

MHI HEAT PUMP

Water to Water
Centrifugal Heat Pump
Heat Recovery Type

ETW



Capacity: 627 kW

Hot Water 80°C Supply



Our Technologies, Your Tomorrow

Water to Water Centrifugal Heat Pump

Heat Recovery Type

ETW

<627 kW>

New

Continuous supply of 80°C water utilizing exhausted waste heat

Save Energy

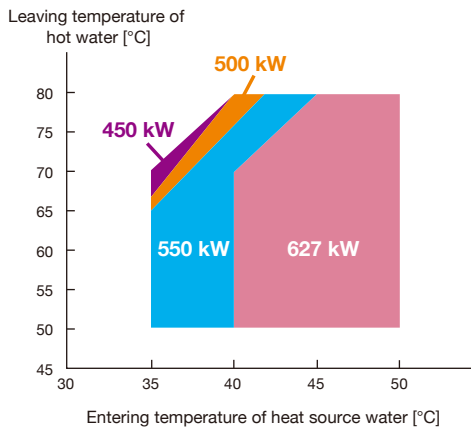
Save Cost & CO₂



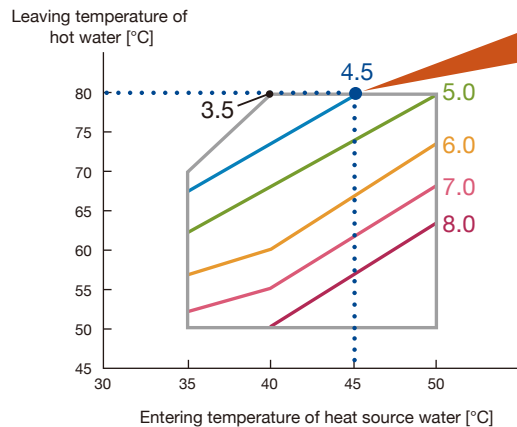
SAVE ENERGY

High efficiency achieved by technologies of MHI centrifugal chiller

Heating Capacity



COP



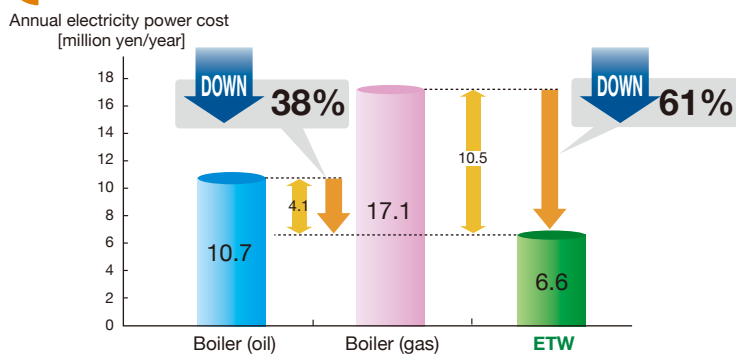
COP

4.5

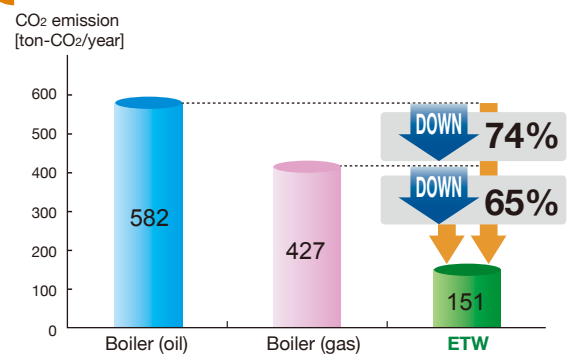
Rated COP achieved entering temperature of heat source water 45°C and leaving temperature of hot water 80°C.

SAVE COST & CO₂

Annual Electricity Cost Reduction



Annual CO₂ Emission Reduction



Conditions of comparison (Rated operation, 3330 h/year)

●1-ton once-through steam boiler

Heat efficiency	Output power	Heavy oil fuel LHV	City gas 13A
95%	627 kW	36.7 MJ/ℓ	40.6 MJ/Nm ³

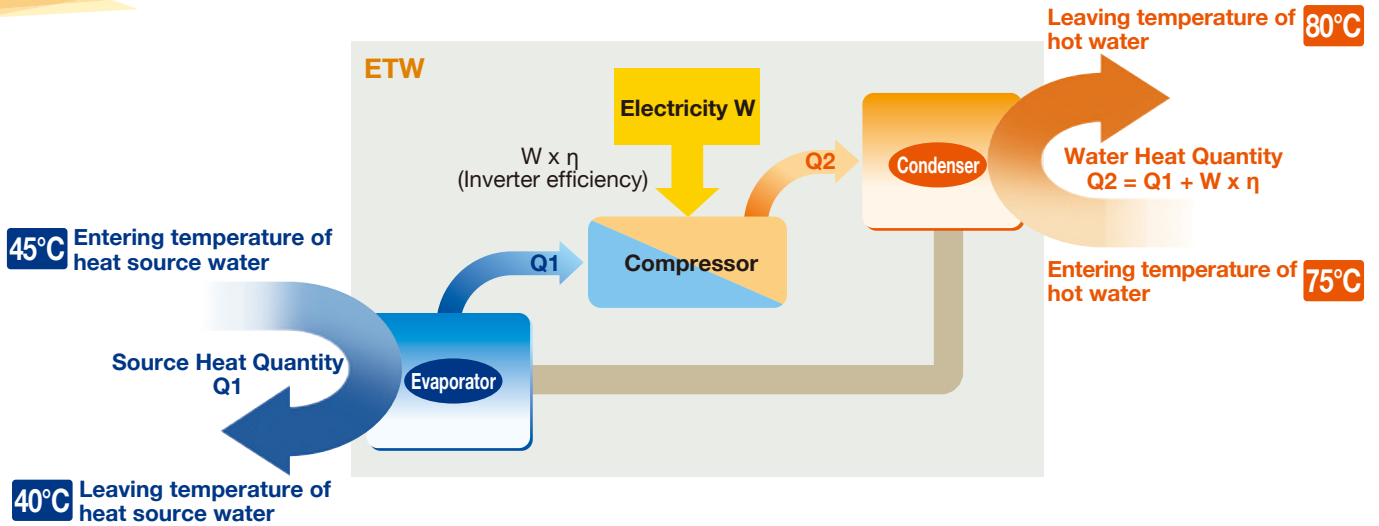
●Unit price

Electricity: 14.5 yen/kWh Heavy oil fuel: 49.8 yen/ℓ City gas 13A: 79.7 yen/Nm³

●CO₂ unit conversion

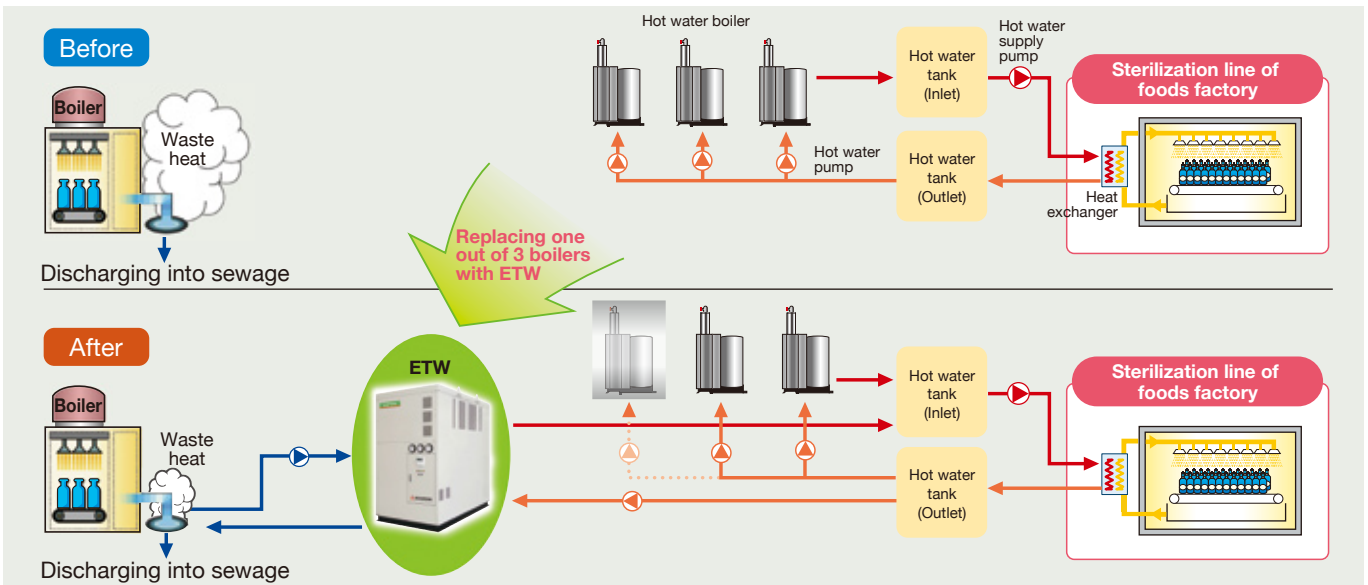
Electricity: 0.332 kg - CO₂/kWh City gas 13A: 2.19 kg - CO₂/m³ Heavy fuel oil: 2.7 kg - CO₂/ℓ

SYSTEM FLOW



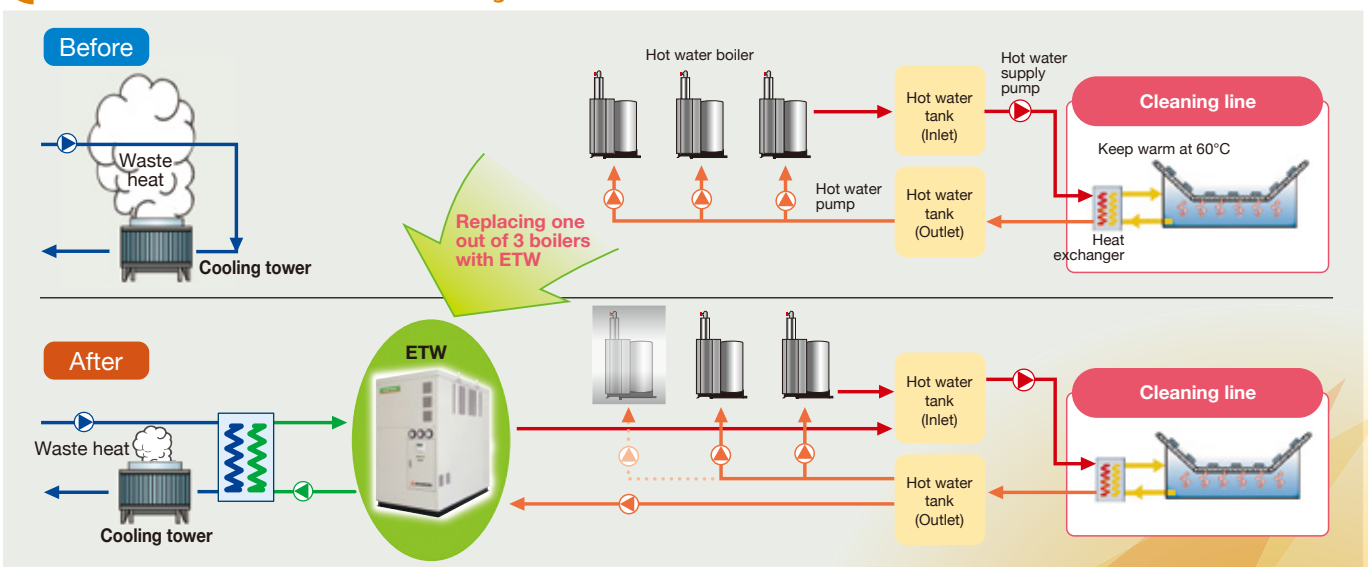
Application Example 1

In case of utilization of discharged heat source water



Application Example 2

In case of utilization of circulation cooling water



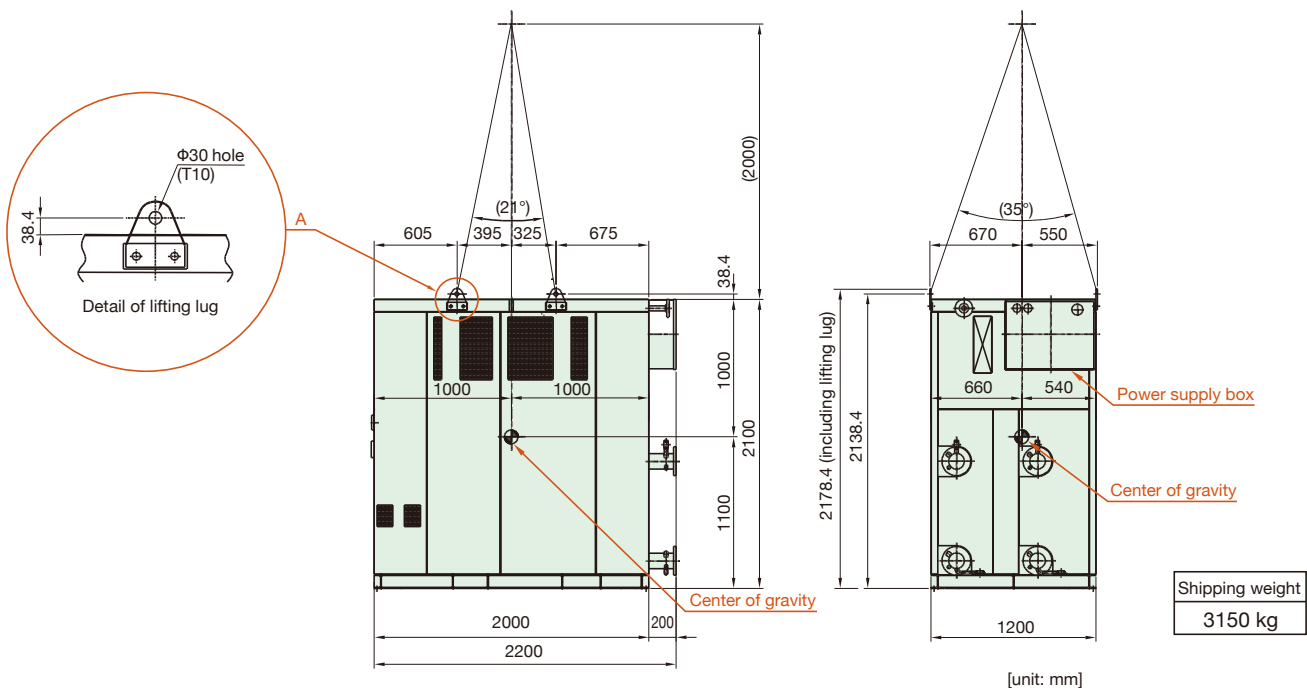
Standard Ratings

Model		ETW-H	
Capacity	Hot water power output	kW	627
	Length	m	2.2
	Width	m	1.2
Dimensions	Height	m	2.1 (including lifting lug 2.2)
	Shipping weight	kg	3150
	Operation weight	kg	3610
Weights	Lubrication oil	—	JOMO FREOL ALPHA 68B
	Charge quantity of lubrication oil	L	15
	Refrigerant	—	R134a
	Charge quantity of refrigerant	kg	195
	Retained water quantity	kg	250
Electricity specification	Power source	V	400 V class (380~440 V), 50/60 Hz free
	Power source: auxiliary	V	200 V class (200~220 V), 50/60 Hz free
	Rated input current	A	240
	Electrical power consumption	kW	136.2
	Starting current	A	Less than rater current value
	Inverter capacity	kW	160
Compressor	Model	—	MCM150W
	Quantity	—	1
	Motor output	kW	115
	Starting method	—	Soft starter by inverter
	Noise (note 4)	dB(A)	Approx. 78 (At 100% load), Approx. 85 (At 20% load)
Evaporator	Water side design pressure	MPa(G)	1.0
	Entering temperature of heat source water	°C	45
	Leaving temperature of heat source water	°C	40
	Flow rate of hear source water	m³/h	84.9
	Nozzle size	—	100A (4 inch)
	Pressure drop	kPa	42
	Drain/Vent size	—	20A (3/4 inch)/15A (1/2 inch)
Condenser	Water side design pressure	MPa(G)	1.0
	Entering temperature of heat source water	°C	75
	Leaving temperature of heat source water	°C	80
	Flow rate of hear source water	m³/h	107.8
	Nozzle size	—	100A (4 inch)
	Pressure drop	kPa	66
	Drain/Vent size	—	20A (3/4 inch)/15A (1/2 inch)
Control	Control equipment		Microcomputer control panel
	Control method		Control of 1st-stage vane, control of motor speed, control of hot gas bypass
	Protecting circuit		High trip evaporator pressure, Low trip evaporator pressure, Inverter failure, Oil differential low pressure, High temperature of oil, Low temperature of oil, Current limit, High temperature of motor, Oil pump error, Sensor error, Stop of heat source water, Stop of hot water, Low temperature of heat source water, High temperature of hot water, Position error of control valve
	Auxiliary machine		Oil pump: 0.4 kW, Heater: 0.5 kW, Cooling fan: 0.1 kW
	Capacity control range		20% (125 kW)~100% (627 kW): continuous control, Less than (Under) 20% (125 kW): control by ON/OFF switch
	Display		Liquid crystal display on remote control board
	Remote control function		Start/Stop, Hot water temperature setting, Status display (pressure, Temperature, Operation, Alarm, Current, Estimated operation hour), Operation schedule setting

Note:

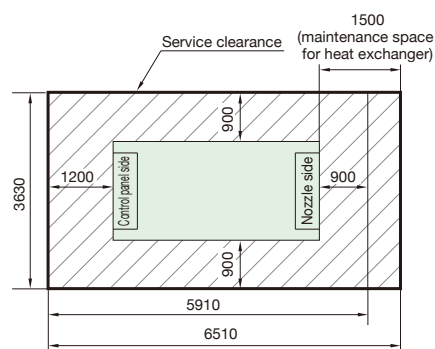
1. Difference of temperature between leaving and entering heat source water: 5°C
2. Ranges of hot water & heat source water temperature are as follows.
Lower limit of temperature of heat source at startup: 10°C
Lower limit of temperature of hot water at startup: 15°C
3. Installation environment are follows
Indoor installation: To be installed in place away form rain, wind, direct sunlight, salt and steam.
To be installed in place away from oil-mist, dust, corrosive gas and flammable gas etc.
To be used in place where ambient temperature is 0°C~40°C, and ambient humidity is 5%~95%.
4. Noise data is for reference only.

Suspension and Center of Gravity

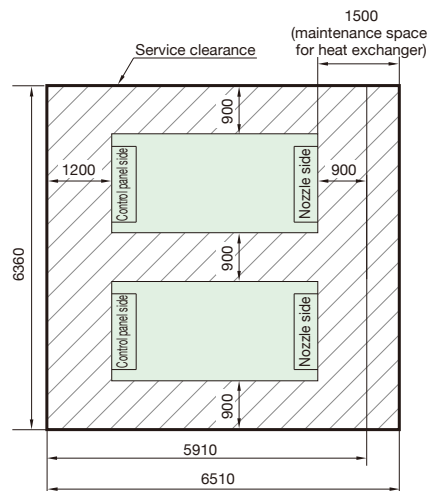


Machine Layout

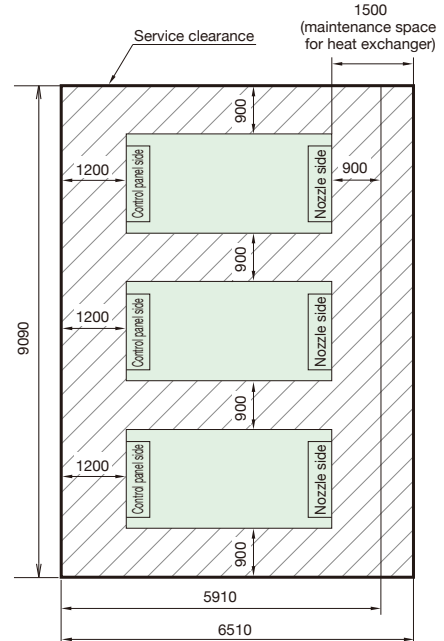
1 Unit Installation



2 Units Parallel Installation



3 Units Parallel Installation



(unit: mm)

Note:

1. Service clearance must be provided as follows: 1200 mm for control panel side, 1500 mm for nozzle side, and 900 mm for the rest of two sides.
2. The piping and flexible joint must be arranged with offsets for flexibility, and adequately supported and balanced independently to avoid strain and vibration transmission on the unit.
3. Plumbing connections of the hot water and the heat source water are made by welding flanges rating: JIS-10K.
4. Thermometers of chilled water and cooling water are furnished by purchaser.
5. Refer to this figure to plan suitable and adequate entrance for machine installation, enough clearance should be provided.
6. The construction of foundation bed and installation work of foundation bolts is purchaser's scope.
7. The piping from the safety valve to outdoor is purchaser's scope.
8. Drainage must be furnished around the foundations by purchaser.
9. Dimensions, nozzle positions, anchor size, anchor hole positions, and power source cable position are subject to change without notice for design progress.

Scope of Supply

○: Standard
×: Out of MHI scope

△: Option
—: Not available

Item		Specifications	
Equipment	Heat Pump Assembly	Indoor type (including control panel)	○
		Outdoor type (including control panel)	—
	Compressor	Hermetic, two-stage, single suction, centrifugal type	○
	Compressor Motor	Liquid refrigerant cooled, hermetic cage type, 3-phase induction motor, 2 pole	○
	Step-up Gear	Integrated inside compressor housing, single helical gear	○
	Lubrication System	Trochoid pump with submerged motor, refrigerant cooled oil cooler, single oil filter, oil heater with temperature control	○
	Oil Mist Separator Tank	Cylinder type, Horizontal	○
	Evaporator & Condenser	Japanese High Pressure Gas Safety Law and JIS	○
		Brazed plate heat exchanger, Design pressure of water side: 1.0 MPa (G)	○
		Design pressure of water side: Over 1.0 MPa (G)	—
	Safety Device	High condensing pressure, Low evaporating pressure, Low oil pressure, Hot and heat source water temperature, Hot and heat source water flow rate, High oil temperature, High compressor motor coil temperature, Low voltage, Compressor motor over load, Inverter failure	○
	Control Panel	Mounted on unit, lamps and control switches	○
	Remote Control Board	Wired remote control board	○
		Wired remote control board with max. 50 m cable	△
	Inverter Panel	Mounted on unit	○
		DC reactor for power factor improvement and harmonic mitigation	○
		380 - 440 V power for compressor motor	○
		200 V, 3 kV, 6 kV, 10 kV and 11 kV power for compressor motor	—
	Power Box	Integrated watt meter	—
		Power fuse medium voltage	—
		Tie transformer for control power (ex: 400/200 V)	—
	Refrigerant	HFC134a in cylinder for one (initial) charge	○
	Lubrication Oil	Ester oil in can for one (initial) charge	○
Accessory	Pressure gauges of condenser, Evaporator and oil pressure, Rubber pad of vibration isolating, One oil filter element (for spare parts)	○	
	Foundation bolt	△	
	Spring mat for vibration isolating	△	
	Thermometer for leaving temperature of hot water	○	
Test	Shop Test	Test in accordance with JIS B8621	○
		Test in accordance with ARI 550/590	—
Witness Test	Witness test at manufacture's (MHI) site	△	
Insulation	Customer's scope. Insulation shall be carried out in accordance with MHI insulation procedure.	×	
Delivery	FOB Kobe port in Japan	○	
	Ex warehouse at Kobe port in Japan (on truck)	△	
	CIF port near site	△	
Shipping Style	Integrated style	○	
	Divided style	—	
Site Works	Foundation	Customer's scope	×
	Installation	Heat pump installation, setting of anchor bolt, water pipe and piping works, and cable and wiring works at site	×
		Supervisor for site installation	△
Commissioning	Supervisor for site commissioning	△	
Others	Drawings	Specification and scope of supply	○
		Machine layout (including foundation)	○
		Outline of control panel	○
		System diagram	○
	Documents	Operation and maintenance manual	○
	Code and Standard	JIS (Japan Industrial Standard), JEC (Japanese Electrotechnical Committee), JEM (The Standard of Japan Electrical Manufacture's Association)	○
		ASME ASTM (Steel Material only)	—
	Capacity Control	100-20%, Controlling compressor speed, compressor inlet guide vane (1st stage) and hot gas bypass valve	○
	Flow Rate Control	Rated flow rate: 100%	○
		Variable flow rate: 100% - 50% (Hot water and heat source water)	
		Flow rate signal input: Provided by customer	△
		Flow switch: Provided by MHI, installation by customer	
	Sequential Control	Excess flow rate	—
		Control 1 unit	○
	Variable Flow Rate Control	Control 2~4 units by “MHI SYSTEM CONTROL PANEL”	△
Fixed flow rate: 100% (ETW trips at 80% of rated flow rate)		○	
Variable flow rate control of heat source water and hot water (Input of flow rate signal is necessary)		△	
Instantaneous Restart	Contact MHI about range of flow rate.		
	To be enable/disable instantaneous function	○	
	In case of instantaneous power failure within 2 seconds, ETW restarts automatically after stop	△	

Item		Specifications	
Others	Display of Each Failure	Display failure code on remote control board	○
		Output of failure signal by communication	△
	Remote Start-Stop Signal	No-voltage pulse signal (a contact point for start, a contact point for stop)	○
		No-voltage pulse signal (a contact point for start, b contact point for stop)	
		Voltage pulse signal (a contact point for start, b contact point for stop)	△
		Voltage pulse signal (a contact point for start, b contact point for stop)	
		No-voltage continuous signal, voltage continuous signal	
	Communication System	Interface and communication to Building Automation System (Available only for LON WORKS®)	—
		Output operation data to central monitor by MHI's smart communication terminal	△
	Output of signal (Digital)	Signal of "Run Operation", "Failure", "Operation Mode Remote", "Alarm", "Compressor running", "Low Load"	○
		Failure is only available in bulk.	△
	Output of signal (Analog)	Failures of individual are able to be supported by the communication device.	
		Failure is only available in bulk.	△
	Control Circuit of Hot-water Flow Rate and Hot-water Temperature	Control start-stop of heat source water pump and hot-water pump by micro control panel (excluding pump motor circuit)	○
		Output of inverter control hot-water pump and bypass valve signals, input of hot-water flow rate signal by customer.	△
	Communication System	—	○
		Remote monitoring system, communication by WEB, Communication by sequencer	△
	Flow Switch of Hot-water and Heat Source Water	Differential pressure switch	○
		Supply of flow switch	△
		Installation on piping by customer	
	Prevention of Vibration	Rubber pad	○
		Spring mat. Contact MHI about other options.	△

SPEC CHECK LIST for MHI WTW Centrifugal Heat Pump [ETW]

Please fill in the below blanks (underlined, boxed and check ☐)

____/____/____
day / month / year

Company name: _____ Project name: _____

Site location: _____

Contact person: _____ Tel: _____

Fax: _____ E-mail: _____

Purpose of usage of heat pump: _____

Estimated delivery date: _____

1 Conditions of HEAT RECOVERY and HOT WATER SUPPLY

HEAT RECOVERY

Temp. : °C

Flow rate: m³/hr

Pressure: MPa

Exhaust heat source:

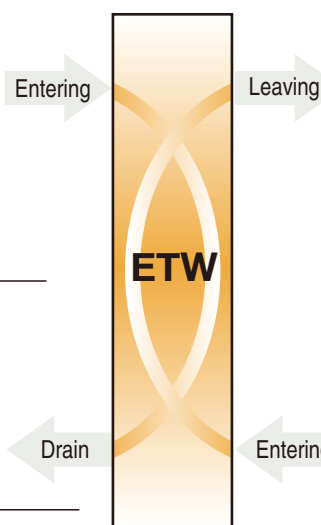
- ☐ Processed water
☐ Circulating water
☐ Boiler
☐ Other _____

Water quality: _____

PH: _____

Leaving temp.: °C

Regulation or
emission cap temp.: _____



HOT WATER SUPPLY

Temp. : °C

Flow rate: m³/hr

Purpose of use:

- ☐ Manuf. process
☐ Circulation
☐ Boiler
☐ Other _____

Temp. : °C

Pressure: MPa

Water quality: _____

PH: _____

Water source:

- ☐ Ground water
☐ Urban water
☐ Industrial water
☐ Soft water
☐ Other _____

2 Utility

Power source: V 50/60 Hz, 3 phase

Installation location (Non-hazardous):

Indoor _____

3 Energy Cost

Currency: _____

Electricity: /kWh

Fuel: ☐ Heavy oil (/Lit) ☐ LPG (/kg)
☐ LNG (/Nm³) ☐ Other _____

Operating hours: hr/day,
 days/month,
 hr/year

4 Scope of Supply

- ☐ Heat pump unit
☐ Site fabrication work
(Piping · Wiring · Installation)
☐ Auxiliary (Pumps · Tanks)
☐ Other _____

5 Other Information/Special Requirement

Necessary information

ISO 9001



Certificate number: JQA-0709
Date of certificate: December 16, 1994

Our Air-Conditioning & Refrigeration Systems Headquarters is an ISO (International Organization for Standardization) 9001 quality management system certified organization.

PED



Certificate: PED97/23/EC Module H1
Certificate number: 01 202J/Q-010001
Certified by: TÜV CERT (Germany)
Date of certificate: April 22, 2001

Our Air-Conditioning & Refrigeration Systems Headquarters is a PED (Pressure Equipment Directive) 97/23/EC Module H1 certified organization.

ISO 14001



Certificate number: YKA 0771887
Date of certificate: June 26, 1998

Our Production Shop, Centrifugal & Absorption Chiller Dept., Air-Conditioning & Refrigeration Systems Headquarters is an ISO (International Organization for Standardization) 14001 environmental management system certified organization.



**Air-Conditioning & Refrigeration Systems Headquarters
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Sales & Marketing Section**

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Because of our policy of continuous improvement, we reserve right to make changes in all specifications without notice.

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www.mhi.co.jp/en/products/category/centrifugal_chiller.html



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