



GREENER WORLD, BLUER SKY

Continental Hope Group

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Fully Premixed Extra Low NO_x Vacuum Water Heater

全预混超低氮真空热水机组



Hope Deepblue

Chinese Construction Energy Conservation and Emission Reduction Enterprise

Top 10 Chinese Trusted Brands

Top 10 in the Most Influential Brand in Chinese HVAC Industry Member of China Leading

Group of Carbon Dioxide Emissions&Carbon Neutrality in Refrigeration&Air-conditioning



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立足中国 服务全球
Based on China
Service All Over The World

希望深蓝空调制造有限公司

HOPE DEEPBLUE AIR-CONDITIONING MANUFACTURE CORP.,LTD.

Hope Deepblue Air Conditioning Manufacture Co.,LTD., founded in 1997, is a national key high-tech enterprise invested by Continental Hope Group. The company, located in the national key high-tech development zone Chengdu High-tech West Zone, is an absorption chiller&heat pump equipment production base in western China, is a member of China Leading Group of Carbon Dioxide Emissions&Carbon Neutrality in refrigeration&air conditioning. The company is committed to the research and development, production, sales and service in the field of absorption chiller, heat pump, industrial waste heat utilization, "one-stop" system solutions. The company mainly produces lithium bromide absorption chiller, heat pump, central vacuum hot water unit, which have been exported to many countries and regions. "Deepblue Green Energy Center", conducted by Hope Deepblue, the first combined cooling, heating and power system with independent intellectual property rights in China, has been running safely and stably since 2003. It is one of the most mature and reliable distributed energy system with the longest stable operation in China.



The company, known as "Waste Heat Utilization Expert", has a strong technical advantage, a nationwide marketing, service network. Its products have won widely recognition in the HVAC, power plant, heating plant, coking, textile, pharmaceutical, chemical, food, and other industrial fields.

The company's products have obtained a large number of patents, proprietary technology, national industrial product production license. It has passed ISO9001 International Quality System Certification, ISO14001 Environmental System Certification, OHSAS18001 Occupational Health and Safety Management System Certification, CE Certification, CCC National Mandatory Product Certification, CRAA Certification, CSC Energy-saving Product Certification, Disinfection Product Enterprise Hygienic License and other certifications. It has won the Gold Medal of China Science and Technology Expo and the Gold Medal of China Patent Technology Expo. Moreover, it has been included in the National Torch Plan Project, National Key New Product Project, China Energy Conservation Project Construction Key Recommended Units, Top 10 in the Most Influential Brand Chinese HVAC Industry, Top 10 in the Most Trusted National Brand among Chinese Designers, the China Building Energy Conservation and Emission Reduction Model Enterprise, the Leading Enterprise in the field of waste heat recovery in China, the Special Contribution Award in the field of building environment and equipment.

QUALIFICATIONS 资质与荣誉 AND HONOR

PRODUCT VALUE
产品价值



TEAMWORK



Hope Deepblue -- Create customers' value



- More security
Negative pressure operation, no explosion risk



- Low emission
NOx emission $\leq 20\text{mg}/\text{m}^3$



- Low cost
Modular integrated design, load adaptive intelligent adjustment to achieve energy efficient heating mode, the average operating costs less than ordinary hot water boiler system energy saving 5% to 10%.



- Long lifespan
More than 25 years of service life, twice time of ordinary boilers.



Business Licence



High-tech Enterprise Certification



Member of China Leading Group of Carbon Dioxide Emissions&Carbon Neutrality



China Building Energy Conservation and Emission Reduction Model Enterprise



Top 10 in refrigeration field



Top 10 in the Most Trusted National Brand among Chinese Designers



National Torch Plan Project Certification



CE Certification



ISO9001



ISO14001



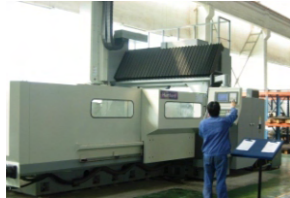
ISO45001



Five-star after-sales service

Production Equipment Inspection Equipment Working Principle

Production Equipment 生产设备 (part)



CNC Processing Center



CNC Drilling Machine



Submerge - Arc Auto Welding Machine



CNC Cutting Machine



Laser Cutting Machine



Tube Sheet Welding Machine



Hydraulic Plate Shear



Painting Room



Hydraulic Cutting Machine

Inspection Equipment 检测设备 (part)



Helium Leak Detector



X-Ray Detector



Weld Seam Detector



Exhaust Analyzer



Electric Testing Device



Whole Unit Performance Testing Center



Ultrasonic Pipe Flaw Detector

Working Principle 工作原理

“Vacuum Water Boiler” is a heating equipment with heat medium water as the intermediate medium: utilizing the evaporation and condensation process of the heat medium water to absorb the heat from the fuel (Exhaust or other heat source) to heat the hot water and deliver it to the terminal. It's commonly known as: vacuum boiler or vacuum phase change boiler.

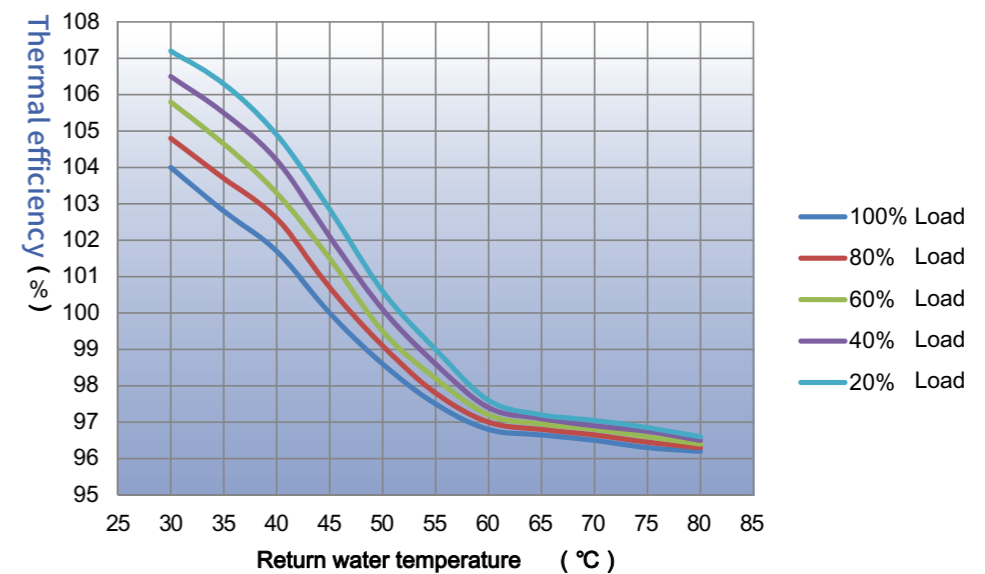
At atmospheric pressure (one atmospheric pressure), the boiling point of the water is 100°C, the working temperature of heat medium water of “Vacuum Water Boiler” should be less than 97°C, the corresponding pressure of 0.9 atmospheres, lower than the atmospheric pressure, so the “Vacuum Water Boiler” is a kind of intrinsically safe heating equipment without the risk of explosion.

“Fully Premixed Extra Low NOx Vacuum Water Boiler” utilizes “Hope Deepblue Micro Flame Low Temperature Combustion Technology” to upgrade and iterate the “Vacuum Water Boiler”, which reduces the product and operating costs and improves the efficiency of the unit under the premise of ensuring safety.

The common fuel of “Fully Premixed Extra Low NOx Vacuum Water Boiler” is natural gas. Its combustion exhaust contains a large amount of vapor, that's why Deepblue's vacuum boiler is standard equipped with exhaust condenser, which is used to recover the latent heat of vaporization of steam in exhaust, and the comprehensive thermal efficiency can be increased to 104% in extreme limit.

Performance Curve 效率曲线图

Thermal efficiency VS return water temperature



Instruction:

1. There will be Exhaust condensation in the condensate boiler when the return water temperature is lower than 55°C.
2. The lower return water temperature, the higher thermal efficiency of boiler.
3. The lower operation load of boiler, the higher thermal efficiency.
4. Exhaust condensate is weakly acidic, it is recommended to prepare machine room drainage system and adopt stainless steel chimney.

Low NOx Combustion Technology
低氮燃烧技术

The formation and harm of nitrogen oxide NOx

During the combustion process of Exhaust, it produces nitrogen oxides, the main components of which are nitric oxide (NO) and nitrogen dioxide (NO2), collectively known as NOx. NO is colorless and odorless gas, insoluble in water. It accounts for more than 90% of all NOx formed during high temperature combustion, and is not highly toxic or irritating when its concentration ranges from 10-50 PPM. NO2 is brownish-red gas that is visible even at low concentrations and has a distinctive acidic odor. It is strongly corrosive and can irritate the nasal membranes and eyes at concentrations of nearly 100 ppm even only remaining a few mins in the air, and it can cause bronchitis at concentrations of up to 150 ppm and pulmonary edema at concentrations of up to 500 ppm.

NOx and O2 can be oxidized by photochemical reactions to form NO2. NOx reacts with water vapor in the air to form acid rain under special circumstances. NOx and hydrocarbons in automobile exhaust are irradiated by ultraviolet rays from the sun to form photochemical smog that is harmful to humans. So in order to protect the environment and human health, we need to reduce NOx emissions.

Formation of NOx during combustion

Thermodynamic type NOx

Nitrogen in the combustion air is oxidized at high temperatures ($T > 1500\text{ K}$) and high oxygen concentrations. Most gaseous fuels (e.g. natural gas and LPG) and general fuels that do not contain nitrogen compounds produce NOx in this way. Thermal NOx in the Exhaust increases dramatically when flame temperatures is above 1200°C. This is the main control item for NOx low-NOx combustion.

Instant type NOx

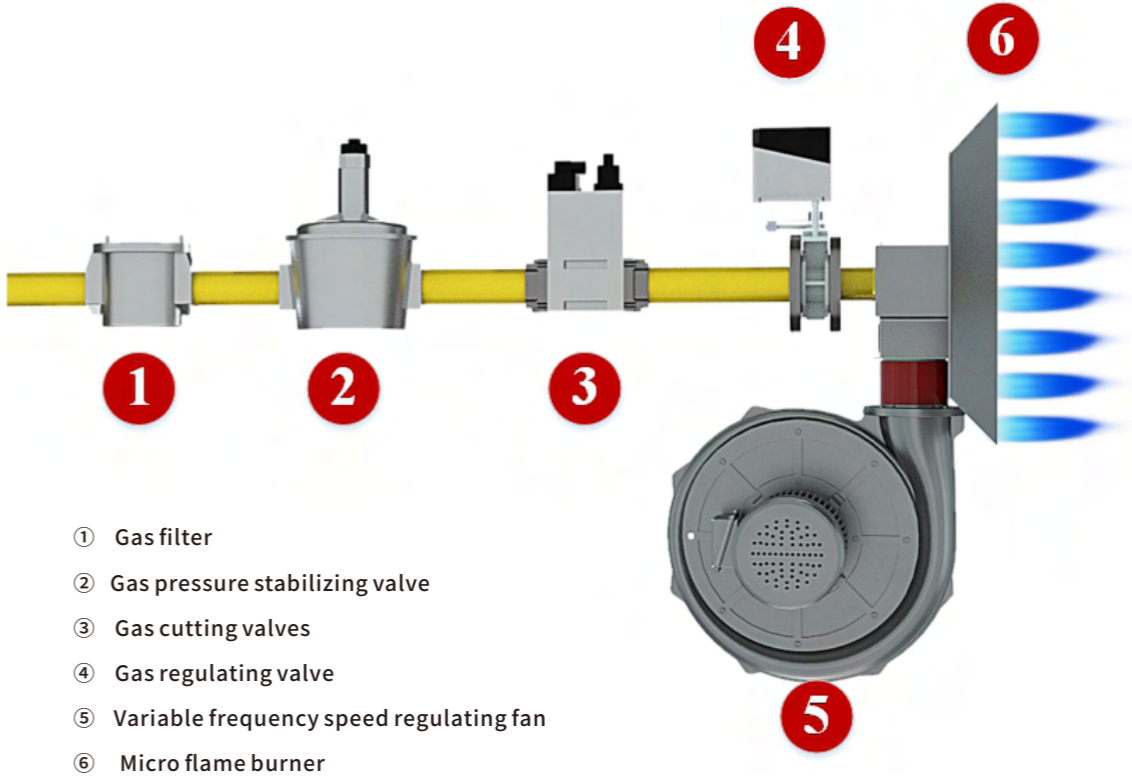
Formed in the flame region by the interaction of hydrocarbons (CHi radicals) formed with nitrogen in the combustion air. This method of forming NOx is very fast. This NOx can only be produced when the oxygen concentration is relatively low. And therefore, it's not a significant source in gas combustion.

Fuel type NOx

The production of fuel-based NOx depends on the nitrogen contained in the fuel. When the nitrogen content of the fuel exceeds 0.1%, the production is already considerable, especially for liquid and solid fuels. The use of natural gas and LPG does not produce this type of NOx.

Hope Deepblue Micro Flame Low Temperature Combustion Technology

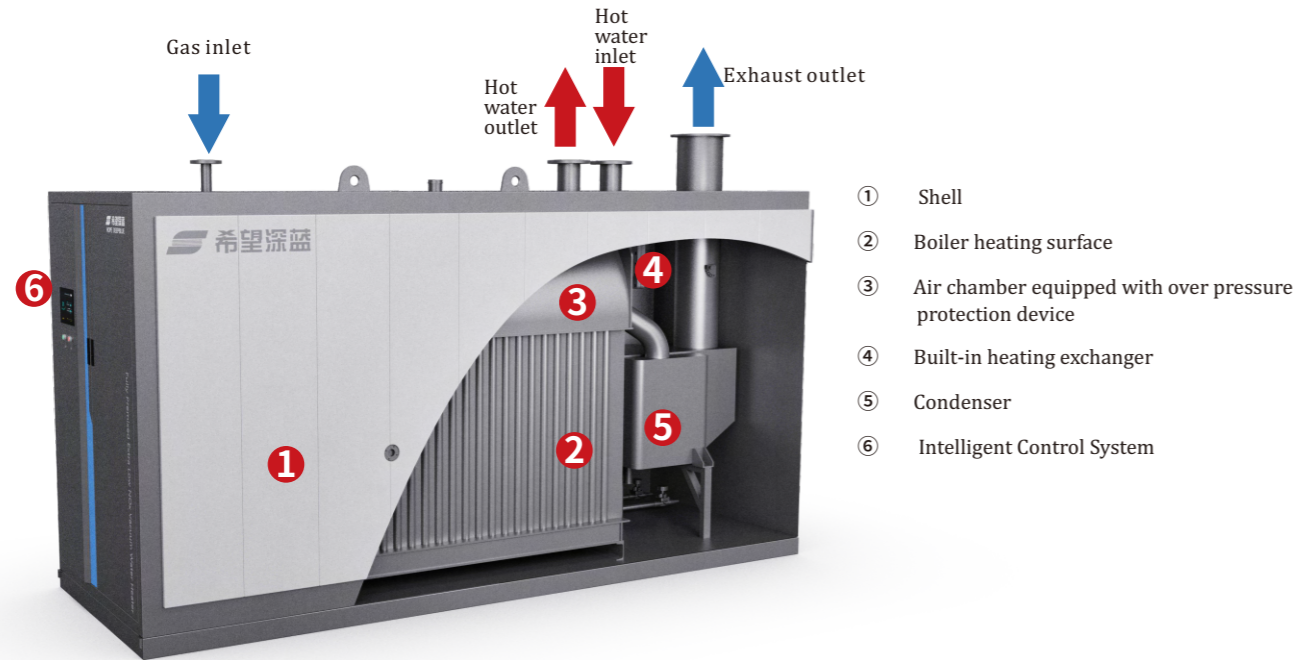
1. Flame cutting, fractional combustion: miniaturization of flames reduces the initial energy of individual flames and lowers flame temperature to radically reduce thermal NOx generation.
2. Microporous jet flame: Physical method to eliminate tempering and ensure system safety.
3. Variable frequency electronic proportional regulation: precise control of oxygen content, eliminating instantaneous NOx, while ensuring efficient combustion and emission compliance at full load.



Basic components of a combustion system

Product Structure

产品结构



- ① Shell
- ② Boiler heating surface
- ③ Air chamber equipped with over pressure protection device
- ④ Built-in heating exchanger
- ⑤ Condenser
- ⑥ Intelligent Control System

Product Advantages

产品优势



Safe

Vacuum phase change heat transfer: no explosion risk, no need for inspection, no installation location restriction, no need for professional operators.
 Reliable internal circulation water quality: fill with soft water or desalted water, no scaling and corrosion risk, long service life.
 Multiple security protection: power supply, gas, air, heat medium water, hot water and other 20 protection measures.
 Full water-cooled film furnace: according to the pressure boiler standard, greater resistance to deflagration and sudden load changes.



Efficient

Vacuum phase change heat transfer: high heat transfer efficiency, internal circulating water in a closed cycle, no need to be replaced.
 Full water-cooled film furnace: low surface temperature, low heat dissipation.
 Operation status real time monitoring: monitor the operation status of fuel, boiler body and hot water, intelligent adjustment of load adaptation to reduce ineffective energy consumption.
 High thermal efficiency: thermal efficiency 97~104% (related to hot water return temperature).



Advanced

Integral modular design: reasonable layout, compact structure, beautiful appearance.
 CFD numerical simulation: control flame temperature and exhaust flow field.
 Low emission: flame cutting, micro flame low temperature combustion technology, the NOx emission of the full load is less than 20mg/m³.
 Unique intelligent control system: simple operation, customized function.
 Global remote operation and maintenance system: global remote expert system, monitor and manage the operation status of the unit, fault prediction and processing.

Protection List

保护列表

| Item | No. | Protection name | Alarm | Interlock action | Note |
|--------------------------|-----|---|-------|---------------------------------|------------------------------|
| Gas system | 1 | High gas pressure | ✓ | Stop | |
| | 2 | Low gas pressure | ✓ | Stop | |
| | 3 | Gas valve leakage | ✓ | Stop | |
| Air system | 4 | Low air pressure | ✓ | Stop | |
| | 5 | Fan overload | ✓ | Stop | |
| | 6 | Inverter fault (lack of phase, over pressure, overload, over current, etc.) | ✓ | Stop | |
| Flame | 7 | No flame (Deflame / Flame Out) | ✓ | Stop | |
| Exhaust system | 8 | High exhaust temperature | ✓ | | |
| | 9 | Exhaust over pressure | ✓ | Explosion door jumps up/Stop | |
| Heat medium water system | 10 | Low liquid level of heat medium water | ✓ | Stop | |
| | 11 | Heat medium water over pressure | ✓ | Stop | |
| | 12 | Heat medium water ultra-limit pressure | ✓ | Rupture disk breaks / Unit stop | Manual replacement and reset |
| | 13 | Heat medium water over temperature | ✓ | Stop | |
| Hot water | 14 | Hot water over temperature | ✓ | Deload | Intelligent adjustment |
| | 15 | Hot water ultra-limit temperature | ✓ | Standby | Automatic restart |
| Software system | 16 | Improper work of servo drive | ✓ | Stop | |
| | 17 | Temperature sensor short circuit/break | ✓ | Stop | |
| | 18 | Hot water outlet and heat medium water setting fault | ✓ | Stop | |
| | 19 | Abnormal air pressure switch | ✓ | Stop | |
| | 20 | Failure of leakage detection and abnormal leakage detection | ✓ | Stop | |
| | 21 | Abnormal flame without ignition | ✓ | Stop | |

Model description Nominal parameters

Model Description 型号编制说明

XWYH 1.4 - 0.8(40/50)0.6(50/60) - N

Additional function: (instruction 1) N-Condenser

Working condition parameter: (instruction 2)

Output power of the first loop: 0.8MW. Return/Supply water temperature: 40/50°C

Output power of the second loop: 0.6MW. Return/Supply water temperature: 50/60°C

Nominal total power: 1.4WM

Series code: Hope Deepblue Fully Premixed Extra Low NOx Vacuum Water Boiler

Note:

1. Additional functions are optional, not within standard supply scope.
2. Working condition parameters are marked one by one according to the loop, and the return/supply water temperature is only marked in the single loop.



Nominal Parameter 额定参数

| Item | Model | XWYH- | 0.24 | 0.35 | 0.53 | 0.7 | 1.05 | 1.4 | 1.8 | 2.1 | 2.5 | 2.8 | 3.5 | 4.2 | 4.9 | 5.6 | 6.3 | 7 | 10.5 | 14 |
|------------------------------|------------------------------------|--------------------|---------------|------|------|------|------|------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Nominal power | MW | | 0.24 | 0.35 | 0.53 | 0.7 | 1.05 | 1.4 | 1.8 | 2.1 | 2.5 | 2.8 | 3.5 | 4.2 | 4.9 | 5.6 | 6.3 | 7 | 10.5 | 14 |
| | 10 ⁴ kCal/h | | 21 | 30 | 46 | 60 | 90 | 120 | 155 | 181 | 215 | 241 | 301 | 361 | 421 | 482 | 542 | 602 | 903 | 1204 |
| Radiator (60~85°C) | Flow | m ³ /h | 8 | 12 | 18 | 24 | 36 | 48 | 62 | 72 | 86 | 96 | 120 | 144 | 169 | 193 | 217 | 241 | 361 | 482 |
| | Pipe diameter | DN | 40 | 50 | 50 | 65 | 65 | 80 | 100 | 100 | 125 | 125 | 125 | 150 | 150 | 200 | 200 | 200 | 200 | 250 |
| Underfloor heating (40~50°C) | Flow | m ³ /h | 21 | 30 | 46 | 60 | 90 | 120 | 155 | 181 | 215 | 241 | 301 | 361 | 421 | 482 | 542 | 602 | 903 | 1204 |
| | Pipe diameter | DN | 50 | 65 | 80 | 100 | 125 | 125 | 150 | 150 | 200 | 200 | 200 | 200 | 250 | 250 | 250 | 300 | 350 | 400 |
| Fan coil (50~60°C) | Flow | m ³ /h | 21 | 30 | 46 | 60 | 90 | 120 | 155 | 181 | 215 | 241 | 301 | 361 | 421 | 482 | 542 | 602 | 903 | 1204 |
| | Pipe diameter | DN | 50 | 65 | 80 | 100 | 125 | 125 | 150 | 150 | 200 | 200 | 200 | 200 | 250 | 250 | 250 | 300 | 350 | 400 |
| Domestic hot water (40~65°C) | Flow | m ³ /h | 8 | 12 | 18 | 24 | 36 | 48 | 62 | 72 | 86 | 96 | 120 | 144 | 169 | 193 | 217 | 241 | 361 | 482 |
| | Pipe diameter | DN | 40 | 50 | 50 | 65 | 65 | 80 | 100 | 100 | 125 | 125 | 125 | 150 | 150 | 200 | 200 | 200 | 200 | 250 |
| Emission | NOx | mg/m ³ | Total load<20 | | | | | | | | | | | | | | | | | |
| | Chimney interface | DN | 100 | 125 | 150 | 200 | 200 | 250 | 300 | 300 | 300 | 350 | 350 | 400 | 450 | 450 | 500 | 500 | 600 | 700 |
| Natural gas | Flow | Nm ³ /h | 24.7 | 36 | 54.5 | 72 | 108 | 144 | 185.2 | 216 | 257.2 | 288.1 | 360.1 | 432.2 | 504.2 | 576.2 | 648.3 | 720.3 | 1082 | 1443 |
| | Pipe diameter | DN | 25 | 40 | 50 | 50 | 65 | 65 | 80 | 80 | 100 | 100 | 100 | 125 | 125 | 125 | 150 | 150 | 200 | 200 |
| Load regulation type | Electronic proportional adjustment | | | | | | | | | | | | | | | | | | | |
| Power supply | 3φ/380V-50HZ | | | | | | | | | | | | | | | | | | | |
| Electrical power | kW | 0.51 | 2.2 | 2.2 | 4.5 | 4.5 | 4.5 | 7.5 | 7.5 | 15 | 15 | 15 | 22 | 22 | 22 | 28 | 28 | 37 | 55 | |
| Weight | t | 1.6 | 2.12 | 3.1 | 3.38 | 4.4 | 5.3 | 6.8 | 7.5 | 9.0 | 10.2 | 11.8 | 13.2 | 15.6 | 18.8 | 21.05 | 22.4 | 37.8 | 49.9 | |
| Dimension | 长 | mm | 3090 | 3400 | 3400 | 3450 | 3850 | 4470 | 4810 | 4810 | 4970 | 5310 | 5330 | 5350 | 5690 | 6030 | 6030 | 8250 | 10580 | |
| | 宽 | mm | 720 | 920 | 920 | 1120 | 1220 | 1420 | 1520 | 1620 | 1720 | 1820 | 2120 | 2320 | 2670 | 2820 | 3100 | 3120 | 3350 | |
| | 高 | mm | 1620 | 1680 | 1880 | 1940 | 2180 | 2260 | 2510 | 2580 | 2790 | 2840 | 3240 | 3410 | 3430 | 3450 | 3480 | 3500 | 3980 | 4050 |

Note:

1. The calorific value of natural gas is based on 8600kCal/Nm³
2. When the supply water temperature ≤ 50°C, the efficiency of unit is 97-104%.
3. The standard hot water nominal working pressure is 1.0MPa, specify the special request, if the pressure is too high.
4. The unit is standard equipped with one loop of hot water, specify the supply/return water temperature when ordering (water supply temperature < 95°C), customization is required if multiple water loops are in demand.

Installation Guide

安装指南

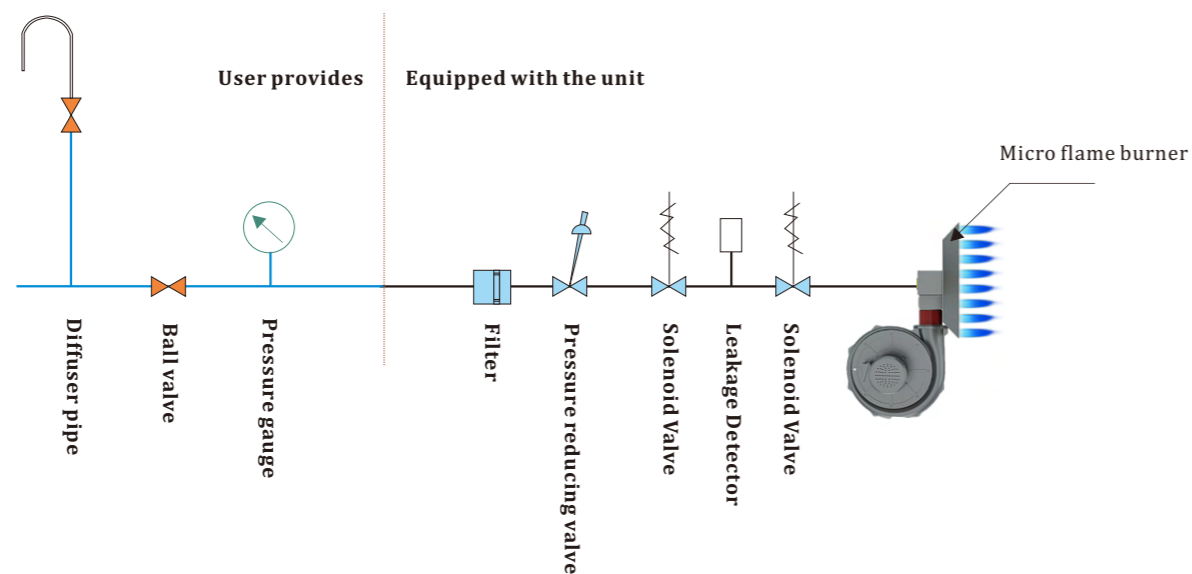


Gas System 燃气系统

- The design and construction of the gas system must conform to the current national standard "Code for Urban Gas Design" and "Gas safety Regulation for Industrial Enterprises".
- The burner gas inlet pressure shall be within the following range.

| Type | XWYH 0.23~0.7 | XWYH 1.05~1.8 | XWYH 2.1~14 |
|----------------------|---------------|---------------|-------------|
| Natural gas pressure | 4~25kPa | 6~30kPa | 8~35kPa |

- The gas inlet pipe of the burner should be installed with a gas diffuser pipe (connected to the outdoor), a ball valve, and a pressure gauge. (Range: 0~50KPa)
- The nominal diameter of the natural gas supply pipe shall be one size larger than the burner gas inlet diameter.



Exhaust System 排烟系统

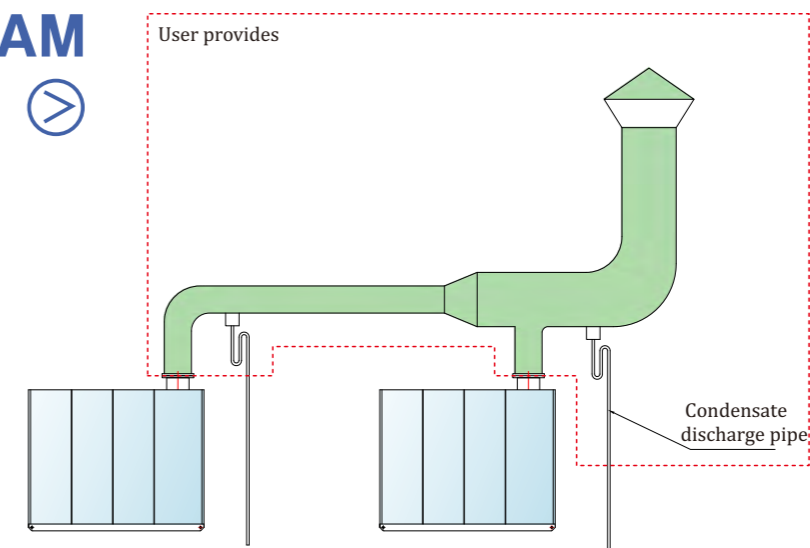
The designed exhaust temperature of the Fully Premixed Extra Low NOx Vacuum Water Boiler is 80°C, exhaust output (m³/h) ≈ heat output (kW) × 2.2(m³/kW · h).

The flue duct structure should minimize flow resistance as possible. The Exhaust pressure of the Fully Premixed Extra Low NOx Vacuum Water Boiler should within -50~0Pa. Chimney height (m) should be ≥0.6×horizontal flue duct length (m) + 1.2×number of flue duct elbows (pcs). The cross sectional area of the circulation of the chimney (or flue duct) shall be not less than the cross-sectional area of the flue outlet of the Fully Premixed Extra Low NOx Vacuum Water Boiler. The circulation cross-sectional area of the common chimney (or flue duct) shall be not less than the sum of the circulation cross-sectional areas of the sub flue duct. The chimney outlet must be equipped with a rain cap, lightning rod and windshield. The diameter of the chimney rain cap should be more than 500mm larger than the diameter of the chimney to ensure that rain will not drift into the chimney or boiler and cause corrosion of the flue pipe.

The bottom of the horizontal flue duct closest to the Fully Premixed Extra Low NOx Vacuum Water Boiler should be equipped with a water collection tank and condensate discharge pipe to discharge flue condensate and rain.

The condensate drain pipe should have a U-shaped water-seal bend to prevent air from being sucked in unit, and condensate can not be discharged.

DIAGRAM 示意图



Machine Room Requirement 机房要求

The Fully Premixed Extra Low NOx Vacuum Water Boiler is free of vibration during the operation, so the foundation can be designed according to static load.

The drainage grooves should be set up around the unit (depth: 50mm, width: 80mm) and the machine room must keep well ventilation.

Typical Project Reference

西安希尔顿酒店



苏州环球188大厦



中国西部国际博览城



南京万达广场



Vacuum hot water boiler model selection 真空热水机组选型表

Please specify the following contents when placing an order (Tick in the and fill in the _____)

Nominal thermal power _____ $\times 10^4$ kcal/h or _____ MW

Function:

- Radiator heating, power _____ inlet/outlet temperature _____ $^{\circ}\text{C}$ / _____ $^{\circ}\text{C}$
- Fan coil heating, inlet/outlet temperature _____ $^{\circ}\text{C}$ / _____ $^{\circ}\text{C}$
- Underfloor heating and domestic hot water, inlet/outlet temperature _____ $^{\circ}\text{C}$ / _____ $^{\circ}\text{C}$
- Other uses, _____ inlet/outlet temperature _____ $^{\circ}\text{C}$ / _____ $^{\circ}\text{C}$

Fuel:

- Natural gas, lower calorific _____ kcal / Nm^3 , pressure _____ kPa
- Artificial gas, lower calorific _____ kcal / Nm^3 , pressure _____ kPa
- Liquefied gas, lower calorific _____ kcal / Nm^3 , pressure _____ kPa
- Other fuel _____, lower calorific _____ kcal / Nm^3 , pressure _____ kPa

Special requirement:

- When hot water pressure is higher than 1.0MPa, specify the pressure: _____ MPa
- Equipped with the RS485 communication interface
- Equipped with the exhaust gas condensation
- Equipped with remote operation and maintenance system

Other special requirements _____

- Xian Hilton Hotel
- Suzhou Universal 188 Building
- Western China International Expo City
- Nanjing Wanda Square
- Oriental Hope Tianxiang Zhidi Square
- Chengdu Wenjiang Bayi Home City
- Eastern Hope Center
- Ningbo Marriott Hotel
- Chongqing Lifan Red Star International Square
- Nanjing Red Sun Furniture Decoration City
- Changchun Ouya Shopping Plaza
- Beijing Yi Lianxuan Real Estate Gediao Community
- Sichuan Provincial Museum
- Xian Shenglong Square
- Wenzhou Li Ticheng Shopping Center
- Shanghai Hengrui Pharmaceutical Co., LTD
- Shandong Feicheng Yiwu International Trade City
- Wuhan Friendship International Square
- Haima Motor Co., Ltd
- Chengdu Jinniu District Government Affairs Center
- Hunan mobile
- Diaoyutai Boutique Hotel
- Wuhai General Times Square
- Jiangsu Yancheng Development Zone Tianhe Optoelectronics
- Hangzhou SMIC wafer semiconductor
- Yunnan Dianzhong Business Square
- Anhui Huaibei People's Hospital
- Hangzhou Asian Games Venues
- CNOOC Marine Engineering equipment Manufacturing base
- Lhasa Shuangchuang Square
- Qiqihar Eastern Hope Group

