

Revision1

Date: 20th December, 2016

Schedule No.: 17
SOLID STATE INVERTERS

1. Scope

This Schedule specifies the star labeling requirements for Solid State Inverters run from Storage Batteries of 12 Volts Direct Current source being manufactured, imported or sold in India. The output rating of the Solid State Inverters run from Storage Batteries, covered under this schedule shall be between 250 VA to 2000 VA for continuous output.

Note: Inclusion of Solid State Inverters run from Storage Batteries of 24 Volts Direct Current source is under consideration.

2. Normative Reference:

This Schedule shall be read in conjunction with IS 13314:1992 SOLID STATE INVERTERS RUN FROM STORAGE BATTERIES-SPECIFICATION with all amendments, as applicable.

3. Terms and Definitions:

The following definitions in additions to those given in IS 1885 (part 27) shall apply;

- (i) **Family of models:** Family of models is the range of models of a particular brand, to which a single set of test reports is applicable and where each of the models has the same physical characteristics, comparative energy consumption, and energy efficiency rating and performance characteristics.

Note: The model which does not come under Family of Models shall be considered as a separate model.

- (ii) **Label** means any written, printed, marked, stamped or graphic matter affixed to, or appearing upon, the Inverter.
- (iii) **Validity of Label:** means the validity period of the Energy Efficiency under star labeling plan specified in the schedule.
i.e., the label shall be valid for a period from the date of commencement of this schedule (from 1st January, 2017 to 31st December, 2019).

4. Eligibility Criteria:

4.1 General Requirements

The inverter shall comply with the following requirements:

- Shall be suitable for operation over an ambient temperature range of -10°C to + 45 °C (Refer clause 5.11 of IS13314:1992).
- The frequency of the output voltage shall be 50 Hz ± 3 percent (Refer clause 7.9.2 of IS 13314:1992)
- Shall confirm the following parameter requirement at Resistive-Inductive Load as per IS13314:1992

4.2 Safety Requirements

Solid State Inverters shall meet the following safety requirements as per IS 13314:1992.

- a High Voltage Test as per IS 13314:1992 (Clause No. 7.6)
- b Insulation Resistance Test as per IS 13314:1992 (Clause No. 7.7)

4.3 Shall have a valid **BIS product certification or Quality system Certification such as ISO 9000 to participate in BEE S&L programme.**

5. Testing Guideline:

5.1 Methods of Tests

The method of test for Solid State Inverters shall be as per IS 13314:1992 with all amendments as of date except for the following deviation.

1. Solid State Inverters shall be designed at Output Power Factor of no less than 0.8 at Resistive-Inductive Loads.
2. Testing shall be done using resistive - inductive load at a power factor of minimum 0.8.
3. Capacity test shall be as per procedure given in item 5.2(d) of this schedule.

5.2 Parameters to be tested

Parameters for initial verification and check testing of Solid State are:

- a. No-Load Test
- b. Output Power Factor
- c. Total Harmonic Distortion
- d. Capacity Test

a No-Load Test

1. No-Load dc Current test shall be conducted as per IS 13314:1992 (Clause No. 7.8.1).
2. Output Voltage test shall be conducted as per IS 13314:1992 (Clause No. 7.8.2).

b Power Factor

The output power factor of Solid State Inverters at the Resistive-Inductive (RL) load shall not be less than 0.8.

c Total Harmonic Distortion

Total Harmonic Distortion test shall be conducted as per IS 13314:1992 (Clause No. 7.11) at Resistive-Inductive (RL) load.

d Capacity Test

Capacity Test shall be carried out at resistive-inductive load which shall be gradually increased from zero to the maximum load corresponding to the rated capacity of the Inverter till the tripping device operates.

6. Star Rating Plan

6.1 Star Rating Plan for Solid State Inverters shall be based on the DC to AC efficiency of the Inverters only while delivering the rated output to a load of power factor 0.8 as per IS 13314:1992. Efficiency test shall be conducted as per IS 13314:1992 (Clause No. 7.9.3) at Resistive-Inductive (RL) load. The Star Rating Plan is given in Table 1.

Table 1
Star Rating Plan for Solid State Inverters run from Storage Batteries (12V DC)
Validity (1st January'2017 to 31st December'2019)

Efficiency Range (DC to AC)	
1 Star *	83% up to and including 85%
2 Star **	Above 85% up to and including 87%
3 Star ***	Above 87% up to and including 89%
4 Star ****	Above 89% up to and including 91%
5 Star *****	Above 91%

Note: Incorporation of charger efficiency in the star rating plan is under consideration

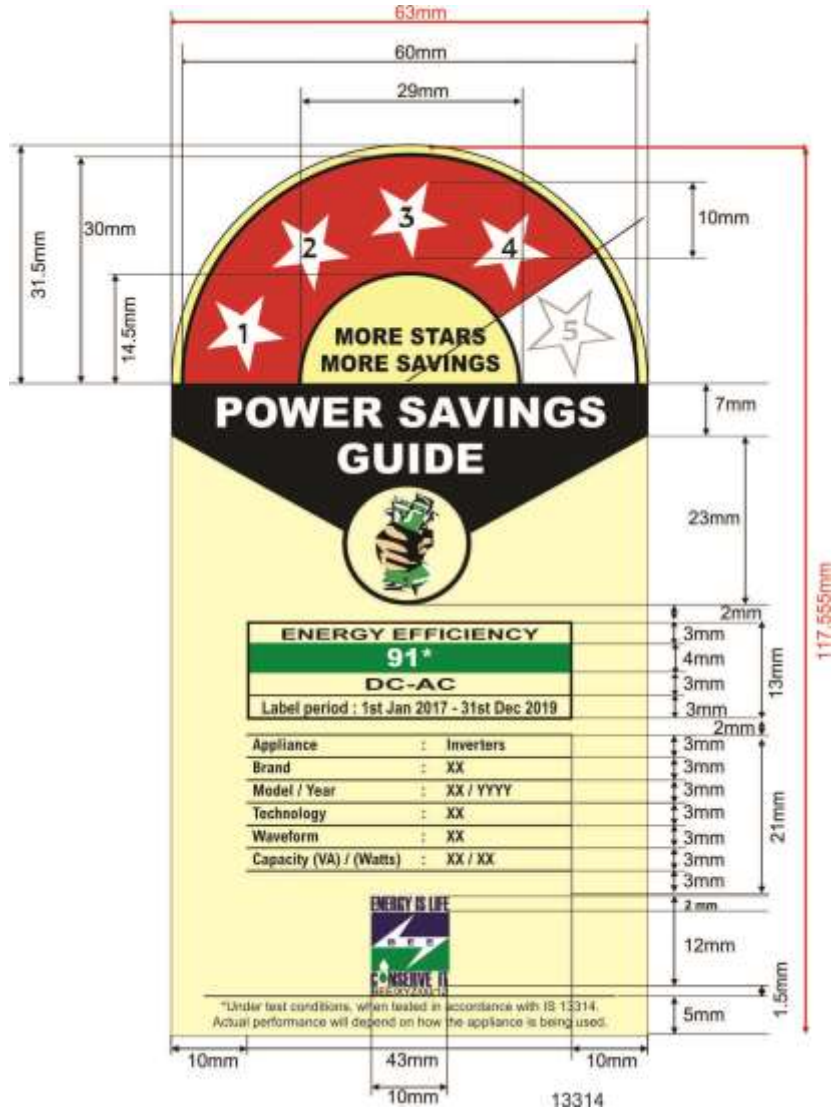
6.2 There shall be **no tolerance** for the Star Rating. All tested products shall meet the minimum threshold limits for each Star Rating Band.

7. Label Design, Placement & Manner of Display

7.1 Design

The detailed label specifications (size, color scheme, font size, security features, if any, etc), content of the label (parameters displayed on the label) is given at Figure 1.

Figure 1: Design Scheme for the Label (Sample).



Details to be mention at the label along with the DC to AC efficiency are given at Table 2.

Table 2

Details at the Label

Appliance	Inverters
Brand	XX
Model/Year	XX/YYY Y
DC Bus Voltage	XX
Waveform	XX
Capacity (VA)/(Watts)	XX/XX

7.2 Color Scheme

The following color scheme shall be followed for Bureau's logo, namely:-

BLUE –

Hue (H)-239o Saturation(S):64% Brightness (B):59%

Luminance or lightness (L):28, chromatic components -a: 24 b: 54

Red(R):54 Green (G):55 Blue (B):151
 Cyan(C):97% Magenta (M):95% Yellow(Y):6% Black (K):1%
 Web color code - #363797

GREEN –

Hue (H)-150o Saturation(S):10% Brightness (B):67%
 Luminance or lightness (L):61, chromatic components -a: 53 b: 32
 Red(R):0 Green (G):170 Blue (B):87
 Cyan(C):81% Magenta (M):10% Yellow(Y):90% Black (K):1%
 Web color code - #00AA56;

The Following color scheme shall be followed for label:

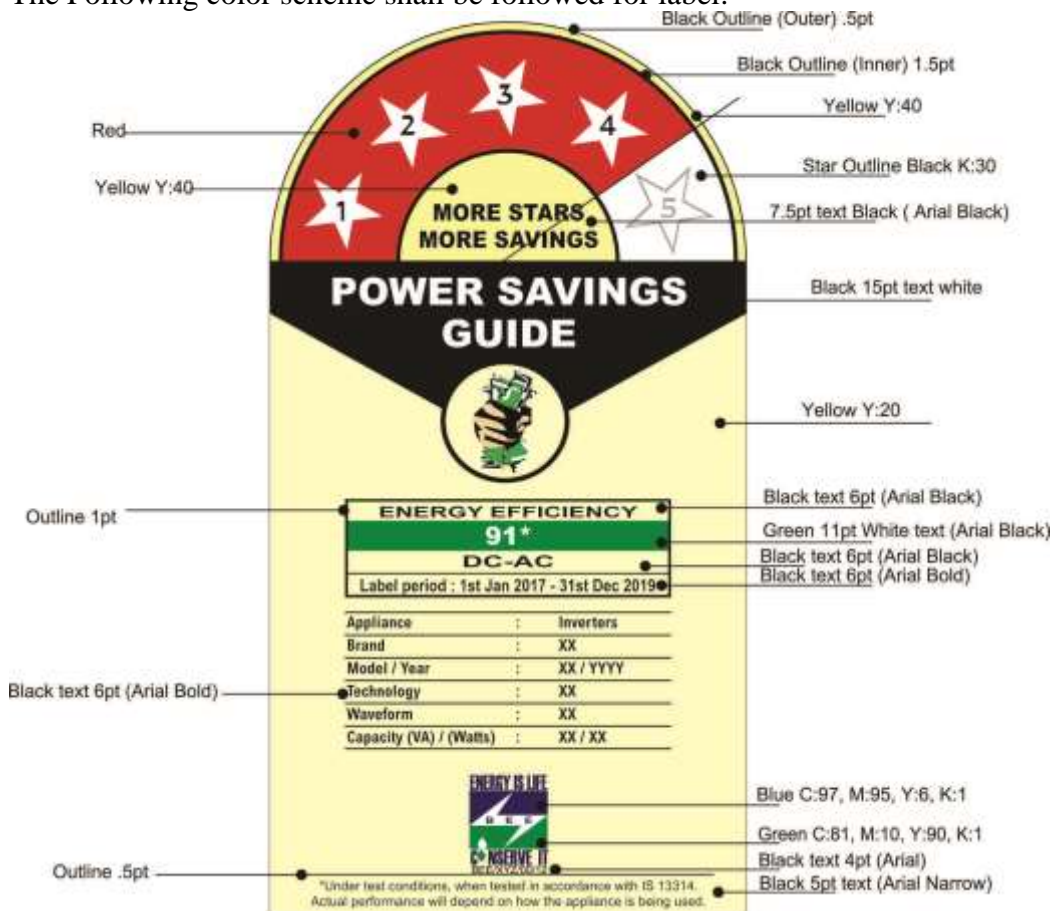


Figure 2: Color Scheme for the Label (Sample).

7.3 Manner of Display & placement:

The label shall be self –adhesive and shall be designed as per the dimensions & color scheme specified above. All Solid State Inverters shall display the label at the point of sale. The label shall be affixed on the front or top of the unit

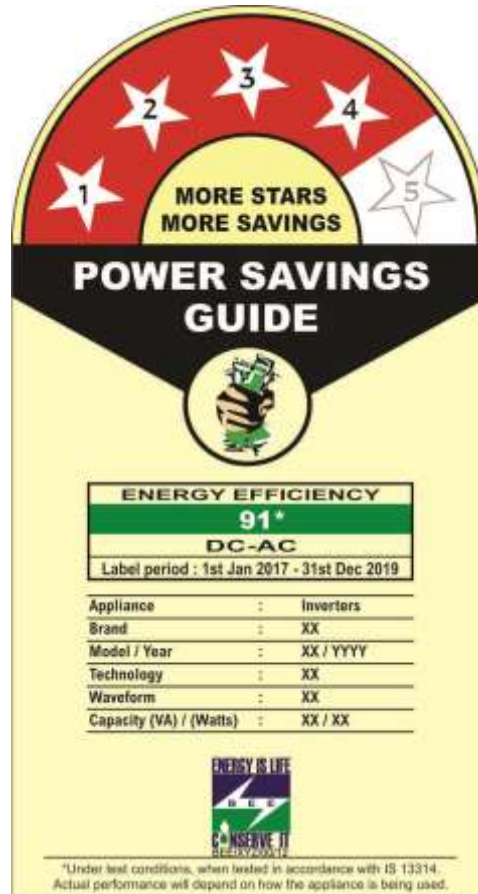


Figure 3: Sample Label

2. Labeling Fees

- 2.1. Application fee payable on application for authority to affix labels is Rs.2000/- (INR Two thousand only).
- 2.2. Fee of Rs. 500/- (INR five hundred only) is payable on application for renewal of authority to affix labels
- 2.3. Labeling fee for affixation of label on each Solid State Inverters is Rs.2.00 (INR two only) plus service tax (applicable as per govt. rate)

**ANNEX I
TEST REPORT FORMAT**

This annexure shall provide the template of the test report to be used by manufacturers to BEE at the time of submission of their application. This must include (minimum requirement):

Test Report No.

Date:

A. Product Details.

- (i) Brand / Manufacturer :
- (ii) Country of Manufacturer:
- (iii) Technology:
- (iv) Model :
- (v) Waveform
- (vi) Rated voltage or voltage range:
- (vii) Rated Current:
- (viii) Rated Capacity:
- (ix) Rated Frequency:
- (x) Rated Efficiency:
- (xi) Serial Number:

B. Test summary

- (i) Complete a separate copy of this page for each test type, as applicable
- (ii) Manufacturer/ Laboratory Name & Address:
- (iii) Test Report No.:
- (iv) Date of Receipt of Sample:
- (v) Date of test:
- (vi) Name of Testing Personnel:
- (vii) Nature of Test and Details of Test conducted:
- (viii) General test condition.,
- (ix) Test Standard:
- (x) Capacity Test Report(to be submitted for each unit tested):

C. Equipment Details

Brand Name	Model Name/Number	Month/Year (mm/yy) of Manufacturer	Serial number(s) of unit tested	
Rated dc input voltage (V)	Rated ac output voltage (V)	Output rating (VA)	Rated frequency (Hz)	Waveform

D. Lab NABL Accreditation Status

Sr. No.	Requirement	Status
1	Whether the Lab has NABL accreditation	
2	If yes, please specify the validity of approval and specify the tests for inverter for which the lab has NABL approval	

E. Measuring Equipment Details

Sr. No.	Instrument Name	Make	Model	Function/Range	Class of Accuracy	Least Count	Uncertainty in Measurement (as per NABL certificates)	Cal. Valid Date

F. Test Procedure

Reference Test Standard	
Ambient Test Condition (Temperature & Relative Humidity)	
Name of the Test with Clause number	

G. Test Results

1. Pre-Qualification Criteria

Sr. No.	Tests	Requirement	Parameters	Measured Value	Rated/Declared Value
1	No- Load Current:	≤ 5.0% of Full Load current			
a			Idle Current Consumption ($A_{No Load}$)		
b			Full Load Current ($A_{Full Load}$)		
c			Percentage Idle Current Consumption ($A_{No Load} / A_{Full Load} * 100\%$)		
2	Output Power Factor	≥0.8 at Resistive-Inductive Load			
a			Output Power Factor at Resistive-Inductive Load		
3	Total Harmonic Distortion (THD)	≤ 5.0%			
a			Output THD (T_M)		
4	Capacity	≥95% of the rated capacity (VA or Watt) of inverter			
a			Output Capacity(Volt-Ampere) at Resistive-Inductive Load (C_M)		
b			Rated Output Capacity (Volt - Ampere) (C_R)		
c			Capacity Attained (%		

			of rated capacity) (C_M / C_R)* 100%		
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2. Efficiency Requirements

Sr. No.	Tests	Requirement		Measured Value	Rated/Declared Value
1	Efficiency	≥83%			
a			Output Power Consumption (P_O)		
b			Input Power Consumption (P_I)		
c			Efficiency (P_O / P_I)*100%		

3. Safety Requirements

Sr. No.	Tests as per IS 13314:1992	Requirement	Status (Pass/Fail)
1	High Voltage Test	With the electronic components by passed, the inverters shall withstand for one minute a test voltage of 1500 V rms applied between all parts of electric circuit and other metallic parts insulated there from without puncture and arcing.	
2	Insulation Resistance Test	This test shall be made at a voltage of 500 V dc. The insulation resistance shall be measured between individual insulated circuits and earth with all electronic-circuits short circuited. The value of insulation resistance shall not be less than 10 megohms. When the test is repeated after climatic tests, the value shall not be less than 5 megohms.	

Tested by	Reviewed by	Approved by
[Signature]	[Signature]	[Signature with Seal]
[Name]	[Name]	[Name]
[Designation]	[Designation]	[Designation]