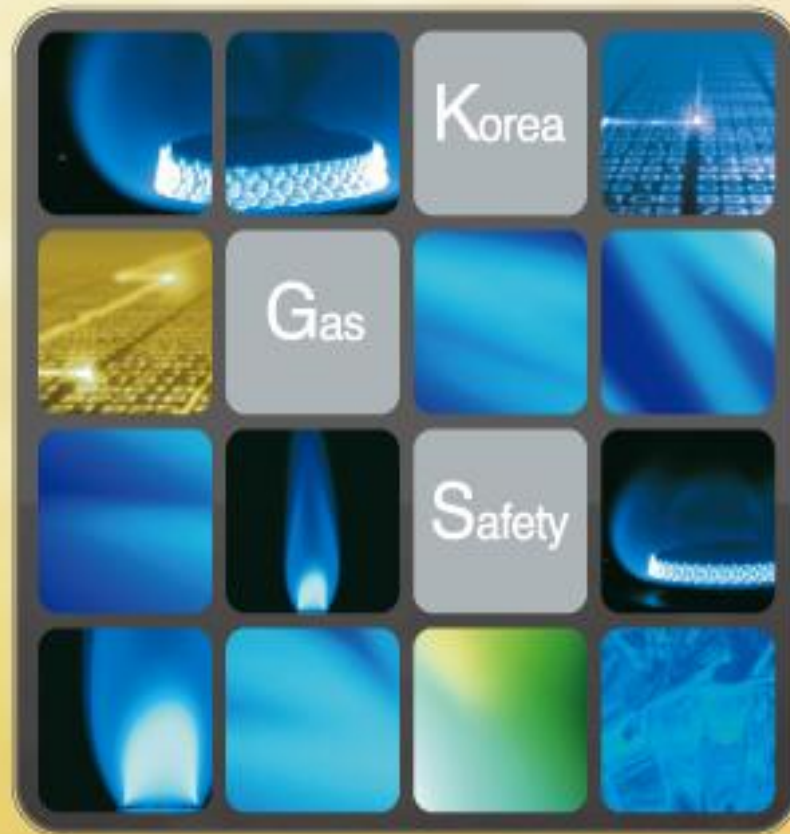




Code for Facilities, Technology and Inspection for Manufacturing of Gas Clothes Dryers

Deliberation/Resolution by Gas Technical Standards Committee : November 23, 2018

Approval by the Ministry of Trade, Industry & Energy : December 13, 2018

Personnel

Gas Technical Standards Committee

Chairman	Kwang-Won Lee, Professor of Hoseo University
Vice-Chairman	Seung-Hoon Nam, Principal Researcher of KRISS
Ex Officio Member	Hui-Won Lee, Manager of Energy Safety Department, Ministry of Trade, Industry & Energy
	Hae-Myeong Yang, Director of Technology and Safety, Korea Gas Safety Corporation
High-Pressure Gas	Seung-Hoon Nam, Principal Researcher of KRISS
	Beom-Seok Lee, Principal Professor of Kyung Hee University
	Dong-Myeong Ha, Professor of Semyung University
	Chang-Gi Kim, Principal Researcher of Korea Institute of Machinery and Materials
	Hyuk-Myun Kwon, Director General of Occupational Safety & Health Research Institute
	Su-Dong Byun, CEO of Q-Best
Liquefied Petroleum Gas	Doo-Seon Park, Managing Director of Daesung Industrial Gas Co., Ltd
	Hyeong-Hwan Ann, Professor of Korea National University of Transportation
	Byeong-Hak Choei, Professor of Gangneung-Wonju National University
	Seong-Min Lee, Director of KOGAS Research Institute
	Yong-Gwon Lee, Vice-President of EG CNE Co.,Ltd
	Gi-hyeon Jang, Director of Kiturmi
	Jeong-Sik Chon, Direto of E1 CO., Ltd.

History of Establishment and Revision of KGS Code

Code Number	KGS AB933 ²⁰¹⁸
Code Title	Code for Facilities, Technology and Inspection for Manufacturing of Gas Clothes Dryers

Date of Establishment/Revision	Description
December 31, 2008	Established (Notification of the Ministry of Knowledge Economy No. 2008-380)
May 15, 2009	Revised (Notification of the Ministry of Knowledge Economy No. 2009-193)
June 26, 2012	Revised (Notification of the Ministry of Knowledge Economy No. 2012-313)
December 28, 2012	Revised (Notification of the Ministry of Knowledge Economy No. 2012-549)
May 20, 2013	Revised (Notification of the Ministry of Knowledge Economy No. 2013-087)
November 17, 2014	Revised (Notification of the Ministry of Trade, Industry & Energy No. 2014-589)
November 4, 2015	Revised (Notification of the Ministry of Trade, Industry & Energy No. 2015-578)
January 8, 2016	Revised (Notification of the Ministry of Trade, Industry & Energy No. 2016-6)
January 9, 2017	Revised (Notification of the Ministry of Trade, Industry & Energy No. 2017-003)
December 13, 2018	Revised (Notification of the Ministry of Trade, Industry & Energy No. 2018-607)

Table of Contents

1. General.....	1
1.1 Scope.....	1
1.2 Validity of Code.....	1
1.3 Reference Codes and Standards.....	2
1.3.1 Inspection standard for new technology products.....	2
1.3.2 Registration standard for manufacturing of foreign products.....	2
1.4 Definitions.....	2
1.5 Application of Codes and Standards.....	3
2. Manufacturing Installation Standard.....	3
2.1 Manufacturing Facilities.....	3
2.2 Inspection Facilities.....	4
3. Manufacturing Technology Standard.....	5
3.1 Materials.....	5
3.2 Construction and Dimensions.....	5
3.3 Devices.....	10
3.3.1 Power failure safety device.....	10
3.3.2 Headwind prevention device.....	10
3.3.3 Flame supervision device.....	10
3.3.4 Other devices.....	10
3.4 Performance.....	10
3.4.1 Product performance.....	10
3.4.2 Material performance.....	12
3.4.3 Operating performance.....	13
3.5 Heat Treatment (currently not used).....	19
3.6 Marking.....	19
3.6.1 Product marking.....	19
3.6.2 Acceptance mark.....	19
3.6.3 Enclosure of manual.....	20
4. Inspection Standard.....	20
4.1 Kinds of Inspections.....	20
4.1.1 Manufacturing installation inspection.....	20
4.1.2 Product inspection.....	20

4.2 Object Audit of Process Inspection	23
4.2.1 Application for audit.....	23
4.2.2 Audit method.....	23
4.2.3 Adjudication committee.....	24
4.3 Inspection Items.....	24
4.3.1 Manufacturing installation inspection	24
4.3.2 Product inspection.....	24
4.4 Inspection Method.....	27
4.4.1 Manufacturing installation inspection	28
4.4.2 Product inspection.....	28
4.5 Other Inspection Standards.....	31
4.5.1 Inspection of imported products.....	32
4.5.2 Partial omission of inspection.....	32
4.5.3 Disposal of rejected products (not applicable)	32
4.5.4 Detailed inspection standards.....	32
 Appendix A General Standard for Operation of Quality Control System for Gas Appliance Manufacturing Plants.....	 33
 Appendix B General Conditions for Test of Gas Clothes Dryers.....	 38
 Appendix C Test Methods of Gas Clothes Dryers	 41

Code for Facilities, Technology and Inspection for Manufacturing of Gas Clothes Dryers

1. General

1.1 Scope

1.1.1 This Code applies to facilities, technology and inspection for manufacturing of the gas clothes driers (hereinafter referred to as "clothes dryers") which come under the following (1) to (2) among the combustors in conformity to the Enforcement Regulation of the Safety Control and Business Regulation of Liquefied Petroleum Gas Act (hereinafter referred to as "Enforcement Regulation"), Table 3, No. 10 and Table 7, No.4-j. <Revised on November 4, 2015>

- (1) Total heat input rate is not over 232.6 kw(200,000 kcal/hr), and
- (2) The working gas pressure is not over 3.3 kPa.

1.1.2 Combustors excluded from the gas appliances subject to license in conformity to the Enforcement Regulation, Table 7, No.5-b are as follows:

- (1) Gas torches used for welding and cutting,
- (2) Dryer combustors used in casting sand dryers, printing ink dryers, concrete dryers, etc.,
- (3) Combustors for heat treatment furnaces or heating furnaces used in metal heat treatment furnaces, glass and ceramic furnaces, atmosphere gas furnaces, etc.,
- (4) Melting furnace combustors used in metal melting, glass melting, etc., and
- (5) Combustors attached to gas canisters of which internal volume is less than 100 mL, and
- (6) Other combustors accepted by the Minister of Knowledge Economy to be free of any problem in safety control.

1.2 Validity of Code

1.2.1 This Code has passed the deliberation and resolution by Gas Technical Standards Committee (Bill No. 2018-9, November 23, 2018) in conformity to the High Pressure Gas Safety Control Act (hereinafter referred to as "High Pressure Gas Act"), Article 33-2 in accordance with the Safety Control and Business Regulation of Liquefied Petroleum Gas Act (hereinafter referred to as "Act"),

Article 45, Clause 1, has been approved by the Minister of Trade, Industry & Energy (Notification No. 2018-607 of the Ministry of Trade, Industry & Energy, December 13, 2018), and is valid and effective as the detailed standards in conformity to the Act, Article 45, Clause 1.

1.2.2 Conformity to this Code is deemed to conform to Table 7 of the Enforcement Regulation in accordance with the Act, Article 45, Clause 4. <Revised on November 4, 2015>

1.3 Reference Codes and Standards

1.3.1 Inspection standard for new technology products

In case the Minister of Knowledge Economy acknowledges that the new manufacturing and inspection methods of clothes dryers developed through technology development do not meet the standard for facilities, technology and inspection in conformity to this Code in accordance with the Enforcement Regulation, Table 7, No. 5-a but do not hinder safety control, such manufacturing and inspection methods of those gas appliances may apply only restrictively to them. <Revised on May 15, 2009>

1.3.2 Registration standard for manufacturing of foreign products <Newly established on June 26, 2012>

The "foreign manufacturing installation standards and manufacturing technology standards" specified the Enforcement Regulation, Article 17, proviso of Clause 3 mean the detailed standards specified by the provisions of the Act, Article 45. <Revised on November 4, 2015>

1.4 Definitions

The terms used in this Code are defined as follows:

1.4.1 "Regular quality inspection" means the performance inspection performed by taking samples from products manufactured in mass production to check whether the products which are to undergo production stage inspection are the same products manufactured as those that have undergone design stage inspection.

1.4.2 "Routine sample inspection" means the inspection performed to check on the basic product performance by taking samples from the same products manufactured in the same production lot for the products to undergo product identification inspection.

1.4.3 "Occasional quality inspection" means the inspection performed by taking samples without any advance notice from products produced in mass production in order to check whether the products which have undergone production process inspection or comprehensive process inspection are being manufactured in the same way as those that have undergone design stage inspection.

1.4.4 "Process identification audit" means the audit conducted to check on the conformity of quality system operation to the manufacturing and self-inspection processes required for manufacturing of the products which have undergone design stage inspection.

1.4.5 "Comprehensive quality control system audit" means the audit conducted to check on the conformity of quality system operation for the whole manufacturing process of insulation joints such as design, manufacturing and self-inspection.

1.4.6 "Type" means the unit of products distinguishable in their construction, material, capacity and performance.

1.4.7 "Process inspection" means production process inspection and comprehensive process inspection.

1.5 Application of Codes and Standards

Codes and standards for the materials, construction and dimensions, performance and other technical matters of clothes dryers not covered in this Code shall conform to relevant Korean Industrial Standards (KS).

2. Manufacturing Installation Standard

2.1 Manufacturing Facilities

A person who intends to manufacture clothes dryers shall be furnished with the following manufacturing facilities to manufacture clothes dryers in accordance with this manufacturing technology standard. However, in case the licensing authority recognizes that it is necessary to

utilize the facilities of specialist parts companies which manufacture the parts or to use the parts manufactured by them for quality improvement, the facilities may be utilized or the parts may be used.

- (1) Drilling machines, presses, tube benders, casting processing machines,
- (2) Surface treatment and painting facilities,
- (3) Ultrasonic cleaning facility (for clothes dryer cocks and governors only), and
- (4) Gas welding machines or electric welding machines and power assembly jigs and tools for clothes dryer assembly

2.2 Inspection Facilities

2.2.1 A person who intends to manufacture clothes dryers shall be furnished with the following inspection facilities required to check on and maintain product performance.

2.2.1.1 The kinds of inspection facilities shall be sufficient for self-inspection and include the followings:

2.2.1.1.1 Kinds of inspection facilities which must be furnished

- (1) Dimension measuring facilities such as vernier calipers, micrometers, thread gauges, etc.,
- (2) Surface temperature gauges, and
- (3) Carbon monoxide meters and carbon dioxide meters.

2.2.1.1.2 Kinds of inspection facilities which shall be furnished when required

- (1) Liquefied petroleum gas or city gas immersion test facilities,
- (2) Pressure-proof test facilities,
- (3) Gas tightness test facilities,
- (4) Safety device operation test facilities,
- (5) Durability test facilities,
- (6) Test gas supply facilities,
- (7) Insulation resistance testers and withstand voltage testers,
- (8) Heat input rate measurement facilities,
- (9) Barometers,
- (10) Voltage regulators and power consumption watt meters,
- (11) Vibration testers,
- (12) Thermal efficiency measuring facilities, and
- (13) Other necessary inspection facilities and tools

2.2.1.2 The capacity of inspection facilities shall match the product production capacity of the relevant manufacturing plant.

2.2.2 Notwithstanding 2.2.1, in case the test and inspection of design stage inspection items are ordered to one of the following authorized agencies to be performed or a lease contract for test and inspection facilities required for design stage inspection items is awarded to one of the following authorized agencies, the relevant test and inspection facilities among the inspection facilities in 2.2.1 shall be deemed to have been furnished.

(1) Korea Gas Safety Corporation (hereinafter referred to as "KGS" or "Korea Gas Safety Corporation") in conformity to the High Pressure Gas Act, Article 28

(2) Test and inspection agencies authorized in accordance the High Pressure Gas Act, Article 35 (hereinafter referred to as "test and inspection agencies"), and

(3) Test and inspection agencies authorized in accordance with the Framework Act on National Standards

3. Manufacturing Technology Standard

3.1 Materials

The metal parts of a clothes dryer shall be made of corrosion resistance materials or their surfaces shall be treated for corrosion resistance for its safety.

3.2 Construction and Dimensions <Revised on December 28, 2012>

A clothes dryer shall be of a construction and dimensions in conformity to the following standard for its safety, serviceability and exchangeability.

3.2.1 A clothes dryer shall be of a construction which is not directly coupled to a gas cylinder.

3.2.2 The opening direction of the handle of a rotary cock or valve for gas or water service shall be counterclockwise. However, in the case of bidirectional multi-function rotary cocks, this provision does not apply.

3.2.3A clothes dryer provided with a pilot burner shall be of a construction of which gas circuit will not be opened unless the pilot is ignited.

3.2.4 A clothes dryer provided with an air supply fan and an exhaust gas fan shall be of a construction of which fans shall be operated before ignition and gas circuit will be automatically cut off if the fans are stopped.

3.2.5 Each part of a clothes dryer shall be fabricated in consideration of safety and durability against gas leakage and fire and shall be free of fracture or deformation detrimental to its use in normal transportation, installation and operation.

3.2.6 The operation of each part shall be smooth and firm.

3.2.7 A clothes dryer shall not be easily dislocated or toppled by its operation in its normal installation state.

3.2.8 The ignition of the burner shall be able to be checked with eyes, a mirror or an indicating lamp in the location where the burner is put into ignition operation.

3.2.9 The piping through which gas flows shall be installed in a location free of excessive heat or corrosion or protective measures shall be taken.

3.2.10 The connection parts through which gas flows shall be firmly made by welding, screwing or bolting and be gas tight.

3.2.11 Gas passes shall be gas tight and the gas tightness shall not be impaired by normal transportation, installation or operation.

3.2.12 The burner and pilot burner shall be stably installed in their specific locations and maintain relative distances to the related parts such as the nozzle, combustion chamber, electric ignition device, safety device, etc. and not be dislocated or moved in the normal service condition.

3.2.13 The burner and pilot burner shall be installed in the locations from which other equipment parts are not overheated or damaged.

3.2.14 The burner and other major parts shall be adjustable and replaceable.

3.2.15 The edges of parts to be touched by the hand in operation or during cleaning shall be smooth.

3.2.16 In principle, parts in need of being disassembled for cleaning and repairs shall be able to be disassembled and assembled with ordinary tools.

3.2.17 Screws used for assembly of each part shall be able to be firmly tightened and screws used in the parts to be disassembled for repairs and inspection shall be able to be repeatedly used.

3.2.18 A clothes dryer which is installed on the wall, column or floor shall be able to be installed and disassembled and shall be firmly installed so that there will be no abnormality to be caused by normal piping connection.

3.2.19 Gas connection parts shall conform to the following standard:

3.2.19.1 In principle, gas connection parts shall be exposed to the outside or be in locations which can be easily noticed from the outside.

3.2.19.2 The threads of a gas connector (inlet side threads of a gas connector integrated with a hose connector) shall be the taper pipe threads in conformity to KS B0222 and shall be free from loosening or deformation which may impair gas tightness due to repeated hose connection and disconnection.

3.2.19.3 The shape and dimension of a hose connector used in a gas connector shall conform to Figure 3.2.19.3 and be free from loosening or deformation which may impair gas tightness due to repeated hose connection and disconnection.

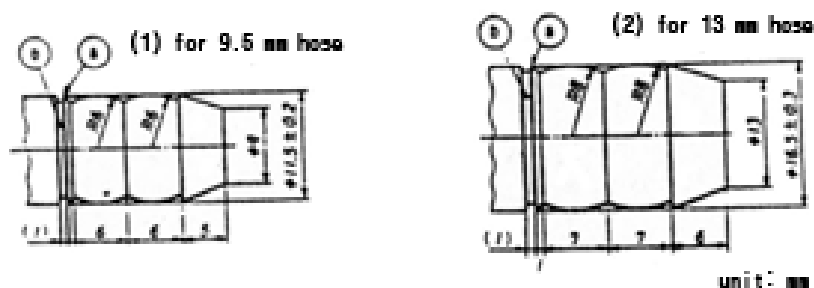


Figure 3.2.19.3 Shape and Dimensions of Hose Connectors

Note:

1. Part (a) shall be chamfered.

2. Part ⑥ shall be grooved, and the grooves shall be painted in red.
3. The part to be inserted for reinforcement may be rounded.
4. Unspecified tolerances shall conform to KS B ISO 2768-1, Coarse Class. However, radius R and the values in () shall be their reference values.

3.2.20 An appliance valve shall conform to the following standard:

3.2.20.1 An appliance valve shall be able to open and close the gas passage of the burner smoothly and firmly. In addition, an appliance valve which opens and closes more than one gas passage shall be able to firmly open and close each gas passage.

3.2.20.2 In principle, the opening direction of an appliance valve which is opened and closed by rotary manipulation shall be counterclockwise. However, this provision does not apply to an appliance valve which is integrated with a gas connector, of which body is installed in a condition exposed to the outside, and which serves more than one burner.

3.2.20.3 The support surface between an appliance valve body and the cock and the circumferential contact surface of the appliance valve of a cock construction shall have effective actual lengths when all the gas passages are closed so that the gas passages can be firmly closed.

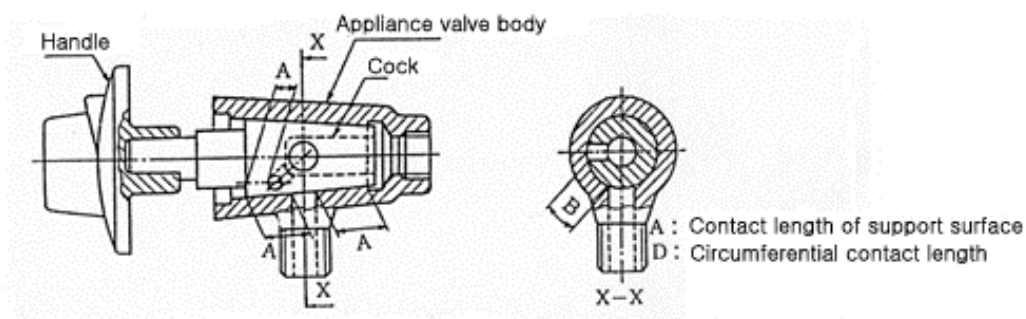


Figure 3.2.20.3 Appliance Valve of Cock Construction

3.2.20.4 In the case of an appliance valve of a valve construction, the valve and its valve seat shall be in close contact and maintain gas tightness so that the gas passage can be firmly closed.

3.2.20.5 Grease used in an appliance valve shall be suitable for the gas and shall have no problem in the case of gas leakage and for service.

3.2.21 The dryer drum shall conform to the following standard:

3.2.21.1 The dryer drum shall be fitted with a temperature controller in its inside.

3.2.21.2 A clothes dryer shall not damage clothes in its normal operation and clothes shall not be in direct contact with the fan blades or high-temperature parts.

3.2.21.3 A clothes dryer fitted with a filter in its lint trap passage shall be able to be easily cleaned.

3.2.21.4 The door shall be able to be easily and firmly closed and opened.

3.2.21.5 The door shall be able to be easily opened by pushing it from inside. However, in case a clothes dryer into which man cannot enter, this provision does not apply.

3.2.21.6 In the case of a door on which clothes can be placed in its opened state, the door shall have such strength as to withstand the weight of the clothes and the clothes dryer shall not be toppled.

3.2.21.7 A clothes dryer shall be fitted with a grounding terminal or a grounding lead cable in a conspicuous location on its outside and a mark of its presence shall be attached on itself or near it. However, in the case of a clothes dryer on which outside any metal part is not exposed or the power plug is of a double insulation construction which can be grounded, this provision does not apply.

3.2.21.8 The materials of the dryer drum and its internal parts shall be corrosion-resistant.

3.2.22 A rotary drum type clothes dryer shall conform to the following standard:

3.2.22.1 The dryer drum shall not rotate unless the door is not closed. In case the door is opened, the rotation of the dryer drum shall be stopped and the gas passage to the main burner shall be automatically shut off at the same time.

3.2.22.2 The lint discharged from a clothes dryer shall not be conspicuously scattered.

3.2.22.3 A clothes dryer shall be fitted with a desorption tube connector.

3.3 Devices

A clothes dryer shall be provided with the devices in conformity to the following standard for its safety and serviceability:

3.3.1 Power failure safety device

A clothes dryer of which gas circuit is opened or closed by AC power shall close the gas circuit when the power is off and shall be provided with a safety device which prevents the gas circuit from being automatically opened or reignited when the power is on again. However, this provision does not apply to a clothes dryers of which pilot flame is not extinguished when the power is off.

3.3.2 Headwind prevention device

A clothes drier provided with an exhaust tube connector shall be provided with a device which prevents headwinds from affecting the burner.

3.3.3 Flame supervision device

A clothes dryer shall be provided with a flame supervision device.

3.3.4 Other devices

3.3.4.1 Governor <Revised on December 28, 2012>

- (1) Governor (applicable to a clothes dryer fitted with a ceramic burner)
- (2) Drum temperature overheat prevention device
- (3) Safety device for prevention of abnormal combustion

3.4 Performance

A clothes dryer shall have the performance in conformity to the following standard to secure its safety and serviceability:

3.4.1 Product performance

3.4.1.1 Gas tightness performance <Revised on December 28, 2012>

Gas tightness performance shall conform to the following standard:

3.4.1.1.1 The leakage through the gas shutoff valve shall not be over 70 mL/h when a clothes dryer undergoes gas tightness test performed at a pressure equal to 1.5 times the normal pressure.

3.4.1.1.2 There shall be no external leakage from the gas connector to the flame holes. However, in the case of parts where gas tightness test is difficult to be performed, leak test in an ignited state may replace the gas tightness test.

3.4.1.2 Durability performance

3.4.1.2.1 The cock and electric igniter shall be free of gas leakage and maintain its normal performance after a 12,000-cycle cyclic test.

3.4.1.2.2 The flame supervision device and hose connector shall be free of gas leakage and maintain their normal performance after a 1,000-cycle cyclic test.

3.4.1.2.3 The governor shall be free of gas leakage and the change in regulated pressure shall not exceed $[0.05P(\text{regulated pressure before the test}) + 0.03]$ kPa after a 30,000-cycle cyclic test.

3.4.1.2.4 In the case of clothes dryers other than electronic type and proportional control type clothes dryers, there shall be no gas leakage and no problem in their use and the variation in time limit shall not exceed 10%. <Newly established on December 28, 2012>

3.4.1.2.5 A clothes dryer fitted with a quick release coupler shall be free of gas leakage and the coupling and decoupling shall be smooth and firm after a 6,000-cycle cyclic test. <Newly established on December 28, 2012>

3.4.1.2.6 The door of a clothes dryer fitted with a quick release latch shall be free of gas leakage and the latching on and latching off shall be smooth and firm after a 6,000-cycle cyclic test. <Newly established on December 28, 2012>

3.4.1.3 Vibration resistance performance <Newly established on December 28, 2012>

A clothes dryer shall be free of leakage and pass the normal combustion state test after a vibration test performed in its packed state with a vibration tester at a frequency of 600 cycle/min and an amplitude of 5 mm in up-down and right-left directions for one hour (30 minutes in each direction) . However, this provision applies to clothes dryers of which heat input rate is not over 5.8 kW.

3.4.1.4 Insulation resistance performance

The insulation resistance between an electrically charged part and an uncharged metal part of a

clothes dryer shall not be less than 1 MΩ.

3.4.1.5 Withstand voltage performance <Revised on December 28, 2012>

A clothes dryer using AC power shall be free of any abnormality when AC voltage in conformity to the following table is impressed continuously for one minute between its electrically charged part and uncharged part in danger of being grounded.

Table 3.4.1.5 Test Voltage for Withstand Voltage Test Depending on Insulation State

Insulated State	Test Voltage (V)	
	Before normal temperature rise test	After normal temperature rise test
Basic insulation impressed with safe extremely low voltage	500	500
Basic Insulation	1250	1000
Additional Insulation	2750	2750
Reinforcing Insulation	3750	3750

3.4.2 Material performance <Newly established on December 28, 2012>

3.4.2.1 Heat resistance performance

- (1) The materials of the burner, nozzle, nozzle holder, Aeration adjuster and heat exchange part shall not be molten when maintained at 500°C in a gas furnace or an electric furnace.
- (2) Metallic materials used in the part from the gas connector to the nozzle holder inlet through which gas flows shall not be molten when maintained at 350°C in a gas furnace or an electric furnace.
- (3) The materials of the part through which combustion gas flows shall have heat resistance performance so that there will be no melting or deformation detrimental to the use in its service state.

3.4.2.2 Gas resistance performance

3.4.2.2.1 In the case of the packing (rubber) and plastic materials of a combustor burning liquefied petroleum gas, the rate of weight change shall not be over 20% and they shall be free of softening or embrittlement detrimental to the use after being immersed in n-pentane at 5 to 25°C for 72 hours and then being left in the air for 24 hours.

3.4.2.2.2 The rate of weight change of the sealing material of the parts through which gas flows shall not be over 10% for a gas temperature of 20°C and 25% for a gas temperature of 4°C when the material is left in butane gas at a pressure of 5.0 kPa in thermostatic baths at 20°C and 4°C

respectively for one hour.

3.4.2.3 Corrosion resistance performance

The metallic materials shall be free of corrosion when tested for 24 hours in accordance with KS D 9502 (Neutral, Acetic Acid and Copper-Accelerated Acetic Acid Salt Spray) and metallic materials of which surfaces are treated with painting shall be free of rust, swelling or peeling when tested for 24 hours by a paint film salt water spray test method.

3.4.3 Operating performance <Revised on December 28, 2012>

3.4.3.1 Electric ignition performance

The electric ignition system of a clothes dryer shall successfully ignite no less than 8 times when it is operated 10 times and shall not consecutively fail twice to ignite.

3.4.3.2 Heat input rate performance

The tolerances of the total heat input rate of a clothes dryer and the heat input rate of each burner shall be within $\pm 10\%$ of their indicated values.

3.4.3.3 Electromagnetic wave conformity performance

A clothes dryer provided with an electromagnetic control system shall conform to the requirements of the following tests and the test methods shall conform to the latest version of IEC 61000-4:

(1) Electric fast transient phenomenon immunity test

After the test equipment and installation condition are set in accordance with IEC 61000-4-4, each of the test levels in Table 3.4.3.3(1) is impressed in standby, operating and locked states while rated voltage is impressed to a clothes dryer. At this time, the clothes dryer shall normally operate in accordance with the performance standard in this code at severity level 2 and maintain a safe state at severity level 3. However, in case the user's manual specifies that the cable length shall not exceed 3 m, tests on I/O signals, data and control terminals are not performed.

Table 3.4.3.3(1) Static Discharge Test Levels of Electric Fast Transient Phenomenon

Severity Level	Power Supply Terminal (kV)	I/O Signal, Data, Control Terminal (kV)
2	1.0	0.5
3	2.0	1.0

(2) Instantaneous power interruption and voltage drop immunity test

After the test equipment and installation condition are set in accordance with IEC 61000-4-11, the test voltage and continuation period in conformity to Table 3.4.3.3(2) shall be impressed in combination to a clothes dryer. At this time, instantaneous power interruption and voltage drop shall be performed no less than 3 times respectively on the random phase of the rated frequency while the clothes dryer is in each of standby, operating and locked states. However, the interval at which instantaneous power interruption and voltage drop occur shall not be less than 10 seconds. The clothes dryer shall normally operate in accordance with the performance standard of this code when the continuation period of power interruption and voltage drop is not over one cycle, and shall maintain a safe state when the continuation period of power interruption and voltage drop is over one cycle.

Table 3.4.3.3(2) Instantaneous Power Interruption and Voltage Drop

Test Level	Continuation Time (cycle)	% of Rated Voltage or Rated Voltage Range against Average Voltage	
		50% (voltage drop)	0% (power interruption)
1	0.5	Not tested	○
	1.0	Not tested	○
2	2.5	○	○
	25	○	○
	100	○	○

(3) Instantaneous voltage variation test

After the test equipment and installation condition are set in accordance with IEC 61000-4-11, the following each test level shall be impressed in each of standby, operating and locked states while a clothes dryer is impressed with the rated voltage. At this time, the impression shall be made 3 times and the impression interval shall be 10 seconds.

(3-1) The clothes dryer shall normally operate at 85 to 110% of the rated voltage in the case of AC power and 80 to 120% of the rated voltage in the case of DC power.

(3-2) The clothes dryer shall be free of any abnormality in safety when it is tested at a voltage less than 85% of the rated voltage in the case of AC power and at a voltage less than 80% of the rated voltage in the case of DC power.

(4) Surge immunity test

After the test equipment and installation condition are set in accordance with IEC 61000-4-5, the following each test level shall be impressed in each of standby, operating and locked states while a clothes dryer is impressed with the rated voltage. At this time, the clothes dryer shall normally operate in accordance with the performance standard in this code at severity level 2 and maintain a safe state at severity level 3. However, if a locked state cannot be generated, pulse shall be

impressed in a shutoff state.

Table 3.4.3.3(4) Surge Test Level

Severity Level	Between Lines (kV)	Between Line and Ground (kV)
2	0.5	1.0
3	1.0	2.0

(5) Electrostatic discharge immunity test

After the test equipment and installation condition are set in accordance with IEC 61000-4-2 in a state where a clothes dryer is impressed with the rated voltage, each of the test levels in Table 3.4.3.3(5) is impressed in standby, operating and locked states. At this time, the clothes dryer shall normally operate in accordance with the performance standard in this code at severity level 2 and maintain a safe state at severity level 3.

Table 3.4.3.3(5) Electrostatic Discharge Test Level

Severity Level	Contact Discharge (kV)	Aerial Discharge (kV)
2	4	4
3	6	8

3.4.3.4 Combustion state performance

Detailed standards for combustion state performance shall conform to Appendixes B and C.

3.4.3.4.1 Windless state condition

- (1) Flames shall be firmly propagated and be free of explosive ignition.
- (2) There shall be no lifting after 15 seconds from ignition.
- (3) Flames shall not be extinguished after 15 seconds from ignition.
- (4) Flames shall be uniform after burner ignition.
- (5) There shall be no backfire until 30 minutes have passed after ignition.
- (6) Combustion noise shall not be over 60 dB and explosion noise not over 80 dB at extinguishment for clothes dryers other than industrial clothes dryers.
- (7) CO concentration in theoretical dry exhaust gas shall not be over 0.10% (0.07% for an opened type).
- (8) Soot shall not be generated.
- (9) The igniter electrode and heat exchange part shall not be always in contact with yellow flames.
- (10) The flame of the pilot burner shall not be extinguished or backfired when visually checked for 15 minutes after the ignition of the pilot burner.

3.4.3.4.2 Windy state (applicable to clothes dryer with desorption tube connector)

- (1) There shall be no flame extinguishment, backfire and flame overflow detrimental to the use.
- (2) The pilot burner shall not be extinguished or backfire.

3.4.3.4.3 Closure of desorption passage

There shall be no flame extinguishment, backfire and flame overflow detrimental to the use.

3.4.3.5 Flame supervision device performance

The flame supervision device shall conform to the following standard:

3.4.3.5.1 The opening time of the valve shall not be over 10 seconds and the closing time of the valve shall not be over 90 seconds.

3.4.3.5.2 When power is on again, there shall be no explosive light-up in the re-ignition and the closing time of the valve shall not be over 1 minute.

3.4.3.6 Drum overheat prevention device performance

The gas passage shall be shut off when the drum temperature is not over 150°C.

3.4.3.7 Performance of safety device for prevention of abnormal combustion

The gas passage of the burner shall be shut off before flames become unstable.

3.4.3.8 Electricity performance

The electricity performance shall conform to the following standard:

3.4.3.8.1 Power consumption performance

The power source shall be 220 V or 110/220V and the maximum power consumption rate shall be measured in a state where the rated voltage is impressed and a constant input is maintained and the tolerance shall not be over a value specified in Table 3.4.3.8.1.

Table 3.4.3.8.1 Tolerance for Rated Input

Kind of Equipment	Rated Input (W)	Tolerance
All equipment	≥25	+20%
Electric heater and compound equipment	25< to ≥200	±10%
	200<	The greater of +5% or 20W -10%
Motor-driven equipment	25< to ≥300	+20%

	300<	The greater of +15% or 60W
[Note] In the case of compound equipment of which motor input is over 50% of total rated input, the tolerance shall conform to a tolerance specified for motor-driven equipment.		

3.4.3.8.2 Leakage current

The tolerance of leakage current shall not be over a value specified in Table 3.4.3.8.2.

Table 3.4.3.8.2 Tolerance of Leakage Current

Kind of Equipment	Leakage Current (during standby and operation)
Motor-driven equipment	≥ 3.5 mA
Electric heater	The greater of 0.75 mA or 0.75 mA per kW of rated input of the equipment but not over 5 mA maximum

3.4.3.8.3 Electric shock protection test

The results of electric shock protection test shall conform to the following standard:

3.4.3.8.3.1 The test finger and test pin specified in IEC 61032 shall not be in contact with a charged part not less than 42.4 Vac (based on peak value) or 42.4 Vdc in a gas clothes dryer.

3.4.3.8.3.2 The charged part shall be provided with an enclosure or a protection wall in conformity to the requirement of IP2X of KS C IEC 60529 (Protection Class against Solid Penetration) and the surface of an enclosure or a protection wall which can be easily assessed shall conform to the requirement of IP3X (Protection Class against Solid Penetration).

3.4.3.8.4 Grounding continuity test

After the greater of a current equal to 1.5 times the rated current of equipment or 25 A is impressed between the grounding terminal or grounding electrode and a metal part which may be touched by man by using AC or DC power of which no-load voltage is not over 12 V, the resistance value calculated from current and voltage drop shall not be over 0.1 Ω .

3.4.3.9 Temperature rise performance

The difference between the temperature of the following parts and the room temperature shall not exceed the temperature specified in Tables 3.4.3.9① and 3.4.3.9② when the clothes dryer is in normal operation and at abnormal temperature rise.

Table 3.4.3.9① Temperature Rise of Each Part in Normal Operation

Measured Part		Temperature (°C)
Parts touched by hands during operation (handles)	Metal	35
	Ceramic	45
	Plastic	65
Parts in danger of being touched by hands during operation	Metal	65
	Ceramic	80
	Plastic	100
Center of dryer drum		100
Gas connector		40
Part of shutoff valve body through which gas flows		65
Surface of ignition unit		65
Surface of governor		50
Surface of wooden wall behind, over and beside a clothes dryer		65
Surface of wooden platform under a clothes dryer		65

Table 3.4.3.9② Temperature Rise of Each Part in Abnormal Cases

Measuring Part	Temperature Rise Value (K)
Surfaces of wooden walls behind, beside, over and under a clothes dryer	100

3.4.3.10 Temperature rise of wirings

The temperature rise of wirings shall be measured by a resistance method and shall not exceed a value specified in Table 3.4.3.14. However, in case the wirings are irregular or contact for measurement is difficult, the temperature rise is measured using thermocouples.

Table 3.4.3.10 Temperature Rise of Wirings

Insulation Level (KS C IEC 60085)	Temperature Rise Value (K)
Class A insulation	75 (65)
Class E insulation	90 (80)
Class B insulation	95 (85)
Class F insulation	115
Class H insulation	140
[Remarks] In case thermocouples are used (except for AC motors), the values in () are applied and the insulation type is specified by the manufacturer.	

3.4.3.11 Drying efficiency

The drying efficiency shall not be less than 45% for a rotary drum type clothes dryer and 25% for a hanging type clothes dryer.

3.4.3.12 Degree of dryness

The degree of dryness shall not be less than 97%.

3.5 Heat Treatment (currently not used)

3.6 Marking

A clothes dryer shall be marked in accordance the following provisions so that the clothes dryer can be safely used.

3.6.1 Product marking <Revised on December 28, 2012>

Each clothes dryer shall be attached with a nameplate and a handling method mark in a conspicuous place in an un-detachable manner, and the nameplate shall be marked with the followings:

- (1) Type of appliance (clothes dryer),
- (2) Manufacturer's type (Model No.),
- (3) Type of gas used (usable gas group for city gas) and working gas pressure,
- (4) Heat input: kw (kg/h for liquefied petroleum gas, kcal/hr for city gas),
- (5) Manufacture number (lot number) and date of manufacturing (import date for imported products) <Revised on December 13, 2018>
- (6) Warranty period and use,
- (7) Name or symbol of manufacturer (name of importer for imported goods),
- (8) Drying efficiency,
- (9) Rated voltage (V) and power consumption (W) (only for the clothes dryers using electricity),
and
- (10) Standard drying capacity (kg), standard drying time (min)

3.6.2 Acceptance mark

A clothes dryer shall be marked with an acceptance mark to be easily identified as a clothes dryer which has passed the inspection in accordance with the Act, Article 39, Clause 2. <Revised on November 4, 2015>

3.6.2.1 The acceptance mark shall be as shown in Figure 3.6.2.1. <Revised on June 26, 2012>

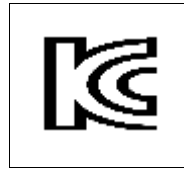


Figure 3.6.2.1 Acceptance Mark

3.6.2.1.1 The size of the acceptance mark shall be 30 mm (width) by 30 mm (height).

3.6.2.1.2 The colors of the acceptance mark shall be silver white in its background and black in its letters.

3.6.2.2 In case clothes dryers are manufactured in an integrated production process, the acceptance marks may be marked in their production process.

3.6.3 Enclosure of manual

A clothes dryer shall be enclosed with its handling manual (inclusive of installation method) for its safe use.

4. Inspection Standard

4.1 Kinds of Inspections

Gas appliance inspections are classified into manufacturing installation inspection and product inspection.

4.1.1 Manufacturing installation inspection

The manufacturing installation of a person who intends to manufacture clothes dryers in accordance with the Act, Article 36, Clause 2 shall undergo manufacturing installation inspection when the installation or modification of the clothes dryer manufacturing installation has been completed. <Revised on November 4, 2015>

4.1.2 Product inspection

A person who intends to manufacture or import clothes dryers in accordance with the Act, Article 39, Clause 1 shall undergo the following inspections in order to check on and maintain the performance of the clothes dryers. However, inspection of the gas appliances specified in the

Enforcement Decree may be omitted in whole or in part. <Revised on November 4, 2015>

4.1.2.1 Design stage inspection

In case a product comes under one of the following cases in accordance with the Enforcement Regulation, Table 7, the product shall undergo design stage inspection. However, in case the test report certified by Korea Gas Safety Corporation or another authorized test and inspection agency is submitted, the design stage inspection of that part may be exempted.

- (1) A gas appliance manufacturer manufactures products of a specific type for the first time.
- (2) A gas appliance importer imports products of a specific type for the first time.
- (3) The material or construction of the products of which type has undergone design stage inspection is changed and the performance of the products is changed.
- (4) The type of the products has undergone design stage inspection but five (5) years have elapsed from its last inspection date.

4.1.2.2 Production stage inspection

The clothes dryers of which type has passed design stage inspection in accordance with the Reinforcement Regulation, Table 7 shall undergo production stage inspection in accordance with the following provisions. In this case, one of product identification inspection, production process inspection or comprehensive process inspection in conformity to Table 4.1.2.2 may be selected as the production stage inspection and be performed depending on self-inspection capability and quality control capability.

Table 4.1.2.2 Kinds, Units and Intervals of Production Stage Inspections

Kind of Inspection	Object	Composition Item	Inspection Unit	Interval
Product Identification Inspection	Items other than objects of production process inspection or comprehensive process inspection	Regular quality inspection	Type	Once every 2 months
		Routine sample inspection	Type	At every application
Production Process Inspection	Items satisfying the conformity requirements of quality system for production process/self-inspection process	Regular quality inspection	Type	Once every 3 months
		Process identification inspection	Item	Once every 3 months
		Occasional quality inspection	Representative type	Twice a year or more often
Comprehensive Process Inspection	Items satisfying the conformity requirements of quality system for total process (design, production and self-inspection)	Comprehensive quality control system audit	Item	Once every 6 months
		Occasional quality inspection	Representative type	Once a year or more often

4.1.2.2.1 Product identification inspection shall be performed as follows:

- (1) Product identification inspections are classified into regular quality inspection and routine sample inspection and each inspection shall be separately performed. In this case, routine sample inspection is performed when the product has passed regular quality inspection.
- (2) Products of which type has passed the inspection in accordance with (1) shall undergo regular quality inspection once every two months. However, regular quality inspection is omitted for the products of the same type of which manufactured or imported quantity does not exceed 20 units a month.
- (3) Routine sample inspection shall be performed in accordance with (1) for the type of products whenever the application for their inspection is made.

4.1.2.2.2 Production process inspection shall be performed as follows:

- (1) Production process inspections shall be classified into regular quality inspection, process identification audit and occasional quality inspection, and each inspection or audit shall be separately performed.
- (2) The process identification audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.
- (3) Occasional quality inspection shall be performed twice a year or more often without prior notice on the products which have undergone regular quality inspection and process identification audit.
- (4) Occasional quality inspection shall be performed for the representative type of products by the same method as that of regular quality inspection.
- (5) A person who has undergone production process inspection may apply for product identification inspection as required.

4.1.2.2.3 Comprehensive process inspection shall be performed as follows:

- (1) Comprehensive process inspections shall be classified into comprehensive quality control system audit and occasional quality inspection, and each audit or inspection shall be separately performed.
- (2) The comprehensive quality control system audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.
- (3) Occasional quality inspection shall be performed once a year or more often without prior notice on the products which have undergone comprehensive quality control system audit.
- (4) Occasional quality inspection shall be performed for the representative type of products by

the same method as that of regular quality inspection.

(5) A person who has undergone comprehensive process inspection may apply for product identification inspection as required.

4.2 Object Audit of Process Inspection

4.2.1 Application for audit

A gas appliance manufacturer who has a 3-month or longer gas appliance manufacturing experience in accordance with Appendix A may apply for production process inspection or comprehensive process inspection.

4.2.2 Audit method

The audit is performed for the persons who are to undergo process inspection, who have failed process inspection and who apply for process re-inspection in accordance with 4.4.2.2(5).

4.2.2.1 Audit of new applicants, persons who failed process inspection and persons who apply for re-inspection

The audit standard for process identification audit or comprehensive quality control system audit for persons who apply for process inspection, persons who have failed process inspection or persons who apply for process re-inspection in accordance with 4.4.2.2(5) (hereinafter referred to as "process inspection applicants") shall conform to Appendix A.

4.2.2.2 Regular audits

In the case of process identification audit performed once every 3 months and comprehensive quality control system audit performed once every 6 months, the maintenance states of the quality system specified in Appendix A such as changes, process management, self-inspection and use of acceptance marks in the period are audited. The audit of production process inspection or comprehensive process inspection is performed as follows:

4.2.2.2.1 Comprehensive process inspections shall be divided into comprehensive quality control system audit and occasional quality inspection, and each audit or inspection shall be separately performed.

4.2.2.2.2 The comprehensive quality control system audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.

4.2.2.2.3 Occasional quality inspection shall be performed once a year or more often without prior notice on the products which have undergone comprehensive quality control system audit.

4.2.2.2.4 Occasional quality inspection shall be performed for the representative type of products by the same method as that of regular quality inspection.

4.2.2.2.5 A person who has undergone comprehensive process inspection may apply for product identification inspection as required.

4.2.3 Adjudication committee

Korea Gas Safety Corporation shall establish an adjudication committee as follows to deliberate the matters related to the judgment on acceptance or rejection of the results of production process inspection and comprehensive process inspection.

4.2.3.1 The adjudication committee shall be comprised of no more than 5 members including one chairperson.

4.2.3.2 The members of the committee shall be commissioned by the president of Korea Gas Safety Corporation from among persons who have extensive knowledge and experience in gas safety or quality control and persons who can represent consumers' right to secure open and aboveboard deliberation.

4.2.3.3 Necessary matters concerning the operation of the committee shall be prescribed by the president of Korea Gas Safety Corporation.

4.3 Inspection Items

4.3.1 Manufacturing installation inspection

Manufacturing installation inspection shall be performed on the following items in accordance with the Enforcement Regulation, Table 7:

- (1) Conformity of manufacturing facilities in accordance with 2.1, and
- (2) Conformity of inspection facilities in accordance with 2.2.

4.3.2 Product inspection

Inspection of clothes dryers shall be divided into design stage inspection and production stage

inspection, and each inspection shall be separately performed in accordance with the Enforcement Regulation, Table 7 to check whether the clothes dryers are manufactured in accordance with the manufacturing standard.

4.3.2.1 Design stage inspection

The inspection items of design stage inspection to check whether the clothes dryers conform to the manufacturing standard are as follows. However, in case the test report on a part of which performance is certified by Korea Gas Safety Corporation or another authorized test and inspection agency is submitted, the design stage inspection of that part may be exempted.

- (1) Conformity of materials in accordance with 3.1,
- (2) Conformity of construction and dimensions in accordance with 3.2,
- (3) Conformity of devices in accordance with 3.3,
- (4) Conformity of performance in accordance with 3.4, and
- (5) Conformity of marking in accordance with 3.6.

4.3.2.2 Production stage inspection

The inspection items of production stage inspection by kinds of inspections to check whether the clothes dryers conform to the manufacturing standard are as follows:

4.3.2.2.1 Product identification inspection <Revised on December 28, 2012>

(1) Regular quality inspection

- (1-1) Conformity of construction in accordance with 3.2,
- (1-2) Conformity of devices in accordance with 3.3,
- (1-3) Conformity of gas passage gas tightness performance in accordance with 3.4.1.1, <Revised on January 9, 2017>
- (1-4) Conformity of insulation resistance performance in accordance with 3.4.1.4,
- (1-5) Conformity of withstand voltage performance in accordance with 3.4.1.5,
- (1-6) Conformity of electric ignition performance in accordance with 3.4.3.1,
- (1-7) Conformity of combustion state performance in accordance with 3.4.3.4.1; however, the test may be performed with test gas for performance test, excluding continuous noise and extinguishing noise, and
- (1-8) Conformity of safety device operating performance in accordance with 4.5.4

(2) Routine sample inspection

- (2-1) Conformity of gas passage gas tightness performance in accordance with 3.4.1.1 <Revised on January 9, 2017>
- (2-2) Conformity of combustion state performance in accordance with 3.4.3.4.1; however, the test may be performed with test gas for performance test, excluding CO, continuous noise and

extinguishing noise, and

(2-3) Conformity of marking in accordance with 3.6

4.3.2.2.2 Production process inspection

(1) Regular quality inspection

The inspection items of regular quality inspection shall conform to 4.3.2.2.1(1).

(2) Process identification audit

The audit items of process identification audit shall conform to Table 4.3.2.2.

(3) Occasional quality inspection

The inspection items of occasional quality inspection shall conform to 4.3.2.2.1(1).

4.3.2.2.3 Comprehensive process inspection

(1) Comprehensive quality control system audit

The audit items of comprehensive quality control system audit shall conform to Table 4.3.2.2.

(2) Occasional quality inspection

The inspection items of occasional quality inspection shall conform to 4.3.2.2.1(1).

Table 4.3.2.2 Items of Process Identification Audit and Comprehensive Quality Control System Audit

<Revised on January 8, 2016>

Classification		Audit Item	Application	
			Process Identification Audit	Comprehensive Quality Control System Audit
General	Organization	Securement of organizations with appropriate technical and business capability	○	○
		Possession of a research or development organization to reflect the causes of potential troubles to product design		○
	Quality System	Operation of an appropriate quality system and review of operation results	○	○
	Human Resource	Maintenance of appropriate qualification for employees affecting quality	○	○
	Facilities & Equipment	Securement of facilities and equipment in conformity to product requirements and quality control	○	○
Design	Design & Development	Securement of a design and development system in conformity to product requirements		○
		Verification of product design through analysis of the effects of potential failures and assessment of reliability, and results of output supply		○
		Check on the feasibility of design and development and operation of change procedure		○

Manufacturing	Purchase	Maintenance of an appropriate management system for purchased materials	○	○
		Reflection of the evaluation of suppliers to purchase policy		○
	Production	Possession of a production process in conformity to product requirements and verification of the implementation	○	○
		Possession of acceptance criteria for process approval	○	○
		Verification of process management capability using a statistical technique		○
		Operation of control plan and guidelines for works		○
		Operation of systems for preventive and forecast maintenances and management of production tools		○
		Operation of systems for handling and storing materials and products	○	○
Self-Inspection	Inspection Method & Procedure	Maintenance of methods and procedures for inspection to secure product conformity	○	○
		Maintenance of acceptance criteria for tally data sampling at zero defect level		○
		Maintenance of traceability for determination of measuring devices and guarantee of effective results, and maintenance of a procedure for record management	○	○
		Analysis of measurement system		○
		Self-inspection of the whole items of design stage inspection (once a year)	○	
		Self-inspection of the whole items of design stage inspection (twice a year)		○
	Corrective and Preventive Measures	Management of unconformity items and operation of preventive measures for recurrence prevention	○	○
	Internal Audit	Possession of capability to maintain system conformity	○	○
Obligation	Acceptance Marking	Maintenance of a written management regulation for acceptance marking	○	○
		Maintenance of a separate written regulation for manufacturing acceptance marks		○
	Training	Completion of training in quality control system	○	○
	Safety Control	Prevention of accidents due to faulty products and circulation of unconformity products	○	○
Others		Other matters related to maintenance of safety	○	○

4.4 Inspection Method

4.4.1 Manufacturing installation inspection

The inspection method of manufacturing facilities is checking on whether manufacturing facilities and inspection facilities in conformity to 4.3.1 are fully furnished. In case all required facilities are fully furnished, the inspection shall be deemed acceptable.

4.4.2 Product inspection

4.4.2.1 Design stage inspection

Design stage inspection shall be performed in accordance with the followings to judge whether each inspection item conforms to the manufacturing standard.

4.4.2.1.1 The type of clothes dryers and the working pressure range by heat inputs shall be checked with the documents submitted by the manufacturer.

4.4.2.1.2 Corrosion-resistant materials shall be checked with the documents submitted by the manufacturer.

4.4.2.1.3 Other inspection methods of design stage inspection shall conform to what the president of Korea Gas Corporation specifies.

4.4.2.2 Production stage inspection

The inspection method of production stage inspection shall conform to the followings for each inspection item to judge whether the item is manufactured in accordance with the manufacturing standard.

4.4.2.2.1 Product identification inspection

(1) Sampling

(1-1) The number of test specimens for regular quality inspection shall be two.

(1-2) The sampling standard for routine sample inspection shall be as follows:

(1-2-1) The same products manufactured in the same production unit shall be one lot.

(1-2-2) The number of test specimens taken from the lot formed in accordance with (1-2-1) shall conform to Table 4.4.2.2.1(1).

Table 4.4.2.2.1(1) Number of Test Specimens for Routine Sample Inspection

Number of Products Forming 1 Lot	10 and less	11 to 100 inclusive	101 to 300 inclusive	301 to 700 inclusive	701 to 3000 inclusive	3001 and over
Number of Test Specimens	All	10 or over	15 or over	20 or over	25 or over	1/100 of quantity applied for inspection

(2) Judgment on acceptance or rejection

(2-1) Product identification inspection shall be performed by performing both regular quality inspection and routine sample inspection, and the products which have passed both inspections shall be deemed acceptable.

(2-2) Routine sample inspection shall be performed on sampled test specimens. All the products in the lot which has passed the inspection shall be deemed acceptable, and all the products in the lot which has failed the inspection shall be deemed rejected.

4.4.2.2.2 Process inspection**(1) Sampling**

The number of test specimens for the regular quality inspection and occasional quality inspection of production process inspection and comprehensive process inspection shall be two.

(2) Judgment on acceptance or rejection**(2-1) Judgment on acceptance or rejection for process inspection applicants**

Judgment on acceptance or rejection for production process inspection or comprehensive process inspection for process inspection applicants shall be as follows. In this case, previous inspection results shall be valid until the decision of the adjudication committee meeting.

(2-1-1) Korea Gas Safety Corporation shall prepare the report on the results of regular quality inspection and process identification audit or comprehensive quality control system audit and submit it to the adjudication committee.

(2-1-2) The adjudication committee shall deliberate the submitted report and determine its acceptance or rejection. In this case, if it is judged that part of quality system shall be complemented according to the deliberation results, conditional acceptance may be granted.

(2-1-3) In case a product has passed regular quality inspection by types and process identification audit for the item, the product shall be deemed to have passed production process inspection.

(2-1-4) In case a product has passed comprehensive quality control system audit, the product shall be deemed to have passed comprehensive process inspection.

(2-2) Judgment on acceptance or rejection for regular process inspection

The judgment on acceptance or rejection for the production process inspection performed once every 3 months and the comprehensive process inspection performed once every 6 months shall be as follows:

(2-2-1) Korea Gas Safety Corporation shall perform regular quality inspection and process identification audit or comprehensive quality control system audit and determine the acceptance or rejection.

(2-2-2) In case a product has passed regular quality inspection by types and process identification audit for the item, the product shall be deemed to have passed production process inspection.

(2-2-3) In case a product has passed comprehensive quality control system audit, the product

shall be deemed to have passed comprehensive process inspection.

(2-3) Judgment on acceptance or rejection for occasional quality inspection

Judgment on acceptance or rejection for occasional quality inspection shall be made by Korea Gas Safety Corporation by performing the inspection by the same method as that of regular quality inspection.

(3) Treatment of inspection results

(3-1) Treatment of inspection results of process inspection applicants

The results of the production process inspection or comprehensive process inspection of a process inspection applicant shall be treated as follows:

(3-1-1) In case the inspection results are accepted in their deliberation, Korea Gas Safety Corporation shall issue the acceptance notification to the applicant.

(3-1-2) In case the inspection results are conditionally accepted in their deliberation, the treatment shall conform to the followings:

(3-1-2-1) The applicant shall submit the complement results of the quality control system to Korea Gas Safety Corporation within one month.

(3-1-2-2) Korea Gas Safety Corporation shall review the submitted complement results, and accept the inspection results if it is confirmed that the complement has been completed.

(3-1-2-3) In case the applicant who has been conditionally accepted fails to submit the complement results within the time limit, Korea Gas Safety Corporation shall reject the inspection results.

(3-1-3) In the case of rejection in deliberation, it shall be treated as follows:

(3-1-3-1) Korea Gas Safety Corporation shall notify the details of unconformity to the applicant and then perform product identification inspection.

(3-1-3-2) In case an applicant who has been notified the unconformity intends to undergo production process inspection or comprehensive process inspection, the applicant may apply for production process inspection or comprehensive process inspection after 3 months from the date of the unconformity notification issued by Korea Gas Safety Corporation.

(3-1-3-3) Applicants who have failed comprehensive process inspection may convert the inspection to production process inspection.

(3-2) Treatment of results of regular process inspection

Treatment of the results of the production process inspection performed once every 3 months and the comprehensive process inspection performed once every 6 months shall be as follows:

(3-2-1) In case the inspection results are accepted, Korea Gas Safety Corporation shall inform the applicant of the acceptance of production process inspection or comprehensive process inspection.

(3-2-2) In case the inspection results are rejected, Korea Gas Safety Corporation shall inform the applicant of the details of unconformity, withdraw the conformity notification and then perform product identification inspection.

(3-2-3) In case an applicant who has been notified the unconformity intends to undergo

production process inspection or comprehensive process inspection, the applicant may apply for production process inspection or comprehensive process inspection after 3 months from the date of the unconformity notification issued by Korea Gas Safety Corporation.

(3-3) Treatment of results of occasional quality inspection

The results of quality inspections performed occasionally shall be treated as follows:

(3-3-1) In case a manufacturer or an importer fails occasional quality inspection, Korea Gas Safety Corporation shall inform the manufacturer or importer of the details of unconformity and then perform the second occasional quality inspection.

(3-3-2) The number of test specimens for the second occasional quality inspection shall be twice the number of test specimens for the first occasional inspection.

(3-3-3) In case the manufacturer or importer fails the second occasional quality inspection, the products shall be rejected, product identification inspection shall be performed and collection inspection shall be performed for the relevant type.

(3-3-4) In case an applicant who has been notified the unconformity intends to undergo production process inspection or comprehensive process inspection, the applicant may apply for production process inspection or comprehensive process inspection after 3 months from the date of the unconformity notification issued by Korea Gas Safety Corporation.

(4) Suspension or change of kind of inspection

In case a person who is subject to production process inspection or comprehensive process inspection in accordance with the Enforcement Regulation, Table 7, No.3 intends to suspend production of an inspection object item for no less than 6 months or to change the kind of inspection, the person shall notify the matter to Korea Gas Safety Corporation and return the acceptance notification.

(5) Process re-inspection

In case a person intends to undergo production process inspection or comprehensive process inspection in accordance with the Enforcement Regulation, Table 7, No.3 and comes under one of the following cases, the person shall undergo production process inspection or comprehensive process inspection again.

(5-1) The location of the business place is changed,

(5-2) A production item is added,

(5-3) Three years have elapsed from the acceptance date of production process inspection or comprehensive process inspection. However, in case a relevant gas appliance item is added, the period shall be the remaining period of the existing item.

4.5 Other Inspection Standards

4.5.1 Inspection of imported products

In principle, inspection of imported products shall be performed in a place which the importer wants, and the costs and expenses required for inspection such as equipment and material costs shall be borne by the applicant.

4.5.2 Partial omission of inspection

4.5.2.1 In case a person who undergoes production process inspection or comprehensive process inspection adds inspection items, part of process identification audit or comprehensive quality control system audit may be omitted.

4.5.2.2 In case a person whose quality assurance system has been certified by a certification body authorized in accordance with the Quality Management and Safety Control of Industrial Products Act applies for production process inspection or comprehensive process inspection, part of process identification audit or comprehensive quality control system audit may be omitted.

4.5.3 Disposal of rejected products (not applicable)**4.5.4 Detailed inspection standards**

Other detailed matters necessary for design stage inspection and production stage inspection shall conform to what the president of Korea Gas Corporation specifies.

Appendix A General Standard for Operation of Quality Control System for Gas Appliance Manufacturing Plants

1. Introduction	
	A. This standard has been established so that gas appliance manufacturers may produce safe and reliable products through production process inspection and comprehensive process inspection in production stage inspections in accordance with the Enforcement Regulation, Table 7, No.3-b-2)-b. B. This standard consists of general, design, manufacturing, self-inspection and obligations, and is intended to be used to assess whether the quality control system of the gas appliance manufacturing plant conforms to the requirements of undergoing production process inspection or comprehensive process inspection in production stage inspections.
2. General <Revised on January 8, 2016>	
A. Organization	
(1)	The organization shall be an organization which has technical and business capability to produce products satisfactory to customers and statutory requirements.
(2)	The top management shall guarantee that processes and procedures required for quality control system have been established and are being implemented and maintained.
(3) 【Comprehensive】	Research and development organizations including the followings shall be maintained to study various failure forms which can appear in design process or after extended use and reflect them to design. (a) Person in charge of research and development and personnel (b) Appropriate facilities and equipment required for research and development
B. Quality Control	
(1)	The manufacturer shall establish, document and implement a quality control system in accordance with the requirements of this standard.
(2)	When any change in the quality control system is planned and made, the safety of the system shall be maintained and the system shall be updated through continuous improvement.
(3)	The top management shall present the evidences of development and implementation of the quality control system and continuous improvement of its effectiveness through the followings: (a) Establishment of quality policy and quality target (b) Implementation of management review (effectiveness of quality system and improvement of products)
(4) <Newly established on January 8, 2016>	Documents necessary for quality system should be managed and documented process necessary for the management of followings should be established. (a) Approval, review, renewal and re-approval of document (b) Management in identification and distribution of document (latest edition, outsourced documents) (c) Prevention on the misuse of nullified documents
C. Human Resources	
(1)	Persons affecting product quality shall be qualified on the basis of appropriate educational background, training, expertness and experiences, and the manufacturer shall implement the followings in accordance with the written procedures: (a) Decision on the qualification of personnel (b) Provision of education and training to satisfy qualification requirements and assessment of its effectiveness (c) Maintenance of the appropriate records of qualification matters

(2) 【Comprehensive】	In the case of persons in charge of design and development of products, it shall be assured that they are skillful with the tools and in the techniques to satisfy and apply the design and development requirements.
D. Facilities and Equipment	
(1) 【Interval】	Facilities, equipment and business environment required to conform to the product requirements shall be determined, secured and maintained. (a) Buildings, business places and utility (b) Process equipment (hardware and software) (c) Supporting services (transportation, communication, etc.)
(2) 【Interval】	The sites shall be maintained in a neatly arranged and clean condition to conform to the requirements of products and manufacturing process.
(3) 【Comprehensive】	Means to minimize potential hazards to employees shall be manifested in design, development and manufacturing activities.
3. Design	
A. Design and Development	
(1) 【Comprehensive】	Design and development capability shall be secured to materialize products in conformity to product requirements.
(2) 【Comprehensive】	The output of product design shall be provided in a form verifiable for the requirements, be approved before distribution, and include the followings: (a) Analysis results such as failure mode effect analysis and reliability results (b) Characteristics of the product, and specification when required (c) Measures to prevent malfunctioning of the product, if applicable (d) Definition of the product including drawings or mathematical basic data, and (e) Review results of product design.
(3) 【Comprehensive】	The output of process design shall be provided in a form verifiable for the requirements, be approved before distribution, and include the followings: (a) Drawings and specifications when required (b) Manufacturing process flow diagram and layout (c) Analysis results such as failure mode effect analysis, etc. (d) Control plan (e) Work manual (f) Acceptance criteria for process approval (g) Methods for detection of product/process unconformity and feed back
(4) 【Comprehensive】	The appropriateness of design and development shall be checked, and the records of the results of appropriateness check and all necessary measures shall be maintained.
(5) 【Comprehensive】	Changes in design and development shall be able to easily grasped and the record shall be maintained. Changes shall be reviewed, verified, checked for their appropriateness and approved before their implementation, when applicable.
4. Manufacturing	
A. Purchase	
(1) 【interval】	Inspection or other activities required to ensure that purchased materials satisfy their specified purchase requirements shall be determined and implemented.
(2)	Suppliers shall be selected on the basis of their capability to supply materials in conformity to the specified purchase requirements. The selection standard shall be established and all records related to the selection shall be maintained.
(3) 【Comprehensive】	Suppliers shall be regularly evaluated, their evaluation results shall be reflected in the purchase policy, and the management methods of suppliers shall be accordingly differentiated.
B. Production	

(1)	The manufacturer shall plan and implement production in the management conditions including the followings: (a) Use of work manuals as required (b) Use of appropriate equipment (c) Measurement (d) Application of acceptance standard for judgment of process approval
(2) 【interval】	The manufacturer shall identify the states of products in connection with the measurement requirements in manufacturing stages.
(3) 【Comprehensive】 【interval】	The manufacturer shall identify the states of products in connection with the measurement requirements and traceability in manufacturing stages.
(4) 【interval】	Work preparation shall be verified whenever the work is initially started, the material is replaced or the work is changed.
(5) 【Comprehensive】	An appropriate statistical technique for each process shall be determined before mass production and be included in the control plan. Basic concept such as distribution and process capacity shall be utilized in the overall organization.
(6) 【Comprehensive】	The manufacturer shall establish and maintain the control plan in consideration of analysis results such as failure mode effect analysis in products and manufacturing processes.
(7) 【Comprehensive】 【interval】	Written work manuals shall be prepared for all personnel affecting product quality. These manuals shall be readily available for reference on working sites.
(8) 【Comprehensive】	The manufacturer shall grasp major processes and provide resources for preservation of machines, equipment, jigs and tools, and develop an overall preventive maintenance system. The system shall include the followings: (a) Planned maintenance activities (b) Packing and preservation of equipment, tools and gauges (c) Availability of spare parts for major manufacturing equipment (d) Documentation, evaluation and improvement of maintenance activities (e) Identification specifying the states of production, repairs or disposal
5. Self-Inspection	
A. Inspection Method and Procedure	
(1) 【interval】	The manufacturer shall determine the inspections to be performed and check whether the products conform to the specified requirements. The inspections shall be performed in relevant stages of production process.
(2) 【interval】	The evidence that inspected products conform to the acceptance criteria shall be maintained. The person who approves the shipment of the products shall be specified in the record.
(3) 【Comprehensive】 【interval】	The acceptance criteria for tally data sampling shall be of zero-defect.

(4) 【interval】	Measurements shall be made in such a way as to meet the requirements, and the measurement equipment shall be as follows to assure effective results: (a) Measurement equipment shall be calibrated or verified to the measurement standards traceable to the international or national standard at specified intervals or before application. In case such standards are not available, the bases for such calibration or verification shall be recorded. (b) Identification to judge the calibrated state (c) Protection from any manipulation which may invalidate measurement results (d) Protection from damage or deterioration during handling, maintenance and safekeeping
(5) 【interval】	The records of calibration and verification results shall be maintained, and the measured values shall be used in calibrated states.
(6) 【Comprehensive】	Changes in measurement systems indicated in the various results of measurement and test shall be analyzed by statistical methods.
(7) 【interval】	The manufacturer shall inspect the whole items of design stage inspection once a year or more often and maintain the records.
(8) 【Comprehensive】 【interval】	The manufacturer shall inspect the whole items of design stage inspection twice a year or more often and maintain the records. <Revised on November 17, 2014,, January 8, 2016>>
(9) 【Comprehensive】	The manufacturer's laboratory shall be included in the quality system documentation by specifying the following technical requirements: a) Appropriateness of personnel, equipment and facilities b) Capability to accurately conduct tests in accordance with relevant specifications c) External laboratories to be authorized in accordance with KS Q ISO IEC 17025 or an equivalent standard <Revised on November 17, 2014>
B. Corrective and Preventive Measures	
(1) 【interval】	It shall be assured that unconformable products and suspicious products are identified and separately managed.
(2)	Measurements shall be taken to prevent recurrence of unconformity and the followings shall be specified in the written procedure: (a) Review of unconformity (inclusive of customer complaints) (b) Determination, implementation and recording of corrective measures
(3)	The effectiveness of quality system shall be continuously improved through the utilization of quality policy, quality target, audit results, data analyses, corrective measures, preventive measures and management review.
(4)	Preventive measures shall be taken to remove the potential causes of unconformity to prevent its recurrence.
C. Internal Audit	
(1)	The manufacturer shall conduct internal audits at planned intervals to check whether the quality system is effectively implemented and maintained.
(2)	Responsibility for and requirements of planning and implementation of audits, guarantee of the independence of audit, report of audit results and maintenance of records shall be specified in the written procedure.
6. Obligations <Revised on January 8, 2016>	
A. Acceptance Marking	

(1) 【interval】	The manufacturer shall maintain a written management regulation on acceptance marking (certificates or stamps), the record of receipt, use, safekeeping and disposal of the acceptance marks shall be immediately updated and maintained, and the management regulation shall include the followings: (a) Handling of acceptance marks (certificates or stamps) by authorized persons only (b) Use of acceptance marks subject to the approval of top management/management representative and in accordance with the planned procedure. (c) Record of the use of acceptance marks in detail (d) Establishment of a plan to prevent the misuse of acceptance marks, and (e) Safekeeping of acceptance marks to prevent their damage or robbery
(2) 【Comprehensive】 【interval】	The regulation on manufacturing of acceptance marks shall be separately documented, and all matters related to the manufacturing and change of acceptance marks shall be recorded and updated.
B. Safety Control	
(1)	For recent one year, the manufacturer shall be free from any accident due to product defects and there shall be no unconformity case in the sampling inspection undergone by the manufacturer.
(2) 【Comprehensive】	For recent three years, the manufacturer shall be free from any accident due to product defects and there shall be no unconformity case in the sampling inspection undergone by the manufacturer.
C. Others	
(1)	When any case which may cause the quality deterioration of products or serious harm to the user breaks out, the manufacturer shall take appropriate measures.
(2)	When there is any important change in the operation of the manufacturer's quality system, the manufacturer shall inform Korea Gas Safety Corporation of the change within 15 days.

[Remarks]

1. 【Comprehensive】 means that the paragraph is applicable only to the objects of comprehensive process inspection.
2. 【Interval】 means that the paragraph is applicable to the inspection to be performed according to its inspection interval.
3. Paragraphs without any mark are common provisions for process identification audit and comprehensive quality control system audit.

Appendix B General Conditions for Test of Gas Clothes Dryers

B1. Laboratory Condition

Item	Condition
Temperature in laboratory	The temperature in the laboratory shall be 20±15°C and temperature variation during test shall be ±5K.
Indoor atmosphere	The humidity in the laboratory shall be 65±20%.
Indoor atmosphere	Carbon dioxide shall not be over 0.2% and carbon monoxide 0.002% in the indoor atmosphere.
[Remarks] The temperature measurement in the laboratory shall be made in four locations in front of, in the rear of, on the right of and on the left of the equipment which are about 1 m from the equipment while the mercury bulbs of the temperature gauges are fixed at a height almost same as that of the top of the equipment (a height of 1.5 m if the height from the floor is over 1.5 m), and the arithmetic average value shall be deemed to be the room temperature. However, the mercury bulbs of the temperature gauges shall not be directly affected by combustion gas or radiation heat from the equipment.	

B2. Test Gas Standard <Revised on May 20, 2013>

B2.1 The volumetric component ratio of the test gas shall be as indicated in Table B2.1 on the basis of 15°C and 101.3 kPa.

Table B2.1 Volumetric Component Ratio of Test Gas

Gas Group	Kind of Test Gas	Component (volumetric %)						Combustibility			
		H ₂	CH ₄	C ₃ H ₈	C ₄ H ₁₀	N ₂	Air O ₂ 21% N ₂ 79%	Gross heating value MJ/m ³ N	Specific Gravity (air=1)	Webber Index (WIs) MJ/m ³ N	MCP
City Gas	1	-	87.0	13.0	-	-	-	45.16 (40.90)	0.682	54.69 (49.53)	37.5
	2	23.0	66.0	11.0	-	-	-	38.07 (34.33)	0.550	51.34 (46.29)	44.1
	3	-	96.5	-	-	3.5	-	36.46 (32.82)	0.569	48.32 (43.50)	35.3
	R ^b	-	96.0	4.0	-	-	-	40.05 (36.13)	0.594	51.97 (46.89)	36.5
	S	Gas of which maximum combustion speed (MCP) is over 35.0 to 44.0 inclusive and of which WI is over 48.80{51.50} to 53.56{56.52} MJ/m ³ inclusive									
Liquefied Petroleum Gas	Propane	-	-	100.0	-	-	-	95.65 (87.99)	1.550	76.83 (70.69)	41.0
	Butane	-	-	-	100.0	-	-	126.21 (116.47)	2.079	87.54 (80.78)	38.0
	S	P, B or their mixed gas									
^b In case the WI of supply gas is within ±1% of the Webber Index of R gas, the manufacturer may use it as test gas for quality control.											

[Remarks]

1. In case the condition of city gas "S" is within the grill of the gas group [WI and combustion speed (replaced by the value of MCP)] and "S" is designated as test gas, the supply gas of the gas group may be used.
2. The WI depending on the heating value and specific gravity of test gas (1, 2, 3 and R of city gas and P and B of liquefied petroleum gas) shall be within $\pm 1\%$ of a value in the above table.
3. The combustion and measurement standard condition of test gas is 15/15°C, 101.3 kPa and the values in () are low heating values for reference.
4. The values in { } of S gas are the values of WI for commercial transaction and are the reference values for 15/0°C, 101.3 kPa.
5. MCP is calculated by the following formula:

$$\text{MCP} = \frac{\sum(S_i f_i A_i)}{\sum(f_i A_i)} (1 - K)$$

where,

MCP: maximum combustion speed

S_i : combustion speed of combustible gas in the gas in the following table; a value indicated in the table

f_i : coefficient related to each combustible gas in the gas; a value indicated in the table

A_i : content of each combustible gas in the gas (mol %)

K: attenuation coefficient; a value calculated by the following formula:

$$K = \frac{\sum A_i}{\sum (\alpha_i A_i)} \left\{ \frac{2.5\text{CO}_2 + \text{N}_2 - 3.77\text{O}_2}{100 - 4.77\text{O}_2} + \left[\frac{\text{N}_2 - 3.77\text{O}_2}{100 - 4.77\text{O}_2} \right]^2 \right\}$$

where,

α : a correction factor of each combustible gas in the gas; a value indicated in the table

CO_2 : content of carbon dioxide in the gas (mol %)

N_2 : content of nitrogen in the gas (mol %)

O_2 : content of oxygen in the gas (mol %)

B2.2 Indication method of test gas conditions

The conditions of the test gases used in this technical standard are indicated with the kind and pressure of test gases and the test gas conditions in each paragraph of this technical standard is indicated with "kind and symbol of test gas – pressure and symbol of test gas".

(1) In the case of liquefied petroleum gas

Kind of test gas

Symbol	Kind of Test Gas
P	Propane
B	Butane
S	Propane, butane or any of mixed gas of these gases

Pressure of test gas (unit)

Symbol	Pressure of Test Gas (kPa)
1 (maximum pressure)	3.3
2 (standard pressure)	2.8
3 (minimum pressure)	2.3

(2) In the case of city gas

Kind of test gas

Symbol	Kind of Test Gas
1	Gas prone to incomplete combustion
2	Gas prone to backfire
3	Gas prone to extinguishment
R ^b	Gas of which performance is tested
S	Any of 1, 2, 3 or R

Pressure of test gas (unit)

Symbol	Pressure of Test Gas (kPa)
1 (maximum pressure)	2.5
2 (standard pressure)	2.0
3 (minimum pressure)	1.0

B2.3 Test gas conditions by combustion state test items

Test Item		Test Gas Condition	
		Liquefied Petroleum Gas	City Gas
Flame propagation		P-2	S-2
Lifting		P-1	3-1
Extinguishment		P-1 & P-3	3-1 & 3-3
Flame uniformity		S-2	S-2
Backfire		P-3	2-3
Continuous noise		P-1	S-1
Extinguishing noise		P-2	S-2
CO %		B-1	1-1
Soot generation		B-1	1-1
Contact with yellow flame		B-1	R-1
Flame overflow		B-1	R-1
Flame stability of pilot burner	Extinguishment	P-1 & P-3	S-1 & S-3
	Backfire	P-3	2-3
Flame stability of burner	Extinguishment	P-1 & P-3	S-1 & S-3
	Backfire	P-3	S-3
	Flame overflow	B-1	S-1

Appendix C Test Methods of Gas Clothes Dryers

C1. Wind Test

Test Method

Combustion State in Windy Condition

[Applicable to a clothes dryer fitted with a desorption tube connector]

(1) After 15 minutes from burner ignition, the wind is blown to both ends of the desorption tube at a speed of 10 m/s and whether there is any burner flame extinguishment, backfire or flame overflow detrimental to the use is visually checked during that period.

(2) The test gas condition shall be P-2 or R-2. Only the pilot burner is ignited and the wind is blown to both ends of the desorption tube by the following test equipment at a speed of 10 m/s after 5 minutes from the stabilization of the burner flame and whether the burner flame is extinguished or the burner backfires is visually checked

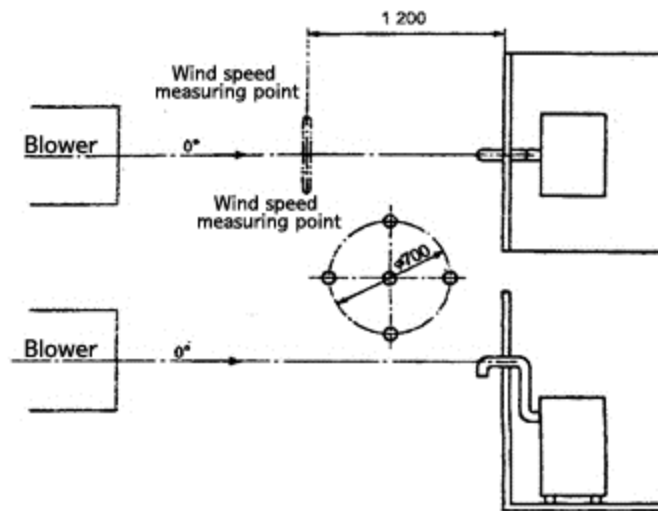


Figure C1. Test Equipment of Combustion State in Windy State

C2. Desorption Passage Closure Test

Test Method

The lint filter is closed to an opened area of 50% of the normal state. In the case of a clothes dryer which has no desorption (exhaust) passage (hereinafter referred to as "desorption passage"), the opened area is reduced. After 15 minutes from burner ignition, whether there is any burner flame extinguishment, backfire or flame overflow detrimental to the use is visually checked. In addition, in case the gas passage of the main burner is closed by the activation of the safety device in this process, the situation up to that time shall be checked as well.

C3. Gas Resistance Test**Packing test**

Three test specimens of which weigh has been already measured are immersed for 72 hours in n-pentane of which temperature is 5°C to 25°C inclusive and then taken out from the n-pentane and left in the air for 24 hours. The weight of each specimen is measured, and the rate of weight change is calculated by the following formula and the arithmetic average value of the three test specimens is obtained.

$$\Delta M = \frac{M - M_0}{M_0} \times 100$$

where, ΔM : rate of weight change (%), M : weight after test (g), M_0 : weight before test (g)

Sealing material test

About 1 g of the sealing material is uniformly applied to an aluminum plate, is left in a constant temperature condition for 24 hours and then the weight is measured. The sealing material is put into the U tube of the sealing material test equipment shown in the Figure C3 and the air in the U tube is purged with butane gas by opening the cocks A and B. Cock B is closed and a butane pressure of 5.0 kPa (500 mm H₂O) is maintained and temperatures of 20±1°C and 4±1°C are maintained respectively for one hour. The weight is measured at each temperature and the rate of weight change is calculated by the following formula:

$$\Delta M = \frac{M - M_0}{M_0} \times 100$$

where, ΔM : rate of weight change (%), M : weight after test (g), M_0 : weight before test (g)

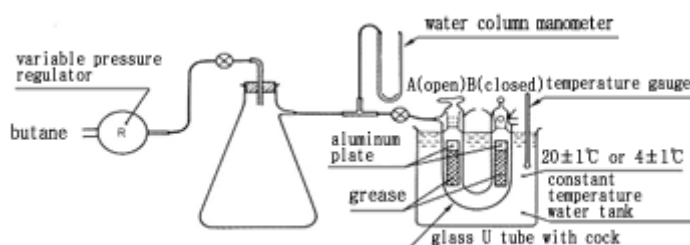


Figure C3. Test Equipment for Gas Resistance Test

C4. Corrosion Resistance Test <Revised on November 17, 2014>**Corrosion-****Resistant Materials**

Material	Standards of Corrosion-Resistant Materials
Castings	KS D 6008
Die-castings	KS D 6005, KS D 6006
Stainless steel	KS D 3534, KS D 3535, KS D 3536, KS D 3576, KS D 3698, KS D 3702, KS D 3705, KS D 3706

	Surface-treated steel	KS D 3544
	Aluminum and aluminum alloys	KS D 6701, KS D 6713, KS D 6759 KS D 6761, KS D 6763
	Copper and copper alloys	KS C 3101, KS C 3102, KS D 5101, KS D 5201, KS D 5301, KS D 5545
Metal plating and painting material	Salt water test shall be performed in a salt water spray laboratory in conformity to KS D 9502, 2 (Equipment) and 8 (Spray Room Condition) by spraying the salt water in conformity to 6 (Salt Solution for Test) for the specified duration and then whether there is any corrosion shall be checked. (1) Galvanized metallic materials shall be free of corrosion or the rating number shall be 9 to 9.8 after a 24-hour spray test. (2) Cross cuts shall be made as shown in Figure C4 on the surface of a painted specimen (size: 130 X 100 mm) by applying a pushing pressure of 5 N (500 gf) with a single-edged razor knife, and then salt water shall be sprayed for 24 hours. The area outside the 2.5 mm width of the cross cut lines and the 10 mm width of the specimen edges shall be checked to see whether there is any rust or blistering. Next, after the specimen has been washed in water and dried in the room condition for 24 hours, a piece of 12 mm wide adhesive cellophane tape specified in KS T 1058 shall be attached to Cross Cut 1. It shall be checked whether there is any peeling in the area outside the 2.5 mm width of the cross cut line when the tape is pulled away perpendicularly to the painted surface. Figure C4. Test Specimen for Salt Water Spray Test on Paint Film	

C5. Electric Ignition Test

State of Equipment	The operating state and installation state of each piece of equipment shall be the same as specified by the manufacturer (in the handling manual). In the case of the exhaust tube of forced exhaust type and the air supply/exhaust tube of forced air supply/exhaust type, the minimum length
--------------------	---

	tube shall be installed.
Test Condition	In the case of power condition, the voltage of a gas clothes dryer using dry batteries shall be 70% of the rated voltage (indicated voltage), and the voltage of a gas clothes dryer using household power shall be 90% of the rated voltage at the rated frequency. In the case of test gas condition, the condition shall be P-1 and P-3 for liquefied petroleum gas, and R-1 and R-3 for city gas. However, in product inspection, the test may be performed with the gas to be used in heating operation.
Test Method	The ignition operation shall be repeated 10 times by the ignition method specified in the handling manual or by the followings, and the number of times of ignition and flame overflow to outside the casing as well as whether there is any explosive ignition shall be checked. (1) Preliminary tests shall be conducted several times in advance. (2) The temperatures of the electric ignition device and burner shall be close to the ambient temperature for every ignition operation. (3) In principle, one cycle of ignition operation and ignition speed shall be as follows depending on the ignition source generation construction: (3-1) In a piezoelectric ignition mode, one ignition operation shall be counted as one time for single ignition type, and the speed of one cycle of ignition operation shall be about 0.5 to 1 second. (3-2) In the piezoelectric ignition mode, one cycle shall be counted as one time for the continuous rotary type, and the speed of one cycle of ignition operation shall be the same as that of (3-1). (3-3) In a continuous discharge ignition mode and a heater ignition mode using dry batteries or a household power source, maintenance of "ignition" position for 5 seconds shall be counted as one time. (3-4) After a 12,000-cycle cyclic test performed at an on-off speed of 2~20 cycle/min, electric ignition performance and whether there is any problem in operation shall be checked by operating the clothes dryer.

C6. Heat input rate Test <Revised on March15, 2013>

Test Condition	The test gas condition shall be P-2 for liquefied petroleum gas and R-2 for city gas.
Test Method	(1) The equipment shall be installed as shown in Figure C6. (2) The equipment shall be operated with test gas as its standard gas at its maximum heat input rate and at the standard pressure (R-2, P-2). (3) The gas pressure of the water column gauge ③ shall be matched to the standard pressure. (4) When the heat input rate becomes constant, the measurement shall be started. When the difference between the values measured consecutively is not over 2%, the arithmetic average value shall be obtained.

(5) The heat input rate in a dry condition at 15°C, standard gas pressure and an atmospheric pressure of 101.3 kPa shall be calculated by the following formula:

$$Q_c = Q \times \frac{1000}{3600} \times V \times \sqrt{\frac{101.3 + P_g}{101.3} \times \frac{P_a + P_g}{101.3} \times \frac{288}{273 + t_g} \times \frac{d}{d_r}}$$

where

Q_c : heat input rate corrected to gross heating value (101.3 kPa, 15°C, dry gas) (kW)

Q : gross heating value of dry standard gas at 15°C, 101.3 kPa (MJ/m³)

V : volumetric gas quantity measured by the gas meter in the humidity, temperature and pressure conditions (m³/h)

P_g : gas pressure at the gas meter (kPa)

P_a : atmospheric pressure at the time of test (kPa)

t_g : gas temperature in the gas meter (°C)

d : density of test gas

d_r : density of standard gas

(6) In case a wet type gas meter is used, the density of gas shall be changed from d to d_h in consideration of humidity and the value shall be corrected by the following formula:

$$d_h = \frac{d(P_a + P_g - P_s) + 0.622P_s}{(P_a + P_g)}$$

where,

P_s is saturated steam pressure and is calculated as follows:

$$P_s = 10^\alpha \text{ kPa} \left(\text{where, } \alpha = 7.203 - \frac{1735.74}{t_g + 234} \right)$$

(7) The accuracy of the measured heat input rate against the indicated heat input rate is calculated by the following formula:

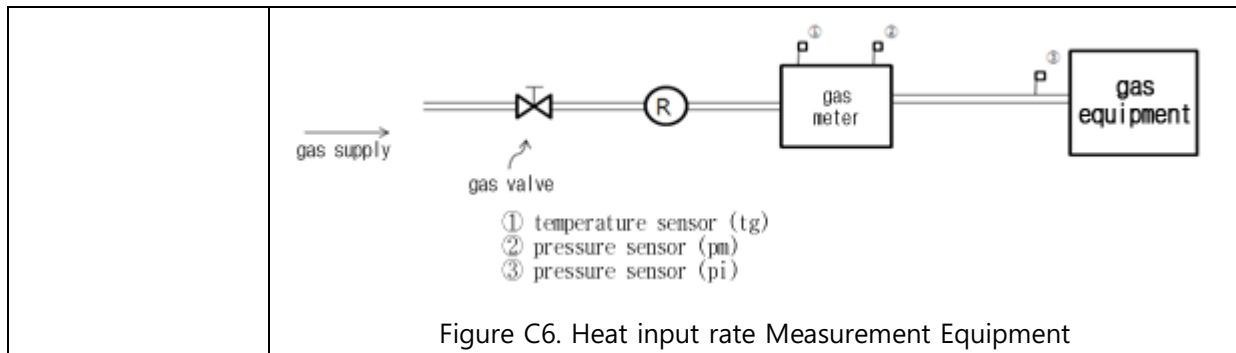
$$\Delta Q_c = \frac{Q_c - Q_r}{Q_r} \times 100$$

where,

ΔQ_c : Accuracy of measured heat input rate against indicated heat input rate (%)

Q_c : measured heat input rate (kW)

Q_r : indicated heat input rate (kW)



C7. Drying Efficiency Test

Test Condition	The test gas condition shall be P-2 or R-2.
State of Clothes Dryer	1) Condition of laundry The laundry to be tested shall be clothes in conformity to the standard drying capacity and the degree of spin-dryness (57±0.5%) specified in KS C 9608, 11.2.2 (Drying Performance) indicated in the appendix. However, the clothes shall be soaked in water at ambient temperature for no less than 15 minutes. 2) Test method The clothes dryer shall be operated with the laundry in its drying drum until the degree of dryness reaches 97±0.5% and the heat input (V), quantity of water vaporized from the laundry (W) and values of others consumed during the operation shall be measured. Drying efficiency shall be calculated by the following formula. In the case of a clothes dryer with a cooling process (cold air operation), the cooling process is not used. The mass of laundry after drying shall be measured immediately after it is taken out from the drying drum. $\eta_D = \frac{W \times H}{V \times Q} \times \frac{273 + t_g}{273} \times \frac{101.3}{B + P_m - S} \times 100$ where, η_D: drying efficiency (%) W: quantity of vaporized water (kg) H: latent heat of vaporization of water (MJ/kg = 2.46) t_g: gas temperature in the gas meter at the time of measurement (°C) V: measured heat input (m³) Q: gross heating value of gas (MJ/m³N) B: atmospheric pressure at the time of measurement (kPa) P_m: gas pressure in the gas meter at the time of measurement (kPa) S: saturated steam pressure at t_g°C (kPa)

[Note 1] Degree of spin-dryness is the rate of spin-drying (%) and is calculated by the following formula. It shall conform to KS C 9608, 11.2.2.

$$D = \frac{M}{M_d} \times 100$$

where,

D: degree of spin-dryness (%)

M: mass of laundry (kg)

M_d : mass of laundry after spin-drying (kg)

[Note 2] Degree of dryness is the dryness rate of laundry (%) and is calculated by the following formula:

$$K = \frac{M}{M_k} \times 100$$

where,

K: degree of dryness (%)

M: mass of laundry (kg)

M_k : mass of laundry after drying (kg)

Preliminary tests shall be performed to reach a degree of dryness of $97 \pm 0.5\%$. Operating time to reach a degree of dryness of $97 \pm 0.5\%$ is measured and the clothes dryer is operated for that time.

[Note 3]

The quantity of vaporized water (W)(kg) is the difference between the weights of laundry before the test and after the test.

[Note 4]

The measurement of heat input (V) (m^3) is made by a method specified in the paragraph of heat input test.

[Note 5]

The laundry shall be well loosened.

[Note 6]

Drying efficiency shall be measured four times and the average value shall be the drying efficiency of the clothes dryer.

[Note 7]

The filter shall be cleaned before each test.

[Note 8] Definitions

① Drying capacity: The mass of laundry in a dry state which can be dried in one time(kg)

② Standard drying capacity: The mass of the maximum laundry in a dry state

that can be dried in one time in drying capacities (kg)

③ Standard drying time: Time required to dry the laundry of standard drying capacity (min)

<<Appendix>> Definition of Simulation Laundry

1. Property and number of laundry objects

The property of laundry objects used in the test shall conform to Table C7①. In addition, the shape of the laundry object shall conform to Figure C6 and the relationship between drying capacity and laundry objects shall conform to Table C7②.

Table C7① Property of Laundry Object

Item	Specification
Density of warp	30±2 ea/cm
Density of weft	27±2 ea/cm
Thickness of warp	32±2 S
Thickness of weft	36±2 S
Mass	100±10 g/m ²
Material	Cotton

Table C7② Number of Laundry Objects

Drying Capacity (kg)	Number of Shirts
1>	0
1≤ to 2>	1
3≤	4

2. The initial mass of laundry shall be the mass of the laundry which is removed of its paste for laundry used in paste removal process test and the mass shall not be less than 93% of the initial mass.

Removal of paste shall be carried out with water at ambient temperature by repeating the process in Table C7③ four times.

Table C7③ Paste Removal Process

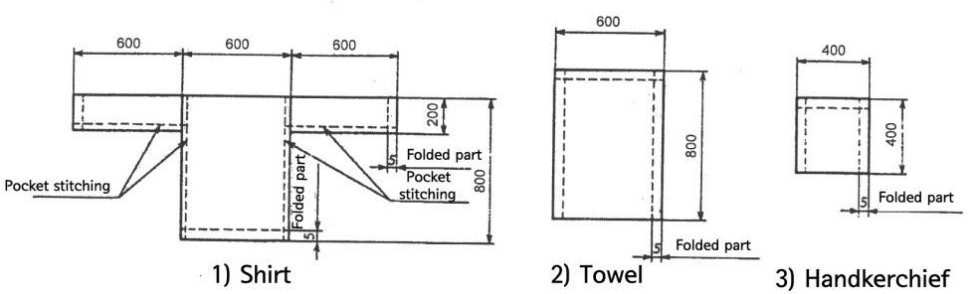
Process	Time (min)	Condition
Washing	10	No detergent is added
Spin-drying	2	-
Watering and rinse	2	15 L/min
Spin-drying	2	-

	Watering and rinse	2	15 L/min
	Spin-drying	5	-

3. The total quantity of towels and handkerchiefs shall be the additional mass to make up the rated load and the ratio of towels to handkerchiefs shall be 2:1.

4. When the mass of laundry is measured, the laundry shall be left all day long in a condition of a temperature of $20\pm 2^{\circ}\text{C}$ and a relative humidity of $65\pm 5\%$. Measurement shall be made when the mass is stabilized. When the above condition cannot be achieved, the laundry shall be dried in a clothes dryer and the mass shall be measured immediately after that operation. Drying shall be continued for 10 minutes and this drying process shall be repeated until the change in measured mass becomes 1% or less. A value obtained by adding 8% to this mass of very dry laundry shall be taken as the mass of laundry.

5. The laundry specified in Figure C7 shall be spread and put into the clothes dryer in order of heavier weight.



1) Shirt 2) Towel 3) Handkerchief

[Remark] The folded parts at the edges of the shirt, towel or handkerchief shall be stitched at the third strand from the edge.

Figure C7. Shapes of Laundry

C8. Degree of Dryness Test

Test Condition	The test condition shall conform to the test condition of drying efficiency.
Test Method	The laundry is put into the drying drum of the clothes dryer, which is operated for standard drying time indicated in the manual. After the drying operation, the weight of the laundry is measured and the degree of dryness is calculated.

C9. Normal Temperature Rise Test

Test Condition	The clothes dryer shall be installed in accordance with the manufacturer's installation manual, the test gas condition shall be R-2 for city gas and P-2 for liquefied petroleum gas and the gas shall be supplied at the indicated
----------------	---

	heat input rate.								
Installation State	The clothes dryer shall be installed by a method specified by the manufacturer (an installation method indicated in the manual) to keep distances from thermometric plates indicated in the following table. In addition, in case effective measures are taken for fire prevention in connection with distances from thermometric plates, if the distances designated by the manufacturer are less than those specified in Table C9, the designated conditions are to be observed. Table C9. Distances between Clothes Dryer and Thermometric Plates Unit: mm <table><tr><td></td><td>Ceiling Face</td><td>Side Face</td><td>Rear Face</td></tr><tr><td>Clothes Dryer Body</td><td>150</td><td>45</td><td>45</td></tr></table> In case a desorption tube can be connected, a desorption tube of the maximum designated length shall be attached by a method designated in the handling manual. (1) Service state of clothes dryer The clothes dryer shall be in a state of maximum heat input rate. In this case, the set temperature of the thermostat shall be matched to the maximum temperature. In the case of a clothes dryer fitted with a rotation speed controller, the clothes dryer shall be set to maximum speed and minimum speed and the test shall be performed at each speed. (2) Temperature measuring time The temperature measuring time shall be one hour after burner ignition for each part of the clothes dryer and two hours for wooden walls around the clothes dryer.		Ceiling Face	Side Face	Rear Face	Clothes Dryer Body	150	45	45
	Ceiling Face	Side Face	Rear Face						
Clothes Dryer Body	150	45	45						

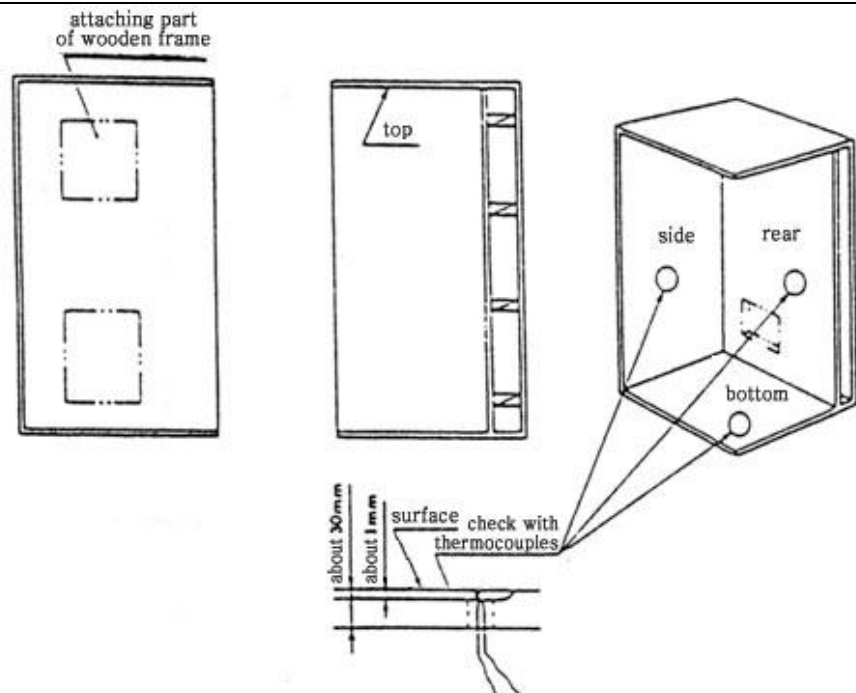


Figure C9. Surface Temperature Measuring Device for Wooden Walls and Wooden Platform

[Remarks]

- (1) The materials of the wooden walls and platform shall conform to relevant Korean Industrial Standards or be equivalent materials made of 5 to 7 sheets of sufficiently dried plywood. The surface of the wooden platform shall be finished with varnish and the surfaces of the wooden walls with non-gloss black paint.
- (2) The sizes of the wooden platform and walls shall be large enough for the gas clothes dryer.
- (3) The number of thermocouples shall be as many as possible. The thermocouples shall be installed at the same intervals in a grid pattern so that the temperature of any point can be measured.
- (4) The thermocouples shall be inserted to a depth of 1 mm from the surface of the wooden platform or wall and be calibrated.
- (5) The thermocouples shall be of T type (copper, constantan) and the diameter of the element wire shall be 0.65 mm.

C10. Abnormal Temperature Rise Test

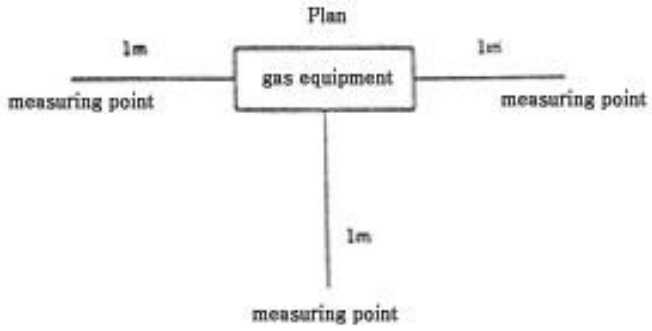
Test Condition	The test gas condition shall be R-1 for city gas and S-1 for liquefied petroleum gas.
Test Method	(1) The installation and operating states of the clothes dryer shall conform

	to those for normal temperature rise test. (2) The measuring time of abnormal temperature rise test shall be a time until the temperature of the temperature measuring point does not change along with the time passing after burner ignition (a maximum of 1 hour). However, in case the overheat prevention device is activated and the main burner gas passage is shut off, the maximum temperature ever reached shall be measured (this provision applies only to a clothes dryer fitted with an overheat prevention device).
--	--

C11. Temperature Rise in Windings

Test Gas Condition	The test shall be performed after the normal temperature rise test.
Test Method	(1) Temperature rise in windings shall be measured by a resistance method. In case the windings are irregular or contact with windings for temperature measurement is difficult, the temperature rise shall be measured using thermocouples. 1-1) Winding temperature rise method: motor, solenoid valve, linear transformer, etc. (1-2) Thermocouple measuring method: electromagnetic wave filter, switching transformer, etc. (2) The electric heater shall be operated at 1.15 times the rated input rate and the motor-driven equipment at 1.06 times the rated voltage. (3) The winding temperature at the start of the test shall be the same as the ambient temperature and the winding resistance value at the end of the test shall be measured as soon as possible after the switch is off. (4) The winding temperature rise shall be calculated by the following formula: $\Delta t = \frac{R_2 - R_1}{R_1} (k + t_1) - (t_2 - t_1)$ where, Δt: temperature rise of winding R_1: resistance value at the start of test R_2: resistance value at the end of test k: 234.5 for copper windings, 225 for aluminum windings t_1: ambient temperature at the start of test t_2: ambient temperature at the end of test

C12. Noise Measurement

Test Method	Continuous noise and explosive noise at flame extinguishment shall conform to the followings: (1) The maximum continuous noise including continuous noises shall be measured in three locations marked in Figure C12 which are separated by 1 m from the centers of the outer surfaces of the gas clothes dryer when all burners are ignited. (2) When all burner valves are manually closed as fast as possible after 30 minutes from burner ignition and flames are extinguished, the explosive noise shall be measured.  Figure C12. Method of Noise Measurement
-------------	---

C13. Measurement of CO Concentration in Theoretical Dry Combustion Gas

Test Condition	After 15 minutes from burner ignition, the combustion gas of the burner shall be sampled as uniformly as possible as shown in the followings. The test gas shall be S-1 for a liquefied petroleum gas clothes dryer or 1-1 for a city gas clothes dryer.
Test Method	$CO = CO_a \times \frac{O_{2t}}{O_{2t} - O_{2a}}$ However, in case the components of the test gas is known, CO concentration and CO₂ concentration in the dry combustion gas may be measured and calculated by the following formula: $CO = CO_a \times \frac{CO_{2max}}{CO_{2a} - CO_{2t}}$ where, CO: CO concentration in theoretical dry combustion gas (vol. %) CO_a: measured CO concentration in dry combustion gas (vol. %) O_{2t}: measured O₂ concentration in supply air inlet atmosphere (dry state) (vol. %) O_{2a}: measured O₂ concentration in dry combustion gas (vol. %)

	CO_{2max} : CO ₂ concentration in theoretical dry combustion gas (vol. %) CO_{2a} : measured CO ₂ concentration in dry combustion gas (vol. %) CO_{2t} : measured CO ₂ concentration in supply air inlet atmosphere (dry state) (vol. %)
--	---

C14. Flame Supervision Device Operating Test

Test Gas Condition	(1) Valve opening time: The test gas condition shall be P-3 for a liquefied petroleum gas clothes dryer or R-3 for a city gas clothes dryer. (2) Valve closing time: The test gas condition shall be B-1 for a liquefied petroleum gas clothes dryer or R-1 for a city gas clothes dryer. (3) Automatic re-ignition construction: The test gas condition shall be P-3 for a liquefied petroleum gas clothes dryer or R-3 for a city gas clothes dryer.
Test Method	(1) Valve opening time After the burner is ignited by normal operation, the time from when the valve of the safety device is opened until the opened state of the valve is maintained shall be measured. (2) Valve closing time After 15 minutes from burner ignition, the burner is extinguished and gas or air is supplied to the pilot burner, etc. while the burner is left in an extinguished state, and the time from when the burner is extinguished to when the valve of the safety device is closed is measured.

C15. Leakage Current Test

Test Condition	Before starting the test, the protection impedance and noise suppression filter are removed.
Test Method	Leakage current is measured by means of a circuit specified in KS C IEC 60990, Figure 9 between one side of power source and a metal part which may be touched by man in contact with an metal foil (of which area in contact with the surface of an insulator which may be touched by man is within 20 cm x 10 cm). In the case of 3-phase equipment, leakage current shall be measured while switches a, b and c are closed. Next, each of switches a, b and c is opened one by one in order (in this case, the remaining two switches are closed), and measurement of leakage current is repeated. In the case of equipment connected only in star connection, the neutral line is cut off.

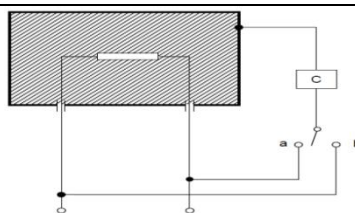


Figure C15① Leakage Current Test Circuit (single-phase 2-line)

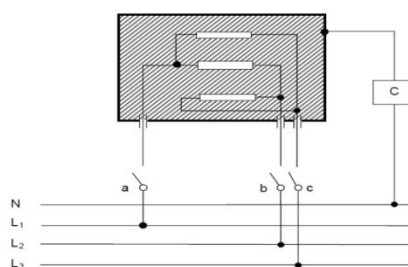


Figure C15② Leakage Current Test Circuit (3-phase 4-line)

C16. Performance Test of Drum Temperature Overheat Prevention Device

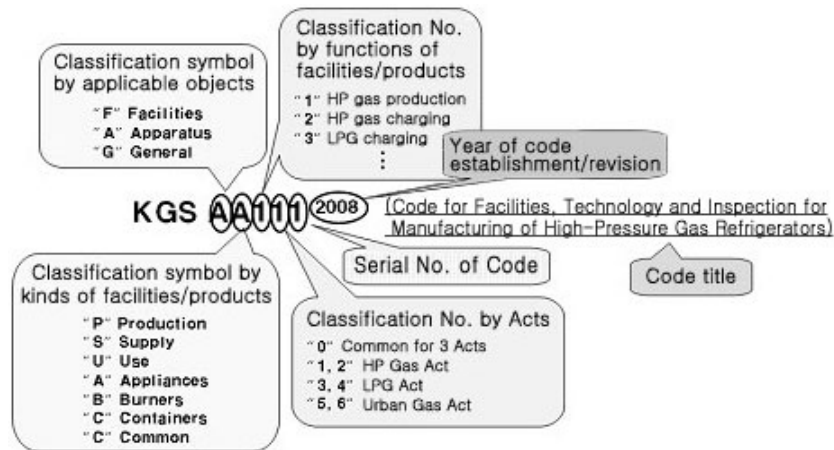
Test Method	While operation and temperature in the drum are being checked in abnormal temperature rise test, whether the gas passage is shut off is checked.
-------------	--

C17. Performance Test of Safety Device for Prevention of Abnormal Combustion

Test Method	While the desorption passage is slowly shut off and operation and flame states during operation are visually checked, whether the gas passage is shut off is checked.
-------------	---

Symbol and Serial Number System of KGS Codes

Korea Gas Safety Codes (KGS Codes) are the codes of detailed standards for technical matters such as facilities, technology and inspection stipulated in gas-related laws and regulations and are the technical standards in gas safety areas deliberated and resolved to be adopted by the gas technical standards committee, and approved by the Ministry of Knowledge Economy.



Classification		Symbol	Facility	Classification		Symbol	Facility
Apparatus (A)	Appliances (A)	AA1xx	Refrigerators	Facilities (F)	Production (P)	FP1xx	High-pressure gas manufacturing facilities
		AA2xx	Piping			FP2xx	High-pressure gas filling facilities
		AA3xx	Valves			FP3xx	LP gas filling facilities
		AA4xx	Pressure regulators			FP4xx	City gas wholesales manufacturing facilities
		AA5xx	Hoses			FP5xx	City gas general manufacturing facilities
		AA6xx	Alarm & shutoff devices		Supply (S)	FS1xx	High-pressure gas sales facilities
		AA9xx	Other appliances			FS2xx	LP gas sales facilities
	Burners (B)	AB1xx	Boilers			FS3xx	LP gas complex supply facilities
		AB2xx	Heaters			FS4xx	City gas wholesales supply facilities
		AB3xx	Ranges			FS5xx	City gas general supply facilities
		AB9xx	Other burners		Use (U)	FU1xx	High-pressure gas storage facilities
	Containers (C)	AC1xx	Tanks			FU2xx	High-pressure gas burning facilities
		AC2xx	Cylinders			FU3xx	LP gas storage facilities
		AC3xx	Cans			FU4xx	LP gas burning facilities
		AC4xx	Composite containers			FU5xx	City gas burning facilities
		AC9xx	Other containers		Common (C)	GC1xx	Basic matters
				General (G)		GC2xx	Common matters

