ANDREWS SYKES CLIMATE RENTAL

THE MIDDLE EAST'S LEADING HVAC HIRE SPECIALIST



HIRE SALES SERVICE INSTALL

[00971] 800 79537

andrews-sykes.ae

Established for over 160 years, The Andrews Sykes group are a leading specialist for pumps, cooling, heating and ventilation rental. Delivering cost-effective hire packages to our many customers in the United Arab Emirates and the Gulf States, our dedicated team of experts will guide you towards the equipment that best suits your application.

Thanks to the proficiency of our team, we are well-equipped to assist virtually every market sector, including facilities management, construction, hospitality, retail, IT & communications and many others. As part of our service, we conduct free site surveys to help us ascertain the best course of action for your individual needs – because no two requirements are ever the same. Whether you are looking to keep guests cool at a large event or install a high capacity ventilation system to provide fresh air for people working in a tunnel, there's nothing we cannot assist with. Our fleet of units ensures we can always accommodate customers even when demand is high, so you never need to worry about product availability.

From straightforward hire services to full solution provision including design, planning, project management, installation and running of complex temporary and permanent solutions. We can provide an extensive range of air conditioners, chillers, heaters, boilers, dehumidifiers and ventilation equipment to withstand the toughest applications and the most demanding environments.

With an impressive and varied client portfolio, our ability to provide a competitive and engineered solution for every climate control requirement, coupled with bespoke, flexible contract terms to suit, provides ultimate peace of mind and makes us the preferred choice when it comes to business critical equipment hire.

We look forward to working with you.

We provide the best HVAC equipment at the right price, for virtually every need, location and application. This guide should provide all the data you need to choose the right equipment, including detailed technical information. If you have any questions simply call us free on 00971 800 79537.

Air conditioning, cooling, chilling and ventilation

- Fully portable air conditioners for locations large or small.
- Stylish portable units for "front of house".
- Mobile fluid chillers and fast chillers - from 6 kW to multi-megawatt packages.
- Low temperature chillers down to -12°C.
- Air handlers.
- Cooling fans.
- Ventilation fans.
- Dehumidifiers.

Our mission is to be Middle East's leading climate hire services company, helping our customers to address the real-life challenges they face - whether planned or emergency - in the fastest, most expert, professional and cost effective ways. We want to help our customers control their environment more effectively and pay less.

For our extensive range of products, our commitments are:

- We will have products available 24 hours a day 7 days a week.
- We will understand our customers needs to ensure we provide the most appropriate solution.
- We will employ highly qualified engineers with the necessary training and experience.
- Free of charge site surveys will be carried out on request.

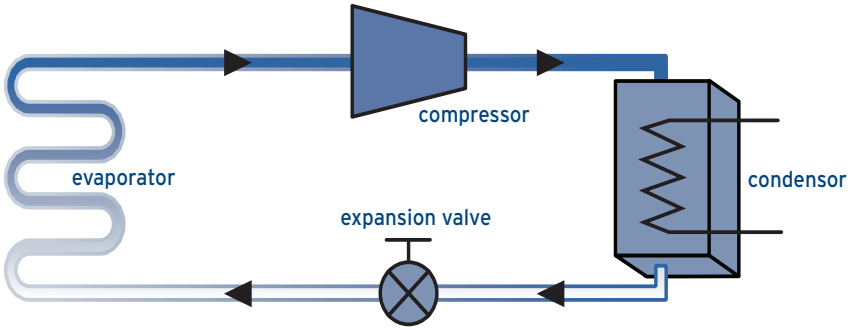
- Any account queries will be resolved within 14 working days.
- We will respond to any breakdown within 4 hours of being notified.

Andrews Sykes Climate Rental are proud to invest in the latest technologies and strive to improve our ever-growing range. We encourage you to visit our website andrews-sykes.ae as we regularly add new products and update our technical specifications.

When the temperature rises, it reduces our work performance and equipment failures can occur. To avoid these problems, Andrews offers a wide range of temporary, portable air conditioners based on air and water cooled versions and with or without external air-cooled heat exchangers as well as a wide range of chillers.

The basic principle of air conditioning

An air conditioner is a closed refrigerant system, comprising of an evaporator, a compressor, a condenser and an expansion valve (or capillary), which are all connected to each other with refrigerant piping. Refrigerant gas is circulated within the system in the direction shown in the below drawing.



The indoor unit, which is usually installed in the room to be cooled, contains the process where the refrigerant evaporates within the cold element (evaporator). This evaporation is caused because the refrigerant has a very low boiling point of -40ºC at atmospheric pressure.

To enable the evaporation, a rise in temperature is necessary. This rise is supplied by the air of the room which is to be cooled and in which the evaporator is situated. As air is passed over the evaporator the air temperature will drop and therefore enable the room air temperature to be reduced.

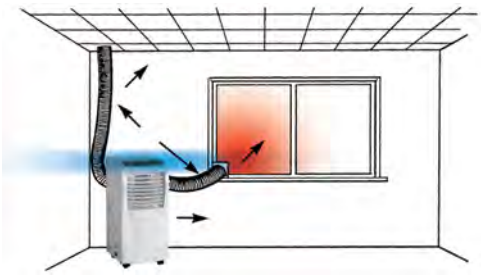
The compressor draws the vapour refrigerant and reduces the pressure in the evaporator. Because of this pressure reduction the refrigerant evaporates. The vapour which is drawn by the compressor is then compressed. The pressure and temperature of the gas rises as it is compressed into the condenser, where the warm gas is cooled down to the condensation temperature of the refrigerant. Subsequently the vapour returns back to liquid again. In the condenser the process is almost directly opposite to the evaporator. The condenser requires cooling otherwise the temperature and gas pressure will rise too high.

For this cooling process either water or air can be used.

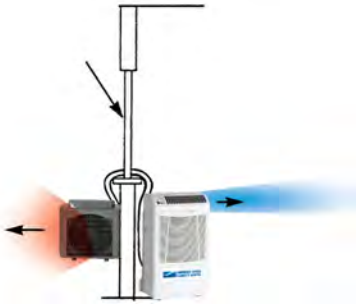
The vapour which has now returned to liquid again is now passed through the expansion valve (or capillary) to the evaporator. Because of the narrowing of the pipe work the pressure decreases and the refrigerant evaporates once more. To enable this evaporation the warm air is needed and so the circuit is closed.

The operation of portable air conditioners: Andrews offer four principle types of portable air conditioners. These are:

1. Exhaust tube units: both the evaporator and condenser are positioned within the room unit. The majority of the air that is passed through the unit is directed over the evaporator and returns back into the room, as cooled air. A smaller volume of air is passed across the condenser to cool the refrigerant gas. This air needs to be removed from the room as it becomes hot. An exhaust tube is used to remove this hot air via an opening in the room (usually through a window). In some cases the exhaust tube may be positioned into a false ceiling void, advice should be sought before using this system.

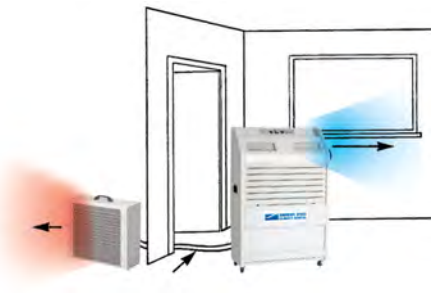


2. Split type units (refrigerant): These are models similar to the PAC14 QC, such units are supplied in 2 parts, a room unit and a condenser. The room unit placed within the area to be cooled comprises of an evaporator and a compressor. The room air enters the unit and once passed across the evaporator is returned into the room as cooled air. The external unit which is connected to the room unit by a flexible pipe, contains the condenser which needs to cooled by ambient air, therefore the external unit needs to be positioned outside of the room to be cooled. Typically the condenser is hung from a window.



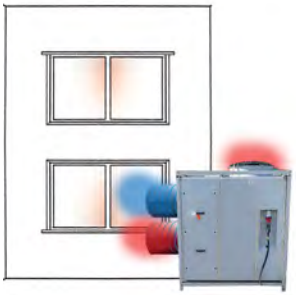
3. Split type units (water)

Units such as the PAC22 and PAC60, are also supplied in 2 parts, a room unit and a heat exchanger. The principle in operation is very similar to that of the refrigerant units. The major difference is that the condenser is placed within the room unit and cooled by water. The water is then circulated to the external unit (heat exchanger) via flexible pipes before returning to the room unit. The system is totally sealed and requires no further water once the unit is in place. The main advantage of this system is that the connection pipes can be extended - up to 30 metres - allowing the heat exchanger to be positioned away from the room unit.



4. High performance units

In situations where large cooling capacities are required, our high performance air conditioners represent the perfect solution and negate the need for a hire arrangement comprising of several smaller units. Available in 30kW, 45kW and 90kW versions, these units are perfect for reducing the temperatures in large open spaces including film sets, marquees, warehouses and other industrial facilities. The two larger models also feature technology that allows them to be used in a heating mode, making them dual-purpose units designed for a range of climate control applications. Variable fan settings provide the option for quieter running modes, which is essential in traditional in environments where low background noise is desired.



For the installation of an air conditioner, a number of considerations are important:

1. Ensure that an air-cooled condenser gets enough fresh air (install outside or indoors with sufficient ventilation).
2. Let the evaporator or the indoor unit blow out the cool air freely (ie not against cabinets, beams, fluorescent lights), to ensure a draft-free air distribution.
3. Make sure the evaporator is level, otherwise the drip tray may overflow.
4. Make sure the condensate can be safely discharged.
5. Make sure the distance between the indoor and outdoor unit is not too great (up to 30 metres).
6. Provide adequate voltage.
7. Do NOT over extend exhaust tube.

Applications for temporary air conditioning equipment

- Offices
- Events & Exhibitions
- Temporary accommodation (eg. portable buildings)
- Shops and Restaurants
- Storage of heat-sensitive products (eg. chocolate)
- Computer server rooms
- Spot Cooling
- Schools
- Telecommunication rooms
- Laboratories
- Hospitals
- Production Facilities
- Process control rooms

- Hotel and conference centres
- Printing and reprographics
- Any application where a fixed unit has broken down or needs to be shut down for maintenance.

Calculating the cooling capacity required and choosing the type of air conditioning

The heat load for each room can vary considerably. This depends on the number of lights, the number of people, glass area facing the sun, and the presence of computers and other equipment. It is therefore essential to determine the capacity correctly.

Rule of thumb for an approximation of air conditioning load are:

Normal Modern Offices:	46 W per m^3
Portable Buildings:	57 W per m^3
Tents/Marquees:	95 W per m^3

In addition to the type and size of the area to be cooled consideration must be given to any appliances that generate heat in the area. Such appliances are listed below along with the approximate heat emission that they generate.

Personal Computer	45 W
Printer	35 W
Photocopier Standby 200 W	
Photocopier In Use	1,300 W
Coffee Machine	800 W
TV/ Video Screen	50 W
Person	50 W

The Andrews specialists will be glad to work out an accurate cooling calculation for you.

Selection and installation of your portable air conditioner
To select which type of temporary air conditioner you must first consider the capacity of the unit and the possible alternatives to remove the condenser heat.

A room without outside walls or windows often means that a standard PAC (split) unit cannot be used. If an exhaust tube cannot be vented into a ceiling void or out of the room the only alternative may be a water-cooled PAC unit. Again, if it is not possible to position a heat exchanger within 30m of the room unit other alternatives such as a chillier, evaporative coolers or cooling fans may need to be considered.

Before you select your Andrews portable air conditioner we suggest the following issues should be considered.

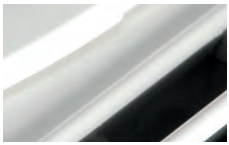
- The indoor unit (evaporator) needs to be positioned within 1.5 metres of a 13 amp 230 volt socket and located in a manner to avoid any obstruction to the airflow.

- If you are to use a PAC type unit the heat exchanger (condenser) will need to be positioned outside of the building or in a very well ventilated area that can withstand the heat transferred from the room being cooled. Condensation is discharged from the room unit to the heat exchanger where it is allowed to drain to the outside of the building. If the heat exchanger is placed within the building a separate means of discharging the condensation needs to be provided.
- When using a PAC unit it is always advisable to position the heat exchanger away from direct sunlight or any position where its operation is likely to cause disruption. The heat exchanger can only be positioned within the distance specified by PAC line length. Always aim to keep the PAC line length to a minimum.
- Always ensure that the electrical supply to the unit is adequate and that the operation of the unit will not cause any problems to other sensitive electronic equipment.

Videos depicting the installation process for many of our air conditioners can be found online at andrews-sykes.com/airconditioning/

EXHAUST TUBE UNIT - AS14

Nominal cooling duty	4.1 kW
Air flow (max)	969 m^3 /h
Typical cooled area	90 m^3
Power supply	230 V 1 ph 50 Hz Run 10.6 A
Plug Type	16A 3 Pin
Noise level (max)	68 dBA @ 1 metre
Weight	47 kg
Dimensions (L x W x H)	405 x 546 x 840mm
Exhaust duct	1.2 metres x 150 mm diameter
Control	Automatic thermostat
Refrigerant gas	R410A
Power input	1.7kW



- Plug and play
- Easy to manoeuvre

CASE STUDY

Andrews Sykes Climate Rental was approached recently for an urgent cooling for an important conference being held in Dubai. Due to an unfortunate circumstances of the venues central air conditioning system failing, the conference which was scheduled to start that same day was sure to be postponed with temperatures soaring above 30 °C.

Our team immediately deployed our portable exhaust AC units AS14 which were placed around the conference to accommodate the participants. Soon after installation, the temperature was cooled down from a whopping 32°C to 23°C, which falls in the range of acceptable working temperatures in the Middle East.

The first day of the conference commenced shortly after the installation, a further two units were later delivered as the number of delegates in attendance increased on day two, which in turn raised the temperatures in the facility.

The authorities thanked our team for the immediate response and helping them start the conference without further delay.

EXHAUST TUBE UNIT - PAC1

Nominal cooling duty	3.5 kW
Air flow (max)	360 m^3 /h
Typical cooled area	90 m^3
Power supply	230 V 1 ph 50 Hz Run 6 A
Plug Type	16A 3 Pin
Noise level (max)	65 dBA @ 1 metre
Weight	39 kg
Dimensions (L x W x H)	390 x 405 x 820mm
Exhaust duct	1.2 metres x 150 mm diameter
Control	Automatic thermostat
Refrigerant gas	R410A
Power input	1.34kW

Plug and play

EXHAUST TUBE UNIT - PAC20

Nominal cooling duty	20 kW
Air flow (max)	2,975 m^3/h
Typical cooled area	426 m^3
Power supply	415 V 3 ph 50 Hz Run 32 A
Plug type	32A 5 Pin
Noise level (max)	63 dBA @ 5 metres
Weight	358 kg
Dimensions (L x W x H)	1,400 x 800 x 2,360 mm
Free Air Throw	Upto 20 metres
Supply Duct (Optional)	300mm x 2
Refrigerant gas	R410A
Power input	7kW

Easy to manoeuvre

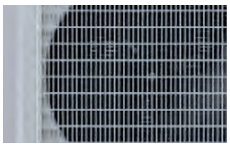
SPLIT TYPE - PAC22 SERIES 2

Nominal cooling duty	6.47 kW
Air flow (max)	1,310 m^3/h
Typical cooled area	156 m^3
Power supply	230 V 1 ph 50 Hz Run 11 A
Plug type	16A 3 Pin
Indoor noise level (max)	62 dBA @ 3 metres
Outdoor noise level (max)	62 dBA @ 3 metres
Indoor weight	122 kg
Outdoor weight	20 kg
Indoor dimensions (L x W x H)	810 x 390 x 1,240 mm
Outdoor dimensions (L x W x H)	560 x 280 x 520 mm
PAC line length	5 metres (max 30 metres)
Control	Automatic thermostat
Optional cold air duct	2 x 200 mm x 5 metres
Refrigerant	134A
Power Input	2kW

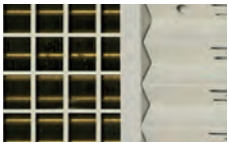
- Plug and play
- Can operate down to 10°C

SPLIT TYPE - PAC48

Nominal cooling duty	14 kW
Air flow (max)	1,852 m^3/h
Typical cooled area	350 m^3
Power supply	415 V 3 ph 50 Hz Run 12.5 A
Plug type	32A 5 Pin
Indoor noise level (max)	49 dBA @ 1 metres
Outdoor noise level (max)	69 dBA @ 1 metres
Indoor weight	62 kg
Outdoor weight	114 kg
Indoor dimensions (L x W x H)	394 x 587 x 1,860 mm
Outdoor dimensions (L x W x H)	410 x 960 x 1,385 mm
PAC line length	Max 30 metres
Control	Automatic thermostat
Power input	6.32 kW
Refrigerant gas	R410A



- Plug and play



SPLIT TYPE - PAC60

Nominal cooling duty	17 kW
Air flow (max)	3,500 m^3/h
Typical cooled area	410 m^3
Power supply	415 V 3 ph 50 Hz 17 A
Plug type	5 pin 32 A
Indoor noise level (max)	65 dBA @ 3 metres
Outdoor noise level (max)	70 dBA @ 3 metres
Indoor weight	230 kg
Outdoor weight	113 kg
Indoor dimensions (L x W x H)	1,000 x 640 x 1,610 mm
Outdoor dimensions (L x W x H)	820 x 605 x 1,085 mm
PAC line length	15 metres (max 30 metres)
Control	Automatic thermostat
Optional cold air duct	2 x 300 mm x 5 metres
Refrigerant	134A
Power input	5.5kW

❄ Can operate down to 10°C

HIGH PERFORMANCE - HPAC 30

Nominal cooling duty	30 kW
Air flow (max)	5,900 m^3/h
Typical cooled area	666 m^3
Power supply	415 v 3 ph N+E RUN 22 A
Plug type	32 A 5 Pin
Noise level (max)	64 dBA @ 3 metres
Weight	435 kg
Dimensions (L x W x H)	1,600 x 730 x 1,660 mm
Duct length (max)	16 metres
Duct Diameter	450 mm
Refrigerant	134A
Power input	6.8kW

❄ Can operate down to 10°C

Easy to manoeuvre

HIGH PERFORMANCE - HPAC 45

Nominal cooling duty	45 kW
Nominal heating duty	50 kW
Air flow (max)	7,500 m^3/h
Typical cooled area	1,000 m^3
Power supply	415 v 3 ph 40 A
Plug type	63A 5 Pin
Noise level (max)	65.4 dBA @ 3 metres
Weight	780 kg
Dimensions (L x W x H)	1,937 x 1,340 x 2,170 mm
Duct length (max)	16 metres
Duct Diameter	600 mm
Refrigerant	R134A
Power input	12.4kW

❄ Can operate down to 10°C

HIGH PERFORMANCE - HPAC 90

Nominal cooling duty	90 kW
Nominal heating duty	90 kW
Air flow (max)	15,000 m^3/h
Typical cooled area	2000 m^3
Power supply	415 v 3 ph 84 A
Plug type	125A 5 Pin
Noise level (max)	75.2 dBA @ 3 metres
Weight	1,640 kg
Dimensions (L x W x H)	2,280 x 2,030 x 2,450 mm
Duct length (max)	48 metres
Control	Automatic thermostat
Duct Diameter	600 mm
Refrigerant	R134A
Power input	48.4kW

❄ Can operate down to 10°C

❄ Cooling and heating

The Middle East's leader in fluid chillers, fast chillers and air handlers for hire

We offer you fully portable fluid and low temperature chillers, delivered and installed fast from depots nationwide: a genuine 24/7 service, 365 days a year. With free site surveys, expert advice and a wide range to choose from, our specialists will help ensure you get the equipment you need at the right price.

Fluid chillers - ideal for applications and locations that need quick and reliable temporary cooling. All chillers can be used in parallel to achieve the cooling capacity you need. They are typically used for:

- **Air Conditioning when used with air handlers/fan coils**
- **Process applications in manufacturing e.g. for volatile petrochemicals, fluids and food products**
- **Facilities Management, Building & Construction and HVAC contractors**
- **Bypassing existing systems for planned maintenance, during breakdowns or for disaster recovery**

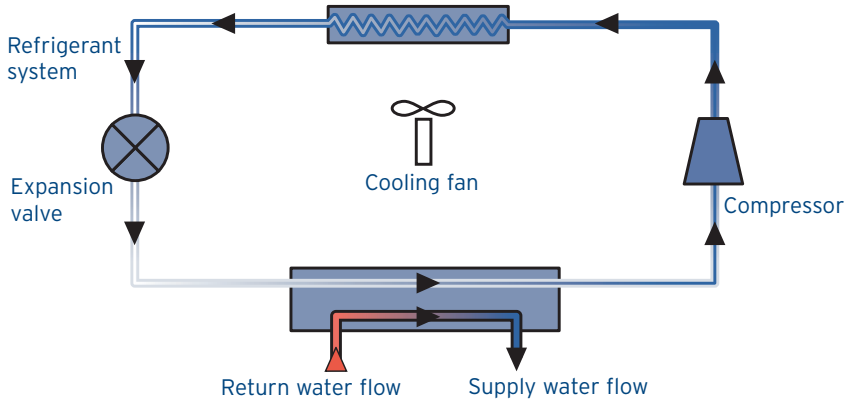
When sizing a chiller for air conditioning applications the same principles should be applied that are mentioned in the air conditioning section of this booklet. The location of the air handlers, fan coils and chiller does require careful consideration and we would therefore suggest that a site survey is carried out by one of Andrews specialists.

Process applications and breakdown/recovery applications require a great deal of calculation to guarantee that flow rates, design temperature and other requirements are met, it is therefore essential that an Andrews specialist is consulted about such applications.

In addition to providing the chillers, air handlers and fan coils, Andrews also provide all necessary accessories and additional equipment. This includes generators, distribution units, cable, flexible hoses, heat exchangers, valves, pipework, adapters, and flexible ducting.

The Andrews specialist hire team offer FREE on-site surveys and advice, together with a delivery, installation and on-site commissioning service. Once the equipment is installed it is supported 24 hours a day, 7 days a week by the Andrews service back-up.

Basic operating principle of a water chiller



The Andrews range of high capacity fluid chillers have been developed to provide a fast and efficient solution for many applications that require high volumes of cooling capacity. In the standard format fluid chillers can provide cooling water to production processes or to bypass/assist permanently installed chillers.

When used along with our wide range of air handlers and fan coils, fluid chillers provide high capacity air conditioning for a wide range of applications.

The standard range comprises of units up to 827kW in capacity and can be used in parallel to achieve higher capacities. Larger units for long term applications are also available. A wide range of temperatures can be provided, with units able to achieve water temperatures below -12ºC. Heat pump versions are available on some models to provide not only cooling but also heating.

All of the units in the Andrews fluid chiller range are air cooled and do not require a permanent water supply. The chiller unit must be placed in a well ventilated area that is able to accept the heat dissipation from the area being cooled. Ideally chillers should always be installed on the exterior of the building, where the ambient air can provide cooling.

Each of the units contains a heat exchanger, condenser, control system, compressor and circulating pumps. Mounted on robust base plates complete with lifting facility, the units can be transported and positioned with the minimum of disruption. The water connection on the supply and return pipework is normally achieved with quick action couplings, removing the need for complicated pipe connections. The chillers use flexible hoses to provide chilled water to either the air handlers or the clients own system.

The operation of high capacity fluid chillers
Andrews offer 3 principle methods of using fluid chillers. These are as follows:

This is where a fluid chiller (or chillers) are connected to air handling units (AHU) or fan coils via flexible pipework.

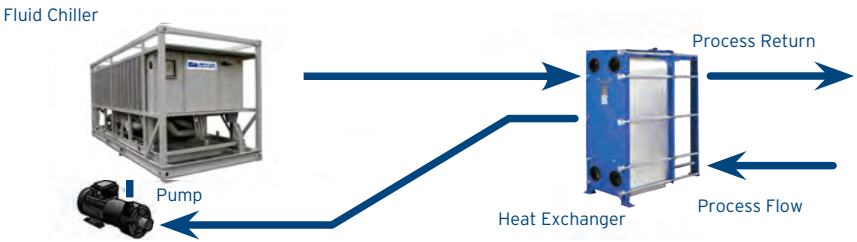
The chiller provides chilled water to each of the fan coils or AHU, which is then pumped through a coil over which the room air is passed. As the air passes over the cold coil the air temperature will drop, the drop in temperature will depend on several factors such as air flow, air temperature and humidity.

Each time the air is passed over the cold coil a similar drop in temperature will take place, this will enable the room temperature to be controlled within specified criteria. As the warm air passes over the cold coil the chilled water temperature rises and therefore returns to the chiller as warm water, the water is then chilled again and returned to the air handlers or fan coils and so the circuit is closed.

Some fan coils have thermostatically operated valves which open and close in relation to the room temperature, bringing in chilled water when required and remaining closed when the desired temperature is achieved. The chiller operates as required depending on the water temperature, although the circulating pump operates at all times.

The normal installation has the fan coils units installed within the room that requires cooling, or AHU installed outside of the room with the air ducted into the room and returned via heavy duty flexible ducting. However in some circumstances it is possible to fit flexible ducting to the fan coils and in others it is possible to install the AHU within the room that is to be cooled.

With heat pump versions of the fluid chillers it is possible to generate hot water and thereby use the fan coils and AHUs as heaters rather than air conditioners. In applications that may require heating at night and cooling by day it is possible to fully automate this process.

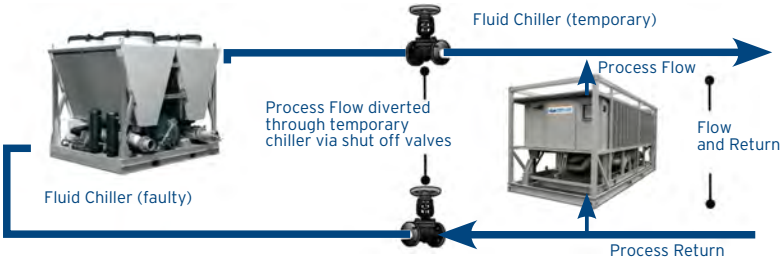


This system is often used where a product requires cooling but due to its nature or consistency cannot come into contact with the refrigeration process. Such products include oil, volatile fluids and food products. Andrews overcome this problem by using a fluid chiller in conjunction with a process heat exchanger (normally a plate type).

The fluid chiller produces chilled water which is then circulated through the heat exchanger and then returned to the chiller in a closed circuit.

The product that requires cooling is also circulated through the heat exchanger but is kept separate from the chilled water at all times. As the product passes through the heat exchanger it is cooled by the chilled water that is being circulated at the same time, this enables the product's temperature to be reduced to the specified level. As the chilled water passes through the same heat exchanger its temperature will rise, as it is effectively being heated by the product. The water will then become warm as it is returned to the chiller to become chilled once more and so the circuit is closed.

The connection between the heat exchanger and the chiller would normally be through flexible pipes with quick release couplings. The temperature can be controlled by the control system within the chiller itself. This application can be easily adjusted to suit most environments.



This application can normally be used where an existing chiller system has broken down, is required to be taken out of operation or needs additional cooling assistance. Such situations may be due to building modifications, maintenance shut downs, main plant failure or abnormal heat loads within the building.

An Andrews fluid chiller can be connected into the clients own pipework system using flanged connections which will be fitted with isolating valves and quick release pipe adapters. Flexible hoses would then connect onto the pipework and run to the temporary chiller.

Where possible the client's own pipework, circulating pumps and controls continue to be used. In some situations the circulating pumps within the chiller may be adequate to cope, or can assist the existing pumps.

Careful consideration must be given to the effect of increasing the flow rate of the chilled water, if the temporary chiller is to be used in conjunction with an existing system. Andrews specialists are able to advise on the correct sizing and correct use of such applications, however it is vital that details of the required flow rates, temperatures and cooling duty are known. A full system diagram of the existing installation is also required. Such systems can be used as a semi-permanent solution or as an emergency back up.

FLUID CHILLER - 50 KW SERIES 2

Nominal cooling duty	50 kW
Power supply	415 V 3 ph 50 Hz Run 65 A
Plug type	63A 5 Pin
Noise level (max)	68 dBA @ 1 metre
Weight	1,820kg (including frame)
Dimensions (L x W x H)	3,000 x 1,270 x 2,740 mm
Control	Automatic programmer
Power input	36.5 kW
Water connection	2" Camlock
Design water flow	2.38 l/s
Low temp	5.5°C on water mode
Low temp	(- 8.0°C) on Glycol mode
Refrigerant gas	R134A

High-capacity cooling

FLUID CHILLER - 100 KW

Nominal cooling duty	100 kW
Power supply	415 V 3 ph 50 Hz Run 85 A
Plug type	125A 5 Pin
Noise level (max)	68 dBA 1 metre
Weight	2,500 kg (including frame)
Dimensions (L x W x H)	4,000 x 1,270 x 2,740 mm
Control	Automatic programmer
Power input	68.1 kW
Water connection	2" Camlock
Design water flow	5.0 l/s
Low temp	5.5°C on water mode
Low temp	(- 8.0°C) on Glycol mode
Refrigerant gas	R134A

High-capacity cooling

FLUID CHILLER - 384 KW

Nominal cooling duty	384 kW
Power supply	415V / 3ph / 50Hz +E Run 310A
Plug type	Hard Wired 4C 240sqmm
Noise level (max)	70 dBA @ 3m
Weight	5,500 kg (including frame)
Dimensions (L x W x H)	6,000 x 2,500 x 2,800 mm
Control	Automatic programmer
Power input	178.5 kW
Water connection	150mm (6") Flange
Design water flow	18.2 l/s
Low temp	5.5°C on water mode
Low temp	(- 12.0°C) on Glycol mode
Refrigerant gas	R410A

High-capacity cooling

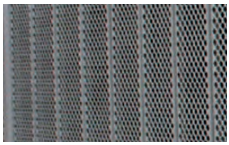
FLUID CHILLER - 682 KW

Nominal cooling duty	682 kW
Power supply	415V / 3ph / 50Hz +E Run 570A (Full load)
Plug type	Hard Wired 4C 240sqmm
Noise level (max)	78 dBA @ 9m
Weight	8,200 kg (including frame)
Dimensions (L x W x H)	6,000 x 2,500 x 2,800 mm
Control	Automatic programmer
Power input	349.7 kW/h
Water connection	150mm (6") Flange
Design water flow	32.7 l/s
Low temp	5.5°C on water mode
Low temp	(- 11.0°C) on Glycol mode
Refrigerant gas	R134A

High-capacity cooling

FLUID CHILLER - 827 KW

Nominal cooling duty	827 kW
Typical cooling duty	703 @ 46°C
Power supply	415V / 3ph / 50Hz / 535A
Plug type	Hard Wired 4C 240sqmm
Noise level (max)	76 dBA @ 10m
Weight	8,500 kg
Dimensions (L x W x H)	7,700 x 2,515 x 2,680 mm
Control	Digital automatic programmer
Water connection	150mm (6") Flange
Nominal water flow	31 l/s
Low temp	5.5°C on water mode
Low temp	(- 11.7°C) on Glycol mode
Refrigerant gas	R134A
Power input	303kW



High-capacity cooling

HEAT EXCHANGER - 1212KW

Nominal cooling duty	1,212 kW
Weight	3,000 kg
Dimensions (L x W x H)	3,570 x 1,490 x 2,980 mm
Water connection	150mm (6") Flange
Design water flow	32.5 l/s
LMTD	1.11 °C
Min / Design Temperature	-10 / +60°C
Design / Test Pressure	16 / 22.88 bar
Plate thickness / Material	0.5 mm AISI 316L

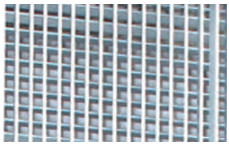
Andrews Sykes Climate Rental offer the biggest range of Heat Exchangers, air handlers and cooling accessories for hire in the Middle East.

To learn more about our extensive range of heat exchangers, call our team on 00971 800 79537.

Cooling

AIR HANDLERS - 15 KW SERIES 1

Nominal cooling duty	15 kW
Air flow (max)	2,700 m^3/h
Power supply	230 V 1 ph 50 Hz Run 5 A
Plug type	16A 3 Pin
Noise level (max)	51 dBA @ 1 metre
Weight	75 kg (including frame)
Dimensions (L x W x H)	600 x 380 x 1,960 mm
Power input	1.1 kW
Integral condensate pump	Yes
Fan speed controller	Yes
Water connection	25mm (1") Camlock
Design water flow	0.65 l/s



Cooling and heating

AIR HANDLERS - 15 KW SERIES 2

Nominal cooling duty	15 kW
Air flow (max)	2,700 m^3/h
Power supply	230 V 1 ph 50 Hz Run 5 A
Plug type	16A 3 Pin
Noise level (max)	51 dBA @ 1 metre
Weight	70 kg
Dimensions (L x W x H)	600 x 380 x 1,930 mm
Control	Automatic thermostat
Integral condensate pump	Yes
Fan speed controller	Yes
Power Input	1.1 kW
Water connection	25mm (1") Camlock
Design water flow	0.65 l/s

Cooling

AIR HANDLERS - 50 KW

Nominal cooling duty	50 kW
Air flow (max)	4,500 m^3/h
Power supply	230 V 3 ph 50 Hz Run 4.8A
Plug type	16A 3 Pin
Noise level (max)	74 dBA @ 1 metre
Weight	460 kg (including frame)
Dimensions (L x W x H)	1,500 x 750 x 2,250 mm
Duct length (max)	20 metres
Duct size (optional)	1 x 600 mm Dia
Power input	1.1 kW
Integral condensate pump	No
Fan speed controller	3 Speed (Low, Medium & High)
Water connection	50 mm (2") Camlock
Design water flow	2.15 l/s

Cooling and heating

AIR HANDLERS - 150 KW

Nominal cooling duty	150 kW
Air flow (max)	20,160 m^3/h
Power supply	415 V 3 ph 50 Hz Run 20 A
Plug type	32A 5 Pin
Noise level (max)	70 dBA @ 5 metre
Weight	950 kg
Dimensions (L x W x H)	2,260 x 2,110 x 1,700 mm
Duct length (max)	50 metres
Duct size	4 x 600 mm (2x inlet / 2x outlet)
Power input	11 kW
Integral condensate pump	No
Fan speed controller	No (Fixed Speed)
Water connection	50 mm (2") Camlock
Design water flow	7.8 l/s

Cooling

AIR HANDLERS - 300 KW

Nominal cooling capacity	300 kW
Air flow (max)	32,400 m^3/h
Power supply	415 V 3 ph 50 Hz Run 30 A
Plug type	63A 5 Pin
Noise level (max)	75 dBA @ 5 metres
Weight	2,150 kg (including frame)
Dimensions (L x W x H)	3,600 x 2,300 x 2,530 mm
Duct length (max)	58 metres
Duct size	8 x 600 mm (4x inlet / 4x outlet)
Power input	15 kW
Integral condensate pump	No
Fan speed controller	No (Fixed Speed)
Water connection	100 mm (4") Camlock
Design water flow	14.0 l/s

Cooling

AIR HANDLERS - 660 KW

Nominal cooling capacity	660 kW
Air flow (max)	40,680 m^3/h
Power supply	415V 3ph 50Hz Run 65A
Plug type	125A 5 Pin
Noise level (max)	79 dBA @ 5 metres
Weight	4,000 kg
Dimensions (L x W x H)	5,000 x 2,500 x 3,410 mm
Duct length (max)	50 metres
Duct size	12 x 500 mm (6x inlet / 6x outlet)
Power input	30 kW
Integral condensate pump	No
Fan speed controller	Yes
Water connection	100 mm (4") Flange
Design water flow	26.7 l/s

Cooling

Tackling high moisture problems with reliable refrigerant and desiccant dryers. If you're experiencing moisture problems in a room or building, our powerful and reliable dehumidifiers can handle up to 1,500 litres dehumidification capacity a day, delivering high levels of drying power. Typical applications include building and construction, offices, industry and manufacturing, agriculture, warehousing and logistics, and even domestic homes.

Two types are available:
Refrigerant - using an evaporator and condenser, providing keep-dry areas up to 9,000m^3 and dry out areas up to 4,500m^3.

Desiccant - using moisture-absorbing materials like silica gel, these units can handle up to 1,500 litres drying capacity a day, providing keep-dry areas up to 20,000m^3 and dry out areas up to 10,000m^3. These units are for when very low relative humidity is needed, if work is being carried out at extremely low temperatures, a low dew point is essential, or for when the unit has to be ducted into the area that needs drying.

With free site surveys and friendly customer service on **+971 800 79537**, our specialists can help you decide which unit is best for you.

Diagram of refrigerant principle

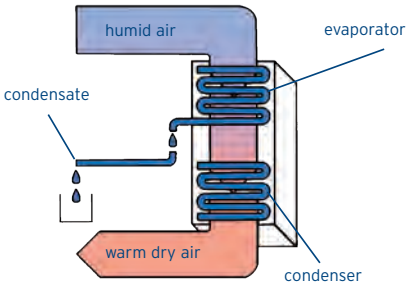
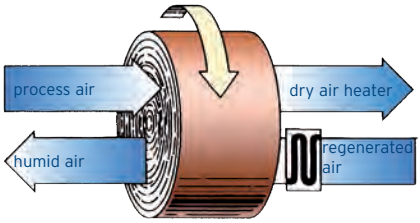


Diagram of desiccant principle



The operation of refrigerant dryers

Refrigerant dryers cool air intake considerably by means of an evaporator section in a closed refrigeration system. As a result of this cooling, the relative humidity of the air over the evaporator rises to above 100% and water vapour condenses. This water (or condensation) is either drained into a reservoir or through a hose to a drain, water container or a suitable outside location.

The heat generated in the cooling system condenser is used to warm the returned air to a temperature above that of the original intake. Each time the room air is passed through the dryer a quantity of moisture is removed from the air, therefore the humidity within the room is reduced. Refrigerant dryers are typically positioned within the room to be dried and require little attention whilst in operation.

The operation of desiccant dryers

A desiccant dryer uses the hygroscopic properties of moisture-absorption materials such as silica gel or lithium chloride. These materials are impregnated within a rotating ceramic wheel, over which the humid air from the room is blown. The hygroscopic material absorbs a large percentage of the moisture from the air, therefore reducing the humidity in the area. The wheel is left very wet, it then continues to rotate slowly and the section which is saturated with moisture is heated with an electric heater, to vaporise the water. This warm and very humid air is then expelled outside through a length of flexible ducting. As well as being able to place a desiccant unit within a room that is to be dried, desiccant dryers are often used in applications where it is not possible to position a dryer, such as hazardous areas or areas with limited access such as pipes and tanks.

Applications of refrigerant and desiccant dryers
Refrigerant dryers are most commonly used in the Middle East climate. Desiccant dryers tend to be only used in the following situations:

- a very low relative humidity is required (< 40%)
- the work is being carried out at extremely low temperatures (< -10°C)
- a low dew point is essential (for example tank-coating)
- the unit has to be ducted into the area that needs drying

A refrigerant dryer uses about one third of the energy of a similar desiccant dryer, therefore the obvious advantage (especially on site) is that it requires much less electricity so that running costs are usually reduced. A desiccant dryer is more efficient than a refrigerant dryer at about -5°C.

Typical applications include:

- drying out buildings during construction/finishing
- drying out after a fire or flood
- storage of delicate products that are moisture sensitive
- keeping electrical switch rooms dry
- equipment drying rooms on construction sites, outdoor activity centres, fire stations, etc
- the drying out of pipework and tanks prior to repainting/coating

Fire and water damage
In the case of fire and water damage, immediate professional action is essential to avoid further damage. Andrews hires dryers, heaters and fans to reduce relative humidity and to ventilate polluted air. Corrosion (HCL) can be stopped; buildings, furniture and inventory can be saved and thus restoration costs can be minimized.

Building drying

The most important reason for using building dryers is to minimize the total building time by creating the perfect conditions for painting, plastering, finishing floors and ceilings, wall-paper, etc. Andrews has the right dryer available whether you need a building dryer for a house, a cellar, a safe storage or complete utility.

Humidity control during storage

Increasingly, higher demands are made upon the relative humidity standards for all storage including agricultural products, electronic components, sheet steel, food, paper products, powders, objects d'art, antiques, etc. The list is almost endless.

Typical relative humidity conditions

Material	% R.H.	Material	% R.H
Nuts	60-65	Steel	45
Chocolate	40-50	Electronics	55
Onions	65-70	Switch Rooms	60
Furniture	50-55	Paper	55-65
Flower bulbs	70-75	Artwork	55

To avoid mould the relative humidity has to be maintained below 70% R.H.

Dehumidification with an Andrews refrigerant building dryer is up to 75% cheaper than using heating in combination with ventilation to dry a room.

A combination of equipment can speed the drying process up, the dehumidifier removes the moisture from the air, whilst heaters and fans accelerates the process by circulating warm air throughout the affected area allowing the dehumidifier to be more efficient.

Calculation and selection of the correct dehumidifier or dryer
To correctly decide upon the most efficient way of drying an area, many factors need to be considered: temperature, materials, relative humidity and drying time. This calculation is best left to the experts at Andrews who, armed with a hygrometer and psychrometric chart, will give you the very best advice - free of charge - on how to use our units.

Basic 'rule of thumb' sizing Refrigerant units
These are usually sized taking a typical RH of 75% at an air temperature of 20°C, the performance of the unit will vary greatly as the temperature and RH rises or falls. Typically the units are shown to be able to keep an area in cubic metres dry, based on the above conditions. The dry out area is usually around 50% of this as the area is assumed to be already wet and this moisture needs to be removed.

Desiccant units
In general, a desiccant unit is suitable to dehumidify a room with a volume two times bigger than the dry air volume produced by the dryer. A desiccant dryer with a dry air volume of 1,600 m^3/hr is suitable to dry a room of approximately 3,200 m^3.

Installation of a dehumidifier
Before the installation of a dehumidifier, the room to be dried has to be sealed as well as possible. This means the room's windows and doors are kept closed and gaps and ventilation holes are covered so that humid air is prevented from flowing inside from the outside. Plastic covers are suitable for sealing a room - If one dryer is to be used, it should be positioned in the middle of the room. For larger rooms, where more dryers are used, the total room should be divided into as many equal sections as dryers to be used. A dryer is installed in the middle of each section to ensure perfect air circulation. The dryer has to be positioned so it can blow dry air without obstruction, and its air inlet grill remains clear. If dryers are used in conjunction with heaters (electrical or indirect fired), make sure hot air is not blown in the direction of the dryers. The condensation from the dryer can be caught in a container or a hose can be used to drain the condensation to outside or to a drain. In this case, the water has to be piped off vertically otherwise leakages will occur. Larger Andrews dryers remove condensation by means of a condensation pump - a new development in dehumidification technology. This pump allows the condensation to be easily pumped upwards through a window or down to an outside drain. Due to this new development, it is no longer necessary to empty and to check the waterbuckets during weekends and holidays, for example.

Faster drying
For a faster drying process, dryers can be installed together with Andrews ventilation fans. The increased air circulation results in faster moisture evaporation, minimising the danger of shrink damage from drying out too fast.

Accessories

- Humidistats, to turn the units on and off automatically
- Automatic timer controllers
- Condensate pumps
- Flexible ducting, which is available in various lengths and diameters
- Electrical extension leads are available in a variety of lengths and voltages
- Tiny tag remote humidity loggers

- Condensate tubing
- Condensate collection containers
- Transformers and distribution boards

Andrews Dehumidification Hire also supply telemetry equipment to allow remote and recorded monitoring of humidity and temperature.

BUILDING DRYERS - DH10

Extraction rate (max)	23 litres/24hr
Nominal extraction duty at 75% RH @ 20°C	11.3 litres/24hr
Air flow (max)	190 m^3 /hr
Power supply	230 V 1ph 50Hz
Plug type	BS1363 230 V 16A 3 Pin
Noise level (max)	51 dBA @ 1 metres
Weight	21 kg
Dimensions (L x W x H)	315 x 390 x 620 mm
Control	Integral humidistat
Power input	0.62 kW

Plug and play

Easy to manoeuvre

BUILDING DRYERS - FD 30

Extraction rate (max)	55 litres/24hr
Nominal extraction duty at 75% RH @ 20°C	34 litres/24hr
Air flow (max)	380 m^3/h
Keep dry area (typical)	748 m^3
Dry out area (typical)	374 m^3
Power supply	230 1 ph 50 Hz Run 4.1
Plug type	16A 3 Pin
Noise level (max)	57 dBA @ 3 metres
Weight	37 kg
Dimensions (L x W x H)	363 x 363 x 805 mm
Control	Manual (humidistat option)
Power input	0.7 kW

Plug and play

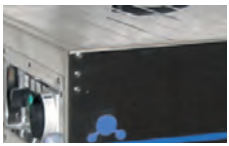
BUILDING DRYERS - FD 40

Extraction rate (max)	75 litres/24hr
Nominal extraction duty at 75% RH @ 20°C	37 litres/24hr
Air flow (max)	420 m^3/h
Keep dry area (typical)	814 m^3
Dry out area (typical)	407 m^3
Power supply	230 1 ph 50 Hz Run 5.7
Plug type	16A 3 Pin
Noise level (max)	53 dBA @ 3 metres
Weight	48 kg
Dimensions (L x W x H)	510 x 491 x 920 mm
Control	Manual (humidistat option)
Power input	1 kW

Plug and play

DESICCANT DEHUMIDIFIER - KT2200

Extraction rate (max)	480 litres/24hr
Nominal extraction duty at 60% RH @ 20°C	310 litres/24hr
Air flow (max)	2,200 m^3/h
Keep dry area (typical)	7,000 m^3
Dry out area (typical)	3,500 m^3
Power supply	415 V 3 ph N+E 50 Hz Run 24A
Plug type	BS4343 5 pin 32 A
Generator size	22 kVA
Duct length (max)	40 metres
Noise level (max)	70 dBA / 79 lwA @ 1 metre
Weight	315 kg
Dimensions (L x W x H)	1,326 x 1,210 x 1,510 mm
Control	Manual or Auto (humidistat mounted)
Average power consumption	7.1 kW/h



Works in low ambient temperatures

At Andrews, we understand the importance of adequate air circulation which is why we offer our customers a full range of cooling, extraction and ventilation fans. Our equipment ensures that confined spaces and hazardous working environments are safe from contaminants and that fresh air is circulated throughout a specific application. It's not uncommon that two high capacity industrial fans are used simultaneously during a project – one to remove dangerous fumes or gases and the other to replace the affected area with safe, clean air.

As far as air extraction is concerned, it is imperative that enough openings are present within the area in which your fan is installed. We have genuine expertise of virtually every type of ventilation project which is why we offer such a broad range of equipment to suit requirements of any nature. We are constantly proposing ventilation hire packages for tunnels, sewers and similarly restricted environments where the availability of clean air is limited.

While effective fume and dust extraction is of critical importance in the above scenarios, it is just as important to take steps to ensure there is sufficient fresh air ventilation to replace what has been removed - particularly when workmen are on site.

Our fans are frequently deployed to assist specialist processes, whether that be welding, tank cleaning, sewage work, excavation, painting or even demolition. Additionally, our fans are also suitable for the temporary storage of agricultural products and livestock.

When warm temperatures strike, it is very common that our free blowing fans are positioned in exhibition centres, classrooms, exam halls and meeting rooms, providing comfort cooling to those inside.

The free-blowing fans are also excellent for creating cool tents, parties, exhibitions, sports halls, theatres, meeting rooms, canteens, offices, etc. (On average, the content of a house has to be refreshed four times an hour).

The following table shows the most common ventilation rates and standards:

Ventilation rates per hour			
Type of space	Ventilation Rates	Type of space	Ventilation Rates
Cafés	10-12	Sports Halls	2-3
Garages	4 -6	Theatres	5-8
Foundaries	8-15	Spray Paint Workshops	20-50
Canteens	6-8	Meeting Rooms	5-10
Laboratories	5 -15	Workshops	6-10
Engineering	15-30	Fume Cupboards	40-50
Storage	3-6	Offices	4-8
Restaurants	6-10		

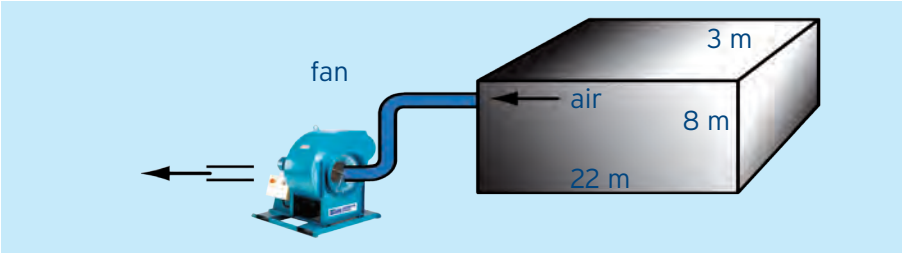
Useful tips on calculation and sizing for the correct Andrews ventilation fan

The selection of the correct fan can be achieved with the help of the following calculation:

1. Calculate the volume of the room which needs to be ventilated (W x L x H)
2. Select the recommended number of air changes per hour
3. Multiply the results of 1 by result 2, this will give the required air volume per hour

Example
An engine room which is 3 metres high x 8 metres wide x 22 metres long requires ventilation due to heat and fume build-up. From the chart we can see that the recommended air change is between 15 and 30 depending on the intensity of the application. This case is fairly intense so on the side of caution we can use the ratio of 30 changes per hour.

To calculate;
3 m x 8 m x 22 m = 528 m^3 x 30 changes = 15,840 m^3 per hour
In this situation a model FV900 which has a capacity of 16,500 m^3 per hour would be most suitable.



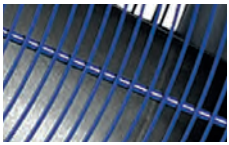
Important note on using ducted units
If it is necessary to use long lengths of ducting or involve several bends in the ducting, it must be remembered that the resistance in the ducting will increase and the air volume provided will decrease drastically.

Due to high resistance, certain fans can become useless, although the stated air volume at low pressure would not indicate this at first sight. The Andrews FV fans do have high pressure capacity and can be used with several lengths of ducting.

In some applications it may be better to blow rather than suck the air out, or use a combination of the two. When used in sensitive environments or handling ignitable fumes, special precautions and equipment must be used. If the application is sensitive, complicated or long lengths of ducting need to be used, you should consult your local Andrews specialist who will be able to provide advice on all types of installations.

COOLING FAN - ASF950

Air flow (max)	37,000 m^3/h
Power supply	230 V 1ph 50 Hz Run 10
Plug type	16A 3 Pin
Noise level (max)	85 dBA @ 1 metre
Weight	85 kg
Dimensions (L x W x H)	1,050 x 440 x 1,170 mm
Control	Manual variable speed (230 V)
Power input	2.3 kW/



Plug and play

VENTILATION/EXTRACTION FAN - FV100

Air flow (max)	1,700 m^3/h
Power supply	230V 1 ph 50 Hz Run 5
Plug type	16A 3 Pin
Duct length (max)	16 Metres x 200 mm
Noise level (max, with duct)	78.6 dBA @ 1 metre
Weight	27 kg
Dimensions (L x W x H)	605 x 440 x 535 mm
Control	Manual
Power input	1.15 kW

Large air flow

CASE STUDY

With Stage Two of the UAE's generational railway network project now well underway, a need to support construction operations with ventilation equipment has led to the involvement of Andrews Sykes Climate Rental.

Engineering work has commenced at various locations, including several long and narrow tunnels that will eventually permit freight and passenger trains to pass through. Naturally, these enclosed applications require a constant circulation of clean, fresh air to ensure those working inside have an adequate source of safe air to breathe.

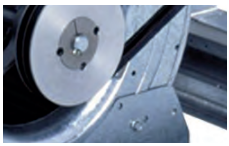
Machinery utilised within the tunnels will produce fumes and dust, so it is essential that temporary equipment is deployed to prevent engineers suffering any ill effects of their working environment.
For this reason, we have installed our high capacity FV1800 ventilation fans at the tunnel entrance to ensure that a constant supply of clean air is delivered inside.

Although simple in terms of their functionality, these large fans are specifically designed for tight, longitudinal tunnels. A single unit will deliver massive airflows of up to 38,000m³ per hour, making it one of the most powerful ventilation fans available on the market.

We are delighted with our contribution to one of the regions' most ambitious infrastructural schemes and have demonstrated both our pumping and HVAC capabilities during our involvement.

VENTILATION/EXTRACTION FAN - FV500

Air flow (max)	12,100 m³/h
Power supply	400V 3PH 50Hz Run 8.8 A
Plug type	32A 5 Pin
Static Pressure	235 Pa
Duct length (max)	30 metres
Duct size	Inlet 600 mm Outlet 450mm dia
Noise level (max, with duct)	68dBA @ 1.5 metre
Weight	108 kg
Dimensions (L x W x H)	1048 x 775 x 1000 mm
Control	Manual
Power input	4 kW



Large air flow

VENTILATION/EXTRACTION FAN - FV600

Air flow (max)	12,100 m^3/h
Power supply	415V 3PH 50Hz Run 6 A
Plug type	32A 5 Pin
Static Pressure	1000 Pa
Duct length (max)	40metres
Duct size	Inlet 600 mm Outlet 450mm dia
Noise level (max, with duct)	83dBA @ 1.0 metre
Weight	245 kg
Dimensions (L x W x H)	1,115 x 1,115 x 1,350 mm
Control	Manual
Power input	4.0 kW

Large air flow

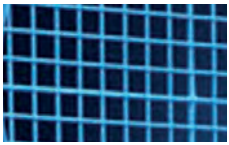
VENTILATION/EXTRACTION FAN - FV900

Air flow (max)	16,500 m^3/h
Power supply	415V 3PH 50Hz Run 10 A
Plug type	32A 5 Pin
Static Pressure	1000 Pa
Duct length (max)	40metres
Duct size	Inlet 600 mm Outlet 450mm dia
Noise level (max, with duct)	86.6dBA @ 1.0 metre
Weight	295 kg
Dimensions (L x W x H)	1,230 x 1,170 x 1,500 mm
Control	Manual
Power input	4.0 kW

Large air flow

VENTILATION/EXTRACTION FAN - FV900 S2

Air flow (max)	19,000 m^3/h
Power supply	415V 3PH 50Hz Run 11.3 A
Plug type	32A 5 Pin
Static Pressure	1000 Pa
Duct length (max)	40metres
Duct size	Inlet 600 mm Outlet 450mm dia
Noise level (max, with duct)	74dBA @ 1.0 metre
Weight	465 kg
Dimensions (L x W x H)	1,552 x 1,152 x 1,965 mm
Control	Manual
Power input	5.3kw



Large air flow

VENTILATION/EXTRACTION FAN - FV1800

Air flow (max)	38,000 m^3/h
Power supply	415V 3PH 50Hz Run 28 A
Plug type	63A 5 Pin
Static Pressure	1000 Pa
Duct length (max)	Upto 100 Meter
Duct size	Inlet 600 mm Outlet 600mm dia
Noise level (max, with duct)	80dBA @ 1.0 metre
Weight	1,110 kg
Dimensions (L x W x H)	2,208 x 2,090 x 2,005 mm
Control	Manual
Power input	17.6kw

Large air flow

Electrical extension leads available in a variety of lengths and sizes complete with plug and sockets to suit different voltages and currents

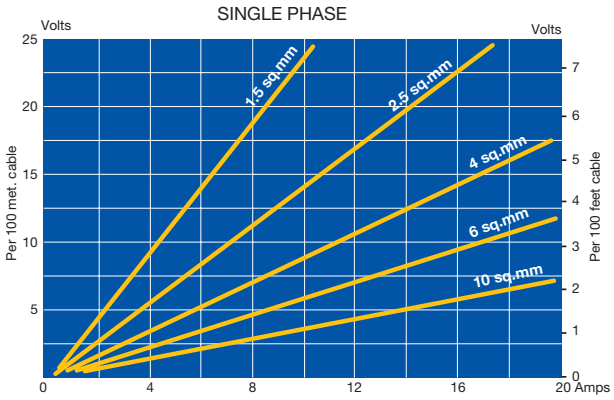
Heavy duty flexible ducting available in various lengths and diameters to suit our range of extraction and ventilation units

Dust collection bags to collect airborne particles when using fans on dust extraction applications

Filter boxes can be provided on request for long term hires where dust pollution is high, or fine filtration is required

Transformers and distribution boards are available to hire in a variety of sizes, for different voltages and multiple connections

Call us on **00971 800 79537** if you require specialist filtration systems. We often provide tailored solutions to meet specific requirements.



Standard electrical supplies

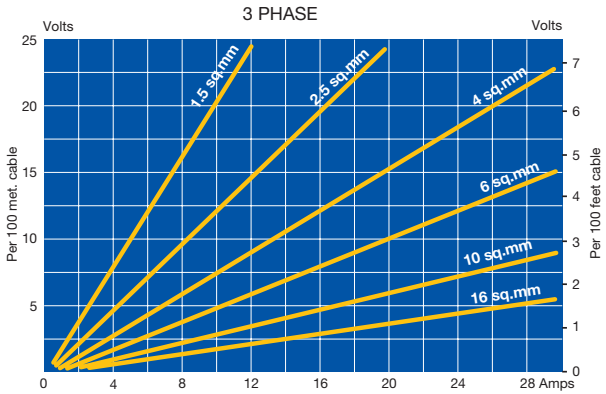
230 volt single phase (220-240) standard voltage found on construction sites for small tools and portable appliances usually only available up to 32 amp.

415 volt three phase (415/3/50) standard voltage on site and within industry for the larger equipment that is not portable.

230 volt single phase (230/1/50) standard domestic voltage used for household appliances, retail and light industrial.

Power = kilowatts (kW)
Current = Amps (A)
Voltage = Volts (V)

	Single Phase	Three Phase
kW =	$\frac{\text{Volts x Amps x Eff \%}}{1000 \times 100}$	$\frac{\text{Volts x Amps x Eff \% x PF x 1.73}}{1000 \times 100}$



Voltage drop

The amount of voltage lost when using long cable lengths, causes cable to get hot and become unsafe. The motor will also draw excessive current causing overloads to trip and motor to overheat the maximum permissible voltage drop over a length of cable is 2.5%.

To calculate volt drop use table on page 48 or use the following calculation, based on copper cable.

$$\frac{\text{Voltage drop} = \text{Length of cable (m)} \times 0.018 \text{ (resist)} \times \text{Amps} \times 1.73}{\text{Cross sectional area of cable (mm}^2\text{)}}$$

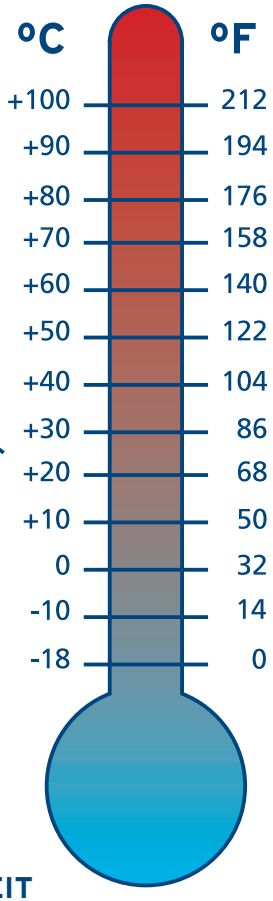
The above will give the voltage lost in cable length (v) divide by the supply voltage will give the % drop which must not exceed 2.5%

Example
16 Amp 3 phase 415 volt pump using 60 metres of 2.5mm cable
$\frac{60 \times 0.018 \times 16 \times 1.73}{2.5\text{mm}^2} = 11.96$
11.96 volt / 415 volt = 2.8% Therefore a larger cable is required as the volt drop exceeds 2.5%

Inches	x	25.4	=	mm	x	0.0394	=	Inches
Feet	x	0.3048	=	m	x	3.281	=	Feet
Yards	x	0.9144	=	m	x	1.0936	=	Yards
Miles	x	1.609	=	km	x	0.6214	=	Miles
Ft^2	x	0.0929	=	m^2	x	10.764	=	Ft^2
$Miles^2$	x	2.59	=	km^2	x	0.3861	=	$Miles^2$
In^3	x	16387	=	mm^3	x	0.000061	=	In^3
Ft^3	x	0.02832	=	m^3	x	35.31	=	Ft^3
Gals (Imp)	x	4.546	=	L	x	0.22	=	Gals (Imp)
Gals (Imp)	x	0.004546	=	m^+	x	220	=	Gals (Imp)

btu	x	0.000293	=	kW	x	3412	=	btu
LBS	x	0.4536	=	kg	x	2.2046	=	LBS
Tons	x	1016	=	kg	x	0.000984	=	Tons
CFM	x	1.701	=	m^3 / h	x	0.5878	=	CFM
L / sec	x	3.6	=	m^3 / h	x	0.277	=	L / sec
PSI	x	0.06895	=	Bar	x	14.504	=	PSI
HP	x	0.7457	=	kW	x	1.341	=	HP

23°C
is the recommended indoor working temperature, if exceeded call Andrews Sykes Climate Rental



CONVERSION CENTIGRADE TO FAHRENHEIT

°C x 1.8+32=**°F**
°F - 32÷1.8= **°C**

R.H.
Relative Humidity is the relationship between the amount of water vapour in air at any temperature and the maximum amount of water vapour which the air could absorb before condensation takes place. Relative humidity is expressed as a percentage.

Dew Point
The temperature at which water vapour in the air condenses out.

Vapour pressure
The partial pressure in the air due to the presence of water.

Condensation
When humid air cools, the water vapour becomes liquid.

Cold Bridge
An area of physical contact between a warm and cold surface where condensation occurs.

Surface area
L x B = m^2

Volume
L x B x H = m^3

Latent Heat
The heat required to evaporate or condense water with no change in temperature.

K-factor
Heat transmission coefficient.

Wet Bulb Temperature
Temperature of humid air with a thermometer with a wet covering around the mercury reservoir, at an air speed of +/-3 m/sec.