DAIKIN
AIR CONDITIONING

The Pocket Guide to Air Conditioning

For the UK commercial sector

DAIKIN
AIR CONDITIONING

Welcome to the first edition of the Daikin Pocket Guide to Air Conditioning. This handy size reference guide has been produced to give you an overview of air conditioning systems; the different types of systems available and the things you should consider prior to installing an air conditioning system in your building.

This guide will try to answer some of the questions you might have on air conditioning and explains in straightforward terms some of the key factors when considering the use of air conditioning. Much of the content included within this guide will be explained to you by your chosen mechanical engineering installation and maintenance company.

Some of the myths surrounding air conditioning are expelled within these pages and should your interest take you even further then a list of references and sources of more information is contained at the back of the guide.

Daikin Airconditioning UK Ltd is the country's leading supplier of air conditioning equipment and solutions and has gained an established reputation for excellence in product design and engineering. This, combined with the company's extensive network of highly professional installers and D1 Partners makes for a winning combination in design, installation, supply and service of modern and energy efficient air conditioning systems.

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DAIKIN

INTRODUCTION

'One of the most valuable innovations of our time.'

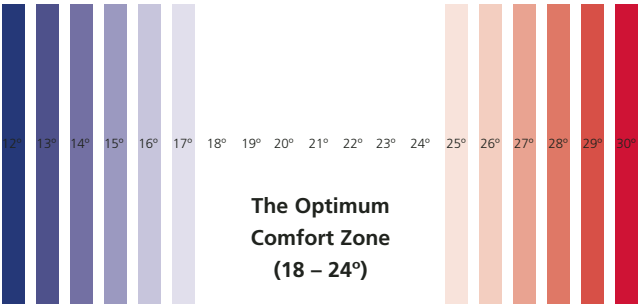
SECTION ONE

INTRODUCTION

WHY IS AIR CONDITIONING NECESSARY?

Air conditioning has had an incredible impact on the way we live, giving us the option to work, play and relax in climate controlled environments.

A controlled environment is no longer a luxury, it is an essential component for a successful business. The perception that air conditioning only 'cools' is a common myth. **Modern air conditioning systems provide the optimum temperature for your business to operate with efficient heating as well as cooling.**



- Air conditioning maintains a steady and comfortable temperature to keep your valuable customers and hard working staff happier.
- An air conditioning system will not only cool in the summer, but also heats in the winter.

- In cooling mode the humidity in the air is reduced, keeping the surroundings feeling fresh and pleasant to be in.
- Air conditioning systems can be very economical to run. The majority of Daikin UK units are eligible under the Government's Enhanced Capital Allowance (ECA) Scheme, which means the end-users may be able to reclaim the cost against taxable profits.

But you'll find the benefits of air conditioning to be much more than personal comfort.

The optimum comfort zone is between 18 – 24 °C, as stated by the World Health Organization (WHO). Above or below this temperature will start to have a negative effect on almost all businesses.

Hotels: A good night's sleep is essential to guarantee a satisfied guest who will want to return.

Gymnasiums: Conditions that are too warm will encourage members to question whether it's the environment that is causing their drop in performance.

Health Care: The World Health Organization warns that any cooler or warmer in the waiting room and the comfort of patients and staff could be compromised.

Retail: The temperature margin is closely linked to the spending habits of customers.

EFFECT ON BUSINESS AS TEMPERATURE FLUCTUATES

A national YouGov* survey, part of a new research project commissioned by Daikin Airconditioning UK Ltd into the optimum office temperature and the effect this has on efficiency, has revealed that nearly two-thirds (62%) of British office workers are too hot at work during the summer months.

Unsurprisingly, this impacts on workforce efficiency, with 63% saying the wrong temperature makes them sleepy and lethargic and 59% feeling less productive. Just under a third (28%) of people also suffer from increased stress and a quarter (25%) become miserable.

Stressed out!

Stress already affects one in five people at work and costs UK industry £3.7 billion each year, making it one of the most serious problems facing employees and employers alike. Caused by a number of factors such as relationships with colleagues, longer working hours, too much work or too much pressure, office temperature is also a major contributor to rising stress levels amongst British workers.

Top office turn-offs

There are a number of factors that turn people off when their office is too hot in the summer:

- Just under half (46%) of workers said office stuffiness and no circulating air was most off-putting.

- Over one in five (22%) workers are put off by bad odours in the office or from sweaty colleagues.
- 13% of workers said having to wear a suit or restrictive clothing is the most off-putting when it's too hot.

Keep your cool

By investing in air conditioning, you can effectively control your internal environment.

John Durbin, sales planning manager at Daikin Airconditioning UK Ltd comments:

"There is currently no statutory limit or government legislation set for the upper temperature in a workplace. However, creating a comfortable workplace environment is essential to maximise productivity and reduce stress. This research highlights a close correlation between a person's working performance and the temperature of their immediate surroundings. By introducing internal climate control measures, UK businesses will not only be making their employees feel happier and more comfortable, but it will also help boost productivity."

*The survey was carried out online by YouGov PLC, between 18 – 22 May 2006. YouGov interviewed 2,213 GB 18+ adults. The results were weighted to be representative of the known profile of the adult population from the 2001 Census. YouGov is a member of the British Polling Council.

Stress already affects one in five people at work and costs UK industry £3.7 billion each year – www.hse.gov.uk/stress.

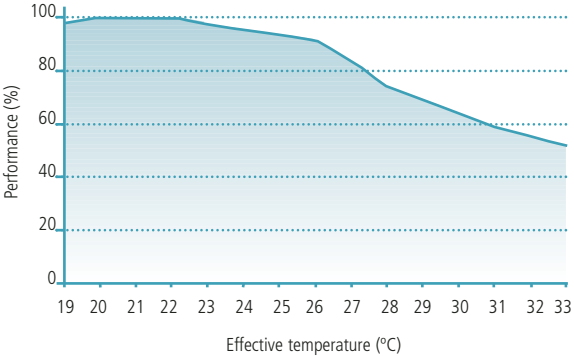
Man and Temperature

"Is there a temperature at which work becomes dangerous and should be stopped?"

The short answer is yes, both very cold and very hot temperatures could be dangerous to your health.

Excessive exposure to heat is referred to as heat stress and excessive exposure to cold is referred to as cold stress.

Performance in function of temperature:



"Air conditioning has changed the way we live."

One of the most valuable innovations of our time

Air conditioning has provided us with comfort and ease in our daily lives, giving us the option to work, play and relax in controlled environments.

We travel to our air conditioned workplaces in air conditioned cars, shop in air conditioned stores and malls and enjoy sports in air conditioned arenas. We have year-round choices of fresh or preserved foods kept cool or frozen and benefit from advances in medical services that are made possible through air conditioning.

Air conditioning applications

Air conditioning engineers broadly divide air conditioning applications into comfort and process.

Comfort applications aim to provide an indoor environment that remains relatively constant in a range **preferred by humans** despite changes in external weather conditions or in internal heat loads.

Comfort air conditioning makes advances in design of modern architecture feasible. In addition to hotels, commercial premises and retail buildings, air conditioning can be used for comfort in a wide variety of transportation including **land vehicles, trains, ships,** and **aircraft.**

Process applications aim to provide a suitable environment for a process being carried out, regardless of internal heat loads and external weather conditions. Although often in the comfort range, it is the needs of the process that determine conditions, not human preference. Process applications include:

- Hospital **operating theatres** in which air is filtered to high levels to reduce **infection** risk and the humidity controlled to limit patient dehydration. Although temperatures are often in the comfort range, some specialist procedures such as **open heart surgery** require low temperatures (about 18 °C, 64 °F) and others such as **neonatal** relatively high temperatures (about 28 °C, 82 °F).

- **Cleanrooms** for the production of **integrated circuits, pharmaceuticals** and the like in which very high levels of air cleanliness and control of temperature and humidity are required for the success of the process.

- Data processing centres
- Textile factories
- Physical testing facilities
- Plants and farm growing areas
- Nuclear facilities
- Mines
- Industrial environments
- Food cooking and processing areas

In both comfort and process applications, the objective is to not only control temperature but also humidity, air movement and air quality.

HEAT LOADS

Providing the optimum business environment is even more necessary, with modern buildings generating far more heat than their predecessors of say 50 years ago.

This is due to:-

Solar Infiltration
Heat from the sun has become increasingly significant due to changes in architecture.

Individuals
Occupancy rates are higher in modern office areas. Typically one person in an office generates some 120W/h – eight people will therefore generate slightly more than the 1000W output of an electrical room heater.

Electrical appliances
Computers, printers and photo-copiers all generate substantial heat loads.

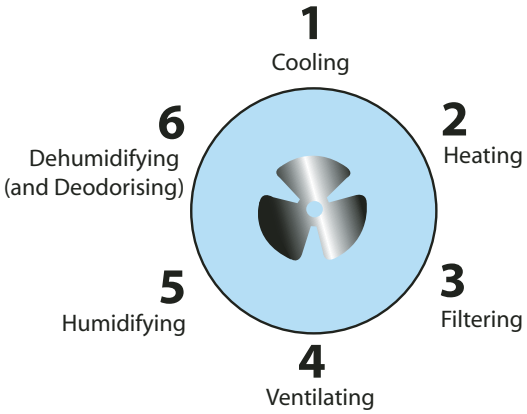
Lighting
Light gives off a substantial amount of heat, UK offices usually generate between 15 and 25 W/m^2 while some shops could be adequately heated by their lighting alone!

Ventilation
Occupants require fresh air ventilation. Unfortunately, if the outside temperature is 5 °C, for example, this will be the temperature of the incoming fresh air as well. Ventilation alone cannot cope with the high internal heat gains experienced in modern office complexes. Indoor temperature and humidity levels can fluctuate wildly if ventilation alone is installed. The optimum solution requires air conditioning and ventilation in combination.

WHAT IS AIR CONDITIONING?

The term **"Air Conditioning"** is one of the most misused phrases in that it covers a wide range but is generally thought of as 'cooling' alone.

There are essentially six facets to air conditioning. These are:



The order shown above reflects the most common requests for air conditioning.

An **air conditioner** *(AC or A/C)* is an **appliance, system,** or **mechanism** designed to extract heat from an area using a refrigeration cycle. The most common uses of modern air conditioners are for comfort cooling/heating in buildings and vehicles.

In relation to equipment there are various ways of creating and delivering conditioned air. These are explained in more detail in section 4.

CASE STUDY: BLUE CROSS UK, ANIMAL WELFARE CHARITY

THE BLUE CROSS

Britain's pet charity

LOCATION:

Grimsby, Lincolnshire

REQUIREMENTS:

A modern and innovative system that offers complete control to complement a new state-of-the-art animal hospital complex.

SOLUTION:

An energy efficient and cost effective VRVII commercial air conditioning system controlled via a Daikin Intelligent touch controller (i-controller) located in the plant room, which also controls the underfloor heating throughout the hospital.

THE BASICS OF AIR CONDITIONING

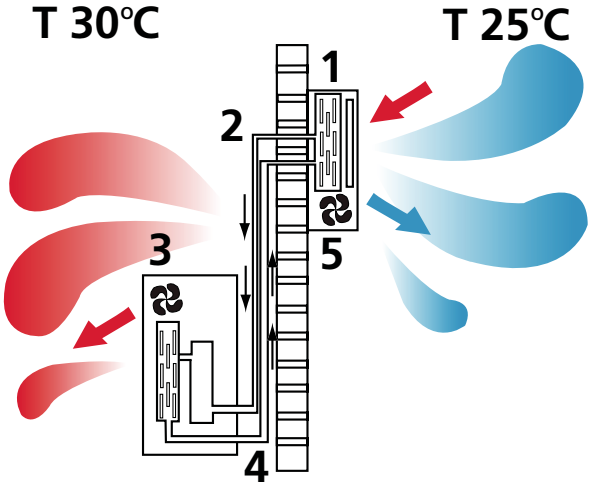
'Personal comfort, satisfaction and a climate for increased business prosperity.'

SECTION TWO

THE BASICS OF AIR CONDITIONING

The air conditioning process requires an indoor unit, an outdoor unit and copper piping to connect both. Through the piping the refrigerant flows from one unit to another. It is the refrigerant that absorbs the energy in one unit and releases it in the other.

Cooling mode



1. Indoor unit
A fan blows the hot indoor air over a heat exchanging coil through which cold refrigerant flows. The cold refrigerant absorbs the heat from the air and cooled air is blown into the room.

2. Copper piping
The refrigerant circulates through the units and the piping and takes the heat from the indoor unit to the outdoor unit.

3. Outdoor unit
Through compression, the refrigerant gas is heated and its boiling point increases. In the outdoor unit the heat obtained through compression is released to the outdoor air by means of a fan which blows the outdoor air over a heat exchanging coil.

4. Refrigerant
The liquid refrigerant flows back to the indoor unit.

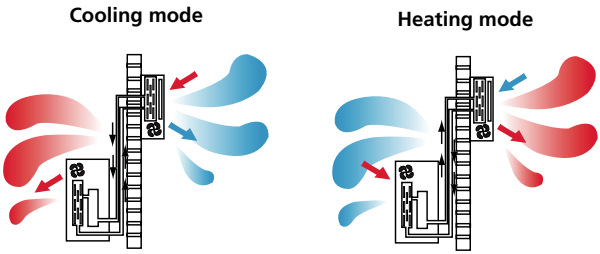
5. Indoor unit
Back in the indoor unit, the refrigerant is decompressed and thus enabled to extract heat from the indoor air.

Heat pumps are air conditioners which can be used both for cooling and heating. The principle is that they are able to reverse the process of transporting heat from one place to another.

Energy efficiency?

Heat pumps are much more energy efficient than other heaters. The reason for this is simple: rather than burning a fuel, they simply 'move heat'. Because of this, heat pumps are up to five times more energy efficient than traditional heating methods.

Heat pumps additionally allow the refrigerant cycle to be reversed. A heat pump extracts energy from the outdoor air and transfers the heat indoors. This principle even continues to function on very cold days with temperatures down to -5°C, -10°C or -15°C, depending on the type of air conditioning system used.



Therefore, heat pumps eliminate the need for a heating system and allow you to cool and heat with the same unit, with savings in costs and energy throughout the year.

CASE STUDY: ONE STOP STORE

LOCATION:

Carlton-in-Lindrick, Nottinghamshire

REQUIREMENTS:

A system that combines freezing, refrigeration and energy efficient heat pump air conditioning with measurable energy savings, reduced running costs information and low operating noise levels.

SOLUTION:

The Conveni-pack system, a complete solution that provides significant energy savings, a major reduction in operating costs, low CO_2 emissions and lower noise levels. It also requires 60% less installation space – and all of the heat rejected from freezers is reclaimed to heat the premises in a controlled manner, offering precise comfort conditions throughout.

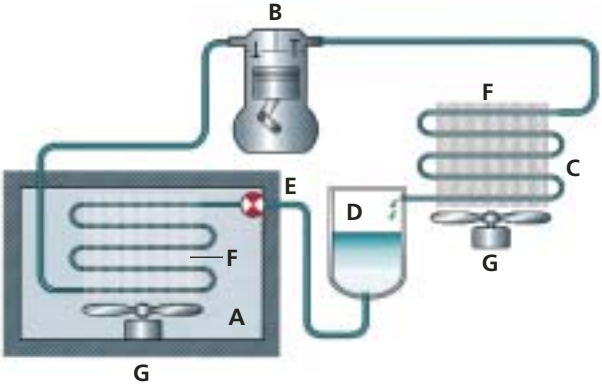
WHY USE REFRIGERANT?

A refrigerant is one of the most efficient and economical ways to collect heat from one area and move it to another. The greater the efficiency the less fuel (mainly electricity) will be used, which apart from lower bills, will be better for the environment.

Cooling Cycle

1. A refrigerant is a chemical substance which is used in a closed circuit.
2. When a gas, it is compressed into a liquid and then evaporated into a gas.
3. When compressed it becomes hot and is condensed into a liquid (in a finned coil which is in an air stream).
4. This heat is transferred away so that when the refrigerant is allowed to evaporate, normally in another finned coil, it gets very cold.

When it evaporates, heat is absorbed by this cold coil. Since the temperature of the liquid remains constant during the vapourising



process, refrigeration is continuous until all the liquid is vapourised. Any container in which refrigerant is vapourised is called an **Evaporator (A).**

In order to re-use the refrigerant, it must be turned back into a liquid so that it can be vapourised again absorbing more heat as it does so. Therefore, a **Compressor (B)** is used to pressurise the gas and pump it through the system to a **Condenser (C)** where the refrigerant turns back to liquid giving off heat as it does so. Water or air is ordinarily used to absorb the heat. The refrigerant is stored in a **Receiver (D).** The **Expansion Valve (E)** reduces the pressure and compensates for the increase in pressure caused by the compressor. This is necessary because the high pressure needed to condense the vapour also makes it impossible for the fluid to evaporate.

IMPROVING HEAT EXCHANGE

Heat exchange efficiency depends on the surface area of the evaporator and the condenser in which the heat exchange occurs. Therefore, both the condenser and the evaporator are built with **Serpentine Coils (F)**. Furthermore, adding fins to the serpentine coil provides better heat exchange efficiency.

Air volume is also a major factor in heat exchange.

The use of an **Electric Fan (G)** improves the heat transference.

The principle of air conditioning always comes down to the same thing...

...absorb energy in one place and release it in another.

THE KEY ISSUES

'Enhance the working environment economically, efficiently and discreetly.'

SECTION THREE

THE KEY ISSUES

Over the following pages we will answer some of the most common concerns that business managers have when considering installing air conditioning. We also explain in brief some of the key issues in the industry at this time.

CAPITAL COSTS VERSUS WHOLE LIFE COSTS

Possibly the first thought of the business manager or owner when considering installing an air conditioning system is what will the capital cost be? However, managers are increasingly considering the concept of whole life costs for the investments they make in building services. It makes sense that if you purchase premium products from a quality manufacturer with a comprehensive service and maintenance package there will be a long term impact on the profitability and productivity of your business.

Essentially, whole life costs for air conditioning equipment are the costs incurred by running the equipment through its lifetime. This can be divided into two areas:

Financial costs

- Purchase Price
- Annual Energy Costs
- Service and Maintenance Charges

Hidden costs

- Downtime
- Staff Performance
- Customer Comfort
- Costs to Environment

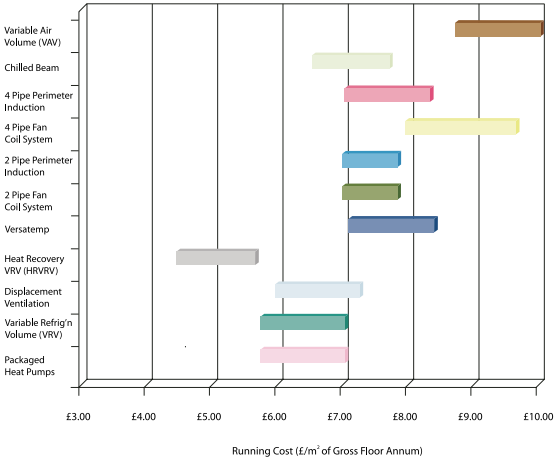
When evaluating different air conditioning systems the above factors should be taken into account, comparing each of these issues on a like for like basis when making a decision about which product manufacturer to choose and which installation company to work with.

The reward for this will be a more energy efficient and well maintained system, which could lead to reduced fuel bills. Ultimately though, by installing a system like this to effectively control the internal environment, the overall comfort of your customers and the productivity of your staff will be greatly improved.

RUNNING COSTS

The running costs of a system are often overlooked and should be considered at the outset. Franklin and Andrews set out the running costs for different systems in their 'Property Little Black Book' reference guide. These figures are reproduced below for your reference with their kind permission:

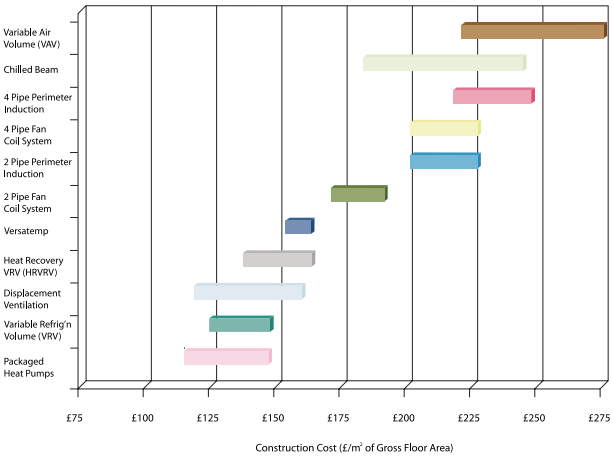
Air Conditioning – Running Costs



CONSTRUCTION COSTS

The following table sets out the construction costs from the 'Property Little Black Book'.

Air Conditioning – Construction Costs



Please note these figures are based on 2004 prices.

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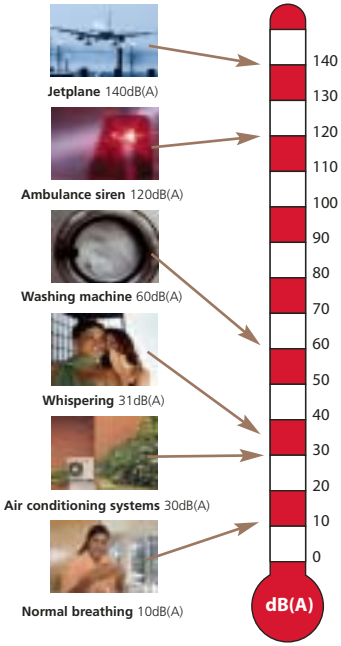
NOISE

One of the most worrying and natural concerns that business owners and managers express when considering the use of air conditioning is that of noise. They imagine the inconvenience of a loud and permanent humming sound resulting in complaints and discomfort for employees or customers. In practice, today's modern systems are manufactured to such a degree that a well designed system will operate within a more than comfortable sound zone often unnoticed by the people occupying the building. It is however, an important area of concern and something that must be considered right at the start of your project.

Sound can be defined by any pressure variation detectable by the human ear; scientists use a logarithmic scale and a weight distribution factor for the frequencies to provide a method of measuring the way in which the human ear perceives sound. This unit of measurement we all know as the 'decibel' and is referred to in technical terms as dB(A). The chart sets out some every day sounds and their respective dB(A) value.

Examples of noise levels

The target zone for an air conditioning system is 30 decibels – 30 dB(A).



COLD DRAUGHTS

Another issue for business managers when considering air conditioning systems is cold draughts and the discomfort that may be caused to employees and customers.

Poorly designed systems can indeed cause uncomfortable draughts and so location of the indoor unit and its air distribution pattern must be considered at the design stage. Again, this is where Daikin or a D1 Partner can provide assistance in planning your new air conditioning system, drawing on their experience of many different environments and situations.

The height of the ceiling in your building will also be relevant in this process. Air conditioning manufacturers generally assume that the optimum ceiling height for a direct expansion system to be between 2.7 and 3.5 metres. Cold air at about 12 to 14 °C supplied from this height is able to mix with warmer room air before reaching personnel level, thereby relieving any feeling of draught.

Of course, not all situations fit this standard and so quality systems and equipment are designed to be 'tuned' to compensate.

LEGIONNAIRES DISEASE

Press reports to do with the spread of Legionnaires disease have naturally caused concern in relation to the use of air conditioning in buildings but in truth it is highly unlikely that the disease will have been passed on by an air conditioning system. It is more likely that it would have grown in a water cooler (cooling tower) on a roof. **These are not used with Daikin direct expansion or air cooled systems.**

The most common and accepted reason for contracting Legionnaires disease is by inhaling mists that come from a water source contaminated with Legionella bacteria. For the disease to be contracted a person would have to come in contact with breathable droplets of contaminated water. The disease is suited to conditions where temperatures range from 20 to 45 °C with sludge, rust or algae or organic matter to provide nutrient.

Conditions suited to this environment include cooling towers, evaporative coolers, whirlpool spas, showers and humidifiers. The disease is not found in air cooled air conditioning systems.

Daikin or a D1 Partner can provide further information to put your mind at rest on this subject and more details can be found at the government operated website www.hse.gov.uk/legionnaires.

BUILDING REGULATIONS

Part L of the Government's Building Regulations is about making sure that the industry minimises the annual energy cost of a building and considers the impact of energy usage right at the design stage.

In April 2006, an upgrade to the Building Regulations parts L2A and L2B covering non-dwellings was released. Part L2A covers new buildings and Part L2B covers refurbishments. It is now necessary to show that a development's annual carbon emissions fall within the limit set by the Department of Communities & Local Government (DCLG).

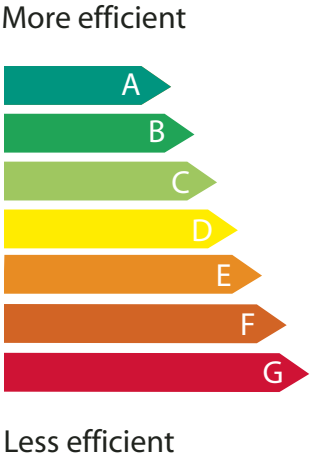
It is therefore essential that any air conditioning equipment specified for new buildings or in refurbishment projects is of the highest standard in terms of quality and energy efficiency to minimise carbon emissions and ultimately to improve indoor air quality.

There are many things to consider when choosing an air conditioning system; Daikin products are energy efficient, quiet, cost effective, and meet or even exceed all legislation requirements, so you can be sure of the highest standards from the whole Daikin product portfolio.

ENERGY LABELLING

Energy labelling is part of a wider European Climate Change Programme that targets energy efficiency as one method of reducing CO_2 emissions – similar to ratings given to white good such as washing machines and dishwashers.

The energy label provides information on the energy consumption of the unit. Air conditioning units (with cooling capacity less than 12kW) are classified in seven different categories (A to G), according to their energy consumption and colour coded according to the category to which they belong.



The most energy efficient units will be included in the 'A' category, indicated by a green arrow on the scale and less efficient units will belong in the 'G' category, indicated by a red arrow. By using this scale it becomes simple to compare the energy efficiency of the same types of units from different brands at a glance.

THE IMPORTANCE OF CONTROL

So what's the use of all of these energy efficient products if we can't control them? The ability to control the environment that surrounds us is becoming more and more important and not just from a comfort viewpoint. The reality is that without control, the products themselves would not be nearly as energy efficient. With this ability we gain the benefit of being able to monitor and automate air conditioning systems, cutting down on waste, reducing carbon emissions and saving money through increased energy savings.

Controllers themselves can range from something as simple as single or multiple remote controls – that will turn a unit on and off, control room temperature and fan speed - right through to highly sophisticated touch-screen controllers linked to a network that give you the ability to automate, schedule, fault-find, and control the air conditioning in over 100 different zones throughout a building.

"The ability to control allows us to monitor and automate air conditioning systems, cutting down waste, reducing carbon emissions and saving money through reduced energy usage"

THE ENHANCED CAPITAL ALLOWANCE (ECA) SCHEME

The Enhanced Capital Allowance (ECA) scheme is a key part of the Government's programme to manage climate change and is designed to encourage businesses to invest in energy-saving equipment.

Qualified for Energy Technology List www.eca.gov.uk TM

Authorised User No. 00061

Why was it introduced?

The Government introduced the ECA scheme in 2001 to encourage businesses to invest in low carbon, energy-saving equipment. As part of the Climate Change Levy Programme, it's designed to help the UK reach its Kyoto target of reducing carbon emissions by 20%.

What does the ECA Energy scheme involve?

The scheme offers companies a tax incentive for investing in equipment that meets published energy-saving criteria. The Energy Technology List (ETL) explains the criteria for each type of technology and includes those products in each category that meet them. It is managed by the Carbon Trust, on behalf of the Government.

Much of the Daikin Product portfolio is fully approved under the scheme and qualifies for this important but largely unknown benefit. To see which equipment qualifies for the ECA Scheme, please visit www.eca.gov.uk/etl.

The Enhanced Capital Allowance scheme enables businesses to claim an 'enhanced' 100% capital allowance on investments in energy-saving equipment during the first tax year.

All businesses that pay UK corporation tax are eligible for ECAs, but the size of the tax reduction depends on the cost of investment.

The scheme delivers significant advantages over Capital Allowances, providing an immediate tax break as well as the potential for long-term savings on energy costs!

Information courtesy of www.eca.gov.uk

SUMMARY CHECKLIST

- ❑ Consider whole life costs – don't just look at the capital cost alone but consider alongside the running costs and the servicing costs, then look at the quality of the product and its performance track record - downtime can cost sales and staff productivity!

- ❑ Pay careful attention to the design of the system and question the positioning of the units to ensure they won't cause drafts and discomfort for employees and customers.

- ❑ Consider the operational efficiency of the units – a system which is running permanently at full capacity is more liable to be noisy and susceptible to greater strain on the machine.

- ❑ Discuss the long-term requirements for the system and any possible expansion plans which may involve increasing the system capacity and efficiency.

- ❑ Examine the option to include a service and maintenance package with your system. This will ensure the operational efficiency of your system and the long-term value to your business.

- ❑ Consider the credentials and experience of the installer company – a bad system installation can reduce operational efficiency, cause employee discomfort and look unsightly!

- ❑ Discuss the ECA scheme with your accountants or advisors as this can provide valuable tax benefits.

THE DIFFERENT SYSTEMS

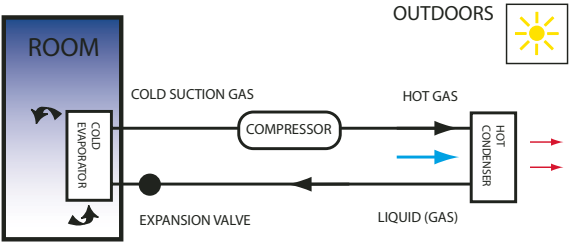
'Cooling, Heating, Filtering, Ventilating and Humidifying.'

SECTION FOUR

THE DIFFERENT SYSTEMS

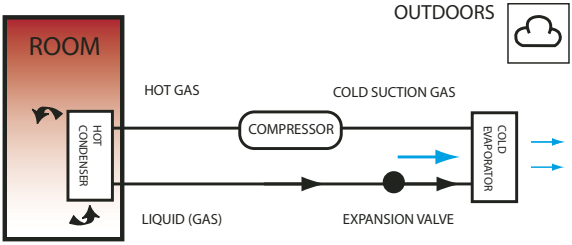
The refrigeration system illustrated in the section entitled 'The Basics of Air Conditioning' is a 'Direct Expansion' system. By using this principle an air conditioning circuit can be made.

A Direct Expansion system - cooling



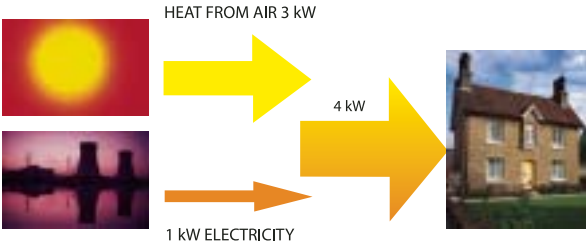
If you turn the system around you could heat indoors instead of cooling. This is known as a 'Heat Pump'. The main advantage is that heat is extracted from the outside air (even at many degrees below zero!) and brought into the building. This is sustainable heat which all goes to helping stave off global warming.

A Direct Expansion system – heating



In the majority of conditions in the UK the outdoor temperature is above zero – this raises the efficiency of the heat pump. The example below shows a system returning 4KW of heat for the use of only 1KW of electricity ~ a COP of 4 to 1.

The efficiency of the heat pump



COEFFICIENT OF PERFORMANCE (COP) 4:1

The above examples are very simple systems. In reality, air conditioning is characterised by its diversity of systems designed to meet a host of requirements from single room residential use to major building projects. These are explained in the next sections.

There are a variety of systems that use the Direct Expansion method, but there are also other types of system that transfer heat by use of water and air.

THE MANY TYPES OF SYSTEMS

There are three basic media for transferring heat from one place to another:

Air
Air is cooled or heated centrally and transferred via large ducts to cool or heat specific areas.

Water
This applies to most central heating systems. Water is cooled or heated and then used to cool or heat specific areas. The water is initially cooled by refrigerant.

Refrigerant
A 'Direct Expansion' system, so called because the refrigerant itself circulates through the building, cooling or heating specific areas.

These are generalised classifications and within each there are sub-sets that are more relevant to applications.

Single Room Applications (Direct Expansion Type)

Single Package

Examples of this are
Window Units and
Mobile Air Conditioners.

Advantages:

- Good in very small areas and for spot cooling
- Quick
- Inexpensive

Disadvantages:

- Crude, noisy and drafty
- Can block light
- Can be unattractive, intrusive and limited in positioning

Creating the right environment is a complex matter. Several factors determine which equipment is the best solution for you. The most important is to be advised by a good installer.

Split Systems

If the outdoor compressor and the outdoor coil are built into a single unit and the indoor into another, it is called a Split System. Installation would require a refrigeration engineer to connect up the pipes, evacuate all air and moisture from the whole system and charge it with the correct quantity of refrigerant.

Split systems can be used in small one-off installations or large applications where each of a multiple of rooms or offices has its own dedicated unit.

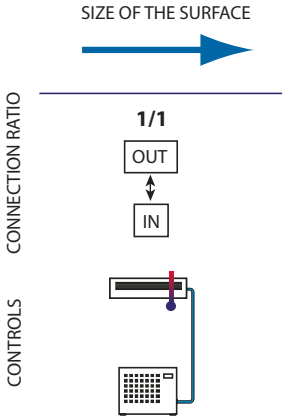
Some single large areas can be fitted with two, three or four indoor units acting as a single system on one outdoor unit.

Advantages:

- Can be installed relatively inexpensively.
- Used for small rooms or in multiples thereof, eg bedrooms, shops, small office complexes etc.
- Each system is totally independent with its own control.

Disadvantages:

- Restriction on total piping lengths.
- Not as economical as VRV* in large installations.
- Control flexibility not as good as larger systems.

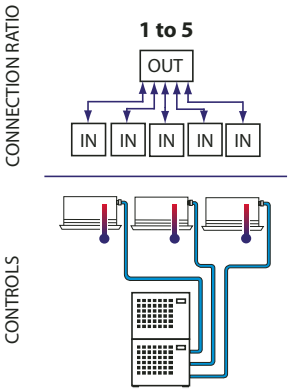


*VRV = Variable Refrigerant Volume

Multiple Room Applications
Direct Expansion Type

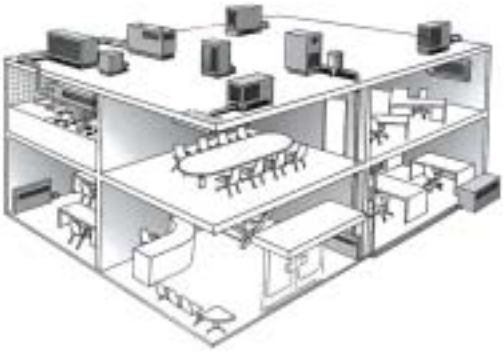
Multi Splits

These are an extension of the split system. If the outdoor (condensing) unit is connected to up to 5 independent indoor units it is a Multi System. Each indoor unit has its own controller and pipe work back to the outdoor condensing unit.



Advantages:

- By and large each indoor unit operates independently.
- Ideal for residential applications, small offices and small hotels.
- Outdoor installation is neater and saves space.



Capital Project Applications (Air, Water and Refrigerant Types)

Designed specifically to cope with the special requirements of larger building projects.

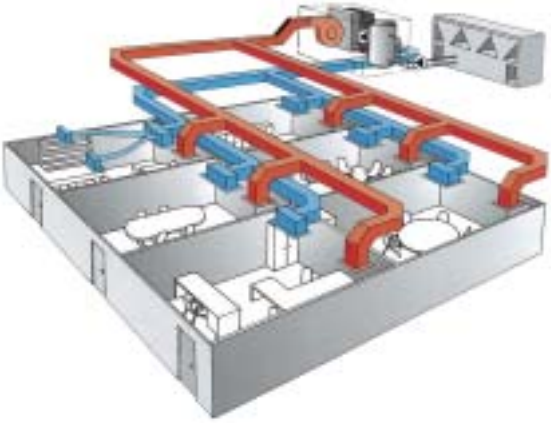
Central Air Handling Unit Systems (AHUs)

This system produces cold or heated air at a central source and distributes it via ducting around a building, during which time it can lose energy. It is then recycled into the AHU where it passes through an air/water or air/refrigerant heat exchanger.

AHUs can comprise several modules in which the air is filtered, cooled, heated, humidified and odours added or removed, as required. Therefore, it is ideal in clean rooms and operating theatres, where air quality is of the utmost importance. AHUs are also ideal for cooling or heating tall internal areas such as auditoria, warehouses, etc.

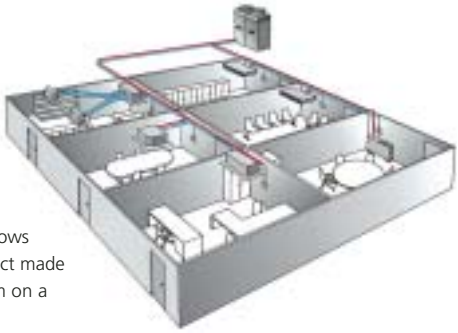
Disadvantages:

- AHUs have a limited role due to their large ducts and potentially high running costs where air distribution is via complicated networks.



VRV Systems (Variable Refrigerant Volume)

VRV systems represent the only capital project applications that genuinely operate on the direct expansion principle. The refrigerant in a multi system is varied to meet the exact requirement, it is known as a Variable Refrigerant Flow VRF System.



The drawing shows clearly the impact made by a VRV system on a typical building

Up to 64 indoor units can act on their own or in a group operating from a single outdoor unit. They lend themselves to medium and large buildings. VRV systems are available in three types, cooling only, heat pump and heat recovery. The heat pump type can only operate in one or other mode (cooling or heating) but the heat recovery VRV systems can provide simultaneous cooling and heating.

Advantages:

- Highly efficient.
- Do not require plant rooms.
- A wide array of controls can be used.
- Utilises smallest bore piping.
- Easy to install and commission.
- The most flexible, economic and efficient commercial system on the market.

Hydronic Systems

In hydronic systems, chillers are used to cool water centrally prior to fan coil units (or other types of heat exchanger) which serve those areas requiring cooling. As it absorbs heat from those areas, the water warms up, returning eventually to the chiller where it is once again cooled by refrigerant. Naturally, the heat from the water must itself be exchanged with the outdoor air and this can be achieved in two ways – each with its own specific impact on system design.

Water cooled system

A water cooled (heated) system is one where the rejected heat is transferred into a water loop which is cooled by going through a blast water cooler or a cooling tower. With water cooled/heated systems the loop can also be used for transferring heat to an internal heat pump.

Advantages:

- Plant can be located in small internal areas.
- With good balancing of heat input a heat pump system can be made to operate very efficiently.

Disadvantages:

- Strong roof structure required in some cases.

Air cooled system

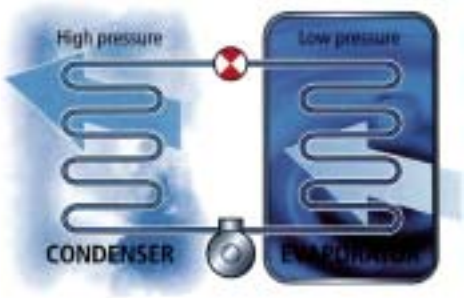
An air cooled system does not need a cooling tower because the heat absorbed by the refrigerant is exhausted by the chillers' fans directly to the outdoor air units.

Advantages:

- The system is set up in the premises only needing the water distribution system to be connected.
- No external water considerations (cleaning, connecting, positioning, etc) need to be made.

Water cooled system

Air cooled system



When considering a system suitable for a specific requirement, the practicalities, installation and hence capital costs are of course the first consideration. However, whole life costs such as running costs, including maintenance and energy consumption, must also be considered.

The effect of global warming must also be considered. Energy efficiency is always a major consideration when looking at the total warming impact over the operating life rather than the initial charge of refrigerant.

WHY CHOOSE DAIKIN?

'The only true air conditioning specialist.'

SECTION FIVE

WHY CHOOSE DAIKIN?

As experts in our field and recognised within the industry, we see it as our responsibility to ensure customers are confident with our range of technological leading edge products. Daikin Airconditioning UK Ltd is a wholly owned subsidiary of Daikin Europe NV. The focus of our business is the sales and distribution of Daikin air conditioning products whilst fully utilising the advantage of our European Group Manufacturing Division.

Over 70 years of precision and innovation has helped Daikin build a worldwide reputation for quality and technology

THE PRODUCT

Daikin offers an extensive range of advanced air conditioning equipment – encompassing split, multi split, packaged, VRV and chilled water – for residential, commercial and industrial applications. Technological advances are evident across the full range of products. For example, Inverter technology has been applied to all split and multi split systems, which are especially suited to shops, restaurants and small offices. This technology provides a more comfortable environment and offers substantial savings in energy consumption.

The type of air conditioning product chosen is only part of today's drive for energy efficiency. The choice of Daikin controls to achieve maximum efficiency and comfort is infinite. Intelligent control systems from entry level to multiple air conditioning systems are available. The levels of expertise available within Daikin UK includes a team of control specialists, the facility of a control management helpdesk and remote monitoring and control of building systems.

Compressors, Electronics and Chemicals

Daikin knows that the compressor is the heart of the air conditioner. It is produced in-house to ensure it meets Daikin's strict quality control. If the compressor represents the heart of the system, the electronics are surely the brain. Electronic expansion valves monitor and regulate compressor capacity by varying the frequency of the power supply. This ensures a balanced and pleasant indoor environment without large scale fluctuations in room temperature.

Daikin is the only air conditioning manufacturer in the world to produce refrigerant chemicals. The company is therefore in a unique and enviable position to research and develop alternative refrigerants and apply them to both new and existing equipment. It enables equipment to be designed around and tested with an individual refrigerant – in fact, optimised to ensure compatibility, performance and long term operating reliability.

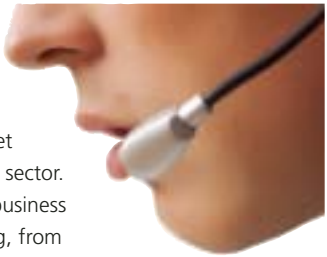
It is the unique combination of these three factors, integral to the company's core business, that has led to worldwide recognition that Daikin is indeed the only true air conditioning specialist.

MEETING THE NEEDS OF OUR CUSTOMERS

Sales Support, Training and Communication

Daikin UK's position as the leading innovator in the market is the result of the close communication and co-operation between our D1 Partners, customers and staff. The Daikin high quality standard depends on it.

The company is structured to ensure flexibility to each sector of our business. An external sales team provides extensive cover throughout the UK, supported by internal sales and full after-sales support. Within the team are dedicated specialists who consolidate consultant demands by developing a working relationship that does not invade their design responsibility but assists by application solving – for example, using case study reference material.



We have gained considerable experience in supply partnerships with national accounts operating on the high street and within the commercial sector. Our capability to develop business in this sector is far reaching, from competitive price structures to detailed feedback data, extended warranty and training for the contractors approved by the national account client. The Daikin UK sales team are quietly confident that between them and a comprehensive Field Quality Support Team anything is possible and indeed that is normally the case.

We are also in a position to recommend companies as Daikin Approved Installers who are part of our D1 Partner Network, which extends throughout the UK. The philosophy of this network is that, through the medium of partnerships, business can be developed for mutual benefit and loyalty is rewarded. The approval bears significant recognition, with engineers given access to an extensive Daikin UK training programme. D1 Partner companies are able to provide an extended five year warranty on all Daikin equipment subject to terms and conditions.

Daikin UK also recognises that training is the first step to making our customers self sufficient and therefore, in a position to need help only with the more difficult situations. It is important that the customer is engaged in the selection, application and installation of the products with trust and clarity.

WAREHOUSING AND LOGISTICS

The sales and distribution network within Europe is further enhanced to ensure customer satisfaction by our activities in the UK. Warehousing facilities at multiple distribution centres hold local stocks. Every day, week and month trucks deliver products from the Ostend factory to these centres. Each distribution centre also carries extensive stocks of spares and accessories and is equipped with its own fleet of modern delivery vehicles to maintain a regular and dependable supply chain to the UK customer base.

All Daikin UK offices are linked with each other and European headquarters in Ostend by a fully integrated computer network, enabling close communication between field sales and technical departments to be maintained at all times for the benefit of customers throughout the country.

QUALITY

Since its formation in 1972, Daikin Europe has evolved from a component assembly plant into a full production unit that meets all European manufacturing standards. The specific quality requirements of the European market are taken into account and high priority is assigned by Daikin Europe to research, resulting in optimised unit capacity and quality.

Following the factories in Japan, Daikin Europe received the ISO 9001 certificate in 1993. ISO9001 certification is the customers guarantee that close attention is paid to quality during all stages

of design and production, as well as after sales. It also guarantees that the quality system itself is audited regularly, both internally and by external bodies.

COMMITMENT TO THE ENVIRONMENT

Daikin's dedicated commitment towards improving the quality of the environment has been rewarded with the coveted ISO 14001 certification.

ISO 14001 provides assurance that "Daikin has an effective environmental management system in place to protect both man and the environment from the potential impact of its manufacturing activities, products and services while helping to maintain and to improve the overall quality of the environment." Daikin is thought to be one of the first air conditioning manufacturers to receive such recognition.

Government legislation prohibiting the use of toxic substances and the generation of pollutants has slowed down the destruction of the environment. Daikin Europe is proud to have been pro-active in this respect, closely following its Japanese parent in implementing policies that have often pre-emptied official legislative codes and directives. As a result, a culture of 'environmental management' implemented since 2001 plays a key role in the company's day to day activities and development strategies.

Top management commitment is reflected in the establishment of a number of action plans which are now strictly observed and implemented throughout the Daikin Group.

1 Sustainable use of energy through product recycling and waste reduction

Reduce, recycle and reuse – promoted in all Daikin's everyday business activities. The manufacturing division has adopted 'ZERO waste' and 'ZERO emission' targets for implementation throughout the production stage.

2 Ozone friendly and energy saving

Daikin Europe have always led the field in promoting the use of ozone friendly refrigerants. In addition, all products are continually subject to redesign in order to ensure their optimum performance during both cooling and heating cycles.

3 Development of environmentally friendly products

Daikin is firmly committed to 'eco design' and continually strives to improve the 'green' content of its products.

4 Efforts at European level

Daikin Europe's environmental policy, although geared overall to worldwide considerations, takes full account of all local and specifically European legislation and directives.

CASE STUDY: BRITISH FILM INSTITUTE, NFT (NATIONAL FILM THEATRE)

LOCATION:

South Bank, London

REQUIREMENTS:

To install an extremely flexible and energy efficient air conditioning system to provide all year round climate control to the whole building without disturbing current services.

SOLUTION:

The Daikin VRV system – This system was specified based on its flexibility, ability to sustain long pipe runs, heat recovery facility and capacity for installation without disturbance to the existing services. The system installed is highly energy efficient, which reduces energy costs and allows for complete control of the whole building's indoor climate.

Histoire
2

DAIKIN D1 PARTNERS

'An absolute commitment to training, development, product knowledge and customer service.'

SECTION SIX

DAIKIN D1 PARTNER NETWORK

WHAT IS THE D1 PARTNERSHIP?

Daikin Airconditioning UK Ltd products and systems are marketed and sold through an extensive UK network of installers who act as Daikin direct sales representatives throughout the UK.

The D1 Partner Network is a recognised group of highly skilled independent companies who have an active and on-going dialogue with Daikin UK and provide many advantages to the customers they serve. These advantages are explained in the following pages and play a vital role in understanding why you should choose a Daikin air conditioning system for your premises and a D1 Partner to install and commission it.

A PARTNERSHIP BUILT FOR SUCCESS

Daikin UK's goal is to work in partnership to help our installer customers grow and develop their business through building long term relationships. The D1 Partnership offers Approved Installers a vast range of benefits including technical support, project assistance, marketing and communication information. D1 Partners benefit from being in a network which rewards and promotes them, gets to know what they expect and how to meet their future demands.

'Our long term relationship with Daikin and D1 Partner status is recognition of the experience we have in the market'

Andrew Reeve, Pitkin & Ruddock

DESIGN AND INSTALLATION

D1 Partners are selected by Daikin UK for their high standards of installation and expertise and awarded 'Approved Installer Status'. Recognition of D1 Partner status provides the end user with peace of mind that the installer is publicly endorsed and supported by Daikin UK.

In many cases the D1 Partner can offer full design and technical assistance and provide detailed support information relevant to the project. The D1 Partner acts as a valuable aid to the M & E consultant or architect offering their expertise to the design process.

'Our D1 partner status demonstrates our commitment to training, installation excellence, and customer service; it's an essential part of our business' Simon Thurstans, Guardian Environmental

QUOTATIONS AND PROPOSALS

The D1 Partners are skilled professionals who will provide proposals based on many years' experience, technical know-how and product knowledge so that you can be confident your new system is the best possible solution, combining operating efficiency with cost. D1 Partners will explain the options available, provide detailed quotes and written recommendations to guide you through the complete process.

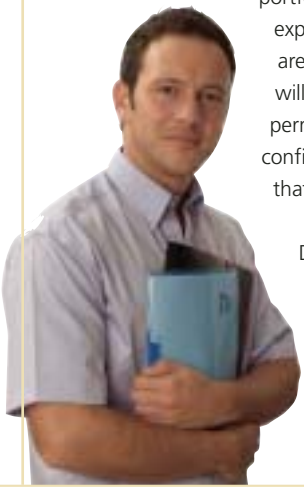
PRODUCT TRAINING AND DEVELOPMENT

One of the key benefits of using a D1 Partner is their access to product training courses from Daikin UK where the goal is to help D1 Partners to continually build upon the skills of their engineers to maintain the highest of industry standards. Daikin UK operates the most comprehensive training facilities in the industry with dedicated centres in Glasgow, Manchester, Birmingham and a state-of-the-art Technology Centre in Woking.

Courses are run throughout the year by an expert training team and cover installation, controls on the full range of Daikin products and systems – from apprentice to senior engineer level. This significant investment is undertaken as part of Daikin UK's overall business strategy and its commitment to maintaining and improving industry standards.

PROFESSIONAL AND ESTABLISHED BUSINESSES

A D1 Partner will have already developed a good working relationship with Daikin UK and have an established client portfolio, product knowledge and experience. By recognising that they are using a D1 Partner, the customer will know that they have a sense of permanence and reliability and can be confident they are dealing with a company that will serve them for many years.



D1 Partners are innovative and dynamic, enthusiastic about building their relationship with Daikin UK in order to grow their business, and committed to the highest standards in customer service.

EXTENDED WARRANTY

All Daikin products typically come with a 3 year manufacturer's warranty on products to demonstrate quality. However, because of Daikin UK's belief in the standard of D1 Partner installations, D1 Partners are offered a 5 year warranty (subject to conditions). This benefit can be passed on to the customer as a sign of confidence in the quality of both the product and the installation.

'We like to be at the forefront of the industry and offer our customers the best possible advice and solutions. As a D1 partner we have access to industry leading thinking'

Paul Worth, 360 Engineering

SERVICE AND MAINTENANCE

Daikin products have an unrivalled reputation for quality and reliability and are manufactured to the highest standards. Continual investment in research and development has resulted in an unmatched product portfolio. D1 Partners can provide full service and maintenance for optimum efficiency in operation for Daikin air conditioning systems, and provide reassurance in those unlikely events of equipment breakdown.

INDUSTRY STANDARDS AND RECOGNITION

Daikin D1 Partners are in many cases members of the leading trade associations, adding to their credentials as industry experts. Daikin UK positively encourages and supports their D1 Partners to become part of independent recognised organisations who look to continually raise industry standards.

SPECIALIST AIR CONDITIONING TOOLS

Daikin D1 Partners have access to specialist diagnostic tools and design software to enable them to provide the very best possible service to customers.

APPROVED INSTALLER STATUS

This certification shows customers of the D1 Partner that they are committed to the Daikin brand and Daikin UK is committed to them in every respect.

WHY CHOOSE A D1 PARTNER FOR YOUR NEW AIR CONDITIONING SYSTEM?

- ✔ Established partners with the full support of Daikin UK.
- ✔ Expert installers with full design and technical capability.
- ✔ Detailed quotations explained to you in straightforward terms.
- ✔ Committed to training and developing installation engineers to the highest standards.
- ✔ Recognised by Daikin UK with 'Approved Installer' status.
- ✔ Many D1 Partners offer full service and maintenance.
- ✔ Professional and established businesses with diverse industry experience.
- ✔ Many D1 Partners are recognised members of industry organisations and the leading trade associations – providing additional sources of information and expertise for the installer.
- ✔ Access to tools and knowledge from Daikin UK for the most up to date product applications.
- ✔ Sensitive to the needs of business, avoiding disruption for customers and their customers.
- ✔ Extended warranty offering.
- ✔ Fast, efficient and friendly service backed by a global leader and manufacturer.

CASE STUDY: EMIRATES STADIUM

PROJECT:

Emirates Stadium, North Bridge Stand – Arsenal Football Club

LOCATION:

Ashburton Grove, North London

REQUIREMENTS:

A tailor-made, innovative and energy efficient air conditioning system to meet strict project specifications and space restrictions.

SOLUTION:

A custom high tech, compact Daikin EWLD-MBY condenserless chiller unit was paired with a low noise, air cooled condenser to provide a reliable, cost effective and energy efficient solution to meet the climate control specifications of the Emirates Stadium.

THE DAIKIN PRODUCT PORTFOLIO

'Modern, stylish, floor and ceiling mounted with an almost unlimited range of options.'

SECTION SEVEN

THE DAIKIN PRODUCT PORTFOLIO

For your home

Daikin air conditioning introduces summer freshness and winter warmth into your home. Creating a perfect balance between temperature, humidity, purity and air movement. Daikin air conditioning is the modern, cost effective route to indoor comfort throughout the year.

Commercial and office spaces

In offices, hotels, department stores and most other commercial premises Daikin air conditioning improves the indoor environment and creates a basis for increased business prosperity – efficiently, economically and discreetly.

Chilled water systems

Daikin chillers are flexible and reliable, providing chilled or heated water for comfort cooling and an almost infinite range of industrial and process applications. Easy to maintain and economic to run, Daikin chilled water systems are renowned for their precision, power and low operating noise.

Control systems

Daikin manufactures and markets a wide range of user friendly controls, all designed to simplify air conditioning regulation and reduce energy usage and running costs.

DAIKIN SPLIT SOLUTIONS

Daikin Split Systems are ultra reliable, easy to operate, quiet running and come complete with a wide choice of elegant wall, floor or ceiling mounted indoor units that will certainly add grace to their surroundings. Advanced inverter control limits energy consumption and ensures that the desired room temperature is reached quickly and maintained, free from power surges and stop/start cycles.

COMMERCIAL AND OFFICE SPACES

Daikin Sky Air and VRV systems represent the ultimate in commercial air conditioning. Ideal for installation in practically any commercial complex, they are one of the most sophisticated systems of indoor environmental management on the market today. Ranging in output from 7.10kW (4HP) to 150kW (48HP), these systems combine advanced technology with hard to beat economy throughout purchase, installation and operation alike.

VRV – VARIABLE REFRIGERANT VOLUME

- Available in Cooling Only, Heat Pump and Heat Recovery.

The VRV systems:

VRVIII Inverter Cooling Only
- For cooling operation from one system.

VRVIII Inverter Heat Pump
- For either cooling or heating operation from one system.

VRVII Inverter Heat Recovery
- For simultaneous cooling and heating operation from one system.
- Heat recovery is achieved by diverting exhaust heat from indoor units in cooling mode to areas requiring heating.

VRV-WII Inverter Heat Pump
- For either cooling or heating operation from one system.

VRV-WII Inverter Heat Recovery
- For simultaneous cooling and heating operation from one system.
- Heat recovery is achieved by diverting exhaust heat from indoor units in cooling mode to areas requiring heating.

CHILLED WATER SYSTEMS

Daikin air and water cooled chillers are based around a unique blend of 'in-house' compressor and refrigerant production expertise and development. They offer industrial and process users precise water control and low running costs throughout an extended working life. Used in conjunction with Daikin water to air fan coil units they provide an excellent alternative comfort cooling solution for applications not suited to VRV and split systems.

FAN COIL UNITS

Daikin fan coils offer a quiet, reliable and comfortable solution of air conditioning. Connected to a water chiller, heat pump or hot water boiler, they provide cooling and/or heating when and where required. Their timeless and elegant design and quiet fan make them ideal for use in offices, hotels and even at home.

CONTROLS

Daikin Control systems range from the smallest room air conditioning controller to highly sophisticated and computerised complete management networks. Operational simplicity, instantaneous response and precise and accurate regulation are common to both large and small systems. Simple hand held and wall mounted units ensure an even room temperature, night and day – larger central monitoring and control systems provide commercial users with valuable fuel consumption, air conditioning operating and performance data.

TO OBTAIN FURTHER INFORMATION…

Although this information is a brief overview of the Daikin product range, there is much more information available; please visit **www.daikin.co.uk**, call us on **0845 6419000** or fill in the tear off sheet at the end of this pocket guide.

FURTHER SOURCES OF INFORMATION

'Adhering to the highest standards can pay dividends in efficiency and running costs.'

SECTION EIGHT

FURTHER SOURCES OF INFORMATION

FETA - The Federation of Environmental Trade Associations
FETA is the recognised UK body which represents the interests of manufacturers, suppliers, installers and contractors within the heating, ventilating, refrigeration & air conditioning industry.
www.feta.co.uk
+ 44 (0)118 940 3416

HEVAC - Heating, Ventilating & Air Conditioning Manufacturers Association
Part of FETA - HEVAC is the only trade association representing manufacturers and distributors in all sections of the HVAC industry.
www.feta.co.uk/hevac

REHVA - Federation of European Heating, Ventilating and Air-conditioning Associations
REHVA is the biggest HVAC organisation in Europe with member associations in 30 countries and more than 110,000 personal members. - CIBSE is a member association.
www.rehva.com

IOR - Institute of Refrigeration (F-Gas Regulation)
An independent organisation, run for refrigeration and air conditioning professionals by refrigeration and air conditioning professionals.
www.ior.org.uk

IIR – International Institute of Refrigeration
A scientific and technical intergovernmental organisation enabling pooling of scientific and industrial know-how in all refrigeration fields on a worldwide scale.
www.iifiir.org
+33 1 42 27 32 35

HVCA - Heating and Ventilating Contractors' Association
The HVCA represents the interests of firms active in the design, installation, commissioning and maintenance of heating, ventilating, air conditioning and refrigeration (HVACR) products and equipment.
www.hvca.org.uk
+44 (0)20 7313 4900

ACRIB - The Air Conditioning and Refrigeration Industry Board
Provides a central forum for all sectors and interests which fall within or are served by the air conditioning and refrigeration industry.
www.acrib.org.uk
+44 (0)208 647 7033

Eurovent Certification
Providing air conditioning and refrigeration products certification programs, Eurovent Certification has a directory of certified products for professionals and acts as a source of technical information for certified HVAC products.
www.eurovent-certification.com
+33 (1) 499 669 80

The Planning Portal
The UK government's online planning and building regulations resource for the general public and building professionals.
www.planningportal.gov.uk

Carbon Trust
Non-profit organisation created by the UK government to help businesses and public organisations to reduce their emissions of carbon dioxide into the atmosphere, through improved efficiency and developing low carbon technology.
www.carbontrust.co.uk
+44 (0) 800 085 2005

CIBSE - Chartered Institution of Building Services Engineers
International body which represents and provides services to the building services profession, covering: lighting, heating, ventilation, air conditioning, public health systems and lifts.
www.cibse.org
+44 (0)20 8675 5211

ECA – Electrical Contractors Association
The UK's largest and leading trade association representing electrical, electronic, installation engineering and building services companies.
www.eca.co.uk
+44 (0)20 7313 4800

ABE – Association of Building Engineers
The Association of Building Engineers is the professional body for those specialising in the technology of building.
www.abe.org.uk
+44 (0) 845 126 1058

ACE – Association of Consulting Engineers
ACE represents the business interests of the consultancy and engineering industry in the UK.
www.acenet.co.uk
+44 (0) 20 7222 6557

RIBA - Royal Institute of British Architects
The RIBA exists to advance architecture and promote excellence in the profession.
www.riba.org & www.architecture.com
+44 (0)20 7580 5533

The Environment Agency
The leading public body for protecting and improving the environment in England and Wales.
www.environment-agency.gov.uk
08708 506 506 & +44 (0)1709 389 201

DEFRA – Department for the Environment, Food and Rural Affairs
Defra's core purpose is to improve the current and future quality of life by integrating environmental, social and economic objectives.
www.defra.org.uk
08459 33 55 77 & +44 (0) 20 7238 6951

CIEH - Chartered Institute of Environmental Health
The Chartered Institute of Environmental Health (CIEH) is at the forefront of environmental and public health.
www.cieh.org
+44 (0)20 7928 6006

By working alongside trade associations, institutions and public bodies and ensuring we adhere to the highest possible standards, we aim to create a brighter, more environmentally friendly future

GLOSSARY OF TERMS

AIR CONDITIONER: Device used to control temperature, humidity, cleanliness, and movement of air in conditioned space.

CAPACITOR: Type of electrical storage device used in starting and/or running circuits on many electric motors.

CARBON FILTER: Air filter using activated carbon as air cleansing agent.

CHLOROFLUOROCARBON (CFC): A compound containing chlorine, with high risk of damaging the ozone layer.

COMPRESSOR: The pump of a refrigerating mechanism which draws a vacuum or low pressure on cooling side of refrigerant cycle and squeezes or compresses the gas into the high pressure or condensing side of the cycle.

CONDENSING TEMPERATURE: Temperature at which a gas changes from a gas to a liquid.

CONDENSER: The part of refrigeration mechanism which receives hot, high pressure refrigerant gas from compressor and cools gaseous refrigerant until it returns to liquid state.

CONDENSING UNIT: That part of refrigerating mechanism which pumps vapourised refrigerant from evaporator, compresses it, liquifies it in the condenser and returns the liquid refrigerant to refrigerant control.

COOLING TOWER: Device which cools water by water evaporation in air. Water is cooled to wet bulb temperature of air.

D-BACS (Daikin Building Air Conditioning Control System): Computer operated control/management system utilising information generated by Daikin and other equipment.

DEHUMIDIFIER: Device used to remove moisture from air in enclosed space.

ELECTROSTATIC FILTER: Type of filter, which gives particles of dust electric charge. This causes particles to be attracted to a plate so they can be removed from air stream or atmosphere.

EVAPORATION: A term applied to the changing of a liquid to a gas. Heat is absorbed in this process.

EVAPORATOR: Part of a refrigerating mechanism in which the refrigerant vapourises and absorbs heat.

EXPANSION VALVE: A device in refrigerating system which maintains a pressure difference between the high side and low side and is operated by pressure.

HEAT RECLAIM VENTILATION (HRV): Ventilation system operates on the principle of reclaiming energy from exhaust air.

HEAT EXCHANGER: Device used to transfer heat from a warm or hot surface to a cold or cooler surface. Evaporators and condensers are heat exchangers.

HEAT LOAD: Amount of heat, measured in Btu, which is removed during a period of 24 hours.

HEAT PUMP: A compression cycle system used to supply heat to a temperature controlled space, which can also remove heat from the same space.

HEAT TRANSFER: Movement of heat from one body or substance to another. Heat may be transferred by radiation, conduction, convection or a combination of these three methods.

HUMIDIFIERS: Device used to add to and control the humidity in a confined space.

HYDROCHLOROFLUOROCARBON (HCFC): A compound containing chlorine – but since hydrogen is present, the risk of damaging the ozone layer is low.

HYDROFLUOROCARBON (HFC): A compound which does not contain chlorine and does not damage the ozone layer.

HUMIDITY: Moisture; dampness. Relative humidity is ratio of quantity of vapour present in air to greatest amount possible at given temperature.

LATENT HEAT: Heat energy absorbed in process of changing form of substance (melting, vapourisation, fusion) without change in temperature or pressure.

REFRIGERANT: Substance used in refrigerating mechanism to absorb heat in evaporator coil by change of state from a liquid to a gas, and to release its heat in a condenser as the substance returns from the gaseous state back to a liquid state.

RELATIVE HUMIDITY: Ratio of amount of water vapour present in air to greatest amount possible at same temperature.

REVERSING VALVE: Device used to reverse direction of the refrigerant flow depending upon whether heating or cooling is desired.

SKY AIR: Sky Air is a trade name of Daikin middle range split systems.

SPLIT SYSTEM: Refrigeration or air conditioning installation, which places condensing unit outside or remote from evaporator. Also applicable to heat pump installations.

SUBCOOLING: Cooling of liquid refrigerant below its condensing temperature.

THERM: Quantity of heat equivalent to 100,000Btu (105,500 kJ).

VACUUM PUMP: Special high efficiency compressor used for creating high vacuums for testing or drying purposes.

VAV (Variable Air Volume): A central air conditioning system which works on the principle of supplying constant temperature air volume to a space and, by varying the volume, controls room temperature.

VRF (Variable Refrigerant Flow): A direct expansion, modular central air conditioning system providing heating and cooling. Operates on the principle of varying the flow of refrigerant to a room terminal unit to achieve desired temperature.

VRV (Variable Refrigerant Volume): Trade mark for Daikin VRF systems.

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