium, Water Cube, Wukesong Indoor Stadium, PetroChina, Sinopec, State Grid, Nanjing Panda, Hangzhou Xiaoshan International Airport, Hainan Airlines Group, Shangri-La Hotel, Manila Ocean Park, Abu Dhabi Al Muneera, SM City in Philippines and Unilever, etc.

TICA is also the outstanding provider of central air conditioners for China's subway networks and has successfully served nearly 60 key subway lines in major cities such as Beijing, Shanghai, Guangzhou, Shenzhen, Chengdu, Suzhou, Hangzhou and Tianjin. TICA is a professional supplier and service provider in China that specializes in system integration of clean environment. While for microelectronics, hospital operating rooms, biopharmaceutical industry and other professional purification areas, our market share has achieved over 40% in each.

TICA Quality For IAQ

TICA focuses on indoor air quality (IAQ) in clean environments. Product lines include return air purifiers, heat recovery ventilators, fresh air purifiers, air purifiers, as well as the clean air handling units and digital variable-capacity air handling units used in the professional purification field. Regarding core technology, TICA established an ISO class 1 super-clean environment integration system and won the first prize of CMIST.

In the field of thermal energy utilization, TICA's product lines include modular chillers, VRF units, screw chillers, centrifugal chillers, and ORC low-temperature waste heat power generation systems. In 2015, TICA and United Technologies Corporation (UTC) established a global strategic joint venture cooperation relationship and acquired PureCycle, an ORC low-temperature power generation company owned by Pratt & Whitney under UTC. TICA obtained PureCycle trademarks and more than 100 patents and national copyrights. TICA's efficient centrifugal chillers, water-cooled screw chillers, and air-cooled screw chillers are manufactured with the technical license of Carrier under UTC.

TICA is characterized by excellent system integration capability. In the application of "Efficient Refrigeration System of Underground Railway Station", the integrated COP of the refrigeration room amounts to 6.0, and the research achievement reaches the international advanced level. In 2018, TICA merged and acquired an OFC central air conditioning enterprise **SMARDT**. TICA's excellent system integration capability and the **SMARDT** world-class OFC water chillers help increase the integrated COP of the efficient equipment room to 6.7 to 7.0.

TICA---We're striving.

TICA aims to build itself into a world-leading system integration supplier and service provider that specializes in clean environment and thermal energy utilization.

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Contents

TICA owns five production sites in Nanjing, Tianjin, Guangzhou, Chengdu and Kuala Lumpur, and a network of over 70 sales and service filiales around the world.

Its Nanjing HQ base received 3-star certification for national No. 001 green industrial construction.

Nanjing Headquarter

Tianjin Base

Guangzhou Base

Chengdu Base

90°C hot water

Product Overview

TICA heat pump high temperature hot water unit (hereinafter referred to as “the unit”) is manufactured under license by MAYEKAWA JAPAN. The unit adopts the natural working medium CO_2 as the refrigerant, and boasts a water outlet temperature of up to 90°C, unrivaled in the industry. It features green and efficient operation, high reliability, compact size and modular design, and supports units running in parallel. The unit can be used to replace boilers and widely used in various high temperature hot water systems for industrial and commercial purposes.

Founded in 1924, MAYEKAWA JAPAN is mainly engaged in refrigeration engineering and compressor manufacturing, and has been leading the world in the R&D, manufacturing and application of CO_2 compressors. The heat pump hot water unit manufactured by TICA has obtained the technical authorization from MAYEKAWA JAPAN and adopts a full set of Japanese design schemes. MAYEKAWA JAPAN works closely together with TICA in the production, manufacturing, testing and application phases, so as to provide customers with Japanese-quality heat pump hot water units.

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Product Features

Providing 90°C hot water

Optimum alternative for small boilers

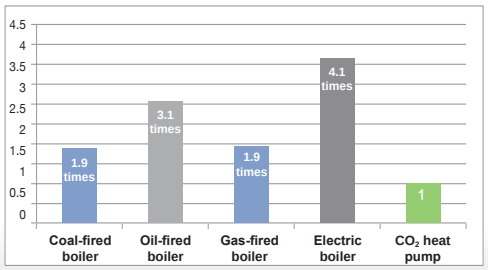
Adopting the natural working medium CO_2 as the refrigerant, the unit heats up water by absorbing heat from the air through a transcritical cycle. The water outlet temperature can reach as high as 90°C, making it a qualified replacement to ordinary water boilers.

Providing 90℃ hot water

High efficiency & energy saving

Energy efficiency ratio up to over 5.0
(at 65°C water supply)

The input electric energy drives the compression cycle of the heat pump unit to obtain heat from the air to heat up the hot water, achieving an energy efficiency ratio of over 5.0 (at 65°C water supply) and substantially reducing users' OPEX.

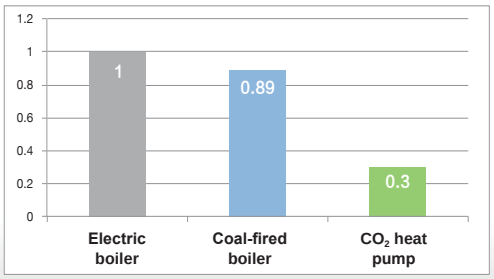


Comparison of OPEX
(with the same amount of water production)

Environmental-friendly

UNEP-recommended refrigerant
Carbon emission of 34% of coal-fired boilers

CO_2 comes from nature, has no any adverse effects on environment, and is not subject to obsolescence that facing conventional chemosynthetic refrigerants.
With a carbon emission of only 34% of that of coal-fired boilers, the heat pump unit operates with high energy efficiency, reducing energy consumption. Energy conservation and emission reduction make the unit the best alternative for boilers.

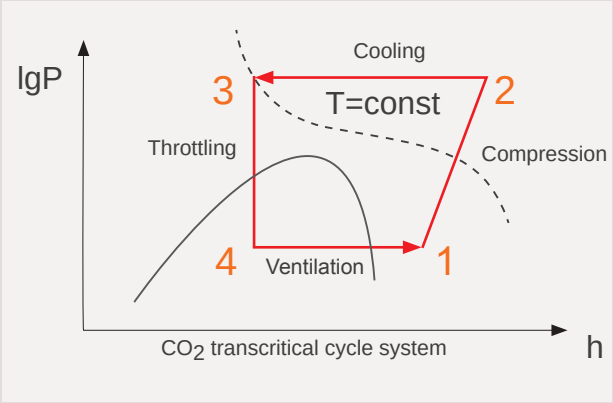


Comparison of carbon emission
(with the same amount of water production)

All year round hot water supply

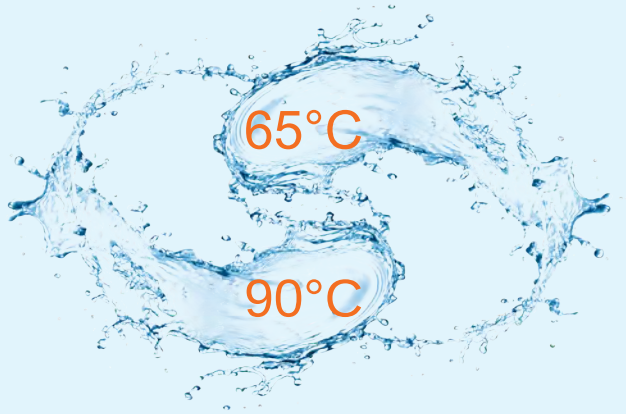
No electric heating compensation required in low temperature condition

With CO_2 transcritical cycle, the unit can provide 90°C hot water all year round without electric heating compensation. The energy efficiency is as high as 3.1 even at 5°C ambient temperature, much higher than that of the heat pump units with conventional chemosynthetic refrigerants.



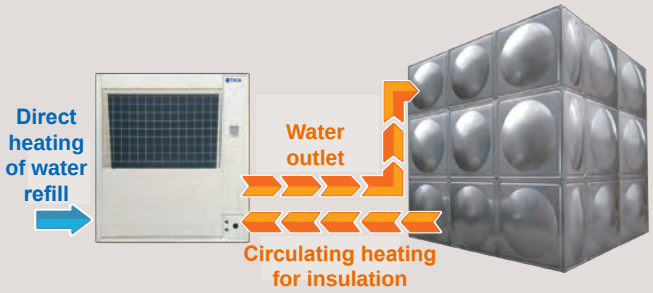
65/90°C hot water optional

The unit provides 65/90°C hot water, which is optional as required.



Direct heating/circulating heating optional

The unit supports both direct heating and circulating heating modes, which can be switched as required.



Small in size

Dedicated machine room not required

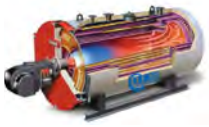
The unit is compact in design and small in size, thus no dedicated machine room is required. The water temperature of 90°C greatly reduces the capacity of the water storage tank, thus requiring less floor space.

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Comparison of OPEX

Efficient heating performance to reduce OPEX

Taking a user in eastern China who uses 20 tons of 90°C hot water per day as an example, if the tap water inlet temperature is 20°C, a heat consumption of 1,400,000 kcal (5,880,000 kJ) is required for heating 20 tons of water from 20°C to 90°C. Assume that the water heating device is to be used 300 days a year, the comparison by adopting different heating schemes is as follows:

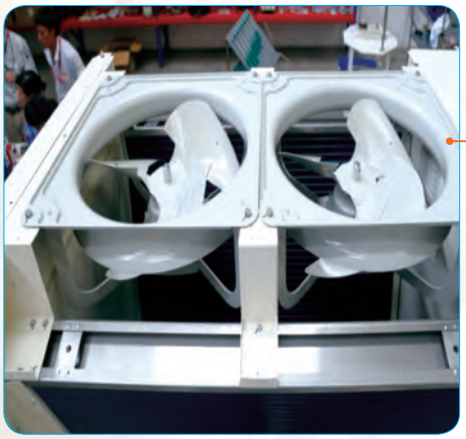
	Coal-fired boiler	Oil-fired boiler	Gas boiler	Electric boiler	CO_2 heat pump
					
Safety	Prone to leakage and explosion	Prone to leakage and explosion	Prone to leakage and explosion	Prone to electric leakage and aging	Safe
Ease of management	Operated by specially-assigned person with certificate	Operated by specially-assigned person with certificate	Operated by specially-assigned person with certificate	Operated by specially-assigned person with certificate	Unattended operation
Intelligence	Unable to adjust parameters	Difficult to adjust parameters	Difficult to adjust parameters	Setting adjustable	Parameters adjustable with intelligent control
Environmental protection	Severely polluted	Polluted	Pollution-free	Pollution-free	Environmentally friendly
Energy consumption	Low coal utilization ratio	Medium energy efficiency	Medium energy efficiency	Medium energy efficiency	High energy efficiency
Site requirements	Dedicated machine room is required Carbon residue removal facility is required	Dedicated machine room is required Dedicated oil storage place is required	Dedicated machine room is required High requirement on machine room design	Dedicated machine room is required High requirement on machine room design	Roof or other vacant space Dedicated machine room not required
Service life	5 years	10 years	10 years	10 years	20 years
Required energy consumption for heating 20 tons of water	1,400,000 kcal	1,400,000 kcal	1,400,000 kcal	1,400,000 kcal	1,400,000 kcal
Heat value	4,000 kcal per kg of coking coal	10,200 kcal per kg of diesel oil	8,600 kcal/m^3	860 kcal/kilowatt hour	860 kcal/kilowatt hour
Heat efficiency	60%	90%	90%	95%	380%
Unit price	RMB 0.8/kg	RMB 5.7/L (RMB 6.83/kg)	RMB 3.5/m^3	RMB 0.83/kilowatt hour	RMB 0.83/kilowatt hour
Fuel consumption	583 kg of coal/day	153 kg of diesel oil/day	181 m^3 of natural gas/day	1,714 kilowatt hours/day	428 kilowatt hours/day
Fuel cost	RMB 467/day	RMB 1,042/day	RMB 633/day	RMB 1,422/day	RMB 356/day
Daily average labor cost	RMB 200/day	RMB 50/day	RMB 50/day	RMB 50/day	RMB 0/day
Daily total cost	RMB 667/day	RMB 1,092/day	RMB 683/day	RMB 1,475/day	RMB 356/day
Annual total cost	RMB 200,000/year	RMB 327,000/year	RMB 205,000/year	RMB 442,000/year	RMB 107,000/year

★ Notes:

1. The annual comprehensive energy efficiency of heat pump in eastern China is calculated based on 3.8 (standard: JRA4060-2014).
2. The electricity fee is based on the peak-valley electricity price of commercial electricity.
3. The coal-fired boiler is operated by one person on a full-time basis, and other boilers are operated on a part-time basis.

Core Technologies

Founded in 1924, MAYEKAWA JAPAN is mainly engaged in refrigeration engineering and compressor manufacturing, and has been leading the world in the R&D, manufacturing and application of CO_2 compressors. The heat pump hot water unit manufactured by TICA has obtained the technical authorization from MAYEKAWA JAPAN and adopts a full set of Japanese design schemes. The unit adopts the following core technologies:



Inverter fan

Stepless speed regulation and precise air volume adjustment

In case of load changes, the inverter fan is steplessly regulated for precise air volume control and avoiding system instability.

High-precision electronic expansion valve

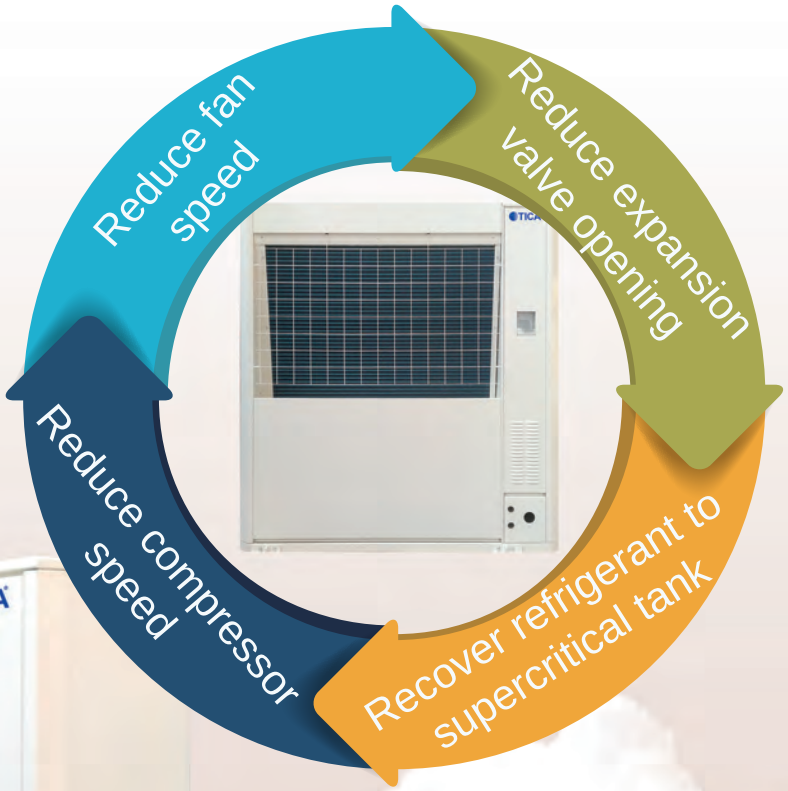
Dynamic matching of refrigerant system and rapid & accurate reaction mechanism

The electronic expansion valve is precisely adjusted for precise opening according to the load demand of the system to realize the dynamic matching of the refrigerant system. In addition, the reaction mechanism is rapid and accurate, significantly improving the operating energy efficiency of the unit.

MAYEKAWA inverter CO_2 compressor

Inverter compressor imported with original packaging from MAYEKAWA JAPAN

The inverter compressor has reached the world leading level. The compressor adjusts the operating frequency according to the load, thus optimizing the system energy efficiency.



Self-balanced supercritical tank

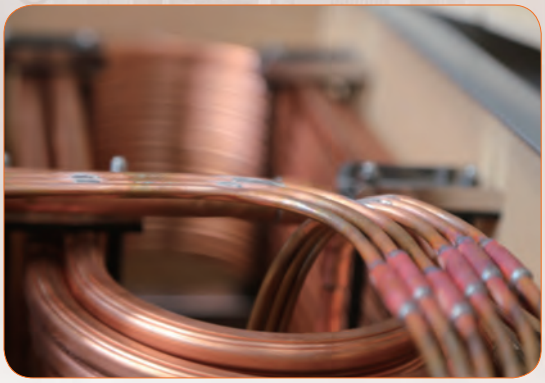
Real-time balancing of operating refrigerant in the system

The demand for refrigerant varies with load. The supercritical tank releases (or recycles) refrigerant according to the demand in real time, and balances the amount of refrigerant actually operating in the system, enabling the system to run more stably and efficiently.

Efficient air-cooled heat exchanger

Independent R&D by MAYEKAWA, efficient and safe

The high-efficiency air-cooled heat exchanger independently developed by MAYEKAWA adopts copper pipes for refrigerant and water flow. These specially-shaped pipes are closely connected to increase the heat exchange efficiency and operating safety.



Intelligent hot-gas bypass defrosting

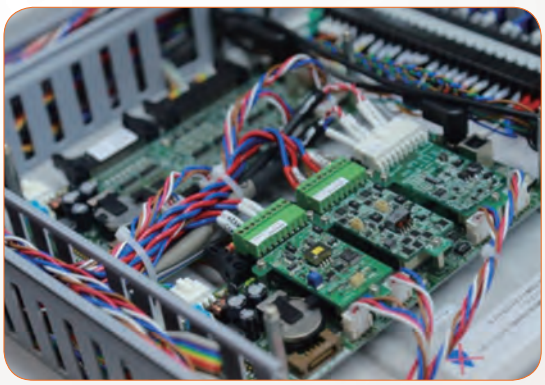
Over 90% of heating efficiency

The defrosting conditions are comprehensively determined according to the ambient temperature, evaporation temperature, running time, and other parameters, so as to ensure that the unit conducts high-efficiency defrosting when there is frost, and performs stable heating when there is no frost, thus reducing defrosting time, and achieving a heating efficiency of over 90%.
High temperature air discharge from the compressor is directly used for defrosting, without absorbing heat in the water, and thus the water temperature fluctuation is small.

Intelligent control

Multiple intelligent functions

The three modes, i.e., standard mode, energy-saving mode, and strong heating mode, are intelligently switched as required to minimize the operating energy consumption under the premise of sufficient water supply.
Multi-level user password management is performed to prevent misoperation.
Automatic and efficient operation: The unit automatically adjusts the operating frequency, water amount, water temperature and other parameters according to the operating conditions, ensuing optimal efficiency in system running.



Multi-protection

Multi-protection and stable operation

The unit program comes with a number of protection functions to ensure stable operation of the unit under various working conditions.
High-voltage protection, low-voltage protection, oil pressure protection, compressor overload protection, fan overload protection, inlet pump overload protection, protection of high-low pressure difference rise, and water break protection.

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Typical Applications

Sanitary hot water for luxury hotels

The heat pump water heaters using chemical synthetic refrigerants (R22, R410A, etc.) have an actual water supply temperature lower than 55°C, and there are a large amount of legionella in the transmission and distribution system, which is harmful to health. TICA CO_2 heat pump high temperature hot water unit supplies water up to 90°C and can effectively control the water temperature in the transmission and distribution system at above 70°C to kill legionella. This is in line with the water requirements of five-star hotels, high-end clubs, and golf courses, etc.

Industrial hot water for food, slaughtering, electroplating, rubber, leather, and chemical industries

Due to the production process requirements, a large amount of warm water is needed in various industrial fields such as food processing, electroplating, textile printing and dyeing, chemicals, and rubber. TICA CO_2 high temperature heat pump is energy saving, environmentally friendly and pollution-free, thus saving a lot of OPEX for various factories. It can also lower the temperature in workshops by using the low-temperature air discharge function of the outdoor unit, greatly improving the working environment of workers.

Sanitary hot water for swimming pools, bathing, and catering

TICA CO_2 provides high-temperature hot water for a variety of civil sanitary hot water applications. In addition to higher energy conservation, the unit has high water storage temperature and compact design, and covers a small area, saving a lot of valuable space for various high-end places.

Hot water for washing and disinfection in hospitals

A large amount of hot water of 80°C is required in hospitals for high-end washing and disinfection of medical textiles, including patients' clothing, bedding, surgical gowns, and staffs' work caps & clothes, etc. TICA CO_2 high-temperature heat pump is more energy efficient, cleaner and safer than oil-fired and gas-fired boilers, thus reducing OPEX of hospitals.

1 KOA Corporation Nishiyama Factory

In the production process of electronic component manufacturing plants, a large amount of pure water is required for cleaning products, while making pure water needs to increase the water refill temperature, which consumes a large amount of heat.

Introduction to the system:

1 set of heat pump unit; water tank capacity: 1.5 m^3; heat storage temperature: 60 to 65°C.

Benefits to users

The customer originally used an oil-fired boiler, resulting in high operating cost, and the emissions of the oil-fired boiler affected the defective rate of electronic parts. After changing to use the CO_2 heat pump unit, the energy consumption of the hot water system was greatly reduced, and there were no emissions, which is very suitable for the pure water heating system of the electronic clean factory.

2 KOSUMOSU Corporation Mita factory

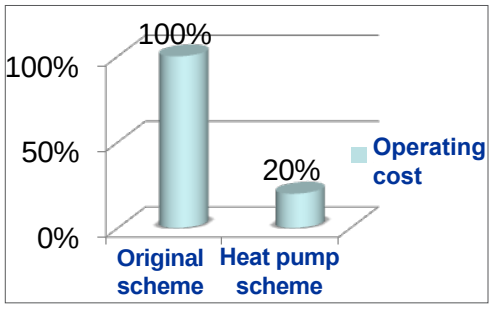
Saving energy and reducing operating cost

Introduction to the system:

3 sets of heat pump units; water tank capacity: 37.5 m^3.

Benefits to users

A large amount of hot water is required during food processing. The customer originally adopted the scheme of the oil-fired boiler & absorption water chilling unit scheme, resulting in high OPEX. After changing to use a heat pump unit with a water chilling unit, the fuel oil consumption was significantly reduced and the operating cost was decreased by 80%.



3 Hokuriku MEYITO Corporation Hakusan Factory

Unattended operation & high efficiency

Introduction to the system: 1 set of heat pump unit; heating capacity: 93 kW

Benefits to users

During the processing of dairy products, a large amount of hot water is required to clean and sterilize the raw materials. The customer originally used an oil-fired boiler to make hot water, which had low efficiency and high and uncontrollable OPEX due to big fluctuations in international oil prices. After changing to use the CO_2 heat pump unit, unattended operation was available, and the operation efficiency was high, with the COP of as high as 4.5.

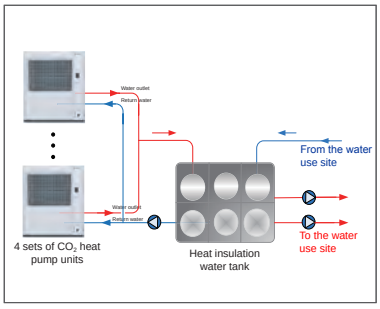
4 Fujinomiya JCG Golf Club

24-hour automatic operation with safety and sanitation

Introduction to the system: 4 sets of heat pump units; water tank capacity: 50 m^3.

Benefits to users

A large amount of hot water is provided throughout the day for bathing and living. 4 sets of CO_2 heat pump units are automatically operated, ensuring 24-hour continuous supply of hot water, meeting the water needs of 400 people, and utilizing electricity at night to store hot water, thus reducing OPEX. In addition, it is pollution-free, safe and sanitary, which protects the environment of the golf course.



5 Kagoshima KUMIAI Dorking Products Corporation

Energy-saving

Introduction to the system: 1 set of CO_2 heat pump unit; water tank capacity: 10 m^3.

Benefits to users

The corporation processes 30,000 chickens per day, which consumes 1 L of 60°C hot water per chicken, resulting in huge heat consumption. The customer originally used an oil-fired boiler, which consumed a lot of fuel every day, caused high OPEX and was not environmentally friendly. After changing to use the heat pump unit, the OPEX was reduced by 80%, reducing energy consumption and realizing environmental protection.

NATURAL REFRIGERANT CO_2
HEAT PUMP HIGH TEMPERATURE
HOT WATER UNIT

Specifications

Model		TCAH200HH
Type		Natural Refrigerant CO_2 Heat Pump Hot Water Unit
Power supply		Three-phase AC 380 V 50 Hz
Standard 65°C water outlet performance *1	Heating capacity (kW)	80
	Power input (kW)	15.96
	Water flow (m^3/h)	1.38
High-temperature 90°C water outlet performance *2	Heating capacity (kW)	79
	Power input (kW)	17.35
	Water flow (m^3/h)	0.92
High-insulation 90°C water outlet performance *3	Heating capacity (kW)	56
	Power input (kW)	19.1
	Water flow (m^3/h)	1.22
Maximum current	(A)	65
Dimensions	W × L × H (mm)	1,250 × 1,900 × 2,085
Quality	(kg)	Net weight: 1,344; operating weight: 1,359
Design pressure	MPa	High-pressure side: 15.0; low-pressure side: 6.4
Compressor	Motor power (kW, number of poles)	25*4P
	Startup mode	Variable-frequency startup
Internal water pump	W, number of poles	250*2P
Unit water resistance	kPa	80 (flow: 1.98 m^3/h)
		42 (flow: 1.38 m^3/h)
		20 (flow: 0.92 m^3/h)
Air heat exchanger		Copper tube aluminum alloy fin
Blower	(kW, set)	0.75*2 sets
External interface	Water inlet 1	Rc3/4 (stainless steel SUS304), for filling cold water
	Water inlet 2	Rc3/4 (stainless steel SUS304), for insulating and circulating water
	Water outlet	Rc3/4 (stainless steel SUS316)
	Drainage outlet	Rc1 1/2 (stainless steel SUS304)
Refrigerant charge		R744 (CO_2), 20 kg
Protective device		High-voltage protection, low-voltage protection, oil pressure protection, compressor overload protection, fan overload protection,
		inlet pump overload protection, protection of high-low pressure difference rise, and water break protection.
Use conditions	Fluid type *4	Tap water
	Water inlet temperature (°C)	5 to 65°C
	Max. water flow (m^3/h)	1.98
	Water inlet pressure	0.15 - 0.49
	Water outlet temperature (°C) *5	65 or 90
	Ambient temperature (°C)	-15 - 43
Level of noise	Summer and transition season/winter (dBA)	62/66

Notes
1. When the ambient dry-bulb temperature is 20°C, the wet-bulb temperature is 15°C, and the water inlet temperature is 15°C;
2. When the ambient dry-bulb temperature is 20°C, the wet-bulb temperature is 15°C, and the water inlet temperature is 15°C;
3. When the ambient dry-bulb temperature is 20°C, the wet-bulb temperature is 15°C, and the water inlet temperature is 50°C;
4. For details of water quality, see page 11 for specific requirements;
5. Under different ambient temperature and water inlet temperature, the actual water outlet temperature and the set target deviates ±3°C. When the water inlet temperature exceeds 30°C, the unit automatically raises the water outlet temperature from 65°C to 90°C for protection.

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Use Conditions

Water Quality Standards

The direct water inlet of the heat pump and the water refill through the hot water storage tank are all required to meet the water quality standards in the table below. Whether it is municipal tap water or other water sources, the water quality shall be investigated before installing the heat pump, and the necessary treatment should be carried out in conjunction with the results of the water quality investigation. The use of water that does not meet the water quality standard may shorten the service life of heat exchangers, heat storage tanks, water piping, and other machines.
Reference standards: *GB1576-2008 Water Quality for Industrial Boilers*, *GB/T 29044-2012 Water Quality for Heating and Air Conditioning Systems*, and *JRA-GL-02-1994 Water quality standards for refrigerating air conditioners.*

	Item		Hot water system		Trend	
			Water circulating temperature 20°C< Water temperature ≤ 90°C	Supply water	Corrosion	Scale deposit
Standard items	PH (25°C)		7.0~8.0	7.0~8.0	○	○
	Electrical conductivity	(25°C, mS/m)	Below 30	Below 30	○	○
	Chloride ion	(mgCl-/m)	Below 30	Below 30	○	
	Sulphate ion	(mgSO42-/m)	Below 30	Below 30	○	
	Acid consumption (pH 4.8)	(mg$CaCO_3$/L)	Below 50	Below 50		○
	Full hardness	(mg$CaCO_3$/L)	Below 70	Below 70		○
	Calcium hardness	(mg$CaCO_3$/L)	Below 50	Below 50		○
	Ionic silicon dioxide	(mgSiO_2/L)	Below 30	Below 30		○
Reference items	Iron	(mgFe/L)	Below 1.0	Below 0.3	○	○
	tube	(mgCu/L)	Below 1.0	Below 0.1	○	
	Sulfide ion	(mgS2-/L)	Not detected	Not detected	○	
	Ammonium ion	(mgNH4+/L)	Below 0.1	Below 0.1	○	
	Residual chlorine	(mgCl/L)	Below 0.1	Below 0.3	○	
	Free carbon dioxide	(mgCO_2/L)	Below 0.4	Below 4.0	○	
	Stability index				○	○

Main differences between tap water and JRA-GL-02-1994 standard

Component		Tap water	Water refilling requirements
pH		6.5-8.5	7.0~8.0
Silicon dioxide	(mgSiO_2/L)	No regulation	Below 30
Full hardness	(mg$CaCO_3$/L)	Below 450	Below 70
Alkalinity	(mg$CaCO_3$/L)	No regulation	Below 50
Calcium hardness	(mg$CaCO_3$/L)	No regulation	Below 50

Pure water	It refers to the water with extremely low electrical conductivity. It is highly corrosive because it does not contain hard and corrosive components.
Reclaimed water	It refers to the water that has been used once and is added with medicine for regeneration.
Softening treatment water	the water containing calcium and magnesium ion hardness components, and the water after replacement reaction of soluble sodium salt.

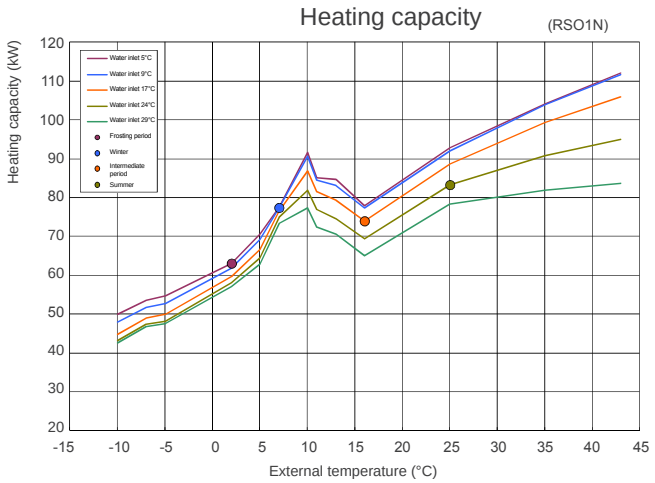
	Electrical conductivity
Pure water	Below 1
Distilled water	1~10
Tap water	100~200

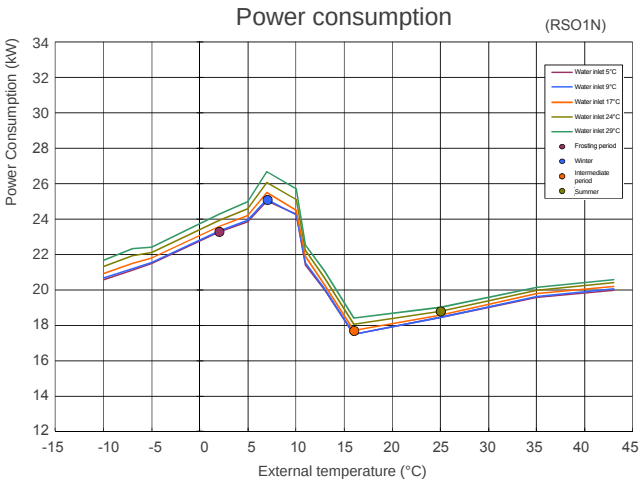
NATURAL REFRIGERANT CO_2
HEAT PUMP HIGH TEMPERATURE
HOT WATER UNIT

Performance Curve under Variable Operating Conditions

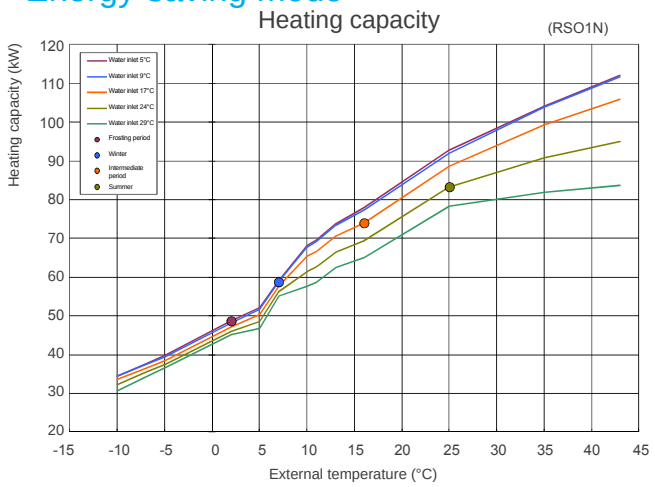
65°C supply water

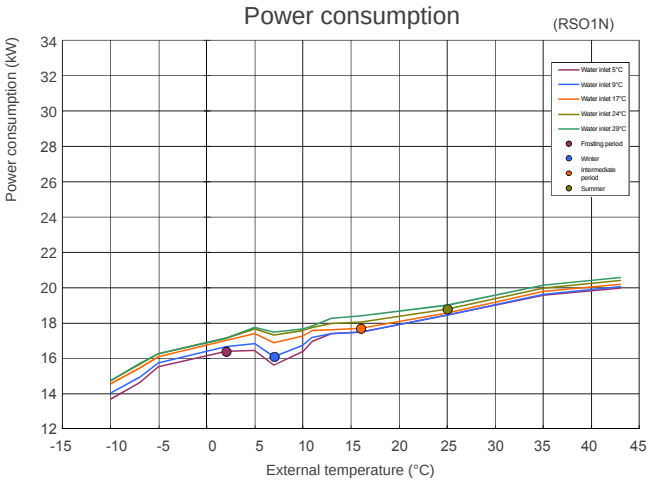
Standard mode



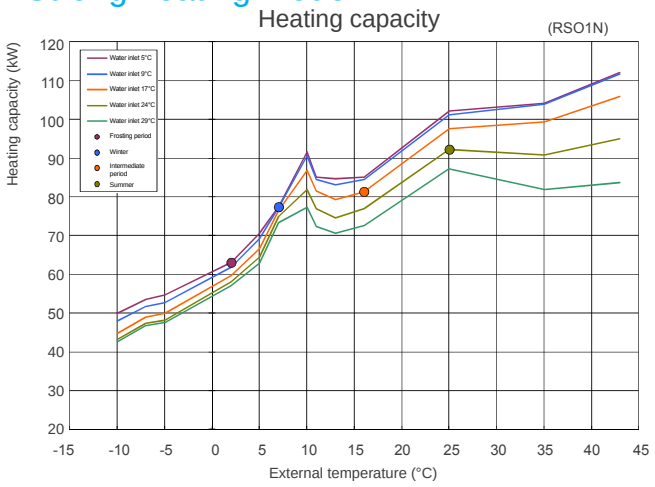


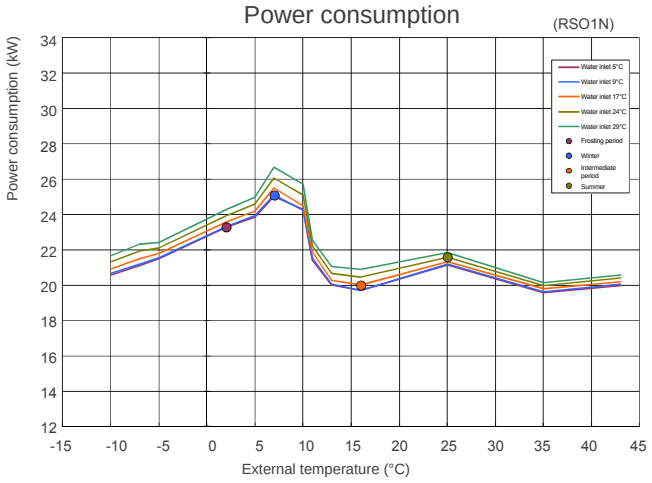
Energy-saving mode





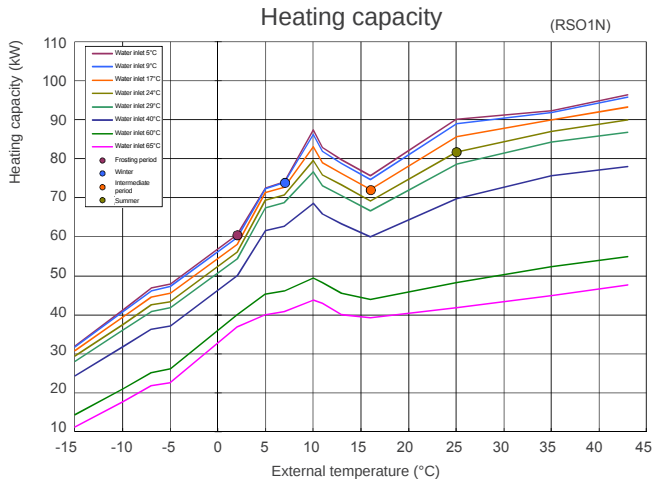
Strong heating mode

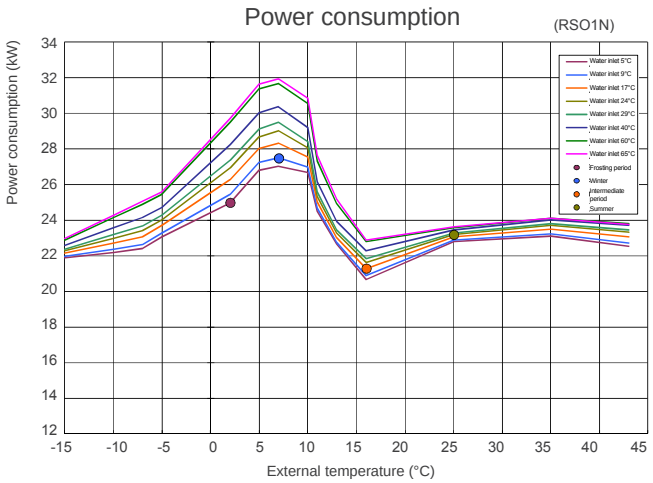




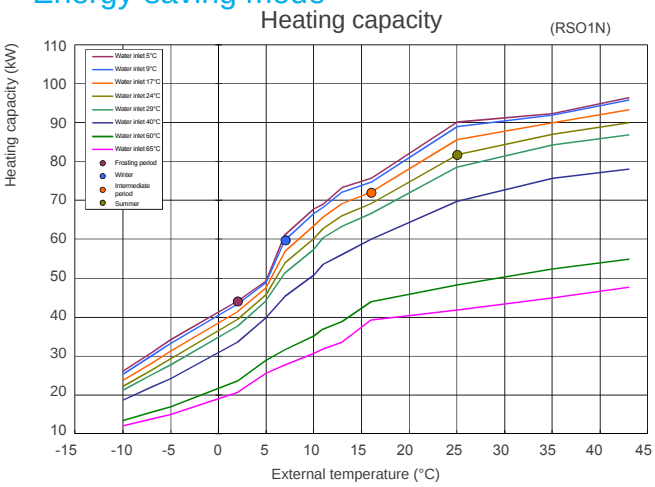
90°C supply water

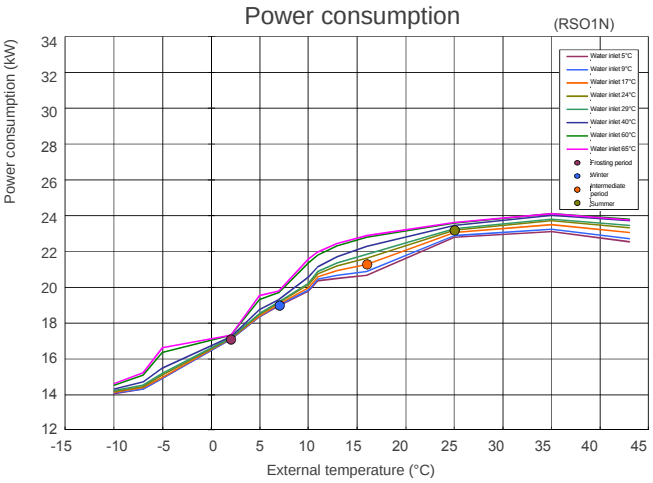
Standard mode



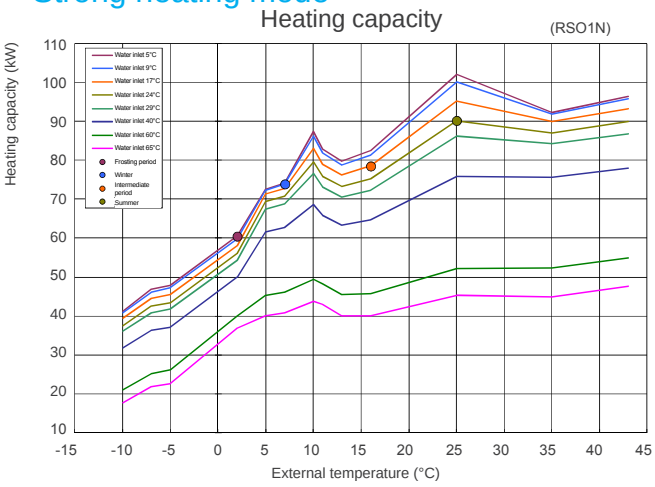


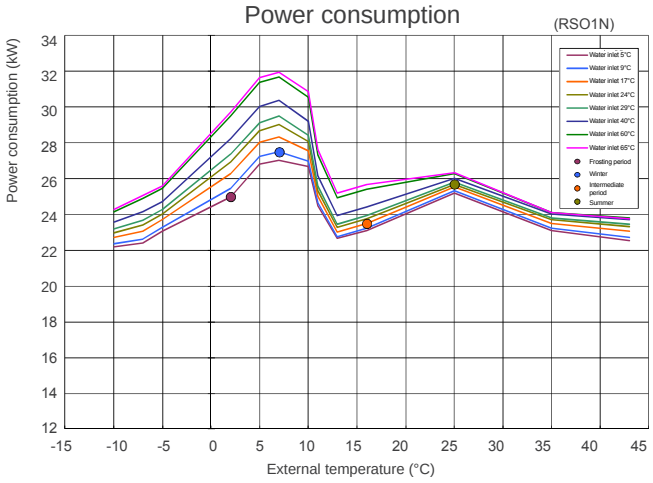
Energy-saving mode



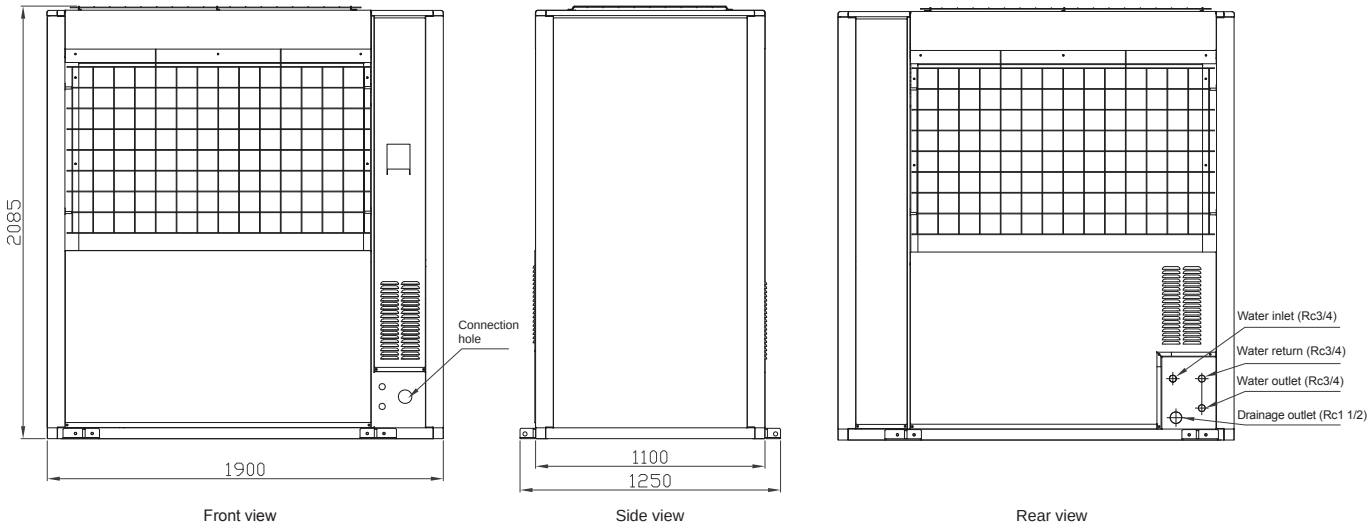


Strong heating mode

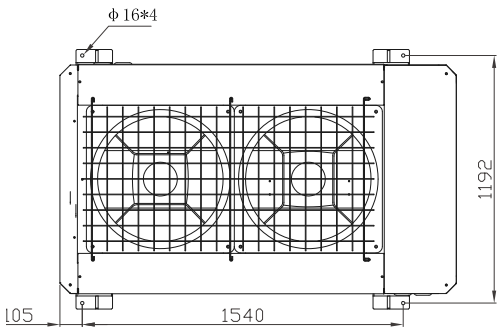




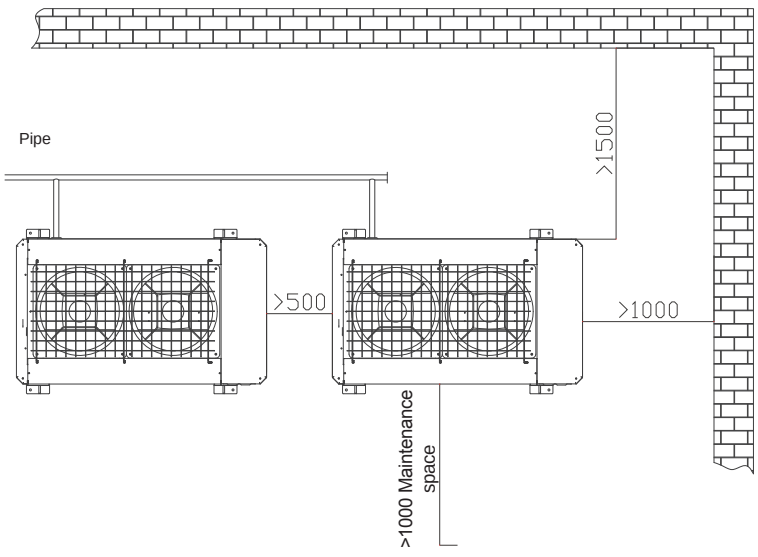
Appearance

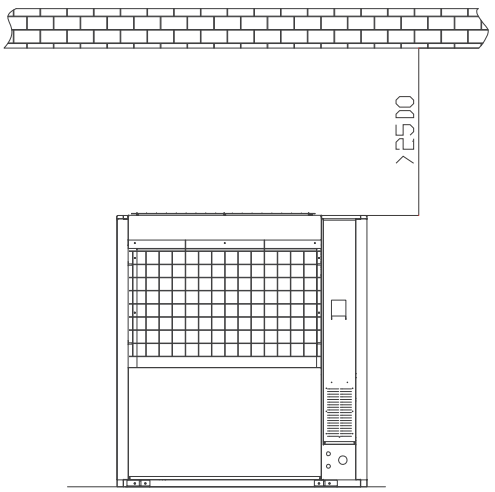


Front view | Side view | Rear view



Installation space

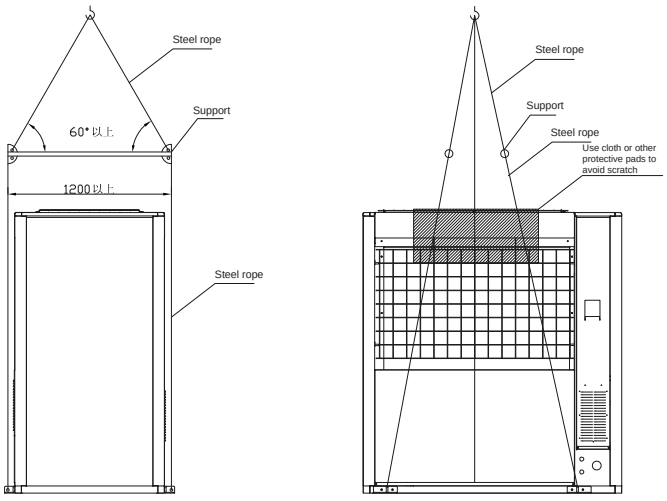




NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Installation Diagram

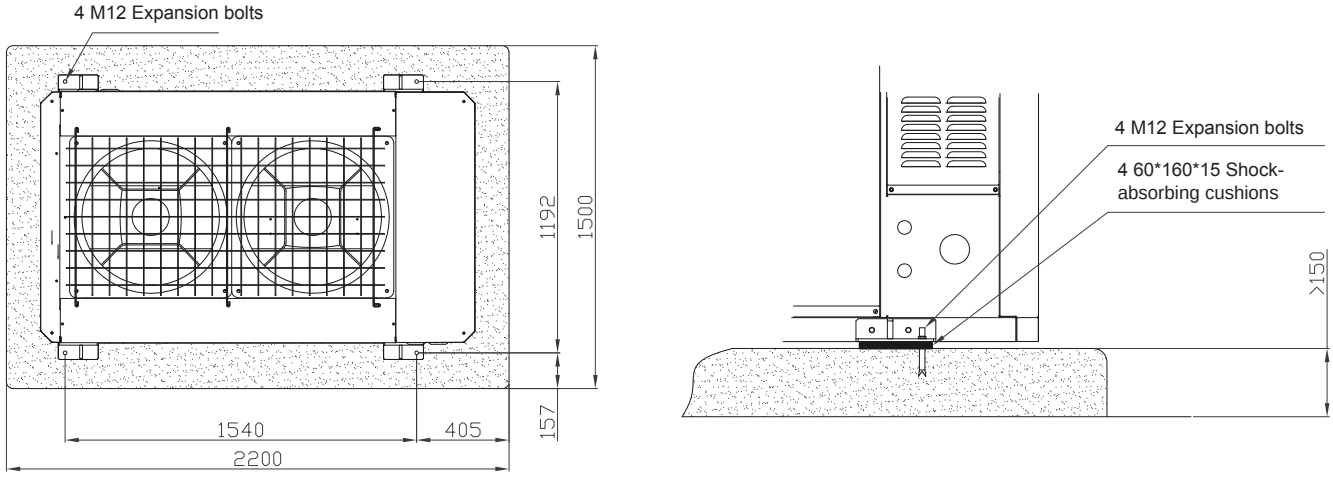
Hoisting Diagram



Hoisting requirements:

1. The machine shall be well-packaged during the transportation from the factory to the site and before hoisting;
2. Handle the machine with care and keep it vertical when carrying;
3. In order to prevent the surface from being scratched or deformed during hoisting, a protective pad should be placed in the contact part of the steel ropes and the machine, and a support assembly should be added between the steel ropes to prevent the ropes from damaging the machine;
4. The steel ropes and support assembly shall be selected in strict accordance with the relevant technical specifications for hoisting;
5. The hoisting shall be carried out by enterprises and individuals with relevant qualifications. The hoisting safety-related operation specifications shall be strictly implemented during operation, and illegal operation is strictly prohibited;

Foundation Diagram



Foundation requirements:

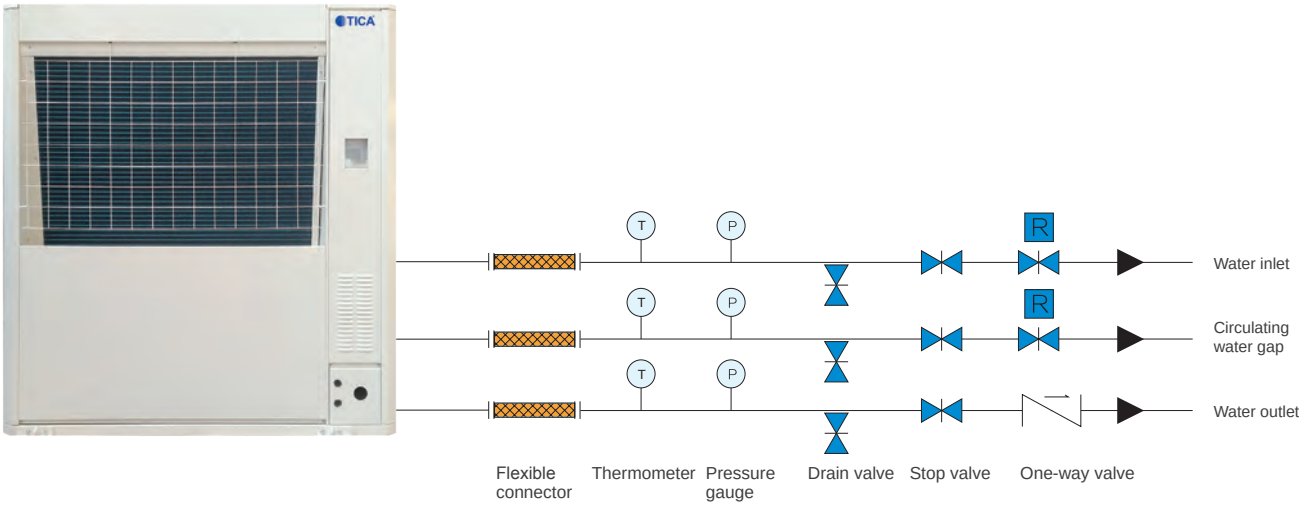
1. The foundation shall be cast from concrete with a grade not less than C20;
2. The foundation may be welded with the 20a I-beam according to the above diagram. After welding, the corresponding anti-corrosion and anti-rust treatment shall be carried out, and the foundation shall be fixed with bolts on the concrete floor;
3. Rubber cushion should be added between the unit base and the foundation;
4. M12 bolts shall be used to fix the unit and the foundation to prevent the unit from vibrating which may cause leakage of adapter tube due to displacement;
5. The base surface must be flat and, if necessary, a drainage ditch should be left around.

Wiring and Piping

Wiring

Wiring requirements		
Power supply wiring	Power source specification	Three-phase AC 380 V 50 Hz
	Power capacity	42.8 (kVA)
	Startup mode	Variable-frequency startup (compressor, fan)
	Maximum current	65 (A)
	Dimension of main power cable	Phase line 3 X 25 mm^2 + Ground wire 1 X 16 mm^2
Control wiring	I/O wiring dimension and type	Above 0.75 mm^2, VCTF, CVS, BVVR, and VVF, etc.
Description of remote control interface		
Signals		Signal description
	Mode switching (XB1)	Switch the operating mode (standard, energy-saving, and strong heating) by the signal ON-OFF
	Device operation (XC1)	Remote power-on/off (On: Run/Off: Stop)
	Anti-freezing operation (XD1)	Remote anti-freezing operation (circulating water) (On: Run/Off: Stop)
	Water inlet three-way valve switching (XE1)	Remote switching of built-in water inlet three-way valve (On: water refill side/ Off: circulation side)
	Hot water outlet temperature switching (XF1)	Switching of hot water outlet temperature control via remote command (On: 90°C/Off: 65°C)
	Device in operation (O1-C)	Unit operating status
	Batch alarm (O2-C)	The status signal of the unit issuing an alarm
	Heat insulation pump operating command (O3-C)	Operating command for linkage operation of heat insulation pump during heat insulation operation
	Anti-freezing requirements (O4-C)	Output signal when anti-freezing environmental conditions are met
	In defrosting and in protection stop (O5-C)	Status signal of the unit in defrosting or protection stop
	Compressor running (O6-C)	Status signal of compressor in running

Piping diagram

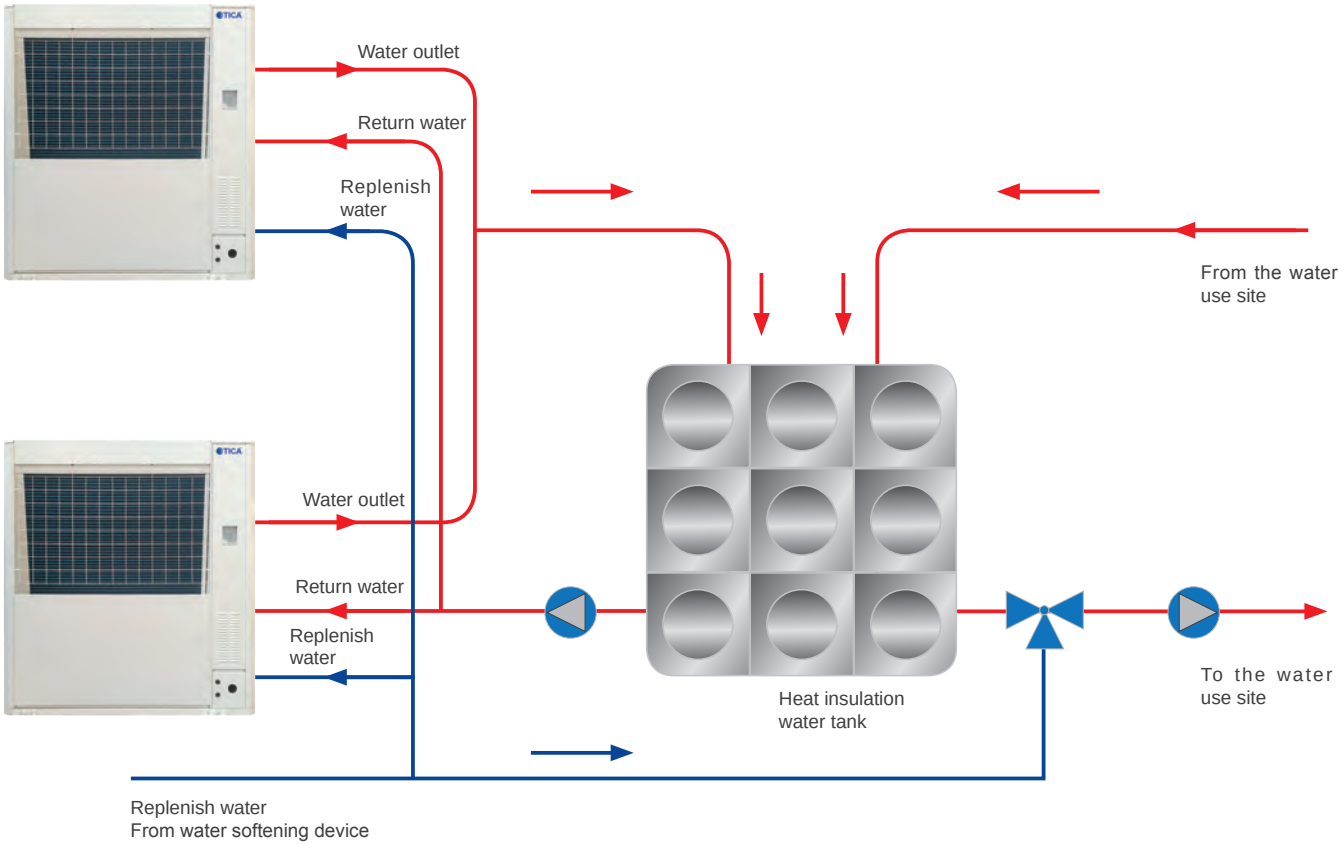


Description of water inlet and outlet piping

1. **A pressure reducing valve needs to be installed at the inlet in areas with high inlet pressure or unstable pressure, to ensure that the water inlet pressure is not higher than 0.49 MPa;**
2. **The inlet and outlet pipe can be tilted appropriately to ensure that a DN15 drain valve can be set at a high/low point to drain the internal water of the unit during the downtime or maintenance;**
   The drain valve is also used for overhaul service or chemical cleaning, and should have a certain joint;
3. **The flexible connector of the unit shall be made of stainless steel but not rubber;**
4. **An automatic discharge valve must be installed in the place where the air is easily trapped on the piping;**
5. **In the cold regions of the north, in order to prevent from freezing the pipelines during the downtime in winter, it is necessary to install a heating device on the pipeline near the unit;**
6. **Pipes, heat insulation and all parts and components should be made of high-temperature (100°C) resistant materials.**

NATURAL REFRIGERANT CO_2 HEAT PUMP HIGH TEMPERATURE HOT WATER UNIT

Typical System Principle - Application of Sanitary Hot Water



★ Notes

1. Stainless steel pipes are recommended for hot water system pipes;
2. In areas with high water hardness, the refilled water must be softened;
3. In cold and severe cold areas, it is necessary to install a heat tracing device on the water outlet pipe and return pipe of the unit to prevent from freezing the water pipe in winter;
4. The water inlet position of the water pump must be lower than the lowest liquid level in the water tank;
5. An appropriate drain valve shall be installed at the lowest point on the water inlet and outlet pipes, water pump systems, and water tanks;
6. The water inlet pressure of the unit is 0.15-0.49 MPa. A pressure reducing valve needs to be installed in areas where the inlet water pressure is too high;
7. A service valve necessary for chemical cleaning heat exchanger must be installed on the water inlet and outlet pipes of the unit;
8. As to application of ordinary sanitary hot water, due to the high storage temperature, it is necessary to mix with the three-way valve according to the water supply temperature before sending them to the water use site to avoid unnecessary accidents;
9. The centralized control system of the hot water system (including water pump, water level, water temperature at the water use site, and water mixing, etc.) varies with different industries. Please consult TICA for additional order.

Components	Check items (criterion)	Qualified or not
Unit	Check whether the heat pump surface is rusted, damaged, or smudged.	
Compressor	Check whether the surface is rusted or damaged.	
	Check whether there is abnormal sound or vibration during operation.	
	Measure whether the insulation resistance is above 5 MΩ.	
Water pump	Check whether the surface is rusted or damaged.	
	Check whether there is abnormal sound or vibration during operation.	
	Measure whether the insulation resistance is above 5 MΩ.	
Fan	Check whether the surface is rusted or damaged.	
	Check whether there is abnormal sound or vibration during operation.	
	Measure whether the insulation resistance is above 5 MΩ.	
Electric two-way valve	Check whether the surface is rusted or damaged.	
	Check whether there is abnormal sound or water leakage during manual operation.	
Air cooler	Check whether the surface is rusted or damaged.	
	Check whether there is leakage of water or refrigerant.	
PLC	Appearance inspection	
	Check whether the surface is rusted or damaged.	
Solenoid valve	Check whether the surface is damaged.	
	Check whether it is manually operated.	
Electric three-way valve	Check whether the surface is damaged.	
	Check whether there is abnormal sound or water leakage during manual operation.	
Leakage detection	Check whether there is leakage of refrigerant, or whether the fluid on the compressor connector is blistering.	
	Comparison of the stop pressure and saturated pressure of external gas	
Water inlet and outlet resistance	Check the change of the water inlet and outlet resistance of the unit to determine whether the unit is seriously scaled.	

NATURAL REFRIGERANT CO_2
HEAT PUMP HIGH TEMPERATURE
HOT WATER UNIT

Reference Projects







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