

Translated English of Chinese Standard: GB25034-2010

www.ChineseStandard.net → Buy True-PDF → Auto-delivery.

Sales@ChineseStandard.net

GB

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 91.140.99

P 46

GB 25034-2010

Gas-fired heating and hot water combi-boilers

Issued on: September 02, 2010

Implemented on: July 01, 2011

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China;**

**Standardization Administration of the People's Republic of
China.**

Table of Contents

Foreword.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	8
4 Classifications and their parameters	11
5 Material, construction and safety requirements	13
6 Performance requirements	23
7 Test methods.....	39
8 Inspection rules.....	92
9 Markings, warnings and instructions	94
10 Packaging, transportation and storage	100
Annex A (informative) Comparison between the clause number of this Standard and the clause number of EN 483:1999 and EN 625:1996	101
Annex B (informative) Technical differences between this Standard and EN 483:1999 and EN 625:1996 and their causes	102
Annex C (informative) Classification according to air supply and combustion products evacuation installation method	103
Annex D (informative) Composition of gas automatic shut-off valve in gas system and requirements for sealing force	106
Annex E (Informative) NO _x pollution	108
Annex F (normative) Electrical safety of appliances using AC power supply	113

Annex G (normative) Electromagnetic compatibility safety	124
Annex H (informative) Test method for the heat losses from the test rig of the indirect method and the contributions of the circulating pump of the test rig	127
Annex I (informative) Test method for the ignition time at full load	128
Bibliography	129

Foreword

5.3.8, 5.4.3, 5.5.1, 5.5.2, 6.2.1, 6.3.4, 6.4.4, 6.5.3.2, 6.5.5.1 a), b), c), 6.5.5.2 a), b), c), d), e), 6.5.7.3 a), b), 6.6.2, 6.8.2, 9.1.1 d), 9.1.2, 9.2.1, 9.2.2 and Annex F of this Standard are mandatory and the rest are recommended.

This Standard modifies EN 483:1999 “Gas-fired central heating boilers - Type C boilers of nominal heat input not exceeding 70 kW” (English version) and EN 625:1996 “Gas-fired central heating boilers - Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kw” (English version).

In order to facilitate comparison, a list of the comparison of the clauses of this Standard and the clauses modified of the European standards is listed in Annex A.

Due to the legal requirements of China and the special needs of industry, this Standard was revised when the two European standards were adopted. A list of technical differences and their causes is given in Annex B for reference.

This Standard deletes the following contents in EN 483:1999:

- 1) Annex A: Product classification and supply conditions of European Community countries;
- 2) Annex B: Particular national conditions;
- 3) Annex E: Compilation of the test conditions;
- 4) Annex K: Examples for marking;
- 5) Annex N: Requirements and test methods for separate air supply and combustion products evacuation ducts of type C6 boilers;
- 6) Annex Z: Clauses of this European standard addressing essential requirements or other provisions of EU Directives;
- 7) Relevant content that the maximum heating working water pressure of appliances is 6 kg.

Annexes D, F and G of this standard are normative annexes, Annexes A, B, C, E, H, and I are informative annexes.

This Standard was proposed by Ministry of Housing and Urban-Rural Development of the People's Republic of China.

This Standard shall be under the jurisdiction of Ministry of Housing and Urban-

Gas-fired heating and hot water combi-boilers

1 Scope

This Standard specifies the terms and definitions, classifications and their parameters, material, construction and safety requirements, performance requirements, test methods, inspection rules, markings, warnings and instructions, packaging, transportation and storage of closed gas-fired heating and hot water combi-boilers (hereinafter referred to as “appliances”).

This Standard applies to heating and hot water combi-appliances of which the rated heat input is less than or equal to 70 kW, the maximum heating working water pressure is less than or equal to 0.3 MPa, the water temperature during work is not greater than 95 °C, using atmospheric burner or fan-assisted burner or full premix burner. This Standard also applies to single heating appliances.

This Standard does not apply to the following appliances:

- outdoor appliances with natural combustion products evacuation duct;
- condensing type appliances;
- combination type appliances;
- appliances in which two sets of independent combustion systems are used for heating and hot water in the same enclosure, including appliances of which heating and hot water systems have common duct.

2 Normative references

The following documents contain the provisions which, through reference in this Standard, become the provisions of this Standard. For dated references, their subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard. However, the parties who enter into agreement based on this Standard are encouraged to investigate whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB/T 191 Packaging - Pictorial marking for handling of goods (GB/T 191-2008, ISO 780:1997, MOD)

GB/T 1019-2008 General requirements for the package of household and

similar electrical appliances

GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection (GB/T 2828.1-2003, ISO 2859-1:1999, IDT)

GB/T 2828.2 Sampling procedures for inspection by attributes - Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection (GB/T 2828.2-2008, ISO 2859-2:1985, NEQ)

GB 4208 Degrees of protection provided by enclosure (IP code) (GB 4208-2008, IEC 60529:2001, IDT)

GB 4706.1-2005 Household and similar electrical appliances - Safety - Part 1: General requirements (IEC 60335-1:2004 (Ed4.1), IDT)

GB/T 5013.1 Rubber insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements (GB 5013.1-2008, IEC 60245-1:2003, IDT)

GB 5023.1 Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements (GB 5023.1-2008, IEC 60227-1:2007, IDT)

GB/T 7306.1 Pipe threads with 55 degree thread angle where pressure-tight joints are made on the threads - Part 1: Parallel internal and taper external threads (GB/T 7306.1-2000, eqv ISO 7-1:1994)

GB/T 7306.2 Pipe threads with 55 degree threads angle where pressure-tight joints are made on the threads - Part 2: Taper internal and threads (GB/T 7306.2-2000, eqv ISO 7-1:1994)

GB/T 7307 Pipe threads with 55 degree thread angle where pressure-tight joints are not made on the threads (GB/T 7307-2001, eqv ISO 228-1:1994)

GB/T 12113-2003 Methods of measurement of touch current and protective conductor current (IEC 60990-1999, IDT)

GB/T 13611 Classification and essential property of city gas

GB 14536.1 Automatic electrical controls for household and similar use - Part 1: General requirements (GB 14536.1-2008, IEC 60730-1:2003, IDT)

GB 14536.6 Automatic electrical controls for household and similar use - Particular requirements for automatic electrical burner control systems (GB 14536.6-2008, IEC 60730-2-5:2004, IDT)

GB 14536.10 Automatic electrical controls for household and similar use - Particular requirements for temperature sensing controls (GB 14536.10-2008, IEC 60730-2-9:2004, IDT)

GB/T 16411 Universal test methods of gas burning appliances for domestic use

GB/T 17624.1-1998 Electromagnetic compatibility - General - Application and interpretation of fundamental definitions and terms (idt IEC 61000-1-1:1992)

GB/T 17626.1 Electromagnetic compatibility - Testing and measurement techniques - Overview of immunity tests (GB/T 17626.1-2006, IEC 61000-4-1:2000, IDT)

GB/T 17626.4 Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test (GB/T 17626.4-2008, IEC 61000-4-4:2004, IDT)

GB/T 17626.5 Electromagnetic compatibility - Testing and measurement techniques - Surge immunity test (GB/T 17626.5-2008, IEC 61000-4-5:2005, IDT)

GB/T 17626.11 Electromagnetic compatibility - Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests (GB/T 17626.11-2008, IEC 61000-4-11:2004, IDT)

GB/T 17627.1 High-voltage test techniques for low voltage equipment - Part 1: Definitions, test and procedure requirements (GB 17627.1-1998, eqv IEC 1180-1:1992)

GB/T 17799.1-1999 Electromagnetic compatibility - Generic standards - Immunity for residential, commercial and light-industrial environments (idt IEC 61000-6-1:1997)

CJ/T 3074 Electronic controller of domestic gas-fired appliances

3 Terms and definitions

For the purposes of this Standard, the following terms and definitions and those established in GB 4706.1, GB 14536.1, GB 14536.6, GB 14536.10, GB/T 16411, GB/T 17624.1 and CJ/T 3074 apply.

3.1

gas restrictor

Key:

a - Air supply and combustion products evacuation installation method code;

b - Heating system construction code.

5 Material, construction and safety requirements

5.1 General

Except where otherwise stated, the requirements are verified by visual inspection of the appliance and its relevant technical documents.

5.2 Materials

5.2.1 General requirements for materials

- a) During a reasonable life stated by the manufacture and under normal conditions of installation and use, changes in its material and construction shall not impair the safety of the appliance;
- b) Materials that are in contact with gas and combustion products shall be resistant to corrosion or subjected to corrosion resistance treatment;
- c) Domestic hot water pipes shall be made of corrosion-resistant materials and materials that do not pollute domestic hot water.
- d) The thermal insulation material shall not contain asbestos, shall be of non-combustible material, and shall withstand the expected thermal and mechanical stresses;
- e) The solder of appliances shall not contain hexavalent cadmium;
- f) The enclosure of the combustion chamber shall be made of metallic materials;
- g) The important materials related to safety, the characteristics of which shall be guaranteed by the manufacturer of the appliances and the supplier of the materials, e.g. by providing the necessary written certification.

5.2.2 Thermal insulation materials

- a) The thermal insulation material of appliances shall withstand a temperature of at least 120 °C without deformation and shall retain its insulating properties under the influences of heat and ageing.
- b) The thermal insulation material shall withstand the expected thermal and mechanical stresses.

- f) A filter mesh shall be fitted at the gas inlet, and the grid does not allow a 1 mm pin gauge to pass through. If the gas circuit contains a class D or D' automatic valve, the maximum diameter of the pin gauge shall be 0.2 mm.

5.3.3.2 Soundness of combustion system

- a) Parts which have to be removed during routine service and affect the soundness of the appliance's combustion system, shall be sealed by mechanical means.
- b) Where the boiler case forms part of the combustion system, there shall be no leakage of combustion products into the room where the appliance is installed.

5.3.4 Air supply and combustion products evacuation system

5.3.4.1 General

- a) Appliances shall be designed so that there is an adequate supply of combustion air during ignition and over the whole range of possible heat inputs stated by the manufacturer.
- b) Fan-assisted appliances may be fitted with an adjustment device in the combustion system, either by restrictors or by setting the adjustment device to predetermined positions in accordance with instructions from the manufacturer, intended to adapt the appliance to the pressure losses in the combustion products evacuation system.

5.3.4.2 Air supply and combustion products evacuation ducts

During installation of air supply and combustion products evacuation ducts, no work is necessary other than adjusting the length (possibly by cutting them). Such adaptation shall not impair the correct operation of the appliance.

5.3.4.3 Wind protection device

When pressing a steel ball with a diameter of 16 mm with a force of 5 N, the ball shall not enter the wind protection device.

5.3.4.4 Fan

- a) Direct access to the rotating parts of a fan shall be prevented.
- b) The parts of a fan in contact with combustion products shall be able to withstand the high temperatures of the combustion products; The parts of a fan in contact with combustion products shall be made of corrosion resistant material, or subjected to corrosion resistance treatment.

- c) The positions of the temperature selector shall be recognizable and it shall be possible to ascertain in which direction the water temperature rises or falls. If numbers are used for this purpose, the highest number shall correspond to the highest temperature.
- d) At its maximum setting, it shall cause at least controlled off before the water flow temperature exceeds 95 °C.

5.5.4 Limit thermostat

- a) The limit thermostat shall comply with the requirements of GB 14536.1 for type I devices.
- b) It shall not be possible to alter the maximum set point of the limit thermostat.
- c) When the water temperature falls below its set point, the appliance shall restart the ignition process and resume normal operation.
- d) The limit thermostat shall cause at least safety shutdown before the water flow temperature exceeds 110 °C.

5.5.5 Overheat cut-off device

- a) The overheat cut-off device shall comply with the requirement of GB 14536.1 for type II devices.
- b) This device shall cause non-volatile lockout before the appliance is damaged or before a dangerous situation for the user occurs.
- c) This device shall not be adjustable and normal operation of the appliance shall not give rise to a change in its set point temperature.
- d) Interruption of the link between the sensor and the device responding to its signal shall cause at least safety shutdown.

5.5.6 Safety temperature limiter

- a) The safety temperature limiter shall comply with the requirements of GB 14536.1 for type II devices.
- b) In addition to the requirements stated in 5.5.5, the safety temperature limiter shall cause non-volatile lockout before the water flow temperature exceeds 110 °C.

5.5.6 Temperature sensors

Thermostats, limit thermostats, overheat cut-off devices and safety temperature

input less than the rated heat input, the ignition heat input shall not exceed the rated value specified by the manufacturer.

6.3.4 Heating rated heat output

Under the test conditions of 7.3.4, the heating heat output shall be greater than or equal to the heating rated heat output.

6.3.5 Hot water rated heat input

Under the test conditions of 7.3.5, the rated hot water heat input shall be reached, or it may be adjusted to be within $\pm 10\%$ of the rated hot water heat input.

6.3.6 Hot water production rate

Under the test conditions of 7.3.6, the measured value of the hot water production rate shall not be lower than 95 % of the nominal value of the manufacture.

6.4 Safety of operation

6.4.1 Surface temperature rise

6.4.1.1 Surface temperature rise of adjusting, control and safety devices

Under the test conditions of 7.4.1.1, the surface temperature rise of adjusting, control and safety devices shall not exceed the value specified by the manufacturer and their operation shall remain satisfactory. For the control knobs and all the parts that have to be touched during normal use, the surface temperature rise of metal parts shall be less than or equal to 35 K; the surface temperature rise of porcelain parts shall be less than or equal to 45 K; the surface temperature rise of plastic parts shall be less than or equal to 60 K.

6.4.1.2 Surface temperature rise of side, front and top of appliances

Under the test conditions of 7.4.1.2, the surface temperature rise of side, front, and top of appliances, other than parts of the case within 5 cm of the edge of the sight glass, and within 15 cm of the combustion products evacuation duct, shall be less than or equal to 80 K.

6.4.1.3 Surface temperature rise of test panel and installation base panel

Under the test conditions of 7.4.1.3, the surface temperature rise of test panels and installation base panels shall be less than or equal to 80 K. When the installation base panel and the wall body are composed of flammable materials, and the surface temperature rises to 60 K to 80 K, the manufacture shall provide

correctly when the fan stops during the standby time.

6.5 Adjusting, control and safety devices

6.5.1 Basic requirements

Under the test conditions of 7.5.1, the devices shall operate correctly at the maximum temperature and when the voltage is varied between 0.85 times and 1.1 times the rated voltage. For voltages below 0.85 times the rated voltage, the devices shall either continue to assure safety or cause safety shutdown.

6.5.2 Control devices

6.5.2.1 Rotary knob

Under the test conditions of 7.5.2.1, the torque of a rotary knob shall be less than or equal to 0.6 N • m.

6.5.2.2 Push-button

Under the test conditions of 7.5.2.2, the force required to open and/or close the push-button shall be less than or equal to 45 N.

6.5.3 Automatic valves

6.5.3.1 Sealing force

Under the test conditions of 7.5.3.1, the leakage rate of class B and class C valves shall meet the requirements of Table D.1 in Annex D.

6.5.3.2 Closing function

Under the test conditions of 7.5.3.2, the closing function of valves shall meet the following requirements:

- a) The valves shall close automatically before the voltage reaches 0.15 times the minimum rated voltage.
- b) The valves shall close automatically on interruption of the electricity supply when the electrical supply voltage is between 0.15 times the minimum rated voltage and 1.1 times the maximum rated voltage.
- c) For pneumatic or hydraulic valves, the valves shall close automatically when the actuating pressure is reduced to 0.15 times the maximum rated actuating pressure specified by the manufacturer.

6.5.3.3 Closing time

concentration in the combustion products shall not exceed 0.10 %.

c) Under the test conditions of 7.5.8.3 c), the gas supply shall be shut off before the $\text{CO}_{\alpha-1}$ concentration in the combustion products exceeds 0.20 %.

d) Under the test conditions of 7.5.8.3 d), at thermal equilibrium, the $\text{CO}_{\alpha-1}$ concentration in the combustion products shall not exceed 0.10 %.

6.5.8.4 Gas/air ratio controls

6.5.8.4.1 Endurance of gas/air ratio controls

Under the test conditions of 7.5.8.4.1, gas/air ratio controls are subjected to an endurance test of 250000 cycles with full diaphragm travel in each cycle. After the endurance test, the gas/air ratio control shall operate correctly.

6.5.8.4.2 Leakage of non-metallic control tubes

Under the test conditions of 7.5.8.4.2, use control tubes that are not made of metal or of other materials with at least equivalent properties, their breakage or leakage shall not lead to an unsafe situation.

6.5.8.4.3 Adjustability of air/gas or gas/air ratio controllers

Under the test condition of 7.5.8.4.3, the adjustable device shall work normally under the extreme pressure and within the adjustable ratio range.

6.5.8.4.4 Safety of operation

The appliance shall meet one of the following requirements:

a) Under the test conditions of 7.5.8.4.4 a), it shall meet the following requirements:

1) when the heat input is higher than the maximum value of the adjustment range specified by the manufacturer, the gas supply shall be shut off before the $\text{CO}_{\alpha-1}$ concentration in the combustion products exceeds 0.20 %;

2) When the heat input is below than the minimum value of the adjustment range specified by the manufacturer, the gas supply shall be shut off before the $\text{CO}_{\alpha-1}$ concentration in the combustion products exceeds

$$\frac{\phi}{\phi_{\min}} \times \text{CO}_{\text{mes}} \leq 0.20 \text{ \%}.$$

where: ϕ is the instantaneous heat input, $\phi_{\min}$ is the minimum heat input, CO_{mes} is the measured CO concentration.

- a) Test 1: CLOSE the first valve of the gas circuit, OPEN all downstream valves for soundness, APPLY air of 15 kPa to the gas inlet, CHECK whether the requirement of 6.2.1 is met.
- b) Test 2: OPEN the first valve of the gas circuit, CLOSE the second valve for soundness of the gas circuit, BLOCK the ignition burner gas circuit. APPLY air of 5 kPa (not using liquefied petroleum gas) or 15 kPa (using liquefied petroleum gas) to the gas inlet. CHECK whether the requirement of 6.2.1 is met. All the closing devices of the ignition burner are subjected to the same test.
- c) Test 3: OPEN the first valve of the gas circuit, CLOSE the second valve of the gas circuit, CLOSE or BLOCK the ignition burner gas circuit. The pressure of the gas inlet is 0.6 kPa. CHECK whether the requirement of 6.2.1 is met.
- d) Test 4: OPEN all valves for soundness, REPLACE the injectors with the appropriate parts provided by the manufacturer to block the gas circuit. CHECK the leakage or CHECK whether the requirements of 6.2.1 is met with 0-1 gas flame.

7.2.2 Soundness of combustion system

7.2.2.1 General

The test uses all the joints specified by the manufacturer under air at room temperature. The tests are carried out with the maximum possible leakage of the appliance.

7.2.2.2 Air supply and combustion products evacuation system

The body and the air supply and combustion products evacuation duct of the appliance shall be tested separately, or the air supply and combustion products evacuation duct shall be mounted on the appliance for overall test.

One end of the gas circuit of the test appliance is connected to the pressure source and the other end is blocked. The test pressure shall be as specified by the supplier but not less than 50 Pa. For appliances with fans and separate air supply and combustion products evacuation ducts, the test pressure is the pressure difference between the internal pressure of the combustion products evacuation duct and the atmospheric pressure at thermal equilibrium of the appliance (fitted with the longest air supply and combustion products evacuation duct specified by the manufacturer). It is checked that the requirements of 6.2.2.2 are met.

7.2.2.3 Combustion products evacuation duct for indirect control method

According to the test method of 7.3.1. MEASURE the total heat input during the ignition safety time, CALCULATE the heat input per unit time. It is checked that the requirements of 6.3.3 are met.

7.3.4 Heating rated heat output

The thermal efficiency of the test method in 7.7.1 is multiplied by the rated heat input as the heating heat output. It is checked that the requirements of 6.3.4 are met.

7.3.5 Hot water rated heat input

USE 0-2 gas. For rapid heat exchange appliances, the gas rate can be adjusted according to the manufacturer's instructions. When the rated hot water heat input is in equilibrium state, the gas rate is measured and calculated according to formulae (1) and (2). It is checked that the requirements of 6.3.5 are met.

7.3.6 Hot water production rate

USE 0-2 gas. ADJUST the temperature of hot water to $30\text{ K} \pm 1\text{ K}$. When it cannot be adjusted to this temperature, adjust it to the nearest temperature. The appliance with automatic thermostatic function shall set the temperature at the maximum temperature; by means of increasing the inlet water pressure, make the appliance operate at rated heat input or maximum heat input. When the rated hot water heat input is in equilibrium state, the test is started. For volumetric appliances, make the appliance operate in hot water mode, adjust the thermostat to the temperature of $65\text{ }^{\circ}\text{C}$ or the nearest temperature. When it cannot be adjusted to this temperature, adjust it to the nearest temperature. When the burner is extinguished, start draining the water, and the end of the first drainage cannot be earlier than the second extinction of the burner and shall last for 10 min. The test shall be conducted twice in a row. Record cold, hot water temperature and water rate. After the appliance is operating for 20 min, a second 10-min water drainage is performed, and the temperature and water rate are recorded. Calculate each drainage according to formula (3):

$$D_i = \frac{M_{i(10)}}{10} \times \frac{\Delta t}{30} \dots\dots\dots (3)$$

where:

D_i - the value of the effective rate at a temperature rise of 30 K per measurement, in liters per minute (L/min);

$M_{i(10)}$ - the value of the amount of water measured each time during the test, in liters (L);

Figure 7 -- Test rig with horizontal duct installed on a vertical wall

7.4.2.3 Ignition stability of ignition burner at low rate

Use reference gas for test.

- a) For appliances without a governor or with a gas/air ratio control, the gas inlet is set to the minimum pressure.
- b) For appliances equipped with a governor, the outlet pressure is adjusted to:
 - Artificial gas: the corresponding value of 90 % of the rated heat input;
 - Natural gas: the corresponding value of 92.5 % of the rated heat input;
 - Liquefied petroleum gas: the corresponding value of 95 % of the rated heat input.

Reduce the gas rate of the ignition burner to the minimum gas rate that maintains its normal operation. It is checked that the requirements of 6.4.2.3 are met.

If ignition is possible under the above conditions, the test is repeated with the minimum heat input allowed by the controller.

7.4.3 Reduction of gas pressure

With the boiler installed as stated in 7.1.3, the gas supply pressure is reduced, in 100 Pa steps, from 70 % of the rated pressure to 0 mbar. At each step it is checked that the requirements of 6.4.3 are met or that at least safety shutdown occurs.

7.4.4 Failure of the gas shut-off valve near the main burner

If the gas supply to the ignition burner is taken between the two automatic valves of the main burner, the gas shut-off valve near the main burner is kept open artificially. Use 0-2 gas or the actual gas at the rated pressure to ignite the small fire burner. It is checked that the requirements of 6.4.4 are met.

7.4.5 Pre-purge

7.4.5.1 Pre-purge volume and pre-purge time

According to the option chosen by the manufacturer, the pre-purge volume or the pre-purge time are tested according to the following methods.

The composition and sealing force requirements of automatic gas valves are given in Annex D.

7.5.3.1 Sealing force

The valves are first opened and closed twice. After turning off the power, apply air under the pressure as shown in Table D.1 in Annex D in the opposite direction to the closing direction of the closure element. The air pressure increase speed is not more than 0.1 kPa/s. After the pressure is stable, test the leakage volume. It is checked that the requirements of 6.5.3.1 are met.

7.5.3.2 Closing function

- a) The valve is energized at the maximum rated voltage and the maximum actuating pressure, and the voltage is slowly reduced to 0.15 times the minimum rated voltage. It is checked that the valve is closed.
- b) The valve is energized at the rated voltage, then the voltage adjusted to 1.1 times the maximum rated voltage and the maximum actuating pressure (pneumatic and hydraulic valves) and remains unchanged. After being de-energized, it is checked that the valve is closed. For valves having control solenoids for alternating current, the electricity supply shall be switched off at a peak value of the alternating current.
- c) The valve is energized at the maximum rated voltage, then the voltage is reduced to between 0.15 times the minimum rated voltage and 0.85 times the maximum rated voltage. The actuating pressure remains unchanged. Select 3 different points between 0.15 times the minimum rated voltage and 0.85 times the maximum rated voltage for the tests, to see whether the above requirements are met.
- d) A valve with a pneumatic or hydraulic actuating mechanism is energized at the maximum rated voltage and the maximum actuating pressure; then the actuating pressure is slowly reduced to 0.15 times the maximum actuating pressure. It is checked that the valve is closed.

It is checked that the requirements of 6.5.1 and 6.5.3.2 are met.

7.5.3.3 Closing time

The valve is operated at the maximum actuating pressure or 1.1 times the rated voltage; the air corresponding to the maximum working pressure of the appliance and 0.6 kPa is used respectively; the interval between interruption of the pneumatic, hydraulic pressure or electrical voltage and the valve reaching the closed position is measured. It is checked that the requirements of 6.5.1 and 6.5.3.3 are met.

7.5.6.1 Voltage regulation performance test

Use 0-2 gas, adjust the appliance to rated heat input. Then adjust the gas supply pressure to: minimum pressure and maximum pressure.

It is checked that the requirements of 6.5.6.1 are met.

7.5.6.2 Endurance

The air is supplied at ambient temperature and at the maximum pressure specified by the manufacturer. A quick acting shut-off valve is fitted both upstream and downstream of the gas governor. The two valves alternately open and close. With 10 s for each cycle, in each cycle the diaphragm is fully flexed and the valve is held on its seat for at least 5 s.

50000 tests are allocated according to the following conditions:

- 25000 tests are at the maximum working temperature specified by the manufacturer but at least 60 °C,
- 25000 tests are at the maximum working temperature specified by the manufacturer but at most 0 °C.

After the test, it shall meet the requirements of 6.5.6.2.

7.5.7 Thermostats and water temperature limiting devices

7.5.7.1 Basic requirements

If the thermostat and the water temperature limiting device are tested separately, the sensor and thermostat shall be placed in a thermostatically controlled enclosure. The test conditions of the thermostat body shall be as specified in 7.5.1 and the test conditions of the sensor shall be as specified in 7.5.7.2b).

7.5.7.2 Control thermostat

a) Adjustment accuracy

The appliance is installed as stated in 7.1.3 and adjusted to the rated heat input with 0-2 gas or an actually distributed gas. Using control valve I in Figures 3 or 4, the cold water rate is adjusted to give a rate of increase of the flow temperature of about 2 K/min.

When the thermostat is adjustable, two tests are carried out at the maximum setting temperature, and at the minimum temperature.

Under these test conditions, the appliance is started at ambient

For gas/air controllers that can be adjusted automatically, test at their maximum and minimum ratios. It is checked that the requirements of 6.5.8.4.3 are met.

7.5.8.4.4 Safety of operation

The appliance is set at the rated heat input, and after reaching thermal equilibrium. The CO and CO₂ or O₂ contents are measured continuously. By choice of the manufacturer one of the following tests is conducted:

- a) The air supply duct or combustion products evacuation duct is progressively blocked (the means of carrying out the blockage shall not give rise to recirculation of the products of combustion). It is checked that the requirements of 6.5.8.4a) are met.
- b) With the appliance at ambient temperature, the maximum blockage of the air supply duct or combustion products evacuation duct which enables the burner to ignite, is established (the means of carrying out the blockage shall not give rise to recirculation of the products of combustion). The appliance is operated until thermal equilibrium is reached. It is checked that the requirements of 6.5.8.4b) are met.
- c) The working voltage at the fan terminals is progressively reduced. It is checked that the requirements of 6.5.8.4c) are met.
- d) With the appliance at ambient temperature, the minimum working voltage at the fan terminals which enables the burner to ignite, is established. The appliance is operated until thermal equilibrium is reached. It is checked that the requirements of 6.5.8.4d) are met.

7.6 Combustion test

7.6.1 General

The tests are carried out with the longest air supply and combustion products evacuation ducts, or with the corresponding pressure losses, unless otherwise stated. The appliance is supplied with 0-2 gas and adjusted at the rated heat input. The CO and CO₂ or O₂ contents of combustion products are measured in thermal equilibrium. When dry, excess air coefficient $\alpha = 1$, the content of CO in combustion products is calculated by formula (5) or formula (6):

$$CO_{\alpha=1} = (CO)_m \times \frac{(CO_2)_N}{(CO_2)_m} \dots\dots\dots (5)$$

where:

(CO)_m - the value of the CO content of the sampling test, in volume fraction

- c) appliances with gas governors or appliances which are intended to be installed solely on a gas installation with a gas governed meter are adjusted to 105 % of the rated heat input.

The reference gas is then replaced by the incomplete combustion limit gas. It is checked that the requirements of 6.6.3.1 are met.

7.6.3.2 Flame lift combustion

First the reference gas is used to adjust the heat input state as follows:

- a) appliances without gas governors are adjusted to the minimum heat input; the pressure at the boiler inlet is the minimum pressure;
- b) appliances with gas/air ratio controls are adjusted to the minimum heat input;
- c) appliances with gas governors are adjusted to a heat input equal to 95 % of the minimum heat input.

The reference gas is then replaced by the flame lift limit gas. It is checked that the requirements of 6.6.3.2 are met.

7.6.3.2 Fan assisted combustion

The appliance tests are performed according to 7.4.2.2a). Calculate the arithmetic mean value of $\text{CO}_{\alpha=1}$ in the combustion products measured under the nine combinations of wind speed and incident angle. It is checked that the requirements of 6.6.3.3 are met.

7.6.4 Sooting

The test conditions are the same as those in 7.6.3.1. After using incomplete combustion limit gas to continuous operate for 0.5 h, it is checked that the surface of the heat exchanger meets the requirements of 6.6.4.

7.7 Thermal efficiency test

7.7.1 Heating thermal efficiency at rated heat input

7.7.1.1 Test conditions

The appliances are installed as stated in 7.1.3, connected to the insulated test rig shown in Figures 3 or 4, or to any other equipment giving equivalent results.

The appliances are supplied with 0-2 gas. The measurement of the efficiency may begin once the appliance, with the control thermostat put out of action, is

- For appliances with adjustable rated heat input, the thermal efficiency is tested at the maximum heat input Q_n and at the arithmetic mean value Q_a of the maximum rated heat input and the minimum rated heat input, respectively.

The tested thermal efficiency shall meet the requirements of 6.7.1.

NOTE: Practical test method for D_p :

- Use a well-insulated, small-volume (approx. 250 mL) container as an alternative to the appliance (1) (see Figure 3), which has a submerged electric heater inside. The circulation system is filled with water; the water pump is started to work under normal settings; the submerged electric heater is connected with the adjustable transformer, the wattmeter and the power supply; the adjustable transformer is adjusted so that the circulating water temperature reaches the thermal equilibrium (this process takes 4 h or for a longer time); record the ambient temperature and measure the heat input. Performing a series of tests at different temperatures, so as to obtain the heat losses at different temperatures above ambient temperature.
- During the actual measurement, the ambient temperature is recorded at the same time, and the heat loss D_p is determined according to the difference between the ambient temperature and the average temperature of the test platform.

7.7.2 Heating thermal efficiency at reduced load

7.7.2.1 General

The thermal efficiency of the test fixture when the load is 30% of the rated heat input; for the rated heat input adjustable appliance, the load is the thermal efficiency when the maximum rated heat input is 30% of the average value of the minimum rated heat input arithmetic.

Test the thermal efficiency of the appliance at a load corresponding to 30 % of the rated heat input; for range rated appliances, test at a load corresponding to 30 % of the arithmetic mean of the maximum and minimum heat input.

7.7.2.2 Direct method

The appliance is installed as stated in 7.1.3 and supplied with 0-2 gas; at rated heat input.

Taking into account temperature variations, throughout the test, the water volume rate is maintained constant within ± 1 %, and the pump operates continuously.

7.7.2.2.1 Test method 1

USE 0-2 gas, under the rated heat input, START the hot water system and gradually REDUCE the water supply pressure until the burner is extinguished. Continuously MEASURE the maximum temperature of domestic hot water with a low-temperature inert thermometer, CHECK whether the requirements of 6.8.3 are met.

7.8.3.2 Water-storage heat exchange type

USE 0-2 gas, ADJUST the hot water thermostat to the highest position so that the domestic hot water runs under the rated heat load. After the burner is extinguished, DISCHARGE the domestic hot water and MEASURE the maximum domestic hot water temperature, CHECK whether the requirements of 6.8.3.2 are met.

7.8.4 Water supply shut-off temperature rise

7.8.4.1 For rapid heat exchange type, use 0-2 gas, make the appliance operate at the rated heat load, adjust the water rate or water temperature control device so that the domestic hot water is at the maximum water temperature. After the appliance is operating for 10 min, immediately turn off the hot water inlet switch and open it after 10 s. At as close as possible to the hot water outlet, use a low-temperature inert thermometer to continuously measure the outlet water temperature at the center of the water flow until the temperature of the outlet hot water is stable. Read the maximum temperature. Then test following the above steps, but the drainage stop time is increased by 10 s each time. Until the maximum temperature is reached. It is checked that the requirements of 6.8.4.1 are met.

7.8.4.2 Water-storage heat exchange type

Use 0-2 gas, adjust the thermostat to the maximum temperature position and operate at rated thermal load. After the water tank reaches a stable temperature and the burner is turned off by the control device for 1 s, the water tank is drained at a rate of 5 %. Until the burner reignites and operates at least 95 % of the rated heat input, record the maximum outlet water temperature. After the burner is extinguished, immediately drain again and repeat the above test until the water temperature does not rise again. Record the maximum water temperature. It is checked that the requirements of 6.8.4.2 are met.

For burners with adjustable heat input or several rates, the next drain shall be performed when the gas rate is reduced to 50 % of full load. Every time the water is drained, record the maximum outlet water temperature. It is checked that the requirements of 6.8.4.2 are met.

7.8.5 Domestic hot water overheating

USE 0-2 gas, SET the temperature of the heating circuit to the highest position. In the heating mode, OPERATE continuously for 1 h with rated heat input without discharging hot water. Then the water is discharged at the nominal hot water production rate. It is checked that the requirements of 6.8.5 are met.

7.8.6 Heating time

According to the requirements of 7.8.1, the rapid heat exchange hot water system shall be operated using 0-2 gas at a pressure of 0.1 MPa, so that the appliance is operating under the rated heat input condition of domestic hot water. SET the outlet hot water temperature higher than the inlet temperature by 40K. After operating for 5 min, STOP the gas supply. The water still flows. RESTART the appliance until the inlet and outlet water temperatures are equal. MEASURE the time required to reach a temperature rise of 36 K to the hot water from the ignition of appliance. It is checked that the requirements of 6.8.6 are met.

7.8.7 Water temperature control

7.8.7.1 Rapid heat exchange type

Use 0-2 gas as required by 7.8.1, make the appliance operate at rated heat input. The water shall be drained under water pressure of 0.1 MPa, 0.2 MPa, 0.3 MPa and 0.6 MPa or water pressure specified by the manufacturer. When the steady state is reached, if the heating thermostat can be adjusted, drain water at the maximum and minimum positions, respectively. It is checked that the requirements of 6.8.7.1 are met.

7.8.7.2 Water-storage heat exchange type

Adjust the water temperature of the water tank according to the manufacturer's specifications. After the appliance burner is controlled off, drain the hot water for 10 minutes at a rate of 5 % of the tank volume per minute or the minimum rate stated by the manufacturer. At this time, the burner is allowed to start when the drainage is done at a rate greater than 5 % of the water tank volume. After 1 min, it is checked that the requirements of 6.8.7.2 are met.

7.9 Hydraulic resistance test

When testing the hydraulic resistance of an appliance (in kPa), the rate of the test water shall correspond to the appliance operating under the rated heat input state, the outlet water temperature is 80 °C, the return water temperature 60 °C or at a value specified by the manufacturer.

The test is carried out with the water at ambient temperature.

- b) Thermostat and water temperature limiting device function (6.5.7, except for endurance);
- c) CO content in incomplete combustion (6.6.3.1);
- d) Functional test for air proving device (6.5.8, except for durability);
- e) Verification of safety shut-off function (6.5.3.2);
- f) Verification of safety time (6.4.5.1);
- g) Domestic hot water performance (6.8);
- h) Soundness of combustion system (6.2.2);
- i) Leakage current (for appliances using AC power) (E.6.2, E.8.2).

8.1.2.3 Products that have been in stock for more than 1 year shall be re-inspected in accordance with 8.1.2.

8.2 Type inspection

8.2.1 Type inspection requirements

In the case of one of the following situations, the type inspection shall be carried out. After the type inspection is passed, mass production and sales are allowed.

- a) Trial model design appraisalment of new product;
- b) Trial model design appraisalment of the product manufactured from a factory to another factory;
- c) After the formal production, if there are major changes in the structure, materials and processes, which may affect the product performance;
- d) Resume production after the production has been suspended for a long time;
- e) When there is a big difference between the factory-exit inspection result and the last type inspection result;
- f) When the national quality supervision agency requires the type inspection.

8.2.2 Inspection items

In this Standard, Clause 5, Clause 6, Clause 9 and 10.1.

8.2.3 Determination principles

l) the IP code of water resistance class;

m) the rated heat input (Q_{nw}) of domestic hot water mode, the unit: kW (if there is different heat input for heating and domestic hot water).

9.1.2 Packaging markings

The packaging box shall carry the name, type, mass, dimension, applicable gas type, area of use and gas supply pressure of the appliance; the name and address of the manufacturer, the date of manufacture; the pictorial marking for handling of goods that complies with the specifications of GB/T 191.

9.2 Warnings

9.2.1 Warning signs

Appliances shall have striking special warning signs, which shall be firm and durable, and shall include the following contents:

- a) Gas other than those specified shall not be used;
- b) Ventilation requirements and installation environment;
- c) Appliances that use AC power shall be safely grounded;
- d) Read the technical instructions carefully before installation;
- e) Read the use instructions carefully before use.

9.2.2 Misuse risk warnings

Warnings shall be given in the instructions on the expected misuse risk, which shall include at least the following contents:

- a) Improper installation can cause harm to people, animals and things;
- b) Appliance installation shall be strictly performed in accordance with the instructions requirements and relevant specifications;
- c) Only agents or technicians authorized by the manufacturer can repair, replace parts or complete machines;
- d) Original accessories shall be used to avoid reducing the product's safety;
- e) Original ducts shall be used, not at liberty to use other ducts. It is forbidden to replace coaxial duct with single duct;
- f) The maintenance of appliances that involves in the maintenance of gas

Annex F

(normative)

Electrical safety of appliances using AC power supply

F.1 General conditions of the test

F.1.1 Type tests are performed according to the items in this Annex.

F.1.2 If Class I appliances have ungrounded, accessible metal parts, which are not separated from live parts by using grounded intermediate metal parts, determine the conformity of these parts according to the relevant requirements specified for Class II appliances.

If Class I appliances carry accessible non-metallic parts, unless the parts are separated from the live parts by a grounded intermediate metal part, determine the conformity of these parts according to the relevant requirements specified for Class II appliances.

F.2 Protection class

The class of protection against electric shock on appliances shall be Class I or Class II; the water resistance level shall be at least IPX4.

Conformity is checked by visual inspection and related tests.

NOTE: The water resistance level is given in GB 4208.

F.3 Marking and instructions

F.3.1 According to the specifications of 7.1 in GB 4706.1-2005.

F.3.2 According to the specifications of 7.8 in GB 4706.1-2005.

F.3.3 According to the specifications of 7.12.5 in GB 4706.1-2005, the appliance shall be Y-type or Z-type connection.

F.3.4 According to the specifications of 7.14 in GB 4706.1-2005.

F.4 Protection against access to live parts

F.4.1 The construction and enclosure of appliances shall have adequate protection against accidental access to live parts, including opening the lid and removing the removable parts without using tools.

F.4.2 For Class II appliances and Class II constructions, the construction and enclosure shall have adequate protection against accidental access to metal parts with basic insulation and metal parts that are separated from live parts by only basic insulation.

F.4.3 According to the requirements of Clause 8 of GB 4706.1-2005, test the protection against accessible live parts.

F.5 Leakage current and electrical strength at working temperature

F.5.1 At working temperature, the leakage current of appliances shall not be excessive, and its electrical strength shall meet the specified requirements.

Conformity is checked by tests of F.5.2 and F.5.3.

The working duration of appliances continues until the time when the most unfavorable conditions occur during normal use.

SUPPLY 1.06 times rated voltage.

Before performing this test, disconnect the protective impedance and radio interference filter.

F.5.2 Leakage current is measured by using the circuit device described in Figure 4 of GB/T 12113-2003, and measurement is made between any pole of the power supply and accessible metal parts that are connected to the metal foil. The area of the metal foil to be connected does not exceed 20 cm × 10 cm and is in contact with the accessible surface of the insulating material.

NOTE 1: The voltmeter shown in Figure 4 in GB/T 12113-2003 shall be able to measure the actual RMS value of the voltage.

For appliances using single-phase power supplies, the measurement circuit is given in the following figures:

- If it is a Class II appliance, see Figure 1 in GB 4706.1-2005;
- If it is not a Class II appliance, see Figure 2 in GB 4706.1-2005.

The leakage current is measured by setting the selector switch to each position of a and b.

The working duration of appliances continues until the time when the most unfavorable conditions occur during normal use, the leakage current shall not exceed the following values:

- for Class II appliances 0.25 mA

NOTE 2: 6.3 specifies the high-voltage power supply for the test.

NOTE 3 For Class II constructions with both reinforced insulation and double insulation, care shall be taken that the voltage applied to the reinforced insulation does not overstress the basic insulation or additional insulation.

NOTE 4: In constructions where the basic insulation and additional insulation cannot be tested separately, this insulation is subject to the specified test voltage for reinforced insulation.

NOTE 5: When testing the insulating coating, a sand bag may be used to press the metal foil against the insulation with a pressure of about 5 kPa. The test can be limited to places where insulation may be weak, for example: where there is sharp metal under the insulation.

NOTE 6: If feasible, insulation linings shall be tested separately.

NOTE 7: Take care to avoid overstressing the components of the electronic circuit.

At the beginning of the test, the applied voltage does not exceed half of the specified voltage and then it is gently raised to the specified value. Breakdown shall not occur during the test.

F.8 Construction

F.8.1 In normal use, the appliance shall be constructed so that its electrical insulation is not affected by water that may condense on cold surfaces or liquids that may leak from water valves, heat exchangers, fittings and similar parts of appliances.

Conformity is checked by visual inspection.

F.8.2 Appliances shall have safety precautions against excessive internal water pressure.

Conformity is checked by inspection and, if necessary, by appropriate tests.

F.8.3 For the reset button of non-automatic reset controller, if its accidental reset may cause danger, it shall be prevented from accidental reset.

Conformity is checked by visual inspection.

F.8.4 It shall effectively prevent direct contact of live parts with thermal insulation, unless the material is non-corrosive, non-hygroscopic and non-combustible.

Conformity is checked by visual inspection.

F.8.5 Wood, cotton, silk, plain paper and similar fibers or hygroscopic materials

the appliance.

Conformity is checked by visual inspection.

F.10.5 The power cord of Class I appliances shall have a yellow/green wire which is connected between the grounding terminal of the appliance and the grounding contact of the plug.

Conformity is checked by visual inspection.

F.10.6 Where the conductors of the power supply cord are subjected to contact pressure shall not be reinforced by lead-tin welding, unless the clamping device is constructed so that there will be no risk of poor contact due to the cold rheology of the flux.

Conformity is checked by visual inspection.

F.10.7 The structure of the power cord inlet shall be such that the power cord sheath can penetrate without risk of damage. Unless the enclosure where the cord enters the opening is made of insulating material, a non-removable bushing or non-removable bushing that meets the additional insulation requirements of 29.3 of GB 4706.1-2005 shall be provided.

Conformity is checked by visual inspection.

F.10.8 For Y-type connections and Z-type connections, the cord fixing device shall be such that the conductors are free from tensions and torques at the terminals and the insulation of the conductors is protected from wear.

It shall not be possible to push the cord into the appliance so as to damage the cord or the internal parts of the appliance.

Conformity is checked by visual inspection, manual tests and by the following tests.

When the cord is subjected to a tension of 100 N and a torque of 0.35 N • m, make a mark at about 20 mm from the cord fixing device, or other suitable point.

Then apply the specified tension in the most unfavorable direction for a total of 25 times. Do not use explosive force. 1 second for each time.

During this test, the cord shall not be damaged and there shall be no significant tension at each terminal. When tension is applied again, the longitudinal displacement of the cord shall not exceed 2 mm.

F.11 Grounding measures

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----