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Gas burning water heaters for
domestic use

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Gas Appliances Inspection Association (JIA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS S 2109**:2011 is replaced with this Standard.

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Gas burning water heaters for domestic use

1 Scope

This Standard specifies requirements for water heating appliance mainly for general domestic use (hereafter referred to as appliance), using liquefied petroleum gas or utility gas (hereafter referred to as gas) as the fuel. Appliances covered in this Standard are given in Table 1.

In this Standard, the pressure other than that indicated as the atmospheric pressure means the gauge pressure.

NOTE The instantaneous gas water heater and bath tub gas water heater are designated as liquefied petroleum gas equipment, etc. under the Act on the Securing of Safety and the Optimization of Transaction of Liquefied Petroleum Gas and as gas equipment under the Gas Business Act (see Annex A).

Table 1 Appliances

Type	Marked gas input rating kW	Function and other information	Figure
Instantaneous gas water heater (hereafter referred to as instantaneous water heater)	70 max.	Appliance of exclusive use for hot water supply having mechanism capable of opening/closing gas passage relating to water supply, and heating water during passing of water through heat exchanger.	Figure 34, Figure 35
Storage type closed vessel gas water heater (hereafter referred to as storage type closed vessel water heater)	42 max.	Appliance of exclusive use for hot water supply having the mechanism to heat water previously stored in the hot water storage vessel capable of opening/closing of gas passage relating to heated water temperature, of which the hot water storage part is tightly closed and not subject to the pressure of exceeding 0.1 MPa and having a heat transfer area of 4 m ² or under.	Figure 36, Figure 37
Bath tub gas water heater (hereafter referred to as bath tub water heater)	Appliance of bath part ^{a)} only: 21 max. Combination bath water and potable water heater of which hot water supply part has an instantaneous water heater structure: 91 max. (21 max. for bath part and 70 max. for hot water supply part)	Device for direct circulation heating of water in a bath tub using combustion heat of gas. Appliance consisting of a bath part only which is integrally constituted by combining a heat exchanger for heating water in a bath tub (hereafter referred to as heater body) and a burner (hereafter referred to as bath burner), and appliance of complex type which is a combination of the bath part and hot water supply function.	Figure 38, Figure 39
Note ^{a)} The bath part includes that which has other functions than the hot water supply function.			

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

- JIS A 1406 *Method for measuring amount of room ventilation (carbon dioxide method)*
- JIS B 0202 *Parallel pipe threads*
- JIS B 0203 *Taper pipe threads*
- JIS B 2061 *Faucets, ball taps and flush valves*
- JIS B 2401-1 *O-rings—Part 1: O-rings*
- JIS B 8410 *Pressure reducing valves for water works*
- JIS C 3101 *Hard-drawn copper wires for electrical purposes*
- JIS C 3102 *Annealed copper wires for electrical purposes*
- JIS C 3301 *Rubber insulated flexible cords*
- JIS C 3306 *Polyvinyl chloride insulated flexible cords*
- JIS C 3312 *600 V Grade polyvinyl chloride insulated and sheathed portable power cables*
- JIS C 3327 *600 V Rubber insulated flexible cables*
- JIS C 8303 *Plugs and receptacles for domestic and similar general use*
- JIS C 8358 *Appliance couplers for domestic and similar use*
- JIS C 8515 *Primary batteries—Physical and electrical specifications*
- JIS G 3302 *Hot-dip zinc-coated steel sheet and strip*
- JIS G 3313 *Electrolytic zinc-coated steel sheet and strip*
- JIS G 3314 *Hot-dip aluminium-coated steel sheet and strip*
- JIS G 3446 *Stainless steel tubes for machine and structural purposes*
- JIS G 3459 *Stainless steel pipes*
- JIS G 4303 *Stainless steel bars*
- JIS G 4304 *Hot-rolled stainless steel plate, sheet and strip*
- JIS G 4305 *Cold-rolled stainless steel plate, sheet and strip*
- JIS G 4308 *Stainless steel wire rods*
- JIS G 4313 *Cold rolled stainless steel strip for springs*
- JIS G 4314 *Stainless steel wires for springs*
- JIS G 5501 *Grey iron castings*
- JIS H 3100 *Copper and copper alloy sheets, plates and strips*
- JIS H 3250 *Copper and copper alloy rods and bars*
- JIS H 3300 *Copper and copper alloy seamless pipes and tubes*
- JIS H 3320 *Copper and copper alloy welded pipes and tubes*

- JIS H 4000 *Aluminium and aluminium alloy sheets, strips and plates*
- JIS H 4040 *Aluminium and aluminium alloy bars and wires*
- JIS H 4080 *Aluminium and aluminium alloy extruded tubes and cold-drawn tubes*
- JIS H 4090 *Aluminium and aluminium alloy welded pipes and tubes*
- JIS H 4100 *Aluminium and aluminium alloy extruded profiles*
- JIS H 5120 *Copper and copper alloy castings*
- JIS H 5202 *Aluminium alloy castings*
- JIS H 5301 *Zinc alloys die castings*
- JIS H 5302 *Aluminium alloy die castings*
- JIS S 2075 *Measurement method of efficiency for domestic gas and oil water heater under standard usage mode*
- JIS S 2091 *Gas and kerosene appliances for domestic use, and their accessories—Glossary*
- JIS S 2093 *Test methods of gas burning appliances for domestic use*
- JIS S 2149 *Bimetal type thermal switches for gas appliances*
- JIS S 2150 *Manually operated gas valves for gas appliances*
- JIS S 2151 *Automatic gas valves for gas appliances*
- JIS S 3200-1 *Equipment for water supply service—Test methods of hydrostatic pressure*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS S 2075**, **JIS S 2091** and **JIS S 2093**, and the following apply.

3.1

liquefied petroleum gas

gases listed in the “standards for liquefied petroleum gas” of the Enforcement Regulation (Ordinance of the Ministry of International Trade and Industry No. 11 of 1997) based on the Act on the Securing of Safety and the Optimization of Transaction of Liquefied Petroleum Gas (Act No. 149 of 1967)

3.2

utility gas

gases of gas groups specified in Appended Table 3 of the Ministerial Order on Technical Requirements for Gas Equipment (Order of the Ministry of International Trade and Industry No. 27 of 1971) based on the Gas Business Act (Act No. 51 of 1954)

3.3

automatically-ignited appliance

appliance which is in a standby mode and then automatically performs the opening of gas passage to the burner, lighting, and confirmation of lighting

3.4

indicated gas input rating

quantity of gas consumed, indicated on the appliance, when an appliance is used under the condition where the quantity of gas consumption is maximum

3.5

rated thermal efficiency

percentage of available heat against heat input amount when an appliance is used under the condition where the quantity of gas consumption is maximum

3.6

heating time

period required for raising the water temperature from the water supply temperature to the specified hot water supply temperature

4 Classification

4.1 Classification by installation

4.1.1 Classification by indoor or outdoor installation

The classification of appliances by indoor or outdoor installation shall be as given in Table 2.

Table 2 Classification by indoor or outdoor installation

Installation type	Classification	Abbreviation	Figure
Indoor type	Appliance installed indoors for use.	—	Figure 2 to Figure 10
Outdoor type	Appliance installed outdoors for use.	RF	Figure 11

4.1.2 Classification of indoor type appliance by air supply and exhaust type

The classification of indoor type appliances by air supply and exhaust type shall be as given in Table 3. The bath tub water heater of unvented type is excluded.

Table 3 Classification of indoor type appliance by air supply and exhaust type

Air supply and exhaust type		Classification	Designation	Abbreviation		Figure
Unvented type		Use indoor air for combustion and exhaust flue gases indoors.	Unvented type	—		Figure 2
Vented type	Natural exhaust type	Use indoor air for combustion and exhaust flue gases outdoors through an exhaust pipe by natural draft.	Natural exhaust type	CF		Figure 3
	Forced exhaust type	Use indoor air for combustion and exhaust flue gases outdoors forcibly using a blower.	Forced exhaust type	FE		Figure 4
Direct vent type	Natural supply exhaust type	Pass a concentric supply and exhaust tube through the wall in contact with outside air to supply and exhaust air by natural draft.	Balance exterior wall type	BF	BF-W	Figure 5
		Connect a concentric supply and exhaust tube to a dedicated air supply and exhaust room (chamber) to supply and exhaust air from/to the open corridor by natural draft.	Balance chamber type		BF-C	Figure 6
		Connect a concentric supply and exhaust tube to a common supply exhaust duct (U shaped supply exhaust duct, inverted T shaped exhaust duct, etc.) to supply and exhaust air by natural draft.	Balance duct type		BF-D	Figure 7
	Forced supply exhaust type	Pass a concentric supply and exhaust tube through the wall in contact with outside air to supply and exhaust air forcibly using a blower.	Forced supply exhaust exterior wall type	FF	FF-W	Figure 8
		Connect a concentric supply and exhaust tube to a dedicated air supply and exhaust room (chamber) to supply and exhaust air from/to the open corridor forcibly using a blower.	Forced supply exhaust chamber type		FF-C	Figure 9
		Connect a concentric supply and exhaust tube to a common supply exhaust duct (U shaped supply exhaust duct, inverted T shaped exhaust duct, etc.) to supply and exhaust air forcibly using a blower.	Forced supply exhaust duct type		FF-D	Figure 10

4.1.3 Classification by installation mode

The classification of appliances by installation mode shall be as given in Table 4.

Table 4 Classification by installation mode

Installation mode	Classification	Figure
Floor type	Appliance installed on a stand or on the floor for use.	Figure 12
Wall mounted type	Appliance installed on the wall for use.	Figure 13
Hang type	Appliance suspended from the wall or the ceiling for use.	—
Built in type	Appliance integrated into the wall, cooking cabinet, etc., for use.	—

4.2 Classification by gas quantity automatic control system

The classification of appliances by gas quantity automatic control system shall be as given in Table 5.

Table 5 Classification of appliances by gas quantity automatic control system

Control system	Classification
Proportional control type	Appliance which increases/decreases gas quantity continuously by proportional control.
Other control types	Appliance of other control types than proportional control type.

4.3 Classification by appliance type

4.3.1 Classification of instantaneous water heater

The classification of instantaneous water heaters by hot water supply system shall be as given in Table 6.

Table 6 Classification of instantaneous water heaters by hot water supply system

Hot water supply system	Classification	Figure
Main stop system	System to supply hot water (exclusively used for main stop type) by operation of the water inlet valve (water supply side) of appliance, not capable of having hot water supply lines.	Figure 34
End stop system	System to supply hot water (hot water supply line, end stop) by operation of the hot water outlet valve (hot water supply end) of appliance, capable of having hot water supply lines.	Figure 35

4.3.2 Classification of storage type closed vessel water heaters

The classification of storage type closed vessel water heaters by heating capacity and water supply system shall be as given in Table 7 and Table 8.

Table 7 Classification of storage type closed vessel water heaters by heating capacity

Heating capacity	Classification	Figure
Quick recovery vessel	Storage type closed vessel water heater having an indicated gas input rating of 1.2 kW or more per 1 L of hot water storage.	Figure 36
Slow recovery vessel	Storage type closed vessel water heater having an indicated gas input rating of less than 1.2 kW per 1 L of hot water storage.	Figure 37

Table 8 Classification of storage type closed vessel water heaters by water supply system

Water supply system	Classification	Figure
Pressure regulated direct connection with house supply type	System to supply water by directly connecting to water service pipe through water pressure reducing check valve and pressure relief valve.	Figure 37 a)
Cistern type	System to supply water from cistern.	Figure 37 b)

4.3.3 Classification of bath tub water heater

The classification of bath tub water heaters by the relation with the bath tub, functions and hot water supply system shall be as given in Table 9 to Table 11.

Table 9 Classification of bath tub water heaters by the relation with bath tub

Relation with bath tub		Classification	Figure
Installed in bath tub		Heater body is installed in a bath tub.	Figure 38
Installed next to bath tub	Natural circulation type	Heater body is installed next to a bath tub and water circulates between the heater body and the bath tub by heat convection.	Figure 39 a)
	Forced circulation type	Heater body equipped with a pump is installed next to a bath tub and water is circulated forcibly between the heater body and the bath tub.	Figure 39 b)

Table 10 Classification by functions of bath tub water heater

Additional function	Classification	Figure
Bath tub water heater with single function	Bath part only.	Figure 39 a)
Bath tub water heater with combined use for hot water supply	A heat exchanger is used for both heating water in a bath tub and hot water supply (one-boiler two-water channel type).	Figure 39 c)
Combination bath water and potable water heater	Appliance having hot water supply part for exclusive use (two-boiler two-water channel type).	Figure 39 d)

Table 11 Classification of bath tub water heater with combined use for hot water supply and combination bath water and potable water heater by hot water supply system

Hot water supply system	Classification	Figure
Main stop system	System to supply hot water (exclusively used for main stop type) by operation of the water inlet valve (water supply side) of appliance, not capable of having hot water supply lines.	Figure 39 e)
End stop system	System to supply hot water (hot water supply line, end stop) by operation of the hot water outlet valve (hot water supply end) of appliance, capable of having hot water supply lines.	Figure 39 f)

5 Performance

5.1 Performance of water heater

When tested by the test method given in Table 12 or in accordance with Clause 9, the water heater shall satisfy performance requirements given in Table 12.

The test conditions, test gases, measuring instruments for test, and test apparatus shall be as specified in **JIS S 2093**.

Table 12 Performance of water heater and test method

Item	Performance	Test method		Applicable appliance		
		JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Air tightness of gas passage	The leak quantity passing through the appliance valve is 70 ml/h or under.	Table 7	—	○	○	○
	The leak quantity passing through gas shut off valve other than appliance valve is 550 ml/h or under.					
	To be free from outside leak from gas supply inlet to burner port.					
Gas input rating	± 10 % of indicated gas input rating.	Table 8	9.3	○	○	○
	For indicated gas input rating of each burner, ± 10 % of indicated gas input rating of each burner stated in the instruction manual (applies to bath tub water heater with combined use for hot water supply, and combination bath water and potable water heater).					

Table 12 (continued)

Item	Performance	Test method		Applicable appliance		
		JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Combustion condition	Windless condition, and ordinary atmospheric condition of BF-D and FF-D	Ignites surely ^{a)} and free from explosive ignition ^{b)} . All burner ports are ignited within 2 s after ignition at one point.	9.4	○	○	○
	To be free from lifting ^{c)} .					
	To be free from extinguishment ^{d)} .					
	The flames are uniform.					
	To be free from flashback ^{e)} .					
	The continuous noise is 60 dB (A) or under.					
	To be free from explosive sound at the time of extinguishment.					
	The carbon monoxide (CO) concentration (volume fraction %) in theoretical dry combustion gas (hereafter referred to as CO %) is 0.14 % (0.03 % for unvented type) or under.					
	To be free from soot generation ^{f)} .					
	To be free from constant contact of the yellow flame ^{g)} with the heat exchanger.					
	To be free from flame overflow ^{h)} .					
	To be free from extinguishment ^{d)} and flashback ^{e)} of pilot burner.					
	To be free from outflow of flue gas from other parts than exhaust out-let (applies to CF and FE).	CF: Table 27 FE: Table 28	—	○	○	○
Exhaust air shut off condition (applies to CF)	CO % in flue gas outflow from other parts than exhaust out-let is 0.14 % or under.	Table 27	9.4	○	○	○

Table 12 (continued)

Item		Performance	Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Combustion condition	Windy condition	To be free from extinguishment ^{d)} , flashback ^{e)} , and flame overflow ^{h)} detrimental to use (applies to BF, FF and RF).	FE: Table 28 BF-W: Table 29 BF-C: Table 31 BF-D: Table 34	9.4	○	○	○
		To be free from extinguishment ^{d)} , flashback ^{e)} , and flame overflow ^{h)} detrimental to use, and to be free from the closing of gas passage by the activation of safety device (applies to FE).	Table 37 FF-W: Table 37 FF-C: Table 39 FF-D: Table 40				
		To be free from extinguishment ^{d)} and flashback ^{e)} of pilot burner (applies to FE, BF-W, BF-C, FF-W, FF-C and RF).	RF: Table 41				
		To be free from outflow of flue gas from other parts than exhaust out-let (applies to FE).					
		CO % is 0.28 % or under (applies to BF-W, BF-C, FF-W and FF-C).					
		Ignites surely ^{a)} and free from explosive ignition ^{b)} (applies to BF-W, BF-C, FF-W, FF-C and RF). All burner ports are ignited within 2 s after ignition at one point.					
		CF shall conform to either of the following a) or b).	Table 27				
	a) Windy condition	To be free from extinguishment ^{d)} , flashback ^{e)} , and flame overflow ^{h)} detrimental to use.					
		To be free from extinguishment ^{d)} and flashback ^{e)} of pilot burner.					
		b) Combustion products discharge safety device	To be equipped with a device to automatically close the gas passage within 1 min from the outflow of flue gas from the outlet of draft hood, and to be free from extinguishment ^{d)} , flashback ^{e)} , and flame overflow ^{h)} detrimental to use before the activation of the device.				

Table 12 (continued)

Item	Performance	Test method		Applicable appliance		
		JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Combustion condition	Spray water condition (applies to BF-W, FF-W and RF)	To be free from extinguishment ^{d)} .	BF-W: Table 29 FF-W: Table 37 RF: Table 41	—	○	○
	Low oxygen atmospheric condition (applies to BF-D and FF-D)	Ignites surely ^{a)} and to be free from explosive ignition ^{b)} . All burner ports are ignited within 2 s after ignition at one point.	BF-D: Table 34 FF-D: Table 40	9.4	○	○
		To be free from extinguishment ^{d)} and flashback ^{e)} of pilot burner.				
		To be free from extinguishment ^{d)} .				
		To be free from soot generation ^{f)} .				
		CO % is 0.28 % or under.				

Table 12 (continued)

Item		Performance			Test method		Applicable appliance			
					JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater	
Temperature rise	Temperature rise at normal time (each part of appliance)	The surface of a part to be touched by a hand during operation (knobs, etc.)	Those made of metal, porcelain and glass	60 °C max.	Table 12	9.5	○	○	○	
			Others	70 °C max.						
			The surface of a part to be touched by a hand during operation (excluding knobs, etc. and flue gas exhaust out-let)							140 °C max.
			The surface of dry cell							55 °C max.
		Outside surface of gas passing part of gas shut off valve (including the appliance valve)	Not higher than 85 °C or the temperature which is confirmed to comply with the requirements for the item of air tightness of gas passage and not to be detrimental to use, by heat resistance test.		Table 12 Table 16					
		Surface of lighting unit (including piezoelectric element)	Not higher than 85 °C or the temperature which is confirmed to comply with the requirements for the item of electric lighting under windless condition and ordinary atmospheric condition of BF-D and FF-D, to be free from deformation and discolouration, and not to be detrimental to use, by heat resistance test.							
		Outside surface of gas passing part of appliance governor	Not higher than 70 °C or the temperature which is confirmed to comply with the requirements for the item of air tightness of gas passage and confirmed that the change of regulated pressure is not more than (0.05 P ₁ + 30) Pa, by heat resistance test. P ₁ : regulated pressure before heat resistance test							

Table 12 (continued)

Item		Performance		Test method		Applicable appliance							
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater					
Temperature rise	Temperature rise at normal time (wooden wall or the like)	The surfaces of wooden walls of appliance's back and sides, and upper ceiling surface as well as the surface of wooden base underneath the appliance (As to the surface of wooden base underneath the appliance, test shall be carried out only for floor type appliances.).	100 °C max.	Table 12 Table 29 Table 31 Table 34 Table 37 Table 39 Table 40	9.5	○	○	○					
		The surface of wooden frame of wall penetrating part of concentric supply and exhaust tube (applies to BF and FF).											
		The surface of wooden wall around the exhaust terminal or vent terminal (excluding CF).											
		The exhaust temperature ⁱ⁾ (excluding the unvented type).											
	Temperature rise at abnormal time (wooden wall or the like)	The surfaces of wooden walls of appliance's back and sides, and upper ceiling surface as well as the surface of wooden base underneath the appliance (As to the surface of wooden base underneath the appliance, test shall be carried out only for floor type appliances.).	100 °C max.						Table 12 Table 29 Table 31 Table 34 Table 37 Table 39 Table 40	9.6	○	○	○
		The surface of wooden frame of wall penetrating part of concentric supply and exhaust tube (applies to BF and FF).											
		The surface of wooden wall around the exhaust pipe.											
		The surface of wooden wall around the exhaust terminal or vent terminal (excluding CF).											
For the appliance of which the pressure in combustion chamber becomes positive pressure, when an abnormality occurs in the heat exchanger, the temperature of heat shield plate (or outer junket if the appliance is not equipped with a heat shield plate) shall not exceed the heat resistance temperature (temperature that does not cause changes detrimental to use when heated repeatedly).													

Table 12 (continued)

Item	Performance		Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Electric lit ignition	Windless condition, and ordinary atmospheric condition of BF-D and FF-D	Lights 19 times out of 20 times for appliances of continuous spark ignition type using domestic power source or dry cell, and lights 9 times out of 10 times for those of other types, and to be free from explosive lighting ^{b)} .	Table 13 Table 29 Table 31 Table 34 Table 37 Table 39 Table 40 Table 41	—	○	○	○
	Water-spray condition (applies to BF-W, FF-W and RF)	Lights not less than 8 times out of 10 times, and to be free from successive non-lighting and explosive lighting ^{b)} .					
	Low oxygen atmospheric condition (applies to BF-D and FF-D)						
	Windy condition (applies to BF-W, BF-C, FF-W, FF-C and RF)	Lights not less than 5 times out of 10 times, and to be free from explosive lighting ^{b)} .					

Table 12 (continued)

Item			Performance	Test method		Applicable appliance			
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater	
Safety device	Pilot safety shut off device	Re-lighting type	Opening valve time in the case of lighting	Within 90 s.	Table 14	—	○	○	○
		Closing valve time in the case of extinguishment	— For the first time of closing valve time after extinguishment, within 3 s for flame rod type and within 60 s for other types. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the second and subsequent times of closing valve time, within 7 s for flame rod type and within 60 s for other types every time the valve is closed. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the type of closing valve twice or more, the integration of closing valve time shall be within 60 s.						
		Closing valve time in the case of non-lighting at the time of lighting (applies to automatically-ignited appliance)	— Within 7 s for flame rod type and within 60 s for other types every time the valve is closed. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the type of closing valve twice or more, the integration of closing valve time shall be within 60 s.						
		Explosive lighting and flame overflow detrimental to use	For the re-lighting after extinguishment or after non-lighting at the time of lighting, to be free from explosive lighting ^{b)} , and the flame overflow ^{h)} detrimental to use.						

Table 12 (continued)

Item			Performance	Test method		Applicable appliance			
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater	
Safety device	Pilot safety shut off device	Other than re-lighting type	Opening valve time in the case of lighting	Within 90 s.	Table 14	—	○	○	○
			Closing valve time in the case of extinguishment	— For the first time of closing valve time after extinguishment, within 3 s for flame rod type and within 60 s for other types. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the second and subsequent times of closing valve time, within 7 s for flame rod type and within 60 s for other types every time the valve is closed. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the type of closing valve twice or more, the integration of closing valve time shall be within 60 s.					
			Closing valve time in the case of non-lighting at the time of lighting (applies to automatically-ignited appliance)	— Within 7 s for flame rod type and within 60 s for other types every time the valve is closed. However, it shall be within 50 s for the type of which the valve of thermocouple type pilot safety shut off device is forcibly closed by using domestic power source or dry cell. — For the type of closing valve twice or more, the integration of closing valve time shall be within 60 s.					
			Explosive lighting, and flame overflow detrimental to use (applies to automatically and repeatedly ignited appliance and FF)	For the re-lighting after extinguishment or after non-lighting at the time of lighting, to be free from explosive lighting ^{b)} , and flame overflow ^{h)} detrimental to use.					

Table 12 (continued)

Item	Performance	Test method		Applicable appliance		
		JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Safety device	Exhaust leak protection device (applies to FE)	Table 28	—	○	○	○
	Excessive wind pressure safety device (applies to FE)	Table 28	—	○	○	○
	Fan blockage protection device (applies to FE)	Table 28	—	○	○	○
	Over heat shut off device	Table 14	—	○	○	○
	High pressure relief valve (applies to end stop system instantaneous water heater and end stop system hot water supply part of bath tub water heater)	—	9.7.1	○	—	○
	Empty water safety device or empty water prevention device (applies to bath part)	—	9.7.2	—	—	○
	Suspension of water supply safety device (applies to hot water supply part of bath tub water heater)	—	9.7.3	—	—	○

Table 12 (continued)

Item			Performance	Test method		Applicable appliance		
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Safety device	Obstruction of heat exchanger safety device		When an abnormality occurs in the heat exchanger, the gas passage to the burner shall be automatically closed and shall not automatically open again.	—	9.7.4	○	—	○
	Oxygen depletion safety shut off device (applies to unvented type)	Insufficient ventilation	Before CO concentration (volume fraction %) in dry flue gas (hereafter referred to as COa) reaches 0.03 %, the gas passage to the burner shall be automatically closed and shall not automatically open again.	—	9.7.5	○	—	—
		Heat exchanger shut off	The gas passage to the burner shall be automatically closed within 30 s and shall not automatically open again.					
		Activation indication	To be indicated so that the activation is recognized by the user.					
		Interlock function	Before the oxygen depletion safety shut off device is activated three consecutive times, the device shall be in the state where the re-lighting is not allowed by normal operation such as replacement of control dry cell.					
	Oxygen depletion safety shut off device (applies to CF)	Safety under windy condition	When the drop wind of velocity 0.5 m/s, 1 m/s, 2 m/s and 3 m/s is generated in secondary exhaust pipe, before CO concentration (volume fraction %) reaches 0.03 % in the atmosphere of the room where the appliance is installed, the gas passage to burner shall be automatically closed.	—	9.7.6	○	○	○
		Safety at the time of exhaust leak	After the shut off by the blocking plate at 1 m height from the fitting part of secondary exhaust pipe, the burner shall be lighted, and before CO concentration (volume fraction %) reaches 0.03 % in the atmosphere of the room where the appliance is installed, the gas passage to the burner shall be automatically closed.					
		Activation indication (applies to the device having an electronic control device)	To be indicated so that the activation is recognized by the user.					
		Interlock function (applies to the device having an electronic control device)	Before the oxygen depletion safety shut off device is activated five consecutive times, the device shall be in the state where the re-lighting is not allowed by normal operation such as the re-power-on operation.					

Table 12 (continued)

Item			Performance	Test method		Applicable appliance		
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Safety device	Oxygen depletion safety shut off device (applies to FE)	Contamina- tion of the same room	Before CO concentration (volume fraction %) reaches 0.03 % in the atmosphere of the room where the appliance is installed, the gas passage to the burner shall be automatically closed.	—	9.7.7	○	○	○
		Contamina- tion of the other room	Before CO concentration (volume fraction %) reaches 0.03 % in the atmosphere of the other room than the room where the appliance is installed, the gas passage to the burner shall be automatically closed.					
		Partial combustion	When a part of the main burner is in the state of the incomplete combustion, before CO concentration (volume fraction %) reaches 0.03 % in the atmosphere of the room where the flue gas inflows, the gas passage to the burner shall be automati- cally closed.					
		Activation indication	To be indicated so that the activation is recognized by the user.					
		Interlock function	Before the oxygen depletion safety shut off device is activated five consecutive times, the device shall be in the state where the re-lighting is not allowed by normal operation such as the re-power-on operation.					
Electric parts (appliance using a.c. power source)	Insulation performance	Insulation resistance						
		Before test of temperature rise at normal time	1 MΩ or more.	Table 20 Table 29 Table 37 Table 41	—	○	○	○
		After water spray test (applies to BF-W, FF-W and RF)	1 MΩ or more.					
		After test of temperature rise at abnormal time	0.3 MΩ or more.					
		Wet-proof insulation resistance (applies to bath tub water heater of which the rated voltage exceeds 30 V)	0.3 MΩ or more.	Table 20	—	—	—	○

Table 12 (continued)

Item		Performance		Test method		Applicable appliance		
				JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Electric parts (appliance using a.c. power source)	Withstand voltage	The electric circuit shall be free from an abnormality.		Table 20 Table 29	—	○	○	○
	Shock resistant voltage	Not to be detrimental to use.		Table 37 Table 41				
	Activation	To be activated.		Table 20	—	○	○	○
	Voltage fluctuation	The operation continues.						
	Accuracy to rated power consumption	Rated power consumption W	Tolerance %	Table 20	—	○	○	○
		10 or under	+ 25					
		Over 10 up to and incl. 30	± 25					
		Over 30 up to and incl. 100	± 20					
		Over 100 up to and incl. 1 000	± 15					
		Over 1 000	± 10					
	Temperature rise of winding (values in parentheses apply to winding of rotating machine.)	Class A insulation: 100 °C max. Class E insulation: 115 °C max. Class B insulation: 125 (120) °C max. Class F insulation: 150 (140) °C max. Class H insulation: 170 (165) °C max.		Table 20	—	○	○	○
	a.c. power source abnormality	Service interruption	To be free from hindrance to safety. If the burner flame goes out in the event of service interruption, the gas passage to the burner shall not be opened automatically or the burner shall ignite automatically when re-energized.					
		Voltage drop	To be free from hindrance to safety.					
	Power source noise (applies to appliance having an electronic control device)		To be free from hindrance to safety.					
Electric parts (appliance using d.c. power source)	Voltage drop (down to 0 V)	To be free from hindrance to safety.		Table 20	—	○	○	○
Electric parts (applies to appliance having an electronic control device)	Short circuit or breaking of wire	To be free from hindrance to safety.		Table 20	—	○	○	○
	Durability of solder (applies to unvented type instantaneous water heater, CF and FE)	To withstand the temperature change during normal use, and soldering crack progress rank is under 7.		Table 20	9.18	○	○	○

Table 12 (continued)

Item		Performance	Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Duty-cycle operation	Appliance valve	Main stop system with hot water supply function	Table 15	Repeat count: 12 000 times	○	—	○
		Others	Table 15	Repeat count: 6 000 times	○	○	○
	Electric lit ignition device	Main stop system with hot water supply function	Table 15	Repeat count: 12 000 times	○	—	○
		Others	Table 15	Repeat count: 6 000 times	○	○	○
	Appliance governor		Table 15	Repeat count: 30 000 times	○	○	○
	Pilot safety shut off device		Table 15	Repeat count: 1 000 times	○	○	○
	Solenoid valve		Table 15	Repeat count: 30 000 times	○	○	○
	Timer (excluding electronic type)		Table 15	Repeat count: 2 000 times	—	—	○
	Thermostat (excluding electronic type and proportional control type)		Table 15	a) Repeat count: 6 000 times b) Perform a test in accordance with 9.11 to confirm the performance.	—	○	○

Table 12 (continued)

Item		Performance	Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Duty-cycle operation	Water actuated gas valve	To comply with the requirements for the item of air tightness of gas passage and not to be detrimental to use.	—	9.8.1	○	—	○
	Oxygen depletion safety shut off device (applies to unvented type instantaneous water heater, CF and FE)	To comply with the requirements for the item of oxygen depletion safety shut off device under safety device.	—	9.8.2	○	○	○
	Remote control (excluding electronic type)	Not to be detrimental to use.	—	9.8.3	—	—	○
Continuous combustion	Air tightness of gas passage	To comply with the requirements for the item of air tightness of gas passage.	Table 7 Table 9	9.9.1	○	○	○
	Combustion condition	To be free from extinguishment ^{d)} and flashback ^{e)} . CO % shall be 0.14 % (0.03 % for unvented type) or under.					
	Abnormalities of heat exchanger	To be free from abnormalities.					
Intermittent combustion	Air tightness of gas passage	To comply with the requirements for the item of air tightness of gas passage.	Table 7 Table 9	9.9.2	○	○	○
	Combustion condition	To be free from extinguishment ^{d)} and flashback ^{e)} . CO % shall be 0.14 % (0.03 % for unvented type) or under.					
	Abnormalities of heat exchanger	To be free from abnormalities.					
Air tightness of airtight structure parts (applies to direct vent type)		The leak quantity shall be not more than (indicated gas input rating × 0.86) m ³ /h. However, for that exceeding 20 m ³ /h, it shall be not more than 20 m ³ /h.	Table 25	—	○	○	○
Falling of waterdrops		To be free from extinguishment ^{d)} of burner caused by the falling of waterdrops, and the condition where CO % exceeds 0.14 % (0.03 % for unvented type) shall not continue for 1 min or longer.	—	9.10	○	○	○
Thermostat (excluding electronic type and proportional control type)	Close valve temperature	The maximum temperature indicated in the instruction manual ± 5 °C.	—	9.11	—	○	○
	Open valve temperature	Close valve temperature ⁰ -20 °C.					
Pressure relief valve	Open valve water pressure	Not more than the indicated maximum pressure.	—	9.12	—	○	—
Vibration resistance		To comply with the requirements for the item of air tightness of gas passage.	Table 18	—	○	○	○

Table 12 (continued)

Item		Performance	Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Using performance of instantaneous water heater	Rated thermal efficiency	70 % or more (when the outlet hot water temperature is 40 °C higher than water temperature).	—	9.13	○	—	—
	Mode thermal efficiency	70 % or more (when the outlet hot water temperature is 40 °C).					
	Accuracy of mode thermal efficiency to indication (applies to the appliance which indicates mode thermal efficiency)	95 % or more.					
	Ratio of outlet hot water capacity to the indication	The outlet hot water amount shall be 90 % or more of that indicated in the instruction manual.					
	Outlet hot water temperature (applies to appliance of proportional control type)	40 °C ± 3 °C (40 °C ± 5 °C when not capable of adjusting to 40 °C).					
	Heating time (applies to main stop system)	Within 45 s.					
	Temperature convergence time (applies to proportional control type appliance that is capable of adjusting the outlet hot water temperature to 40 °C)	Within 90 s.					
	Heat rise after shut off	Set temperature + 18 °C or under.					
	Pressure influence and scattering of steam and boiling water	The pressure inside the water pipe caused by steam and boiling water shall not have an influence on others. Any dangers shall not be caused by scattering, etc. of steam and boiling water.					
Using performance of storage type closed vessel water heater	Quick recovery vessel	Thermal efficiency	—	9.14	—	○	—
		Outlet hot water temperature					
		Ratio of outlet hot water capacity to the indication					
	Slow recovery vessel	Thermal efficiency					
		Ratio of net amount of outlet hot water to the indication					

Table 12 (continued)

Item	Performance	Test method		Applicable appliance		
		JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Using performance of bath tub water heater	Mode thermal efficiency	—	9.15.1	—	—	○
	Accuracy of mode thermal efficiency to indication (applies to the appliance which indicates mode thermal efficiency)	—				
	Rated thermal efficiency of bath tub water heater with single function and bath part	—	9.15.2	—	—	○
	Rated thermal efficiency of hot water supply part	—	9.15.3	—	—	○
	Hot water supply part of combination bath water and potable water heater					
	Hot water supply part of bath tub water heater with combined use for hot water supply					
	Ratio of outlet hot water capacity to the indication					
	Outlet hot water temperature (applies to the appliance of proportional control type)					
	Heating time (applies to main stop system excluding that with combined use for hot water supply)					
	Temperature convergence time (applies to the proportional control type appliance that is capable of adjusting the outlet hot water temperature to 40 °C)					
	Heat rise after shut off					
Using performance of hot water supply part	Pressure influence and scattering of steam and boiling water					
	Shut off of outlet hot water pipe (applies to that having a shower head)					

Table 12 (concluded)

Item		Performance	Test method		Applicable appliance		
			JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Hydrostatic pressure of water passage	Heater body (bath heat exchanger)	To be free from leakage, deformation, breakage and other abnormalities.	—	9.17.3	—	—	○
	From water inlet connection lip to water outlet connection lip (applies to forced circulation type)	To be free from leakage, deformation, breakage and other abnormalities.					
Hot water storage vessel of cistern type		To be free from leakage, deformation, breakage and other abnormalities.	—	9.17.2	—	○	—
Blowing wind velocity of flue gas (applies to FF-D)		6.5 m/s or lower. This requirement does not apply to the appliance of the structure which steadily exhaust air obliquely upward when the exhaust out-let is installed in the normal way.	Table 40	—	○	○	○

In the temperature rise test, the reference ambient temperature is 35 °C, and in the temperature rise test of winding, it is 30 °C.

NOTE The symbols “○, —” in the column of applicable appliance indicate whether the test is applicable; however, the application obligation is determined by the individual product.

- Notes**
- a) “Ignite surely” means ignitions are successful five times out of five attempts.
 - b) “Free from explosive lighting” means that flame flows out of the outer junket and the noise generated by lighting does not exceed 85 dB. “Free from explosive ignition” means that flame flows out of the outer junket and the noise generated by ignition does not exceed 85 dB.
 - c) “Free from lifting” means that flame that is separated from the burner port after 15 s from ignition does not exceed one-third for each burner corresponding to the orifice.
 - d) “Free from extinguishment” means that there is no extinguishment of flame for each burner corresponding to the orifice.
 - e) “Free from flashback” means that flame is not in the combustion condition inside the burner, and that there is no extinguishment due to flashback.
 - f) “Free from soot generation” means that soot does not adhere to the heat exchanger until 30 min have elapsed after lighting (excluding at the time of lighting).
 - g) “Free from constant contact of the yellow flame” means that the yellow flame has been in contact with the heat exchanger for 30 s or less in any 1 min until 30 min have elapsed after lighting.
 - h) “Free from flame overflow” means that the flame does not flow out of the outer junket.
 - i) For the vented type appliance and direct vent type appliance, “exhaust temperature” applies to those for which the appliance body and instruction manual do not indicate that the exhaust temperature exceeds 260 °C.

5.2 Performance of appliance of pressure regulated direct connection with house supply type

The appliance directly connected to the water service pipe using threads, when tested by the test method given in Table 13 or in accordance with Clause 9, shall satisfy the requirements for performance given in Table 13.

Table 13 Performance of appliance of pressure regulated direct connection with house supply type and test method

Item			Performance		Test method		Applicable appliance		
					JIS S 2093	Test method specified in this Standard	Instantaneous water heater	Storage type closed vessel water heater	Bath tub water heater
Hydrostatic pressure of water passage	Instantaneous water heater	From water supply inlet to water faucet (applies to main stop system)	To be free from leakage, deformation, breakage and other abnormalities.		—	9.17.1	○	—	—
		From water supply inlet to hot water outlet (or to hot water supply inlet for end stop system)							
	Storage type closed vessel water heater	Hot water storage vessel and pressure relief valve	To be free from leakage, deformation, breakage and other abnormalities.		—	9.17.2	—	○	—
Hot water supply part of bath tub water heater		From water supply inlet to water faucet (applies to main stop system)	To be free from leakage, deformation, breakage and other abnormalities.		—	9.17.3	—	—	○
		From water supply inlet to hot water outlet (or to hot water supply inlet for end stop system)							

6 Structures, materials and dimensions of appliance

6.1 General requirements for structure

The structure of appliance and parts of the appliance shall be designed in consideration of safety and durability in relation to a gas leak, fire, etc. and shall not cause breakage or deformation detrimental to use during normal transportation, installation, use, etc. The structure shall conform to the following requirements. For all items described in Clause 6, the tests shall be performed in accordance with 9.16.

- a) Activation of each part shall be smooth and steady.
- b) It shall not move or fall easily during normal operation under normal installation conditions.
- c) The gas supply inlet shall be the threads specified in **7.2 b)** and shall be in a position where it can be easily connected.
- d) It shall be equipped with the appliance valve specified in **7.3**.
- e) Parts where gas passes through shall be as follows.
 - 1) The gas passage shall be airtight and the air tightness shall not be compromised during normal transportation, installation, use, etc.
 - 2) The gas pipe shall be installed in places where there is no risk of excessive heat or corrosion, or measures such as protection shall be taken against such incidents.
 - 3) The joint shall be securely connected by welding, screwing, bolt and nut, thread, etc.
- f) The burner and intermitted pilot burner shall be installed as follows.
 - 1) They shall be stably installed in designated positions, their relative positions to the related parts such as orifice, combustion chamber, electric lit ignition device, safety device, etc. shall be securely maintained, and they shall not be moved or disconnected under normal use conditions.
 - 2) They shall be installed in positions so that unnecessary parts are not overheated or damaged.
- g) The appliance shall be equipped with a pilot safety shut off device.
- h) The major functional parts shall be adjustable and replaceable.
- i) The ends of the parts to be touched by a hand during use or cleaning shall be smooth.
- j) Parts which are required to be removed for cleaning, routine maintenance, etc. shall be removable and attachable without tools.
- k) The threads used for attaching each part shall be effectively tightened, and parts that are required to be removed for maintenance inspection shall be able to be used repeatedly.
- l) The appliance used by being installed on the wall, pillar, floor, etc. shall be attachable and removable, and no abnormality shall be caused by ordinary piping connection work.

6.2 Materials

The materials to be used for appliances shall withstand the mechanical, chemical or thermal actions that could be given under normal use and maintenance conditions and shall conform to the following requirements.

- a) The materials of gas containing part, fin and air shutter shall be tested according to 1 of Table 19 of **JIS S 2093**, and shall not melt at the temperature of 500 °C.

However, this does not apply to members for keeping air tightness, such as packing (including diaphragm and rubber valve element; the same applies hereinafter) and seal materials (including grease; the same applies hereinafter).

- b) The materials of gas containing part, heat exchanger, air shutter, part where flue gas passes, direct vent type vent terminal, direct vent type exhaust terminal and air intake flue terminal, direct vent type airtight structure part, and outdoor type outer junket shall be corrosion resistant materials conforming to either of the following 1) to 3) and shall be incombustible. However, the materials may be combustible for members for keeping air tightness, such as packing and seal materials, and direct vent type airtight structure part, which are placed in the position free from thermal effects and members of combustion air supply inlet which are subject to mechanical effects such as vibration as well as members of outdoor type outer junket, used for carrying handle, control area, and parts free from thermal effects under normal use. In addition, materials for outer junket and air supply/exhaust part of bath tub water heater of BF type shall be corrosion resistant materials conforming to either of the following.

- 1) Materials given in Table 14.
- 2) Materials for which the 24-hour (or 192-hour for outer junket and air supply/exhaust part of BF type bath tub water heaters) test has been performed according to 2 a) of Table 19 of **JIS S 2093**, and which have been confirmed that there is no corrosion or that the materials have the corrosion area ratio of a rating number between 9.8 and 6.
- 3) Metallic materials that have undergone surface treatment with coating, for which the 24-hour (or 192-hour for outer junket and air supply/exhaust part of BF type bath tub water heaters) test has been performed according to 2 b) of Table 19 of **JIS S 2093**, and which have been confirmed that there is no rust, blistering or exfoliation. “Surface” mentioned above means external surface for the part where gas passes through (limited to other parts than burner or orifice), appliance valve, direct vent type vent terminal, direct vent type exhaust terminal and air intake flue terminal, direct vent type airtight structure part, outdoor type outer junket, outer junket of BF type bath tub water heater, and air supply/exhaust part of BF type bath tub water heater, while “surface” means internal surface for the part where flue gas passes through, and means both internal and external surfaces for burner, orifice, heat exchanger and air shutter.

Table 14 Corrosion resistant metal material

Material	Applicable standard
Casting	JIS H 5120 JIS H 5202
Die casting	JIS H 5301 JIS H 5302
Stainless steel	JIS G 3446 JIS G 3459 JIS G 4303 JIS G 4304 JIS G 4305 JIS G 4308 JIS G 4313 JIS G 4314
Surface treated steel	JIS G 3302 JIS G 3313 JIS G 3314
Aluminium and aluminium alloy	JIS H 4000 JIS H 4040 JIS H 4080 JIS H 4090 JIS H 4100
Copper and copper alloy	JIS C 3101 JIS C 3102 JIS H 3100 JIS H 3250 JIS H 3300 JIS H 3320
Iron castings specified in JIS G 5501 , which has a thickness of 2 mm or more are deemed to be made of corrosion resistant materials.	

- c) Members for keeping air tightness, such as packing and seal materials, used for the parts where gas passes through shall be as follows.
- 1) Materials such as rubber and plastic shall be tested according to 3 a) of Table 19 of **JIS S 2093**. The mass change ratio shall be 20 % or less, and the materials shall be free from softening, embrittlement etc. detrimental to use. In addition, the rubber [excluding nitrile rubber for general application (NBR), nitrile rubber for fuel application (NBR), fluoro-rubber (FKM) and ethylene propylene rubber (EPDM) specified in Table 2 of **JIS B 2401-1**] shall be tested according to 3 b) of Table 19 of **JIS S 2093**, and the transmission amount of *n*-pentane per hour shall be 5 mg or less.
 - 2) Seal materials shall be tested according to 3 c) of Table 19 of **JIS S 2093**, and the mass change ratio shall be within 10 % at the gas temperature of 20 °C and within 25 % at the gas temperature of 4 °C.

- d) Conductive materials shall be copper, copper alloy or any materials that have electrical, thermal and mechanical stabilities at least equivalent to those of copper or copper alloy and shall be rust resistant. This does not apply when the materials are used for parts that need elasticity or parts that structurally cannot meet such requirements, and there is no risk of danger.
- e) Heat insulating materials, etc. used near the gas passage, combustion section and electrical section, when tested according to 5 of Table 19 of **JIS S 2093**, shall not burn out, and the fire shall be extinguished within 10 s. This does not apply where there is no risk of electric shock, fire or other danger when the heat insulating materials, etc. burn.

6.3 Structure and dimensions by appliance type

6.3.1 Structure of instantaneous water heater

The structure of instantaneous water heater shall be as follows.

- a) **Appliance of main stop system** The appliance of main stop system shall be as follows.
 - 1) The water actuated gas valve specified in **7.14** shall be provided.
 - 2) The water faucet for hot water discharge operation shall be provided.
 - 3) The appliance of which the pressure in combustion chamber becomes positive pressure shall be equipped with the obstruction of heat exchanger safety device.
- b) **Appliance of end stop system** The appliance of end stop system shall be as follows.
 - 1) The water actuated gas valve specified in **7.14** shall be provided.
 - 2) The high pressure relief valve shall be provided.
 - 3) As a rule, the water supply connecting part shall be located at the right side and the hot water supply connecting part at the left side, when viewed from the front of the appliance.
 - 4) The appliance of which the pressure in combustion chamber becomes positive pressure shall be equipped with the obstruction of heat exchanger safety device.

6.3.2 Structure of storage type closed vessel water heater

The structure of storage type closed vessel water heater shall be as follows.

- a) The thermostat shall be provided.
- b) It shall be equipped with the pressure relief valve specified in **7.15** or shall be of structure where the relief pipe having sufficient relief effect can be connected. It may be of structure where the hot water supply outlet is branched from the relief opening, in which case a T-joint shall be included.
- c) The heat insulation shall be provided for slow recovery hot water storage vessel.
- d) In the case where the heat exchanger is made of plain steel and only the surface contacting with water is treated to provide corrosion resistance, the thickness shall be 2 mm or more.

6.3.3 Structure of bath tub water heater

The structure of bath tub water heater shall be as follows.

- a) The empty water safety device or empty water prevention device shall be provided.
- b) **Connection lip** The connection lip shall be as follows.
 - 1) The outside diameter of connection lip of the heater body shall be, as a rule, 45 mm or 50 mm, and the attachment and detachment of connection sleeves shall be easy.
 - 2) The vertical centre distance of connection lip of the heater body shall be, as a rule, 100 mm, 150 mm or 200 mm. For the connection lip of BF type appliance, as a rule, the vertical centre distance and the horizontal centre distance of connection lip of the heater body shall be 130 mm and 320 mm, respectively, and the right side shall be down when viewed towards the connection lip.
- c) **Bath tub water heater having hot water supply part of main stop system**
The hot water supply part of bath tub water heater having hot water supply part of main stop system shall be as follows.
 - 1) As a rule, the water actuated gas valve specified in 7.14 shall be provided. If not provided, the suspension of water supply safety device shall be provided.
 - 2) The water faucet for hot water discharge operation shall be provided.
 - 3) For the appliance of which the pressure in combustion chamber becomes positive pressure, the obstruction of heat exchanger safety device shall be provided.
- d) **Bath tub water heater having hot water supply part of end stop system**
The hot water supply part of bath tub water heater having hot water supply part of end stop system shall be as follows.
 - 1) The water actuated gas valve specified in 7.14 shall be provided.
 - 2) The high pressure relief valve shall be provided.
 - 3) For the appliance of which the pressure in combustion chamber becomes positive pressure, the obstruction of heat exchanger safety device shall be provided.

6.4 Structure and dimensions of indoor type appliance by air supply and exhaust type

6.4.1 Unvented type appliance

The unvented type appliance shall be as follows.

- a) **Instantaneous water heater** Instantaneous water heater shall be as follows.
 - 1) The indicated gas input rating shall be 12 kW or less.
 - 2) The oxygen depletion safety shut off device shall be provided.
- b) **Storage type closed vessel water heater** The indicated gas input rating shall be 7 kW or less.

6.4.2 Appliance of natural exhaust type (CF)

The appliance of natural exhaust type shall be as follows.

- a) For installation purposes, unless there are any specific structural reasons, it shall be of structure capable of connecting the exhaust pipe having any of the inside diameters specified in Table 15, and shall have an insertion margin of at least 15 mm.

Table 15 Inside diameter of exhaust pipe

Unit: mm

Nominal diameter of exhaust pipe	70	75	80	90	100	110	120	130	140	160	180	200	250
Inside diameter of exhaust pipe	70	75	80	90	100	110	120	130	140	160	180	200	250

- b) According to indicated gas input rating given in Table 16 or Table 17, the exhaust pipe to be connected shall have inside diameter not less than that given in these tables. "Structure capable of connecting" means the structure where the outside diameter of the part to which the exhaust pipe is connected is larger than the inside diameter of exhaust pipe corresponding to indicated gas input rating and the structure that does not allow the connection of exhaust pipe with inside diameter equal to or smaller than the inside diameter mentioned above. The minus tolerance of the outside diameter of the part to which the exhaust pipe is connected shall be 3 mm.

Table 16 Inside diameter of exhaust pipe of instantaneous water heater according to indicated gas input rating

Indicated gas input rating kW	13 max.	16 max.	19 max.	22 max.	27 max.	30 max.	42 max.	55 max.	70 max.
Inside diameter of exhaust pipe mm	90	100	110	120	130	140	160	180	200

Table 17 Inside diameter of exhaust pipe of bath tub water heater according to indicated gas input rating

Indicated gas input rating kW	10 max.	11 max.	13 max.	16 max.	19 max.	30 max.	42 max.
Inside diameter of exhaust pipe mm	75	80	90	100	110	120	140

- c) The draft hood shall be provided.
d) The oxygen depletion safety shut off device shall be provided.

6.4.3 Appliance of forced exhaust type (FE)

The appliance of forced exhaust type shall be as follows.

- a) The exhaust leak protection device specified in Table 12 and **7.12.2** or the excessive wind pressure safety device specified in Table 12 and **7.12.3** shall be provided.
- b) The fan blockage protection device specified in Table 12 shall be provided.
- c) The exhaust pipe fitting part shall have a structure that enables the exhaust pipe to be connected securely and fixed so that it does not come off easily.
- d) The oxygen depletion safety shut off device shall be provided.

6.4.4 Appliance of direct vent type (BF, FF)

The appliance of direct vent type shall be as follows.

- a) The vent terminal of balance exterior wall type (BF-W), balance duct type (BF-D), forced supply exhaust exterior wall type (FF-W) and forced supply exhaust duct type (FF-D), and the air intake flue terminal and exhaust terminal of balance chamber type (BF-C) and forced supply exhaust chamber type (FF-C) shall be as specified in **7.8**.
- b) The exhaust pipe fitting part of the appliance of forced supply exhaust exterior wall type (FF-W) shall have a structure that enables the exhaust pipe to be connected securely and fixed so that it does not come off easily. The supply air connection fitting part shall have a structure that enables the air supply tube to be connected securely and fixed so that it does not come off easily.

6.5 Structure and dimensions of outdoor type appliance

The outdoor type appliance shall have a structure that prevents foreign matter (16 mm diameter steel ball) from entering the outer junket and air supply/exhaust part.

6.6 Structure by installation mode

6.6.1 Floor type appliance

The floor type appliance shall be as follows.

- a) Any parts other than those around the bottom or mounting supports of appliance shall not directly contact a stand or the floor. This does not apply to parts not to be detrimental to use.
- b) The appliance that could topple over shall be tested according to 2 of Table 18 of **JIS S 2093**. When the appliance is tilted in either direction, it shall not fall at an angle of 15 degrees or less, and no part that may cause fire shall be moved or detached.
- c) For the appliance with the exhaust out-let upward, the exhaust out-let shall not be blocked easily, or a clear statement shall be made to the effect that the exhaust out-let shall not be blocked.
- d) The structure shall not allow the flue gas to be exhausted from the backside of the appliance or from the top of the back guard. This does not apply to the case where the exhaust out-let is not likely blocked, and measures have been taken to prevent the wall surface behind the appliance from overheating.

- e) For the appliance that has an exhaust out-let on the back guard, the distance between the top end of the exhaust out-let and the top of the back guard shall be 20 mm or more.
- f) The structure of appliance that is installed side by side with cooking cabinet etc. shall be normally as follows.
 - 1) The outer junket on the sides and back of the appliance shall be double-structured and in accordance with any of the following.
 - 1.1) The clearance between the internal wall and the external wall shall be 150 mm or more.
 - 1.2) The clearance between the internal wall and the external wall shall be 45 mm or more, and incombustible heat insulating materials having a thickness of 10 mm or more shall be provided inside the external wall.
 - 1.3) The clearance between the internal wall and the external wall shall be 15 mm or more, and the space between the walls shall be filled with incombustible heat insulating materials.
 - 2) The outer junket on the bottom surface of the appliance shall be double-structured, and the clearance between the internal wall and the external wall shall be 5 mm or more.
 - 3) A clearance of 45 mm or more shall be maintained between the bottom surface of the appliance and the floor.
 - 4) The appliance that is installed side by side with cooking cabinet etc. shall be 800 mm or 850 mm in height (from the floor to the top surface), unless there is a particular problem in safety or use.

6.6.2 Built in type appliance

The built in type appliance shall be as follows.

- a) For the appliance with the exhaust out-let upward, the exhaust out-let shall not be blocked easily, or a clear statement shall be made to the effect that the exhaust out-let shall not be blocked.
- b) For the appliance that has an exhaust out-let on the back guard, the distance between the top end of the exhaust out-let and the top of the back guard shall be 20 mm or more.
- c) The parts that are installed inside the structure or work shall have outer junket parts.
- d) It shall be structured to be fixed to the structure or work.

6.7 Appliance that has a function to automatically start operation at the scheduled time

The appliance that has a function to automatically start operation at the scheduled time shall be as follows.