Kawasaki
Powering your potential

Kawasaki Multi tube Once-Through Boiler


IF Series


WILLHEAT


KF Series

Kawasaki Thermal Engineering Co., Ltd.

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

Gas Fired　Oil Fired

- High Efficiency
- High Quality Steam
- Long Life
- Various Options

WILLHEAT

Gas Fired

KF Series

Gas Fired Oil Fired

CONTENTS

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 ω-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.

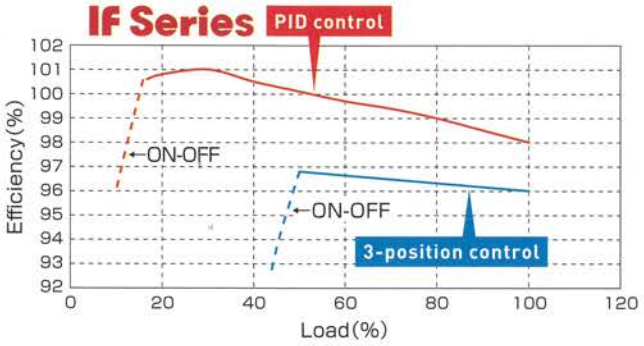
PID Feed Water Control

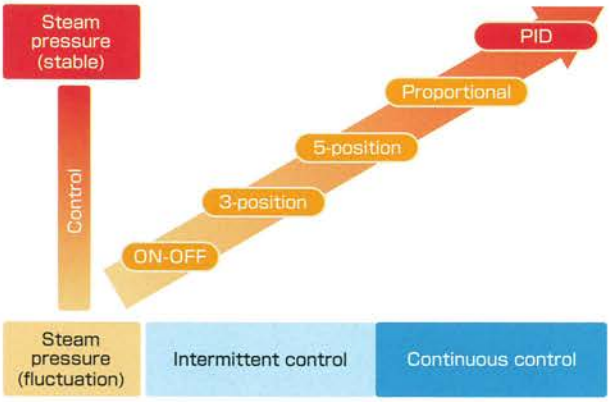
In the case of ON-OFF control for feed water, excess of feed water tends to take heat from the boiler and substantially decrease steam pressure. In order to minimize such steam pressure change, PID modulating control is also applied to feed water control, which continuously controls necessary amount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

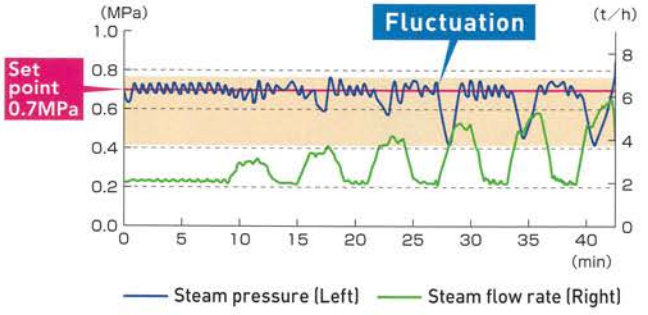
Steam supply pressure ±0.01 MPa Under static load

Steam pressure remains stable even when load fluctuates.

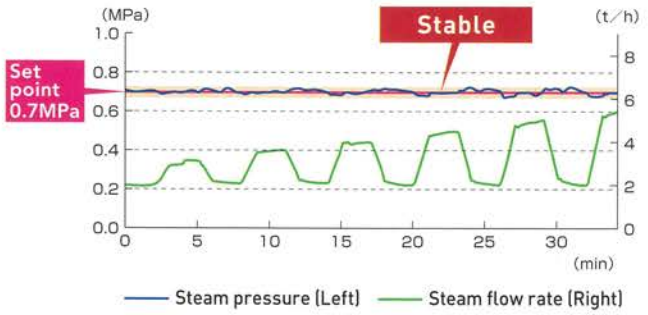
Comparison of control specifications

		Once-through boiler			
		Small capacity			Large capacity
		KF Series	WILLHEAT GE	WILLHEAT GEX	IF Series
Equivalent evaporation (kg/h)x Q'ty		2,000×4	2,000×4	2,000×4	4,000×2
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 KF Series

High steam dryness

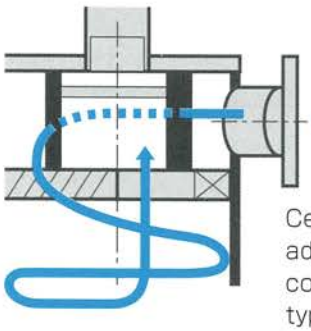
Dryness 99.5% or more

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.



Centrifugal rotatation 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

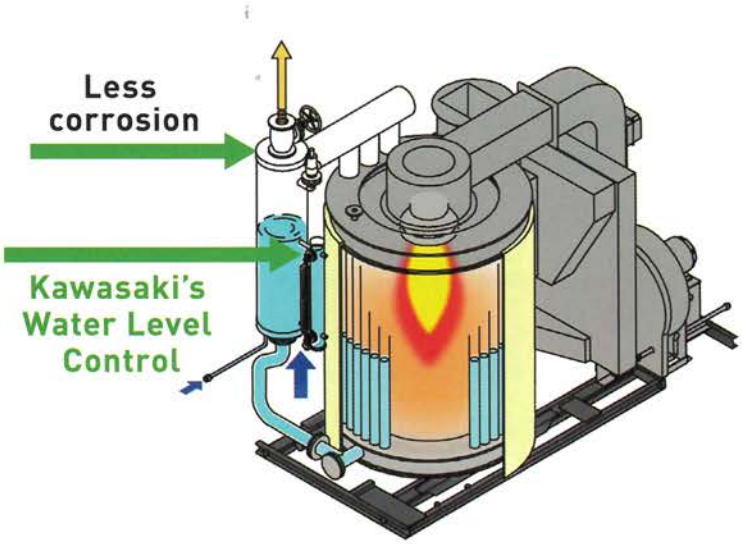
The following manufacturing know-hows have realized such long life of once-through boiler equivalent to large boiler's life.

Water feeding to steam water separator

■Commonly-used once-through boilers apply direct water feeding to boiler body, but we have applied a syetem 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)

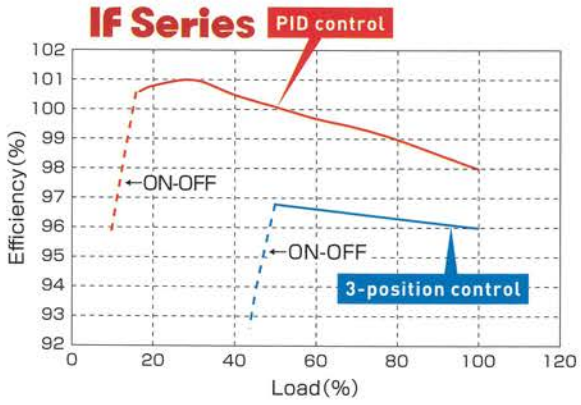
Diesel oil fired LPG fired **5:1** (standard)

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.

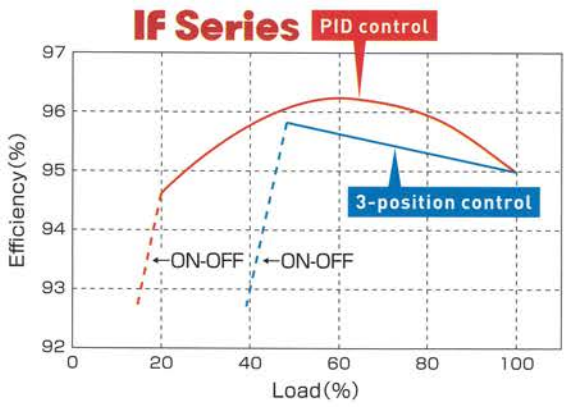
*Depending on gas component. Need study each time.

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]

Other features

- Compact design - space saving
- Quick start-up

IF Series WILLHEAT

PID multi-unit control

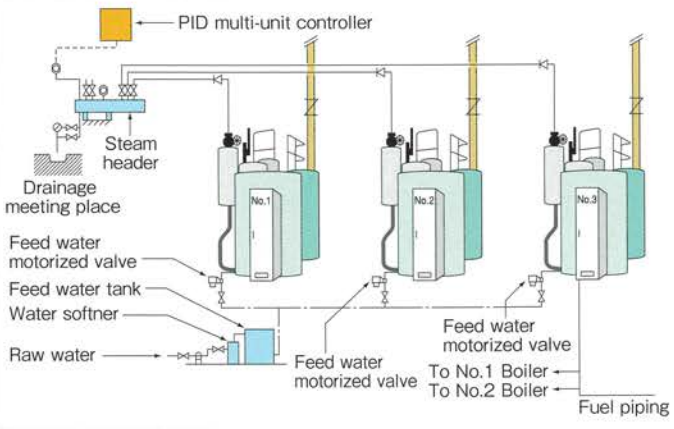
System efficiency **100%** or more

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 boielr facility. In the case a large boiler continues operating at low load or repeates 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.

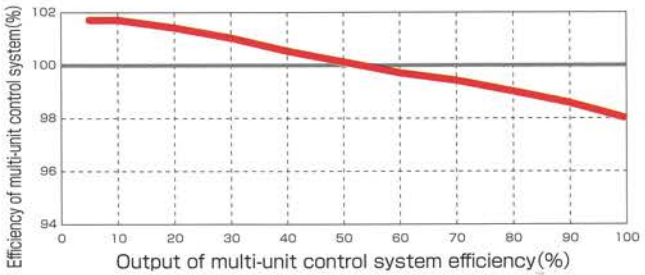
Summary of PID multi-unit control system

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
[Feed water temperature] 15℃
[Outdoor temperature] 35℃
[Blow loss] None
[Boiler efficiency] 98%※
[Multi-unit controll]
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

IF Series WILLHEAT

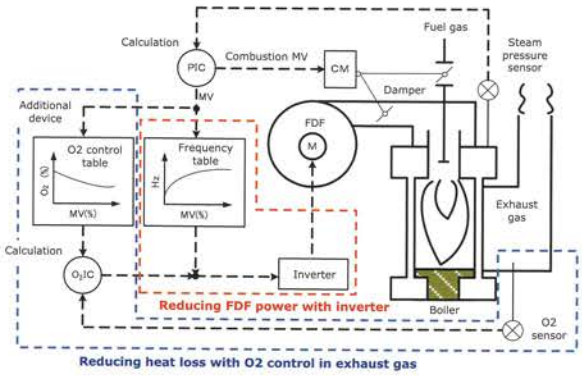
OPTION O_2 Trimming (option for only NG fired)

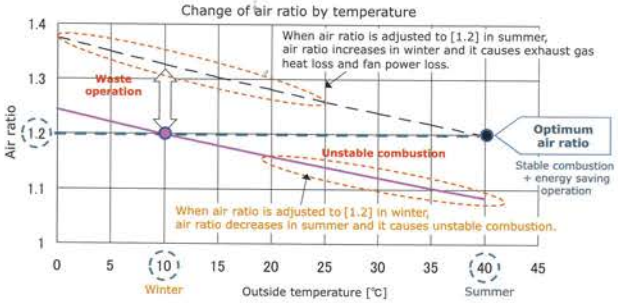
Advantage of O_2 adjustment control

It is important to control air-fuel ratio through a year as a measure of energy-saving. Since air density for combustion depends on air temperature and pressure, it is affected by change of season and environment.

The following graph shows changes of air ratio depending on air temperature. This O_2 trimming system continuously monitorizes O_2 in boiler exhaust gas and controls an inverter of forced draft fan. As a result, air-fuel ratio is optimized and kept at optimized level without an effect by change of air temperature and air pressure, which enables to reduce heat loss.

Air-fuel ratio adjustment by O_2 trimming in exhaust gas system





IF Series

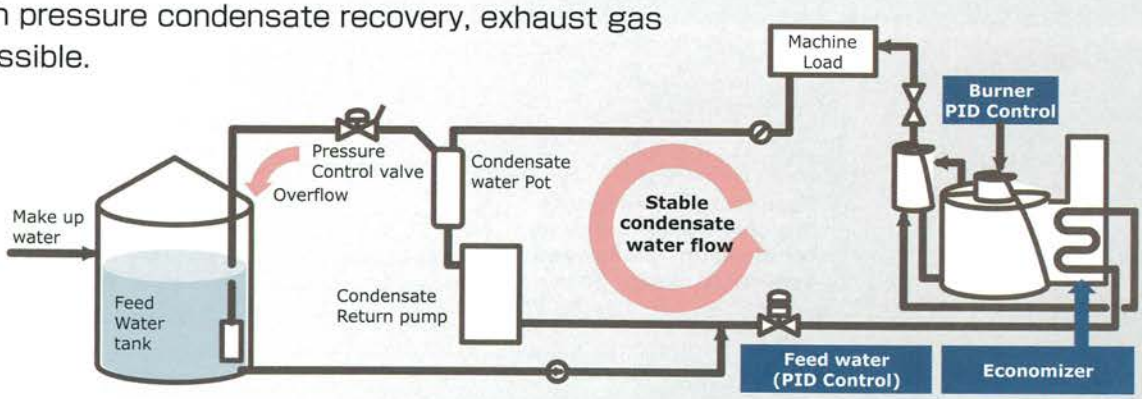
OPTION Drain recovery

Direct drain recovery

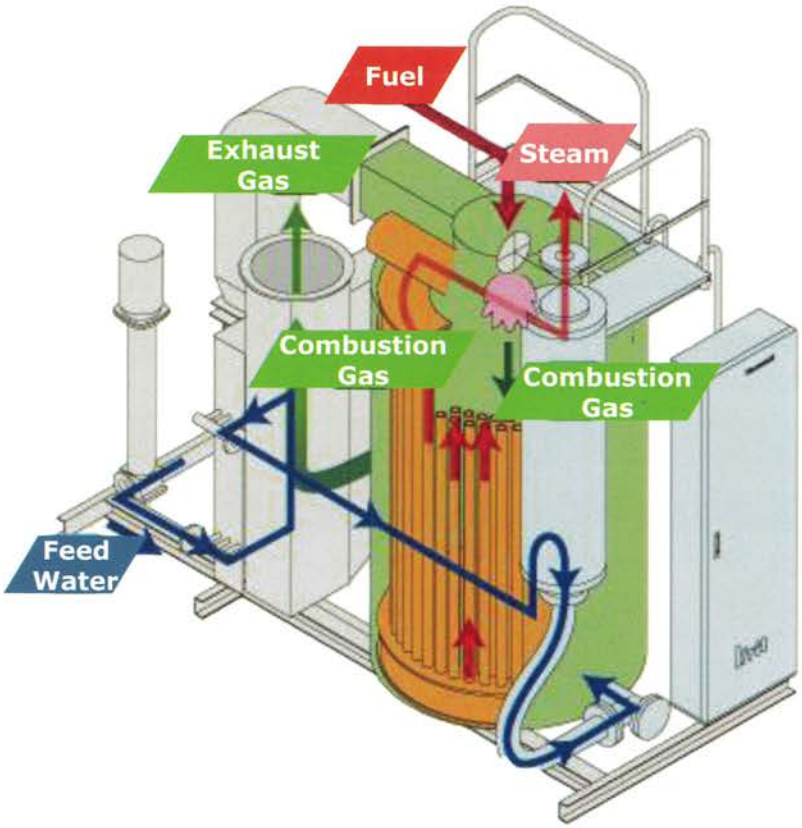
As a energy saving system, direct drain recovery has realized by PID control for combustion.

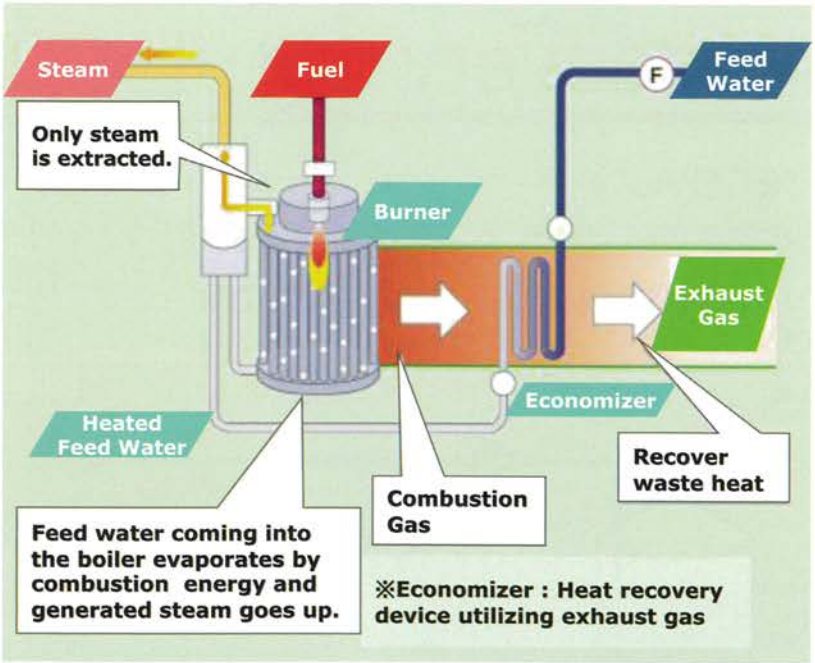
Drain recovery together with economizer

In addition to high pressure condensate recovery, exhaust gas recollection is possible.



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	**WILLHEAT** (1,500~2,000kg/h)	**KF Series** (750~2,000kg/h)
	LPG		
	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	**IF Series** (3,000~6,000kg/h)				
	LPG					
	Diesel Oil					

*Depending on applied boliler standard.

IF Series

Gas Fired

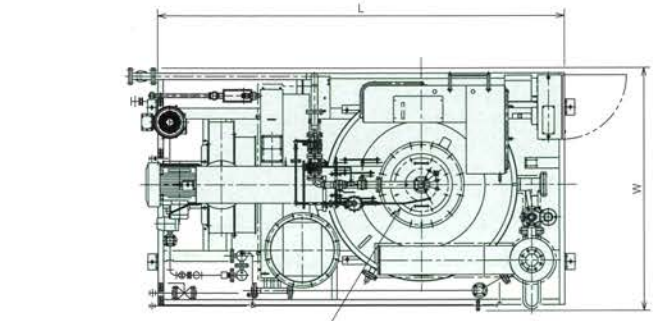
Boiler Specifications (IF Series - Gas fired)

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	㎡	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	㎥N/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]

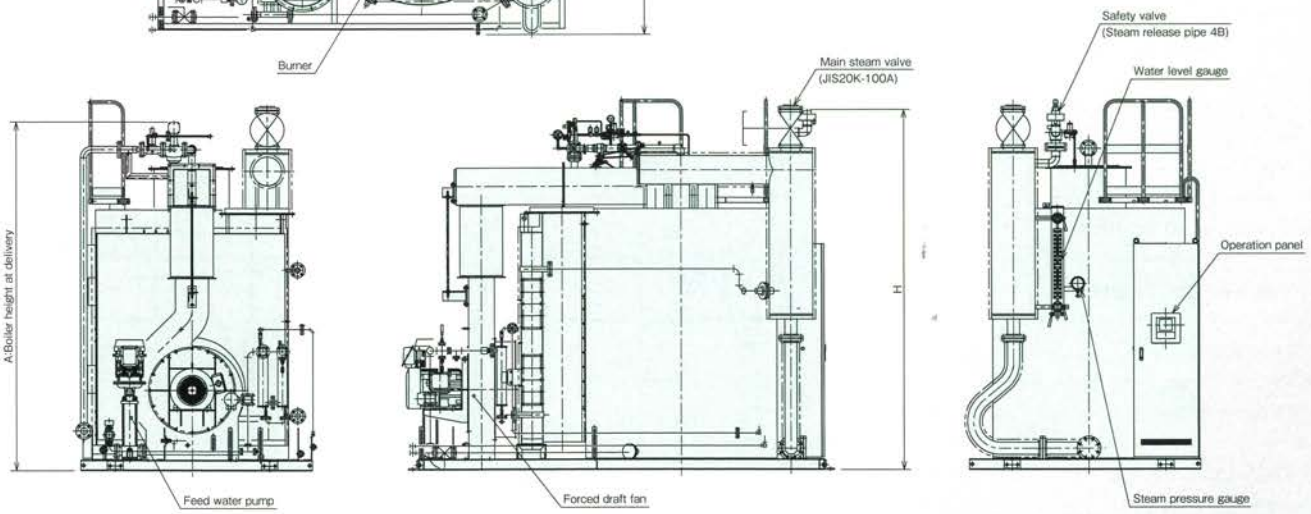
- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/㎥N (NG).
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15℃ and the room temperature of 35℃.
- 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℃ 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



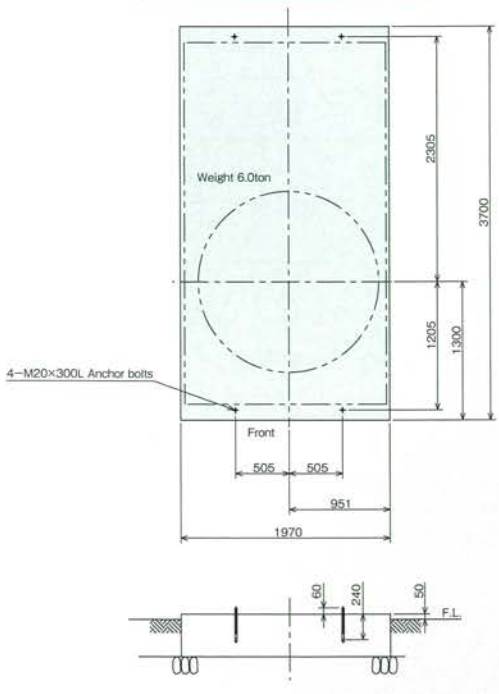
(mm)

	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

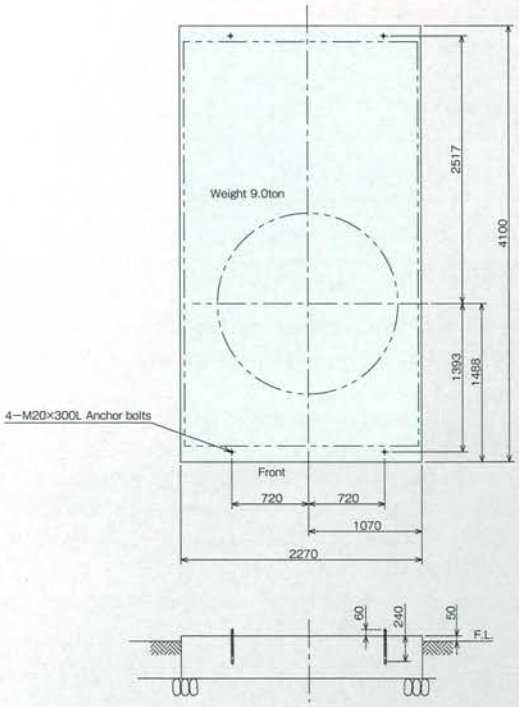


Foundation

IF-3000CGE, IF-4000CGE



IF-5000CGE, IF-6000CGE



IF Series

Oil Fired

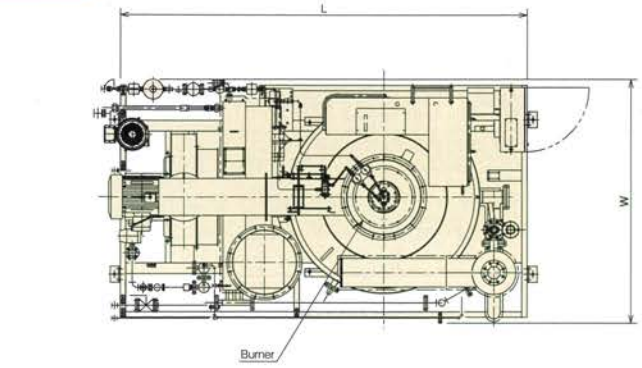
Boiler Specifications (IF Series - Oil fired)

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	㎡	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]

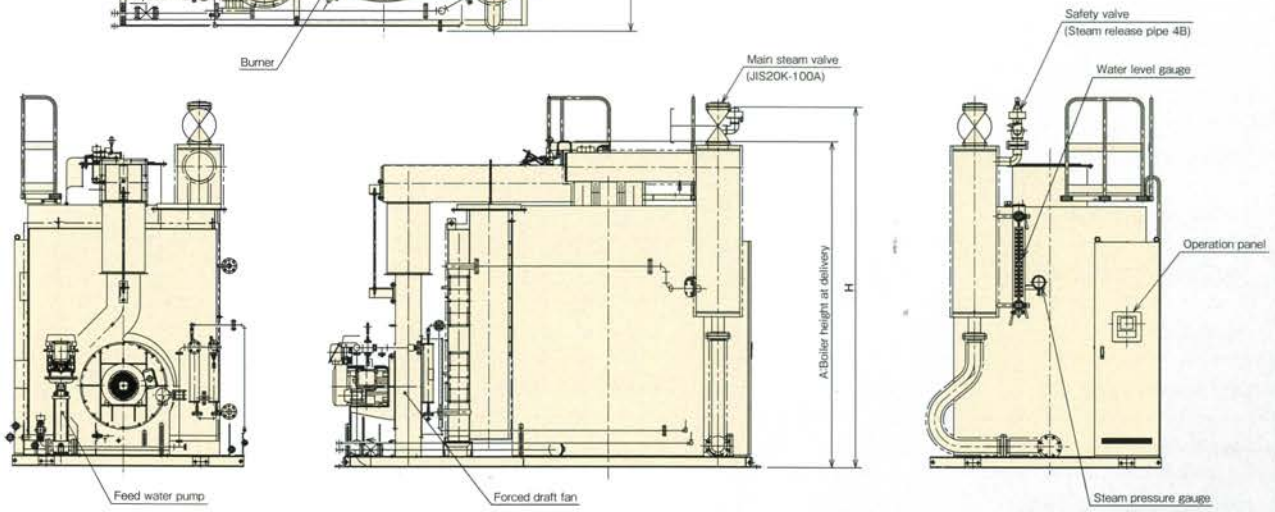
- The fuel oil consumption is shown based on the fuel's lower heating value at 42.7 MJ/kg.
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.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



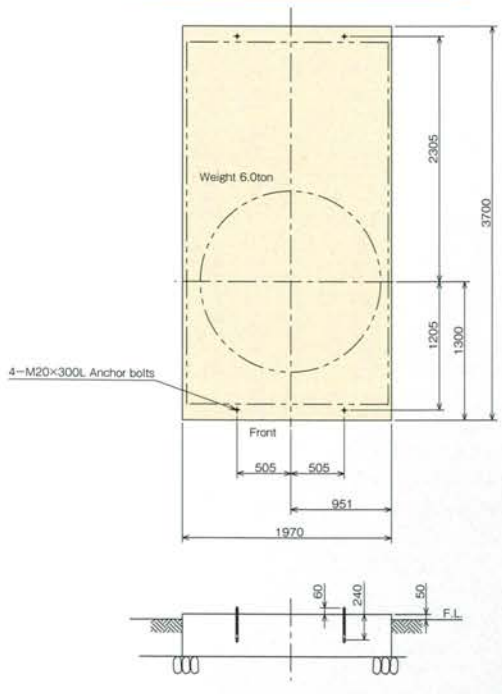
(mm)

	IF-3000CE	IF-4000CE	IF-5000CE	IF-6000CE
L	3,400	3,400	3,800	3,800
W	1,924	1,924	2,272	2,272
H	3,123	3,123	3,360	3,360
A	2,804	2,804	3,038	3,038

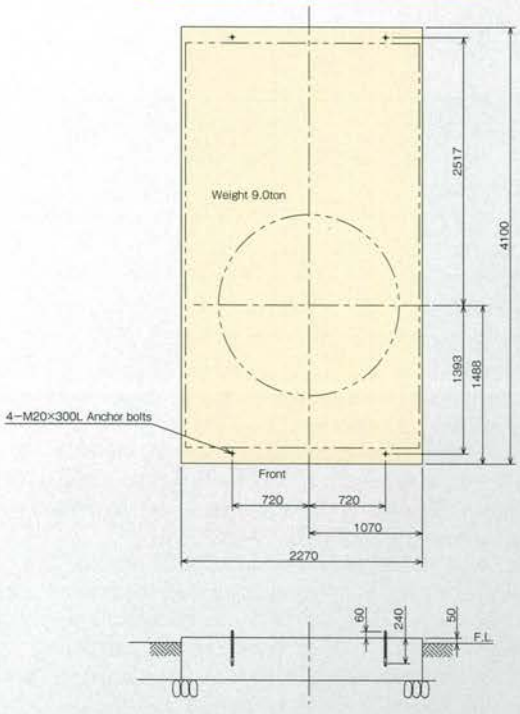


Foundation

IF-3000CE, IF-4000CE



IF-5000CE, IF-6000CE



IF Series

Gas Fired Oil Fired

Boiler Specifications (IF Series - Dual fuel fired)

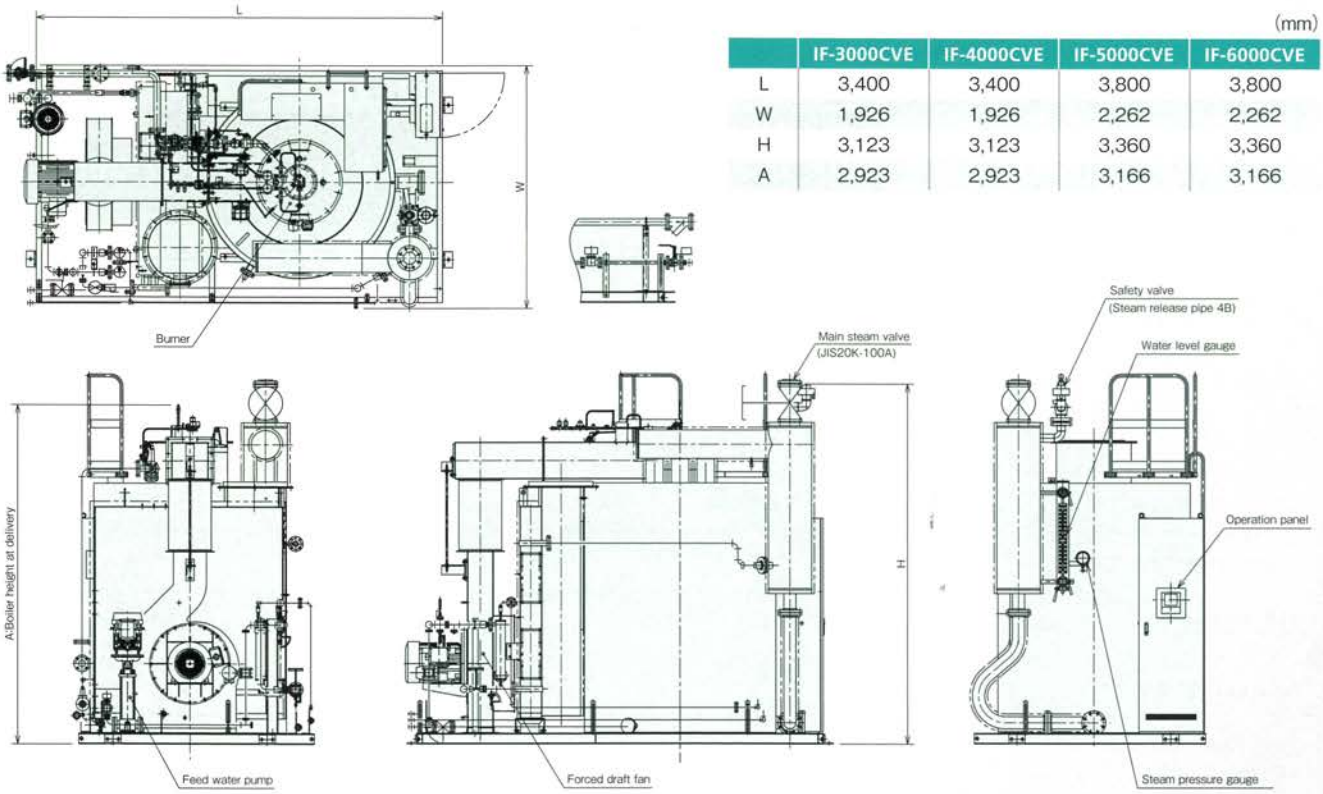
Boiler model		IF-3000CVE	IF-4000CVE	IF-5000CVE	IF-6000CVE
Equivalent evaporation	kg/h	3,000	4,000	5,000	6,000
Actual evaporation	kg/h	2,516	3,354	4,192	5,031
Maximum working pressure	MPa	0.98			
Heat surface	㎡	18.6		29.4	
Combustion control		PID continuous			
Feed water control		PID continuous			
Used 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^3_N/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^3_N (NG), 42.7 MJ/kg (Diesel Oil)
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15℃ and the room temperature of 35℃.
- 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℃ 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

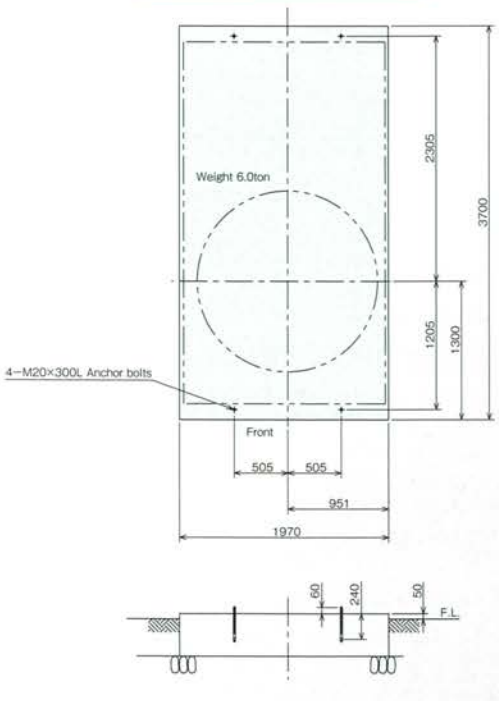
(mm)

	IF-3000CVE	IF-4000CVE	IF-5000CVE	IF-6000CVE
L	3,400	3,400	3,800	3,800
W	1,926	1,926	2,262	2,262
H	3,123	3,123	3,360	3,360
A	2,923	2,923	3,166	3,166

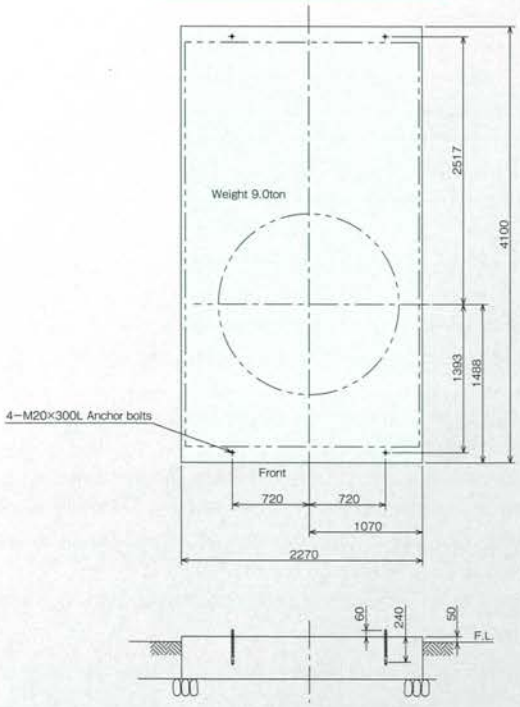


Foundation

IF-3000CVE, IF-4000CVE



IF-5000CVE, IF-6000CVE



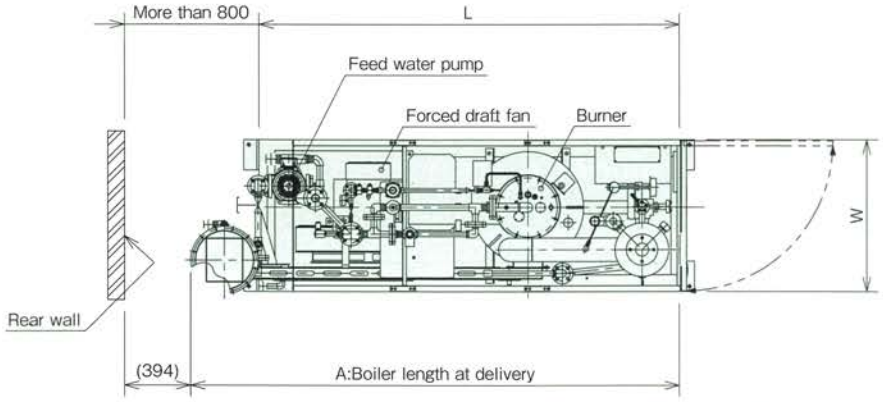
WILLHEAT Gas Fired

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	㎡	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	㎥N/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			

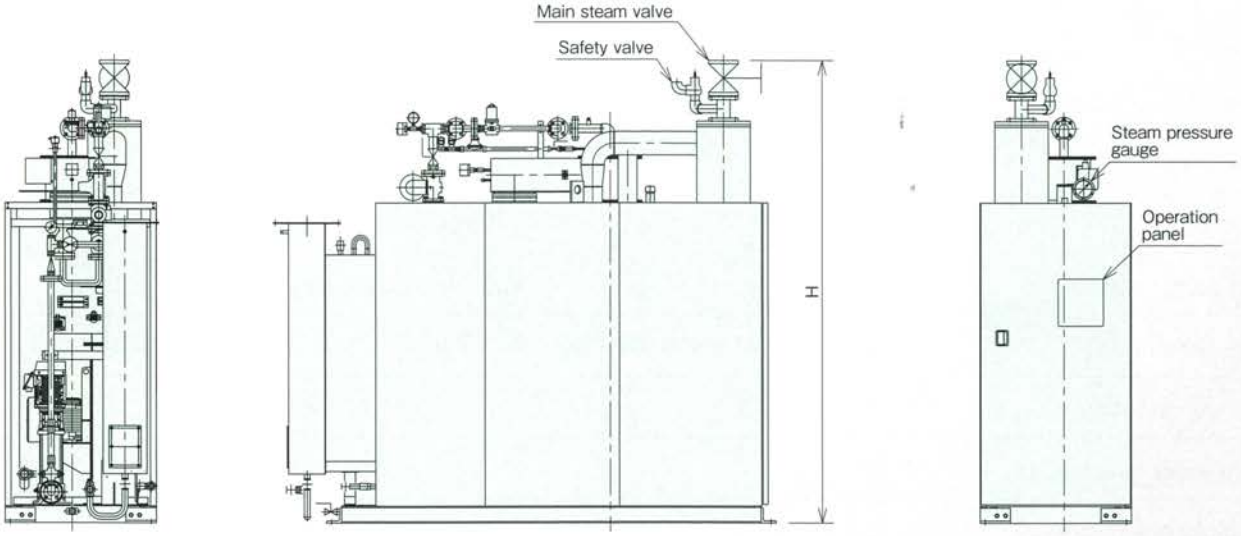
[NOTE]
- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/㎥N.
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15℃ and the room temperature of 35℃.
- 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℃ 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

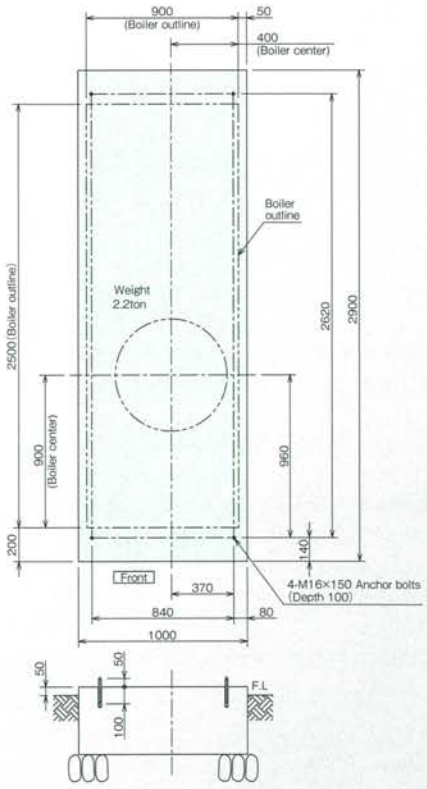


(mm)

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



Foundation



KF Series

Gas Fired

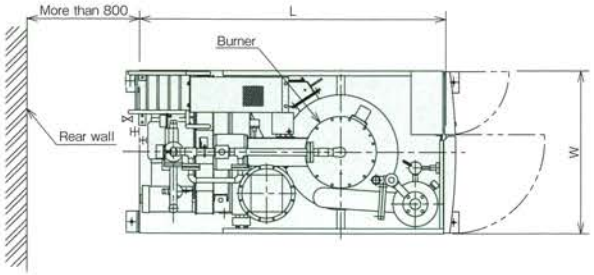
Boiler Specifications (KF Series - Gas fired)

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	㎡	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	㎥N/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
Power capacity — Feed water pump	kW	0.75	1.5	1.5	2.2
Power capacity — Control panel	kW	0.2			

[NOTE]

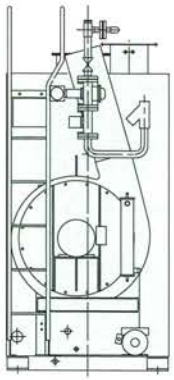
- The fuel gas consumption is shown based on the fuel's lower heating value at 40.6 MJ/㎥N (NG).
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15℃ and the room temperature of 35℃.
- 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.

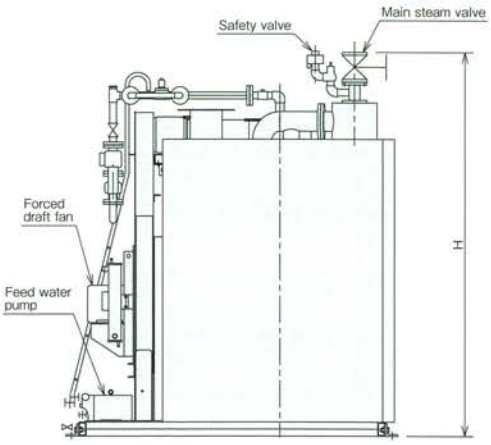
Dimension

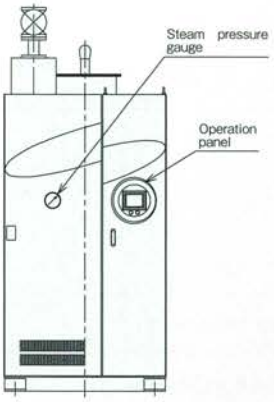


(mm)

	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

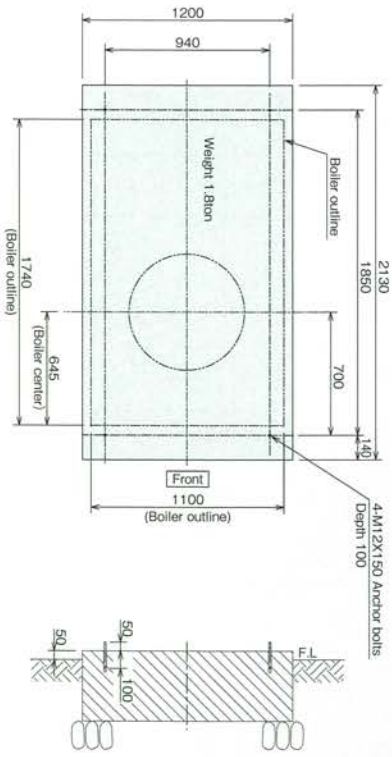




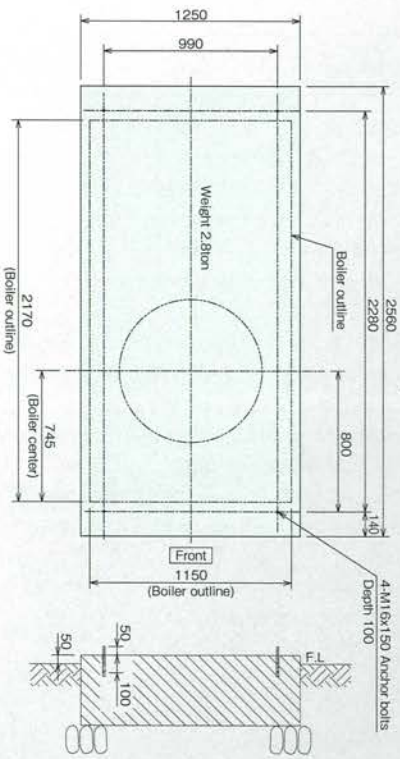


Foundation

KF-750AGE, KF-1000AGE



KF-1000AGE, KF-2000AGE



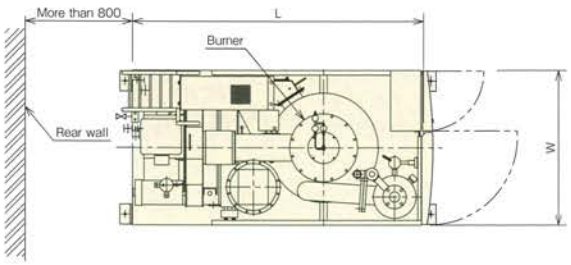
KF Series Oil Fired

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	㎡	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
Power capacity: Feed water pump	kW	0.75	1.5	1.5	2.2
Power capacity: Feed oil pump	kW	0.4			
Power capacity: Control panel	kW	0.2			

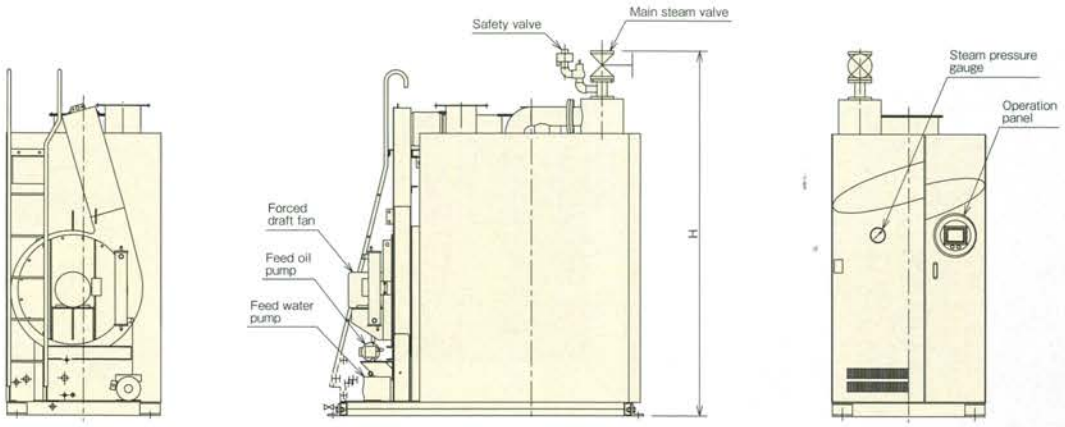
[NOTE]
- The fuel oil consumption is shown based on the fuel's lower heating value at 42.7 MJ/kg.
- Equivalent evaporation is specified on condition that feed water of 100℃ change into steam of 100℃.
- Actual evaporation is indicated based on the steam pressure of 0.49MPa and the feed water temperature of 15℃.
- Boiler efficiency is indicated based on the steam pressure of 0.49MPa, the feed water temperature of 15℃ and the room temperature of 35℃.
- 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



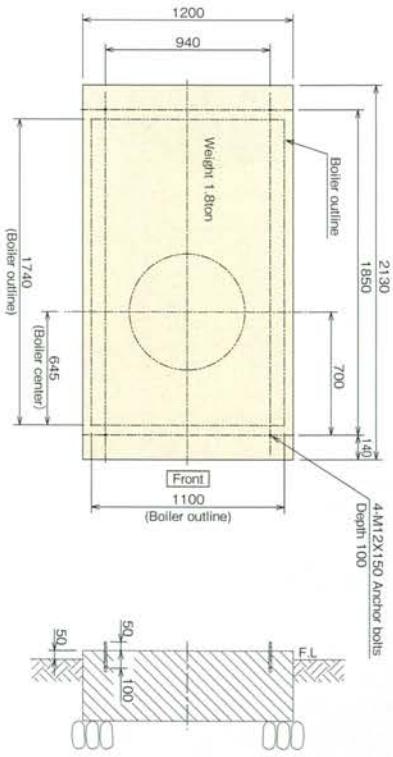
(mm)

	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

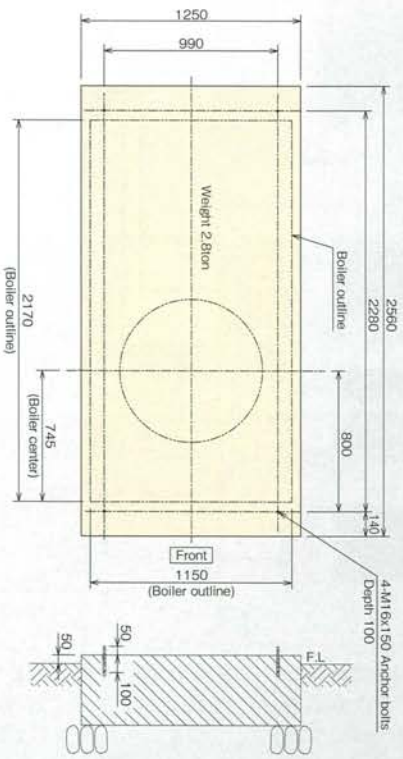


Foundation

KF-750AE, KF-1000AE



KF-1500AE, KF-2000AE



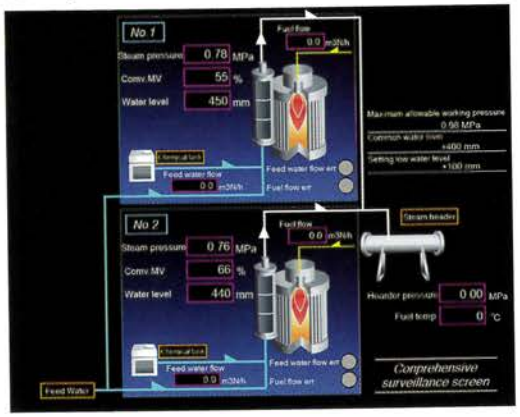
Data logger

Comprehensive surveillance system [Every FIT]

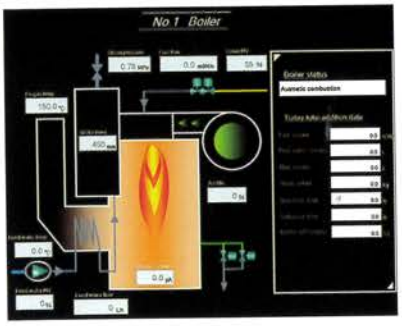
- This system monitorizes every facility.
- Surveillance screen and daily/monthly report can be customized freely according to the customer's application.
- Not only boiler data signal but also auxiliary facilities signals can be input to 'Every FIT'

Display example

Comprehensive surveillance screen



Individual surveillance screen

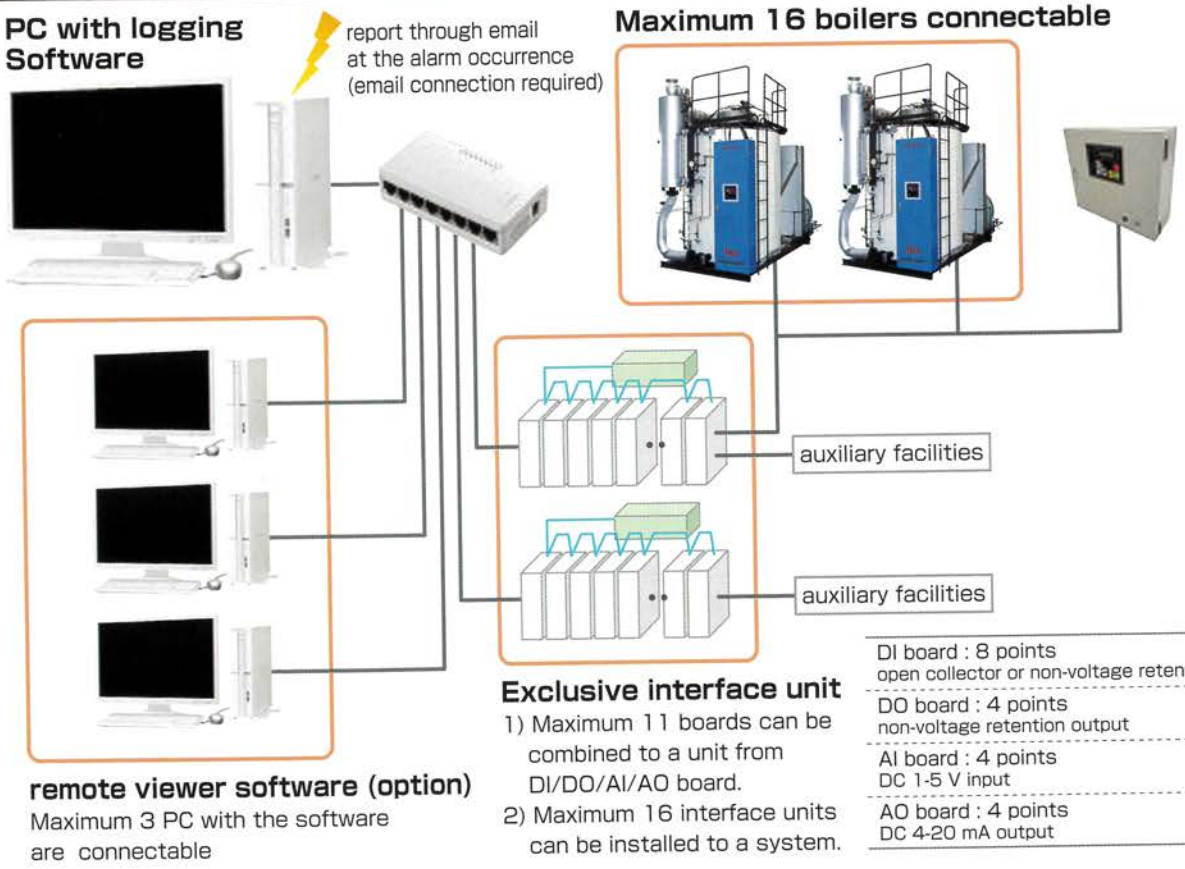


Screen switching by boiler icon click

Others

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

System flow



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

Exclusive interface unit

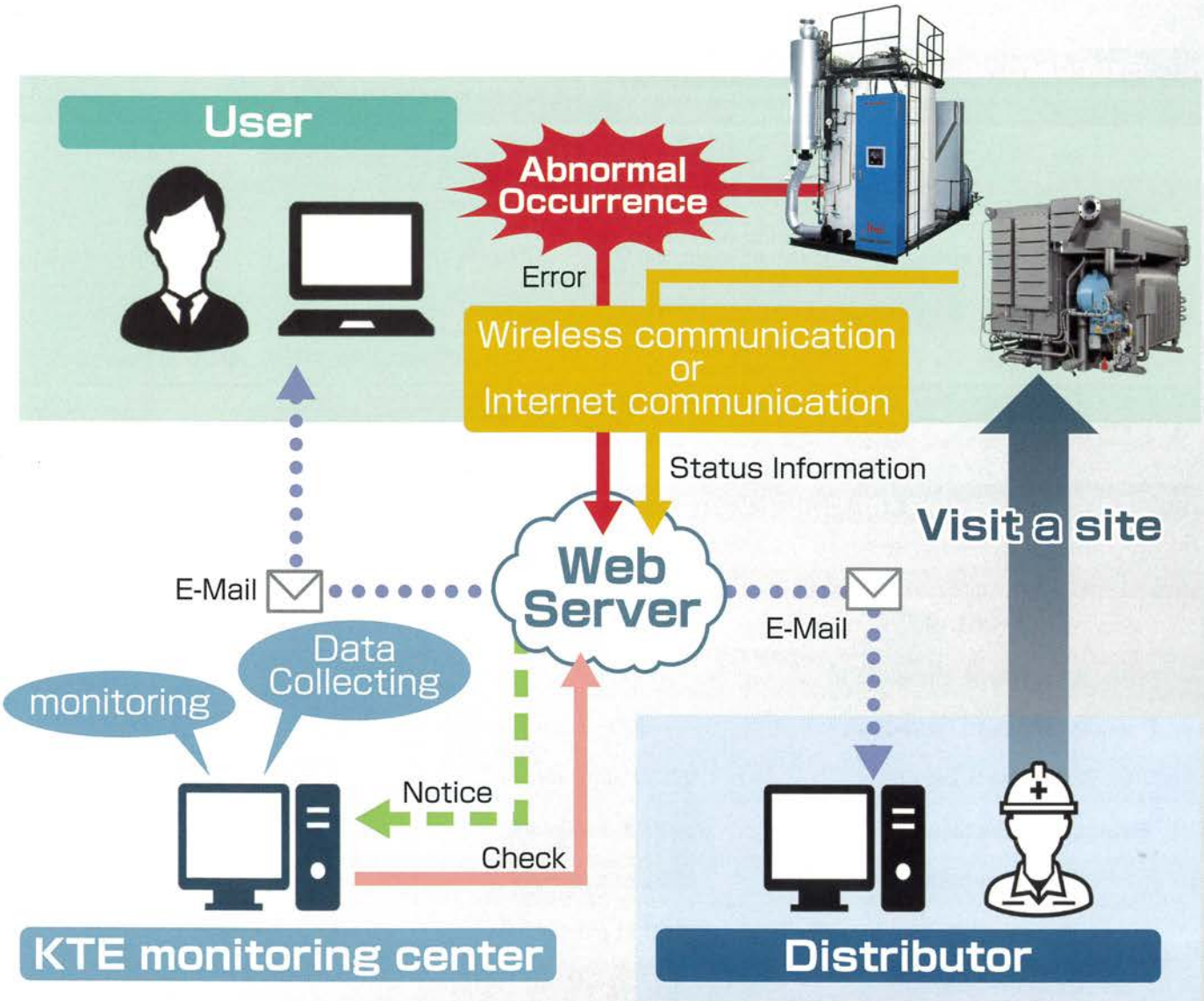
1) Maximum 11 boards can be combined to a unit from DI/DO/AI/AO board.
2) Maximum 16 interface units can be installed to a system.

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℃)	7~8.5	M alkaline strength (mg$CaCO_3$/L)	40
Total hardness (mg$CaCO_3$/L)	1 at maximum	Electric conductivity (mS/m)	15
Oil and grease (mg/L)	Maintain at levels near 0	Chloride ion (mgCl^-/L)	20
Dissolved oxygen (mgO_2/L)	Maintain at low levels	Silica (mgSiO_2/L)	20
Total iron	Maintain at low levels smaller than 0.3	Copper (mgCu/L)	0.05 at maximum

※1mgCaCO3/L=0.056°dH(German hardness) 1°dH(German Hardness)=17.85mgCaCO3/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

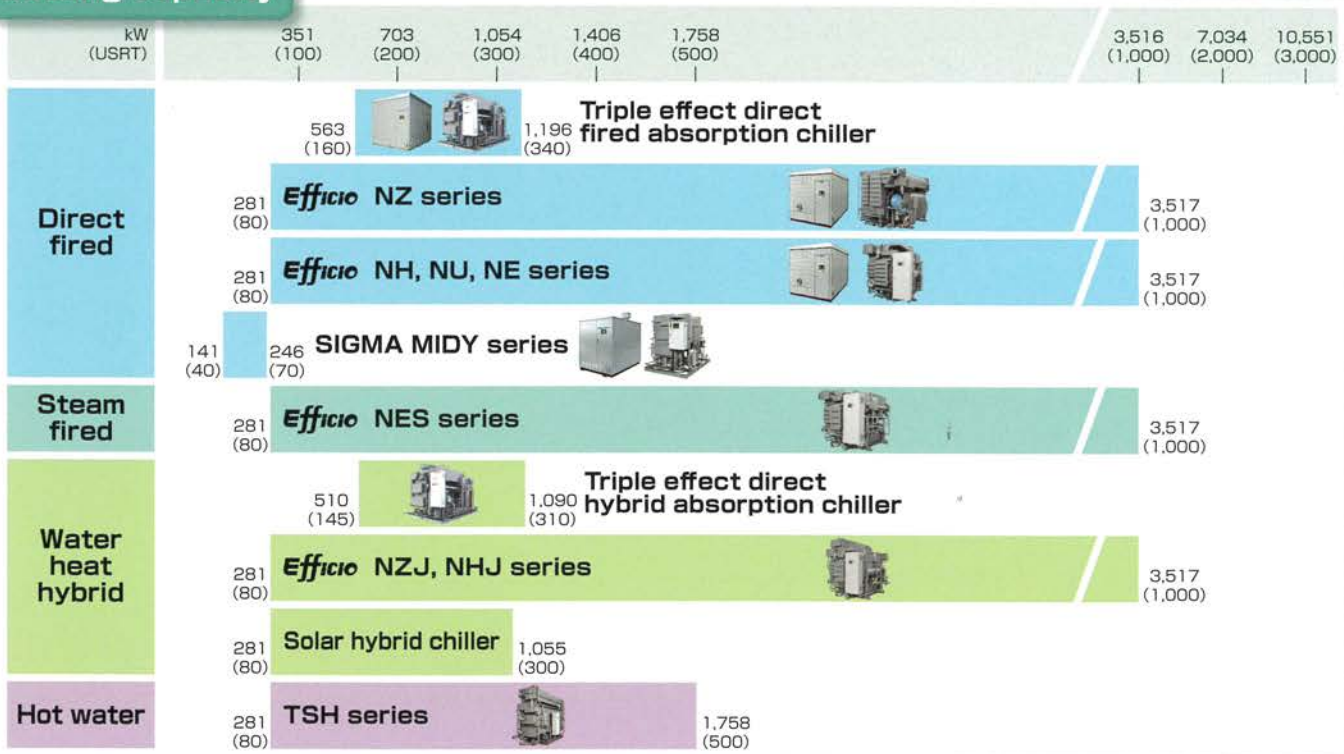
(in the case of working pressure 1.0MPa at maximum)

Item	Standard value	Remarks
pH (25℃)	11.0~11.8	Criteria for preventing corrosion and scale inside the boiler
M alkaline strength (mg$CaCO_3$/L)	500~800	
P alkaline strength (mg$CaCO_3$/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^-/L)	400 at maximum	
Silica (mgSiO_2/L)	300 at maximum	
Phosphate ion (mgPO_4^{3-}/L)	20~40	Criteria for preventing scaling inside the boiler
Copper (mgCu/L)	1.0 at maximum	
Hydrazine (mgN_2H_4/L)	0.1~0.5	To prevent corrosion due to oxygen
P ratio P alkaline strength (mg$CaCO_3$/L)	1.7 at minimum	Criteria for preventing silica scaling
P ratio Silica (mgSiO_2/L)	1.7 at minimum	Criteria for preventing silica scaling

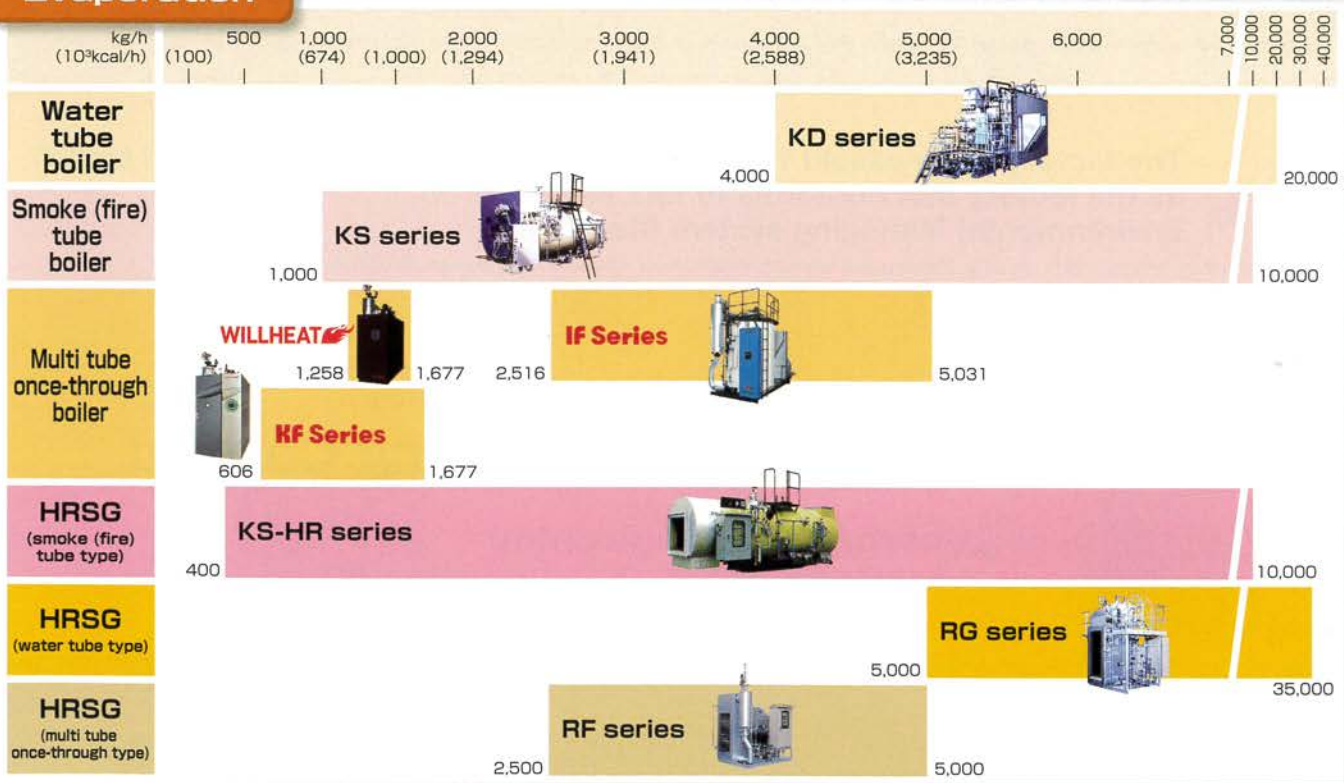
※Treat the boiler drainage water in compliance with the values of water pollution control acts and other laws and local regulations.

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	℃
5. Type of Fuel	
5-1 Heating value (Based on LHV)	MJ/m^3N
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

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