



H Series
Surgical room air conditioners

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Essential features

For all fresh air or partial air recirculation treatment. Air return section from the environments and exhaust. Dynamic management of both overpressure and depression in the controlled room with regard to the reference environment.

- with direct expansion coil: OHA series
- with chilled water coil: OHU series

The units are equipped with controls, electric board, micro-processor, and dedicated software, and expressly designed for:

- General surgery rooms
- Special orthopaedics surgery rooms
- Low-low temperature heart surgery rooms
- Intensive care units
- Sterilization rooms
- Rooms for diagnostic by images
- BSLs for the treatment of viruses, flammable, nuclear, toxic, radioactive, or contaminated substances, in general
- Biotechnology and pathologic anatomy laboratories
- Mortuaries

Complying with the most severe European Standards, the primary goal of a surgical room air conditioning installation is to eliminate chemical and bacteriological contamination.

TUV certification - Compliance with Standard DIN 1946/4

H Series air conditioners have been designed according to German Standard DIN 1946 part 4, and TUV Deutschland has certified their conformity.

TUV certification - Compliance with Standard EN1886

The units comply with the air tightness tests and are not subject to leak under both overpressure and depression conditions.

They are classified "class B", which is the strictest one according to EN1886 concerning the construction of air handling units. TUV Deutschland certifies their conformity.





Structure of the unit

The structure is made up of welded plate, accurately puttied to guarantee perfect air tightness, and painted with 60 micron white epoxy resins, after rigorous sandblasting, metal-coating, and priming. This process also guarantees maximum resistance to sterilisation.

This is the only way to obtain perfect air tightness without resorting to silicone sealing, which would be indispensable with aluminium profile structures, which, however, do not guarantee good setting and long lasting tightness.

Also for allowing for sterilisation of the cold coils the aluminium wings are of alupaint treatment pre-coated type and the shoulders are in stainless steel. The panels are 25 mm (50mm for external installation) thick double-wall sheet-steel type, white painted, processed as described above, and thermally and acoustically insulated with a polyurethane foam layer. The frontal panels have inspection glasses specially positioned to allow checking the internal conditions of the unit without stopping and opening it; in fact, remember that these units must not be stopped as this would compromise the quality of the air.

The panels are equipped with key locks for access and maintenance, and with seals made of sterilising agents which are steam proof.

Easy hygienisation and sterilisation

H Series air conditioners offer high efficiency in hygienising and sterilising all the internal parts of the unit that are in direct contact with the airflow.

These can be easily reached and extracted by just opening the access doors, which are equipped with special hinges and handles with key locks. You can accede to the inner parts of the unit in a few seconds: this way, cleaning and maintenance operations will not be deferred. On the contrary, they will be executed in an easy and quick manner, within the prefixed time.

No risk of Legionella Pneumophila

H Series air conditioners for surgical rooms have been designed and constructed applying all the measures possible to bar decidedly any chance of formation of bacterial colonies of Legionella Pneumophila in them. The materials used, the easy cleaning of the most risky parts (condensate bacs, water traps, coils, etc.), and the operating ranges assure very high hygienic inner unit condition.

For indoor and outdoor installation

H Series air conditioners have been designed for both indoor and outdoor installation. Their extreme compactness, their reduced noisiness, and their pleasant aspect make them suitable for installation near the rooms to be controlled, so avoiding long and expensive ducting works.

H Series Surgical room air conditioners





H Series

Surgical room air conditioners

High and constant fresh air flow

Chemical contamination due to anaesthetic gas cannot be filtered but must be diluted with a very high fresh air quantity.

Despite the progressive clogging of the filters, the flow consistency is controlled by the microprocessor through the inverter of the air discharge fan. The desired air flow is directly selectable by the user and can vary from a minimum air flow to a maximum one according to the size and model of the air conditioner. If one unit has to supply air for more than one single room, a constant pressure in the duct air flow system becomes mandatory (accessory). To make this type of regulation Tecnair LV installs a differential pressostat on the supply mouth of the air conditioner. The pressostat measures the pressure inside the supply duct and informs the microprocessor which compares it with the set point and corrects it adjusting the fan revolution speed it through the inverter and therefore changing the airflow.

Air discharge fan section

The unit is equipped with either one or two inverter-controlled "plug fans", with high static pressure, which guarantee constant air flow even with clogged filters.

Air return and expulsion fan section

Also, the unit is equipped with either one or two high static pressure "plug fans", with inverter control to guarantee the required overpressure or depression level.

If the local Standards allow partial air by-pass, a motorised by-pass damper between the air discharge and return ducts can be installed as an accessory, opposed to the standard damper on the fresh air ducts. This will permit to get a noticeable energy and running costs saving.



Motorised damper on fresh air intake mouth and overpressure damper on air exhaust one

To prevent the wind from blowing pollution into the unit during sterilisation shutdown. Motorised dampers on the ducts to and from the controlled room are also available as accessories. In this case, the air expulsion damper too is motorised-type.

Motorised recirculation and sterilisation damper

In case the local norms allow for a partial recirculation it is possible to install a motorised damper in bypass and counter opposed to the fresh air one. This allows appreciable energy and economics reductions on operating costs.

Version without exhaust fan section

In case of installation in environment where the fresh air quantity is necessary only for the room pressurization, a unit without return and expulsion fan section is disposable.

Double fan

As an accessory, the unit can be supplied with a double fan on supply and a double fan on return air. This solution guarantees an absolute level of security and functioning of the unit in case of break of one of the fans. Both fans are intercepted by a motorised damper upstream the airflow so to avoid possible recirculation during the functioning of one single fan. The fans are controlled by the microprocessor through the inverter based on the information coming from the air flow measuring system within the unit. They work so to give the total nominal air flow of the unit. In case of breakdown of one of the fans the microprocessor measures the reduction in the airflow and therefore raises the revolutions of the remaining fan so to guaranty the nominal air flow.

Very high air filtering

To avoid bacteriological contamination carried inside the room by the fresh airflow. According to the applicable Standards, the air treatment occurs by pre-filtering (F6 efficiency) the outdoor air to the unit and by post-filtering (F9 efficiency) the air after the fan at the inlet of the air discharge ducts. Moreover, the unit is provided with a F5 filter at the inlet of the return air duct before the extract air fan, to keep the unit clean. Further, the unit supplies up to 800/1000 Pa static pressure for the outdoor air intake and discharge ducts, the mandatory silencer, and the final absolute filter to install directly in the room to control, as any other aeraulic element after it may contaminate the air flow. Finally, the high static pressure of the expulsion air fan allows installing an absolute filter at the inlet of the return air ducts before the silencer. This filter, together with the depression room control, helps not to pollute the environment in case of toxic substances or septic surgical operations.

Differential pressostat on each filter

Each filter is equipped with a differential pressure switch for clogged filter signalling by the microprocessor.



H Series

Surgical room air conditioners

Dynamic control of overpressure and depression

To avoid inlet or outlet to or from the surgical room of any bacteriological contamination. A crucial and sophisticated characteristic of H Series air conditioners is the automatic control of two different operating ranges, as concerns the overpressure and the depression of the surgical room compared to the surrounding environments, with tolerance ± 2 Pa. A differential pressure switch (standard supplied) to install between the controlled room and an adjacent environment, and an inverter on the extract air fan allow the microprocessor to control:

- Overpressure, by reducing the flow of expelled air compared to that of the discharged one, which must always remain constant. It prevents possible pathogens and toxic substances from being introduced in the surrounding environments. In case of doors constantly open the microprocessor reduces the expulsion air flow so to avoid any possibilities of particles entering the room.
- Depression, raising the exhaust air flow in comparison to the supply one. This way the loss towards the surrounding environments of toxic substances or pathogenic agents is avoided. Obviously depressed environments are not protected against contaminating infiltrations, therefore they must be perfectly sealed and connected to the external environments through an overpressure filter zone with a interlocked doors system. The filter zone can be controlled by the air conditioner itself.

Constant depression in the suction duct control system (accessory)

In units with a constant pressure in the supply duct control system it is necessary that also the ambient pressure is controlled through a pressure in the duct system. This is possible by installing a pressostat in the return/suction air duct so to maintain a constant depression in the return duct. It becomes necessary to install in the ducts motorised cassettes of VAV regulation type (not included in the supply), one for each room to be controlled. This system is necessary if one single unit supplies air to more than one room and therefore needs to have a independent control of over and under pressure for each one.

Integrated temperature and humidity control

Our units (standard version) are equipped with all the components necessary for cooling, heating, humidification and dehumidification control, suitably dimensioned for all fresh air or partial air recirculation treatment. In particular:

- Hot water heating coil with modulating three way valve
- Chilled water cooling coil with modulating valve, OHU series, or alternatively:
- Direct expansion coil with cooling circuit, OHA series
- Electric modulating reheater, or as an alternative water
- Independent modulating immersed-electrode double humidifier, or alternatively:
- Modulating distribution system for steam network

Air conditioners with direct expansion coil OHA

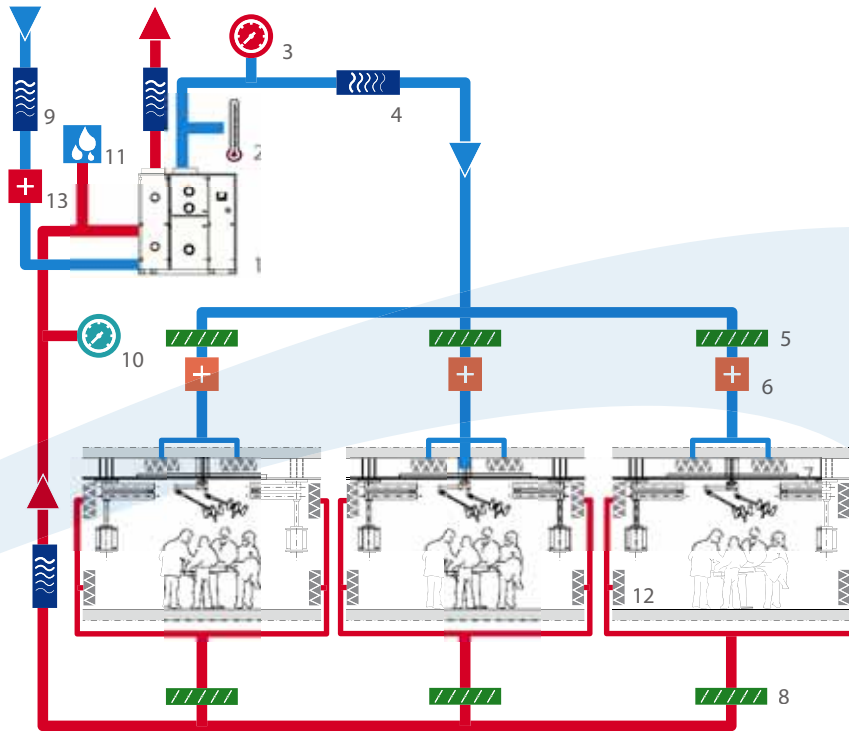
The H Series air conditioners with direct expansion coil are all equipped with one or two independent cooling circuits. They offer high safety as service continuity even in case of circuit fault, and two-step cooling capacity control. The compressors used are high-efficiency scroll-type with low sound levels.

The cooling circuits are equipped with all the necessary control, protections and safety devices, and are installed together with the electric panel and all the controls, in the right technical compartment outside the conditioned airflow.

Ecologic refrigerant R 407C

The cooling circuits use the ecologic refrigerant R 407C, a stratospheric-ozone safe HFC with low ecological impact. The OHA models, to be matched with remote air or water cooled condensers, are supplied with a pressurisation nitrogen charge.

The final charge, together with the eventual oil fill up, must be made by the installer at the jobsite. In case of installation of the built in water cooled condenser, the oil and refrigerant charge is completely made in the factory.



- 1 - Air conditioner for total fresh air or partial recirculation. Air flow 4500 m3/h
- 2 - T.T. : Temperature Transmitter - Temperature sensor
- 3 - P.T. : Pressure Transmitter - Pressure sensor in the supply duct set to 600 Pa
- 4 - Sound damper in the supply duct
- 5 - Constant air flow regulation in the cassette in the supply duct
- 6 - Post heating water or electrical coil controlled by a thermostat installed in the room
- 7 - Absolute filters installed in the room
- 8 - Air flow regulation cassette for controlling the over pressure of the room
- 9 - Sound dampers (on the external air damper, supply towards the room, return air and exhaust)
- 10 - P.T. : Pressure Transmitter - Pressure sensor in the supply duct set to -300 Pa
- 11 - M.T. : Moisture Transmitter - Humidity sensor
- 12 - Return air filter grill
- 13 - Antifreeze coil on the return air



H Series

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Modulating regulation of the cooling capacity (units equipped with cooling circuit)

If the required temperature tolerance is very severe, a special system (optional) made of a special electronically controlled expansion valve and of another electronically-controlled hot gas injection valve, allows obtaining a modulating regulation from 100% to 10% of the cooling capacity of the unit, and therefore a very low tolerance on the room temperature, even with a very high outdoor air flow.

Air conditioners with chilled water coil OHU

The microprocessor-controlled three-way valve provides for perfect modulating control of both cooling and dehumidification.

Humidification system

The humidification system standard installed in H Series air conditioners is an immersed-electrode type. Peculiarity of these humidifiers is a proportional steam production from 10 to 100% of its capacity.

Distributor of net steam

If the Hospital has rising steam available, at the relative pressure of 1 bar, it is possible to ask for the installation of a steam distributor in stainless steel. This system allows a modulation of the steam supply from 0 to 100%.

Temperature and humidity feelers

The unit is controlled based on the information collected by the temperature and humidity feelers. These feelers are installed in the air return and extract section (standard version). However, the temperature feeler can also be installed in the air discharge compartment, and the humidity feeler in the air return compartment (on request).

Alternatively, the feelers can be delivered not mounted, to allow the Customer to install them in the controlled room or in the air return ducts, as required (at customer's charge).

Each solution is suitable for a particular type of system. The instruction manual for unit installation specifies the advantages and disadvantages of every solution.



Ease of installation

The unit is studied and manufactured for the maximum ease of installation. Once positioned in the designated installation area it only requires electrical connections, hydraulic and frigorific connections and eventual ducting and remote accessories.

The specific manual supplies all the procedures necessary for the perfect installation of the unit as well as verification of the HVAC system and tests on the final working unit.

Condensate discharge and siphon

All air conditioners, both in direct expansion or chiller water type, need to be connected to the buildings discharge system for the condensate and humidification discharge.

The siphon, mandatory for the condensate discharge since the drip tray is in a depression point, is supplied loose with the unit and has to be installed during the unit's installation phase.

Control microprocessor

All the operating and safety functions of H Series air conditioners are managed by the standard microprocessor, which allows controlling both temperature and relative humidity either proportional or proportional-integrally.

Also, the microprocessor controls the room overpressure or depression and can be easily connected with the BMSs of all major constructors.

Sterilization cycle

The standard software of the unit foresees a sterilization cycle, activable manually, as long as the optional motorized damper for air re-circulation is present.

For a settable time the unit stops the expulsion fan, closes the relative damper and totally opens the recirculation damper. In this way the sterilizing agent reaches all parts of the aeraulic circuit saturating them.

After this the unit is completely stopped so to allow for the sterilizing agent to act. Finally the unit activates both fans at 100% and closes completely the recirculation damper. In this way it is possible to introduce a great amount of fresh air and expel all the sterilising agent.

Once the sterilization cycle is over the unit goes back to its normal functioning.

Serial communication and supervision / BMS system

With the development of the BMS (Building Management System), not only are the quality and the reliability of the instruments important, but also the external connectivity that they can provide.

Thanks to the technological evolution in the communications sector, Tecnair LV products can now:

- be integrated into systems consisting of instruments made by different manufacturers;
- be managed remotely via modem or Internet using a standard browser;
- inform authorized personnel of any alarm condition by SMS messaging.

Remote interface in the surgical room

The microprocessor is the heart of the control and regulation system and allows, as an accessory, to install in the surgical room a remote interface to control the unit. One version can be a direct clone of the on board microprocessor or a further version, simplify, to be installed in the surgical room itself. This simplified 6 key version only allows for the modification of the temperature and humidity set points.



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Security functioning

The H series air conditioners are studied, both from a mechanical and software point of view, so to guarantee the maximum assurance of good functioning and avoid stopping a surgical operation.

Complete electric board

The electric board is equipped with a door-locking main switch and with all the components necessary for the normal operation of the unit. It is equipped with terminals for remote-connection of a general alarm signal; other terminals are provided for controlling the remote start up/stop of the unit.

Preferential electric feeding (UPS)

In the electric panel two terminals are available to be connected to a clean contact of the continuity group or the generator so that, at the fall of the line's tension, the microprocessor stops the operation of the non essential components, such as compressors, humidifiers and electric batteries, leaving in operation, thanks to the preferential feeding, only the supply fans, the re-suction and expulsion ones and the regulation.

Anti freeze system

This system, activable only with the presence of the relative temperature feeler, is installed downstream the pre-heating coil and upstream the cold coil and the post heating water one, guarantying an active protection from freezing risks.

If the anti freeze feeler, during normal working mode, feels a temperature under the one set, it intervenes in emergency and opens the heating at 100%.

If after set amount of time the temperature still results under the alarm level, the fans are stopped and an alarm appears on the main mask. As soon as the temperature comes back over the set level the fans will start again.



Energy saving

Hydronic heat recovery system

Made up of two identical water coils, the first one in the air return section and the other one in the outdoor air conditioning section. They are connected via a hydraulic circuit equipped with pump and expansion tank.

The microprocessor starts the pump when the temperature favours energy saving. The hydraulic circuit is supplied empty, as the percentage of glycol must be determined as a function of the minimum temperature of the place of installation.

The integration of the heat recovery system involves a change in the unit size and in the directions of the airflow, so a special version has been created.

It is identified with letters "HR" (heat recovery) after the numerical part of the code.

The hydronic heat recovery system, even if its efficiency is lower than a plate exchanger or a rotative one, as it is the solution that prevents "cross contamination" between air expulsion and discharge.

Night unit stand-by

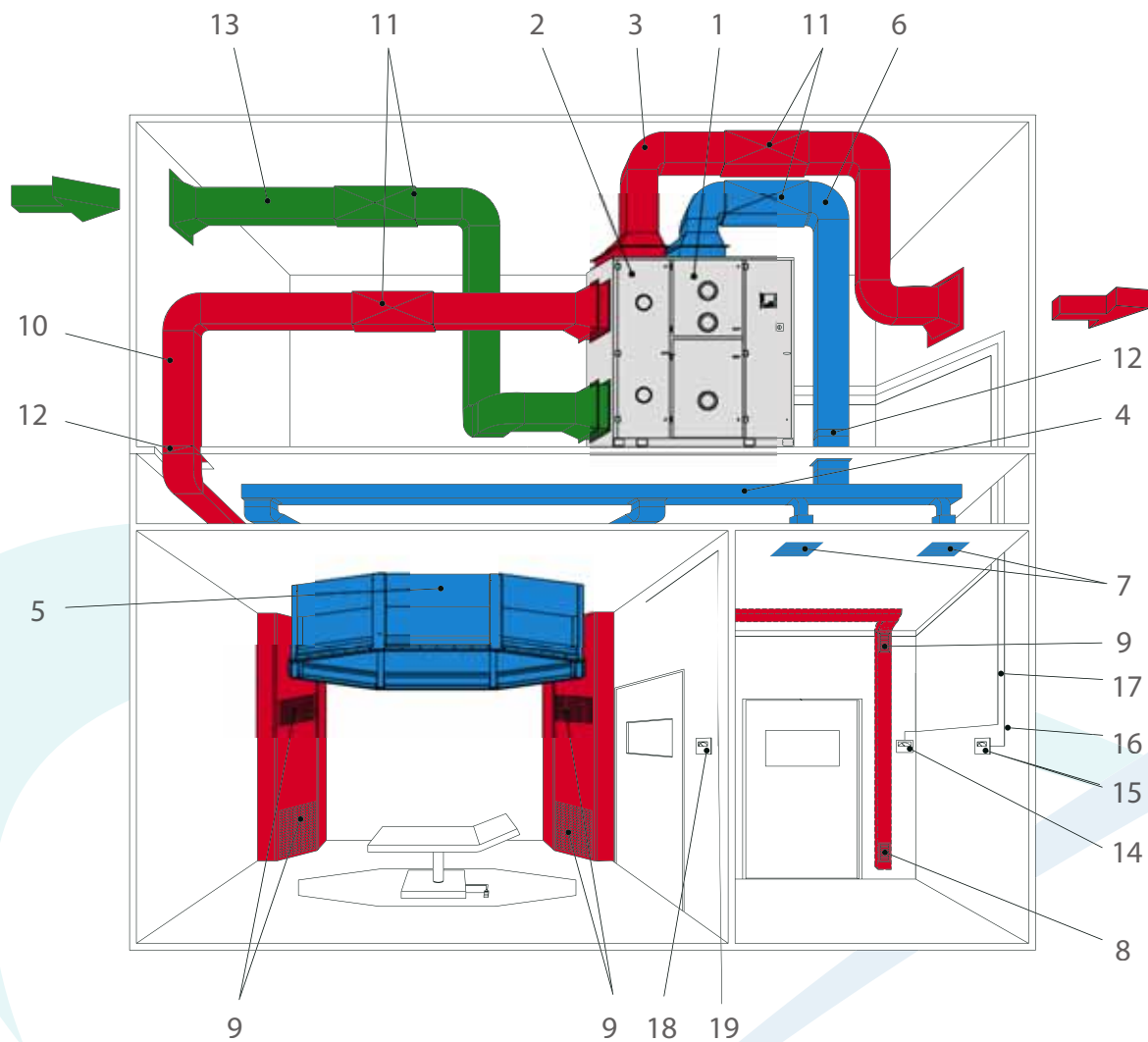
When the room is not operational the external airflow can be reduced to a set limit so to maintain the environment in overpressure and the window of inactivity for temperature and humidity raised so to maintain the room sterile avoiding unnecessary energy consumptions.

This important function, provided for in the standard software and managed by the microprocessor, can be

called up manually, by BMS or time bands. In case of emergency it will be possible to deactivate the stand-by so to bring the unit back to the standard functioning values.



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- | | |
|--|---|
| 1. Supply fan | 13. Fresh air intake duct |
| 2. Exhaust fan | 14. Differential pressostat supplied loose |
| 3. Exhaust duct | 15. Interface for remote control (accessory) |
| 4. Electric or water reheating coil | 16. Telephonic cable for remote interface (6 wires, max 100m) |
| 5. Unidirectional filtering ceiling | 17. Shielded cable for remote presostat (3x0.5 50m. max) |
| 6. Supply air duct (Thermally insulated) | 18. Temperature and humidity feeler (supplied loose) |
| 7. Air diffuser with absolute filter | 19. Connecting cable between the feeler and the unit (6x0.5m max) |
| 8. Lower filtered air intake (G4) | |
| 9. Higher filtered air intake (G4) | |
| 10. Air suction duct | |
| 11. Sound damper (hospital type) | |
| 12. Cut fire damper | |

ZERTIFIKAT

CERTIFICATE

證書

証明書

CERTIFICADO

CERTIFICAT



Wir bestätigen der Firma

TECNAIR LB
I-21040 Uboldo

aufgrund der mit positivem Ergebnis abgeschlossenen
Prüfungen der

Gerätebaureihe OH

dass die Anforderungen gemäß dem Zertifizierungsprogramm
der TÜV Süddeutschland Bau- und Betrieb GmbH erfüllt sind.

Der Hersteller ist berechtigt folgendes Prüfzeichen zu benutzen:



München, 15.10.2001

Kälte- und Klimatechnik

Der Sachverständige

A handwritten signature in blue ink, appearing to read 'Tommy Hill'.

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OHA MODELS - WITH REMOTE CONDENSER

Operating performance									
MODELS	51H	81L	81H	101L	101H	151H	202L	202H	302L
Total cooling capacity, kW	17,3	21,9	25,1	29,0	32,4	47,1	57,5	70,1	83,8
Air flow, m ³ /h	2400	2400	3600	3600	4700	7200	7200	11400	11400
LPS dB(A)*	55	55	57	57	59	62	62	64	64
Features referring to: Outdoor air temp. 32°C, 40% R.H. Static pressure: 800 Pa. *SPL at 2-meter distance, free field with sound damped mouths									

Dimensions and weights									
MODELS	51H	81L	81H	101L	101H	151H	202L	202H	302L
LENGTH	1700	1700	1700	1700	2120	2120	2120	2120	2120
DEPTH	870	870	870	870	1200	1200	1200	1750	1750
HEIGHT	1910	1910	1910	1910	1980	1980	1980	1980	1980
NET WEIGHT, KG	62	620	620	620	1370	1370	1370	2200	2200

OHU MODELS WITH CHILLED WATER COIL

Operating performance				
MODELS	88	118	218	318
Total cooling capacity, kW	23,7	32,3	69,3	108,1
Air flow, m ³ /h	2400	3600	7200	11400
LPS dB(A)*	54	56	59	62
Features referring to: Chilled water temp: 7/12°C; outdoor air temp. 32°C, 40% R.H. Static pressure: 800 Pa. *SPL at 2-meter distance, free field with sound damped mouths				

Dimensions and weights				
MODELS	88	118	218	318
LENGHT	1700	1700	2120	2120
DEPTH	870	870	1200	1750
HEIGHT	1910	1910	1980	1980
NET WEIGHT, KG	600	600	1270	2060

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Accessories

Several fixtures are available to customise the unit according to the requirements of each individual application:

- Additional user interface terminal for unit remote control
- Microprocessor pCO accessories for remote control, such as RS485 serial gate, RS232, TCP/IP
- Modem for GSM
- Hot gas injection electronic cooling capacity control (OHA mod. only), for perfect cooling circuit power modulation, as a function of the outdoor conditions. Indispensable with all fresh air treatment
- Double directly driven air-discharge fan (plug fan) installed in parallel to the standard one for safest functioning
- Double direct-driven fan (plug fan) in the air expulsion section
- Motorised modulating recirculation damper opposed to the fresh air one
- Water cooled plate condenser
- Two way pressostatic valves
- Temperature feeler installed in the supply fan section (regulation at cold point) and humidity one in the suction section
- Temperature and humidity feeler supplied loose rather than installed in the resuction fan section
- Motorised dampers on the air discharge mouths from and to the controlled room
- Direct expansion post cooling coil for heart surgery rooms
- Glycol water post cooling coil
- Modulating mains steam distributor instead of the immersed-electrode type
- Waterproof lighting inside the unit for good-functioning check without stopping and opening the unit
- Water presence alarm

Basic Models

OHA

With direct expansion cooling circuit to be matched with air or water-cooled condenser.

OHU

With chilled water coil to be matched with remote water chiller.

OHA HR

With direct expansion cooling circuit to be matched with air or water-cooled condenser and heat recovery system.

OHU HR

With chilled water coil to be matched with remote water chiller and heat recovery system.

Air Ceiling Unidirectional Filtering Ceiling for surgical rooms





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