

super EQOS

FAI Series



EQOS Steam Boiler

GAS EQi (H) Series

OIL EQI Series

For more information, please contact the following offices.

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AFFILIATES

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ISO 9001 certified



ISO 14001 certified



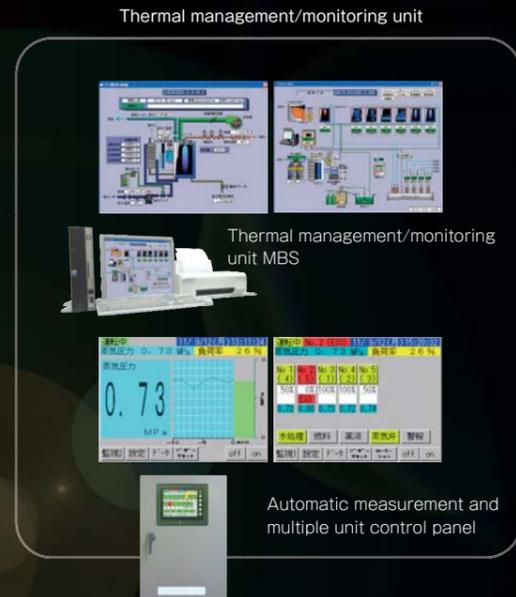
● Please note that the descriptions are subject to change without prior notice.

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“Super EQOS” Series, high-end models pursuing high efficiency and excellent functions

Realizes higher levels of performance, leading to a new stage of once-through boilers

“Higher Levels of Performance”



1 Water softener

This device thoroughly removes substances in raw water that increase the water hardness and cause scale to adhere to the boiler without troubling users. The high-performance water hardness leakage sensor strengthens reliability by regularly checking the water hardness when water is passed and immediately switching the water softener to another one if water hardness leakage is detected.

2 Feedwater tank

Feedwater deaeration and boiler water supply are automated. Of course, an opening for drain recovery is provided and can be used together. The tank is made of stainless steel, which is resistant to rust.

3 Nitrogen gas type deoxygenation device

Utilizes a method to blow in nitrogen gas into the water and remove other gases. When water contacts nitrogen gas, dissolved oxygen in the water moves to air bubbles of the nitrogen gas that have a lower oxygen partial pressure.

4 Chemical feeding equipment

By injecting a water treatment chemical (Thermo Fresh), this device treats scale and a slight amount of substances increasing the water hardness that cannot be treated by the water softener.

5 Pure chemical Thermofresh

This pure chemical for (simplified / compact / large) once-through boilers prevents various failures and troubles caused by water and supports their stable operation for a long period of time.

6 Carbon dioxide pH neutralization device

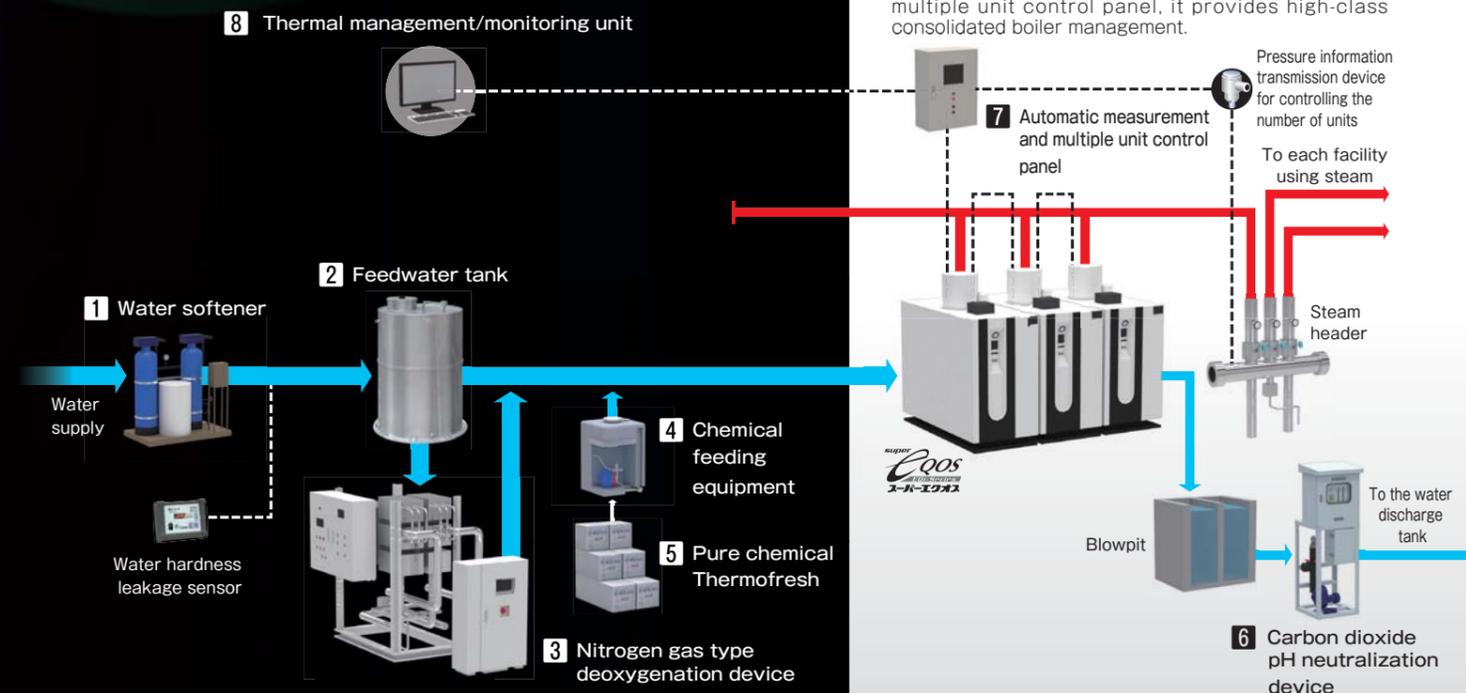
Delivers superior performance in pH treatment of boiler blow-down water. A proprietary technique of controlling the inside of the pipe provides a high mixing rate, and easy operations and maintenance are realized. In addition, this space-saving device can easily be installed both indoors and outdoors.

7 Automatic measurement and multiple unit control panel

For multiple boilers, this device properly controls operation of each boiler according to the steam load.

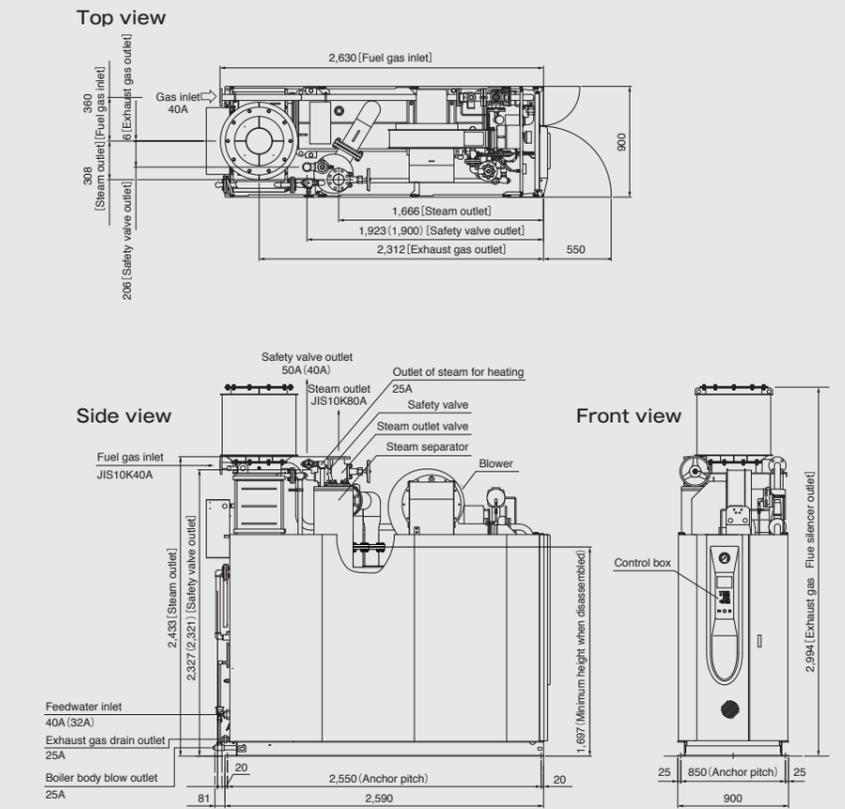
8 Thermal management and monitoring unit

In combination with the automatic measurement and multiple unit control panel, it provides high-class consolidated boiler management.





External dimensional drawing (unit: mm)



* Values in () show dimensions of EQi-2000.

EQi-2000•2500NM/LM

Once-through boiler Conversion evaporation: 2,000/2,500kg/h

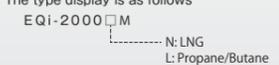
■ Specifications

Item	Type ^{*1}	EQi-2000NM/LM	EQi-2500NM/LM	Item	Type ^{*1}	EQi-2000NM/LM	EQi-2500NM/LM				
Performance	Conversion evaporation	kg/h	2,000	2,500	Power source	Three phase, AC 200V, 50/60Hz					
	Actual evaporation	kg/h	1,676	2,096		Facility electric power	9.4	10.9			
	Thermal output	kW	1,254	1,567			Sub - items	Feedwater pump motor	kW	2.2	3.7
	Heating surface area	m ²	9.8					Blower motor	7.0		
	Maximum working pressure	MPa	0.98		Control box	0.2					
	Boiler efficiency	%	98		Connecting pipe diameter	Fuel inlet	40				
	Holding water quantity	ℓ	200			Feedwater inlet	A	32	40		
	Fuel consumption	Max combustion capacity (input)	kW	1,279		1,599	Steam outlet	80			
			LNG	m ³ (N)/h		113.5	141.8	Safety valve discharge outlet	40(80) / 50(80)		
			Propane	kg/h	99.3	124.1	Exhaust gas outlet	φmm	400 (Flue silencer outlet)	450 (Flue silencer outlet)	
Butane			m ³ (N)/h	38.7	48.4	Product weight	kg	2,500	2,600		
	kg/h	100.8	126.0								

- Notes:
- The actual evaporation is the value for the saturated steam at 15°C feedwater temperature and 0.49MPa steam pressure.
 - The boiler efficiency value is calculated by the heat loss scheme provided in JIS B 8222-1993. However, the calculation is made under the following conditions. 0.49MPa steam pressure, 15°C feedwater temperature, 35°C charge air temperature
 - The margins of error are as follows:
 • Boiler efficiency error: ±1% • Combustion capacity error: ±3.5%
 - The fuel consumptions are calculated based on the following fuel lower calorific values:
 LNG : 40.6MJ/m³ (N)
 Propane : 93.7MJ/m³ (N), 46.4MJ/kg
 Butane : 118.9MJ/m³ (N), 45.7MJ/kg
 - Install the gas piping so as to ensure a sufficient feed gas pressure, even while the boiler is running, stopped, or other gas equipment is being operated.
 Supply gas pressure: 0.03 to 0.3MPa

- The main unit of the boiler come with an economizer. Be sure to set the feedwater temperature to 50°C or higher.
- If the feedwater temperature is high when, for example, collecting the drain water, fuel consumption may be reduced as the standard of actual evaporation.
- The diameter of the safety valve discharge outlet shown between parentheses applies piping for blowing outdoors.
- Maximum combustion capacity (input) is computed based on the standard lower calorific value.
- The silencer for the flue is included as standard. The position to connect the flue is the outlet of the silencer for the flue.

*1. The type display is as follows



POINT 1

Supplies high-quality steam

A combination of the advanced water level control according to two parameters of the combustion capacity and pressure, and the newly designed baffle plate type separator has realized resistance to load fluctuations and stable steam dryness of 99% or more.

Steam dryness **99% or more**



POINT 2

Super high efficiency & reduced electricity consumption

Combustion at a low fuel-air ratio contributed to achieving industry leading boiler efficiency of 98%. Tightening air supply for combustion means that there is no need to heat redundant air exceeding the amount of air necessary for combustion, leading to improvement in boiler efficiency.

With combustion at a low fuel-air ratio, energy consumption for operating the blower has been reduced by 10% as compared with conventional products. In addition to this, the inverter controls the number of rotation according to the boiler load, which largely reduces energy consumption for the blower during a low load operation. Saving fuel and electricity consumption contributes to reducing CO₂ emissions as well as operation costs.

Boiler efficiency **98%**

Partial load efficiency **100%** (load factor: 20%)

Turndown ratio **5:1*** (four-level control)

* The turndown ratio represents a ratio between the rated (maximum) combustion capacity and smallest combustion capacity. When it is 5:1, the combustion capacity can be reduced to 20%.

Reduction in operation costs and CO₂ emissions when using EQi-2500

Annual load factor	30%
Boiler efficiency	98%
Annual fuel saving amount	4,000m ³ N
Fuel-air ratio for combustion (exhaust gas O ₂ concentration)	1.17 (O ₂ =3.0%)
Energy for activating the blower	5.8kW
Energy consumption saved in a year	Approx. 1,300kWh
LNG CO ₂ emissions factor	2.08kg-CO ₂ /m ³ N
Electricity CO ₂ emissions factor	0.555kg-CO ₂ /kWh
CO ₂ emissions reduced in a year	Approx. 9t-CO ₂

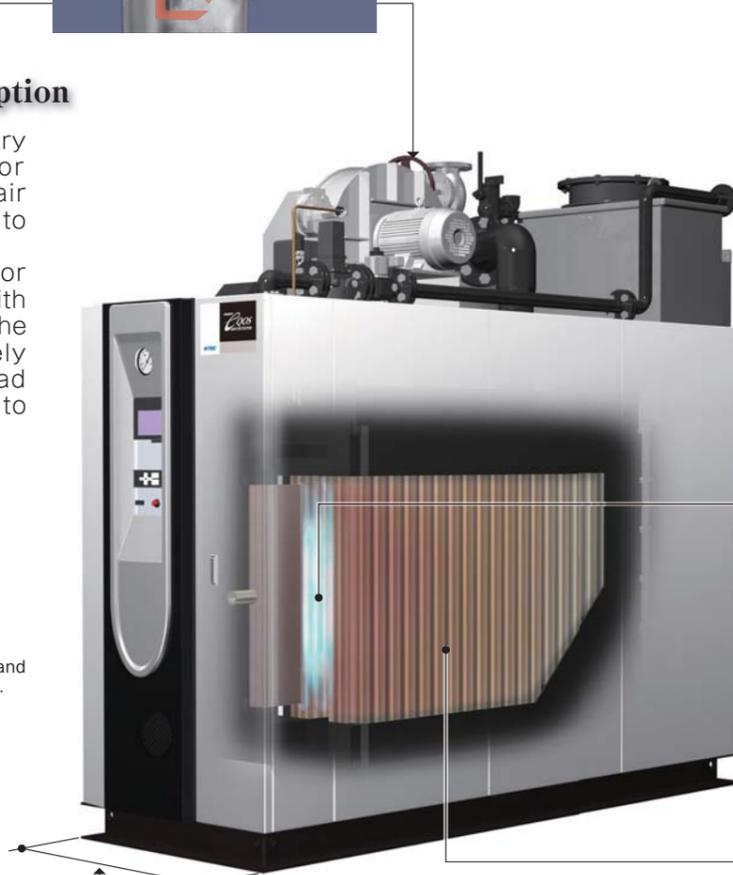
CO₂ emissions factor: According to "Calculation Method of Greenhouse Gas Emissions" by Ministry of the Environment

POINT 3

Space saving design

With an installation width of 900mm, which is the smallest level in the industry, a slender boiler package with a compact body has been realized.

Overall width **900mm**



POINT 4

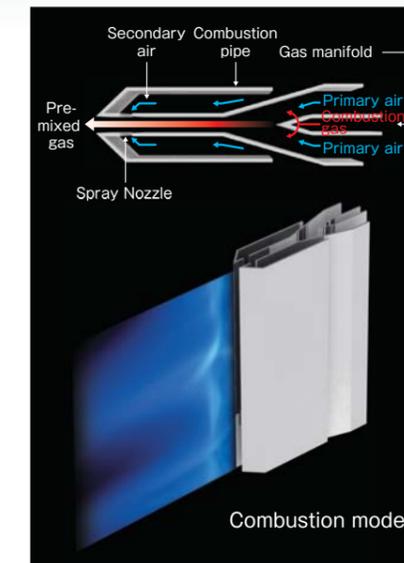
Combustion with super low emissions reduces burden to the environment

In combustion at a low fuel-air ratio in which air supply for combustion is tightened, reducing emissions of CO and NO_x has been extremely difficult with conventional techniques. The jet film combustion technique, however, contributed to achieving super low emissions which are at NO_x=25ppm and CO=30ppm levels in combustion at a low fuel-air ratio. This is a revolutionary gas emission performance that greatly surpasses existing combustion technologies.

Jet film combustion[®] is adopted
At a low fuel-air ratio, low **NO_x 25ppm**
CO 30ppm

NO_x emissions of EQi-2000/2500

Fuel-air ratio for combustion (exhaust gas O ₂ concentration)	NO _x emissions (O ₂ =0% conversion value)
	EQi-2000 • 2500
1.35 (O ₂ =5.5%)	10ppm
1.25 (O ₂ =4.2%)	15ppm
1.17 (O ₂ =3.0%)	25ppm

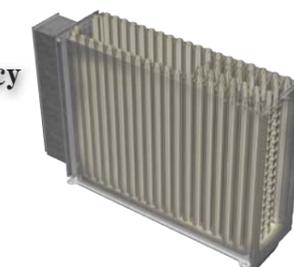


POINT 5

Boiler body with low pressure drop and high efficiency

By further optimizing rectangle-shaped combustion chamber and water pipes (arranged heat-conductive water pipes adopting the downflow system), which are our proven technologies used in the conventional models, the boiler body structure ensuring high efficiency and a low level of pressure drop has been realized.

Boiler body enabling high efficiency and a low fuel-air ratio is adopted



EQi series comes standard with the S-Navi system
System management for safer and securer maintenance...

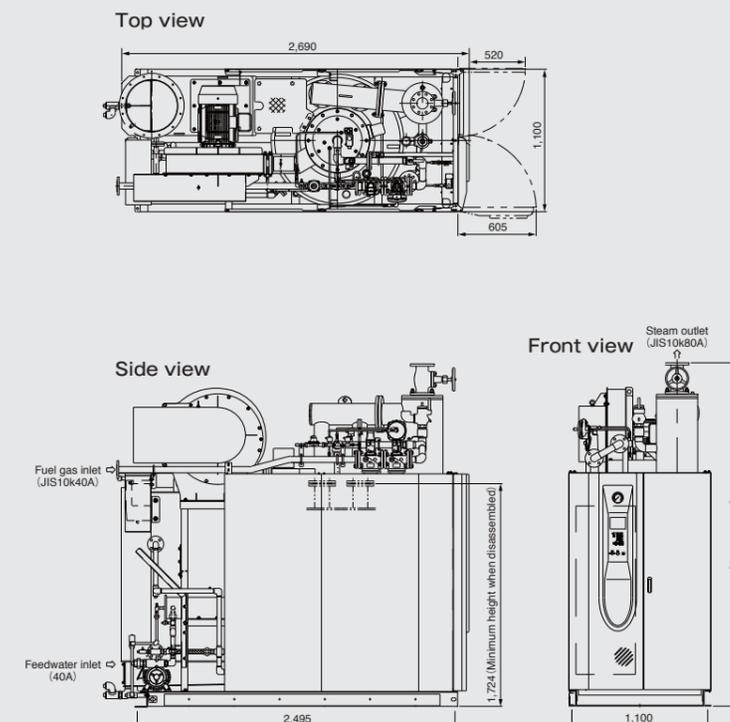
Management of boiler control and maintenance with the S-Navi system (common for both gas and oil fired types, mounted to all models as standard)

We call the whole process including efficiently generating steam, controlling, managing, and maintaining the boiler "Steaming", and this system, named "Steaming Navi", is designed to have not only an advanced control function for the boiler but also a function to provide operators with appropriate information and guidance for boiler operations. In addition to boiler control, this control system can give operators easily-understandable information that goes into the boiler management area with easy operations.





External dimensional drawing (unit: mm)



EQi-3000NM/LM

Once-through boiler Conversion evaporation: 3,000kg/h

■ Specifications

Item	Type*1	EQI-3000NM/LM	Item	Type*1	EQI-3000NM/LM		
Conversion evaporation		3,000	Power source		Three phase, AC 200V, 50/60Hz		
Actual evaporation	kg/h	2,514	Facility electric power		14.9		
Thermal output	kW	1,881	Sub-items				
Heating surface area	m ²	9.85	Feedwater pump motor	kW	3.7		
Maximum working pressure	MPa	0.98	Blower motor		11.0		
Boiler efficiency	%	98	Control box		0.2		
Holding water quantity	ℓ	180	Fuel inlet	A	40		
Max combustion capacity (input)	kW	1,919	Feedwater inlet		40		
Performance	Connecting pipe diameter		Steam outlet		80		
			Safety valve discharge outlet		50 (80)		
			Exhaust gas outlet		φmm 400		
			Product weight		kg 2,990		
Fuel consumption			Performance				
			LNG	m ³ (N)/h	170.2	Power source	Three phase, AC 200V, 50/60Hz
			Propane	kg/h	148.9	Facility electric power	14.9
			Butane	m ³ (N)/h	58.1	Sub-items	
			Feedwater pump motor	kW	3.7		
			Blower motor		11.0		
			Control box		0.2		
			Fuel inlet	A	40		
			Feedwater inlet		40		
			Steam outlet		80		
			Safety valve discharge outlet		50 (80)		
			Exhaust gas outlet		φmm 400		
			Product weight		kg 2,990		

- Notes: 1. The actual evaporation is the value for the saturated steam at 15°C feedwater temperature and 0.49MPa steam pressure.
 2. The boiler efficiency value is calculated by the heat loss scheme provided in JIS B 8222-1993. However, the calculation is made under the following conditions. 0.49MPa steam pressure, 15°C feedwater temperature, 35°C charge air temperature
 3. The margins of error are as follows:
 - Boiler efficiency error: ±1% - Combustion capacity error: ±3.5%
 4. The fuel consumptions are calculated based on the following fuel lower calorific values:
 LNG : 40.6MJ/m³ (N)
 Propane : 93.7MJ/m³ (N), 46.4MJ/kg
 Butane : 118.9MJ/m³ (N), 45.7MJ/kg

5. Install the gas piping so as to ensure a sufficient feed gas pressure, even while the boiler is running, stopped, or other gas equipment is being operated.
 Supply gas pressure: 0.03 to 0.3MPa
 6. The main unit of the boiler come with an economizer. Be sure to set the feedwater temperature to 50°C or higher.
 7. If the feedwater temperature is high when, for example, collecting the drain water, fuel consumption may be reduced as the standard of actual evaporation.
 8. The diameter of the safety valve discharge outlet shown between parentheses applies piping for blowing outdoors.
 9. Maximum combustion capacity (input) is computed based on the standard lower calorific value.
 *1. The type display is as follows
 EQi-3000 □ M
 □ : LNG
 □ : Propane/Butane

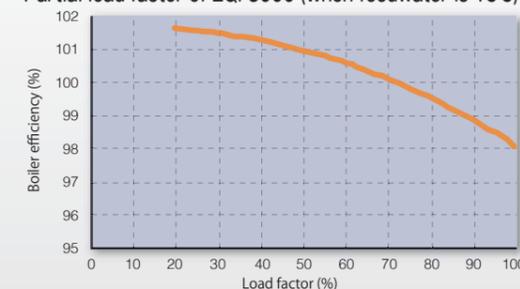
POINT 1 Large energy savings with highly efficient operations

Boiler efficiency **98%**
 Partial load efficiency **101.5%** (load factor: 20%)
 Turndown ratio **5:1*** (four-level control)

The combustion control at four levels, 0-20-50-100%, largely improves efficiency when a load of 20 to 30% is applied. Eliminating unnecessary activations and stops largely saves energy consumption.

* The turndown ratio represents a ratio between the rated (maximum) combustion capacity and smallest combustion capacity. When it is 5:1, the combustion capacity can be reduced to 20%.

Partial load factor of EQi-3000 (When feedwater is 15°C)



POINT 2 Stable supply of high-quality dried steam

Steam dryness **99% or more**

The water level control according to the steam pressure and combustion capacity enables stable supply of dried steam.

POINT 3 Comfortable silence design

Achieved 75dB (at the front side of the boiler).

POINT 4 Fan inverter included as standard

The blower and feedwater pump are controlled with the fan inverter.

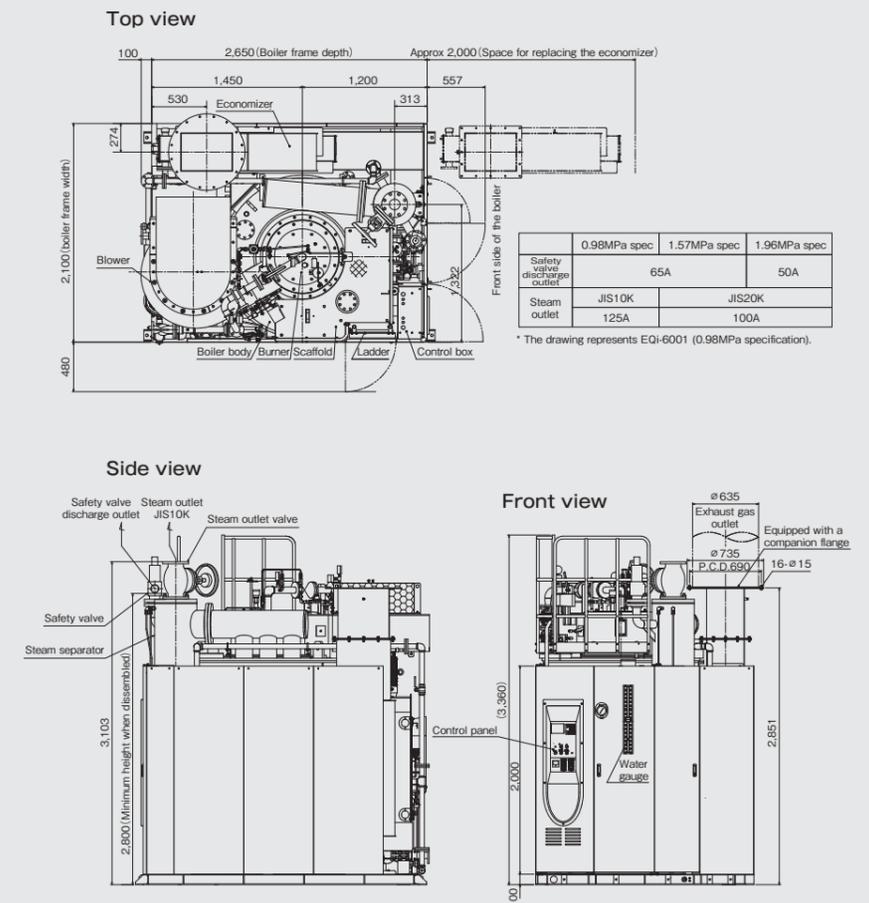
POINT 5 Low NOx emissions reduce burden to the environment

NOx emissions=**60ppm or less** (O₂=0% conversion value)

With the pre-mixed and separated flame burner, the NOx emissions is 45ppm or less in a rated operation. (when the LNG type is used)



External dimensional drawing (unit: mm)



EQi(H) - 6001NM / LM

Once-through boiler Conversion evaporation: 6,000kg/h

■ Specifications

Item	Type ¹⁾	EQiH-6001NM/LM		Item	Type ¹⁾	EQiH-6001NM/LM		
		EQi-6001NM/LM	1.57MPa spec			1.96MPa spec	EQi-6001NM/LM	1.57MPa spec
Conversion evaporation	kg/h	6,000		Power source		Three phase, AC 200V, 50/60Hz		
Actual evaporation		5,030	4,970	4,960	Facility electric power	27.7	29.7	33.2
Thermal output	kW	3,761		Feedwater pump motor	kW	5.5	7.5	11.0
Heating surface area	m ²	25.3		Blower motor		22.0		
Maximum working pressure	MPa	0.98	1.57	Control box		0.2		
Boiler efficiency	%	99		Fuel inlet	A	50		
Holding water quantity	ℓ	670		650		Feedwater inlet	50	
Max combustion capacity (input)	kW	3,800	3,819	3,819	Steam outlet	125	100	
Fuel consumption	LNG	m ³ (N)/h	336.8	338.5	Safety valve discharge outlet	65(100)		50(80)
	Propane	kg/h	146.0	146.7	Exhaust gas outlet	φ635 (Outer diameter)		
	Butane	m ³ (N)/h	115.0	115.6	Product weight	kg	7,450	7,520
	kg/h	299.1	300.7					

- Notes: 1. The actual evaporation is the value for the saturated steam under the following conditions:
 0.98MPa spec: 15°C feedwater temperature, 0.49MPa steam pressure
 1.57MPa spec: 15°C feedwater temperature, 1.3MPa steam pressure
 1.96MPa spec: 15°C feedwater temperature, 1.6MPa steam pressure
2. The boiler efficiency value is calculated by the heat loss scheme provided in JIS B 8222-1993. However, the calculation is made under the following conditions.
 0.98MPa spec: 0.49MPa steam pressure, 35°C feed air temperature, 15°C feedwater temperature
 1.57MPa spec: 1.3MPa steam pressure, 35°C feed air temperature, 15°C feedwater temperature
 1.96MPa spec: 1.6MPa steam pressure, 35°C feed air temperature, 15°C feedwater temperature
3. The margins of error are as follows:
 • Boiler efficiency error: ±1% • Combustion capacity error: ±3.5%
4. The fuel consumptions are calculated based on the following fuel lower calorific values:
 LNG : 40.6MJ/m³ (N)
 Propane : 93.7MJ/m³ (N), 46.4MJ/kg
 Butane : 118.9MJ/m³ (N), 45.7MJ/kg
5. Install the gas piping so as to ensure a sufficient feed gas pressure, even while the boiler is running, stopped, or other gas equipment is being operated.
 Supply gas pressure: 98 to 294kPa
6. The main unit of the boiler come with an economizer. Be sure to set the feedwater temperature to 50°C or higher.
7. If the feedwater temperature is high when, for example, collecting the drain water, fuel consumption may be reduced as the standard of actual evaporation.
8. The diameter of the safety valve discharge outlet shown between parentheses applies piping for blowing outdoors.
9. Maximum combustion capacity (input) is computed based on the standard lower calorific value.
10. An electromagnetic feedwater flowmeter is adopted as standard. If the boiler feedwater has an electrical conductivity lower than 1mS/m, the flow rate cannot be measured in some cases. Please consult with our sales representative.
- *1. The type display is as follows
- EQiH-6001 □ M
- N: LNG
 □ L: Propane/Butane
 □ H: High pressure
 □ None: Standard

POINT
1

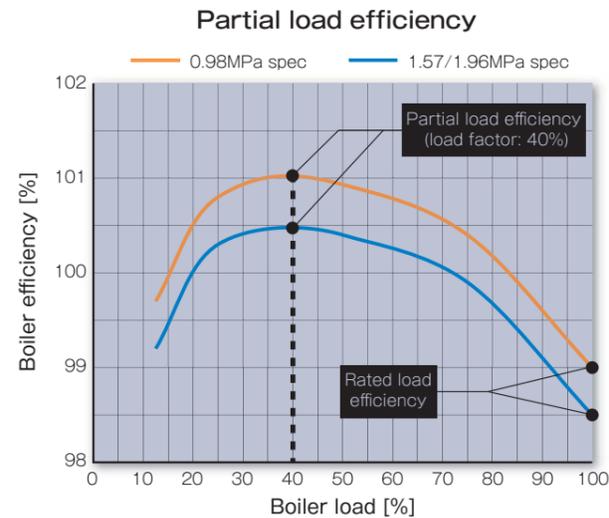
Industry leading super-highly efficient operation!

Boiler efficiency of 100% or more has been achieved during partial loading. The boiler does not repeat activations and stops even during a low steam load operation, which enables the high operation efficiency to be maintained.

Rated load efficiency **99%***

Partial load efficiency **101%***
(load factor: 40%)

* 0.98MPa specification (0.49MPa steam pressure, 35°C feed air temperature, 15°C feedwater temperature)



POINT
2

PI control (pressure control)

The pressure is controlled with the PI (proportional integral) control method, and the boiler pressure is stable regardless of whether the load keeps stationary or changes.

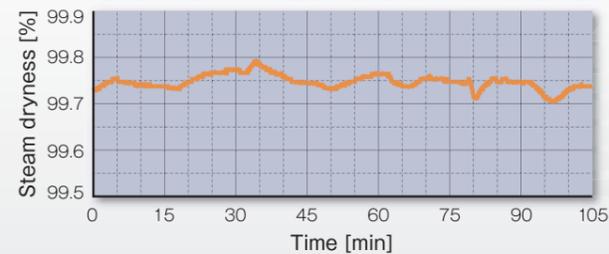
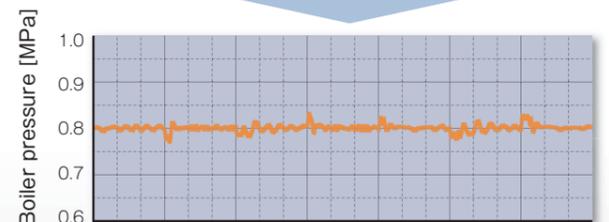
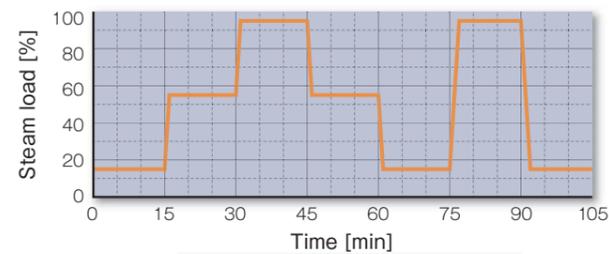
Range of pressure fluctuations : ± 0.005 MPa
when the load keeps stationary

Range of pressure fluctuations : ± 0.025 MPa
when the load changes

In addition, even when the load changes, the steam dryness is excellent and high-quality steam can be supplied.



Steam pressure during automatic operation, steam dryness (with respect to the steam load)



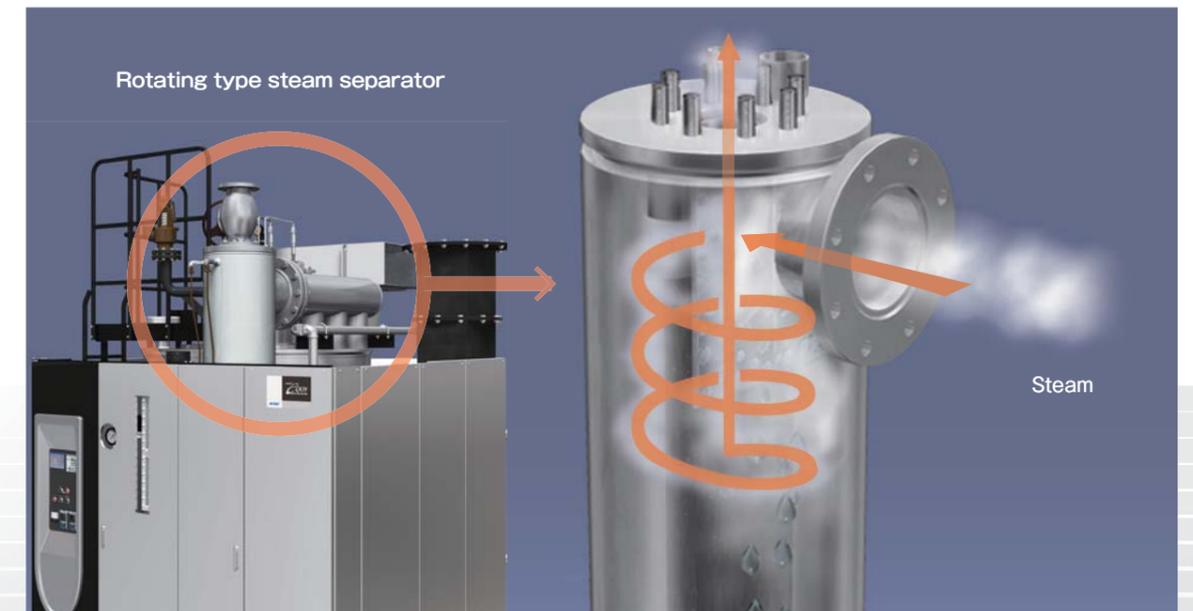
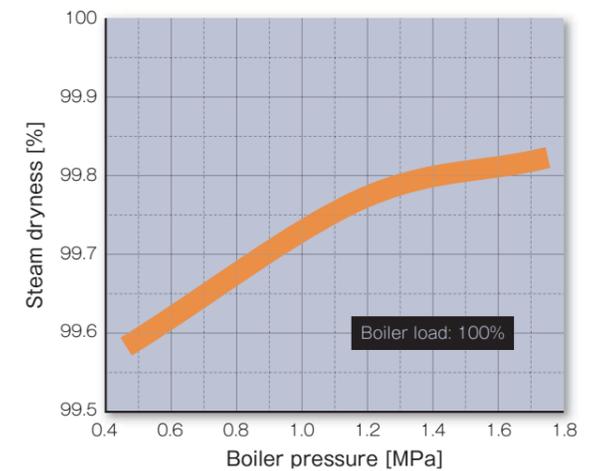
POINT
3

Stable supply of high-quality dried steam

In a wide range of the pressure, steam dryness of 99.5% or more has been achieved.

Steam dryness **99.5% or more**

Steam dryness during a rated operation (with respect to the boiler pressure)



POINT 4

Highly efficient operation reduces burden to the environment

By adopting a proportionally controlled burner having a high turndown ratio, the operation efficiency and load following capability at a low load operation have been improved.

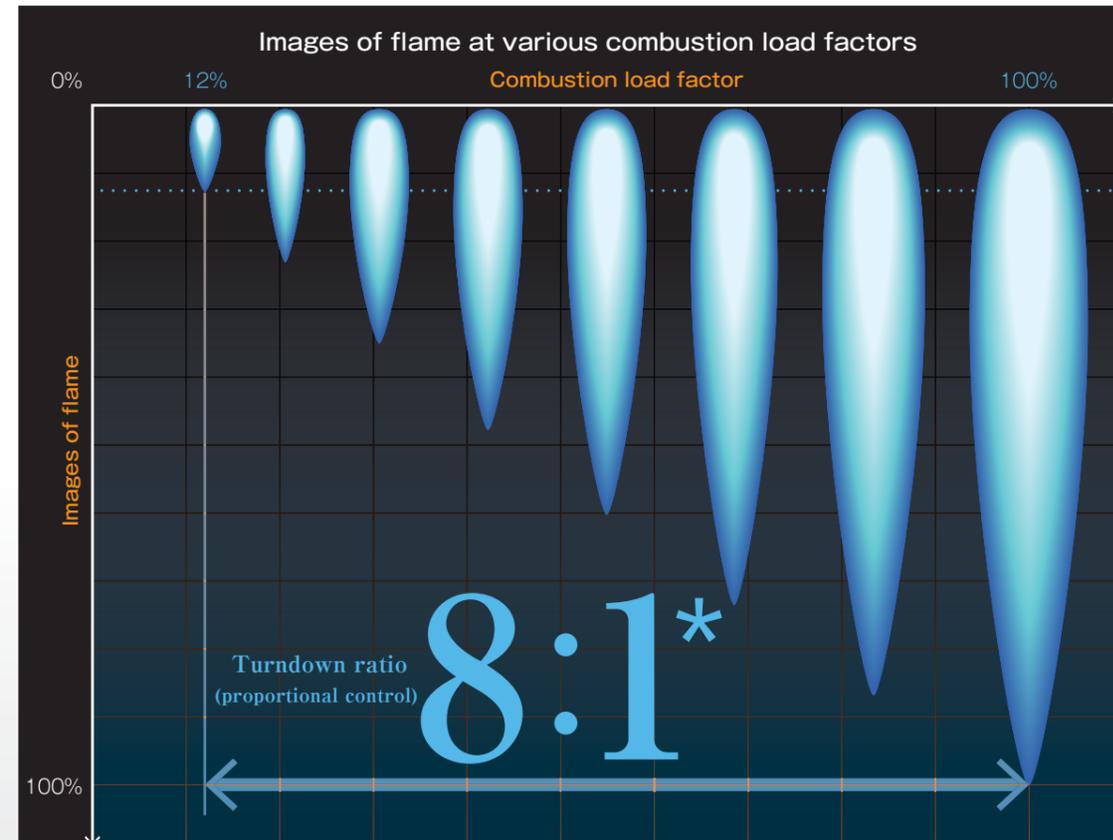
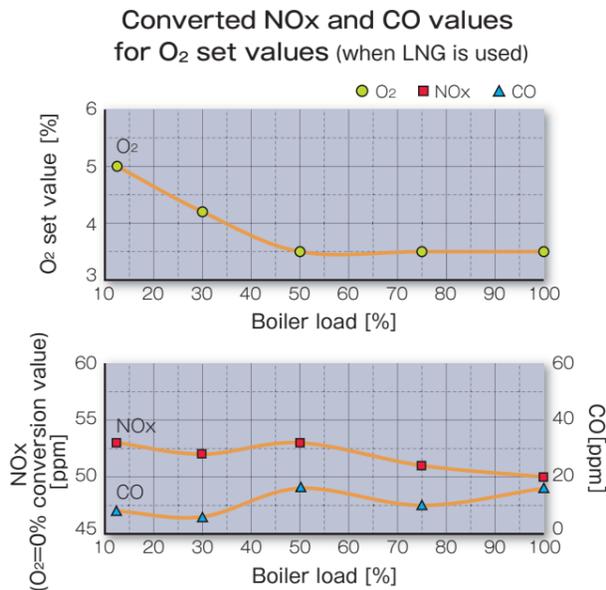
The newly developed burner, which enables combustion at a low fuel-air ratio, contributed to achieving NOx emissions of 55ppm at a fuel-air ratio of 1.2. In addition, proportional control of the combustion capacity in a range of 12 to 100% finely responds to the load demand.

Turndown ratio 8:1* (proportional control)

NOx= 55ppm or less (when the LNG type is used)

Low fuel-air ratio 1.2

* The turndown ratio represents a ratio between the rated (maximum) combustion capacity and smallest combustion capacity. When it is 8:1, the combustion capacity can be reduced to 12.5%.

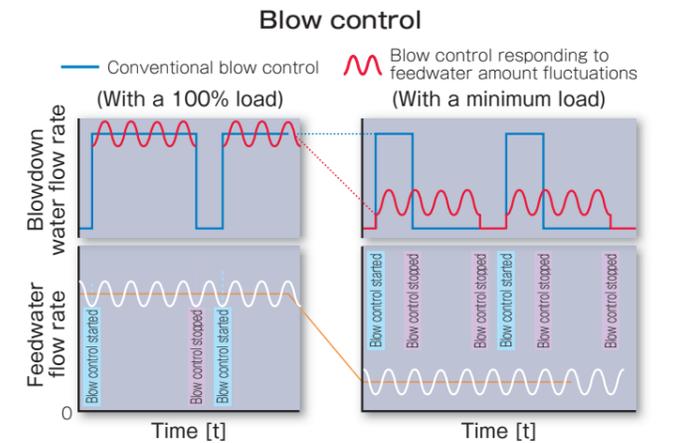


POINT 5

Blow control responding to feedwater amount fluctuations

Comes standard with the blow control mechanism responding to feedwater amount fluctuations

When continuous blowing is conducted, the amount of blowdown water is increased and decreased according to the amount of feedwater, which enables efficient heat recovery from blowdown water regardless of the boiler load.



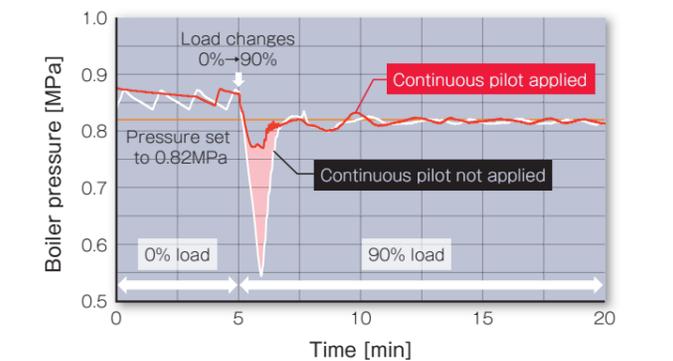
POINT 6

Continuous pilot control (option)

Excellent load following capability

Even when the load is increased from 0%, reduction of the boiler pressure can be minimized.

Load following capability in the continuous pilot mode



POINT 7

Silence design

74dB or less in front of the boiler body (-6dB as compared with conventional products)

POINT 8

Enables multi-boiler setup

Space saving by **20%***

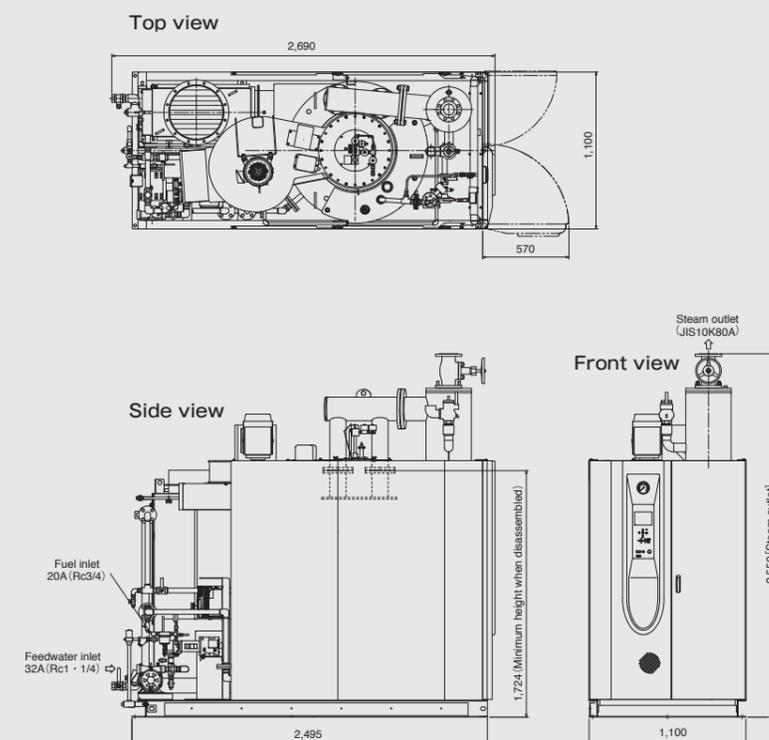
* As compared with our conventional products



super
EQOS
EQi-Series



External dimensional drawing (unit: mm)



EQi-2501KM/AM

Once-through boiler Conversion evaporation: 2,500kg/h

Specifications

Item	Type*1	EQI-2501KM/AM	Item	Type*1	EQI-2501KM/AM
Conversion evaporation		2,500	Power source		Three phase, AC 200V, 50/60Hz
Actual evaporation	kg/h	2,096	Facility electric power		10.7
Thermal output	kW	1,567	Feedwater pump motor	kW	3.1
Heating surface area	m ²	9.85	Blower motor		7.0
Maximum working pressure	MPa	0.98	Fuel oil burning pump motor		0.4
Boiler efficiency	%	96	Control box		0.2
Holding water quantity	ℓ	180	Fuel inlet	A	20
Max combustion capacity (input)	kW	1,633	Feedwater inlet		32
Kerosine	kg/h	135.1	Steam outlet		80
	ℓ/h	168.9	Safety valve discharge outlet		50(80)
Fuel oil A	kg/h	137.6	Exhaust gas outlet		φmm
	ℓ/h	160.2	Product weight	kg	2,400

Notes: 1. The actual evaporation is the value for the saturated steam at 15°C feedwater temperature and 0.49MPa steam pressure.
 2. The boiler efficiency value is calculated by the heat loss scheme provided in JIS B 8222-1993. However, the calculation is made under the following conditions. 0.49MPa steam pressure, 15°C feedwater temperature, 35°C charge air temperature
 3. The margins of error are as follows:
 • Boiler efficiency error: ±1% • Combustion capacity error: ±3.5%
 4. The fuel consumptions are calculated based on the following fuel lower calorific values:
 Fuel oil A: 42.7MJ/kg, density 0.86g/cm³
 Kerosine: 43.5MJ/kg, density 0.80g/cm³

5. For fuel oil A, use JIS Class 1, No. 1, which contains 0.5 mass% sulfur or lower.
 6. The main unit of the boiler come with an economizer. Be sure to set the feedwater temperature to 50°C or higher.
 7. If the feedwater temperature is high when, for example, collecting the drain water, fuel consumption may be reduced as the standard of actual evaporation.
 8. The diameter of the safety valve discharge outlet shown between parentheses applies piping for blowing outdoors.
 9. Maximum combustion capacity (input) is computed based on the standard lower calorific value.
 *1. The type display is as follows
 EQi-2501□M
 □: K: Kerosine
 A: Fuel oil A

POINT 1 Largely saves energy consumption with highly efficient operation

Boiler efficiency **96%**
 Partial load efficiency **97.5%** (load factor: 33%)
 Turndown ratio **3:1*** (three-level control)

The combustion control of 0-33-100%, which covers a wide range of combustion capacity, largely improves efficiency during a low load operation. Eliminating unnecessary activations and stops largely saves energy consumption.

* The turndown ratio represents a ratio between the rated (maximum) combustion capacity and smallest combustion capacity. When it is 3:1, the combustion capacity can be reduced to 33.3%.

POINT 2 Achieved a larger capacity

A once-through boiler with a generated steam amount of 2.5t/h. The proven boiler bodies arranged concentrically in two rows realizes equalized heating to improve durability. In addition, the holding water quantity is large (180L), and self-evaporation improves the load following capability when the pressure declines.

POINT 3 Inverter included as standard and silence design

Higher efficiency of the blower and the inverter control largely save energy consumption. Reduction in noise has also been achieved (75dB).

POINT 4 Stable supply of dried steam

Steam dryness **99% or more**

The steam separator has been largely improved. The water level control according to the steam pressure and combustion capacity enables stable supply of dried steam.

While utilizing existing facility, the steam boiler feedwater preheating system builds a highly efficient system environment.

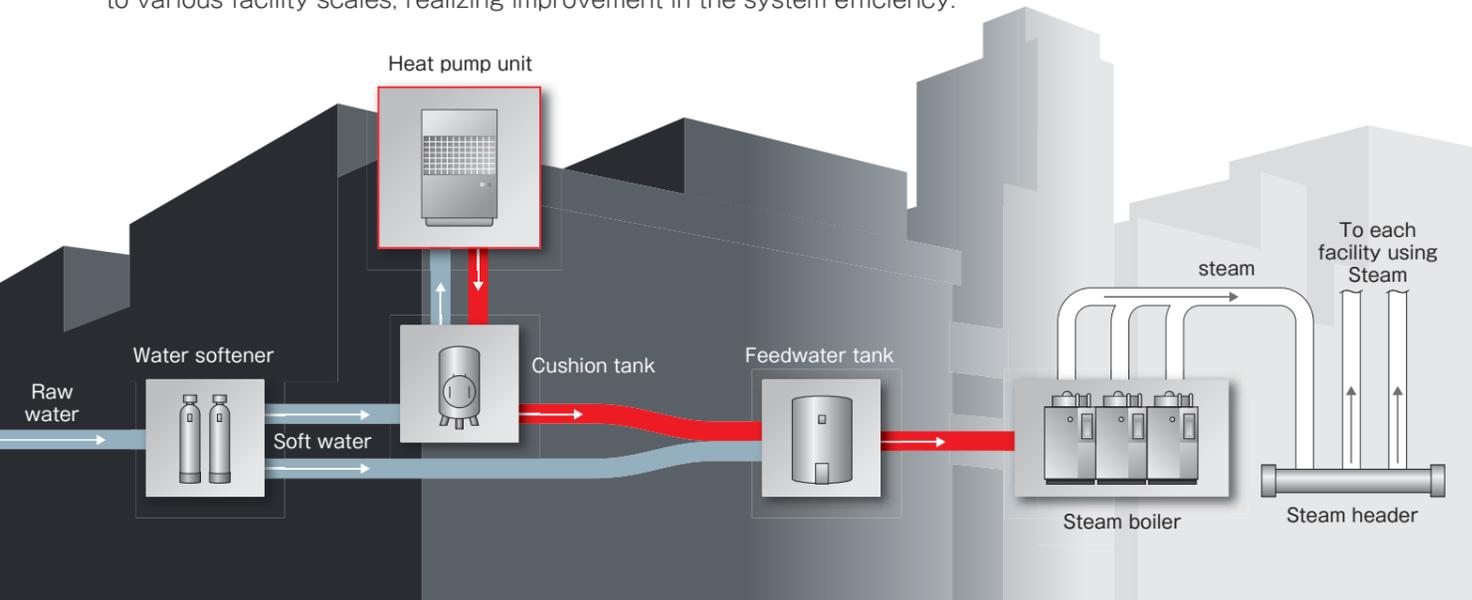
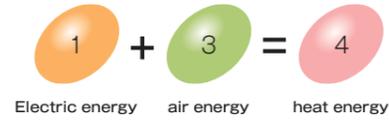


MEMO

F-nex demonstrates a great performance in systems whose drain recovery rate is relatively low, such as food and confectionery related systems, and builds small- to large-scale highly efficient systems for various industries, business types and scales.

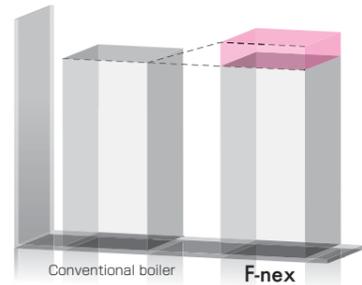
This system heats feedwater of the steam boiler with the heat pump unit that is able to extract more heat energy with less electric energy.

The most appropriate heat source equipment can be selected according to various facility scales, realizing improvement in the system efficiency.



Highly efficient boiler evolves into highly efficient boiler system

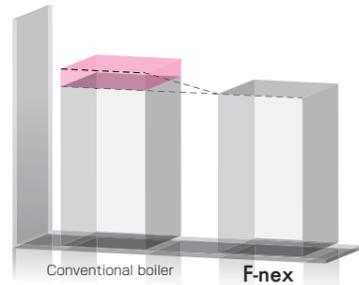
The efficiency of the combustion type boiler itself has already been improved to the highest level. F-nex, which utilizes a combination of a highly efficient heat pump and conventional boiler system, evolves into a highly efficient boiler system.



Comparison of highly efficient systems

Improves daily running costs

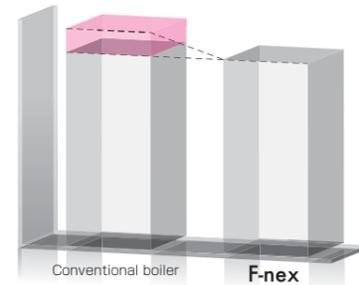
Heating low-temperature feedwater by its own steam causes a large energy loss. F-nex supports the sensible heating range up to 60°C to enable the facility to improve its efficiency.



Comparison of running costs

Reduces CO₂ emissions, contributing to improvement of the environment

The electric type heat pump technique realizes over three times higher efficiency than that of the combustion type. In addition to this, it reduces CO₂ emissions and provides eco-friendly energy.



Comparison of CO₂ emissions