

AIR HANDLING UNITS SPECIALLY DESIGNED
FOR MARINE INSTALLATIONS

HORIZONTAL AIR HANDLING UNITS



CONSTRUCTION

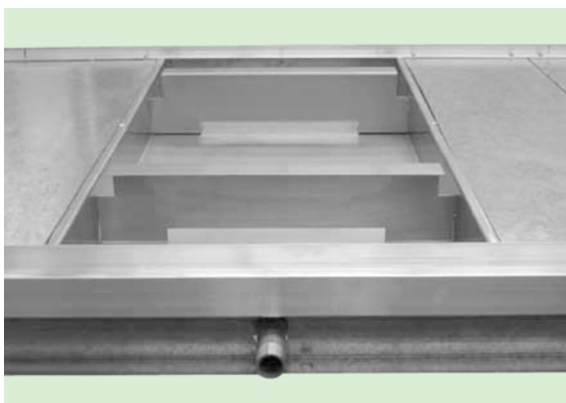
The casing for the Air Handling units is made up of three basic elements: Support base, structure frame and sealing panels.

SUPPORT BASE

It is formed by a series of perimetral "U" profiles of great rigidity and longitudinal and/or transversal reinforcements, whenever this is required due to the size of the unit or the components. If required, cold laminated, galvanised or painted profile or painted hot laminated profiles will be used.

All this structure will be used as support to construct the floor of the unit, based on sandwich-style panels with an exterior plate of 0.5 mm and 1.5 mm in the interior, with mineral wool insulation. When a drain tray is used, this will be manufactured from AISI 304 stainless steel, with condensation-proof insulation and a drainage channel to take out the condensation.

This base will include a coupling system for loading and downloading operations, along with boreholes of diameter 14 in the support wing.



BASE WITH DRAIN TRAY



"U" PROFILE WITH COUPLING SYSTEM



BRACKET

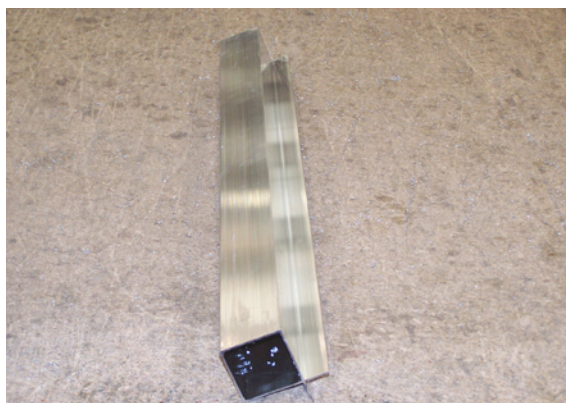


BASE

HORIZONTAL AIR HANDLING UNITS

STRUCTURE FRAME

These are polyedric modules formed by a series of profiles finished in 2 mm thick anodised aluminium, interconnected by way of aluminium brackets and secured with rivets or cadmium-plated screws.



FRAME

SEALING PANELS

The sealing panels are sandwich-style, comprising, on the outfacing side, laminated 1 mm thick plate, 50 mm of insulation with mineral wool of 40 kg/m³ density and with M0 fire reaction classification, and, on the inside, smooth galvanised plate of 0.5mm or perforated galvanised plate of 0.8mm.

Thermal transmission coefficient
 $K = 0.56 \text{ Kcal/h m}^2 \text{ }^{\circ}\text{C}.$

Acoustic attenuation 28 dB (A).

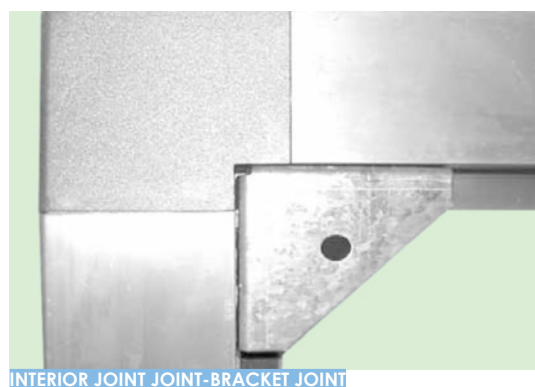
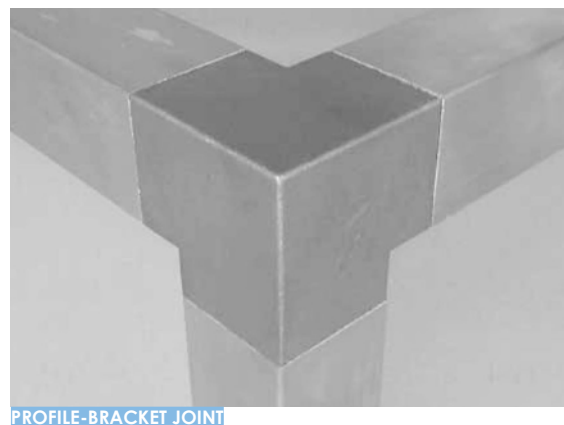
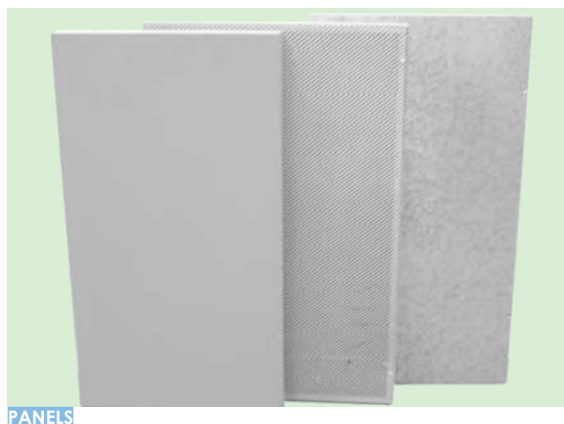
The panels are interconnected and also connected to the support structure with cadmium-plated screws on the outside, and strips between the joints on the interior, in order to ensure seal tightness.

MODULES JOINT

When the unit is supplied in modules, these shall be connected using the screws and seals included with the equipment.

Firstly hydraulic jacks or any other means will be used, with the corresponding sections facing each other, and with strip being placed around the perimeter on the frame.

Following this, the base supports are screwed to the lower section, and the brackets are secured to the frame on the internal part.



ACCESS DOORS

The standard doors are of smooth sandwich-style, manufactured with the same materials as the panels.

The doors are hinged and have exterior handles with progressive close on the inside.

The doors under overpressure have a safety device to prevent the opening bang, as required for EC MARKING.

The hinges, handles and locks are made of PVC, with a number in proportion to the size of the door. A tight seal, made from ageing-resistant rubber, will be mounted around the perimeter between the frame and the door.



ACCESS DOOR

UNITS FOR WEATHER EXPOSED LOCATIONS

It will be supplied with a laminated plate roof, of grey colour, 1 mm thick, and with a protective cover on the upper part of the access door.



ROOF

DECLARATION OF EC MARKING

All the units will be assembled with:

- Belt Cover.
- Earth connections.
- Signs indicating the interior hazard.
- Safety devices in doors in excess pressure areas.

For units with an inside height of over 1 600 mm:

- Manufactured bearing in mind that indicated above.
- Protection grille in the aspiration inlets of the fans.
- Lighting points cabled to external switch in the ventilation sections.
- Protection grille in the discharge mouth of return fans, whenever there is access.

AIR INLET SECTION

These can be supplied with regulation dampers or with openings for duct connection.

The regulation dampers are made of anodised aluminium, with aerodynamic blades, mounted on nylon pads and connected by way of low friction toothed wheels. As the blades are aerodynamic, the noise and loss of load is reduced as far as possible.

The dampers can be operated manually or with extended axle, specially prepared for motorisation.

In outdoor units, the inlet air damper can include a rainproof grille with a bird-proof mesh.

We recommend selecting the gates at a speed of between 5 and 6 m/sec.

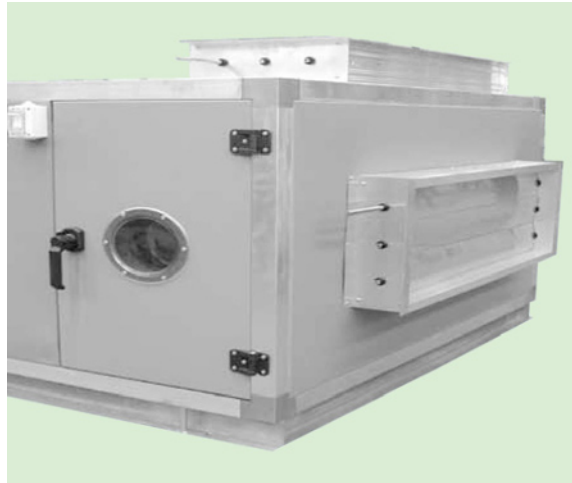
TYPES OF SECTIONS

With one damper, for outside or recirculated air, regulating the flow, as anti-freeze function or for closing in the event of fire.

With two dampers, allowing the mixing of the recirculated air and outside air.

With three dampers, formed by two chambers, one for the exhaust of the air of the return fan, and the other as the mixing section of the return air and the outside air.

This package forms a free energy recovery section, known commonly as free cooling.



MIX



DAMPERS



FREE-COOLING

FILTER SECTION

The size of the particle is the most important factor for the selection of the filter, for which reason the correct choice is decisive in order to obtain good air quality.

In order to achieve correct maintenance, FRIZONIA recommends installing a differential hand gauge in each filters section in order to detect the state of the filter and proceed with its cleaning or replacement, as necessary.

The main characteristics of the filters are:

- Efficiency, which must always be related to the test method used.
- The pressure loss of filter depends on the speed of air and on the level of saturation. As pressure loss of filter, we shall consider the mathematical mean between the starting and end values recommended by the manufacturer.

FILTER CLASSIFICATION TABLE							
GRAVIMETRIC							
MEDIUM EFFICIENCY	THICK FILTERS	EU2			EN 779	G2	≥ 65%
		EU3				G3	≥ 80%
		EU4				G4	≥ 90%
OPACIMETRIC							
HIGH EFFICIENCY	FINE FILTERS	EU5			EN 779	F5	≥ 40%
		EU6				F6	≥ 60%
		EU7				F7	≥ 80%
		EU8				F8	≥ 90%
		EU9				F9	≥ 95%
DOP 0,3 µm MPPS							
VERY HIGH EFFICIENCY	HEPA	EU10	Mil STD 282	≥ 95%	EN 1822	H10	≥ 85%
		EU11		≥ 99,9%		H11	≥ 95%
		EU12		≥ 99,97%		H12	≥ 99,5%
		EU13		≥ 99,99%		H13	≥ 99,95%
		EU14		≥ 99,999%		H14	≥ 99,995%
	ULPA					U15	≥ 99,9995%
						U16	≥ 99,99995%
						U17	≥ 99,999995%

Medium efficiency filter. (G-4) (Thick filters)

Comprising a galvanised steel frame, with particle filter on the grille.

50 mm thick and blanket folded in "v-shape", comprising a metallic framework which can be dismounted to change the blanket or to wash it. The blanket is supported by way of a support clip and mesh, or mesh on both sides.

Mounted on guides, allowing side access from the outside and/or front.

High efficiency filter. (F-5, F-7, F-8, F-9) (Fine filters)

These can be accessed frontally and are mounted on metal frames, with four pressure clips and a neoprene seal, requiring a front plenum for access.

When this type of filter is installed, we recommend mounting a G-4 type pre-filter in front, on the frame, in order to retain the thickest particles.

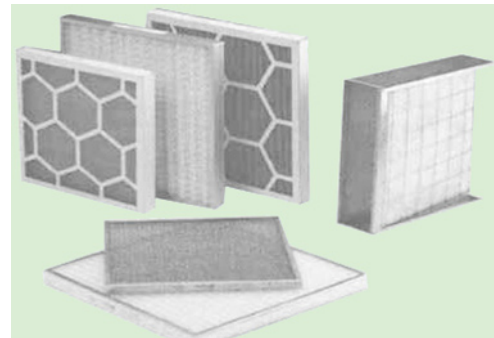
In line with requirements, one of these two types will be installed: Bags or rigid bags.

Absolute filters. (H-13, H-14)

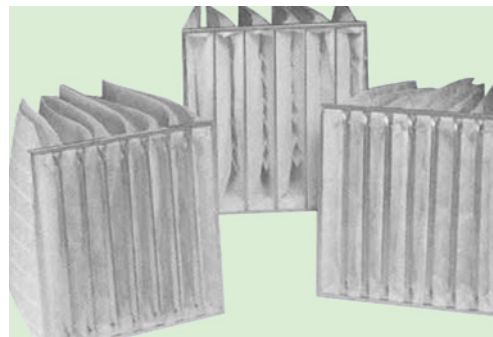
They are installed in impulsion in order to prevent outside air coming in once the air of the air handling unit has been filtered.

These are accessed frontally, with special frames which ensure the seal between the filters and the walls of the air handling unit.

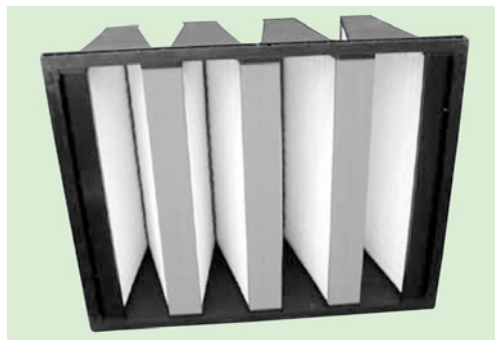
When this type of filter is installed, a G-4 and an F-7 pre-filter should be installed; we also recommend installing a frequency drive in order to regulate the airflow.



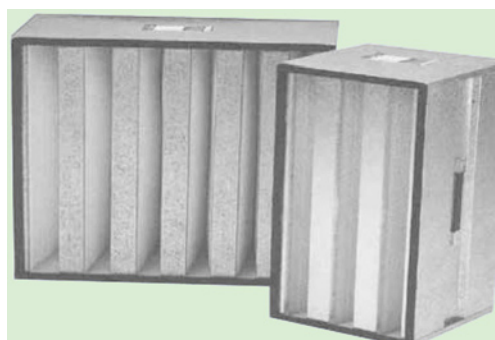
PREFILTERS



BAGS



RIGID BAGS



ABSOLUTE

COIL SECTION

This is one of the most important sections in the air handling unit, since it is where the thermal exchange, both hot and cold, takes place between the primary and secondary fluids.

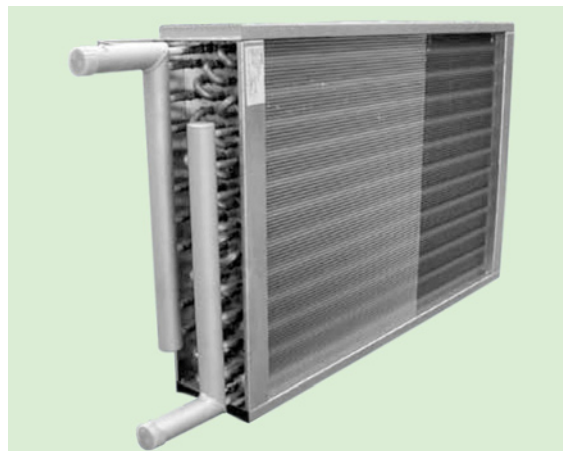
Coils can be installed for different types of fluid: chill water, hot water, Glycol water, steam, and different types of refrigerants, ammonia, R-410A, R-407C...

In air handling units with cooling coil, the section has a stainless steel condensation collection tray, with anti-condensation insulation and a pipe to take the waste water outside. The installer should supply and assemble a siphon on site, twice the height of the static depression of the fan.

The sizing is based on the conditions required in each project, with an air passage speed which prevents problems of drops being carried along in cold coils (this problem does not exist for heat coils). The selection speeds are around 2.6 m/s for cold and 3.5 m/s for heat only. In speeds which may cause dripping, a drip separator will be installed in the same section.

The choice of the water circuits is made so as to reach maximum performance in the exchange of temperatures, controlling the loss of load in the water.

The commonly used coils, hot or chill water, are manufactured with high rigidity galvanised steel frames; copper tube of 5/8" mounted in quincunx; turbulenced blades; aluminium curtains with collars, geometry 60x30, with different separations (2.1 - 2.5 - 3.2... mm) in line with requirements; achieving perfect adherence between the tube and the blade, through tube expansion.



THERMAL EXCHANGER



MOUNTED COIL



DISCHARGER DETAIL

Welding-free steel sleeves and collectors, as Standard DIN 2440, sleeves with air forges and wastewater run-off, threaded at the ends with gas thread drainage up to 2 1/2", and for welding in larger sizes.

The coils are tested by the manufacturer at a pressure of 7 Kg/cm².

For maintenance tasks, the coils can be easily accessed on both sides, by way of the removable panels attached on the outside.

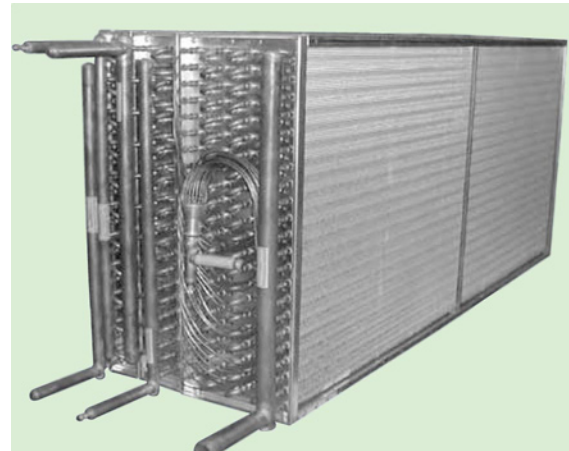
ELECTRICAL COIL SECTION

The electrical coils are formed by a series of forks or heating elements, comprising a stainless steel tube and galvanised metal blades which favour radiation, mounted on a galvanised metal frame and pre-connected in stages, in a delta or star (230/400 V). The coil has an automatic reset temperature switch for safety (70°C), a protection grille and terminal covers.

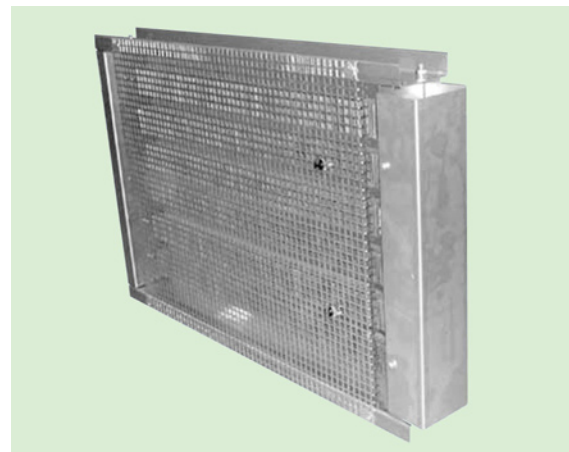
Manufactured for an air speed not less than 2 m/sec, as this would reduce the capacity of the air to dissipate the energy.

The coils are studied for each case in particular, and adapted to the measurements of the air handling unit.

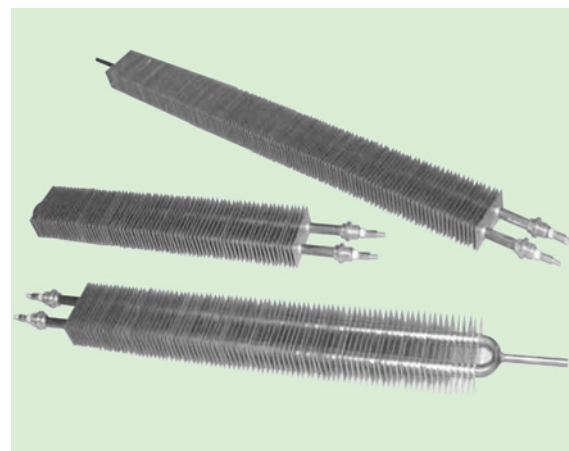
There is a side panel in the connections side, allowing access to the connectors of the coil, in order to make the electrical connection.



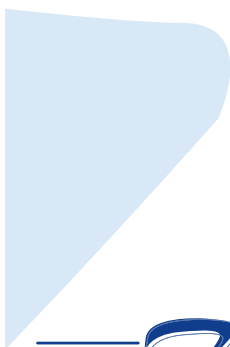
DIRECT EXPANSION COIL



ELECTRICAL COIL



ELECTRICAL RESISTANCE



HUMIDIFICATION SECTION

SELF-CONTAINED STEAM HUMIDIFIERS

This comprises a steam production unit installed outside of the treatment unit, and one or several expellers for the distribution of the steam in the interior of the Air Handling Unit, in line with the required capacity.

Please, see "Self-Contained Steam Humidifiers" brochure.

HUMIDIFICATION CENTRAL SYSTEM

The section includes an interior drain tray to collect any possible condensation, with run-off to the outside.

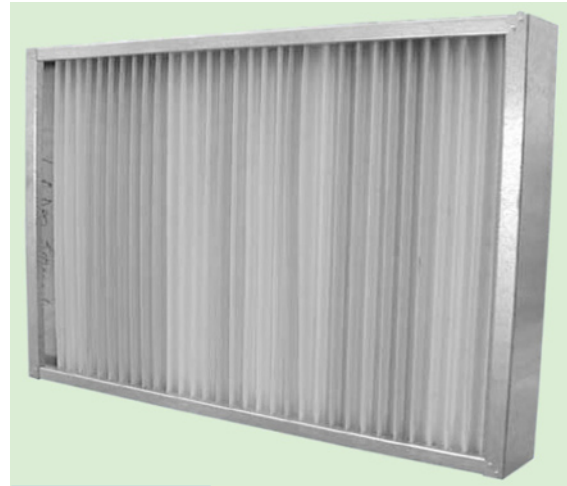
MOISTURE SEPARATOR AND SILENCER SECTION

MOIST ELIMINATOR

This can be one of two types, for coils or for humidification, and are selected to prevent the drips generated in the cooling or humidification processes from being dragged in.

Formed by polypropylene plates reinforced with talcum, mounted on a stainless steel or galvanised plate, suitable to support a maximum temperature of 100°.

The maximum operation speed is 5 m/s.



MOISTURE SEPARATOR

SILENCERS

There exists the possibility of incorporating silencers in the air handling unit in order to absorb noise in return sections, in impulsion, or in both cases. These are manufactured in galvanised plates and inorganic, incombustible mineral fibre acoustic material, with a covering which prevents the fibre becoming detached as the air passes.

The lengths can be from 600 to 1800 mm, in line with the level of attenuation required.



SILENCER

RECOVERY SECTION

HEAT RECOVERY SECTION

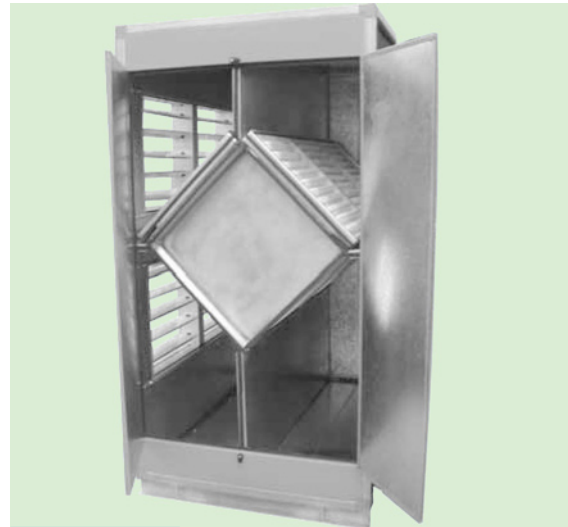
Used to increase the global efficiency of an air conditioning system.

The heat recoverers are exchangers, and, as such, fulfil the heat exchange equations "Energy transferred - Energy recovered", or, in other words, "Enthalpy transferred - Enthalpy recovered", meaning they are "Isoenthalpic".

It is possible to mount static recovery units, with crossed airflow, for sensitive heat and rotating recoverers with independent flows, with the rotation of the accumulation mass making the exchange, for the recovery of sensitive heat or the recovery of sensitive+latent heat (hygroscopic rotor).

Dual coil recovery

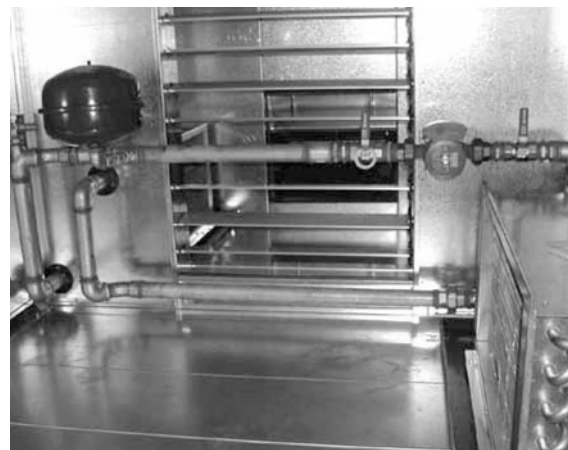
A system which obtains the recovery by way of two interconnected coils in a closed circuit, allowing mounting in independent climate control units, extraction unit and impulsion unit, or integrated in the same unit, in which case there is the option of interconnection between both (pump, expansion vessel, drain, filling valve and purge).



STATIC RECOVERER



ROTATIVE RECOVERER



DUAL BATTERY RECOVERY INTERCONNECTION

FAN SECTION

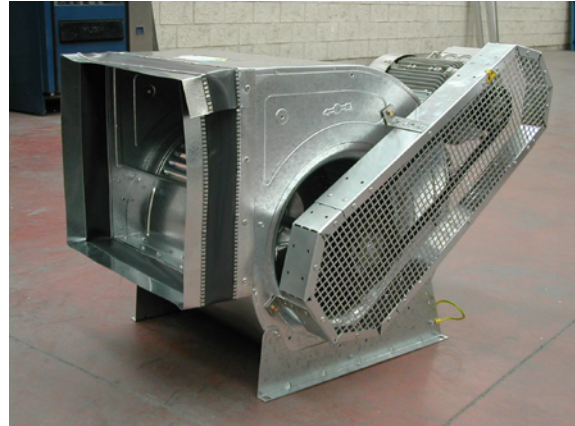
It is made up of a motor-fan, comprising a centrifugal fan, an electrical motor mounted on a rail, with transmission by way of pulleys and belts, with protective belt covers. This equipment will be mounted on the fan spiral in the light series and with low motor powers, while for others it will be mounted on a robust base frame, thus providing rigidity throughout. All of this is isolated from the rest of the unit by way of vibration isolators and a flexible connection in the mouth of the fan, a structure base frame earth connection and, in accordance with size, an inlet protection mesh.

The fans are selected with technical criteria regarding flow ($\text{m}^3/\text{h.}$), work pressures, performance, speed and sound level, and are generally of dual aspiration, with operation impellers (blades slanting forwards) or reaction impellers (blades slanting backwards), depending on the work pressure.

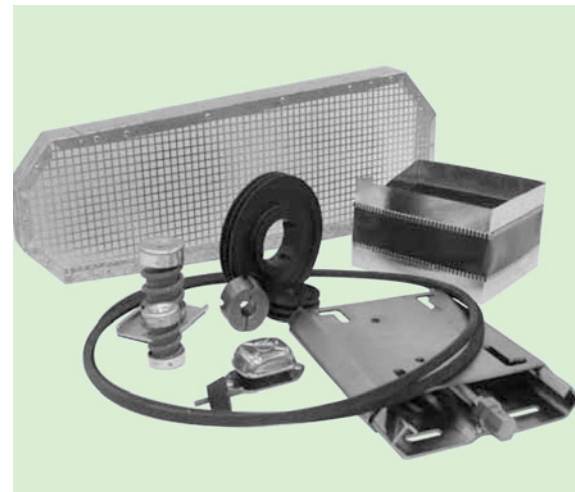
The casing of the fans is made from galvanised steel with inlaid ribs for rigidity; the aspiration outputs and the impulsion mouth deflector are aerodynamically designed, avoiding, in the latter case, any possible turbulence at the air output; statically and dynamically balanced impellers, G4 grade in line with ISO 1940 or VDI-2060; axles in highly resistant steel with protection from corrosion; and, generally, a cotter in both ends to attach pulleys, self-centring hermetic ball bearings with longlife lubrication in the absorption rubber inserts type or in order to relubricate those mounted on right supports on the frame type.

The motors are three-phase with a squirrel cage rotor, surface refrigerated, IP55 protection and F class insulation, in compliance with Standards IEC 60034-1 or DIN EN 60034-1.

The transmission shall be made up of interchangeable crown pulleys with conical flanges; trapezoidal belts, of varying type and amount in line with the power of the motor.



MOUNTED MOTOR-FAN GROUP



COMPONENTS



MOTOR-FAN GROUP IN SECTION

OTHER SECTIONS

MULTIZONE AND DUAL CONDUCT SECTION, BIZONE, TRIZONE...

The multizone section is used in facilities where is required a diversification of flows to different areas with independent treatments.

It comprises a cold coil, a heat coil and a damper, independent of flows and areas, which, duly regulated, allow us to obtain the required conditions in each area or site.

The cold and heat coils are sized to balance the drop of pressure in both airflows.

In the dual duct section, the constructions are the same as the multizone section, but with the dampers being replaced by two mouths for the outgoing independent hot air and cold air flows, making the mixes necessary in a terminal unit.

The bizon, trizone sections etc... shall be used in facilities where different areas need to be centralised with independent treatments.

Comprising several series of cold and/or heat coils and independent regulation dampers for each zone.

EMPTY SECTIONS

These sections shall be used in order to allow the installation of other accessories not envisaged at source in the air handling unit, and in order to access any section or as an air expansion plenum.

These sections shall be multiples of 75 mm.

GERMICIDE LAMPS SECTION.

Applied when treatment is required on the thermal exchange coil and the condensation collection tray for the control of fungi or bacteria, or in order to prevent the proliferation of contagious diseases.



MULTIZONE



BIZONE



GERMICIDE LAMPS

OPTIONALS

CONSTRUCTION:

- Support base in other materials or treatments.
- Frames in other materials or treatments.
- Panels in other materials or treatments.
- Panels which can be removed from the outside.
- Removable door with pressure seal on the outside and handle for use.
- Inspection glass.
- Electricity connection point.
- Exterior and interior handles.
- Inox screws.

INLET SECTION:

- Servomotor assembly in regulation damper.
- Interconnection of dampers.
- Dampers with rod-operated strips.
- Dampers in other materials and treatments.
- Weatherproof grilles.
- Bird-proof mesh covers.
- Overpressure Dampers.

FILTER SECTION:

- Active carbon filters.
- Metal filters.
- Filters for special applications.
- Frames in other materials
- Assembly of hand gauges.
- "Dirty filter" switch.

COIL SECTION:

- Stainless steel tube.
- Tube of 3/8 or 1/2".
- Pre-lacquered or copper blades.
- Frames in aluminium or stainless steel.
- Thermometers.

HUMIDIFICATION SECTION:

- Humidification by spraying system
- Humidification by atomisation (vacuum or ultra-sound).
- Humidification by centralised steam.

FAN SECTION:

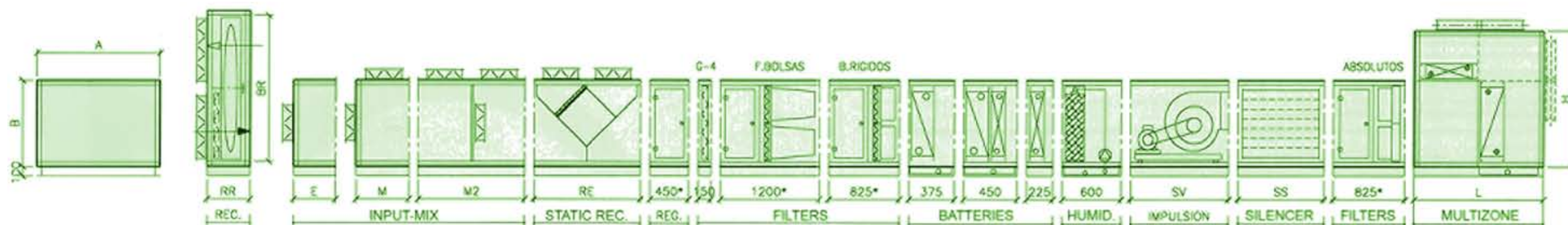
- Fans:
 - Twin impeller.
 - Single inlet.
 - With epoxy paint.
 - Non-spark inlet.
 - With pressure sensor.
 - With inspection door and waste water plug.
- Motors:
 - Single phase or three phase.
 - Twin speed.
 - With special protection (anti-explosive).
 - With frequency variator.
- Transmission:
 - Variable pulleys up to motors of 7.5 kw.

SILENCER SECTION:

- Finished in Melinex.
- Finished in perforated plate.

DEFINITION OF SECTIONS

INPUT	FRONT	UPPER	LOWER	SIDE	PLENUM	ACCESS
MIX	FRONT/UPPER	FRONT/LOWER	UPPER/LOWER	FRONT/SIDE	UPPER/SIDE	SIDE/SIDE
FREE-COOLING	UPPER/FRONT/UPPER	SIDE/FRONT/SIDE	UPPER/FRONT/SIDE			
FILTER	PRE-FILTER	FILTERS IN V	BAGS	RIGID BAGS	ABSOLUTE	OTHER <ul style="list-style-type: none">- Rotating- Active carbon- Special
RECOVERER	STATIC			ROTATING		
BATTERIES	HEAT	COLD (+SEPARATOR)	COLD+HEAT(+SEPARATOR)	RECOVERER	ELECTRICS	
HUMIDIFICATION	CELLULAR PANEL	STEAM LAUNCHER	SEPARATOR			
FAN	UPPER 0°	FRONT 90°	LOWER 0°	UPPER 180°	FRONT 270°	LOWER 180°
SILENCER	RETURN	IMPULSION				
MULTIZONE	FRONT	UPPER	DUAL CONTACT		BIZONE	



Model	m3/h	With cooling			Heat only			Rotating Recovery		Input-Mix			Sta. Rec.	Fan	Silencer			Multizone	
		Sf.m2	A	B	Sf.m2	A	B	RR	RR	E	M	M2	RE	SV	S-900	S-1200	S-1500	H	L
2007/1	1600	0,30	775	550	0,30	775	550	925	550	275	350	900	750	750	975	1275	1575	925	1075
2007/2	2100	0,37	925	550	0,30	775	550	1075	550	275	350	900	750	750	975	1275	1575	925	1075
2009/1	2800	0,49	925	700	0,40	775	700	1075	550	350	425	1050	975	825	975	1275	1575	1075	1225
2009/2	3450	0,58	1075	700	0,49	925	700	1075	550	350	425	1050	975	900	975	1275	1575	1075	1225
2010/1	4400	0,66	1075	775	0,56	925	775	1150	550	350	425	1050	1275	975	975	1275	1575	1300	1375
2012/1	6000	0,86	1375	775	0,66	1075	775	1375	550	350	425	1050	1275	975	975	1275	1575	1300	1375
2015/1	7200	1,05	1375	925	0,80	1075	925	1375	625	350	575	1275	1500	1125	975	1275	1575	1375	1450
2015/2	8500	1,30	1675	925	1,05	1375	925	1675	625	350	575	1275	1500	1125	975	1275	1575	1375	1450
2018/1	10200	1,53	1675	1075	1,24	1375	1075	1675	625	500	575	1275	1650	1275	975	1275	1575	1600	1525
2018/2	12600	1,65	1675	1150	1,32	1450	1075	1675	625	500	575	1275	1650	1275	975	1275	1575	1675	1525
2020/1	15000	2,07	1865	1340	1,89	1715	1340	1865	665	520	670	1500	1800	1350	975	1275	1575	1940	1790
2020/2	17000	2,25	2015	1340	1,89	1715	1340	2015	665	520	670	1500	1800	1500	975	1275	1575	1940	1790
2022/1	19000	2,53	2015	1490	2,23	1790	1490	2015	665	520	745	1650	1950	1500	975	1275	1575	2090	2015
2022/2	21000	2,73	2315	1490	2,23	1790	1490	2315	665	520	745	1650	1950	1575	975	1275	1575	2090	2015
2025/1	23500	3,03	2315	1565	2,67	2015	1565	2315	665	520	820	1875	2175	1650	975	1275	1575	2315	2390
2025/2	26000	3,42	2315	1715	2,88	2165	1565	2315	665	595	820	1875	2175	1650	975	1275	1575	2465	2390
2025/3	28500	3,75	2315	1865	3,10	2315	1565	2465	665	670	820	1875	2250	1650	975	1275	1575	2540	2390
2030/1	31000	3,91	2315	1940	3,46	2240	1790	2540	665	670	1045	2100	2250	1800	975	1275	1575	2615	2615
2030/2	33500	4,32	2540	1940	3,59	2315	1790	2690	665	670	1045	2100	2250	1800	975	1275	1575	2690	2615
2030/3	36000	4,59	2690	1940	3,59	2315	1790	2690	665	670	1045	2100	2250	1800	975	1275	1575	2690	2615
2030/4	38500	4,86	2840	1940	4,08	2615	1790	2840	665	670	1045	2100	2400	1800	975	1275	1575	2690	2615
2080/1	40800	5,26	2840	2090	4,08	2315	2015	3065	815	745	1120	2250	2400	1800	975	1275	1575		
2080/2	45000	5,70	3065	2090	4,64	2615	2015	3065	815	745	1120	2250	2400	1950	975	1275	1575		
2080/3	48500	6,14	3290	2090	4,83	2615	2090	3290	815	745	1120	2250	2550	1950	975	1275	1575		
2090/1	52000	6,61	3290	2240	5,41	2915	2090	3290	815	745	1345	2550	2550	2100	975	1275	1575		
2090/2	56000	7,09	3515	2240	5,41	2915	2090	3515	815	745	1345	2550	2550	2100	975	1275	1575		
2090/3	60500	7,56	3740	2240	5,99	3215	2090	3740	890	745	1345	2700	2550	2100	975	1275	1575		
2090/4	65000	8,10	3740	2390	6,58	3515	2090	3740	890	820	1345	2700	2550	2100	975	1275	1575		
2100/1	70000	8,82	3815	2540	7,34	3515	2315	3815	890	895	1345	2700	2550	2250	975	1275	1575		
2100/2	80000	10,80	4340	2540	8,00	3815	2315	4340	890	895	1420	2700	2550	2250	975	1275	1575		

* Minimum levels

*** Approximate levels, may vary in line with sections and availability of components