

# Kawasaki Multi tube Once-Through Boiler

IF Series



WILLHEAT



KF Series





# Kawasaki Thermal Engineering

## The Pioneer of Japanese Boilers

We Kawasaki Thermal Engineering (KTE) have been a leading supplier of package boiler in Japan through our long experiences since 1899.

We have developed "Once-through Boiler" with the equivalent performance to water tube boiler and smoke (fire) tube boiler, supplying a large number of once-through boilers to Japanese major industries.

We believe that our boilers will greatly contribute to your business.

### IF Series



**High  
Efficiency**

**High Quality  
Steam**

**Long Life**

**Various  
Options**





**WILLHEAT** 



**KF Series**



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# Features of Boiler

## IF Series WILLHEAT KF Series High efficiency

Boiler  
efficiency

**98%**

### Boiler efficiency 98%

as standard for IF Series (Gas Fired) and WILLHEAT only.  
※ Diesel Fired ... 95%

Boiler efficiency has achieved 98% by applying  $\omega$ -shaped exhaust gas flow and high-performance economizer consisting of stainless steel and aluminum heat exchanger tubes.

### High efficiency at partial load

Applying PID modulating control (Proportional-Integral-Derivative) has realized high efficiency during partial load operation in addition to rated operation. It can contribute to improving boiler efficiency of actual boiler operation.

### PID Combustion Control

In addition to Proportional modulating control for combustion, Integral-Derivative modulating control is applied to stabilize steam pressure.

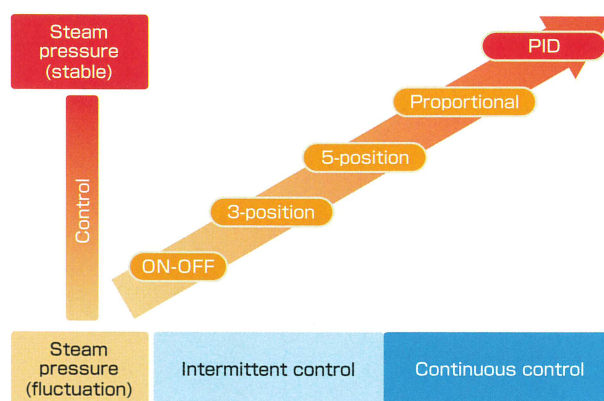
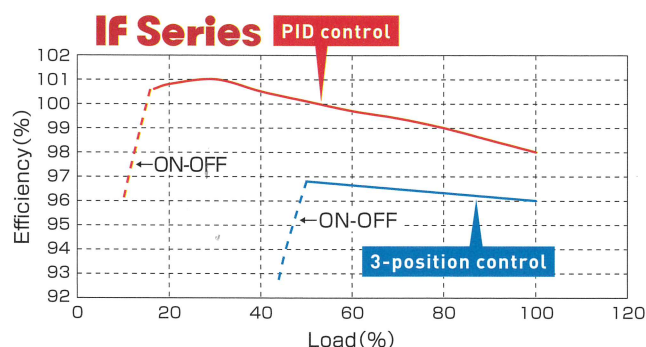
### PID Feed Water Control

In the case of ON-OFF control for feed water, excess of feed water tends to take heat from the boiler and substantially decrease steam pressure. In order to minimize such steam pressure change, PID modulating control is also applied to feed water control, which continuously controls necessary amount of feed water for operation.

### Inverter as standard (Forced Draft Fan and Feed Water Pump)

Inverter control is applied to forced draft fan and feed water pump as standard, which greatly saves power consumption.

### Boiler efficiency (Estimated) (Based on heat input/output comparison method)





IF Series WILLHEAT

# Stable steam pressure

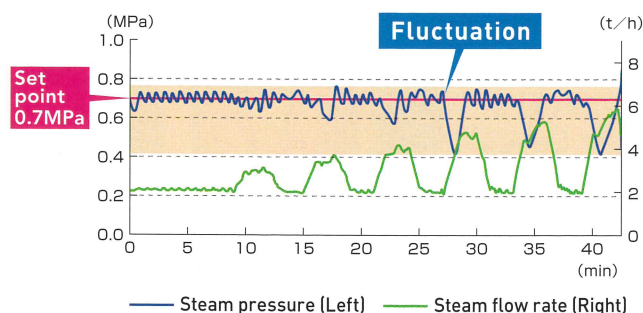
Steam pressure remains stable even when load fluctuates.

Steam supply pressure  
 $\pm 0.01$   
 MPa  
 Under static load

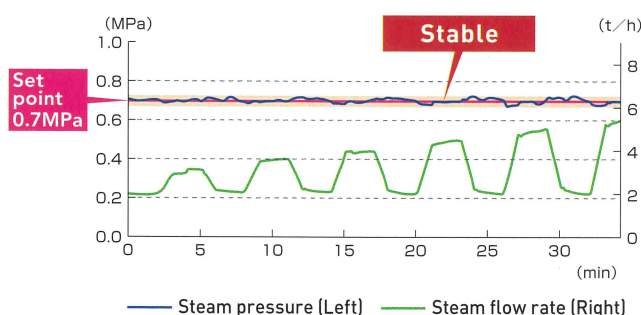
## Comparison of control specifications

		Once-through boiler			
		Small capacity			Large capacity
		KF Series	WILLHEAT GE	WILLHEAT GEX	IF Series
Equivalent evaporation (kg/h) x Q'ty		2,000x4	2,000x4	2,000x4	4,000x2
Control	Combustion	Intermittent (3-position)	Intermittent (4-position)	PID continuous	PID continuous
	Water feeding	Intermittent (ON-OFF)	PID continuous	PID continuous	PID continuous

### 3-position control



### PID control



IF Series WILLHEAT

# High steam dryness

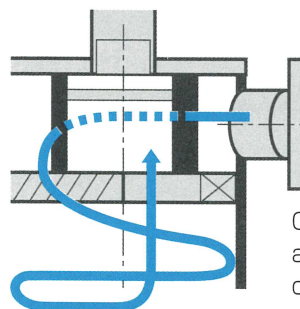
Supply high quality steam

## Centrifugal steam water separator

Steam dryness reaches 99.5% or more at every operation load by steam water separator.

Highly efficient steam water separation is realized by our unique technology of axial spiral vane in the steam water separator, which is able to separate saturated steam from even very minute saturated water by means of rotation of steam-water mixture.

Dryness  
**99.5%**  
 or more



Centrifugal rotation is additionally applied to commonly used reversing type of steam water separator so that steam dryness has highly improved.



## IF Series WILLHEAT KF Series Long life

Designed  
life time

**15**  
years

### Designed life time -15years

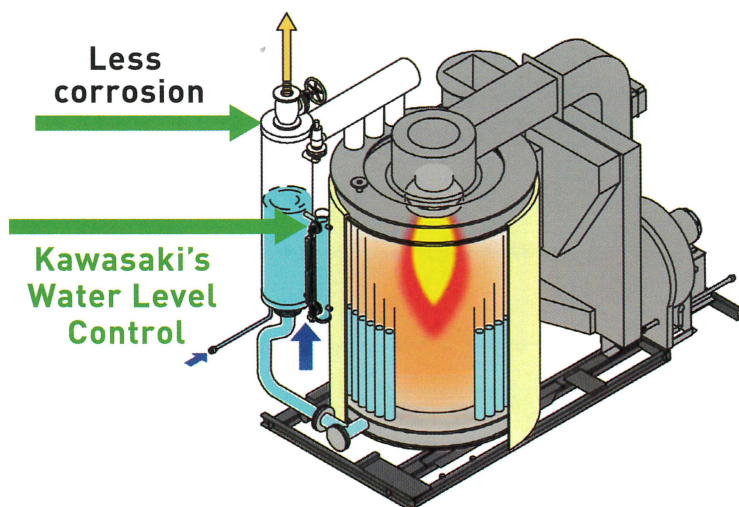
The following manufacturing know-hows have realized such long life of once-through boiler equivalent to large boiler's life.

#### Water feeding to steam water separator

■Commonly-used once-through boilers apply direct water feeding to boiler body, but we have applied a system of water feeding to steam water separator instead. Such feed water supply system makes density of boiler water in the water tubes uniformly and prevents adhesion of scales caused by boiler water concentration in a particular part.

■Combustion starts only when boiler water level is full in order to prevent combustion without sufficient water.

■Piping connection between boiler body and steam water separator is designed to relieve deformation which comes from heat expansion due to heat stress and cold water feeding.



#### Built-in deaerator

Because of adopting our unique design of water feeding to steam water separator, corrosion possibilities are diminished by means of removing dissolved oxygen in boiler water as much as possible.

#### Annealing of pressure vessel

Boiler is commonly manufactured by means of welding which causes heat stress. In order to relieve such stress, to all of our boilers pressurized parts are annealed after having been assembled.

#### PID control

Continuous combustion control prevents boiler body from heat stress and thermal fatigue breakdown.



## IF Series WILLHEAT Wide turn-down

NG fired  
**6:1**  
(standard)

NG fired  
**10:1\***  
(OPTION for  
5t/h & 6t/h)

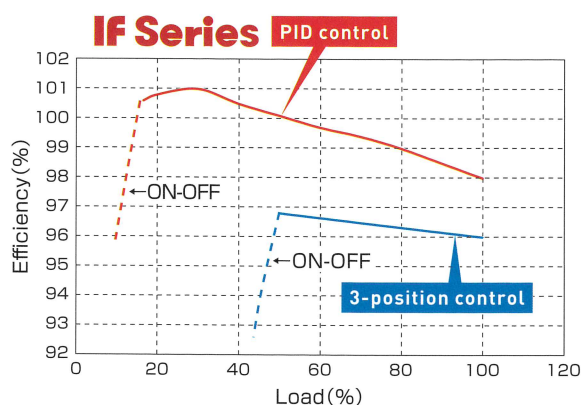
Diesel oil fired  
LPG fired  
**5:1**  
(standard)

Compared to commonly used once-through boiler with turn-down ratio 2:1, our once-through boiler offers highly efficient operation with wider turn-down. In the case of lower operation load than 100%, wide turn-down contributes to reducing number of times of ON-OFF for combustion, keeping high boiler efficiency.

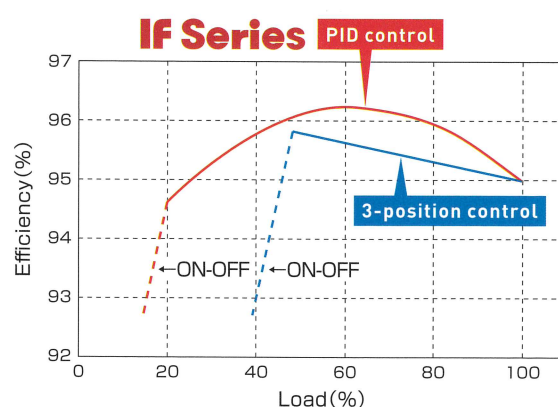
\*Depending on gas component. Need study each time.

### Relation between boiler load and boiler efficiency

Comparison between turn-down 6:1 and 2:1



Comparison between turn-down 5:1 and 2:1



## IF Series WILLHEAT KF Series Simple operation by color touch screen

### Display [Example]



Boiler  
under  
suspension  
**W**



Boiler  
in operation  
with  
combustion  
**G**



Boiler  
in operation  
without  
combustion  
(Ready for  
boiler operation)  
**B**



Check  
occurred  
**Y**



Error  
occurred  
**R**

## Other features

- Compact design - space saving
- Quick start-up



## IF Series WILLHEAT PID multi-unit control

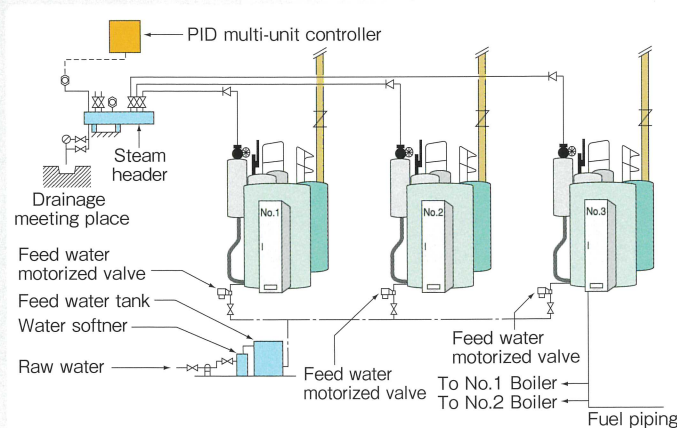
System  
efficiency  
**100%**  
or more

### Cost reduction by optimization of multi-unit boiler operation

PID multi-unit control automatically controls number of operation unit, leading to total cost reduction of boiler facility. In the case a large boiler continues operating at low load or repeats to start and stop, boiler efficiency tends to become low with large heat loss. Our multi-unit control system automatically selects which unit to operate and number of operation unit depending on steam load. By such efficiently optimized operation, fuel consumption, power consumption and heat loss can be substantially reduced.

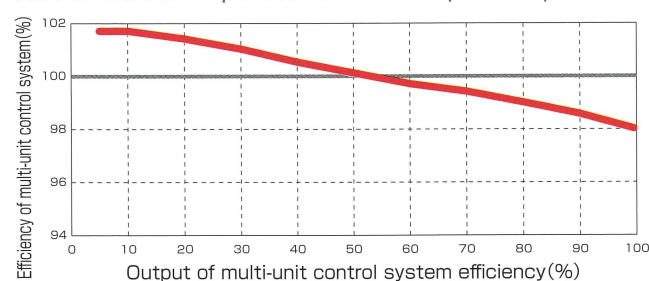
### Summary of PID multi-unit control system

For multi units of boilers, PID operation is applied, automatically controlling number of operation units and combustion rate. Therefore, setting value of steam pressure can be kept at any steam load. In the case feed water temperature is low, exhaust gas from boiler is cooled until water contained in the exhaust gas becomes drain. Since boiler takes such latent heat of condensation and lower heating value is applied to fuel heating value, system efficiency of PID multi-unit control drastically improves at low load where exhaust gas temperature becomes low.



### Multi-unit control system efficiency

Case of multi-unit operation of IF-6000 (NG fired) x 2 units





Operation condition

[Steam pressure] 0.49MPa	[Blow loss] None
[Feed water temperature] 15°C	[Boiler efficiency] 98%*
[Outdoor temperature] 35°C	[Multi-unit control]
	Turn-down ratio : 20:1

※Based on heat input/output comparison method

### Comparison of multi-unit control specifications

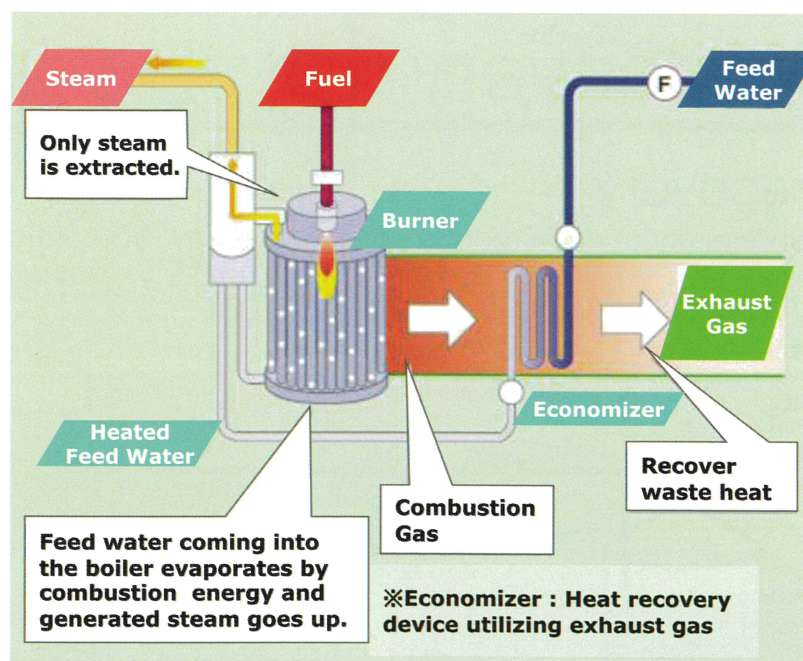
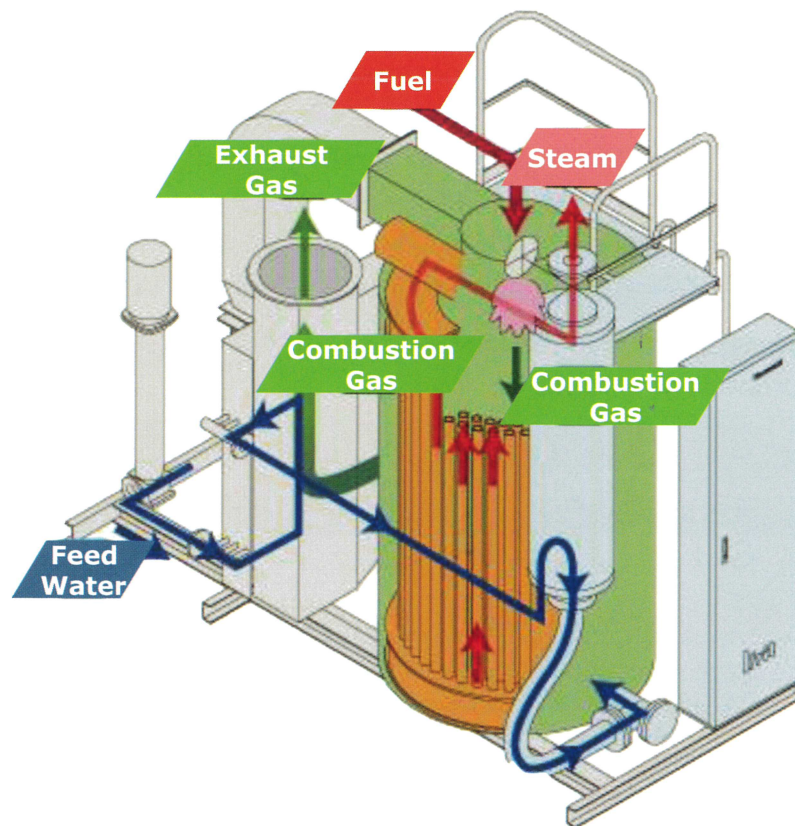
	Small capacity			Large capacity
	KF Series	WILLHEAT  GE	WILLHEAT  GEX	IF Series
Multi-unit control	Intermittent	Intermittent	PID continuous	PID continuous







# Structure of once-through boiler





# Once-through boiler lineup

Equivalent evaporation : 2,000kg/h or less

		Maximum Working Pressure	
		0.98 MPa	1.56 MPa
Fuel	Natural Gas	<b>WILLHEAT</b> (1,500~2,000kg/h)	
	LPG	<b>KF Series</b> (750~2,000kg/h)	
	Diesel Oil		

Equivalent evaporation : more than 3,000kg/h

		Maximum Working Pressure				
		0.98 MPa	1.56 MPa	1.96 MPa	2.35 MPa*	3.2 MPa*
Fuel	Natural Gas	<b>IF Series</b> (3,000~6,000kg/h)				
	LPG					
	Diesel Oil					

\*Depending on applied boiler standard.



# IF Series



## Boiler Specifications (IF Series - Gas fired)

		Boiler model	IF-3000CGE	IF-4000CGE	IF-5000CGE	IF-6000CGE
Equivalent evaporation		kg/h	3,000	4,000	5,000	6,000
Actual evaporation		kg/h	2,516	3,354	4,192	5,031
Maximum working pressure		MPa	0.98			
Heat surface		m <sup>2</sup>	18.6		29.4	
Combustion control			PID continuous			
Feed water control			PID continuous			
Used fuel			Natural Gas, LPG			
Gas supply pressure		MPa	0.078~0.294 (NG)		0.098~0.294 (NG)	
Boiler efficiency		%	98			
Fuel consumption		m <sup>3</sup> /h	170.3	227.0	283.7	340.4
Feed water temperature		℃	15 ~ 100			
Holding water quantity		L	620		990	
Dry weight		kg	5,000		7,800	
Power supply			AC380V·50Hz·3φ			
Power capacity	Forced draft fan	kW	11	15	15	22
	Feed water pump	kW	3.0	3.0	4.0	5.5
	Control panel	kW	0.5			

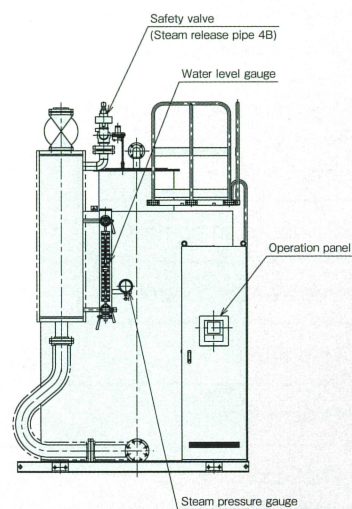
### [NOTE]

- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/m<sup>3</sup> (NG).
- Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
- Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
- Gas supply pressure is the value required to operate at the rated fuel consumption.
- When planning the fuel gas piping, check to see if this gas supply pressure is kept in advance.
- Feed water temperature exceeding 100°C can be applied as option.
- Maximum working pressure exceeding 0.98MPa can be applied as option.

[OPTION] 1.56MPa, 1.96MPa, 2.35MPa, 3.2MPa

- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.





	IF-3000CGE	IF-4000CGE	IF-5000CGE	IF-6000CGE
L	3,400	3,400	3,800	3,800
W	1,926	1,926	2,263	2,263
H	3,123	3,123	3,360	3,360
A	3,015	3,015	3,254	3,254

## Foundation

Technical drawing of a circular water tank with a rectangular base. The drawing includes the following dimensions and labels:

- Top View:**
  - Overall width: 1970
  - Overall height: 3700
  - Central circular area diameter: 1205
  - Weight: 6.0ton
- Front View:**
  - Base width: 951
  - Base height: 505
  - Overall height: 2305
  - Label: "Front"
- Labels:**
  - "4-M20x300L Anchor bolts" (pointing to the base)
  - "F.L." (Finish Level)

Weight 9.0ton

4-M20x300L Anchor bolts

Front

720 720 1070 2270

1393 1488 2517

60 240 50 F.L.



# IF Series



## Boiler Specifications (IF Series - Oil fired)

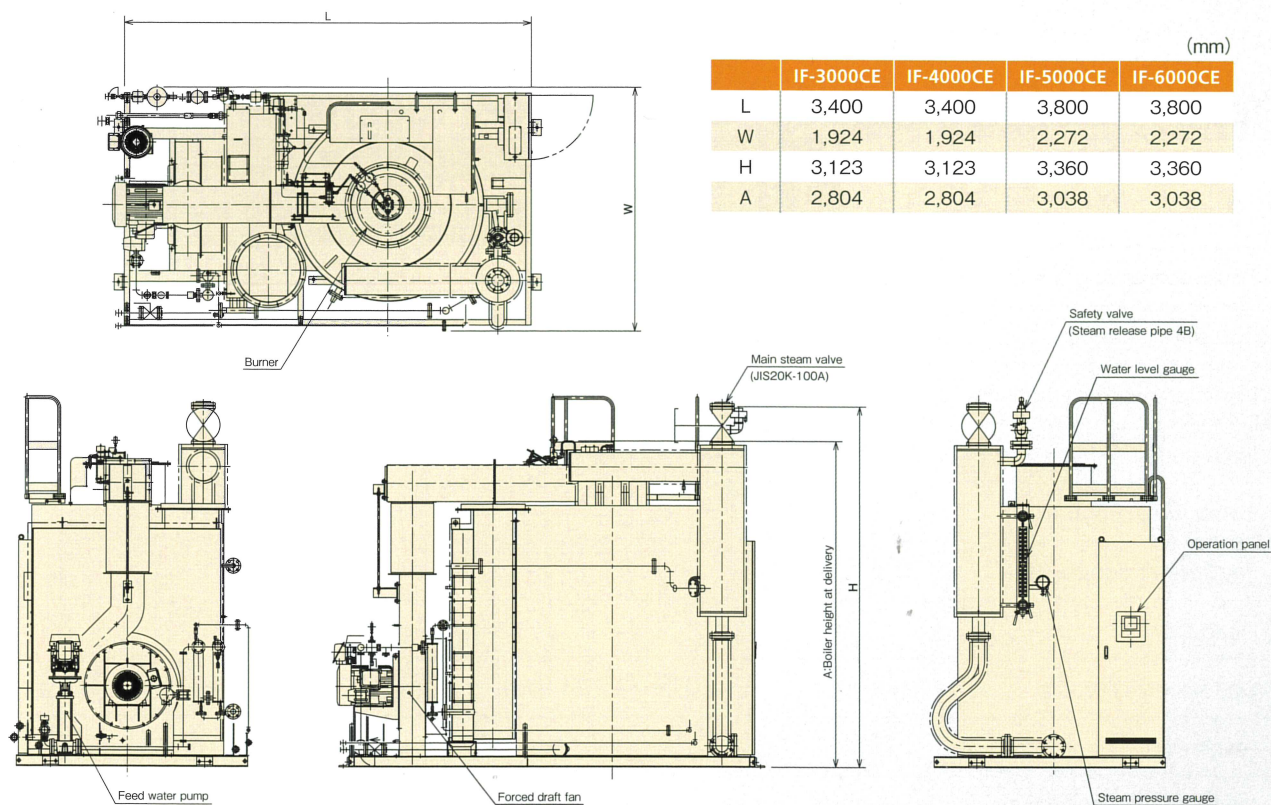
Boiler model			IF-3000CE	IF-4000CE	IF-5000CE	IF-6000CE	
Equivalent evaporation			kg/h	3,000	4,000	5,000	6,000
Actual evaporation			kg/h	2,516	3,354	4,192	5,031
Maximum working pressure			MPa	0.98			
Heat surface			m²	18.6		29.4	
Combustion control				PID continuous			
Feed water control				PID continuous			
Used fuel				Diesel Oil			
Boiler efficiency			%	95			
Fuel consumption			kg/h	167.0	222.6	278.2	333.9
Feed water temperature			℃	55 ~ 100			
Holding water quantity			L	620		990	
Dry weight			kg	5,000		7,800	
Power supply				AC380V·50Hz·3φ			
Power capacity	Forced draft fan	kW	11	15	15	22	
	Feed water pump	kW	3.0	3.0	4.0	5.5	
	Feed oil pump	kW	1.5				
	Control panel	kW	0.5				

### [NOTE]

- The fuel oil consumption is shown based on the fuel's lower heating value at 42.7 MJ/kg.
  - Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
  - Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
  - Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
  - Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
  - Feed water temperature exceeding 100°C can be applied as option.
  - Maximum working pressure exceeding 0.98MPa can be applied as option.
- [OPTION] 1.56MPa, 1.96MPa (, 2.35MPa, 3.2MPa)
- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.

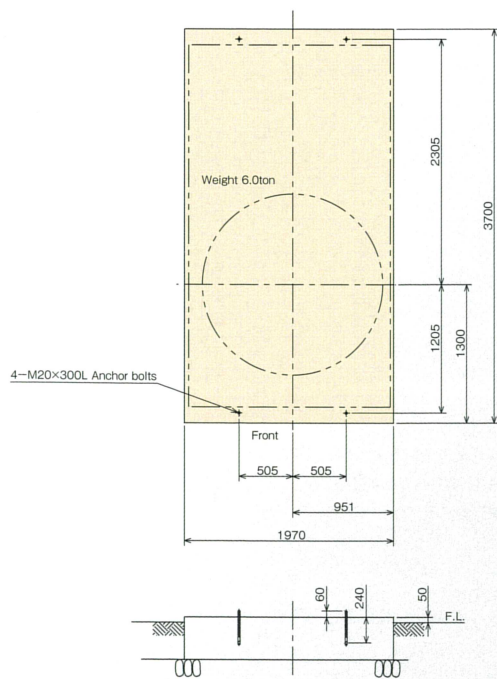


## Dimension

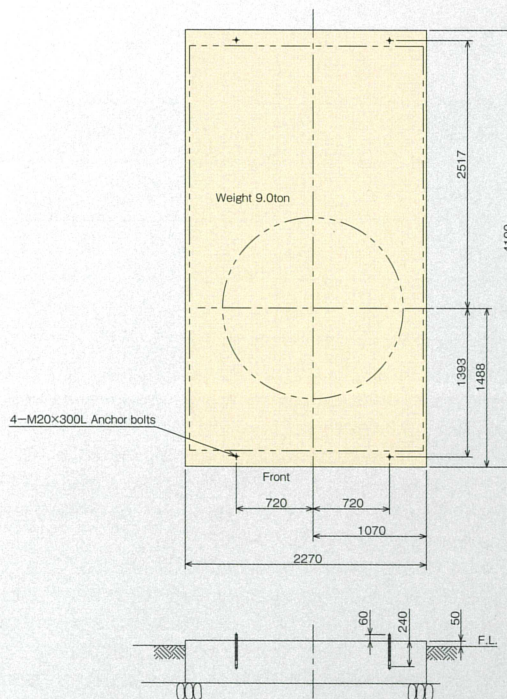


## Foundation

IF-3000CE, IF-4000CE



IF-5000CE, IF-6000CE





# IF Series



## Boiler Specifications (IF Series - Dual fuel fired)

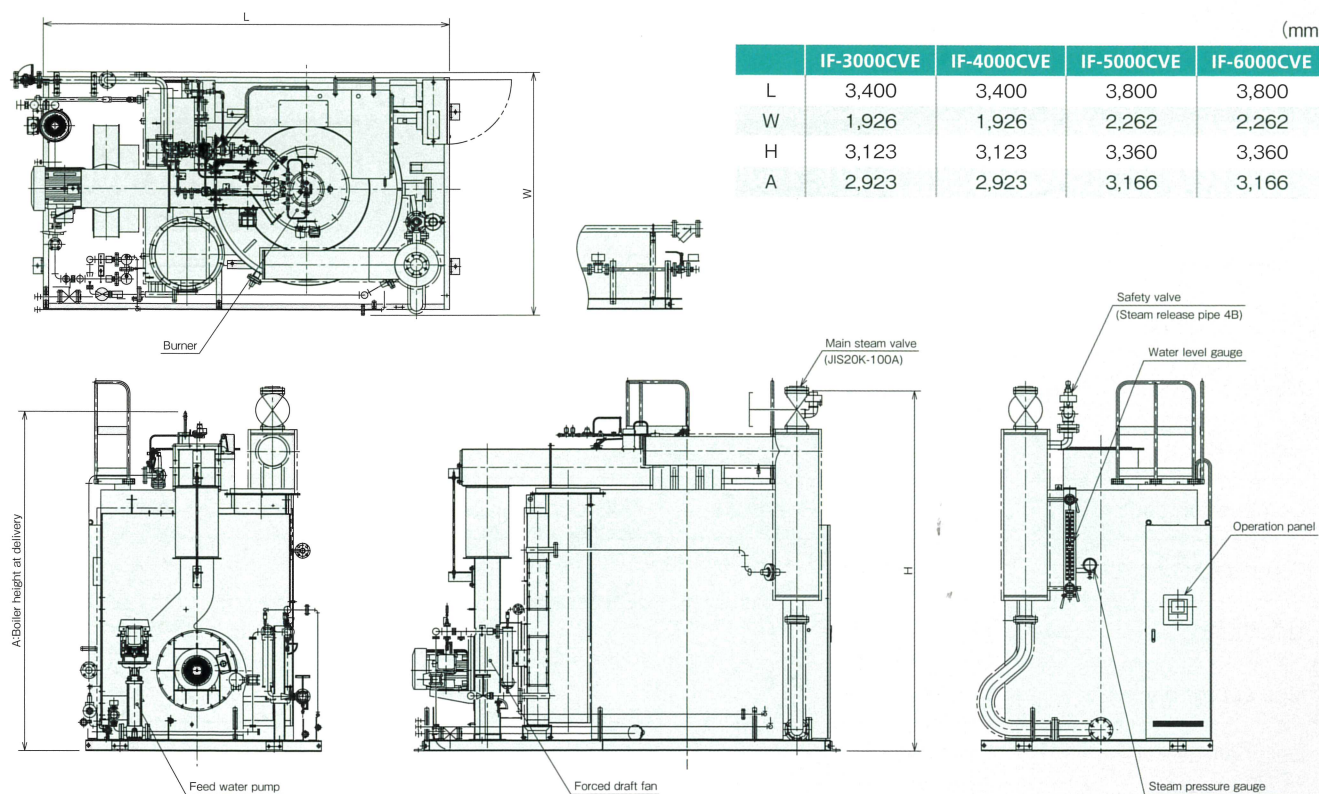
		Boiler model	IF Series Specifications (IF-3000CVE ~ IF-6000CVE)			
			IF-3000CVE	IF-4000CVE	IF-5000CVE	IF-6000CVE
Equivalent evaporation		kg/h	3,000	4,000	5,000	6,000
Actual evaporation		kg/h	2,516	3,354	4,192	5,031
Maximum working pressure		MPa	0.98			
Heat surface		m <sup>2</sup>	18.6		29.4	
Combustion control			PID continuous			
Feed water control			PID continuous			
Used fuel			Natural Gas & Diesel Oil			
Gas supply pressure		MPa	0.078~0.294 (NG)		0.098~0.294 (NG)	
Boiler efficiency		%	95			
Fuel consumption (Gas)		m <sup>3</sup> /h	175.6	234.1	242.6	351.1
Fuel consumption (Oil)		kg/h	167.0	222.6	278.2	333.9
Feed water temperature		℃	55 ~ 100			
Holding water quantity		L	620		990	
Dry weight		kg	5,000		7,800	
Power supply			AC380V·50Hz·3φ			
Power capacity	Forced draft fan	kW	11	15	15	22
	Feed water pump	kW	3.0	3.0	4.0	5.5
	Feed oil pump	kW	1.5			
	Control panel	kW	0.5			

### [NOTE]

- The fuel consumption is based on the following fuel's lower heating value:  
40.6 MJ/m<sup>3</sup> (NG), 42.7 MJ/kg (Diesel Oil)
- Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
- Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
- Gas supply pressure is the value required to operate at the rated fuel consumption.  
When planning the fuel gas piping, check to see if this gas supply pressure is kept in advance.
- Feed water temperature exceeding 100°C can be applied as option.
- Maximum working pressure exceeding 0.98MPa can be applied as option.  
[OPTION] 1.56MPa, 1.96MPa, 2.35MPa, 3.2MPa
- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.

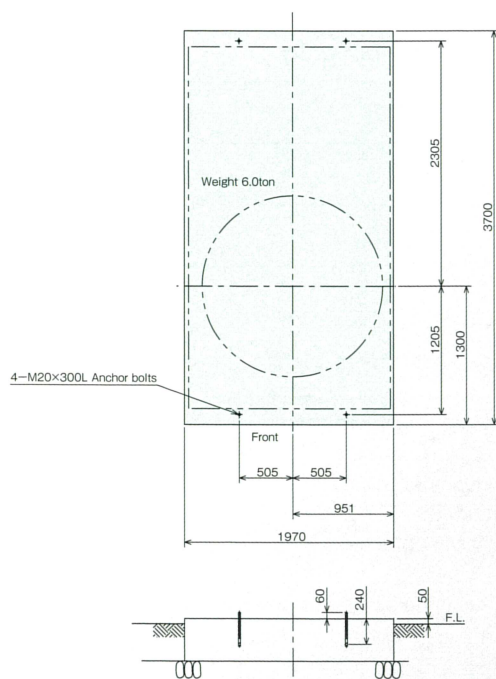


## Dimension

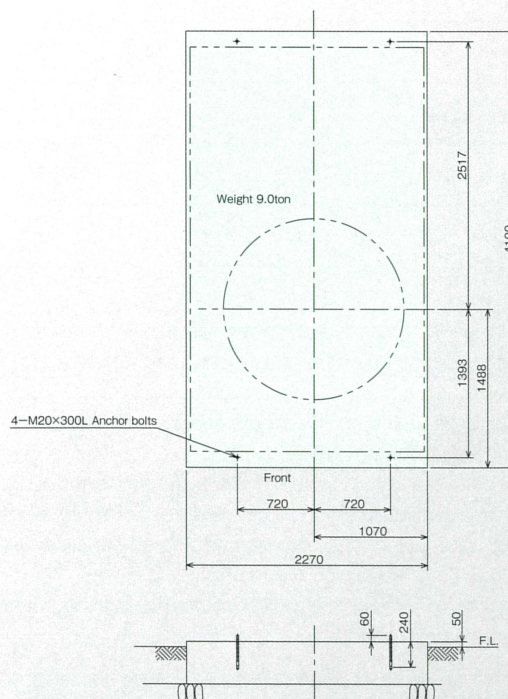


## Foundation

IF-3000CVE, IF-4000CVE



IF-5000CVE, IF-6000CVE







## Boiler Specifications (WILLHEAT - Gas fired)

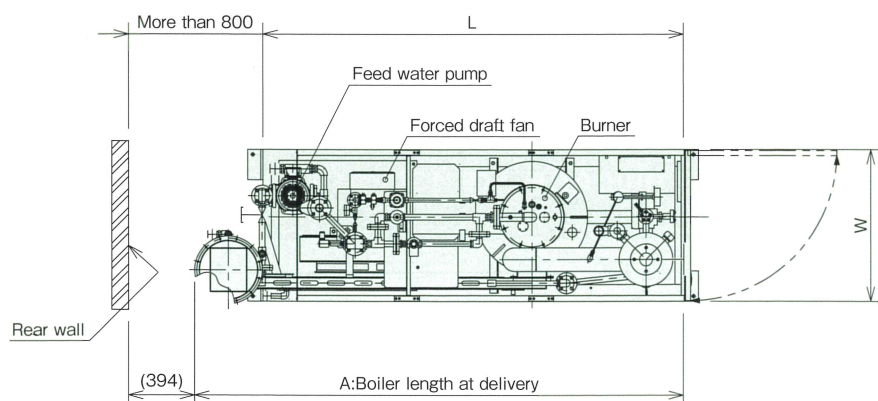
Boiler model			WF-1500GE	WF-1500GEX	WF-2000GE	WF-2000GEX
Equivalent evaporation		kg/h	1,500		2,000	
Actual evaporation		kg/h	1,258		1,677	
Maximum working pressure		MPa	0.98			
Heat surface		m <sup>2</sup>	8.0			
Combustion control			4 Positions	PID continuous	4 Positions	PID continuous
Feed water control			PID continuous			
Used fuel			Natural Gas			
Gas supply pressure		MPa	0.08 ~ 0.294			
Boiler efficiency		%	98			
Fuel consumption		m <sup>3</sup> /h	85.1		113.4	
Feed water temperature		℃	15 ~ 100			
Holding water quantity		L	230			
Dry weight		kg	1,900			
Power supply			AC380V·50Hz·3φ			
Power capacity	Feed water pump	kW	7.5			
	Forced draft fan	kW	1.5			
	Control panel	kW	0.2			

### [NOTE]

- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/m<sup>3</sup>.
- Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
- Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
- Gas supply pressure is the value required to operate at the rated fuel consumption.  
When planning the fuel gas piping, check to see if this gas supply pressure is kept in advance.
- Feed water temperature is preferably 55°C or more.
- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.

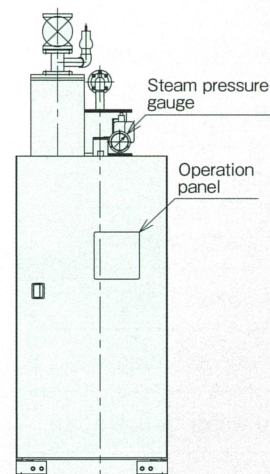
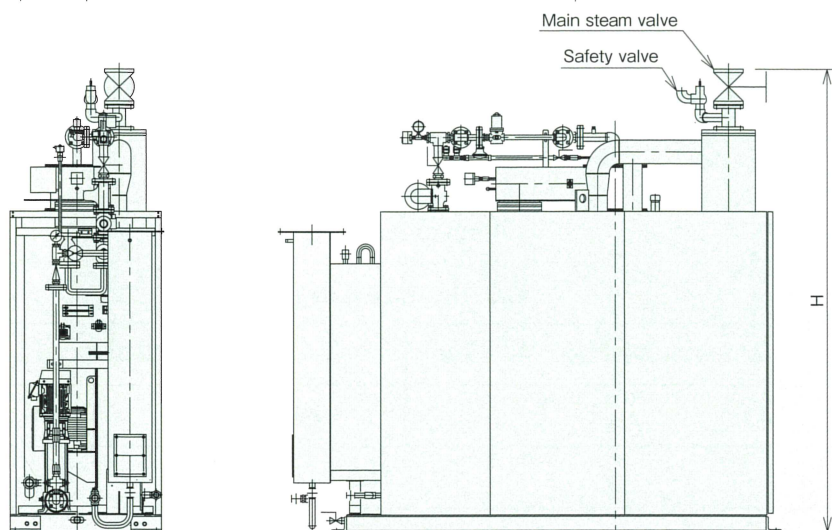


## Dimension

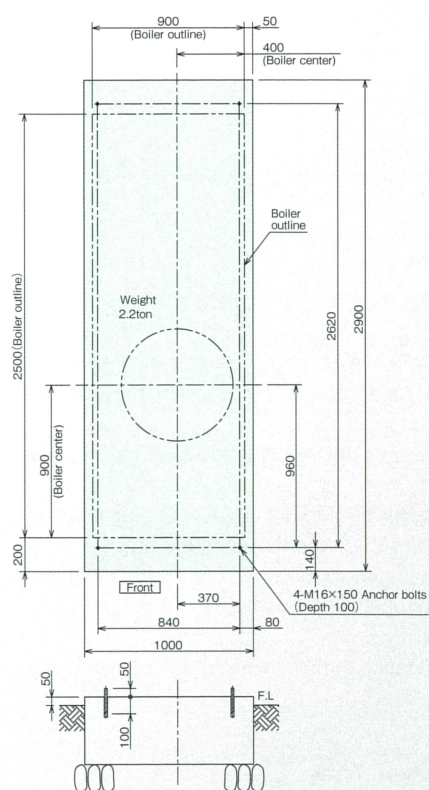


(mm)

	WF-1500GE	WF-1500GEX	WF-2000GE	WF-2000GEX
L		2,500		
W		900		
H		2,744		
A		2,906		



## Foundation





# KF Series



## Boiler Specifications (KF Series - Gas fired)

		Boiler model	KF-750AGE	KF-1000AGE	KF-1500AGE	KF-2000AGE
Equivalent evaporation		kg/h	750	1,000	1,500	2,000
Actual evaporation		kg/h	629	839	1,258	1,677
Maximum working pressure		MPa	0.98			
Heat surface		m <sup>2</sup>	4.9		9.8	
Combustion control			3 Positions			
Feed water control			2 Positions			
Used fuel			Natural Gas, LPG			
Gas supply pressure		MPa	0.078 ~ 0.294 (NG)			
Boiler efficiency		%	96		98	
Fuel consumption		m <sup>3</sup> /h	43.4	57.9	85.1	113.4
Feed water temperature		℃	15 ~ 100			
Holding water quantity		L	148		275	
Dry weight		kg	1,460	1,560	2,400	2,500
Power supply			AC380V·50Hz·3φ			
Power capacity	Forced draft fan	kW	2.2	5.5	5.5	7.5
	Feed water pump	kW	0.75	1.5	1.5	2.2
	Control panel	kW	0.2			

### [NOTE]

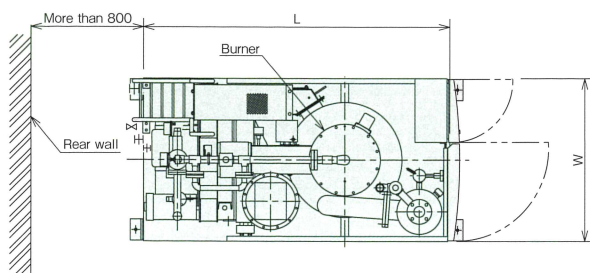
- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/m<sup>3</sup> (NG).
- Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
- Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
- Gas supply pressure is the value required to operate at the rated fuel consumption.
- When planning the fuel gas piping, check to see if this gas supply pressure is kept in advance.
- Maximum working pressure exceeding 0.98MPa can be applied as option.

### [OPTION] 1.56MPa

- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.

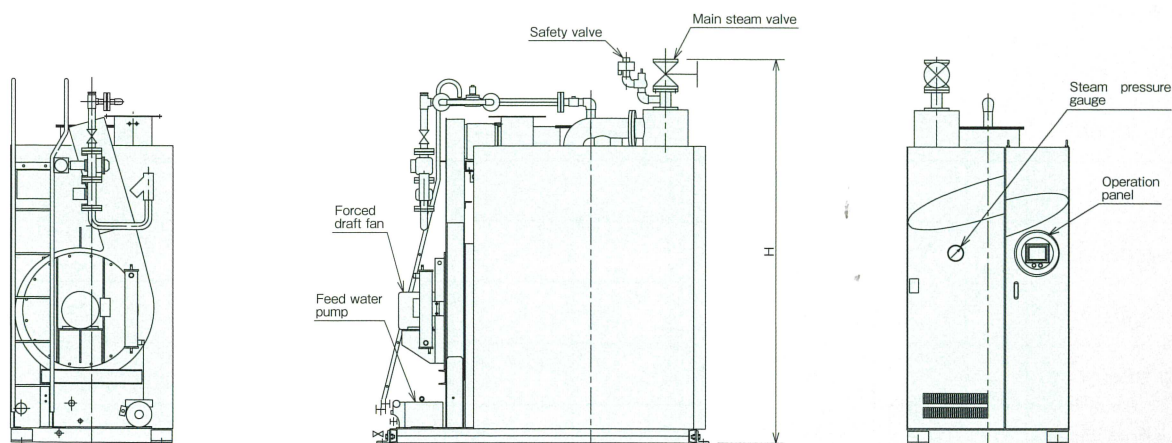


## Dimension



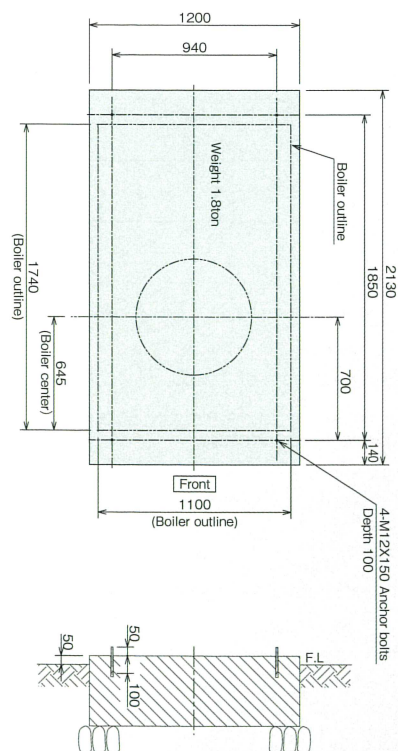
(mm)

	KF-750AGE	KF-1000AGE	KF-1500AGE	KF-2000AGE
L	1,740		2,170	
W	1,100		1,150	
H	2,187		2,708	2,714

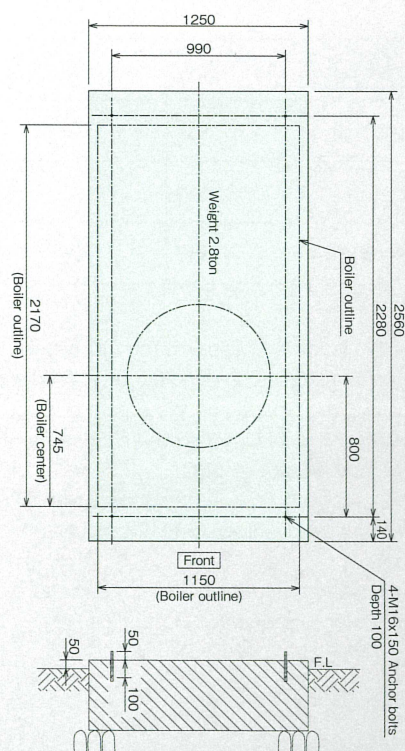


## Foundation

### KF-750AGE, KF-1000AGE



### KF-1000AGE, KF-2000AGE





# KF Series



## Boiler Specifications (KF Series - Oil fired)

		Boiler model	KF-750AE	KF-1000AE	KF-1500AE	KF-2000AE
Equivalent evaporation		kg/h	750	1,000	1,500	2,000
Actual evaporation		kg/h	629	839	1,258	1,677
Maximum working pressure		MPa	0.98			
Heat surface		m <sup>2</sup>	4.9		9.8	
Combustion control			3 Positions			
Feed water control			2 Positions			
Used fuel			Diesel Oil			
Boiler efficiency		%	95			
Fuel consumption		kg	41.7	55.6	83.4	111.2
Feed water temperature		℃	55 ~ 100			
Holding water quantity		L	148		275	
Dry weight		kg	1,460	1,560	2,300	2,400
Power supply			AC380V·50Hz·3φ			
Power capacity	Forced draft fan	kW	2.2	5.5	5.5	7.5
	Feed water pump	kW	0.75	1.5	1.5	2.2
	Feed oil pump	kW	0.4			
	Control panel	kW	0.2			

### [NOTE]

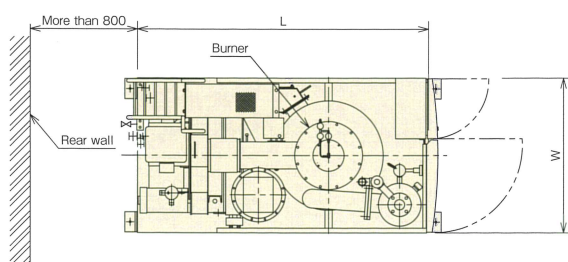
- The fuel oil consumption is shown based on the fuel's lower heating value at 42.7 MJ/kg.
- Equivalent evaporation is specified on condition that feed water of 100°C change into steam of 100°C.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15°C.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15°C and the room temperature of 35°C.
- Boiler efficiency shall have the following tolerance; boiler efficiency:±1%, fuel consumption:±3.5%.
- Maximum working pressure exceeding 0.98MPa can be applied as option.

### [OPTION] 1.56MPa

- The parameters described in this table list of specification can be changed by the manufacturer for the purpose of technical improvement without notice.

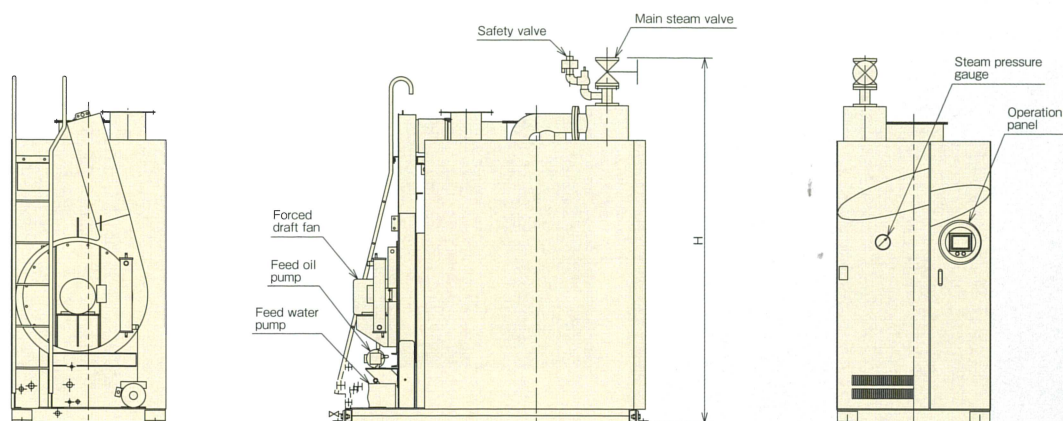


## Dimension



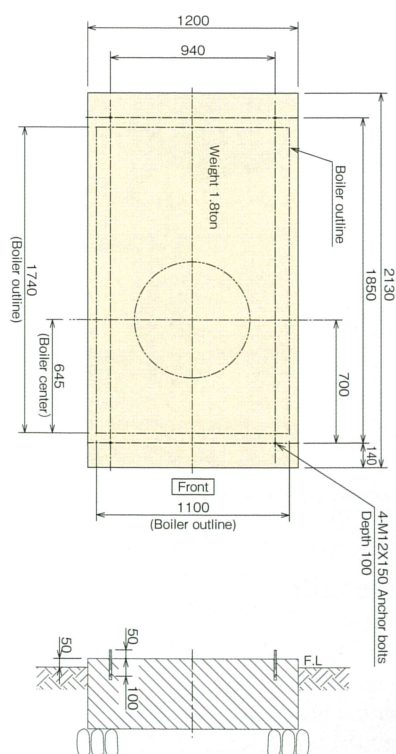
(mm)

	KF-750AE	KF-1000AE	KF-1500AE	KF-2000AE
L	1,740	2,170		
W	1,100	1,150		
H	2,187	2,708	2,714	

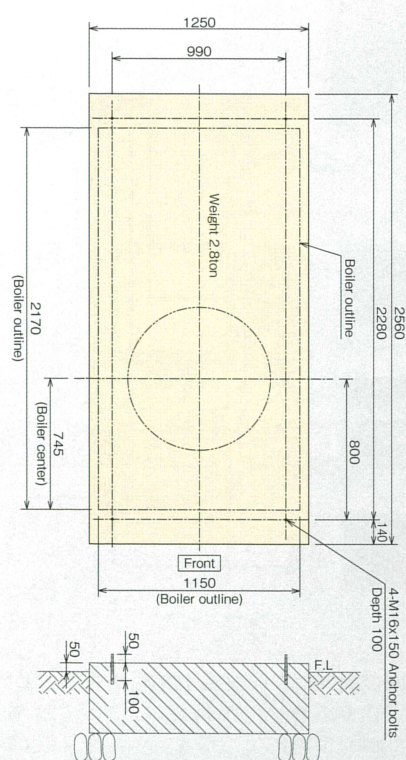


## Foundation

KF-750AE, KF-1000AE



KF-1500AE, KF-2000AE





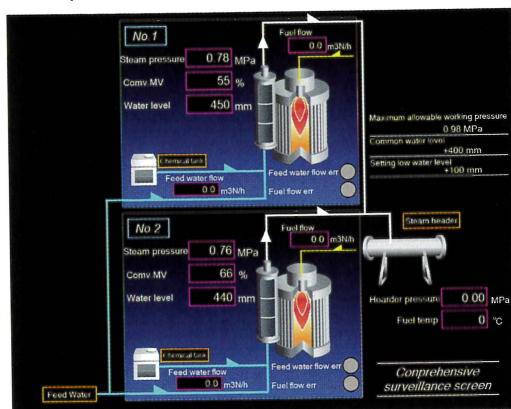
# Data logger

## Comprehensive surveillance system [Every FIT]

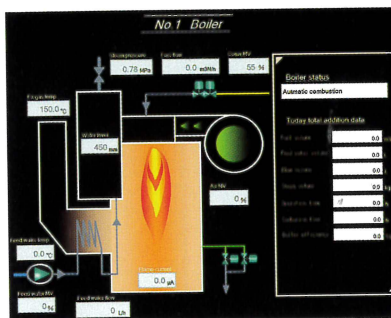
- This system monitorizes every facility.
- Surveillance screen and daily/monthly report can be customized freely according to the customer's application.
- Not only boiler data signal but also auxiliary facilities signals can be input to 'Every FIT'

### Display example

Comprehensive surveillance screen



Individual surveillance screen



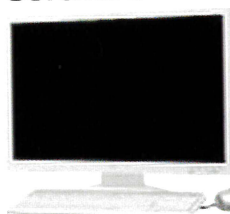
Screen switching by boiler icon click

Others

- Historical trend graph
- Real time trend graph
- Alarm surveillance
- Remote control
- Report
- Schedule setting

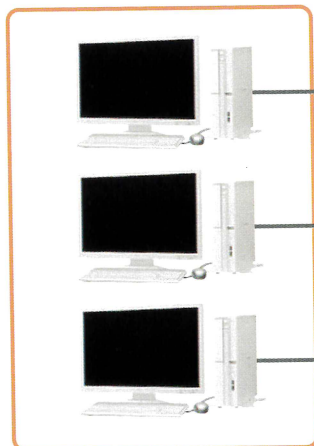
### System flow

PC with logging Software

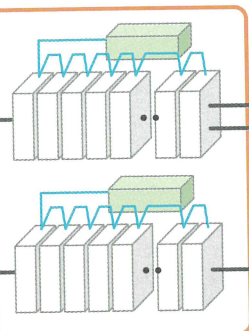


report through email at the alarm occurrence (email connection required)

Maximum 16 boilers connectable



**remote viewer software (option)**  
Maximum 3 PC with the software are connectable



**Exclusive interface unit**

- 1) Maximum 11 boards can be combined to a unit from DI/DO/AI/AO board.
- 2) Maximum 16 interface units can be installed to a system.

auxiliary facilities

auxiliary facilities

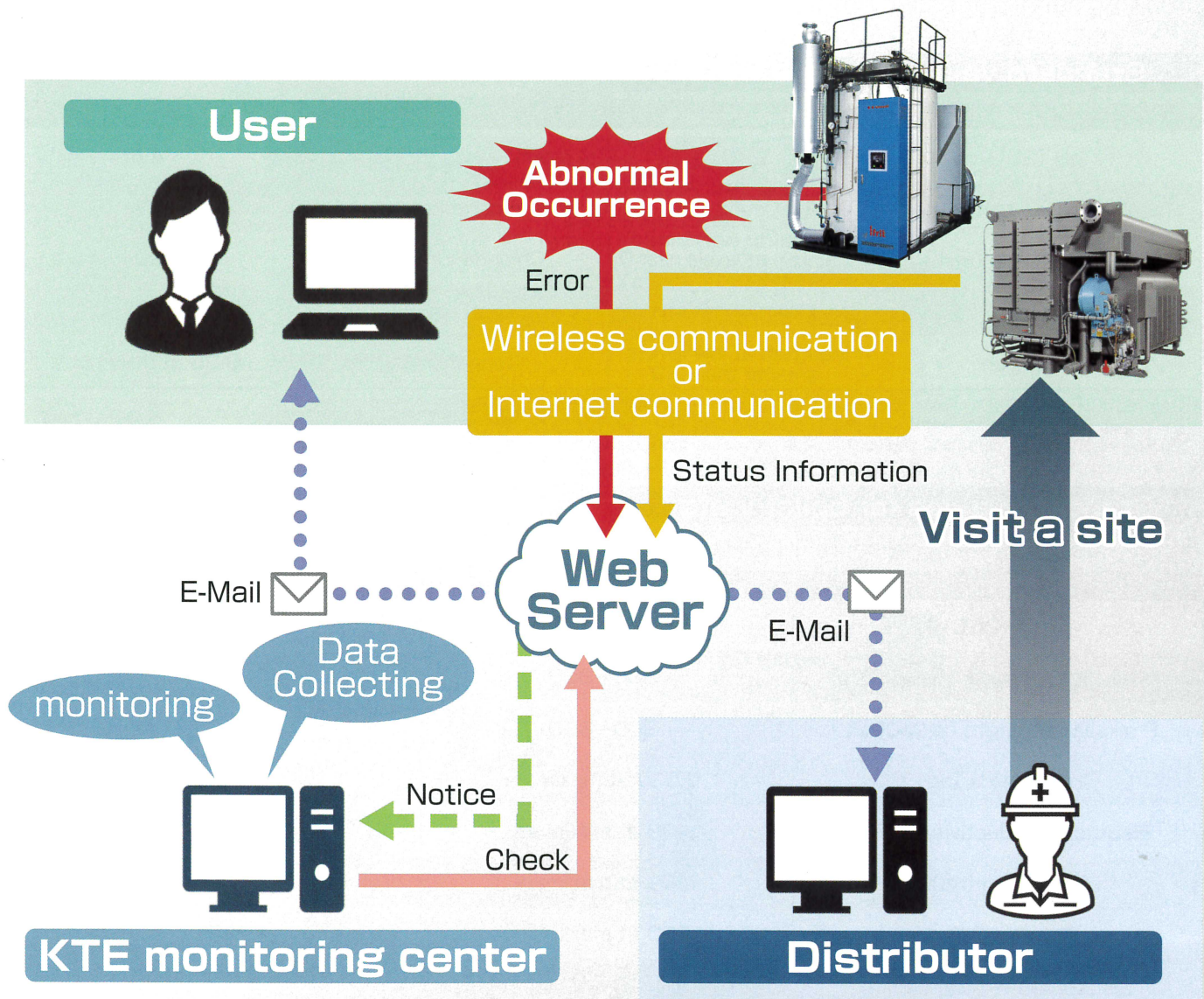
DI board : 8 points	open collector or non-voltage retention input
DO board : 4 points	non-voltage retention output
AI board : 4 points	DC 1-5 V input
AO board : 4 points	DC 4-20 mA output



## Remote monitoring system

KTE monitor operating condition via wireless communication or internet communication.

- When abnormal error occurs, operation data will be sent to the remote monitoring system.
- Our service engineer and distributor check the error before site visit. It contributes to shortening the time for trouble shooting.





## Water treatment

Water quality control is quite important to keep boiler operation in good condition. In particular, once-through boilers with high heat efficiency tend to force high load on the heat transfer area, probably resulting in trouble like water tube breakage provoked by scales and corrosion without an appropriate water treatment. For prevention of such trouble, the following tables show our standard values for water treatment to be carried out from outside of the boiler (i.e. removing impurities from feed water) and inside of the boiler (i.e. properly managing boiler water quality).

### Standard values for feed water

Item	Standard value	Item	Standard value
pH (25°C)	7~8.5	M alkaline strength (mgCaCO <sub>3</sub> /L)	40
Total hardness (mgCaCO <sub>3</sub> /L)	1 at maximum	Electric conductivity (mS/m)	15
Oil and grease (mg/L)	Maintain at levels near 0	Chloride ion (mgCl <sup>-</sup> /L)	20
Dissolved oxygen (mgO <sub>2</sub> /L)	Maintain at low levels	Silica (mgSiO <sub>2</sub> /L)	20
Total iron	Maintain at low levels smaller than 0.3	Copper (mgCu/L)	0.05 at maximum

※ 1mgCaCO<sub>3</sub>/L=0.056°dH(German hardness) 1°dH(German Hardness)=17.85mgCaCO<sub>3</sub>/L

※ The pH value shows the strength of alkaline and acidity. The value 7 indicates neutral. As the value increases from 7, the degree of alkaline increases, and as the value decreases from 7, the degree of acidity increases.

### Standard values for boiler water

(in the case of working pressure 1.0MPa at maximum)

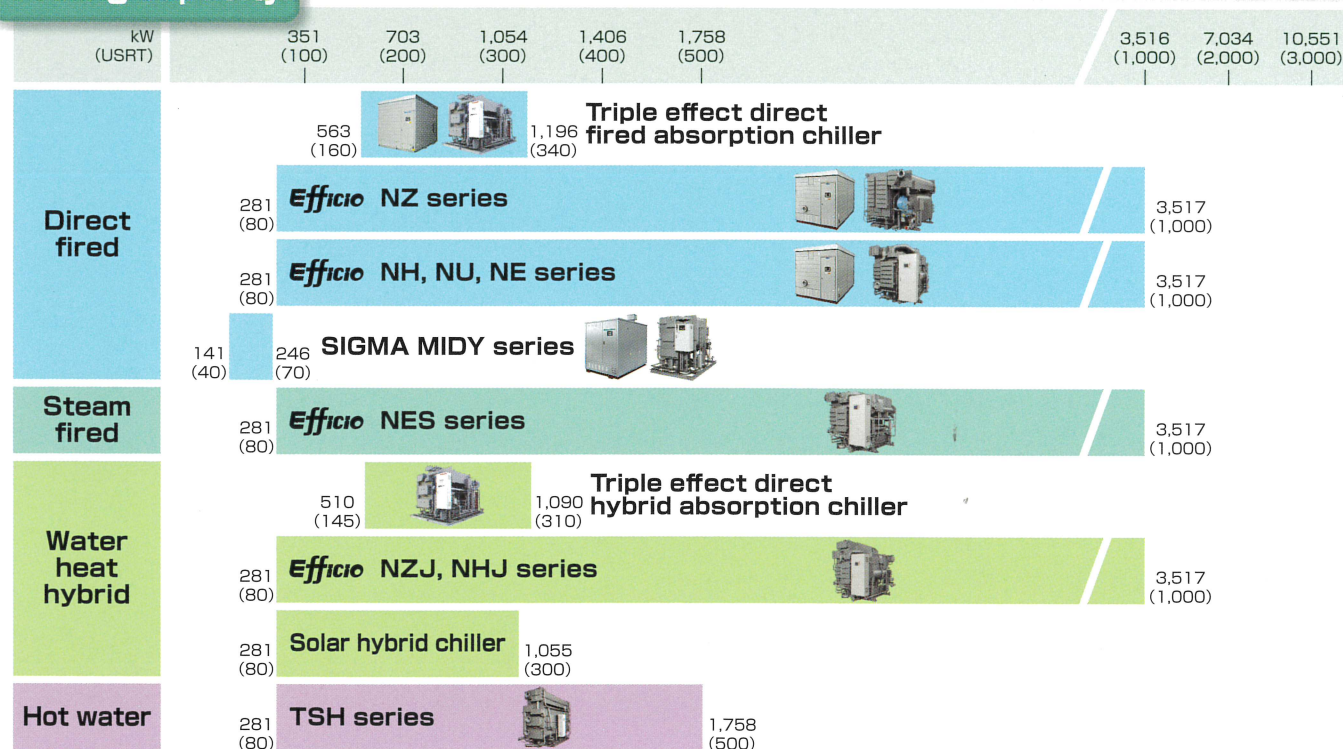
Item	Standard value	Remarks
pH (25°C)	11.0~11.8	Criteria for preventing corrosion and scale inside the boiler
M alkaline strength (mgCaCO <sub>3</sub> /L)	500~800	
P alkaline strength (mgCaCO <sub>3</sub> /L)	300~600	
Total solids (mg/L)	2,500 at maximum	Criteria for concentration and for preventing carry-over
Electrical conductivity (mS/m)	400 at maximum	Criteria for concentration and for preventing carry-over
Chloride ion (mgCl <sup>-</sup> /L)	400 at maximum	
Silica (mgSiO <sub>2</sub> /L)	300 at maximum	
Phosphate ion (mgPO <sub>4</sub> <sup>3-</sup> /L)	20~40	Criteria for preventing scaling inside the boiler
Copper (mgCu/L)	1.0 at maximum	
Hydrazine (mgN <sub>2</sub> H <sub>4</sub> /L)	0.1~0.5	To prevent corrosion due to oxygen
P ratio P alkaline strength (mgCaCO <sub>3</sub> /L)	1.7 at minimum	Criteria for preventing silica scaling
P ratio Silica (mgSiO <sub>2</sub> /L)	1.7 at minimum	Criteria for preventing silica scaling

※ Treat the boiler drainage water in compliance with the values of water pollution control acts and other laws and local regulations.

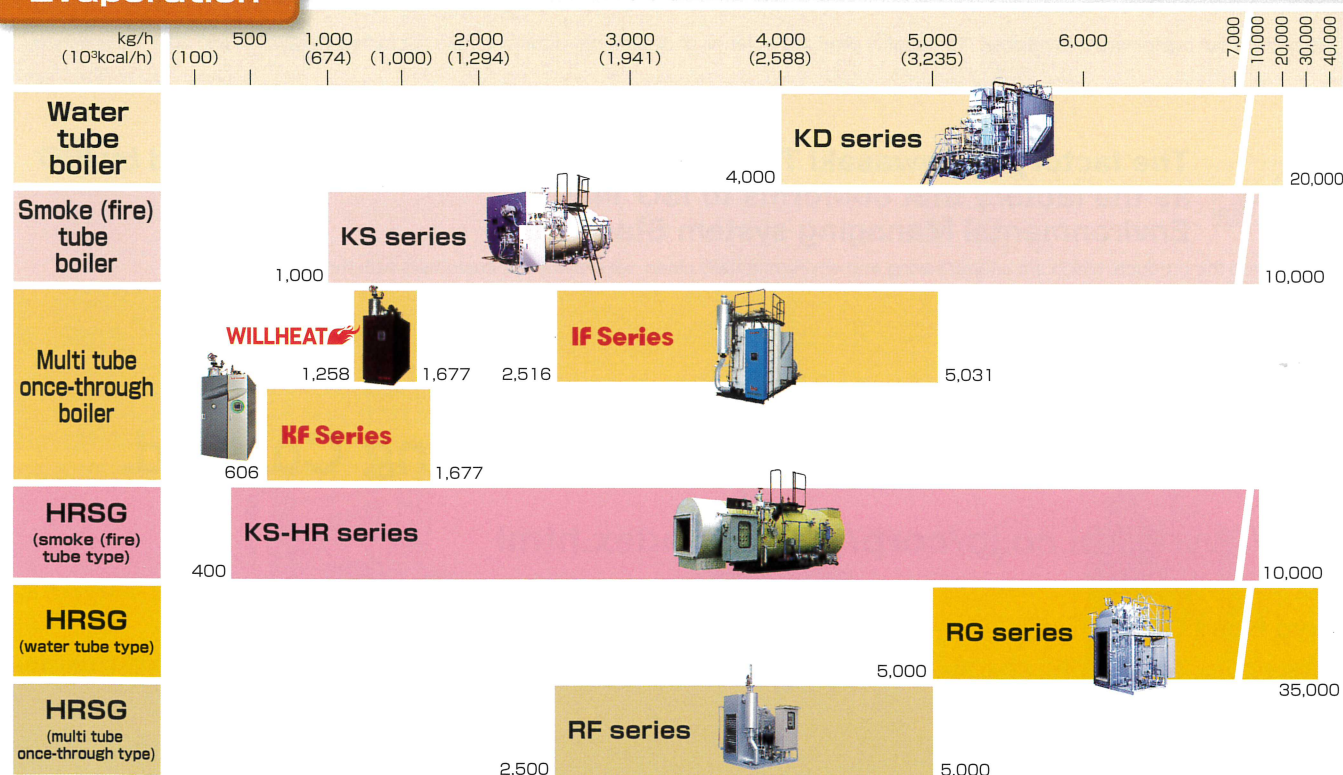


# Product line up/Absorption Chiller & Boiler

## Cooling capacity



## Evaporation



HRSG : Heat Recovery Steam Generator



## Safety Precautions

### Before operating the machine

- The machine should be put into operation only after reading the Operation Manual carefully and consulting with our technical staff.

### Before installation

- The machine should not be installed where flammable materials such as gas, gasoline, thinners, etc. are or will be present, or where corrosive gas such as ammonia, chlorine, etc. may be generated.
- Carrying-in, installation, foundation construction, electric wiring and hot insulation should be done at the site by qualified subcontractors.  
Faulty or improper work in any of these areas can cause electric shocks, fires, water leakage, fuel leakage or burns to the skin.
- Construction work of flues, exhaust gas ducts and chimneys should be done by subcontractors where necessary. Faulty construction work can result in fire and oxygen deficiency in the plant room and burns to the skin.
- A waterproof floor or base should be provided for the machine, with a trench in the floor.  
Faulty waterproofing work can cause damage to other equipment and facilities nearby.
- Installation of the machine should be planned with enough maintenance space around the machine.  
Narrow working areas can result in injury to personnel.

Please kindly fill in the following items for our proposal.

- |   |                     |
|---|---------------------|
| 1. Maximum Working Pressure               | MPa                 |
| 2. Normal Working Pressure                | MPa                 |
| 3. Maximum Evaporation                    | kg/h                |
| 4. Feed Water Temperature                 | °C                  |
| 5. Type of Fuel                           |                     |
| 5-1 Heating value (Based on LHV)          | MJ/m <sup>3</sup> N |
| 5-2 Component of fuel                     |                     |
| 6. Fuel Gas Supply Pressure               | kPa                 |
| 7. Detail of Feed Water and Boiler Water  |                     |
| 8. Usage of Steam                         |                     |
| 9. Average Load during operation          |                     |
| 9-1 Annual Operating Hour                 | h/year              |
| 9-2 Load Flucuation (Output and pressure) |                     |
| 10. Power Source                          | 3ø V Hz             |



**Kawasaki Thermal Engineering Co.,Ltd. is approved by ISO for the ISO 9001 as a manufacturer of chillers and boilers.**

We provide our customers with reliable, high-quality products in terms of design, development, manufacturing, installation and after-sales service.



**The factory of Kawasaki Thermal Engineering Co.,Ltd. is approved by ISO as the factory that conforms to ISO 14001, Environmental Managing system Standard.**

We develop the products which are energy saving and environmentally clean. we provide our customers with those products.



# Kawasaki Thermal Engineering Co., Ltd.

<http://www.khi.co.jp/corp/kte/EN/index.html>

### Tokyo Head Office

5th Floor, South Tower, 1-5-25, Kiba, Koutou-ku, Tokyo 135-0042 Japan  
Phone:+81-3-3645-8251 Fax:+81-3-3645-8233

### Shiga Plant

1000 Aoji-cho, Kusatsu-shi, Shiga 525-8558 Japan  
Phone:+81-77-563-1111 Fax:+81-77-563-1120

The company reserves the right to change design and specifications without notice.  
Kindly consult with us when planning an installation.  
Performance figures in this catalog are based on our own calculations.  
On-site data may differ depending upon measurement tolerance, measurement conditions, etc.  
Kindly consult with us when you order.