



Date: 1<sup>st</sup> August, 2024

## Draft Schedule

### Refrigerant Compressors Used in Cold Chain Applications

#### 1. SCOPE

This schedule specifies the requirement for participating in the energy labeling scheme for refrigerant compressors with capacity between 1.5 KW – 15 KW (2 HP - 20 HP), used in the cold chain applications as specified under the scope of IS 5111.

1.1 In particular, this schedule specifies the following:

- 1) Definitions
- 2) Reference Standards,
- 3) Testing methods and guidelines,
- 4) Test report requirement,
- 5) Star Rating plan,
- 6) Validity period of the label,
- 7) Model registration process,
- 8) Labelling Fees
- 9) Label design and its contents,
- 10) Check Testing
- 11) Test report format,

#### 2. REFERENCE

This schedule shall be read in conjunction with the following standards for the purpose of star labelling program:

Reference Standard	Title of the Standard
IS 5111	Testing of refrigerant compressors (First revision)



### 3. TERMINOLOGY

For the purpose of this schedule, the following definitions in addition to those given in IS 5111 with as amended from time to time shall apply:

- 3.1 Family of models:** It is the range of models to which a single set of test reports is applicable and where each of the models has the same relevant physical characteristics, measured efficiency star rating and other performance characteristics.
- 3.2 Label:** Any written, printed, marked, stamped or graphic matter affixed to, or appearing on the product and the packaging provided always that the product inside the packaging to which the label is thus applied conforms to every requirement of this schedule.
- 3.3 Label Period:** It is the label validity period of the energy performance standards provided under the star rating plan as specified in the schedule.
- 3.7 Star Rating:** The number of stars displayed on the star label. The available stars are between a minimum of one and a maximum of five shown in one-star interval. The star rating is calculated from the Star Rating Band on the basis of Coefficient of Performance (COP).
- 3.8 Star Rating Band:** The Star Rating Band is a range of COP which is arrived at by an established tests method and calculations and is used for determining the number of stars to be displayed on the Star Label.
- 3.9 Validity of Label:** The validity period of Energy Efficiency Rating table specified in this schedule.

### 4. TESTING GUIDELINES

#### 4.1 Test Parameters

The methodology and the test protocol for measurement of the test parameters specified in this schedule shall be as in accordance with IS 5111. All testing conditions and deviations shall be in accordance with clause 5 of IS 5111.



For the purpose of determining the star level, the refrigerant compressors shall meet the requirements of following tests.

- a. Specific enthalpy
- b. Refrigerant mass flow rate
- c. Specific volume of the refrigerant
- d. Speed of the compressor
- e. Refrigerating capacity
- f. Power input
- g. Coefficient of performance (COP)

**4.2 Uncertainty of measurement and test conditions:** Calibration and accuracy of the measuring instruments shall be as specified in Annex A of IS 5111

## 5. TEST REPORT

The results of the test shall be submitted in the prescribed format as given in Annexure A of this schedule.

## 6. RATING PLAN

The star rating parameter for the labeling program shall be Coefficient of Performance (COP).

COP thresholds are captured in the tables below.

<b>Table 2.1</b> <b>Star Rating Band for Medium Temperature Range ( -10 ° C to 0° C)</b> <b>Refrigerant Compressors</b> <b>Valid from 1<sup>st</sup> August, 2024 – 31<sup>st</sup> July, 2026</b>	
Star rating	COP Threshold
1 Star *	$1.5 \leq \text{COP} < 2$
2 Star **	$2 \leq \text{COP} < 2.5$
3 Star ***	$2.5 \leq \text{COP} < 3$
4 Star ****	$3 \leq \text{COP} < 3.5$
5 Star *****	$\text{COP} \geq 3.5$



<b>Table 2.2</b> <b>Star Rating Band for Low Temperature Refrigerant Range (- 20 ° C to - 30 °C) Compressors</b> <b>Valid from 1<sup>st</sup> August, 2024 – 31<sup>st</sup> July, 2026</b>	
Star rating	COP Threshold
1 Star *	$1.2 \leq \text{COP} < 1.5$
2 Star **	$1.5 \leq \text{COP} < 1.8$
3 Star ***	$1.8 \leq \text{COP} < 2.1$
4 Star ****	$2.1 \leq \text{COP} < 2.4$
5 Star *****	$\text{COP} \geq 2.4$

<b>Table 2.3</b> <b>Star Rating Band for High Temperature Refrigerant (+ 5 ° C to + 15 ° C ) Compressors</b> <b>Valid from 1<sup>st</sup> August, 2024 – 31<sup>st</sup> July, 2026</b>	
Star rating	COP Threshold
1 Star *	$2.3 \leq \text{COP} < 2.8$
2 Star **	$2.8 \leq \text{COP} < 3.3$
3 Star ***	$3.3 \leq \text{COP} < 3.8$
4 Star ****	$3.8 \leq \text{COP} < 4.3$
5 Star *****	$\text{COP} \geq 4.3$

## 7. COMPANY REGISTRATION

For participating in the Refrigerant Compressor labeling program, the manufacturer has to first register his/her organization. The manufacturer shall submit to BEE all necessary documents required as per BEE guidelines. BEE after scrutiny and subject to submission of all documents by the manufacturer shall grant company registration to the organization/manufacturer to participate in BEE's labelling program.

## 8. MODEL REGISTRATIONS

**8.1** For a Star Rating label, manufacturer shall apply on BEE's website ([www.beestarlabel.com](http://www.beestarlabel.com)) along with a valid test report of the model/family of models and other documents as required for registration process.

**8.2** The manufacturer may register a refrigerant compressor model under star labelling



program, with a physical test report from NABL accredited lab tested as per the test conditions mentioned in IS 5111. In the absence of above, BEE may also accept test report from manufacturer's self-test facility accredited by national accreditation body having scope of the tests mentioned in IS 5111.

**8.3** The manufacturer shall submit the test reports as per **Annexure - A** of this schedule.

## 9. FEES

- a) The applicant shall deposit a security fee of INR 1,00,000/- (Rupees One Lakh only) for each registration as security deposit. However, applicants registered as small-scale industries (SSI units), shall deposit INR 25,000/- (Rupees Twenty-Five Thousand only) provided that they submit the valid SSI registration certificate.
- b) Application fee payable on application for each model seeking permission to affix label is INR 2000/- (Rupees Two Thousand only)
- c) No application fee is payable on application for renewal of permission to affix label on the model.
- d) The labeling fee for affixation of label on each unit of air compressor is Rs. 20 per KW. The labelling fees shall be collected based on the production data submitted by manufacturers through the online portal.

## 10. LABEL DESIGN AND MANNER OF DISPLAY

**10.1 Content of Label:** The label will mention the following:

- a. Appliance: Refrigerant Compressor - Cold Chain Application
- b. Coefficient of Performance at rated conditions (i.e., COP)
- c. Star level
- d. Model, Year of Manufacturing
- e. Brand
- f. Category
- g. Refrigerating Capacity at rated conditions
- h. Power Absorbed at rated conditions (power input - KW)
- i. Refrigerant
- j. Label Period
- k. Unique Series code

### 10.2 Placement of label and QR Code

With an intent to authenticate the star rating approval issued for a model of refrigerant compressor, BEE will share the printable/readable version of the dedicated QR code for



each model along with approval letter with manufacturers. The QR code is recommended to be placed just below the star label being affixed on each unit of the Refrigerant Compressor. The QR code will contain the information as mentioned in Sub-Clause 10.1 under Clause 10 of Refrigerant Compressor Schedule.

The placement of the label along with QR code shall be at the discretion of the manufacturer where it has clear visibility, is not easily removable and also no possibility of the label and QR code getting spoiled over time.

### 10.3 Material & Dimension of Label

The label shall be a non-perishable material and shall be of durable cardboard or be self-adhesive and shall be cut to one of the outlines. Dimension, design, colour scheme and a sample label is given in Annex B.

## 11. CHECK TESTING

- a) Testing for compliance of Refrigerant Compressor covered under the S&L program with respect to BEE performance standards will be carried out in laboratories that are NABL accredited.
- b) The samples will be picked up by BEE or its designated agency for testing as per the following sampling plan:
  - (I) Samples will be picked up at random from manufacturer's authorized dealer/retailer/e-market platform.
  - (II) In case the sample drawn for the first check testing fails, the Bureau or its designated agency shall conduct a second check testing for which it shall buy twice the quantity of samples for the same model. If the first set of sample fails, only then second check testing will be done.
  - (III) The permittee/user of the label would be accordingly informed about the failure of the first check testing and shall be advised to deposit the cost of the samples, cost of check testing and transport for the second check testing in advance.
  - (IV) If permittee fails to deposit/pay the expenses, Bureau shall continue the verification by check testing and stop further processing of application received for new appliance/equipment of the respective permittee.
  - (V) Second set of samples will be picked up at random from the market for second check testing, and both samples must pass the test.
  - (VI) BEE or its designated agency shall inform the date of second check testing to the permittee to witness the second check testing. If the permittee is unable to witness the testing, the Bureau shall proceed with testing in the presence of BEE/Designated Agency personnel and the test result shall be binding on the permittee.



- (VII)** If any one of the samples fail during second check testing, the refrigerant compressor will be in non-compliance with prescribed BEE standards and
- (VIII)** Bureau/Designated Agency shall proceed with the following actions:
- direct the permittee, under intimation to all the State Designated Agencies, that the permittee within a period of two months from the date of issuance of such intimation, shall-
    - Withdraw all the stocks from the market to comply with the directions of the Bureau; and
    - Change the particulars displayed on advertising material.
    - Correct the star level displayed on the label of the appliance/equipment or remove the defects and deficiencies found during testing from the existing and new stock;
  - publish, for the benefit of the consumers, the name of the permittee, brand name, model name or model number, logo and other specification in any national or regional daily newspaper and in any electronic or in any other manner as it deems fit within two months;
  - The permittee within ten days of the conclusion of the period of two months from the date of issuance of intimation shall send the action taken report to the Bureau/Designated Agency with respect to action taken in compliance with the direction.
- c)** Every permittee, trader and seller shall comply with other terms and conditions as specified under Disseminating Star Labeling in Household Appliance (DISHA)  
- Operation Manual on Standards and Labeling program.



## ANNEXURE A

### Form for Test Report of Refrigerant Compressors used in Cold Chain Applications

Name and address of manufacturer:	
Certificate No.:	
Order Acceptance No.:	
Purchaser:	
Purchaser's Order No.:	

#### **Basic Data**

S.no	Data Point	Description
1	Date of Test	
2	Time test Started	
3	Time test finished	
4	Duration of Test	
5	Make and Serial number of Compressor	
6	Type of compressor (single or double acting, number of cycles, etc.)	
7	Cylinder diameter and stroke (if applicable!	
8	Compressor displacement per revolution:	
9	Designation of refrigerant:	
10	Source of thermodynamic Properties (tables) used:	

#### **Additional Data**

S.no	Data Point	Description
1	Test methods used for	
	Test X	
2	Test Y	
3	Absolute pressure or saturation temperature at compressor suction:	
4	Temperature at compressor suction	
5	Absolute pressure or saturation temperature at compressor discharge:	
6	Rotational speed of compressor	
7	Ambient temperature	
8	Barometer reading	
9	Pressure of refrigerant at compressor suction inlet	
10	Temperature of refrigerant at compressor suction inlet	
11	Pressure of refrigerant at compressor discharge outlet:	
12	Temperature of refrigerant at compressor discharge outlet:	





<b>13</b>	Inlet temperature of cooling water	
<b>14</b>	Outlet temperature of cooling water:	
<b>15</b>	Mass flow rate of cooling water	
<b>16</b>	When possible, compressor lubrication oil temperature	
<b>17</b>	Voltage and frequency of electrical supply	

\*Additional information may be-required depending on the test method used as per clauses 8 to 15 of IS 5111

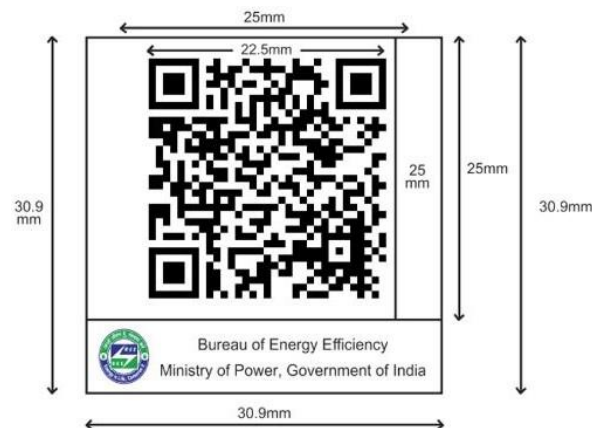
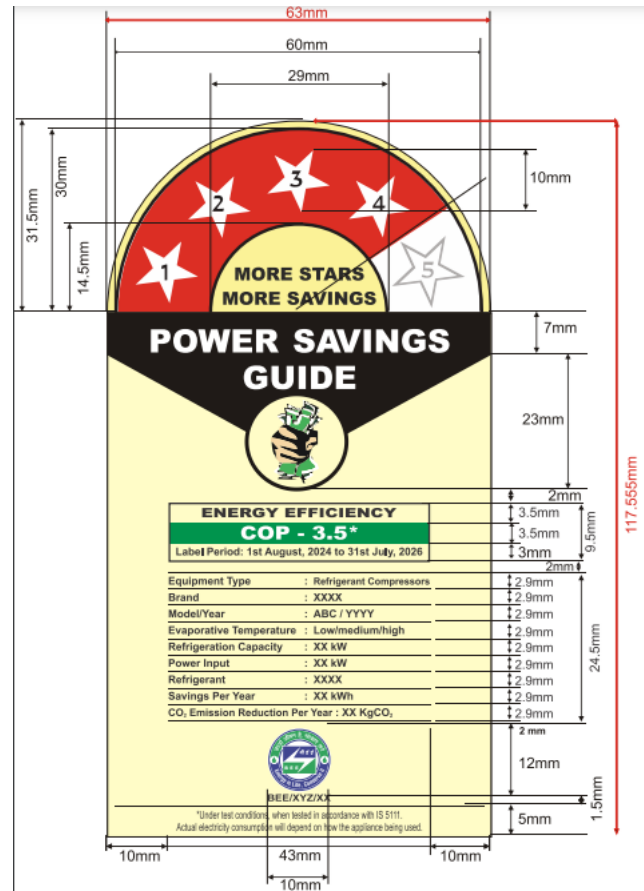
**Test Results:**

Determination of following Values as required in Clause 8 to 15 of IS 5111 – Part-1

<b>S.no</b>	<b>Data Point</b>	<b>Observed Value</b>	<b>Symbol for Units</b>
<b>1</b>	Heat Leakage Factors		
<b>2</b>	Mass Flow of Refrigerant		kg/s
<b>3</b>	Relevant enthalpy difference		J/kg
<b>4</b>	Refrigerating capacity of the compressor at the specified test conditions (Q)		W
<b>5</b>	volumetric efficiency ( $\eta_v$ )		
<b>6</b>	Power Input specified test conditions in (P)		W
<b>7</b>	Coefficient of Performance, (COP = Q/P)		
<b>8</b>	Estimated error of results		

## ANNEXURE B

- Material & Dimension of label:** The label shall be self-adhesive and shall be designed as set out in sample label.



- Color scheme of label:** The label shall be printed as per the following specification in the following colors on a white background:
  - Red: Pantone warm red

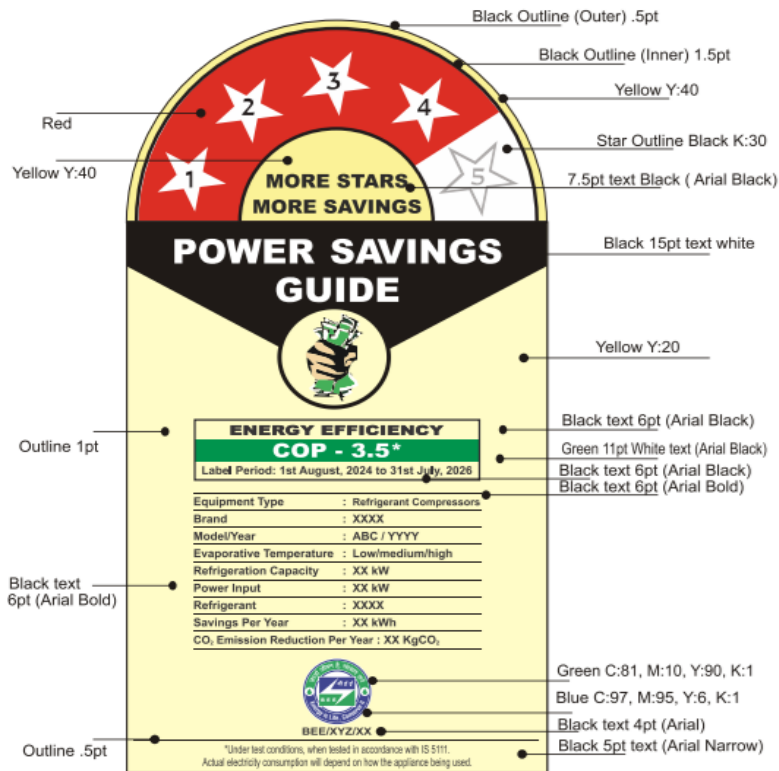


- b.** Yellow: Pantone 116
- c.** Black: Pantone Black
- d.** Green: Pantone 340

Note: The color tone at the background of Annual Energy Consumption Display (Green) will be similar as followed for the Bureau of Energy Efficiency Logo.

The following color scheme for Bureau's logo, namely:

- a.** BLUE – Hue(H)-239o Saturation(S):64% Brightness(B):59%
- b.** Luminance or lightness(L) :28, chromatic components -a:24 b:54
- c.** Red(R):54 Green(G):55 Blue(B):151
- d.** Cyan(C):97% Magenta(M):95% Yellow(Y):6% Black(K):1%
- e.** Web color code - #363797
- f.** GREEN – Hue(H)-150o Saturation(S):10% Brightness(B):67%
- g.** Luminance or lightness(L) :61, chromatic components -a:-53 b:32
- h.** Red(R):0 Green(G):170 Blue(B):87
- i.** Cyan(C):81% Magenta(M):10% Yellow(Y):90% Black(K):1%
- j.** Web color code - #00AA56





3. **Sample label:** An example of a printed star label along with QR Code for a refrigerant compressor is shown in following label.

**MORE STARS  
MORE SAVINGS**

**POWER SAVINGS  
GUIDE**

**ENERGY EFFICIENCY  
COP - 3.5\***

Label Period: 1st August, 2024 to 31st July, 2026

Equipment Type	: Refrigerant Compressors
Brand	: XXXX
Model/Year	: ABC / YYYY
Evaporative Temperature	: Low/medium/high
Refrigeration Capacity	: XX kW
Power Input	: XX kW
Refrigerant	: XXXX
Savings Per Year	: XX kWh
CO <sub>2</sub> Emission Reduction Per Year	: XX KgCO <sub>2</sub>

**BEE/XYZ/XX**

\*Under test conditions, when tested in accordance with IS 5111.  
Actual electricity consumption will depend on how the appliance being used.

**Bureau of Energy Efficiency  
Ministry of Power, Government of India**