



Split Air Conditioners

More efficiency for the energy

As consumers' awareness levels – with respect to price, quality and value – increase and there is generally the desire to move up the value chain, the same is reflected in better quality products (not only superior in quality but also consume less resources). In the case of air conditioners (and other devices that run on electricity), this evolution is typified by the creation of versions that are high on energy efficiency parameters. So, of course there is a buzz around ACs with inverter technology, these being a definitive step up in terms of energy efficiency (can adjust to room temperature by running at variable speed). While the market is wide open for this segment to zoom right in, our test here focuses on the segment that has the lion's share of the market – with about 75 per cent of the total AC market in India, split ACs are as of now in a very comfortable space.

A Consumer Voice Report

We carried out the comparative testing on nine brands of domestic split air conditioners of the most commonly sold capacity (1.5 ton) and with energy rating of five stars under Bureau of Energy Efficiency (BEE) of India. The test programme was mainly adopted from IS: 1391 (Part 2) 1992 with all the latest amendments

as well as related sections from IEC and IS: 302-1-2008 for safety requirement. Other reference points were test parameters under the standards and labelling (S&L) programme of BEE which makes energy labels mandatory for window and split air conditioners.

The comparative testing was carried out in an independent NABL-accredited laboratory. We did repeat tests to ensure accuracy of results.

The Social Connect

Apart from helping consumers in making an informed choice, the focus of this test report is also to sensitize manufacturers towards the environment so that they make energy-efficient products. Brands that consume less power and save energy are always rated better in *Consumer Voice* reports. Each watt saved by an efficient appliance is valuable for the planet.

The electricity generated to power air conditioning carries both global and personal health consequences. In burning fossil fuels such as coal to supply electricity to homes and workplaces, power plants discharge clouds of soot and other pollutants into the atmosphere. Among these are mercury and carbon dioxide (CO2). Air conditioner use in the United States results in an average of about 100 million tons of CO2 emissions from power plants every year.

ENERGY LABEL REQUIREMENT

For the 5 stars-labelled ACs tested by us, the required energy efficient ratio was 3.30 to 3.49, as applicable at the time of samples purchase. Effective 1 January 2014, the 5 stars label requirement for split air conditioners is 3.50; for 4 stars it is 3.30–3.49. (See table)

Star Level	Energy Efficiency Ratio (From 01-01-2014 to 31-12-2015)	
	Minimum	Maximum
1 Star*	2.70	2.89
2 Stars**	2.90	3.09
3 Stars***	3.10	3.29
4 Stars****	3.30	3.49
5 Stars*****	3.50	

**CV Recommendation | Top Performer |
Most Energy-Efficient**

DAIKIN

Toppers in Energy Efficiency Ratio

DAIKIN

followed by Blue Star, LG and Voltas



Comparative Test

BRANDS TESTED

Rank	Total Score out of 100 (Rounded off)	Brand	Model	Manufactured/Marketed by	Retail Price (Rs)	Warranty*	Indoor Unit Dimension (cm)
1	93	Daikin	FT50MV16 R50MV16	Daikin Air-conditioning India Pvt. Ltd	38,500	1 year; 4 years	36.6 x 114.7 x 33.7
2	88	Blue Star	5HW18ZBR	Blue Star Limited	36,000	1 year; 4 years	NA
3	86	Voltas	185 PX	Voltas Ltd	33,500	1 year; 5 years	89.8 x 22.9 x 29.6
3	86	LG	LSA5AR5M	LG Electronics India Pvt. Ltd	32,752	1 year; 4 years	81 x 27 x 56.8
3	86	Panasonic	CS-KC18PKY/ CU-KC18PKY	Panasonic India Pvt. Ltd	34,200	1 year; 5 years	NA
4	84	Godrej	GSC18FG5 WMG	Godrej & Boyce Mtd. Co. Ltd	29,268	1 year; 5 years	90 x 20.2 x 28
5	80	O General	ASGA18ACT	ETA General Pvt. Ltd	48,000	1 year; 5 years	NA
6	78	Hitachi	RAU518ETD RAC518ETD	Hitachi Home & Life Solution (India) Ltd	42,629	1 year; 5 years	105 x 29 x 22
7	77	Samsung	ARI8FC5TAPD	Samsung India Electronics Private Ltd	37,300	1 year; 5 years	NA

Score Rating: >90: very good*****, 71-90: good****, 51-70: average***, 30-50: poor**, <30: very poor*

*All the brands have given one-year warranty on product and four/five years' warranty on compressor.



KEY FINDINGS

- The air conditioner you buy may be of lesser capacity than rated.
- Only four out of 9 brands – Daikin (3.51), LG (3.4), Blue Star (3.38) and Voltas (3.32) – clearly meet their claim of energy efficiency ratio, which means they are more efficient in terms of high cooling capacity and are low on power consumption. Two brands – Panasonic and Godrej – meet the 5 stars requirement (3.30–3.49) but are slightly lower than their declared EER.
- Samsung (3.08), Hitachi (3.11) and O General (3.01) do not meet the energy efficiency rating of 5 stars as claimed. Samsung and O General fall within the 3 stars rating band and Hitachi within the 4 stars band.
- Total room cooling effect is highest in O General (though it also consumes the highest amount of power), followed by Blue Star and Panasonic.
- All the brands passed the maximum operating condition test (tested at outside temperature of 46 °C and at 207 and 253 volts). This means they are capable of running in high temperature during summer.
- Noise level in room side is lowest in Samsung, followed by Blue Star. It is highest in Voltas, LG and O General. Noise level in outdoor unit is lowest in Daikin and highest in Hitachi.
- Only Daikin, Hitachi and O General have provided copper condenser coil; rest all have aluminium coil – in effect, this means lesser life in the long run.
- To save on electricity, run your AC between 25 °C and 27 °C if you prefer lower temperature; use the AC along with a ceiling fan to spread the cold air.

TEST RESULTS FOR PERFORMANCE

EER | Total room-cooling efficiency | Power consumption | Maximum operating condition test | Noise level | Dehumidification | Net total sensible effect

◆ Energy efficiency ratio (EER)

An air conditioner with higher EER saves more energy and is more efficient – which translates into higher cooling capacity with lesser power consumption. The EER is the ratio of rated cooling capacity Btu/h [W] and rated power input (in watts) in standard conditions.

The efficiency of an AC directly affects the operating cost of an air conditioning system. The efficiency ratio reflects the total cooling/heating capacity that we can get out from an AC system per unit power that we input to it. You can reduce your electricity consumption by using higher star-rated products available in the market (5 for most efficient to 1 star for least efficient).



Comparative Test

Brand	Declared (W/W)	Results (W/W)	% Variation	Score out of 20	Remark
Daikin	3.40	3.51	+3.23	20	Passed; higher than the declared EER
Blue Star	3.33	3.38	+1.50	17.75	Passed; higher than the declared EER
Voltas	3.31	3.32	+0.30	16.31	Passed; higher than the declared EER
LG	3.40	3.43	+0.88	17.33	Passed; higher than the declared EER
Panasonic	3.43	3.38	-1.46	16.86	Slightly less than the declared value but in 5 stars rating band
Godrej	3.45	3.33	-3.75	15.42	Less than the declared value but in 5 stars rating band
O General	3.15	3.01	-4.45	10.41	Less than the declared value and is 3 star
Hitachi	3.45	3.11	-9.86	10.29	Less than the declared value and is 4 star
Samsung	3.38	3.08	-8.88	10.13	Less than the declared value and is 3 star

- Daikin, LG, Blue Star and Voltas clearly meet their claim of EER and are more effective in terms of higher cooling capacity with low power consumption.
- Panasonic and Godrej are slightly lower than their declared EER.
- Samsung (3.08), Hitachi (3.11) and O General (3.01) did not meet the BEE 5 stars energy efficiency rating and thus could not qualify as 5 star.

◆ Net total room-cooling capacity

Total room-cooling capacity is the available capacity of the air conditioning unit for removing heat from the space to be conditioned. A higher capacity means it is better in terms of cooling and dehumidifying effect.

Brand	Score out of 10
O General	9.93
Blue Star	9.88
Panasonic	9.71
LG	9.62
Voltas	9.18
Daikin	9.1
Samsung	8.88
Hitachi	8.76
Godrej	7.61

- Total room cooling effect was highest in O General, followed by Blue Star and Panasonic.
- Godrej scored lowest, followed by Hitachi.



Declared vs Measured Capacity

Brand	Measured Cooling Capacity (BTU/Hour)	Declared Cooling Capacity (W)	Measured Cooling Capacity (W)	Measured Capacity in Tonnage
Daikin	17,270	5,200	5,061.30	1.44
Blue Star	18,334	5,175	5,373.20	1.52
Voltas	17,380	5,100	5,093.70	1.44
LG	17,979	5,275	5,269.10	1.49
Panasonic	18,246	5,280	5,347.40	1.52
Godrej	15,241	4,900	4,466.60	1.27
O General	18,409	5,300	5,395.20	1.53
Hitachi	16,812	5,410	4,927.00	1.40
Samsung	16,971	5,300	4,973.80	1.41

- 1 ton = 12,000 BTU (British thermal unit)/hr = 3,514 watts
- Except O General, Panasonic and Blue Star, all other brands had total cooling capacity lower than their declared value.

◆ Power consumption (input power) (watts)

Air conditioners were rated between 1,420 watts and 1,680 watts for input power. Input power should not be more than the declared value by the manufacturer. Since the AC may run for hours during summer days, this becomes a very important aspect for users as their electricity bill will be affected accordingly.

Brand	Power Consumption (Input Power, Watts)	Score out of 10
Godrej	1,340	10
Daikin	1,441	8.99
Voltas	1,533	8.07
LG	1,535	8.05
Hitachi	1,586	7.33
Blue Star	1,587	7.12
Panasonic	1,583	7.01
Samsung	1,617	6.63
O General	1,795	4.08

- Godrej followed by Daikin, Voltas and LG showed the lowest power consumption.
- Highest power consumption was in O General and Samsung.

◆ Maximum operating conditions test

The purpose of this test was to prove that the air conditioner was capable of operating satisfactorily under maximum operating conditions when outside temperature was 46 °C and supplied voltage was 207 volts and 253 volts (+-10% of 230 volts.)

For all the brands, the air conditioner was run in the test condition for two hours. After two hours the air conditioner was switched off for three minutes, after which power was restored. Voltage rise on switching off the AC was less than three per cent. The AC started without any rattling or abnormal sound. There was no physical damage to the test unit. It ran continuously for one hour after start, and there was no tripping.

- All the brands were capable of running in the test conditions and scored equally.

◆ Noise level

When operated with rated voltage and rated frequency, the noise level in the indoor side and outside was measured. Maximum sound level for the indoor unit should not be more than 58 decibels (dB) and for the outdoor unit it should not be more than 68 dB. All the brands were within limit.

Comparative Test

PERFORMANCE

	Weightage %	Daikin	Blue Star	
Power consumption	10	8.99	7.12	
Total room-cooling effect	10	9.1	9.88	
Dehumidification	5	3.65	4.78	
Net total sensible effect	5	4.84	3.71	
Energy efficiency ratio (EER)	20	20	17.75	
Maximum operating condition test	10	10	10	
Noise level	8	6.49	6.8	

- Noise level inside room was lowest in Samsung, followed by Blue Star and Godrej.
- Noise level was higher in Voltas and LG, followed by O General.

◆ Net dehumidifying effect

This is the total capacity of the unit for removing latent heat from the space to be conditioned.

- Hitachi topped the test; Blue Star and Voltas came next.

◆ Net total sensible effect

This means the capacity of the unit for removing sensible heat from the space to be conditioned.

- The total sensible effect was highest in Daikin, followed by Samsung and Panasonic.
- The total sensible effect was lowest in Hitachi.

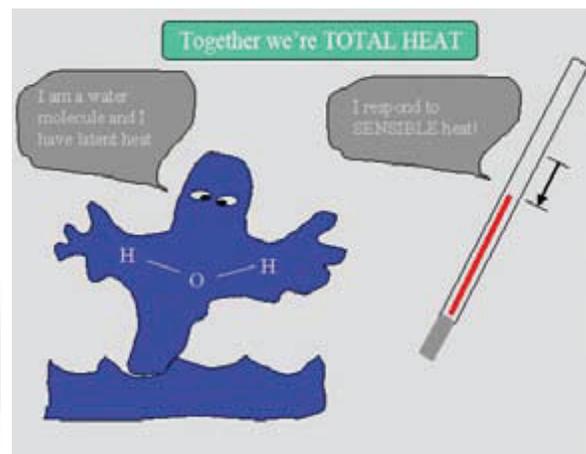
Sensible Heat

Heat that causes a change in temperature in an object is called sensible heat. When an object is heated, its temperature rises as heat is added. The increase in heat is called sensible heat. Similarly, when heat is removed from an object and its temperature falls, the heat removed is also called sensible heat.

Latent Heat

All pure substances in nature are able to change their state. Solids can become liquids (ice to water) and liquids can become gases (water to vapour) – changes such as these require the addition or removal of heat. The heat that causes these changes is called latent heat.

Latent heat, however, does not affect the temperature of a substance – for example, water remains at 100°C while boiling. The heat added to keep the water boiling is latent heat. Heat that causes a change of state with no change in temperature is called latent heat.



TESTS

	Voltas	LG	Panasonic	Godrej	O General	Hitachi	Samsung
	8.07	8.05	7.01	10.00	4.08	7.33	6.63
	9.18	9.62	9.71	7.61	9.93	8.76	8.88
	4.48	3.85	3.81	4.21	4.08	4.84	3.76
	4.01	4.64	4.68	4.28	4.43	3.65	4.74
	16.31	17.33	16.86	15.42	10.41	10.29	10.13
	10	10	10	10	10	10	10
	6.29	6.28	6.31	6.57	6.29	6.31	6.74

FOR SAFETY

Leakage current | Insulation resistance | Electrical strength

All the nine brands passed the three tests satisfactorily.

FOR PHYSICAL OBSERVATIONS

Packaging | Marking

◆ **Packaging**

This includes:

- a) Type of packing and quality for robustness and safe transportation
- b) Material of packaging, whether recyclable/biodegradable, dustproof
- c) Carrying provision and reusability
 - LG, Panasonic, Samsung and Blue Star had

very good quality of packaging and were given full score.

◆ **Markings on product and packaging**

- a) Manufacturer’s name and address
- b) Type and model and serial number
- c) Refrigerant and charge
- d) Rated voltage, phase, frequency
- e) Nominal cooling capacity
- f) Power consumption at rated conditions
- g) Nominal current at rated conditions
- h) Dimensions
- i) Energy labels on both the units as well as packaging
 - All the brands provided the relevant marking and labelling information as per Indian Standard.

Responses of Manufacturers

As a matter of policy, before publication the test results of the brands are shared with their respective manufacturers/marketers inviting their views/comments. We reproduce in brief the reactions.

Brand	Manufacturer’s Comment	VOICE Society’s Reply
Daikin, Voltas, Blue Star, Panasonic	Queries/clarifications related to test results	Replies sent giving all the details
Samsung	Sought details of cooling test	Provided
Godrej	Submitted extracts of cooling test report of a lab	Our lab confirmed the results as reported
O General	a) Sought details of cooling capacity test conditions b) Model tested was 4 stars as registered with BEE	a) Details of test conditions provided b) Actual EER was 3.01 against declared 3.15, which meant 3 stars against the rated 5 stars (the star label valid for the year of manufacturing, which was 2011)
Hitachi	Cooling capacity data given was not correct and not acceptable	Their comments were invited on test results but they did not respond within specified time. We could have done retesting in their presence had they responded within time

Comparative Test

Energy and Cost Savings for 1.5 Ton Window or Split Air Conditioner at Different Star Ratings (under standard test conditions and as per latest BEE regulations)

Star Rating	Minimum Energy Star (Approx.) Efficiency Ratio (EER)	Maximum Cooling Capacity (Watts)	Input Power (Watts)	Units Consumption/Day (kWh)	Electricity Cost/Day	Electricity Cost/Month (Rs)	Savings per Month (w.r.t. 1 star) (Rs)
1*	2.7	5,200	1,926	15.4	108	3,234	0
2**	2.9	5,200	1,793	14.34	100	3,011	223
3***	3.1	5,200	1,677	13.42	93.94	2,818	416
4****	3.3	5,200	1,575	12.6	88	2,652	582
5*****	3.5	5,200	1,486	11.89	83	2,497	737

Note: Assuming eight-hour operation per day and power cost @ Rs 7.00. The actual operating cost will vary according to outside temperature and your own temperature setting.

How to Run Your AC Efficiently

- Run it at 25 to 28 degrees Celsius.
- Try to insulate the room from all sides.
- Check its star rating.
- Shade your condensers. A well-shaded condenser will use up to 10 per cent less electricity than those in direct sunlight.
- Every degree below 26 increases energy consumption of AC.
- Clean the filter of your AC regularly as it can help reduce energy consumption by almost 10 per cent.
- If you prefer lower temperature, it would be wiser to use the AC along with a ceiling fan.



Inverter Technology: The Newest on the Block

An inverter model means that the compressor is powered by a variable speed drive or ‘inverter’, which enables the compressor to run at a range of speeds from slow to fast, to match the output required. Most conventional compressors run at a constant speed and these types of units vary their capacity by switching on and off at different intervals.

Inverters improve the performance and energy efficiency of air conditioners under normal use. An inverter unit will gradually increase its capacity based on the capacity needed to cool down or heat up the room. The non-inverter can be compared with switching on or off a lamp. Switching on this type of unit will start to run on full load.

Advantages

- You reach your desired comfort temperature much faster.
- The start-up time is reduced by one-third.
- You save energy and also money: there is 30 per cent less power consumption.
- You avoid cycling of the compressor, which means that there are no voltage peaks.
- The energy consumption cost is reduced by one-third (compared to normal on/off units).
- There are no temperature fluctuations.



Which Is Better: Window or Split?

Parameter	
Ease of installation	Window AC
Price	Window AC
Flexibility to install anywhere	Split AC
Noise level	Split AC
Room aesthetics	Split AC
Variety of models	Split AC
More than 2 tons requirement	Split AC
Power consumption	Both consume same power
Star-rated models	Available in both types
Mobility, shifting	Window AC