

CTAE

AIR HANDLING UNITS



INTRODUCTION

Maximum configuration flexibility, high energy efficiency, easy and quick handling during transport and installation: these are the main characteristics required of a modern air handling unit.

The CTAE series offers all of this, accompanied by an efficient and innovative construction technology that allows it to be included in any building project or production process. The advanced design ensures maximum energy efficiency and reduced operating costs, the available sizes are virtually unlimited as well as the possibilities to combine different

internal components. The flexible design of the CTAE air handling units allows all requirements to be met with a range of airflow rates from 500 m³/h up to 190.000 m³/h.

The CTAE series air handling units represent the tailor-made solution for every commercial and industrial application: meeting rooms, cinemas, hotels, restaurants, offices, pharmaceutical industry, chemical and mechanical industry, the quality of construction and components used are a guarantee of reliability and functionality.

EUROVENT CERTIFICATION

VORTICE INDUSTRIAL S.r.l. participates in the *Eurovent Certified Performance* programme for Air Handling Units.

Check ongoing validity of certificate:
www.eurovent-certification.com

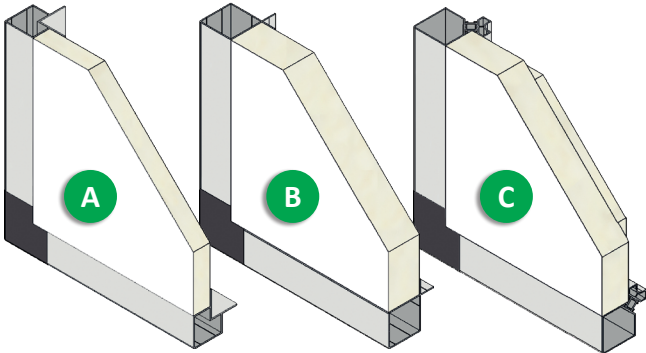


Result SP63 TB PU	Eurovent Classification according to EN1886					
D1	Casing strength class	D1	D2	D3		
	Max. relative deflection mm x m-1	4.00	10.00	EXCEEDING10		
L1	Casing air leakage class at -400 Pa	L1	L2	L3		
	Max. leakage rate (f400) l x s-1 x m-2	0.15	0.44	1.32		
L1	Casing air leakage class at +700 Pa	L1	L2	L3		
	Max. leakage rate (f700) l x s-1 x m-2	0.22	0.63	1.90		
ePM₁ 80% (F9)	Filter bypass leakage class	ePM ₁ 80% (F9)	EPM ₁ 70% (F8)	ePM ₁ 55% (F7)	ePM ₁₀ 70% (F6)	ISO Coarse
	Max. filter bypass leakage rate k in % of the volume flow rate	0.50	1	2	4	6
T2	Thermal transmittance	T1	T2	T3	T4	T5
	(U) W/m ² x K	U <= 0.5	0.5 < U <= 1	1 < U <= 1.4	1.4 < U <= 2	No requirements
TB2	Thermal bridging factor	TB1	TB2	TB3	TB4	TB5
	(kb) W x m-2 x K-1	0.75 < Kb <= 1	0.6 < Kb <= 0.75	0.45 < Kb <= 0.6	0.3 < Kb <= 0.45	No requirements

MAIN CHARACTERISTICS

STRUCTURE

The structure of our air handling units is made up of anodised aluminium profiles joined by means of aluminium corner joints and double-shell sheet metal panels with thermal-acoustic insulation in between.



PROFILES AND PANELS

The frame is made up of a modular system with extruded profiles in UNI 9006/1 anodized aluminium alloy, coupled with angles in die-cast aluminium or, in the case of the thermal break profile, corners in nylon reinforced with fiberglass. There are 3 types of profiles available:

A: 40 mm aluminium profile with 23 mm thick panels.

Available panel materials thick: mm 6/10.

B: 50 mm aluminium profile with 48 mm thick panels.

Available panel materials thick: mm 6/10 and 10/10.

C: 60 mm aluminium thermal break profile with 63 mm thick panels. Available panel materials thick: mm 6/10 and 10/10.

INTERNAL INSULATION

The applicable thermal and acoustic insulation is:

- Injected polyurethane, 40+/-5 kg/m³ density, thermal conductivity 0.02 (W/mk). Fire reaction according to ISO 3582 DIN 4102:B3.

- Mineral wool, 90/100 kg/m³ density, thermal conductivity 0,04 (W/mk). Fire reaction according to ISO 3582 and DIN 4102: B0.

MATERIALS

The sandwich panels can be made in different types with thicknesses of 23/48/63 mm.

The materials used for the realization of the panels are:

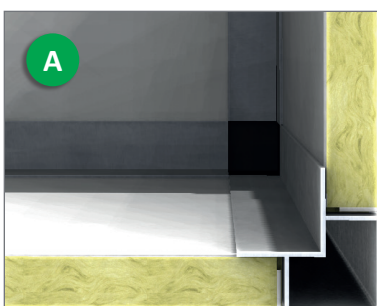
- Galvanized steel sheet, type DXD51-Z200 (EN 10142).
- Prepainted hot-dip galvanized steel sheet, UNI EN 10169, EN 10327, Z100 coating. The protective system is made according to standard 13523.
- Aluminium sheet 5754 H 111 with magnesium
- Austenitic stainless steel sheet AISI 304 (EN10088/97), cold rolled, with 2B brilliant surface finish.

BASE FRAME

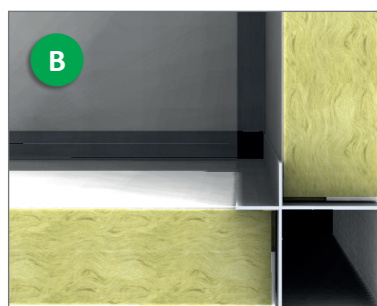
The base frame is made with high thickness bended beams in galvanised sheet metal or AISI 304 stainless steel. The base frames are fixed on the 4 sides of each section and the support to the ground is guaranteed in the transversal direction of the unit.



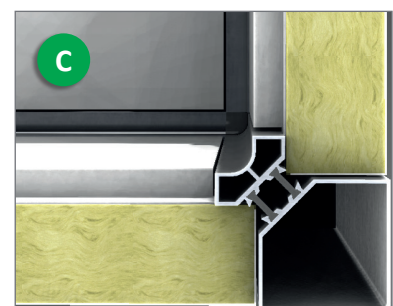
For small/medium-sized sections, if required, additional base beams are supplied, or threaded adjustable feet, suitable to level the unit in case of uneven support base.



40 mm profile
23 mm thickness profile



50 mm profile
48 mm thickness profile



60 mm thermal break profile
63 mm thickness profile

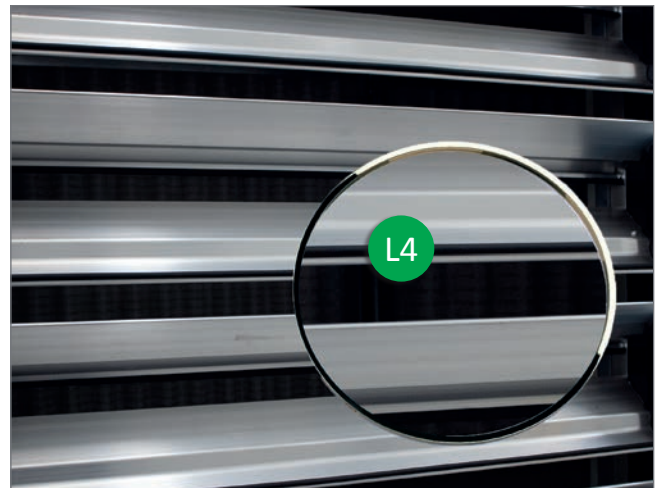
AIR DAMPERS

In the standard version they are made with frame and aerofoil fins in aluminium, spacing 100 mm.

On request, they can be made of AISI 304 stainless steel for hygienic applications according to VDI6022.

The special shape of the fin allows the seal according to DIN1946-EN1751. The dampers can also be equipped with specific gaskets that allow sealing classes **L2** and **L4**.

All dampers are equipped with a motorised pin for the application of manual or electric actuator. They can be installed both inside and outside the unit.



SEALING GASKET



ALUMINIUM DAMPERS



ELECTRIC ACTUATOR

FILTERS

Air filtration is to be considered a fundamental part of the composition of the air handling unit, as it performs an action of removal of contaminants present in the aeraulic flow.

MEDIUM EFFICIENCY FILTERS

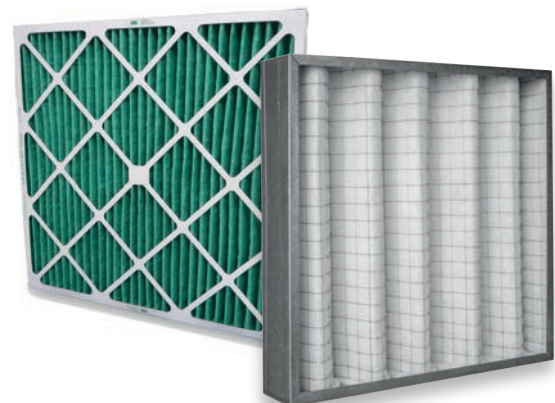
Medium efficiency or coarse filters are used as first or second stage filters.

Filtration class according to EN 779-2002:

ISO Coarse 40% (G2): Average weight efficiency $\geq 65\%$, filter cells with corrugated metal mesh (stainless steel galvanized).

ISO Coarse 45% (G3): Average weight efficiency $\geq 80\%$, roller mattress filter synthetic septum with progressive density.

ePM₁₀ 50% (G4): Average weight efficiency $\geq 90\%$, corrugated filter cells with synthetic mat, galvanised steel frame, electrowelded galvanised steel wire protection mesh.



FILTERS

HIGH EFFICIENCY FILTERS

High efficiency filters or fine filters are used as a second stage or as a pre-filtration stage for HEPA /ULPA. Filtration class according to EN 779-2002:

F5

Average colorimetric efficiency $\geq 40\%$, corrugated filter cells with synthetic mat, galvanized steel frame, electrowelded galvanized steel wire protection mesh. Soft bag filters with large filtering surface in fibreglass. Galvanized steel frame.



F6 / ePM₁ 55% (F7) / ePM₁ 80% (F9)

Average colorimetric efficiency $\geq 60\%/80\%/90\%$, soft bag filters with large filtering surface in fibreglass. Galvanized steel frame Length mm 380. On request, the filtering surface can be increased by increasing the length of the filter to 535 or 635 mm. Filter with rigid bags in fibreglass, frame in ABS polypropylene.

VERY HIGH EFFICIENCY FILTERS

Very high efficiency filters are used as final stages to ensure high air purity. They are mainly installed in those environments where maximum asepticity is required, such as clean rooms, hospitals, pharmaceutical or electronic sectors. The type of installation of these filters is basic and they are housed in special galvanized or stainless steel counterframes, fitted with suitable gaskets that make the assembly free of by-passes.

Filtration class according to EN 1822:

H11 Efficiency $\geq 95\%$

H13 Efficiency $\geq 99.95\%$

H14 Efficiency $\geq 99.995\%$

Absolute filtration of polyhedron HEPA, frame made of galvanized steel, filter medium made of glass microfiber paper.



MOLECULAR FILTRATION

These filters are designed to eliminate pollution caused by gases (molecules) such as exhaust gases from cars, industrial emissions released by combustion processes or simply cigarette smoke.

They have variable retention capacity depending on the type of molecule treated. They can be combined with dust filtration. Types:

- Soft bag filter with coal performs a double action: filtration of dust with filtration efficiency ePM₁ 55% (F7) and gaseous contaminants. It is installed in place of the existing bag filter and no additional filtration is required. It consists of fibreglass media + active carbon.
- Rigid bag filter with charcoal performs a double action: filtration of dust with filtration efficiency ePM₁ 55% (F7) and gaseous contaminants. It is installed in place of the existing bag filter and no additional filtration is required. It consists of fibreglass media + active carbon.
- Cartridge filters with active carbon, ideal for applications in the service and industrial sectors where deodorization is required. They are applied on galvanized sheet metal plates with bayonet interlocking device.

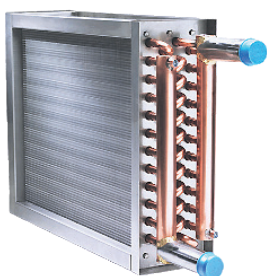


HEAT EXCHANGERS

The heat exchange coils are the main elements that guarantee the thermo-hygrometric transformations of the air. The heat exchange is indirect; there is a primary fluid such as hot or cold water, hot or cold gas which, when suitably conveyed into the coils, interacts with the secondary fluid, which in this case is the air. They are made up of a finned pack consisting of tubes made of different materials and continuous fins, equipped with a collar that

increase the contact surface and makes the spacing of the same constant. The tubes are mechanically expanded, this operation allows the perfect contact between tube and fin and therefore a perfect heat exchange. The fins have a corrugated surface that makes it rigid and allows to create a turbulence of the air increasing the heat exchange coefficient. All the coils can be removed both on the connection side and the opposite side.

HEATING, COOLING, OVERHEATING WATER COILS



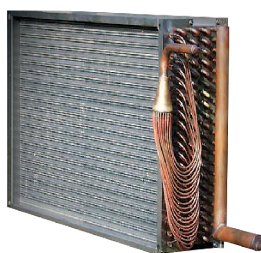
Frame made of galvanised steel, stainless steel AISI 304 / 316, Aluminium
Pipe made of copper, iron, stainless steel AISI 304 / 316
Fins made of aluminium, prepainted aluminium, copper
Fin spacing according to performance requirements (2.0 10 mm)
Headers and manifolds made of copper, galvanised iron, stainless steel AISI 304 / 316
Special coating for greater corrosion protection
SPECIAL VERSIONS AVAILABLE ON REQUEST

STEAM COILS



Frame made of galvanised steel, stainless steel AISI 304 / 316, Aluminium
Pipe made of copper, iron, stainless steel AISI 304 / 316
Fins made of aluminium
Fin spacing according to performance requirements (2.0 10 mm)
Coils complete with threaded or welded flanges
Accessories such as flanges, gaskets, etc. available on request
SPECIAL VERSIONS AVAILABLE ON REQUEST

DIRECT EXPANSION COILS



Frame made of galvanised steel, stainless steel AISI 304 / 316, Aluminium
Pipe made of copper, tinned copper
Fins made of aluminium, prepainted aluminium, copper
Fin spacing according to performance requirements (2.0 6.0 mm)
Cooling or heat pump operation
Several types of refrigerant gases available
SPECIAL VERSIONS AVAILABLE ON REQUEST

ELECTRIC COILS



Frame made of galvanised steel or stainless steel AISI 304
Pipe made of iron and finning made of galvanised iron
Single or multistage armoured electric heaters
Complete with mechanical thermoregulator
Power supply 400V 3ph 50Hz
Automatic reset thermostat
Terminal block protection IP55

HUMIDIFICATION SECTIONS

Air humidification is crucial in normal air conditioning processes, as the hygrometric content of the air has often to be kept at a constant level to ensure the well-being of users and the management of production processes. The most used systems are:

HONEYCOMB HUMIDIFICATION

The adiabatic humidification consists of a suitably shaped honeycomb pack made of sheets of absorbent paper impregnated with resins that, in addition to giving the right consistency and self-support, protect it from decomposition processes and inhibit the formation of mold.



HONEYCOMB HUMIDIFICATION

HUMIDIFICATION WITH PRESSURIZED WATER

This type of humidification represents a new generation of humidifiers, with only 4 watts of electricity consumption per l/h of water.

It uses a special high pressure pump to pressurize the water which is then atomised through stainless steel nozzles producing a very fine and uniform mist.

In compliance with the main international guidelines and standards (ASHRAE 12-2000, VDI6022, VDI3803, L8).



HUMIDIFICATION WITH PRESSURIZED WATER

SPRAYED WATER HUMIDIFICATION WITH SINGLE OR DOUBLE NOZZLE RAMPS

Adiabatic humidification consisting of a series of low pressure spray nozzles fed by a header connected to the normal water supply or to various pumping systems.

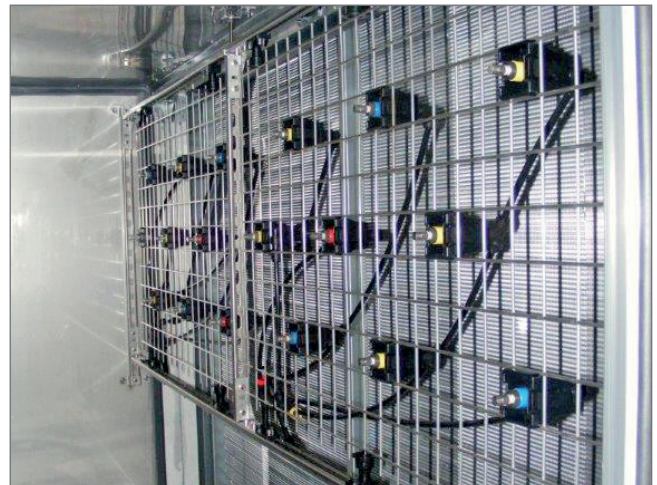
This type of humidification can also be used as adiabatic cooling or as a washer.



NOZZLES HUMIDIFICATION

STEAM HUMIDIFICATION

Isothermal humidification consisting of one or more manifolds made of perforated stainless steel pipe, complete with additional concentric pipe for discharge of condensation.



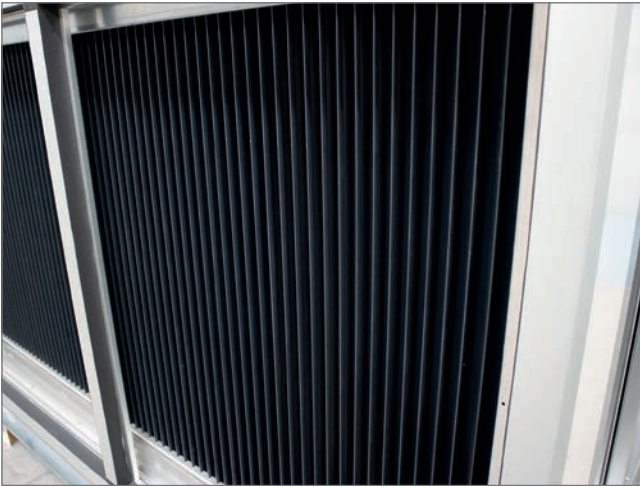
STEAM HUMIDIFICATION

DROPLET ELIMINATORS

They are designed to ensure maximum retention of water drops that are created inside the unit, due to cooling treatments and humidification of the air.

The materials and types that can be selected are:

- extruded polypropylene;
- extruded aluminium;
- stainless steel press-formed sheet metal.

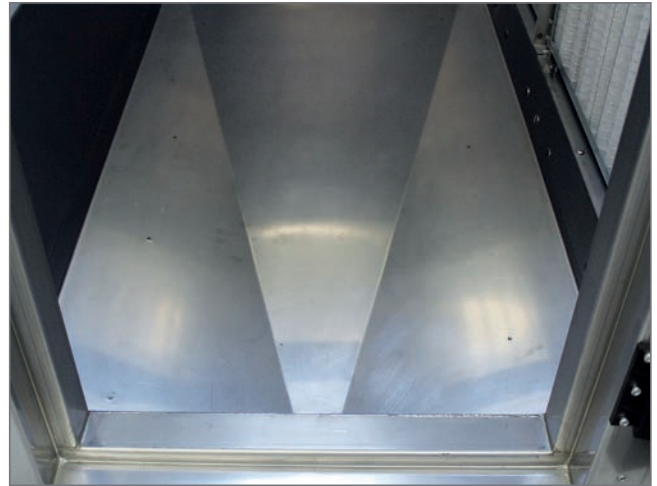


DROPLET ELIMINATOR

DRAIN PANS

The drain pans are made of press-formed and welded sheet metal with a high thickness of AISI 304/316 stainless steel or galvanized iron.

They can be "flat" type (without inclination) or "draining" type single sloped and rounded edges. They are equipped with a discharge hole on the front or on the bottom, with a sleeve to facilitate the hydraulic connection on site.



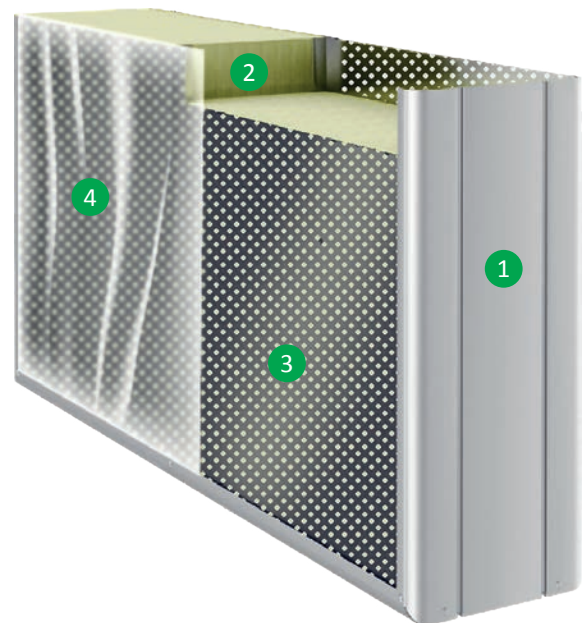
SLOPED DRAIN PAN

SOUND ATTENUATORS

They are made of mineral wool, thickness 100/200 mm, density 90 kg/m³ and are protected by a fabric veil or, on request, by a plastic film that makes the unit airtight. The mineral wool is contained in a galvanised frame, equipped with a micro-expanded mesh containing galvanised steel.



SOUND ATTENUATORS



①	Steel frame / structure
②	Mineral wool
③	Steel mesh
④	Plastic film (on request)

HEAT RECOVERY UNITS

The heat recovery units are widely used for the partial recovery of the exhausted energy, favouring a considerable saving in the operating costs of the plant.

PLATE HEAT RECOVERY UNITS

Plate heat recovery units are heat exchangers that allow the transfer of heat between two airflows under the action of a temperature difference.

The use of these devices allows significant savings on operating costs in air conditioning systems, thus allowing the recovery of energy that otherwise would be lost in the form of heat.

They can be made of aluminium, aluminium with non-toxic coating based on corrosion-resistant polyurethane or stainless steel AISI 316L.



PLATE HEAT EXCHANGER

ROTARY HEAT WHEEL RECOVERY UNITS

The rotary heat recovery units consist of a cylindrical rotor containing thousands of channels and characterized by a very high surface development, a containment frame (complete with brush seals to minimize the leakage between the intake and exhaust airflows), and a drive system consisting of an electric motor equipped, as required, with a speed regulator.

They can be made of aluminum, aluminum with non-toxic paint coating.

Wheels can be supplied with hygroscopic surface treatment that allows the recovery of latent load.

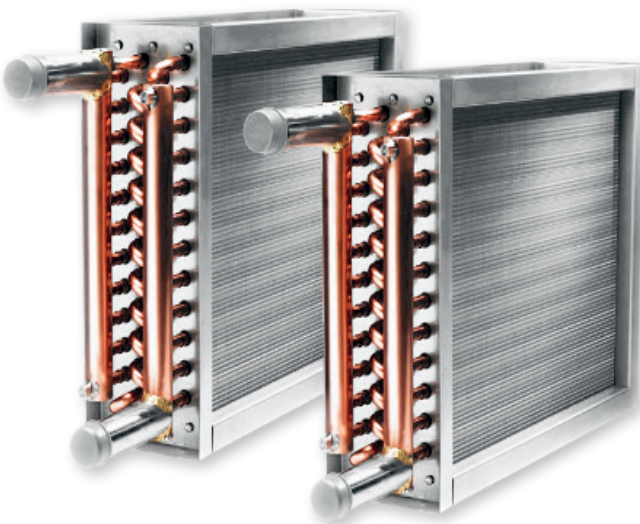


ROTARY HEAT WHEEL EXCHANGER

RECOVERY COILS

They are manufactured as standard heat exchange coils, they are installed on the exhaust section and on the external air section, connected by a glycol water circulator, they create a heat exchange between the two flows.

They are mainly used in environments where airflows must not be contaminated in any way.



RECOVERY COILS

HEAT PIPE RECOVERY UNITS

The heat pipe recovery units consist of a heat exchanger, remarkably similar to a coil finned pack, generally with copper pipes and aluminium fins, divided into two adjacent sections. The pipes are loaded with a two-phase fluid (normally R134a), which changes state from liquid to steam and vice versa, allowing energy recovery with low pressure drops.

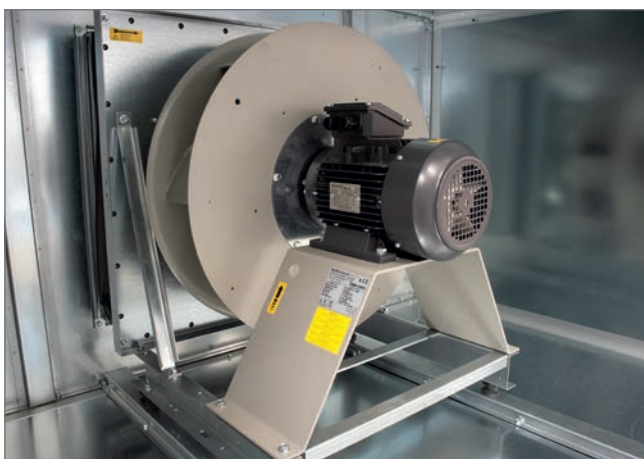
The divider, generally located in the centre of the exchanger, separates the flow of fresh air from the flow of exhaust air.

FAN SECTIONS

TYPE OF FANS

There are 2 types of fans that can be installed:

- Centrifugal fans (with forward or backward blades); of double inlet type, with forward or backward blades, depending on the required performance, statically and dynamically balanced according to ISO 1940 grade 6.3 standards. The fans are coupled by means of belts and pulleys to electric motors, fixed on special belt tensioning slides, three-phase asynchronous type with cage rotor, closed construction, external ventilation, IP55 protection degree, insulation class F, in compliance with IEC 60072-1 IEC 60034 standards and suitable for continuous duty (S1).



PLUG FAN WITH BASE FRAME

- Plug-fan fans with directly coupled motor, centrifugal impeller with backward blades in sheet steel, welded and painted, linked to the electric motor shaft, statically and dynamically balanced according to DIN ISO 1940. Performances in accuracy class 1 according to DIN 24166.

These fans can be coupled to EC brushless electric motors to ensure accurate air flow regulation, ensuring that all regulatory requirements (such as SFP) are met. The fan airflow can be kept at constant value or at constant pressure.



WALL PLUG FAN

FREQUENCY CONVERTERS

In air handling units, frequency converters are often used to control the speed of motors to improve energy savings. In particular, they are used to control airflow or differential pressure. Simple commissioning is facilitated by the selectable operating modes included in the unit. Frequency converters can be used flexibly. Versions with integrated mains switch or flat versions for special installations are available.



FREQUENCY CONVERTERS

ACCESSORIES

In each fan section are installed, as standard, the safety microswitches, safety net, grounding cable, flexible coupling. On request it is possible to have the fan sections with inspection porthole, low consumption lighting sources, rubber or metal vibration damping spring supports.

Other accessories available are RAL painting on request and ATEX explosion-proof versions.



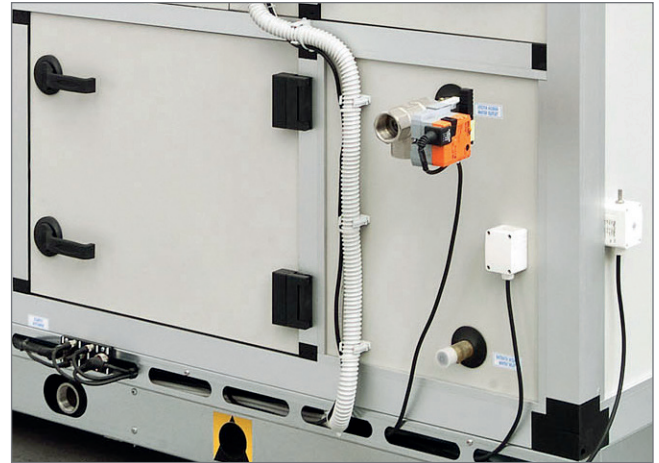
ACCESSORIES

CONTROLS

The CTAE air-handling unit control has been designed to meet a wide variety of control requirements for air conditioning and air quality with the aim of providing a complete solution to the end user.

The control is supplied mounted on the unit and complete with internal wiring, ready for interfacing with the main models of transducers and actuators available on the market.

The LCD display housed on board the machine, or the remote one, allows the complete configuration of the parameters and the monitoring of the operating status of the plant. All the components are located in an internal technical compartment or on a metal frame installed on the machine.



CONTROL WIRING



ELECTRIC BOX WITH DISPLAY

The main control functions provided are as follows:

- temperature control;
- humidity control;
- periodic or continuous control of the external air;
- control of external air dampers;
- control of heat recoveries device;
- fan airflow control as a function of differential pressure;
- control of enthalpy free-cooling;
- control of start up and transitional periods;
- antifreeze management;
- alarm management;
- control of periodic maintenance of the fans;
- alarm history record;
- alarm history recording on USB device;
- control of supervision system.

The solutions adopted always favour easy access to the panel and to the electrical components in order to facilitate the electrical power connections of the unit.



ACCESSORIES

On request, a wide range of practical and functional accessories can be installed on all the control units, allowing you to customize the unit according to your needs:

- Wired IP65 LED light
- Porthole on inspection doors
- Handles of different types with or without key lock
- Fixed or adjustable hinges
- Safety net on inspection doors of the fan sections
- Wired main-switches
- Different cable glands
- Indoor/outdoor frequency converters supplied fitted and wired
- Safety micro-switches or emergency button
- Manual controls on dampers
- Actuators on dampers
- Differential pressure switches or manometers for filters, complete with pressure connections



INSPECTION PORTHOLE



ADJUSTABLE OR FIXED HINGE



MAIN SWITCH



LED LIGHT WIRED



HANDLE WITH KEY

- Sensor control module for differential volume / pressure complete with pressure connections
- Differential pressure transducers for fans
- Antifreeze probes for coils
- Additional soundproofing of fan sections with sound-absorbing material
- Lifting legs
- Adjustable or fixed threaded feet
- Anti-vibrating flexible connections for ducts in canvas
- Drains with siphons
- Spare filters
- Circular flanges and counterflanges for steam coils
- Aluminium louvres with fixed fins and net
- Flat or sloped protruding roof of any sheet metal
- Rain hoods with bird screen
- Technical compartments for coils valves or electrical panels housing and more.



SENSOR CONTROL MODULE



DIFFERENTIAL PRESSURE SWITCH