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GUIDE ON MINIMUM ENERGY PERFORMANCE STANDARD (MEPS) REQUIREMENTS FOR REFRIGERATOR

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Contents

**GUIDE ON MINIMUM ENERGY PERFORMANCE STANDARD (MEPS)
REQUIREMENTS FOR REFRIGERATOR**

1.0 Scope

This guide specifies the minimum energy performance standards (MEPS) requirements for household refrigerating appliances with one door or two door (Refer to figure 1) that can be connected to mains power and which are within the scope of MS IEC 62552-1 or identical.

Figure1: Type of Refrigerator regulated
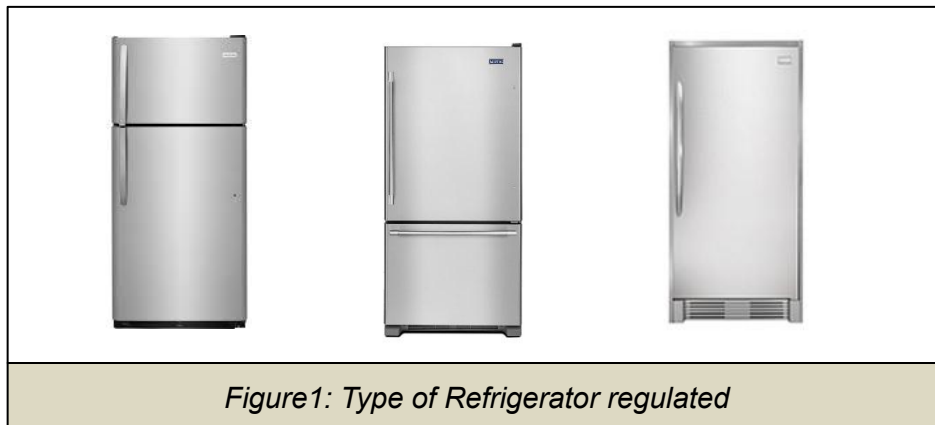
The following products are excluded from MEPS requirements:

a) mini bar / mini refrigerator which have a total volume of less than 60 L;

b) products that are designed exclusively for use in vehicles (e.g. mobile homes, campervans and/or rail cars) or boats and which have a total volume of less than 60 L;

c) portable products that have a volume of less than 30 L;

d) products that have a volume of less than 30 L where the refrigeration function is secondary (e.g. boiling or cooled water dispensers);

e) products that have no options for connection to a 230 V to 400 V 50 Hz mains electricity supply;

f) products that cool using technologies other than the vapour compression cycle; and

g) products that are designed exclusively for built-in in house.

h) French door/side by side door/More than 2-door refrigerator

This guide does not specify the procedure for Certificate of Approval (COA) application and safety requirements. For COA application procedure and information, please visit to Energy Commission website at www.st.gov.my.

2.0 Testing Standard

The refrigerator must be tested according to the testing standards specified below.

a) MS IEC 62552-1:2016, Household Refrigerating Appliances - Characteristics and Test Methods – Part 1: General Requirements (Second Revision) (IEC 62552-1:2015, IDT)

b) MS IEC 62552-2:2016, Household Refrigerating Appliances - Characteristics and Test Methods – Part 2: Performance Requirements (Second Revision) (IEC 62552-3:2015, IDT)

c) MS IEC 62552-3:2016, Household Refrigerating Appliances - Characteristics and Test Methods – Part 3: Energy Consumption and Volumes (Second Revision) (IEC 62552-3:2015, IDT)

3.0 Terms and definitions

For the purposes of this guide, terms and definitions mentioned in MS IEC 62552-1, and MS IEC 62552-3 as well as the following terms applies.

3.1 Energy efficiency factor (EEF)
Energy efficiency factor is a ratio between adjusted volume in litres and energy consumption per day in kWh obtained using the test method as in MS IEC 62552-1 and MS IEC 62552-3.

3.2 EEFAverage
EEFAverage is energy efficiency factor that is determined through local market survey.

3.3 Minimum energy performance standards (MEPS)
The minimum level of energy efficiency which must be met by each individual unit of a refrigerator.

3.4 Star rating
The number of stars display on the energy label. Available stars are between a minimum of one and a maximum of five. The star rating is calculated from the star rating index.

3.5 Star rating index (SRI)

An indication of the claimed energy efficiency of a model. A higher SRI indicates higher energy efficiency. It is derived from the energy efficiency factor (EEF).

4.0 Measuring condition

4.1 General

The energy consumption shall be determined by interpolation from the results of two tests: one giving a temperature warmer than, and the other a temperature colder than, the target temperature as in accordance with MS IEC 62552- 3

4.2 Electricity Supply

The refrigerating appliance shall be tested at the 230V, 50Hz.

4.3 Ambient Temperature and Humidity

Ambient temperature of 32 ⁰C. With humidity less than 65%

4.4 Specified auxiliaries

This value is determined by ambient controlled anti-condensation heaters only. Probability for temperature and humidity data are shown in Table 1.

Table 1:Probability for temperature and humidity data – ambient controlled anti-condensation heater

Relative humidity	RH band mid-point	Probability at 16 ⁰C	Probability at 22 ⁰C	Probability at 32 ⁰C
0 to 10 %	5 %	0.0	0.0	0.0
10 to 20 %	15 %	0.0	0.0	0.0
20 to 30 %	25 %	0.8	0.4	0.0
30 to 40 %	35 %	3.3	3.4	0.3
40 to 50 %	45 %	6.4	10.7	2.1
50 to 60 %	55 %	8.0	14.2	7.8
60 to 70 %	65 %	5.8	9.0	11.3
70 to 80 %	75 %	2.5	3.9	6.3
80 to 90 %	85 %	0.8	0.9	1.8
90 to 100 %	95 %	0.0	0.0	0.3

4.5 Load processing efficiency

This value is determined by using equation (57) of Annex G of MS IEC62552-3. This value is determined at ambient temperature of 32 ⁰C only. A regional factor to scale

processing load used is 1.

4.6 Determination method for number of valid defrost and recovery period
Both option 1 and 2 of C.4 of MS IEC62552-3 can be used.

Note: In the case of major changes of the any component related to performance of the refrigerator i.e. compressor, evaporator, condenser, PCB Board, defrost heater etc. the refrigerator shall be tested again.

5.0 Star index

Star index is determined based on daily energy consumption obtained from test conducted in accordance with MS IEC 62552-1 and MS IEC 62552-3. The example calculation of Star Index value can be found in Annex A.

Star index is determined by the following equation:

$$Star\ Index = \left[\frac{EEF_{Tested}}{EEF_{Average}} - 1\right] \times 100\%$$

where energy efficiency factor is determined by the following equation:

$$EEF_{Tested} = \frac{V_{adjusted}\ (L)}{Energy\ consumptioned\ per\ day\ (kWh)}$$

$$EEF_{Average(1door)} = 1.114 \times V_{adjusted} + 79.87$$
$$EEF_{Average(2doors)} = 0.6402 \times V_{adjusted} + 64.45$$
$$Energy\ consumption\ per\ day = \frac{E_{Total}}{365}$$

where
$$E_{Total} = E_{daily32C} \times 365 + E_{aux} + \Delta E_{processing32C} \times 365.$$

The adjusted volume ($V_{adjusted}$) of a refrigerating appliance is calculated by summing the adjusted volume for each compartment as per equation below:

$$V_{adj} = \sum_{i=1}^{n} K_{ci} \times V_i$$

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where

n is number of compartments in the refrigerating appliance

V_i is volume of compartment i (litres)

K_{ci} is adjustment volume factor for compartment i as determined in accordance with the following equation.

$$K_{ci} = \frac{[T_{ka} - T_{ti}]}{[T_{ka} - T_{tff}]}$$

Where,

T_{ka} is the environment test temperature (set at + 32 ºC);

T_{ti} is the target temperature of compartment i (°C) from Table 2

T_{tff} is the target temperature of a fresh food compartment (4 °C)

The volume adjustment factor (K_{ci}) for each compartment type is specified in Table 2 below.

Table 2:Volume adjustment factor by compartment type

Compartment type	Target temperature (°C)	Volume adjustment factor (K_{ci})
Pantry	17	0.54
Wine storage	12	0.71
Cellar	12	0.71
Fresh food	4	1.00
Chill	2	1.07
Zero star	0	1.14
1 star	-6	1.36
2 star	-12	1.57
3 star and 4 star	-18	1.79

6.0 Star rating

The star rating shall be in accordance with Table 3.

Table 3:Star rating index value

Star rating	Star index value
5	+ 25 % ≤ Star index
4	+ 10 % ≤ Star index < + 25 %
3	- 10 % ≤ Star index < + 10 %

2	- 25 % ≤ Star index < - 10 %
1	- 35 % ≤ Star index < - 25 %

7.0 MEPS requirement

The MEPS requirement is 2-star.

8.0 Energy Efficiency Label

Based on Electricity Regulation 1994 (Amendments 2013) Regulation 101A (3)

"Any equipment that meets all the requirements of efficient use of electricity under sub regulation (1) shall be affixed with an efficiency rating label in such form and manner as may be determined by the Commission."

All manufacturers and importers, must affix the Energy Efficiency Label onto the products before it can be sold to the customer.

8.1 Information in the label

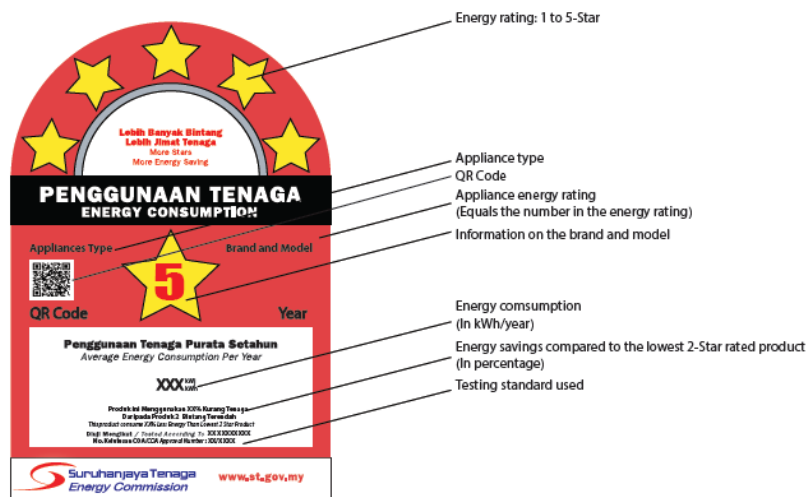Please refer to the picture below for the information that must be included in the MEPS label.

Figure 1:Information Required in the Label

8.2 Calculation Method

Annual Energy Consumption (kwh)= E_{Total} (Obtained From the Test Report)

Percentage of Energy Saving Compared to Lowest 2-Star=$100\%-(\dfrac{EEF_{Lowest\ 2\text{-}Star}}{EEF_{Tested}}\times100)$

Where

$EEF_{Lowest\ 2\text{-}Star}=0.7593V_{adjusted}+54.459$ (1-Door)
$EEF_{Lowest\ 2\text{-}Star}=0.4802V_{adjusted}+48.338$ (2-Door)
$EEF_{Testesd}$ can be obtained from the report.

8.3 Size Specification

Please refer to the picture below for the size specification

Figure 2: Size Specification

8.4 Font Specification

The font guide specified below is the minimum requirement. The font can be bigger proportionate to the label size but cannot be smaller.
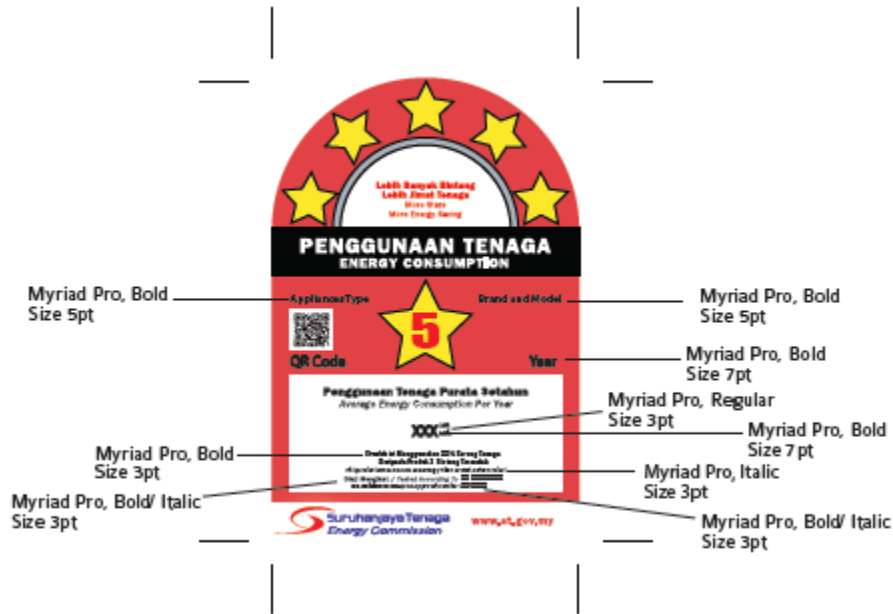
Figure 3:Font Specifications

8.5   Colour Specification

The label shall be printed according to the colour specifications as follow:

Figure 4:Color Specifications

8.6 Design for 2-Star Rating Until 5-Star Rating

Note: The softcopy of energy efficient label with AI format can be obtained from Energy Commission. Please send your request for the softcopy file to meps@st.gov.my.

8.7 QR Code Generation Guideline

Guide to generate QR code for ST COA product verification by Importer / Manufacturer

1.0 QR Code Details

1.1 Importer / Manufacturer can include the QR in the star rating sticker.

1.2 Consumer can scan the QR to check product certification information from ST.

2.0 QR content

2.1 The QR content consist of a link which will call to ST enquiry page to request for COA product information.

2.2   Parameters require to pass through in the link as below:

No.	Parameters	Data length	Remarks	Example
2.2.1	coa	18	COA No.	SJT161817103442019
2.2.2	roc	Refer to ROC	Company ROC. Without '-' or space	123456X
2.2.3	checksum	32	Please refer 2.4 for method to compute checksum.	46ed89b9c32a32cdb406426bc42b91e8

2.3   Example:

https://edik.st.gov.my/productenquiry.aspx?coa=SJT161817103442019&roc=123456X&checksum=46ed89b9c32a32cdb406426bc42b91e8

2.4   To compute checksum, please refer step as below:

2.4.1   Form a string by COA No. and ROC (without '-' or space)
Example: SJT161817103442019123456X

2.4.2   Hash the string by MD5
Example output: 9b9bfc138d5001f5501432bd57c8d7bb

2.5   Convert the link to QR code.

Example:

3.0   Product information enquiry

3.1   Once scan the QR code, the link will redirect to ST enquiry page. ST system will validate the COA no., ROC, and the checksum.

3.2   If all information is correct, the product certification information will be displayed on screen (browser).

3.3   Example COA info as below:

No.	Information	Example
1	No. COA *(COA No.)*	SJT161817103442019
2	Jenis Pemohonan *(Type of Application)*	MENGIMPORT
3	Nama Pengimport *(Importer Name)*	ABC SDN BHD
4	No. Daftar Syarikat *(ROC)*	123456-X
5	No. Permohonan *(Application No.)*	SJT1612019822671
6	Tarikh COA *(COA Date)*	10 - Jan - 2019
7	Tarikh Tamat *(COA Expiry Date)*	9 - Jan - 2020
8	Kategori Kelengkapan *(Equipment Category)*	KETTLE including HEATING ELEMENTS IF SUPPLIED SEPARATELY

9	Model & Jenama *(Model & Brand)*		
		Model	Brand
		MA-321	BDX

Annex A

(Example)

Determination of star rating index

An example calculation of star rating index for 2 doors refrigerator, as follows:

Tka = environment test temperature (set at +32 ℃)

constant value: 32 ℃

The target temperature and volume adjustment factor are given by Table 2 as below:

Compartment type	Target temperature (constant value)	Volume adjustment factor(Kci) (constant value)
Pantry	17	0.54
Wine storage	12	0.71
Cellar	12	0.71
Fresh food	4	1.00
Chill	2	1.07
Zero-star	0	1.14
One-star	-6	1.36
Two-star	-12	1.57
Three-star and four-star	-18	1.79

Vr = Volume of fresh food compartment (L) = 295 (measured volume as rated)

Vf = Volume of frozen compartment (L)

Vf (T^{***}) = 75 (measured volume as rated)

Vf (T^{**}) = 0

Vf (T^{*}) = 0

Remarks: T^{***} is subjected to 3-star compartment.

: T^{**} is subjected to 2-star compartment.

: T^* is subjected to 1-star compartment.

$Vadj$ = total adjusted volume = $Vr + (K_{ci} \times Vf)$ (L)

$\qquad$ = 295 + (1.79 x 75) + (1.57 x 0) + (1.36 x 0)

$\qquad$ = 429.25 L (2 decimal points)

E_{total} = annual energy consumption = 380.23 kWh/year

$$\text{Energy consumption per day} = \frac{E_{total}}{365}$$

$$\text{Energy Consumption Per Day} = \frac{380.23 \text{ kwh/year}}{365}$$

=1.0417 kwh/day

$$\text{EEFTested} = \frac{\text{Adjusted volume}}{\text{Energy consumption per day}}$$

$$\text{EEFTested} = \frac{429.25}{1.0417}$$

= 412.07

EEFAverage (2door) = 0.6402 x ($Vadj$) + 64.45

EEFAverage (2door) = 0.6402 x (429.25) + 64.45

$\qquad$ = 339.26

$$\text{Star index percentage} = \left[\frac{EEF_{Tested}}{EEF_{Average(2door)}} - 1\right] \times 100\%$$

$$\text{Star Index Percentage} = \left[\frac{412.07}{339.26}\right] - 1) \times 100\%$$

$\qquad$ = 21.461 %

Table 3: Star rating index value

Star rating	Star index value
5	+ 25 % ≤ Star index
4	+ 10 % ≤ Star index < + 25 %
3	- 10 % ≤ Star index < + 10 %
2	25 % ≤ Star index < - 10 %
1	- 35 % ≤ Star index < - 25 %

Result: By referring to Table 3, the **21.461** % is subjected to **4-star rating**.

Note. The number of significant digits of the following values used for calculation of star index is all rounded off to five digits.; V_{adj}, E_{total}, Energy consumption per day, EEF_{tested}, $EEF_{average}$