

Your Guide To Purchasing

Air Conditioners

by

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Introduction.

There are hundreds of different types, sizes & brands of air conditioner available in the UK market place today. Discounting the Evaporative Coolers (which are not true air conditioners as such) , small air conditioners are can be grouped into the following categories:-

Mobile – like a small fridge on wheels

Fixed – “proper” air conditioners, usually in two halves – an “indoor” half connected by copper pipes to an “outdoor” half.

Mobile air conditioners are at the budget end of the air conditioning market place. Their use is quite limited due to their bulk to duty/efficiency ratio and high noise levels. They are, however, an excellent “value for money” solution for providing localised, spot cooling in commercial environments or where noise isn’t an issue.

Fixed air conditioners are where cooling starts to get viable for domestic use – sleek indoor units coupled with compact and quiet outdoor units mean that the prospect of home air conditioning is now a reality.

The Asian market crash of ten years ago, coupled with an excess of the Chinese manufacturing capacity has lead to massive price reductions of all consumer items within Europe in recent times. Fridges, Freezers, Televisions/DVD players/VCR’s and Power Tools etc can now be bought for a fraction of their cost 5 years ago. This also applies to air conditioners. In order to keep up with continued price reductions, many Japanese manufacturers have shifted production from Japan or Malaysia to China – Albeit in factories co-owned by the Japanese and operated by Japanese management.

It is difficult to make sweeping generalisations about brand names and countries of manufacture and so on. However, as a rule, it is fair to say that one probably wouldn’t buy a car if it had a Chinese brand name that nobody had ever heard of. Although most people probably wouldn’t hesitate to buy a Honda/Toyota/Nissan (if that’s what they wanted) made in a Chinese factory operating a Japanese manufacturing system and quality control procedure. There is a good reason for this. Japanese manufacturers have a “Brand Reputation” to protect. Their goods are, typically, well made and have a good standing within their product market place.

The same can be said of air conditioners. If the brand is one you have never heard of or the manufacturer (not the importer) doesn’t have UK or Europe based support system, be very careful with your money! Apply the same brand purchase rules that you would for any other expensive purchase i.e. car, top end Hi Fi or computer.

You get what you pay for in air conditioning just like any other market place.

What size do I need?

In air conditioning, **size matters!**

Too small and your cash has been completely wasted.

Too large and your system will be give big temperature swings, cost too much too run & probably be too noisy.

It is important to select the machine that best matches the cooling and/or heating LOAD in the room you will use it.

What is the cooling/heating load – How is it measured?

Cooling.

The total cooling load is simply the **sum of the heat gains** within the space or room. These are calculated as follows:-

Solar heat gain through windows +
Solar gain via external walls/flat roofs etc +
Gains from electrical appliances (Computers/TV's/Lights) +
Gains from occupants +
Gains from infiltration (of warm air) +
Any other gains – Hot meals, big cookers and so on.

It goes almost without saying that anything you can do to reduce the heat gains, will reduce the size (and cost) of your system.

How can I reduce the gains?

The easiest heat gains to reduce are:-

Solar gain from windows – reduce by using blinds, curtains or solar control window film (commercial premises)

Solar gains from walls/roof structures – reduce by using insulation

Lighting/electrical gains – reduce by using low energy type lighting systems

Some typical gain figures for various types of occupancy are detailed below:-

Area	Watts per Square Metre floor area	Translated to BTU's/h
Large open plan office	125 watts per metre square	426
Small office	150 watts per metre square	512
Living room	110 watts per metre square	375
Bedroom	90 watts per metre square	307

These are "Guess-timate" figures based on our experiences. Very accurate figures can be obtained with the M.H. Mear packaged air conditioning calculator available at a discount via the AirConWarehouse.com website.

Heating.

As you would expect, the heating load is figured as a direct opposite of the Cooling load. Your air conditioner needs to defeat any heat being lost through walls, windows, ceilings & vent systems – The heat losses.

For newer buildings (less than 3 years), the heat losses are generally figured (for domestic heating) to be around 32 watts per CUBIC metre. As a rule, you may want to add between ten and twenty percent to the final sum to allow for warmer overall indoor temperatures/extreme outside cold spells.

So, a room measuring 6 metres long by 4 metres wide with a ceiling height of 2.5 metres might need:-
6m x4m x 2.5m x 32 watts = 1,920 watts or 1.9 kW to keep warm.

Add the ten percent cold weather loading and that takes us to 2.1kW or so.

For older houses, use a figure of 50 watts per CUBIC metre for your heating calculations.

i.e. $6\text{m} \times 4\text{m} \times 2.5\text{m} \times 50 = 3,000$ watts or 3 kW.

Many Air Conditioners have their cooling duty incorporated into their model numbers in either BTU's or kW, hence a Hitachi RAC-25YNH has a nominal cooling duty of 2.5kW. A Fujitsu ASY-9F has a cooling duty of around 9,000 BTU's/h .

For the record, the conversion factors are:-

kW to BTU's/h = kW x 3,412 so, 2.5 kW = 2.5 x 3,412 = 8,530 BTU's/h

BTU's to kW = BTU's x 0.000293 so, 9,000 BTU's x 0.000293 = 2.63 kW

Fortunately, good heat pump air conditioners **always** give more heating than cooling when used in heat mode. This is because heat pumps (air conditioners that can work backwards) are an extremely efficient method of providing heat – a modern heat pump will give around four times MORE heat than the electricity it absorbs.

i.e. a modern, small wall mounted heat pump will give over 4 kW of heat output whilst absorbing only 1 kW of electricity.

Use the above figures for guidance only – very accurate heating & cooling calculations can be made with M.H. Mear Packaged Air Conditioning Calculator available via the website, www.AirConWarehouse.com

Inverter or Fixed Speed?

The next decision you have to make is whether to buy an Inverter Air Conditioning System (has a compressor that speeds up/slows down according to load) or a traditional Fixed Speed system.

The fixed speed systems are like your fridge or boiler – they are either cooling/heating or not cooling/heating.

The inverter air conditioning systems generate more or less power by speeding or slowing the compressor as the room temperature dictates. They also have the added advantage of only ever using as much power as they need to do the job, giving extremely low operating costs.

Another advantage of inverter systems is that many of the internal components are Direct Current (DC) operated. As DC motors generate more torque than their AC equivalents, this means that the motors are smaller and quieter than those on a fixed speed AC system. Also, inverter systems have, by default, an electrical soft start mechanism which means no “dimming” lights on compressor start up.

The obvious downside to Inverter systems is that their complexity = more cost. They are typically 30-40% dearer than their fixed speed counter parts.

R407c or R410a?

R407c and R410a are the international code numbers for two different types of refrigerant gas used in air conditioning. Both are environmentally friendly refrigerants but R410a is the newer, more efficient of the two. If you get the choice, always go for system that uses R410a as the refrigerant.

An older refrigerant, **R22, is outlawed** in Europe under CFC/HCFC regulations for use in new equipment. Never, ever buy a “new” air conditioning system that uses this refrigerant – it is illegal for the seller to offer it & probably illegal for you to buy it! Soon, the use of R22 will also be outlawed in existing equipment, which means the gas will be discontinued & unavailable shortly after that.

What format of unit do I need?

There are five main formats of air conditioner indoor unit:-

Cassette – like you see in the ceiling of you local bank or building society

Wall mount – does what it says on the can!

Floor mount – ditto

Ducted – hidden away from view, the air is carried along hidden ducts and ejected via grilles

Under Ceiling – use when there is insufficient ceiling void for a cassette unit.

Cassettes & under ceiling units don't really have a place in a domestic environment – these are generally commercial units and are manufactured in commercial sizes (typically 5kw upwards)

The format most used in residential air conditioning is the wall mounted indoor system. This is generally because they are the cheapest and are made in the duties more applicable to residential room sizes.

Floor mounted units have a place in conservatory applications as they are made in quite large duty ranges – some floor mounted units also have two fans, a lower fan for heating mode & an upper fan for cooling.

Ducted systems have a place in residential air conditioning projects – typically where one system is used to air condition more than one room i.e. a single ducted indoor unit could be mounted in a loft space and air condition three or four bedrooms.

What is involved in the installation

The short answer is “much more than you would think” !!

Using a wall mounted system as a benchmark, the installation procedure is as follows:-

1. Identify a wall within the room to be conditioned – ideally an external wall.
2. Identify a location for the outdoor unit that is within the maximum permitted piping distance.
3. Mount the indoor unit back plate , use this as a template for the pipework hole to outside.
4. Outside, mount the pipework support system – cable tray/trunking/clips
5. Draw in the insulated pipework – use a flaring tool on the pipework ends
6. Connect the flare connections – two outside, two inside
7. Pressure test the pipework to 400 PSI (27 Bar) with Nitrogen – use no other gas for this operation!
8. Install the air conditioner drain system/pipe
9. Evacuate the refrigerant pipework with a deep vacuum pump to below 400 microns
10. Install mains electrical wiring and interconnecting control wiring
11. Remove the vacuum pump – do not allow the vacuum to be broken within the pipework during this operation.
12. Open the outdoor unit refrigerant valves
13. Test the electrical installation
14. Run the unit in heating & cooling modes and check gas pressures with gauges.
15. Test the drain system for leaks by adding water until visible at drain outlet
16. Job complete – typically 8-12 hrs when done correctly depending on pipe run.

What additional features are worth paying for?

The first must have would be to go for a heat pump rather than cool only machine. Heat Pumps cost very little over & above a standard unit, the extra money would soon be recovered in energy savings.

The next most worthwhile feature is an upgrade to an inverter controlled compressor if funds allow. They offer increased comfort by varying the air outlet temperature together with lower running costs and noise levels. **Always** compare noise levels on any prospective purchase, particularly if you are going to use the system in a bedroom. Look for a system that has a “Sleep Mode” and offers noise levels down to 20 dba – Any noise level above 32 dba would likely require a TV to be turned up to compensate!!

All air conditioners have filters which remove dust from the air – also, when in cooling mode, air conditioners remove many pollens - they stick to the cold damp surface inside the unit and run off through the condensate water drain. Some units now incorporate special electronic filters called electrostatic or plasma filters. These filters charge high voltage plates located downwind of the standard filters. The plates attract & retain particles as fine as cigarette smoke & viruses, and can be a real boon for allergy sufferers. Electrostatic/plasma filters are a worthwhile option if you have a hay fever or allergy sufferer in the house.

Another feature gaining popularity on residential air conditioners are built in ionisers. These devices incorporate negative ion generators and emit negative ions (anions) into the airstream. These ions are claimed to enhance well being.

See www.samsung.com/in/products/airconditioner/technicalinfo/ for Samsung’s description of their ion system and it’s claimed effects.

Toshiba also have a small wall mount system which incorporates both plasma filtration & an ion generator system, see www.toshiba-aircon.co.uk/html/daiseikai.html

Summary

As with any purchase, common sense should be applied to buying an air conditioning system & you should apply the same brand selection criteria you would any other domestic appliance purchase.

i.e Is the brand well established? Toshiba, Mitsubishi, Hitachi, Samsung, Panasonic, Fujitsu etc

And

Does the manufacturer have a UK office for spares & support?

Also, the length of warranty or guarantee is important – 1 year minimum, with 3 year warranties becoming more common.

Another buying factor is to consider the *seller's* credentials; Do they know about air conditioning? Is air conditioning the CORE of their business, Can they offer you a choice of leading brands? How long have they been in business? Can they support the product they are selling Etc. All these criteria should be considered before you part with your cash.

Key points

If a seller can't tell you the C.O.P.* of the system he is selling you – look elsewhere!

If the brand is some “No Name”** far eastern one with no UK office – look elsewhere!

Don't part with your cash without a sensible guarantee from a seller that has been in business long enough to support that guarantee.

*C.o.P stands for Co-efficient of Performance – the difference between the output power of a system compared against the input power.

i.e. If a system gives 4.4 kw of heat output whilst consuming 1 kW of electricity, the C.o.P. is said to be 4.4 to 1 or just 4.4
All good heat pumps systems should have a C.o.P. in excess of 3.0

** See our Air Conditioning Brand League Table to see Who is Who in Air Conditioning.

Who's Who in Air Conditioning.

Manufacturer/Brand league table
For RAC product group (Room Air Conditioners)

Manufacturer or Brand	Made Where	Perceived Position*
Hitachi	Jap/Spain/Malaysia/ROC	Joint Top
Mitsubishi Electric	Jap/UK/ROC	Joint Top
Daikin	Jap/Belgium	Joint Top
Toshiba	Jap/UK/Thailand	Joint Top
Fujitsu	Japan	Joint Second
Panasonic	Japan/ROC	Joint Second
Samsung	Japan/Italy/Malaysia	Joint Second
Sanyo	Japan	Joint Second
Airwell	France/Australia	Joint Second
Chigo	ROC	Joint Best Chinese Brand
Gree	ROC	Joint Best Chinese Brand
Haier	ROC	Joint Best Chinese Brand
Anything else	ROC/Thailand/UAE/Israel/Italy	Runners up

*These brand positions are perceived positions backed up by 23 years experience within the air conditioning industry. They are based on the writer's perception rather than facts or figures – much the same as one might perceive a BMW to be better than a Lada.

The table is only representative of the RAC product group, Commercial & Close Control equipment group brands are excluded.

The definitive test of any Heat Pump Air Conditioner Brand can be found at this link:-

<http://www.eca.gov.uk/efl/search.asp?pagecode=0001000200010001>
(select Heat Pump, Air Source, Split & Multi Split from the list menu)

This link will take you to a searchable list of air conditioner brands and model numbers. It has been prepared by the UK government's Carbon Trust, an organisation which tests & approves (or otherwise!) low energy technology & equipment.

If the Brand or Model of unit is not in this list, then the unit is likely to be more expensive to run than it's equivalents that *are* listed.