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ISO 9001:2015

JSC «GMZ «HIMMASH»

Universal climatic units

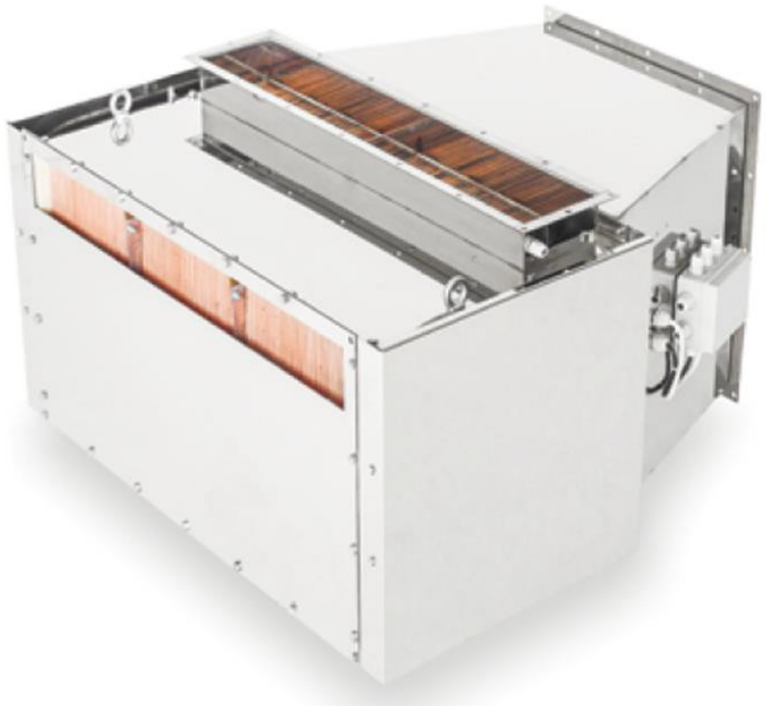
Uniclimatics – Universal climatic systems

JSC "GMZ" Himmash" for almost 15 years in the market of the manufacture of ventilation and air conditioning equipment. Our equipment is installed at many facilities of State Company "Rosatom" and the fuel and energy sector.

The great experience in the design and manufacture of complex and non-standard products allowed us to come close to creating an almost ideal air conditioner that is capable of producing large capacities in the cold with small dimensions and power consumption. Due to the wide possibilities for application, we named these machines the universal climate units - Uniclimatics (abbr. UCU).

To solve air cooling problems, JSC "GMZ" Himmash "offers energy-efficient equipment developed on the principle of indirect evaporative cooling (IEC), which, due to low power consumption, allows to reduce capital costs for the electrical equipment of the facility, and significantly reduce maintenance and operation costs.

There are no complicated and energy-consuming equipment in the UCU, and there is no chemical refrigerant (freon), which ensures ecological, economical, reliable and trouble-free operation during the whole service life.



Advantages

Uniclimatics demonstrate a significant advantage over freon equipment when cooling air to +17 .. + 20 °C.

In the case where it is necessary to cool the air more than +17 .. + 20°C, we recommend the use of an additional stage of the freon equipment. So, for example, if you want to cool the room from + 40°C to + 15°C, 80% of the total cooling work will be made by the heat exchanger by indirect evaporative cooling, and the remaining 20% - by the freon unit.

Advantages of GMZ «HIMMASH» Uniclimatics over freon conditioners

- **Highest energy efficiency**
  Up to 10 times less energy consumption.
- **Long service life**
  Up to 10 years of non-stop operation.
- **Simlplest principle**
  Absence of complex mechanisms (compressors,heat exchangers, etc.)
- **High temperatures**
  Operation at the temperature of +60°C and higher.
- **Non-linear efficiency**
  One unit can work at +25°C and +50°C at the same time.
- **Ease of maintenance**
  Change of filters only and simple plumbing works
- **Full factory complete set**
  Does not require the selection of piping and mixing units
- **Easy mounting**
  Does not require qualified personnel and complex schemes for mounting
- **Wide range of application**
  Great solution for industrial, commercial and transport enterprises
- **Modularity and scalability**
  Capacity from1 kilowatt to dozens of megawatts
- **Environmentally friendly**
  Does not contain freon in standard set
- **Sizes equivalent to freon air conditioners**

Advantages of GMZ «HIMMASH» Uniclimatics over conditioners based on direct water evaporation

- **Minimal water consumption**
  1.3 l/h per kW of cold instead of 1000 l/h per kW of cold in the irrigation chambers
- **More intense cooling**
  Up to 3-5 °C better
- **Minimal requirements to feed water**
  Simple and available cartridge filters are applicable.
- **Built-in system for washing plates from dust and plaque**
  Uniclimatics wash themselves every 400 work cycles

Structure

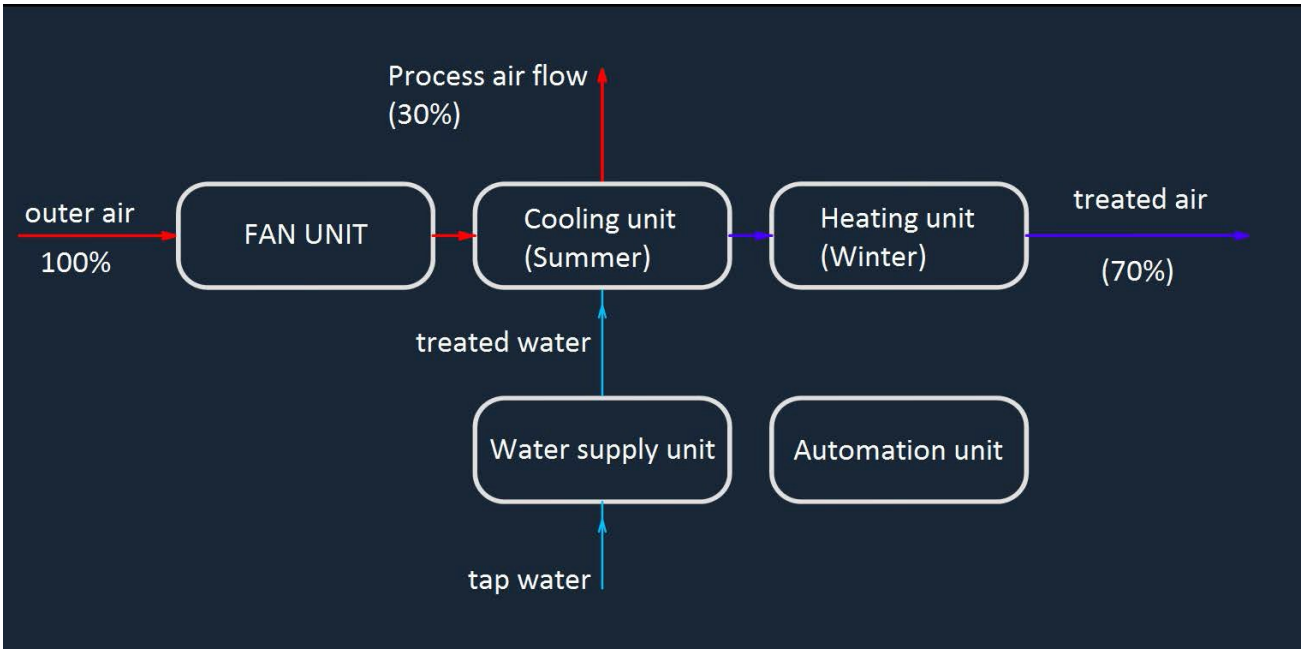



As standard, the Uniclimatics consists of five units: a fan, a cooling unit, a water supply unit, a heating unit and an automation unit.

- **Fan Unit** consists of a fan and an air filter
- **Cooling Unit** consists of a device for distribution and supply of water, a pallet and unique plates, the physical principle of which allows you to replace the whole complex of freon equipment.
- **Water Supply Unit** consists of a low-pressure pump for water supply, a storage tank, filters, counters and a surfactant adding device (surfactant)
- **Heating Unit** consists of a liquid or electric air heater (optional)
- **Automation Unit** consists of a power supply and a regulating control module. At the request of the customer, a dispatching device can also be installed that allows monitoring the operation of the UCU remotely

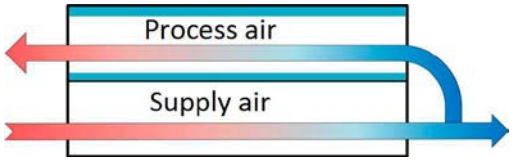
Also, power control units and a freon cooling unit may be provided to achieve lower temperatures (below 17-20^{0}C).

Universal climatic units can be either individual machines or components of central air-conditioners.



Principle of operation

The air enters the air cooling unit, where it passes through the dry channels in full and, is partially separated into the supply air, which is supplied to the building and process air flow, which is humidified, heated and removed from the heat exchanger.

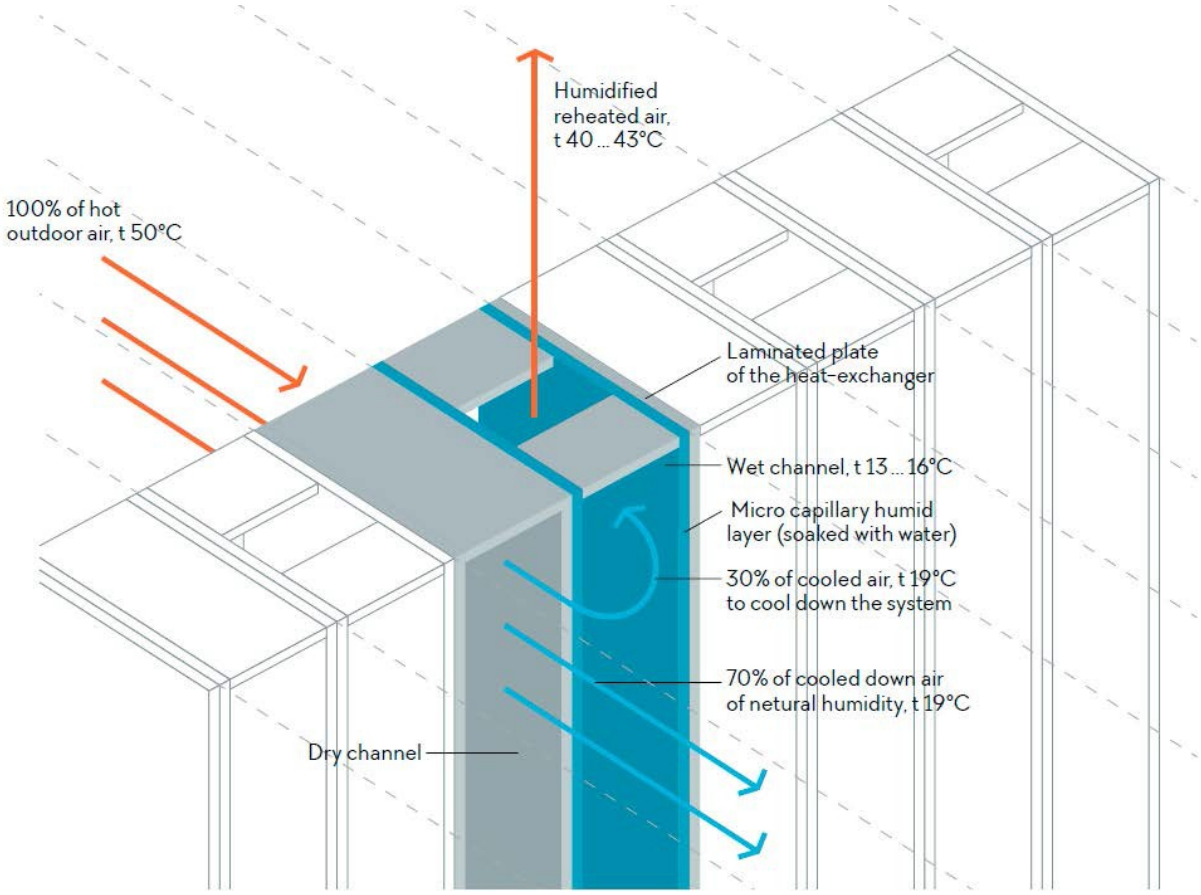


Plates form two types of channels - the dry channel, in which the cooled air flows, and the wet microcapillary channel, in which a part of the cooled air flows countercurrent. The channels interchange each other.

The wet channel is constantly saturated with water and transmits a portion of the air (30% of the total flow). There is a process of evaporation in it, which is accompanied by a loss of heat. Due to the special scheme of partial air circulation, the surface of the plate cools down through its entire length.

Without direct contact, through the wall, the cold is transferred to the adjacent dry channel, in which hot outer air flows. Thus, at the outlet to the room, there is 70% of the fresh cooled air at a comfortable temperature, without changing the value of natural humidity. The product of the evaporation process, humidified air (30% of the total flow), is released into the atmosphere.

The temperature at the supply channel outlet is conditionally equal to the temperature of the wet thermometer for the inlet air estimate indicators. *For example, the air at the temperature of 50°C and humidity of 10% will be cooled in the unit down to 20°C.*

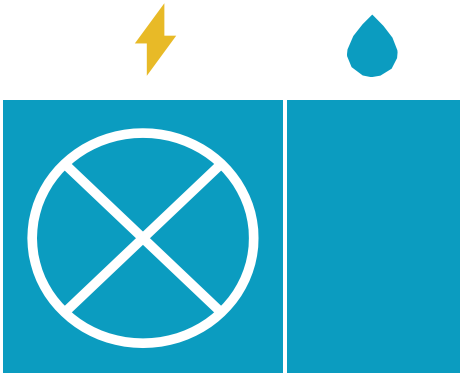


Energy Efficiency

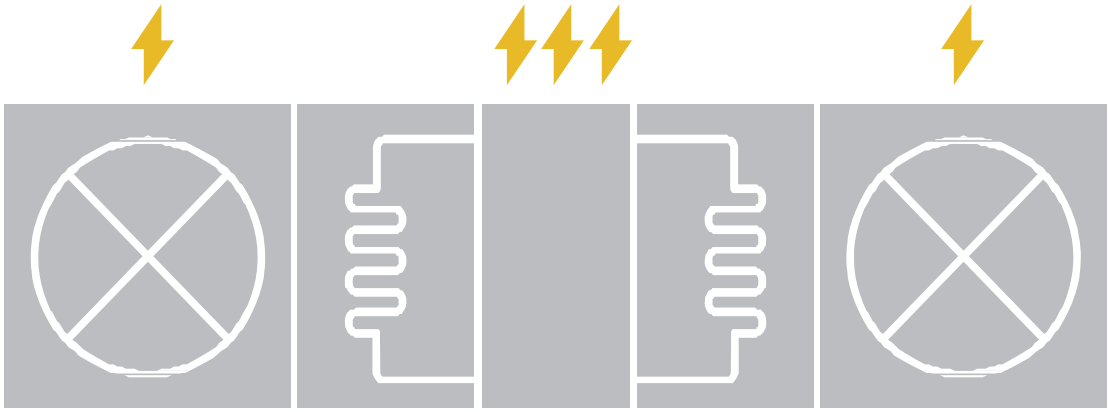
The most unique feature of air conditioners in terms of technology is that cooling rate directly depends on the initial temperature of the air to be cooled. The higher the outside temperature, the more effective the cooling process is. As it is known, the efficiency of freon equipment, on the contrary, is reduced with increase of the temperature.

Unlike freon systems, where the main energy consumer is a compressor that pumps up freon to an average of 40 atmospheres, only the fan and the pump, which supplies the heat exchange plates, operate in Uniclimatics.

Consumers of electricity in UCU



Consumers of electricity in freon equipment



Let's consider an example. For air-conditioning of a machine room with an area of 800 m2, 175 kW of cold is required.

Using the central air-conditioner - chiller system, we will consume **3 kW** on the air supply fan and **40 kW** on the chiller. Total **43,0 kW** of electricity.

Using universal climatic systems, we will consume **4 kW** for the air supply fan and **0.2 kW** for the pump. Total **4.2 kW** of electricity.

The difference in power consumption - 10 times!

And the higher the temperature of the cooled air and the lower its relative humidity, the more efficient the technology works.

Field of application

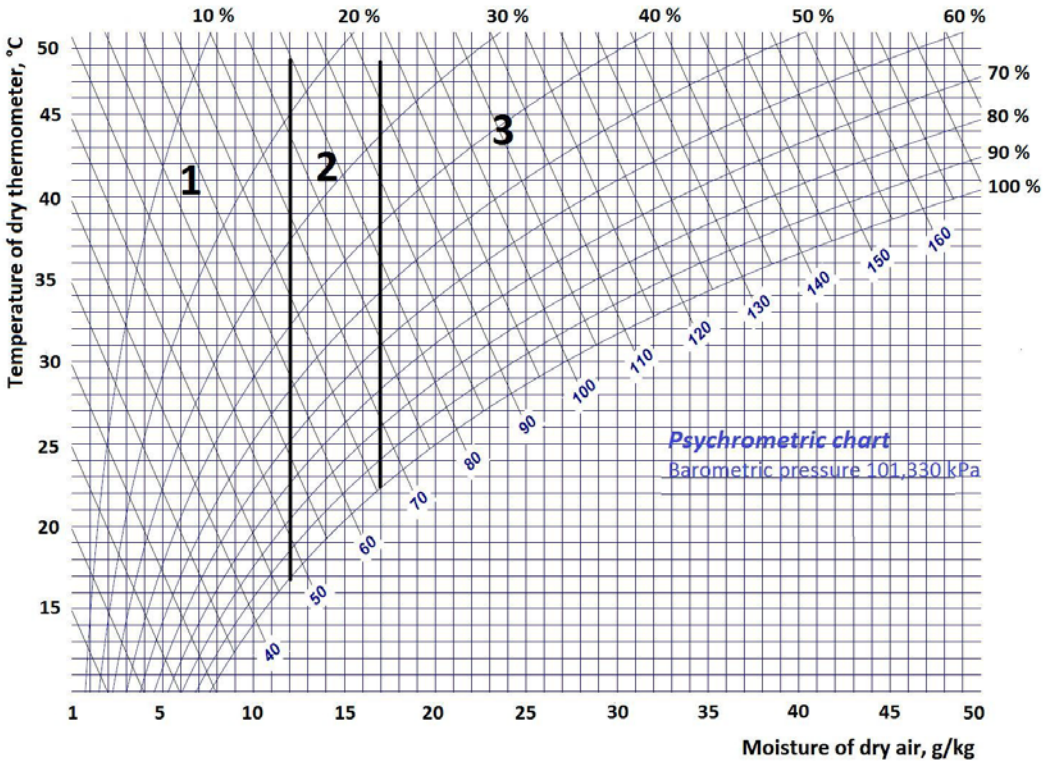
Universal climatic units can be used as:

- Central air conditioners
- Rooftop air conditioners
- Supply-and-exhaust units
- Crane and vehicle air conditioners
- Mobile and packaged air-conditioners
- Air-conditioners for electric control rooms, special and process air-conditioners
- Air-conditioners for spaced server rooms and data processing centers

Depending on the application and climatic parameters, it`s possible to determine the composition of the unit

There`re two categories of application of air-conditioning systems: *comfort application for a man*, *process application for machines*. The diagram below shows clearly three areas which would determine composition of the units and necessity of additional freon systems.

- **Area 1** – range of climatic parameters where use of UCU without a freon system is appropriate *for human comfort*.
- **Area 2** – range of climatic parameters where use of UCU without a freon system is appropriate for *processing procedures*.
- **Area 3** – range of climatic parameters where UCU should be used with a freon system.



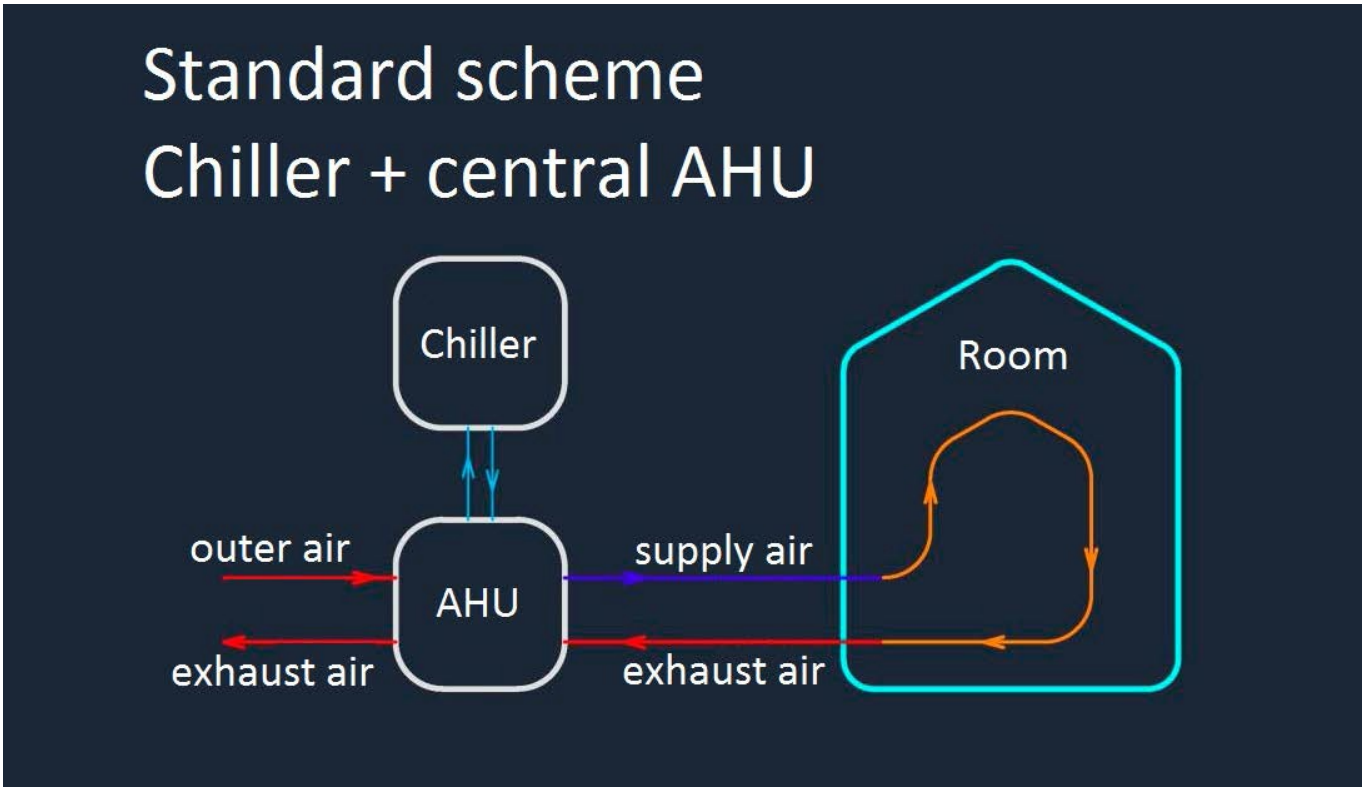
*The diagram very roughly shows the application areas, we recommend that for each borderline case a comparison should be made between freon technology and indirect-evaporation technology.

Application options

Universal climatic units can be used as analogues of the most common systems: central air-conditioner combined with a chiller or a compressor-condensing unit, central air-conditioner with an irrigation chamber, packaged air-conditioner. Also, the units can be used as room terminals which serve not for replacement but for provision of support and stand-by for freon systems.

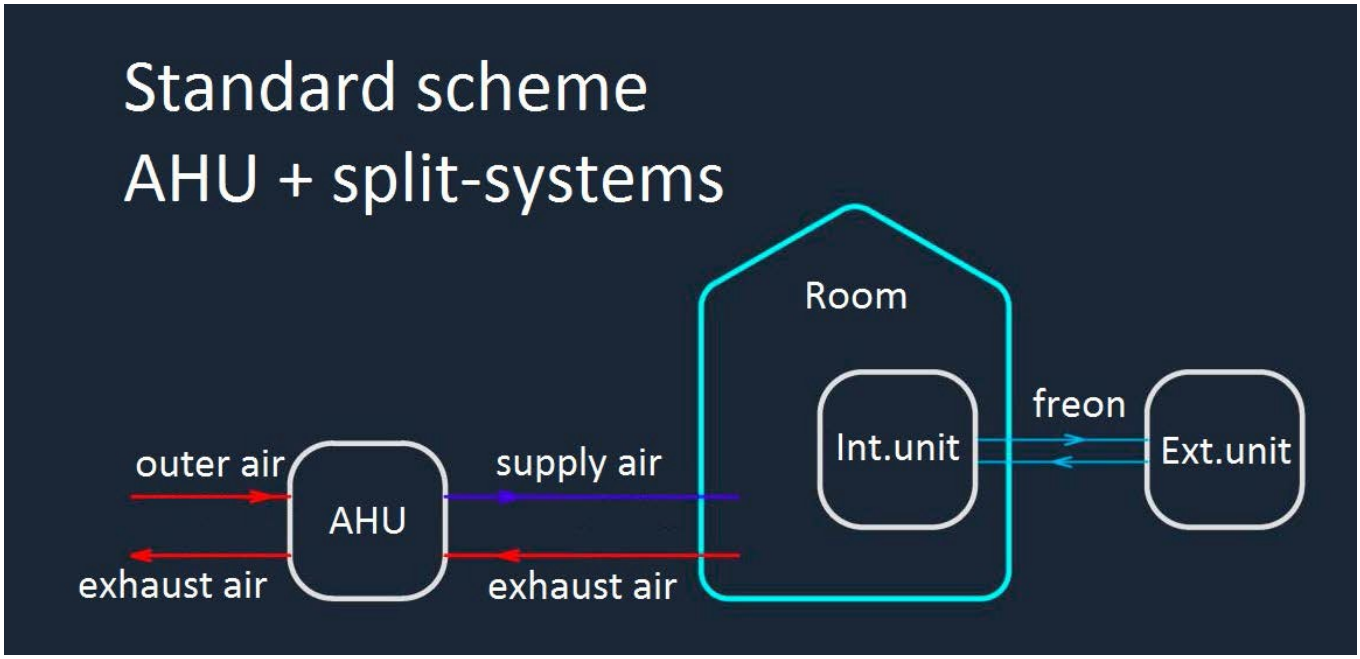
For clarity, we give the well-known schemes of freon equipment.

Standard solutions on the basis of freon air cooling equipment



Classical air conditioning circuit expects the placement of unified air handling units (central air conditioners) serving the room. At the same time, outer air is processed in the central air conditioner and is supplied prepared into the serviced room. To heat up the supply air, heaters are used, and to cool the supply air, air cooling sections are used; these air cooling sections usually use a freon system as a source of cold (chiller or compressor-condensing unit).

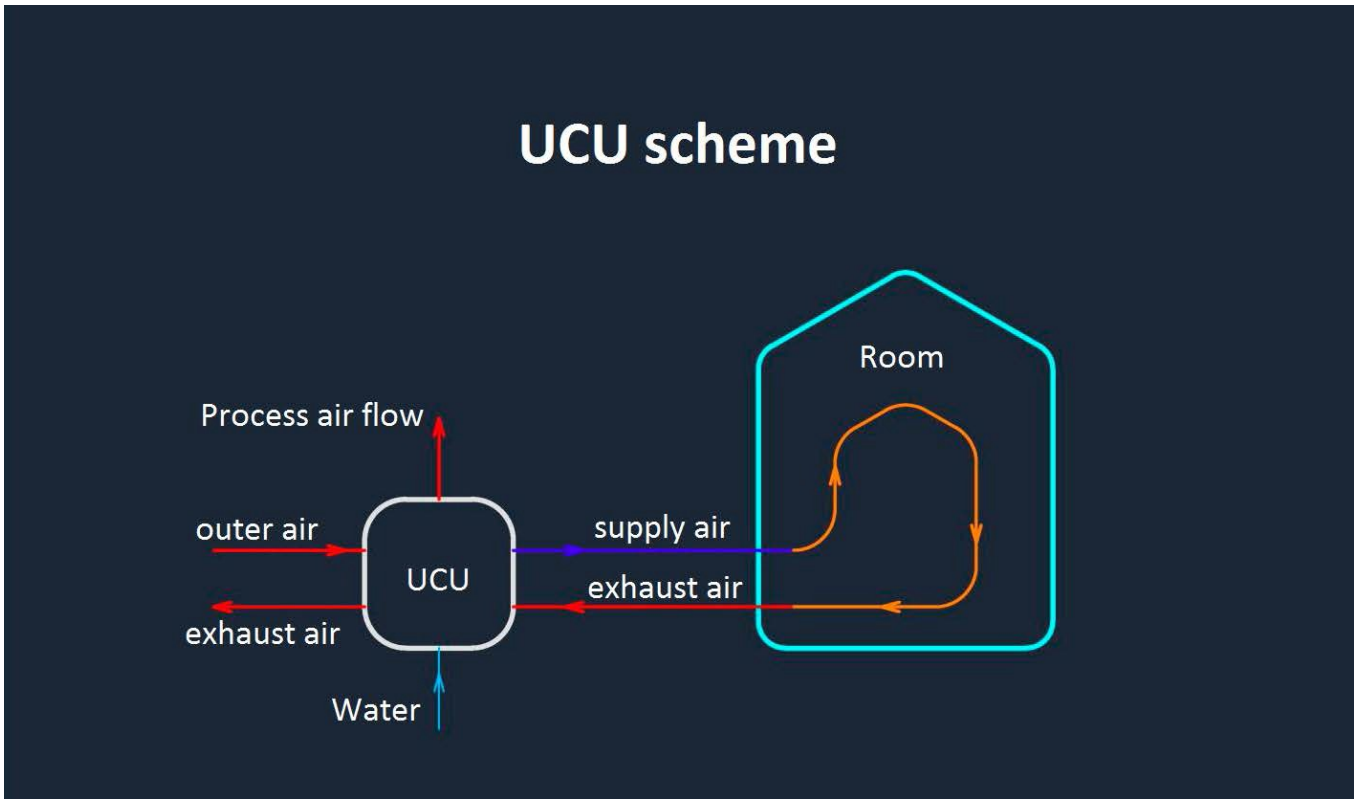
Standard solutions on the basis of freon air cooling equipment



For the circuits with local cold (heat) sources split systems (air conditioners with separated blocks: the outside block (condensing) is located outdoors, and the indoor block (evaporating) is located inside the room) are used as room terminals. Packaged air conditioners are also belong to split systems due to their layout.

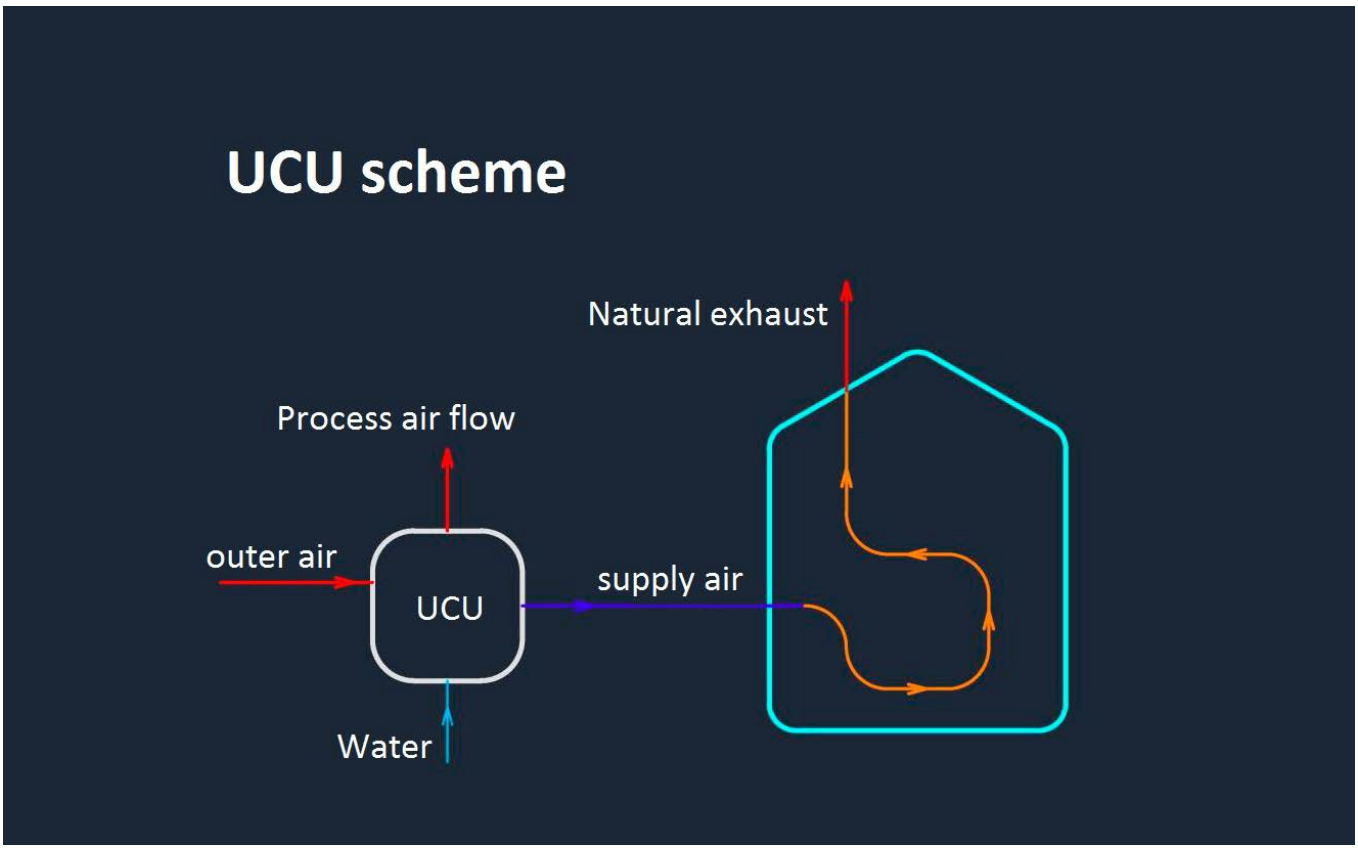
There are other ways to maintain the climate in the room, but they are all based on the circuits described above.

Supply-and-exhaust ventilation



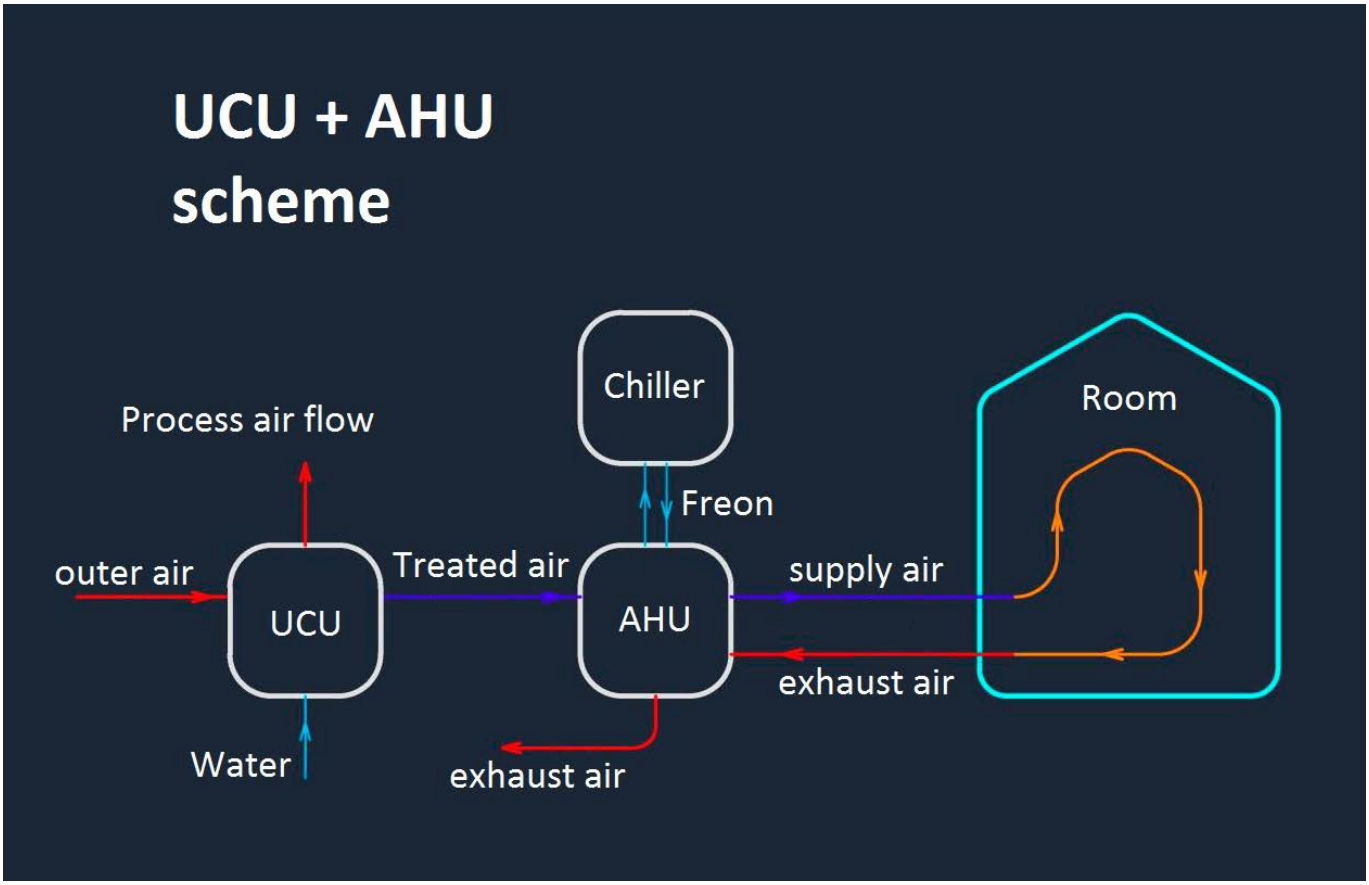
This operation circuit is similar to the circuit Central air conditioner – Chiller (Compressor-condensing unit). The refrigeration machine is excluded. It is required to include an additional air duct in the system to relieve heat when cooling the air, a process air duct. The air consumption in the process air duct is 30% of the air delivered into the unit. The air flow delivered to the consumer is 70% of the air delivered into the unit. In winter, the process air flow is blocked, and the airflow for the consumer is adjusted in accordance with the specified winter parameters. Winter operation circuit is basically the same as for the standard solution.

Supply-and-exhaust ventilation with natural exhaust ventilation



This circuit is similar to the previous aside except for one provision – no forced exhaust ventilation is used. The circuit is excellent for relatively small rooms and contains a minimum amount of maintainable equipment.

Support of the existing refrigeration equipment

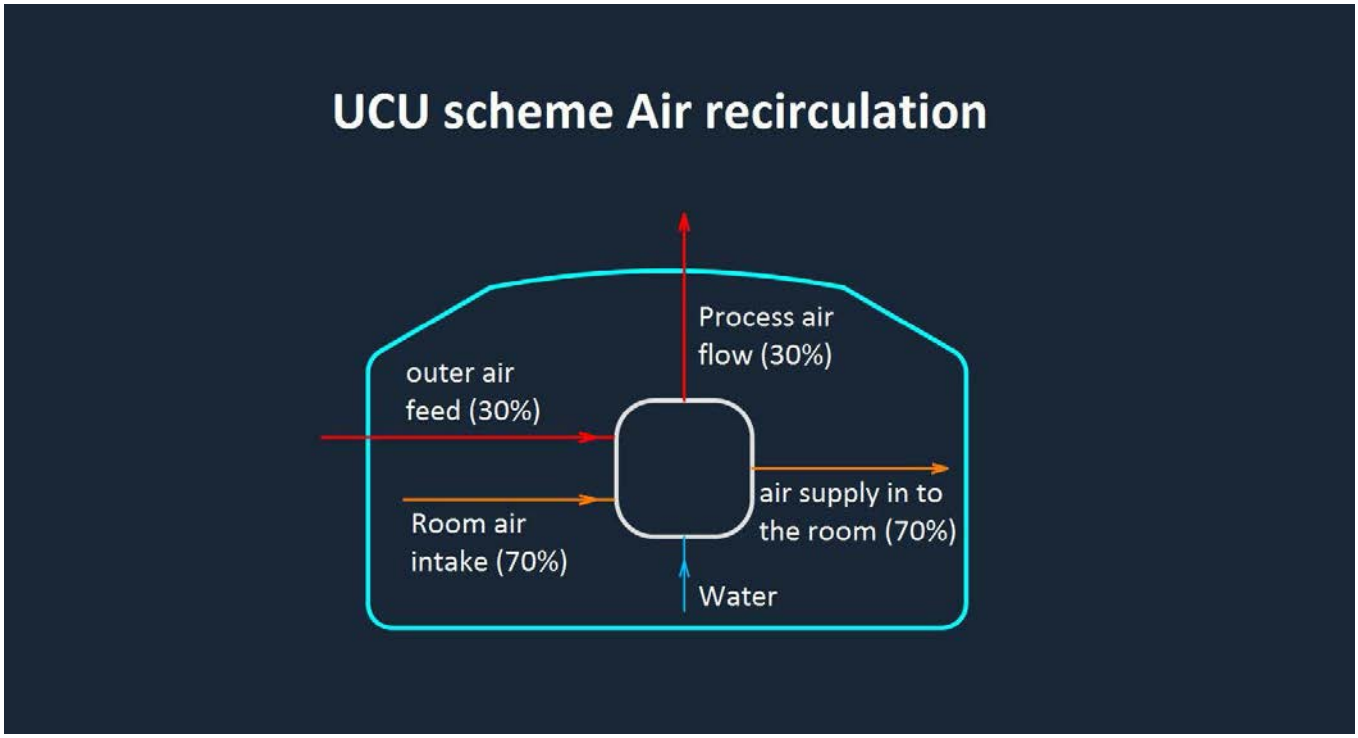


If replacement of the existing equipment is not possible and not reasonable despite all its disadvantages, first of all despite insufficient cooling capacity, we recommend additional conditioning stage – to install universal climatic unit prior to air intake of the central air conditioner.

E.g., the building is equipped with equipment, the building is put into operation, but for some reason, the air conditioner does not reach the rated capacity. Up to 24°C ventilation system fulfills its functions and process parameters are maintained. Over 24°C overheating of the building occurs. The solution to the problem may not be redesign of the ventilation system, not its complication, but only one universal climatic unit before air intake. Thus, the central air conditioner will be supplied with 18-24°C, and the previously installed equipment will send the rest of temperature down.

Application of this cooling circuit ensures safety of the objects. In combination with a basically different physical cooling principle, different from the vapor compression refrigeration it`s possible a) to ensure reduction of general cooling capacity of the equipment being designed (first of all, chillers); b) to increase common safety parameters of ventilation systems.

Air recirculation



If necessary, universal climatic units can also be used to recirculate air. To ensure full operation of the unit, compensation is required by addition of outdoor air to the intake of the unit, since 30% of the supplied air should be exhausted with the process air flow.

Model range

Today we are in possession of seven standard models with an option of adjustable cooling capacity.

In case universal AC-units with increased cooling capacity are needed we are ready to offer a solution avoiding oversized dimensions by combining several units together.

Model	Air consuming rate, m3/h	Max. cooling capacity, kW	Max. energy consumption, kW	COP (EER)
XM KT-3	1500	13	0.5	26
XM KT-6	3000	26	1.05	24.7
XM KT-9	4500	39	1.6	24.3
XM KT-12	6000	52	2.1	24.7
XM KT-18	9000	78	2.85	24.3
XM KT-24	12000	104	4.2	24.7
XM KT-36	18000	156	6.3	24.7

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