GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 91.140

P 45

GB/T 38603-2020

Safety and control devices for gas burners and gas-burning appliances - Particular requirements - Electronic controller

燃气燃烧器和燃烧器具用安全和控制装置 特殊要求 电子控制器

Issued on: March 31, 2020 **Implemented on: February 01, 2021**

Issued by: State Administration for Market Regulation;
Standardization Administration of PRC.

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Safety and control devices for gas burners and gas-burning appliances - Particular requirements - Electronic controller

1 Scope

This standard specifies the terms and definitions, classification, structure, requirements, test methods, inspection rules, marking, installation and operating instructions, packaging, transportation and storage, of the electronic controllers for gas burners and gas-burning appliances, which are used for city gas, as specified in GB/T 13611.

This standard applies to the electronic controllers for gas burners and gas-burning appliances, of the gas water heaters, gas heating water heaters, gas burners/machines, gas steam generators, gas boilers, gas stoves and other combustion appliances, which have automatic combustion control functions.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

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 4208 Degrees of protection provided by enclosure(IP code)

GB/T 6346.14 Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

GB/T 13611 Classification and basic characteristics of city gas

GB/T 14004 Fixed capacitors for use in electronic equipment - Part 6: Sectional specification - Fixed metallized polycarbonate film dielectric d.c. capacitors (available for certification)

5 Structure

5.1 Protection provided by the enclosure

5.1.1 When the controller is installed and used in the manner, which is declared by the manufacturer, it shall have a degree of protection, which is suitable for its use.

5.1.2 When the controller is used on a gas-burning appliance, it is protected by the gas-burning appliance.

5.1.3 When the controller is used barely in atmosphere, the degree of protection shall not be lower than IP54, which is specified in GB/T 4208.

5.2 Structure design of controller

5.2.1 The structural appearance requirements of the controller shall comply with the provisions of Chapter 11 of GB/T 14536.6-2008.

5.2.2 When the controller has two or more control functions, it shall meet the following requirements:

a) The functional safety level of the controller shall be the same as the highest safety level of a single function;

b) Any failure of any function shall not affect the safe operation of other control functions;

c) Each function of the controller system shall meet the same continuous operation performance requirements, as a single control function module.

5.2.3 When the controller is composed of two or more functional modules, it shall meet the following requirements:

a) When combining various functional modules, it shall avoid mutual interference;

b) When the functional module of the controller is connected to the gas-burning appliance, it shall not affect the functional safety of the control device;

c) When incorporating the controller and control device into the overall control system design of the appliance, it shall declare the safety critical parameters of the entire controller system.

5.3 Circuit structure of internal fault protection

5.3.1 Circuit structure of category A controller

Category A controllers have no circuit structure requirements for internal fault protection.

5.3.2 Circuit structure of category B controller

The circuit structure of the category B controller shall at least conform to one of the following structures:

a) Single-channel structure with function detection;

b) Single-channel structure with periodic self-test;

c) Dual-channel structure without comparison.

5.3.3 Circuit structure of category C controller

5.3.3.1 The circuit structure of category C controller shall at least conform to one of the following structures:

a) Single-channel structure with periodic self-test and monitoring;

b) Dual-channel structure with comparison (homogenous);

c) Dual-channel structure with comparison (diverse).

5.3.3.2 The comparison between dual-channel structures can be achieved, in the following ways:

a) By using a comparator;

b) By mutual comparison.

6 Requirements

6.1 Function

When the controller is designed according to function, it can be divided into the following functional modules; each module shall meet the requirements of Appendix B ~ Appendix F:

a) Combustion control function module;

Category B controller shall have self-protection function, under the condition of single independent fault. When testing according to the test method of 7.5.1, the second independent fault is not considered. The failure of the controller shall be controlled, in accordance with the provisions of Appendix G.

c) Category C controller

Category C controller shall have self-protection function, under the first and second independent fault conditions. When testing according to the test method of 7.5.2, the third independent fault is not considered. The failure of the controller shall be controlled in accordance with the provisions of Appendix G.

6.5 Safety of electrical components

The controller shall meet the requirements of 6.3.8 in GB/T 30597-2014.

6.6 EMC safety

The electromagnetic compatibility safety of the controller shall meet the requirements of Appendix H.

6.7 Battery-powered controller

The battery-powered controller shall comply with the provisions of Appendix I.

7 Test method

7.1 Test conditions and allowable errors

7.1.1 Test conditions

The controller shall be tested under the following test conditions:

a) Laboratory's ambient temperature: (20 ± 5) °C;

b) Laboratory's relative humidity: 25% ~ 75%;

c) The test shall be carried out in the installation position, which is declared by the manufacturer. When multiple installation positions are declared, the test shall be carried out in the most unfavorable installation position.

7.4 Continuous operation performance test

The controller is tested, in accordance with the provisions of D.3.2.2 in GB/T 30597-2014.

7.5 Internal fault protection test

The controller is tested, in accordance with the provisions of D.3.3 in GB/T 30597-2014. When the internal fault protection test is performed on the category C controller, the second fault shall be introduced, under the following conditions:

a) For the non-continuous operation system, under the starting state after the first failure;

b) For the continuous operation system, 24 h after the first failure.

8 Inspection rules

8.1 Exit-factory inspection

8.1.1 General requirements

Each batch of products shall be subject to the exit-factory inspection, when they enter the finished product warehouse or when they are delivered. The exit-factory inspection shall be carried out in the form of sampling.

8.1.2 Sampling inspection

Sampling inspection shall meet the following requirements:

a) For sampling inspection, it shall take sample batch by batch. The inspection batch shall be composed of products of the same material, same production process, uniform specifications and models;

b) The sampling scheme shall be determined, in accordance with the provisions of GB/T 2828.1. The inspection level is the special inspection level S-3. The sampling scheme can be determined by the manufacturer. The inspection items and acceptance quality limit (AQL) shall meet the requirements of Table 1.

Table 1 -- Exit-factory inspection items and nonconformance classifications

9 Signs, installation and operating instructions

9.1 Signs

The signs of the controller shall not only comply with the provisions of 8.1 in GB/T 30597-2014, but also include at least the rated voltage or voltage range.

9.2 Installation and operating instructions

The installation and operation instructions of the controller shall not only comply with the provisions of 8.2.1 in GB/T 30597-2014, but also include at least the following contents:

a) Power supply voltage and frequency;

b) Maximum and minimum ambient temperature;

c) Degree of protection;

d) Circuit connections, which use different power supply voltages, shall be clearly indicated (for example, the instructions shall clearly indicate that: if the connected circuit is not grounded or connected to a multi-phase power supply, it shall use an isolation transformer, which has grounding at one end);

e) The maximum rated current of the output terminal;

f) The installation location of the controller;

g) The type of flame sensor used, the value of flame induction current, as well as appropriate protective measures, which are carried out by the system installer on the adjustment method, when the sensitivity adjustment of the flame sensor will cause unsafe conditions;

h) The length and type of cables, which are used to connect the flame sensor and other external components;

i) External wiring diagram;

j) Rated input power of the system;

k) The description of the switch action, that can cause the burner's control system to restart from the locked state, such as the description of the thermostat or similar device;

Appendix B

(Normative)

Combustion control function module

B.1 Classification

B.1.1 The combustion control function module shall at least meet the category B safety requirements.

B.1.2 When the combustion control function module includes a flame detector device, it shall meet the category C safety requirements.

B.1.3 When the combustion control function module includes an automatic shut-off valve, it shall comply with the provisions of Appendix E AND shall meet the category C safety requirements.

B.2 Structure

The structure of the combustion control function module shall comply with the provisions of Chapter 5.

B.3 Requirements

B.3.1 Function

B.3.1.1 Safety time

B.3.1.1.1 Time adjustment

When it is allowed to adjust the cleaning time, waiting time, ignition safety time, flame failure reaction time, delay time to complete the lock, the time adjustment shall be completed by the manufacturer.

B.3.1.1.2 Midway cleaning time and midway waiting time

For a system with a restart function, after completing an unsuccessful ignition attempt, the halfway cleaning time and halfway waiting time, before restarting, shall not exceed the manufacturer's declared value.

B.3.1.1.3 Pre-cleaning/post-cleaning time and waiting time

The pre-cleaning/post-cleaning time and waiting time shall not be less than the time, which is declared by the manufacturer. When the system is set with adjustable time, the measured value, under the conditions specified in 7.1, is the reference value; the adjusted time shall not be less than the reference value.

For systems with reset devices, the reset devices shall meet the following requirements:

a) In the non-volatile locked state, it shall be restarted by manual actions, such as the restart button on the operating device OR the restart button on the remote controller;

b) Improper use or damage to the reset device shall not cause the system to operate, failure to meet the requirements of this standard, OR prevent the system from performing a safe shutdown OR entering a locked state.

Note: Improper use or damage of the reset device refers to the reset device, regardless of whether it comes with the device OR is remotely controlled, is subject to the continuous operation of manual restart button, the internal fault of reset device, the short circuit of the cable which connects the reset device, the short circuit between cable and ground, etc.

B.3.2 Thermal stress

The thermal stress requirements shall meet the requirements of 6.2.

B.3.3 Continuous operation performance

The performance requirements for continuous operation shall meet the requirements of 6.3.

B.3.4 Internal fault protection

The internal fault protection requirements shall meet the requirements of b) or c) in 6.4.

B.4 Test method

B.4.1 Function test

B.4.1.1 Safety time test

According to the manufacturer's instructions, supply power to the controller, according to the voltage conditions specified in 7.2.1, to test whether it meets the requirements of B.3.1.1.

B.4.1.2 Flame detector device test

According to the manufacturer's instructions, supply power to the controller, according to the voltage conditions specified in 7.2.1, to test whether the flame induced current value of the flame detector device meets the manufacturer's declaration. The open circuit of the sensor or its connecting cable, which is used in the test, shall cause the flame signal to disappear, to test whether it meets

the requirements of B.3.1.2.

B.4.1.3 Locking and resetting device test

B.4.1.3.1 Locking function test

According to the manufacturer's instructions, supply power to the controller, according to the voltage conditions specified in 7.2.1; perform a lock function test, each time it starts; follow the fault modes, which are described in Appendix I and Table H.11.12.7 in GB/T 14536.1-2008, to carry out analysis, to test whether it meets the requirements of B.3.1.3.1.

B.4.1.3.2 Reset device test

According to the manufacturer's instructions, supply power to the controller, according to the voltage conditions specified in 7.2.1. In the non-volatile locked state, the system's restart function is completed by manual action. The restoration of the interrupted power supply cannot achieve the restart function. Test whether it meets the provisions of B.3.1.3.2.

B.4.2 Thermal stress test

Carry out the thermal stress test, according to the requirements of 7.3; the D.3.2.1.1.1d) in GB/T 30597-2014 shall be replaced by the following:

- Where there is no flame signal, perform 2500 cycles;

- During operation, turn off the flame signal AND perform 2500 cycles.

The controller is subject to 55000 cycles, in the normal operation mode (standby, start, run), to test whether it meets the requirements of B.3.2.

B.4.3 Continuous operation performance test

Carry out continuous operation performance test, according to the requirements of 7.4, to test whether it meets the requirements of B.3.3.

B.4.4 Internal fault protection test

B.4.4.1 The combustion control function module of category B safety requirements shall be tested for internal fault protection, in accordance with the provisions of D.3.3.1 of GB/T 30597-2014, to test whether it meets the provisions of B.3.4.

B.4.4.2 The combustion control function module of category C safety requirements shall be tested for internal fault protection, in accordance with the provisions of D.3.3.2 in GB/T 30597-2014. For the continuous operation system, the D.3.3.1.1c) does not apply. Test whether it meets the requirements of B.3.4.

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