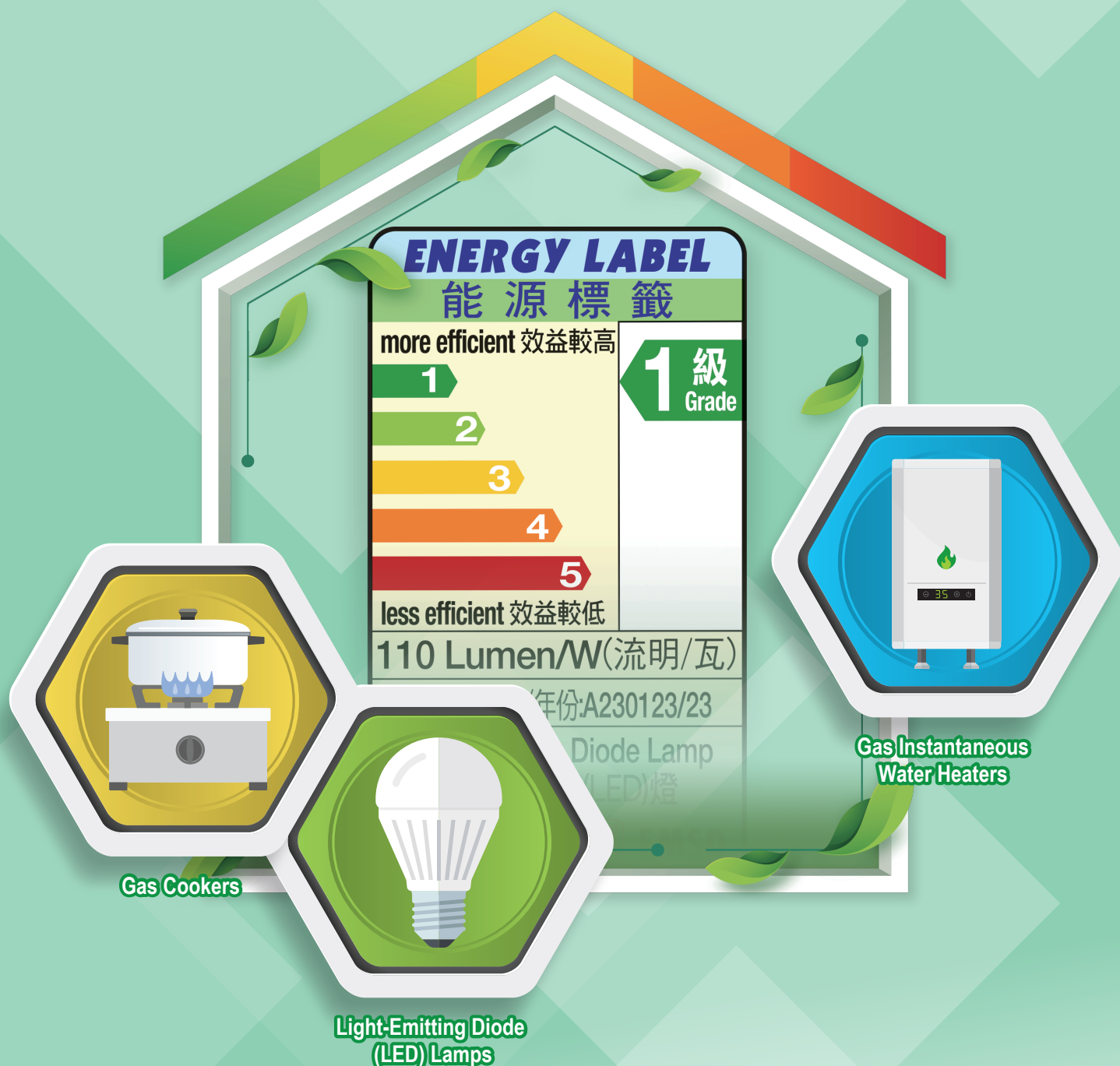


Revision of the Code of Practice on Energy Labelling of Products for the Fourth Phase of the Mandatory Energy Efficiency Labelling Scheme (MEELS)

Consultation Document



June 2022

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Chapter 1

Purpose

1. We would like to invite your views on the revision of the Code of Practice on Energy Labelling of Products (CoP) for inclusion of three additional types of products, namely Light Emitting Diode (LED) lamps, gas cookers and gas instantaneous water heaters, into the fourth phase of the Mandatory Energy Efficiency Labelling Scheme (MEELS).

Mandatory Energy Efficiency Labelling Scheme

2. The Mandatory Energy Efficiency Labelling Scheme (MEELS) was introduced through the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) (Ordinance), which was enacted on 9 May 2008. Under the Ordinance, energy labels are required to be shown on all prescribed products for supply in Hong Kong to inform consumers of their energy efficiency performance.
3. The MEELS has been implementing in phases as follows:
 - (i) The initial phase of the MEELS, covering three types of products, namely room air conditioners, refrigerating appliances and compact fluorescent lamps (CFLs), has been fully implemented since 9 November 2009.
 - (ii) The second phase of the MEELS, extending the coverage to two more electrical products, namely washing machines and dehumidifiers, has been fully implemented since 19 September 2011.
 - (iii) The upgrading of energy efficiency standards for three types of products, namely room air conditioners, refrigerating appliances and washing machines has been fully implemented since 25 November 2015.
 - (iv) The third phase of the MEELS further extends the coverage to three additional types of electrical products, namely televisions, storage type electric water heaters and induction cookers, and expands the scope of room air conditioners and washing machines. The third phase has been fully implemented since 1 December 2019.
 - (v) The upgrading of energy efficiency standards for single package type room air conditioners, dehumidifiers and CFLs has been fully implemented on 31 December 2021.
4. A three-month public consultation on the proposal for the fourth phase of the MEELS was launched on 1 March 2021 and completed on 31 May 2021. Comments received are in general supportive of the proposal. In addition, the Energy Efficiency and Conservation

and Renewable Energy Sub-committee under the Energy Advisory Committee and the Panel on Environmental Affairs of the Legislative Council were consulted in 2021 and members also expressed support for the proposal.

5. The Code of Practice on Energy Labelling of Products (CoP) is approved and issued under section 42 of the Ordinance and provides practical guidance for requirements under the Ordinance. The latest edition of the CoP is available at the website of the Electrical and Mechanical Services Department (EMSD) with the following link:

<https://www.emsd.gov.hk/energylabel/>

The latest revision of the CoP is shown as below:

<u>Version</u>	<u>Effective Date</u>	<u>Details of Revision</u>
Rev. 4	31 December 2020	<ul style="list-style-type: none"> - Upgrading of energy efficiency standards for single package type room air conditioners, compact fluorescent lamps and dehumidifiers - Revision of Appendices 6A and 7A
<u>Rev. 5</u>	<u>Q2 2023 (Tentative)</u>	<u>Inclusion of light emitting diode (LED) lamps, gas cookers and gas instantaneous water heaters</u>

6. We now invite views from members of the trade on the revision of the CoP for the fourth phase of the MEELS. Please send in your views on or before **14 August 2022** by mail, email or facsimile to the following:

Mail:	Energy Efficiency Office Electrical and Mechanical Services Department 3 Kai Shing Street Kowloon
Email address:	meels_review@emsd.gov.hk
Facsimile:	(852) 2890 6081

7. Chapter 2 of this document outlines the requirement of “Energy Efficiency Labelling for Light Emitting Diode (LED) Lamps”.
8. Chapter 3 of this document outlines the requirement of “Energy Efficiency Labelling for Gas Cookers”.
9. Chapter 4 of this document outlines the requirement of “Energy Efficiency Labelling for Gas Instantaneous Water Heaters”.

PERSONAL DATA COLLECTION STATEMENT

1. The Electrical and Mechanical Services Department respects personal data privacy and is committed to implementing and complying with the data protection principles and relevant provisions under the Personal Data (Privacy) Ordinance.
2. It is voluntary for any member of the public to supply his/her personal data upon providing views on the consultation document. Any personal data provided with a response form for consultation will only be used for this consultation exercise. The response forms and personal data collected may be transferred to the relevant Government bureaux, departments or agencies for purposes directly related to this consultation exercise. The relevant parties receiving the data are bound by such purposes in their subsequent use of such data.
3. The Electrical and Mechanical Services Department may, either in discussion with others or in any subsequent report, whether privately or publicly, attribute comments submitted in response to the consultation document. We will respect the wish of senders to remain anonymous and/or keep the views confidential in relation to all or part of a submission; but if no such wish is indicated, it will be assumed that the sender can be named and his/her views can be disclosed and/or published for public information.
4. Any sender providing personal data to the Electrical and Mechanical Services Department in the submission will have the right of access and correction with respect to such personal data. Any request for data access or correction of personal data should be made in writing to the contact specified above.

Chapter 2

Energy Efficiency Labelling for Light Emitting Diode (LED) Lamps

15. Energy Efficiency Labelling for Lighting Emitting Diode Lamp

15.1 Scope

15.1.1 Clause 15 of the Code, unless the Director provides otherwise, applies to a lighting emitting diode (LED) lamp defined in the Ordinance, that is, the products specified in clauses 15.1.2 and 15.1.3.

15.1.2 “Lighting emitting diode lamp”, subject to clause 15.1.3 of the Code, means a product –

- (a) that is a type of directional or non-directional lighting emitting diode lamp which has a single lamp cap;
- (b) that is of integrated type;
- (c) that is intended for general lighting purposes, and –
 - (i) uses mains electricity as the only power source; and
 - (ii) has a rated lamp wattage up to 60 watts,whether or not having a dimming feature.

15.1.3 “Lighting emitting diode lamp” does not include –

- (a) lighting emitting diode tubes;
- (b) lighting emitting diode lamps that solely produce tinted or coloured light; or
- (c) organic lighting emitting diode lamps.

15.2 Definitions

This clause provides definitions of terms used in clause 15 of the Code.

Unless otherwise specified, the definitions adopted in clause 15 follow those stipulated in the Ordinance, if any.

<i>ANSI C78.377</i>	means American National Standard ANSI C78.377-2017, Electric Lamps – Specifications for the Chromaticity of Solid State Lighting (SSL) Products.
<i>CIE</i>	means International Commission on Illumination (the latest edition of the standard shall be followed for test methodology).
<i>correlated colour temperature (CCT)</i>	means the temperature of a Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions.
<i>directional lamp</i>	means a lamp having at least 80% of luminous flux within a solid angle of π sr (corresponding to a cone with angle of 120 degree).
<i>displacement factor</i>	expressed by $\cos\phi$, where ϕ is the phase angle between the fundamental of the mains supply voltage and the fundamental of the mains current.
<i>full test report</i>	<p>in relation to a light emitting diode, means a test report that presents the results of a test carried out –</p> <p>(a) to find out all aspects of the lamp's energy efficiency and performance characteristics specified in the Code; and</p> <p>(b) to a standard specified in the Code.</p>

<i>Colour Rendering Index (Ra)</i>	means the photometric code or the colour rendering index, colour designation of an LED lamp giving white light as defined by the correlated colour temperature and CIE 13.2:1974 general colour rendering index.
<i>general lighting</i>	<p>means the substantially uniform level of illumination throughout an area and with all of the following optical characteristics:</p> <p>(a) chromaticity coordinates within the range:</p> <p>(i) $0.270 < x < 0.530$; and</p> <p>(ii) $-2.3172 x^2 + 2.3653 x - 0.2199 < y$ $< -2.3172 x^2 + 2.3653 x - 0.1595$; and</p> <p>(b) luminous flux not less than 60 lumen.</p>
<i>IEC 62301</i>	means the international standard IEC 62301:2011, Household Electrical Appliances - Measurement of Standby Power.
<i>IEC 62612</i>	means the international standard IEC 62612:2013, Self-ballasted LED Lamps for General Lighting Services with Supply Voltages > 50 V – Performance Requirements.
<i>initial value</i>	means the photometric, colorimetric and electrical characteristics at the end of the ageing period and stabilisation time.
<i>LED lamp</i>	means a lamp, incorporating a Light Emitting Diode (LED) light source and any additional elements necessary for stable operation of the light source, provided with a lamp cap conforming with IEC 60061-1.

<i>integrated LED lamp</i>	means a Light Emitting Diode (LED) lamp incorporating control gear and any additional elements necessary for stable operation of the light source, designed for direct connection to mains voltage.
<i>non-integrated LED lamp</i>	means a Light Emitting Diode (LED) lamp intended for connection to a separate control gear and cannot operate directly on mains voltage.
<i>LED tube</i>	means a tubular light source which can be straight (linear) or bent (e.g. U-shaped, circular).
<i>lumen maintenance</i>	means a ratio of the luminous flux emitted by an LED lamp at a given time in its life to its initial luminous flux, the lamp being operated under specified conditions and expressed as a percentage of the initial luminous flux.
<i>luminous efficacy (lm/W)</i>	means a ratio of luminous flux emitted by a lamp to the electrical power consumed by the lamp.
<i>luminous flux (lm)</i>	means a quantitative measure of light emitted by a light source. The quantity is derived from radiant flux (power in watts) by evaluating the radiation in accordance with the spectral sensitivity of the standard eye as described by the CIE Standard Photometric Observer.
<i>non-directional lamp</i>	means a lamp that is not a “directional lamp”.
<i>organic light emitting diode (OLED)</i>	means a technology in which light is produced from a solid state device embodying a p-n junction of organic material. The junction emits optical radiation when excited by an electric current.

<i>rated lamp life (hours)</i>	means a length of time during which a population of LED lamps provides at least the claim for luminous flux percentage (70%) and less or equal the claim for failure fraction percentage (50%), as determined and declared by the manufacturer or importer of the LED lamp in accordance with the standard and requirements specified in the Code.
<i>rated lamp wattage</i>	means the wattage of an LED lamp as determined and declared by the manufacturer or importer of the LED lamp in accordance with the standard and requirements specified in the Code. (Note: the rated lamp wattage is identical with the rated power consumption in value.)
<i>rated lumen maintenance</i>	means the lumen maintenance of an LED lamp as determined and declared by the manufacturer or importer of the LED lamp in accordance with the standard and requirements specified in the Code.
<i>rated luminous flux (lm)</i>	means the luminous flux of an LED lamp as determined and declared by the manufacturer or importer of the LED lamp in accordance with the standard and requirements specified in the Code.
<i>rated power consumption</i>	means the power input of an LED lamp as determined and declared by the manufacturer or importer of the LED lamp in accordance with the standard and requirements specified in the Code.
<i>stabilization time</i>	means the time which an LED lamp requires to obtain stable photometric conditions with constant electrical input for each measurement.

standby mode means the condition of a lamp where it is connected to the power supply but the light source is intentionally not emitting light and is awaiting a remotely initiated trigger to return to a state with light emission.

standby power means the power being used when the LED lamp is in “standby-mode”.

15.3 Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with IEC 62612 or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a light emitting diode lamp. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Measurement of luminous flux (initial);
- (b) Measurement of power consumption (initial);
- (c) Measurement of standby power consumption (initial);
- (d) Measurement of colour rendering index (initial and at 6 000 hours)
- (e) Measurement of colour consistency (initial and at 6 000 hours);
- (f) Measurement of displacement factor (initial);
- (g) Measurement of number of switching cycles;
- (h) Measurement of lumen maintenance at 6 000 hours; and
- (i) Measurement of lamp survival factor at 6 000 hours.

15.4 Test Methodology and Standards

15.4.1 Test Standards – Technical Performance

- (a) The luminous efficacy value (lm/W) is the major criterion to determine whether a lamp can meet the specific energy efficiency requirement specified in the Code.
- (b) The testing standards for measurement of electrical and photometric performances are based on the following standards or equivalent standards approved by the Director. Detailed requirements and procedural descriptions should be referred to the respective standard (if applicable).
 - (i) IEC 62612, Self-ballasted LED Lamps for General Lighting Services with Supply Voltages > 50 V – Performance Requirements;
 - (ii) IEC 62301, Household Electrical Appliances – Measurement of Standby Power;
 - (iii) CIE 84, The Measurement of Luminous Flux; and
 - (iv) ANSI C78.377, Electric Lamps – Specifications for the Chromaticity of Solid-state Lighting Products.

15.4.2 Test Conditions

- (a) The tests shall be carried out at a voltage and frequency of mains electricity in Hong Kong as specified in the standards mentioned in clause 15.4 of the Code. The sample size for carrying out all the tests shall be determined in accordance with clause 15.8 of the Code.
- (b) LED lamps with dimming or adjustable colour control shall be adjusted to maximum power output for all tests. Such setting and/or methods of reaching the most consumptive white light setting should be provided by the lamp manufacturer or supplier with detailed instructions for the control settings (if applicable).

- (c) For LED lamps with integral control (e.g. wireless control or connected functionality), lighting control parts and non-lighting parts shall be disconnected or switched-off or, in case this is not possible, the power consumption of these parts shall be minimal for all tests, except the test for standby power consumption.
- (d) For LED lamps of the same characteristics but with different colour temperatures, they shall be tested individually as their energy efficiency performances are different. For LED lamps with the same energy efficiency and performance characteristics (including colour temperature) but with different lamp caps, they may be treated as belonging to the same family of models and adopt the same test report.
- (e) The test conditions shall be as follows –
 - (i) the stabilisation of test lamps and the test conditions shall be as described in IEC 62612; and
 - (ii) test lamps shall be tested in a vertical base-up position.

15.4.3 Measurement of Luminous Flux

The luminous flux at the test conditions shall be measured in accordance with the requirements of CIE 84.

15.4.4 Measurement of Lumen Maintenance and Lamp Life

The lumen maintenance and lamp life at the test conditions shall be measured in accordance with IEC 62612.

15.4.5 Standby Power Consumption

Lamps with integral control (e.g. wireless control or connected functionality) shall consume no more than 0.5W in standby mode. The standby power consumption shall be measured in accordance with IEC 62301.

15.4.6 Measurement of Electric and Photometric Characteristics

The electric and photometric characteristics shall be measured in accordance with IEC 62612. The measurement of colour consistency shall be referred to IEC 62612 for the range of chromaticity values. ANSI C78.377 is referred as an option of extended chromaticity values.

15.4.7 Determination of Luminous Efficacy

Luminous efficacy (E_m) shall be determined by computing the ratio of the measured luminous flux and the corresponding electrical power consumption at the test conditions. The resulting quotient shall be rounded off to the nearest unit of a lumen per watt.

15.5 Energy Efficiency Grading

15.5.1 The energy efficiency grading of an LED lamp shall be determined as shown in Table 15.1, with Grade 1 having the best performance and Grade 5 having the worst performance.

15.5.2 In order to determine the energy efficiency grading according to clause 15.5.3 of the Code, the measured luminous efficacy (E_m) obtained in clause 15.4 of the Code shall be compared with the following rated luminous efficacy (E_r) which is determined and calculated based on the rated luminous flux and the rated wattage of the same product model –

$$\text{Rated Luminous Efficacy } (E_r) = \frac{\text{Rated Luminous Flux}}{\text{Rated Wattage}}$$

The energy efficiency grading is determined by using the measured lamp luminous efficacy (E_m) or the rated lamp luminous efficacy (E_r), whichever is smaller.

Table 15.1 – Derivation of Energy Efficiency Grades

X <i>Note(1)</i>				
Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
$X \geq 110$	$110 > X \geq 90$	$90 > X \geq 63$	$63 > X \geq 50$	$50 > X$

Note: X = measured lamp luminous efficacy (E_m) or the rated lamp luminous efficacy (E_r), whichever is smaller.

15.5.3 The aforesaid measured luminous efficacy refers to the average values (both luminous flux and power consumption) measured after stabilisation of the LED lamp.

15.5.4 The aforesaid lumen maintenance refers to the average value measured after stabilisation of the LED lamp.

15.5.5 Unless otherwise indicated, the requirements set forth in the Code shall apply to non-dimmable LED lamps, and also to LED lamps with dimming control and/or adjustable colour that are operating at maximum power.

15.5.6 An example illustrating the method on how to determine the energy efficiency grade of an LED lamp is shown in Appendix 9A.

15.6 Performance Requirements

15.6.1 In the test report submitted to the Director under clause 6 of the Code, the results of the test carried out in accordance with CIE 84, IEC 62612, IEC 62301 or other equivalent international standards approved by the Director shall show that the model concerned of the LED lamp conforms with the following performance requirements –

- (a) The initial luminous flux of each individual LED lamp in the measured sample shall not be less than the rated luminous flux by more than 10%. The average of the measured initial luminous flux of all tested lamps shall not be less than the rated luminous flux by more than 7.5%.

- (b) The initial power consumed by each individual LED lamp in the measured sample shall not exceed the rated power by more than 10%. The average of the measured initial power consumption of all tested lamps shall not exceed the rated power by more than 7.5%.
- (c) The average of the measured initial standby power consumption shall be no more than 0.5W in standby mode.
- (d) The colour rendering index of each individual LED lamp in the measured sample shall not be less than 80 in the initial measurement and at the end of 6 000 hours.
- (e) The spread of chromaticity of each individual LED lamp in the measured sample shall fall within a 6-step MacAdam ellipse in the initial measurement and at the end of 6 000 hours.
- (f) For rated power that is greater than 2W and less than or equal to 5W, the average displacement factor shall not be less than 0.4; for rated power that is greater than 5W and less than or equal to 25W, the average displacement factor shall not be less than 0.7; for rated power that is greater than 25W, the average displacement factor shall not be less than 0.9.
- (g) For rated lamp life that is greater than or equal to 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to 15 000 cycles; for rated lamp life that is less than 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to half the rated lamp life in hours.
- (h) The average measured lumen maintenance at the end of 6 000 hours shall not be less than 80%.
- (i) The average measured lamp survival factor at the end of 6 000 hours shall not be less than 90%.

- 15.6.2 The rated power consumption, rated luminous flux, rated chromaticity co-ordinates, rated colour rendering index, rated displacement factor, rated lamp life as declared by the manufacturer or importer shall meet the requirements specified in clause 15.6.1 of the Code.

15.7 Safety Requirements

In addition to the energy efficiency performance requirements, all LED lamps shall comply with the Electrical Products (Safety) Regulation (Cap. 406G) and the latest version of other relevant codes of practice and guidance notes with respect to LED lamps.

15.8 Number of Samples to be Tested

- 15.8.1 For submission of product information of a model under section 6 of the Ordinance, a test report on samples of the model shall be submitted. The minimum number of samples for the tests are indicated in Table 15.2.

Table 15.2 – Minimum Number of Samples for Tests

Tests Required	Minimum Number of Samples
Power consumption, standby power consumption (if applicable), luminous flux, colour rendering index, colour consistency, displacement factor, lumen maintenance and lamp survival factor	20
Switching cycle	10

(Remark: The same samples shall be used for the above tests. LED lamps used in the switching cycle test shall not be used in other tests.)

- 15.8.2 The test results of the samples shall be determined in accordance with the requirements in Table 15.3 and meet the performance requirements in clause 15.6 of the Code.

Table 15.3 – Determination of Test Results

Tests Required	Test Results	
	Measured value of each sample	Average of the measured values
<u>Initial measurements (after stabilisation period)</u>		
Luminous flux	Not less than the rated luminous flux by more than 10%	Not less than the rated luminous flux by more than 7.5%
Power consumption	Not exceed the rated power by more than 10%	Not exceed the rated power by more than 7.5%
Standby power consumption (if applicable)	Not applicable	$\leq 0.5W$
Colour rendering index	≥ 80	Not applicable
Colour consistency	Within a 6-step MacAdam ellipse or less	Not applicable
Displacement factor	Not applicable	<p>Rated power $\leq 2 W$: no requirement;</p> <p>$2W < \text{Rated power} \leq 5W$: displacement factor ≥ 0.4;</p> <p>$5W < \text{Rated power} \leq 25W$: displacement factor ≥ 0.7; and</p> <p>Rated power $> 25W$: displacement factor ≥ 0.9</p>

Tests Required	Test Results	
	Measured value of each sample	Average of the measured values
<u>Initial measurements (after stabilisation period) – Cont'd</u>		
Switching cycle	$\geq 15\ 000$ if rated lamp life $\geq 30\ 000$ hours, otherwise \geq half the rated lamp life expressed in hours.	Not applicable
<u>At the end of 6 000 hours</u>		
Colour rendering index	≥ 80	Not applicable
Colour consistency	Within a 6-step MacAdam ellipse or less	Not applicable
Lumen maintenance	Not applicable	$\geq 80\%$
Lamp survival factor	$\geq 90\%$ of the test samples	

15.8.3 The measured luminous efficacy shall be determined by computing the ratio of the average value of the luminous flux and the average value of the power consumption as determined in accordance with clause 15.4 of the Code. The resulting quotient shall be rounded off to the nearest unit of a lumen per watt.

15.9 Energy Label

15.9.1 The specification of the energy label for LED lamp is shown in Appendix 9B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed model showing the energy efficiency grade and associated information in accordance with the requirements in Appendix 9B.

15.9.2 The energy label is to be –

- (a) printed on or affixed to a prominent position of the individual product packaging and is to be clearly visible; or
- (b) attached to the product packaging in a manner approved by the Director.

15.9.3 The energy label shall be self-adhesive, if it is to be affixed on each individual packaging, and shall be cut to the outline shown in Appendix 9B or otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.

15.9.4 The size of the energy label is to be chosen according to the following criteria—

- (a) The energy label is to be contained in a blank border, the width of which must be at least 2 mm. The energy label must not cover more than 50% of the surface area of the largest side of the product packaging.
- (b) The largest energy label is to be first chosen and checked whether it complies with all the requirements in clause 15.9.4(a). If those requirements cannot be met, then the second largest energy label (in the descending order of 90%, 80%, 70%, 60% (by length) of the largest energy label) is to be chosen. 60% (by length) of the largest energy label is the minimum size to be used. This selection process is to be repeated until an appropriate energy label is chosen.
- (c) Where the product packaging is too small to accommodate the smallest energy label specified in this clause, the specified person of the product is to apply for the Director's directions on the manner of displaying the energy label on the packaging.

15.9.5 When the products are already procured, manufactured or imported before the commencement date, necessary supporting documents shall be provided to prove that identifications such as batch number, serial number, etc. on the products can clearly indicate the date of import.

15.10 Compliance

15.10.1 During the compliance monitoring testing carried out by the Director, a listed model of LED lamp will be accepted as conformance if the test results of the listed model meet the following criteria:

(Note: The minimum number of samples and the determination of test results are shown in Table 15.2 and 15.3 respectively.)

- (a) The initial luminous flux of each individual LED lamp in the measured sample shall not be less than the rated luminous flux by more than 10%. The average of the measured initial luminous flux of all tested lamps shall not be less than the rated luminous flux by more than 7.5%.
- (b) The initial power consumed by each individual LED lamp in the measured sample shall not exceed the rated power by more than 10%. The average of the measured initial power consumption of all tested lamps shall not exceed the rated power by more than 7.5%.
- (c) The average of the measured initial standby power consumption shall be no more than 0.5W in standby mode.
- (d) The colour rendering index of each individual LED lamp in the measured sample shall not be less 80 in the initial measurement and at the end of 6 000 hours.
- (e) The spread of chromaticity of each individual LED lamp in the measured sample shall fall within a 6-step MacAdam ellipse in the initial measurement and at the end of 6 000 hours.
- (f) For rated power that is greater than 2W and less than or equal to 5W, the average displacement factor shall not be less than 0.4; for rated power that is greater than 5W and less than or equal to 25W, the average displacement factor shall not be less than 0.7; for rated power that is greater than 25W, the average displacement factor shall not be less than 0.9.
- (g) For rated lamp life that is greater than or equal to 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to 15 000 cycles; for rated lamp life that is less than 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to half the rated lamp life in hours.
- (h) The average measured lumen maintenance at the end of 6 000 hours shall not be less than 80%.

- (i) The measured lamp survival factor at the end of 6 000 hours shall not be less than 90%.
- (j) The energy efficiency grade calculated in the compliance monitoring testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person.

15.10.2 The Director may remove from the record the reference number of a listed model of LED lamp, if he has reasonable grounds to believe that the LED lamp does not conform with the specified information or a specified document or their updates submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in clause 15.10.1 above and apply for further testing of the concerned model for the Director's consideration.

15.10.3 If further testing is approved to be carried out, the number of samples of the same model as indicated in Table 15.2 of the Code shall be tested at the specified person's own costs and the determination of test results as indicated in Table 15.3 shall be followed. A listed model of LED lamp will be accepted as conformance if the results of further testing meet the following criteria:

- (a) The initial luminous flux of each individual LED lamp in the measured sample shall not be less than the rated luminous flux by more than 10%. The average of the measured initial luminous flux of all tested lamps shall not be less than the rated luminous flux by more than 7.5%.
- (b) The initial power consumed by each individual LED lamp in the measured sample shall not exceed the rated power by more than 10%. The average of the measured initial power consumption of all tested lamps shall not exceed the rated power by more than 7.5%.
- (c) The average of the measured initial standby power consumption shall be no more than 0.5W in standby mode.

- (d) The colour rendering index of each individual LED lamp in the measured sample shall not be less 80 in the initial measurement and at the end of 6 000 hours.
- (e) The spread of chromaticity of each individual LED lamp in the measured sample shall fall within a 6-step MacAdam ellipse in the initial measurement and at the end of 6 000 hours.
- (f) For rated power that is greater than 2W and less than or equal to 5W, the average displacement factor shall not be less than 0.4; for rated power that is greater than 5W and less than or equal to 25W, the average displacement factor shall not be less than 0.7; for rated power that is greater than 25W, the average displacement factor shall not be less than 0.9.
- (g) For rated lamp life that is greater than or equal to 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to 15 000 cycles; for rated lamp life that is less than 30 000 hours, the number of switching cycles of individual tested LED lamp shall be greater than or equal to half the rated lamp life in hours.
- (h) The average measured lumen maintenance at the end of 6 000 hours shall not be less than 80%.
- (i) The average measured lamp survival factor at the end of 6 000 hours shall not be less than 90%.
- (j) The energy efficiency grade calculated in the further testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person.

Example for Calculating the Energy Efficiency Grade for**Light Emitting Diode (LED) Lamp**

Rated power input..... 2W
 Rated luminous flux..... 180 lm
 Rated lamp life..... 25 000 hours

Measurements taken after stabilisation of the lamps:

Power input.....1.43 W
 Standby power consumption0.3W ($\leq 0.5W$)
 Luminous flux.....199 lm
 Lumen maintenance at 6 000 hours 91% ($\geq 80\%$)
 Lamp survival factor at 6 000 hours100% ($\geq 90\%$)
 Colour consistency.....4 (≤ 6)
 Colour rendering index.....83 (≥ 80)
 Displacement factor.....0.64 (≥ 0.4 for $2W < \text{Rated Power} \leq 5W$)
 Number of switching cycles12 500 cycles (\geq half the rated lamp life in hours)

Measured Luminous Efficacy
 (E_m)

$$= \frac{\text{Measured luminous flux}}{\text{Measured power input}}$$

$$= 199 / 1.43$$

$$= 139 \text{ lm/W}$$

Rated Luminous Efficacy
 (E_r)

$$= \frac{\text{Rated luminous flux}}{\text{Rated power input}}$$

$$= 180 / 2$$

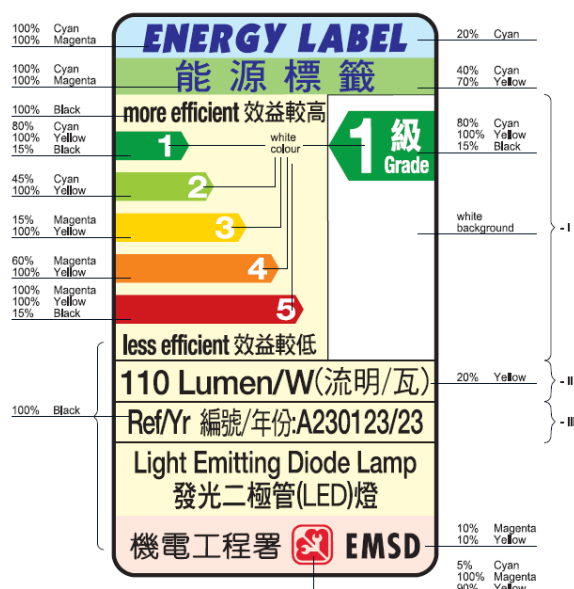
$$= 90 \text{ lm/W}$$

Since the $E_m > E_r$, the E_r (90 lm/W) is used to determine the energy efficiency grade.

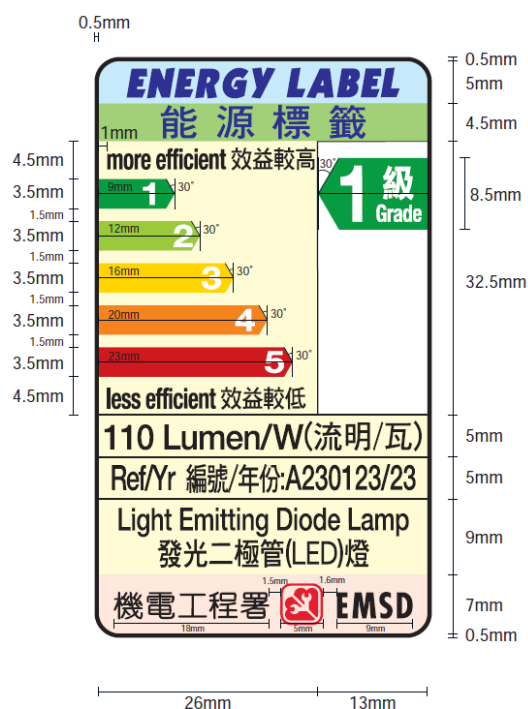
According to Table 15.1 in clause 15 of the Code, the LED lamp is rated as **Grade 2**.

Specification of Energy Label

- (1) The colour and design of the energy label must be as specified in the diagram below—



- (2) The dimensions of the energy label must be as specified in the diagram below—



Actual Size : 40mm(W) x 69mm(H)

- (3) The energy label under clause 1 of Appendix 9B is divided into 3 rectangular areas (marked I, II and III by the side of the label). The information to be contained in each area of the energy label is specified in column 2 of the following Table in relation to the area specified opposite to that information in column 1 of the Table.

<u>Area</u>	<u>Information to be contained</u>
I	The energy efficiency grading of the model, calculated in accordance with the Code. The head of the arrow containing the energy efficiency grade number is to be placed at the same level and has the same colour as the head of the relevant arrow on the left.
II	The lumen per watt, which is the lamp lumen efficacy calculated by computing the ratio of the measured lamp luminous flux and the lamp electrical power input, and determined in accordance with the Code.
III	The reference number assigned by the Director and the year in which the reference number is assigned or, where the energy efficiency grading is calculated in accordance with the new calculation method under section 12 of the Ordinance, the year in which the new calculation method takes effect.

- (4) The specifications for the font size of the words printed on the largest energy label are as follows —

<u>Description on the Energy Label</u>	<u>Font and font size</u>
ENERGY LABEL	13 point Italic Kabel Ult BT (English)
能源標籤	12.5 point DFHeiBold (Chinese)
more efficient 效益較高	9.6 point Helvetica Neue Bold (English)
less efficient 效益較低	9.1 point DFHeiBold (Chinese)

<u>Description on the Energy Label</u>	<u>Font and font size</u>
Grade on the left (1, 2, 3, 4, 5)	10.6 point Helvetica Neue Bold (English)
Grade on the right —	
The word “Grade”	8 point Helvetica Neue Bold Condensed (English)
The figure “1”	27 point Helvetica Neue Bold (English)
The word “級”	14 point DFHeiBold (Chinese)
Lumen/W (流明/瓦)	11.8 point Helvetica Neue Medium (English) 10.8 point DFHeiBold (Chinese)
Figure of lumen/W	11.8 point Helvetica Neue Medium (English)
Ref/Yr 編號/年份：	11.8 point Helvetica Neue Medium (English) 10.8 point DFHeiBold (Chinese)
Characters of reference number and year	11.8 point Helvetica Neue Medium (English)
Light Emitting Diode Lamp 發光二極管燈 (LED)	10.65 point Helvetica Neue Medium (English) 10.65 point DFHeiBold (Chinese) 10.65 point Helvetica Neue Medium (English)
機電工程署 EMSD and its logo	10.4 point Monotype Yuen (Chinese) 11.6 point Futura Bold Condensed (English)

Chapter 3

Energy Efficiency Labelling for Gas Cookers

16. Energy Efficiency Labelling for Gas Cookers

16.1. Scope

16.1.1. Clause 16 of the Code, unless the Director provides otherwise, applies to a gas cooker defined in the Ordinance, that is, the products specifies in clause 16.1.2.

16.1.2. “Gas cooker”, means a product —

- (a) that is a gas appliance with pan supports for which the pans being heated are in direct contact with the flames;
- (b) that is a domestic gas appliance which is a fixed installation in premises designed for indoor application; and
- (c) that—
 - (i) burns gas as defined in the Gas Safety Ordinance (Cap. 51);
 - (ii) has a rated heat input not exceeding 7kW for each burner; and
 - (iii) is either table-top type or built-in type.

16.2. Definitions

This clause provides definitions of terms used in clause 16 of the Code. Unless otherwise specified, the definitions adopted in clause 16 follow those stipulated in the Ordinance, if any.

built-in type gas cooker means a gas cooker that is designed to be installed in a recess of cooking cabinet.

burner means a component which effects the gas/air mixing and ensures the gas combustion.

GB means China National Standard or Guobiao standard.

GB30720 means China National Standard GB30720-2014, Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Domestic Gas Cooking Appliances.

<i>gross calorific value (GCV)</i>	means the quantity of heat produced by complete combustion of a unit volume or mass of gas, with the water produced by combustion assumed to be condensed.
<i>rated heat input</i>	means the heat input of a burner when operating independently, as determined and declared by the manufacturer or importer of the gas cooker in accordance with the standard and requirements specified in the Code.
<i>net calorific value (NCV)</i>	means the quantity of heat produced by complete combustion of a unit volume or mass of gas, with the water produced by combustion assumed to be in the vapour state.
<i>table-top type gas cooker</i>	means a gas cooker that is designed to rest on a cooking surface with a raised support or stand.
<i>thermal efficiency</i>	means the ratio of the heat delivered by a burner at a given time to the heat input to a burner.

16.3. Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with GB 30720 or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a gas cooker. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Heat input test for each burner (in which values shall be expressed in GCV); and
- (b) Thermal efficiency test for each burner (in which values shall be expressed in NCV).

16.4. Test Methodology and Energy Efficiency Grading

16.4.1. Test Conditions

In carrying out the tests as specified in clause 16.3 of the Code, the gas cooker shall be tested with the test gases for Hong Kong. Moreover, unless otherwise approved by the Director, the following conditions of the test gases shall be followed:

- (a) The composition of the reference gases for the testing is shown in Table 16.1. Tests are to be carried out with the reference gases at nominal pressure.

Table 16.1 – Composition of Reference Gases and Test Conditions

Reference Gases	Composition (% by Volume) (For reference only)	Wobbe Index (MJ/m ³) (GCV)	Nominal Pressure (kPa)
Town gas	H ₂ : 50.5%, CH ₄ : 29.2%, CO ₂ : 17.4%, CO: 1.2%, Air: 1.7%	24.65	1.5
Liquefied petroleum gas (LPG)	C ₃ H ₈ : 30%, C ₄ H ₁₀ : 70%	84.17	2.9

- (b) The Wobbe Index of the test gas adopted for testing shall be within a tolerance of $\pm 2\%$ as compared to the Wobbe Index of the reference gas.

16.4.2. Measurement of Heat Input

- (a) The heat input test of each burner shall be conducted in accordance with GB 30720 or other equivalent international standards approved by the Director.

16.4.3. Measurement of Thermal Efficiency

- (a) The thermal efficiency test shall be conducted in accordance with GB 30720 and the corresponding test pans used for the test shall satisfy the requirements and the size specification in Annex C of GB 30720, or other equivalent international standards approved by the Director.
- (b) Two test pans of different sizes, namely upper and lower limit pans, shall be selected by the measured heat input of the burner in accordance with GB 30720. The test shall be conducted with each test pan individually and the thermal efficiency is calculated as follows:

$$\eta = \frac{M \times c \times (t_2 - t_1)}{V \times Q} \times \frac{273 + t_g}{288} \times \frac{101.3}{p_{amb} + p_m - s} \times 100 \dots \dots (\text{eq. 1})$$

$$M = M_1 + 0.213M_2 \dots \dots (\text{eq. 2})$$

where

η = Measured thermal efficiency (%);

- M = The value calculated in (eq. 2): the sum of (a) mass of water added and (b) mass of the aluminium test pan (kg);
 c = Specific heat capacity of water,
i.e. $c = 4.19 \times 10^{-3} \text{ (MJ/(kg} \cdot \text{°C))}$;
 t_1 = Initial water temperature (°C);
 t_2 = Final water temperature (°C);
 V = Test gas consumed (m^3);
 Q = Thermal input (NCV) of the test gas at 15°C, 101.3kPa (MJ/m^3);
 t_g = Temperature of gas in the gas flow meter at the time of measurement (°C);
 p_{amb} = Atmospheric pressure at the time of measurement (kPa);
Static pressure on the gas flow meter at the time of measurement
 p_m = (kPa);
Saturated water vapour pressure at t_g (kPa); if a dry gas flow
 s = meter is used, s should be corrected by multiplying the relative humidity of the test gas;
 M_1 = Mass of the water added into the pan (kg); and
 M_2 = Mass of the aluminium test pan (including the cover and the stirrer) (kg);

By using the upper limit pan and the lower limit pan, the thermal efficiency of a burner is calculated as follows:

$$\eta = \eta_{lower} + \frac{q_{lower}^{-5.47}}{q_{lower} - q_{upper}} \times (\eta_{upper} - \eta_{lower}) \dots \dots \text{(eq. 3)}$$

where

- η = Thermal efficiency (%);
 η_{lower} = Measured thermal efficiency by using the lower limit pan (%);
 η_{upper} = Measured thermal efficiency by using the upper limit pan (%);
 q_{lower} = Thermal intensity* at the bottom of the lower limit pan (W/cm^2);
 q_{upper} = Thermal intensity* at the bottom of the upper limit pan (W/cm^2).
*Thermal intensity = measured power (W)/ area of the bottom of the test pan (cm^2)

The energy efficiency grading of a burner is determined by the thermal efficiency of the burner calculated in eq. 3.

The test report to be submitted shall contain relevant test data adopted and results obtained in accordance with eq. 1 to eq. 3 for illustrating the calculation of the measured thermal efficiency.

16.4.4. Energy Efficiency Grading

The energy efficiency grading of a gas cooker shall be determined as shown in Table 16.2, with Grade 1 having the best performance and Grade 5 having the worst performance.

Table 16.2 – Derivation of Energy Efficiency Grades

Gas Cooker Types	Thermal Efficiency (%)				
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Table-top	≥ 66	≥ 62	≥ 58	≥ 54	<54
Built-in	≥ 63	≥ 59	≥ 55	≥ 51	<51

Note:

For a gas cooker with two or more burners, the lowest energy efficiency grade among all burners is used to determine the overall energy efficiency grading.

16.5. Performance Requirements

16.5.1. In the test report submitted to the Director under section 6 of the Ordinance, the results of the tests carried out in accordance with GB 30720 or other equivalent international standards approved by the Director shall show that the concerned model conforms with the following performance requirements —

- (a) The measured heat input of each burner shall be neither less than 90% nor greater than 110% of the rated heat input of each burner; and
- (b) The thermal efficiency calculated shall meet the requirements as stipulated in clause 16.4.4.

16.6. Safety Requirements

In addition to the energy efficiency performance requirements, all gas cookers shall comply with the Gas Safety Ordinance (Cap. 51) and the latest version of other relevant codes of practice and guidance notes with respect to gas cookers.

16.7. Number of Samples to be Tested

16.7.1. For submission of product information of a model under section 6 of the Ordinance, a test report on one sample of the model shall be submitted.

16.8. Energy Label

16.8.1. The specification of the energy label for gas cooker is shown in Appendix 10B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed model showing the energy efficiency grade and associated information in accordance with the requirements in Appendix 10B.

16.8.2. (a) Subject to clause 16.8.2(c), the energy label is to be attached or affixed to a prominent position of the gas cooker and is to be clearly visible.

(b) To avoid doubt, if only part of the gas cooker is being exhibited, the energy label is to be attached or affixed to a prominent position of that part and is to be clearly visible.

(c) The energy label may be attached to the gas cooker or its packaging in a manner specified by the Director where the Director has approved its being so attached.

16.8.3. The energy label shall be of cardboard, if it is to be attached as a swing tag, or be self-adhesive and shall be cut to the outline shown in Appendix 10B or otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.

16.8.4. The paper used for the energy label shall be durable with good wear and tear characteristics.

16.8.5. When the products are already procured, manufactured or imported before the commencement date, necessary supporting documents shall be provided to prove that identifications such as batch number, serial number, etc. on the products can clearly indicate the date of import.

16.9. Compliance

16.9.1. During the compliance monitoring testing carried out by the Director, a listed model of gas cooker will be accepted as conformance if the test results of a single sample of the listed model meet the following criteria:

- (a) The tested heat input of each burner shall be neither less than 90% nor greater than 110% of the rated heat inputs of each burner.
- (b) The thermal efficiency calculated in the compliance monitoring testing shall be equal to or better than the requirements of thermal efficiency as stipulated in clause 16.4.4 for the respective grade determined by the specified person.

16.9.2. The Director may remove from the record the reference number of a listed model of gas cooker, if he has reasonable grounds to believe that the gas cooker does not conform with the specified information or a specified document or their updates, if any, submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in clause 16.9.1 above and apply for further testing of the concerned model for the Director's consideration.

16.9.3. If further testing is approved to be carried out, three samples of the same model shall be tested at the specified person's own costs. A listed model of gas cooker will be accepted as conformance if the results of all samples for further testing meet the following criteria:

- (a) The tested heat input of each burner shall be neither less than 90% nor greater than 110% of the rated heat input of each burner.
- (b) The thermal efficiency calculated in the compliance monitoring testing shall be equal to or better than the requirements of thermal efficiency as stipulated in clause 16.4.4 for the respective grade determined by the specified person.

(Remark: The specified person can choose to accept the results of further testing undertaken on fewer than three samples if the results of each sample subsequently tested also do not meet the acceptance criteria as stated above.)

Example for Calculating the Energy Efficiency Grade for Gas Cooker

The given gas cooker is of table-top type with two burners (left and right side).

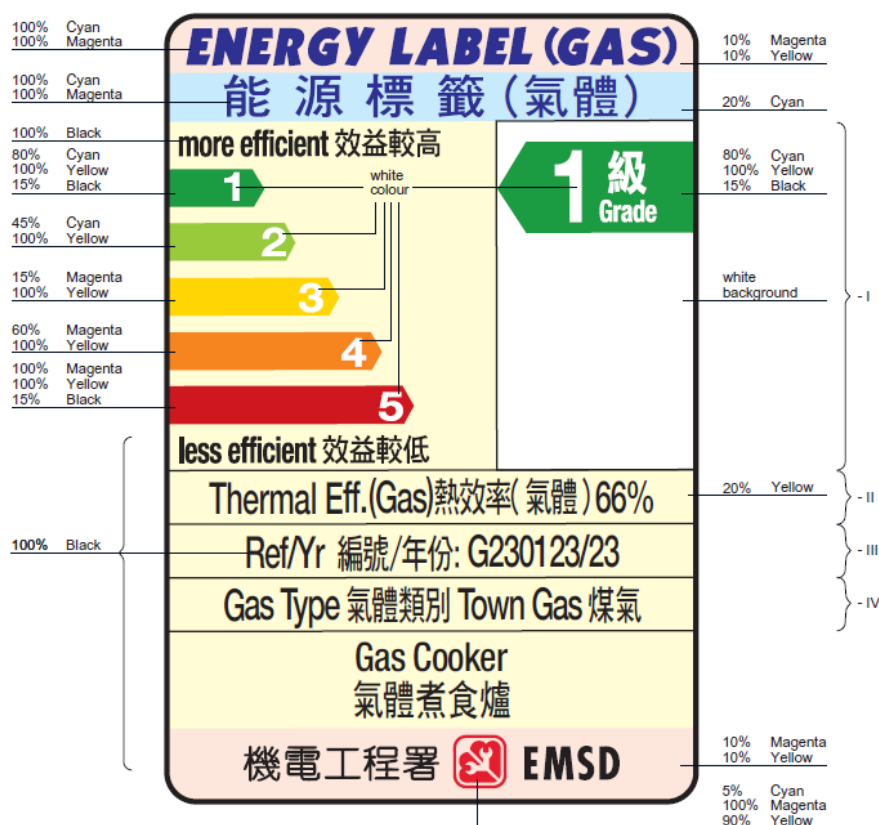
Rated heat input of left side burner (burner 1)	6 000W
Rated heat input of right side burner (burner 2)	6 000W
Measured heat input (burner 1)	5 980W
Measured heat input (burner 2)	6 120W
Measured thermal efficiency of burner 1	66.1%
Measured thermal efficiency of burner 2	63.2%

The measured heat input of the gas cooker is neither less than 90% nor greater than 110% of the rated heat input of each burner.

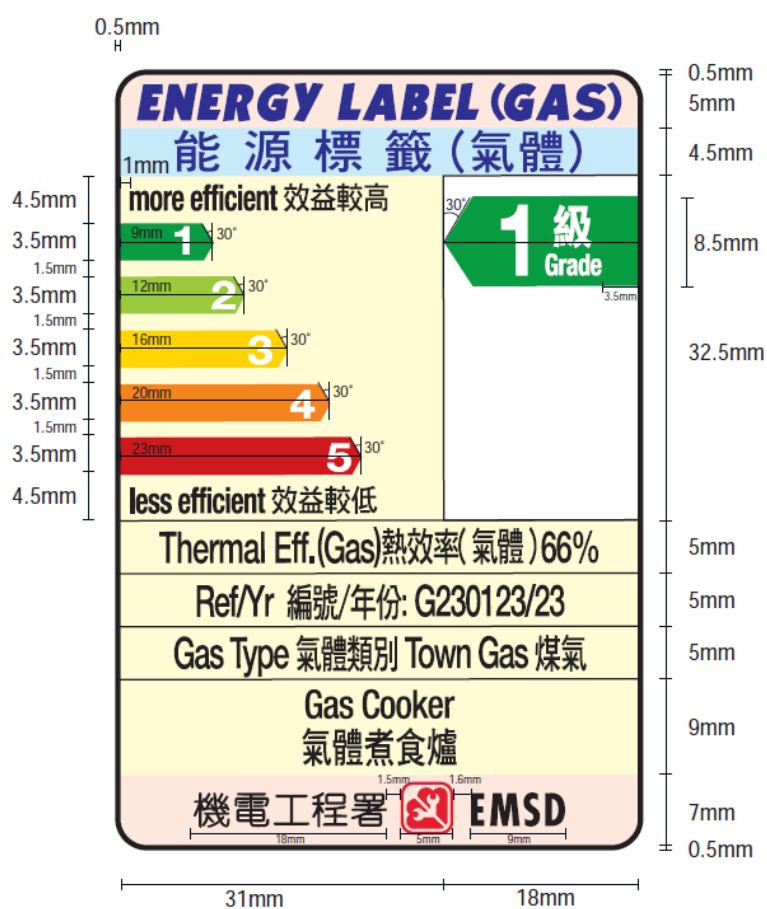
According to Table 16.2 in clause 16 of the Code, the measured thermal efficiency of burner 1 is rated as Grade 1 whereas the measured thermal efficiency of burner 2 is rated as Grade 2. Besides, for the gas cooker with two or more burners, the lowest energy efficiency grade among burners is used to determine the overall grading. According to the test results, the gas cooker is rated as Grade 2.

Specification of Energy Label

- (1) The colour and design of the energy label must be as specified in the diagram below—



(2) The dimensions of the energy label must be as specified in the diagram below—



Actual Size : 50mm(W) x 74mm(H)

- (3) The energy label under clause 1 of Appendix 10B is divided into 4 rectangular areas (marked I, II, III and IV by the side of the label). The information to be contained in each area of the energy label is specified in column 2 of the following Table in relation to the area specified opposite to that information in column 1 of the Table.

<u>Area</u>	<u>Information to be contained</u>
I	The energy efficiency grading of the model, calculated in accordance with the Code. The head of the arrow containing the energy efficiency grade number is to be placed at the same level and has the same colour as the head of the relevant arrow on the left.
II	The thermal efficiency, calculated by computing the ratio of the heat generated at a given time to the measured heat input, and determined in accordance with the Code.
III	The reference number assigned by the Director and the year in which the reference number is assigned or, where the energy efficiency grading is calculated in accordance with the new calculation method under Section 12 of the Ordinance, the year in which the new calculation method takes effect.
IV	The type of gas burnt by the model.

- (4) The specifications for the font size of the words printed on the largest energy label are as follows —

<u>Description on the Energy Label</u>	<u>Font and font size</u>
ENERGY LABEL (GAS)	13 point Italic Kabel Ult BT (English)
能源標籤 (氣體)	12.5 point DFHeibold (Chinese)
more efficient 效益較高	9.6 point Helvetica Neue Bold (English)
less efficient 效益較低	9.1 point DFHeiBold (Chinese)
Grade on the left (1, 2, 3, 4, 5)	10.6 point Helvetica Neue Bold (English)

<u>Description on the Energy Label</u>	<u>Font and font size</u>
Grade on the right – The word “Grade”	8 point Helvetica Neue Bold Condensed (English)
The figure “1” The word “級”	27 point Helvetica Neue Bold (English) 14 point DFHeiBold (Chinese)
Thermal Eff. (Gas) 熱效率 (氣體)	11.8 point Helvetica Neue Medium (English) 10.8 point DFHeiBold (Chinese)
Figure of thermal efficiency and the sign “%”	11.8 point Helvetica Neue Medium (English)
Ref/Yr 編號/年份： Characters of reference number and year	11.8 point Helvetica Neue Medium (English) 10.8 point DFHeiBold (Chinese) 11.8 point Helvetica Neue Medium (English)
Gas Type 氣體類別	11.8 point Helvetica Neue Medium (English) 10.8 point DFHeiBold (Chinese)
Gas Cooker 氣體煮食爐	10.65 point Helvetica Neue Medium (English) 10.65 point DFHeiBold (Chinese)
機電工程署 EMSD and its logo	10.4 point Monotype Yuen (Chinese) 11.6 point Futura Bold Condensed (English)

Chapter 4

Energy Efficiency Labelling for Gas Instantaneous Water Heaters

17. Energy Efficiency Labelling for Gas Instantaneous Water Heaters

17.1. Scope

17.1.1. Clause 17 of the Code, unless the Director provides otherwise, applies to a gas instantaneous water heater defined in the Ordinance, that is, the products specified in clauses 17.1.2 and 17.1.3.

17.1.2. “Gas instantaneous water heater”, subject to clause 17.1.3 of the Code, means a product—

- (a) that is an appliance having a mechanism capable of opening and closing the gas passage relating to water supply, and heating water during passing of water through a heat exchanger by combustion of gas;
- (b) that is a domestic appliance which is a fixed installation in premises designed for indoor application; and
- (c) that—
 - (i) burns gas as defined in the Gas Safety Ordinance (Cap.51); and
 - (ii) has a rated heat input not exceeding 70kW.

17.1.3. “Gas instantaneous water heater” does not include storage type gas water heater.

17.2. Definitions

This clause provides definitions of terms used in clause 17 of the Code. Unless otherwise specified, the definitions adopted in clause 17 follow those stipulated in the Ordinance, if any;

GB means China National Standard or Guobiao standard.

GB20665 means China National Standard GB20665-2015, Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Domestic Gas Instantaneous Water Heaters and Gas Fired Heating and Hot Water Combi-boilers.

gross calorific value (GCV) means the quantity of heat produced by complete combustion of a unit volume or mass of gas, with the water produced by combustion assumed to be condensed.

net calorific value (NCV) means the quantity of heat produced by complete combustion of a unit volume or mass of gas, with the water produced by combustion assumed to be in the vapour state.

rated heat input means the heat input of a burner when operating independently, as determined and declared by the manufacturer or importer of the gas cooker in accordance with the standard and requirements specified in the Code.

thermal efficiency means the ratio of the heat delivered by a heater at a given time to the heat input to a heater.

17.3. Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with GB 20665 or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a gas instantaneous water heater. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Heat input test (in which values shall be expressed in GCV); and
- (b) Thermal efficiency test (in which values shall be expressed in NCV).

17.4. Test Methodology and Energy Efficiency Grading

17.4.1. The conditions of the test gases shall be as follows:

In carrying out the tests as specified in clause 17.3 of the Code, the gas instantaneous water heater shall be tested with the test gases for Hong Kong. Moreover, unless otherwise approved by the Director, the following conditions of the test gases shall be followed:

- (a) The composition of the reference gases for the testing is shown in Table 17.1. Tests are to be carried out with the reference gases at nominal pressure:

Table 17.1 – Composition of Reference Gases and Test Conditions

Reference Gases	Composition (% by Volume) (For reference only)	Wobbe Index (MJ/m ³) (GCV)	Nominal Pressure (kPa)
Town gas	H ₂ :50.5%, CH ₄ : 29.2%, CO ₂ : 17.4%, CO: 1.2%, Air: 1.7%	24.65	1.5
Liquefied petroleum gas (LPG)	C ₃ H ₈ : 30%, C ₄ H ₁₀ : 70%	84.17	2.9

- (b) The Wobbe Index of the test gas adopted for testing shall be within a tolerance of $\pm 2\%$ as compared to the Wobbe Index of the reference gas.

17.4.2. Measurement of Heat Input

- (a) The heat input test shall be conducted in accordance with GB 20665 or other equivalent international standards approved by the Director.

17.4.3. Measurement of Thermal Efficiency

- (a) The thermal efficiency test shall be conducted in accordance with GB 20665 or other equivalent international standards approved by the Director. The test shall be conducted at 100% load and 50% load condition and be calculated as follows:

$$\eta = \frac{M \times c \times (t_{w2} - t_{w1})}{V \times Q} \times \frac{273 + t_g}{273} \times \frac{101.3}{P_{amb} + P_g - S} \times 100 \dots \dots (\text{eq. 1})$$

where

- η = Thermal efficiency (%);
 c = Specific heat capacity of water,
i.e. $c = 4.19 \times 10^{-3} \text{ (MJ/(kg} \cdot ^\circ\text{C))}$;
 M = Flow rate of hot water (kg/min);
 t_{w2} = Temperature of water outlet ($^\circ\text{C}$);
 t_{w1} = Temperature of water inlet ($^\circ\text{C}$);
 Q = Thermal input (NCV) of the test gas (MJ/m³);
 V = Flow rate of the test gas (m³/min);

- t_g = Temperature of gas in the gas flow meter at the time of measurement (°C);
 p_{amb} = Atmospheric pressure during testing (kPa);
 P_g = Gas pressure measured by the gas flow meter during testing (kPa);
 and
 Saturated water vapour pressure at t_g (kPa); if a dry gas flow meter
 S = is used, s should be adjusted by multiplying the relative humidity of the test gas;

The test report to be submitted shall contain relevant test data adopted and results obtained in accordance with eq. 1 for illustrating the calculation of the measured thermal efficiency.

17.4.4. Energy Efficiency Grading

The energy efficiency grading of a gas instantaneous water heater shall be determined as shown in Table 17.2, with Grade 1 having the best performance and Grade 5 having the worst performance.

Table 17.2 – Derivation of Energy Efficiency Grades

Thermal Efficiency (%)		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Measured at 100% load and 50% load: η_1 : Thermal efficiency of higher value (either at 100% load or 50% load)	η_1	≥ 92	≥ 89	≥ 86	≥ 83	< 83
η_2 : Thermal efficiency of lower value (either at 100% load or 50% load)	η_2	≥ 88	≥ 85	≥ 82	≥ 79	< 79

Notes:

- When both η_1 and η_2 attain the same grade, the same energy efficiency grading of a gas instantaneous water heater will be assigned correspondingly.
- When η_1 and η_2 attain different grades, the lower energy efficiency grading of a gas instantaneous water heater will be assigned correspondingly.

17.5. Performance Requirements

17.5.1. In the test report submitted to the Director under section 6 of the Ordinance, the results of the tests carried out in accordance with GB 20665 or other equivalent international standards approved by the Director shall show that the concerned model conforms with the following performance requirements—

- (a) The measured heat input shall be neither less than 90% nor greater than 110% of the rated heat input of the heater.
- (b) The thermal efficiency calculated shall meet the requirements as stipulated in clause 17.4.4 of the Code.

17.6. Safety Requirements

In addition to the energy efficiency performance requirements, all gas instantaneous water heaters shall comply with the Gas Safety Ordinance (Cap. 51) and the latest version of other relevant codes of practice and guidance notes with respect to gas instantaneous water heaters.

17.7. Number of Samples to be Tested

17.7.1. For submission of product information of a model under section 6 of the Ordinance, a test report on one sample of the model shall be submitted.

17.8. Energy Label

17.8.1. The specification of the energy label for gas instantaneous water heater is shown in Appendix 11B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed model showing the energy efficiency grade and associated information in accordance with the requirements in Appendix 11B.

- 17.8.2. (a) Subject to clause 17.8.2(c), the energy label is to be attached or affixed to a prominent position of the gas instantaneous water heater and is to be clearly visible.
- (b) To avoid doubt, if only part of the gas instantaneous water heater is being exhibited, the energy label is to be attached or affixed to a prominent position of that part and is to be clearly visible.
- (c) The energy label may be attached to the gas instantaneous water heater or its packaging in a manner specified by the Director where the Director has approved

its being so attached.

- 17.8.3. The energy label shall be of cardboard, if it is to be attached as a swing tag, or be self-adhesive and shall be cut to the outline shown in Appendix 11B or otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.
- 17.8.4. The paper used for the energy label shall be durable with good wear and tear characteristics.
- 17.8.5. When the products are already procured, manufactured or imported before the commencement date, necessary supporting documents shall be provided to prove that identifications such as batch number, serial number, etc. on the products can clearly indicate the date of import.

17.9. Compliance

- 17.9.1. During the compliance monitoring testing carried out by the Director, a listed model of gas instantaneous water heater will be accepted as conformance if the test results of a single sample of the listed model meet the following criteria:
 - (a) The tested heat input shall be neither less than 90% nor greater than 110% of the rated heat input.
 - (b) The thermal efficiency calculated in the compliance monitoring testing shall be equal to or better than the requirements of thermal efficiency as stipulated in clause 17.4.4 for the respective grade determined by the specified person.
- 17.9.2. The Director may remove from the record the reference number of a listed model of gas instantaneous water heater, if he has reasonable grounds to believe that the gas instantaneous water heater does not conform with the specified information or a specified document or their updates, if any, submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in clause 17.9.1 above and apply for further testing of the concerned model for the Director's consideration.
- 17.9.3. If further testing is approved to be carried out, three samples of the same model shall be tested at the specified person's own costs. A listed model of gas instantaneous water heater will be accepted as conformance if the results of all samples for further testing meet the following criteria:
 - (a) The tested heat input shall be neither less than 90% nor greater than 110% of the rated heat input of the heater.

- (b) The thermal efficiency calculated in the compliance monitoring testing shall be equal to or better than the requirements of thermal efficiency as stipulated in clause 17.4.4 for the respective grade determined by the participant.

(Remark: The specified person can choose to accept the results of further testing undertaken on fewer than three samples if the results of each sample subsequently tested also do not meet the acceptance criteria as stated above.)

Example for Calculating the Energy Efficiency Grade for Gas Instantaneous Water Heater

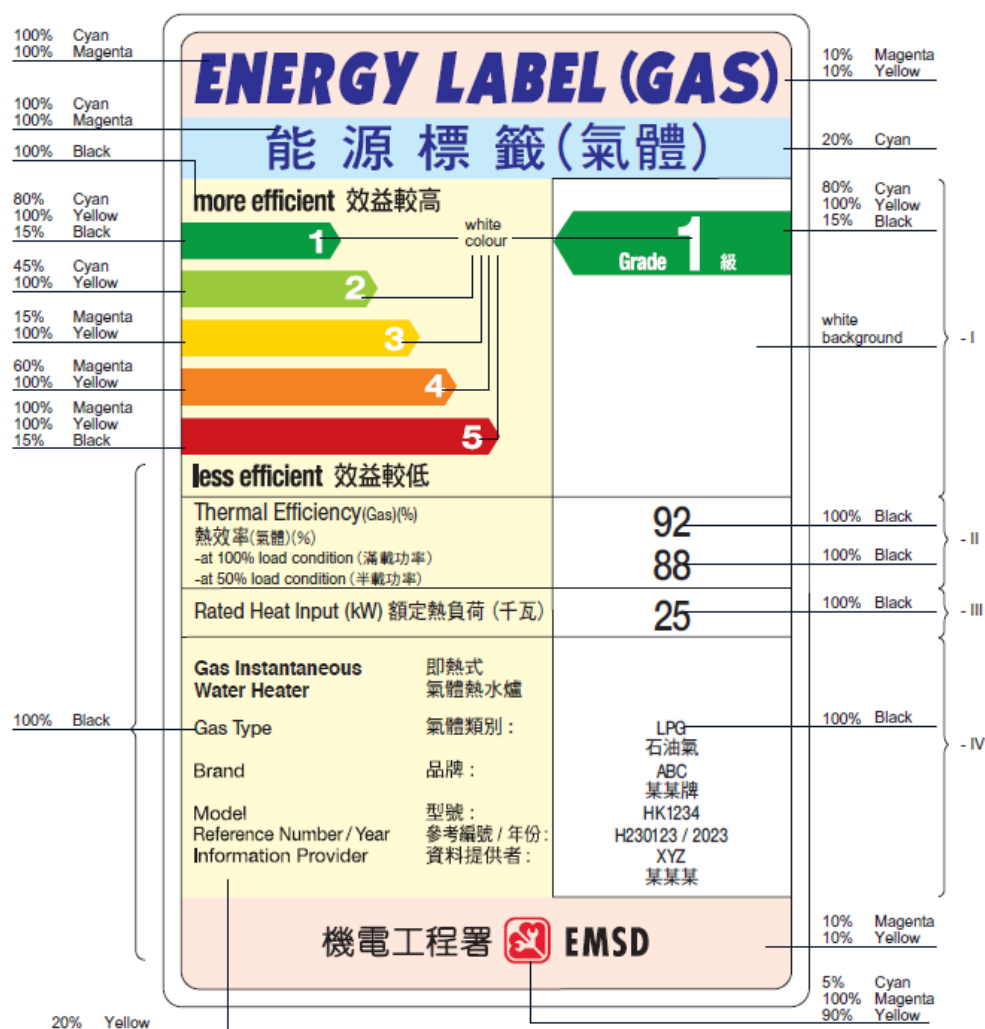
Rated heat input	26 700W
Measured heat input	29 000W
Measured thermal efficiency at 100% load	90.32%
Measured thermal efficiency at 50% load	94.92%

The measured heat input of the gas instantaneous water heater is neither less than 90% nor greater than 110% of the rated heat input of the heater.

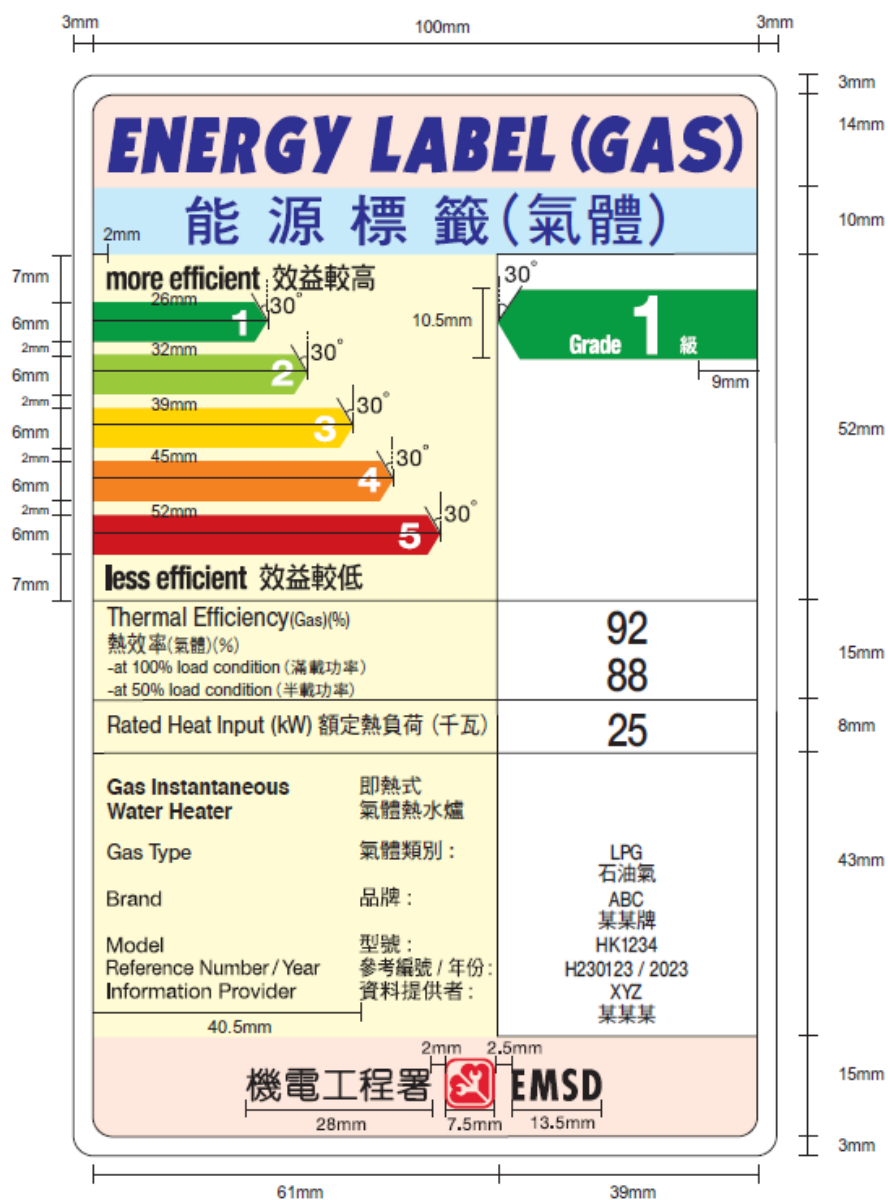
According to Table 17.2 in clause 17 of the Code, the measured thermal efficiency at 50% load is of a higher value than the measured thermal efficiency at 100% load. Therefore, the measured thermal efficiency at 50% load would be regarded as η_1 and rated as Grade 1, whereas the measured thermal efficiency at 100% load would be regarded as η_2 and rated as Grade 1. When η_1 and η_2 attain the same grade, the same energy efficiency grading of a gas instantaneous water heater will be assigned correspondingly. According to the test results, the gas instantaneous water heater is rated as Grade 1.

Specification of Energy Label

- (1) The colour and design of the energy label must be as specified in the diagram below –



(2) The dimensions of the energy label must be as specified in the diagram below—



Actual Size : 106mm(W) x 163mm(H)

- (3) The energy label under clause 1 of Appendix 11B is divided into 4 rectangular areas (marked I, II, III and IV by the side of the label). The information to be contained in each area of the energy label is specified in column 2 of the following Table in relation to the area specified opposite to that information in column 1 of the Table.

<u>Area</u>	<u>Information to be contained</u>
I	The energy efficiency grading of the model, calculated in accordance with the Code. The head of the arrow containing the energy efficiency grade number is to be placed at the same level and has the same colour as the head of the relevant arrow on the left.
II	The thermal efficiencies, calculated by computing the ratio of the heat generated at a given time to the measured heat input at 100% load condition and 50% load condition, and determined in accordance with the Code.
III	The rated heat input, which is as determined and declared by the manufacturer or importer of the gas instantaneous water heater in accordance with the standard and requirements specified in the Code.
IV	The type of gas burnt by the model, brand name, the product model, the reference number assigned by the Director, the year in which the reference number is assigned or, where the energy efficiency grading is calculated in accordance with the new calculation method under section 12 of the Ordinance, the year in which the new calculation method takes effect and the name of the information provider. The information provider is the specified person who submitted the specified information to the Director.

- (4) The specifications for the font size of the words printed on the energy label are as follows—

<u>Description on the Energy Label</u>	<u>Font and font size</u>
ENERGY LABEL (GAS)	31 point Italic Kabel Ult BT (English)
能源標籤 (氣體)	24 point DFHeibold (Chinese)

<u>Description on the Energy Label</u>	<u>Font and font size</u>
more efficient 效益較高	14 point Helvetica Neue Bold (English)
less efficient 效益較低	14 point DFHeiBold (Chinese)
Grade on the left (1, 2, 3, 4, 5)	15 point Helvetica Neue Bold (English)
Grade on the right – The word “Grade”	11 point Helvetica Neue Bold Condensed (English)
The figure “1”	35.5 point Helvetica Neue Bold (English)
The word “級”	9.5 point DFHeiBold (Chinese)
Thermal Efficiency (Gas) (%) 熱效率(氣體)(%)	11.5 (8) point Helvetica Roman (English) 10 (8) point DFHeiMedium (Chinese)
- at 100% load condition (滿載功率)	7 point Helvetica Roman (English) 7 point DFHeiMedium (Chinese)
- at 50% load condition (半載功率)	7 point Helvetica Roman (English) 7 point DFHeiMedium (Chinese)
Rated Heat Input (kW) 額定熱負荷(千瓦)	10 point Helvetica Roman (English) 10 point DFHeiMedium (Chinese)
Figures of thermal efficiency and rated heat input on the right	20 point Helvetica Medium
Gas Instantaneous Water Heater 即熱式氣體熱水爐	9 point Helvetica Bold (English) 9 point DFHeiMedium (Chinese)
Gas Type Brand Model Reference Number/Year Information Provider	} 9 point Helvetica Roman (English)

<u>Description on the Energy Label</u>	<u>Font and font size</u>
氣體類別： 品牌： 型號： 參考編號/年份： 資料提供者：	9 point DFHeiMedium (Chinese)
Characters of gas type, brand, model, reference number, year and information provider on the right	9 point Helvetica Roman (English) 7.5 point DFHeiMedium (Chinese)
機電工程署 EMSD and its logo	16 point Monotype Yuen (Chinese) 17.9 point Futura Bold Condensed (English)

Energy Efficiency  **EMSD**

Energy Efficiency Office
Electrical and Mechanical Services Department
3 Kai Shing Street, Kowloon, Hong Kong
Tel: (852) 2808 3867 Fax: (852) 2890 6081
Website: www.emsd.gov.hk
Email: meels_review@emsd.gov.hk



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