

CTL

Air handling units special execution for higher air volumes



PRODUCT SPECIFICATIONS

- This catalogue represents a summary of the CTL series air handling units, illustrating their main characteristics.
- The purpose is to describe the standard range, while at the same time highlighting the flexibility and best technical solutions possible for meeting different needs on site.
- Loran air handling units make an important contribution to improving air quality and the environments we live in. The company is constantly committed to research and development of environmentally-sustainable products with maximum energy efficiency.
- Constructional quality and the components used guarantee reliability, functionality and efficiency that last over time.
- The CTL units are available in 32 sizes, covering a vast range of air flows, and are designed using a simple and flexible modular system.

CERTIFICATION

CE marking

All VORTICE air handling units are built in compliance with Machinery Directive 2006/42/EC, Low Voltage Directive 2006/95/EC, and Electromagnetic Compatibility Directive 2004/108/EC, and consequently conform to the “essential health and safety requirements” defined by such Directives. The design work is developed respecting these standards and to this end the machines are equipped with a series of prevention and safety features suitable for satisfying the obligatory requirements:

- accident prevention protection grills over moving parts;
- safety micro-switches;
- lights for illuminating the inside of the machines;
- handles that open also from inside the machine;
- rounded edges and no parts that cut.

Adhesive signs - clearly visible because of their colour and size are applied to the external casings of the machine indicating possible dangers from moving parts and the electric current present.

CERTIFICATION

■ EUROVENT certificate

VORTICE S.p.A. adheres to the product certification programs run by Eurovent, the European association that brings together manufacturers of ventilation, air-conditioning refrigeration appliances from various different countries. The voluntary certification programs established and managed by Eurovent involve comparing the technician specifications declared by the manufacturer in its product documents and selection

software, against the results of tests conducted on working products. Eurovent represents a reference point for engineers, consultants, installers and end users, who can rely on Eurovent certification when choosing air-conditioning and refrigeration systems with certified performance. VORTICE S.p.A. has obtained Eurovent certification on its CTL series products, thus guaranteeing customers complete transparency and accuracy of declared performance.





SIZE

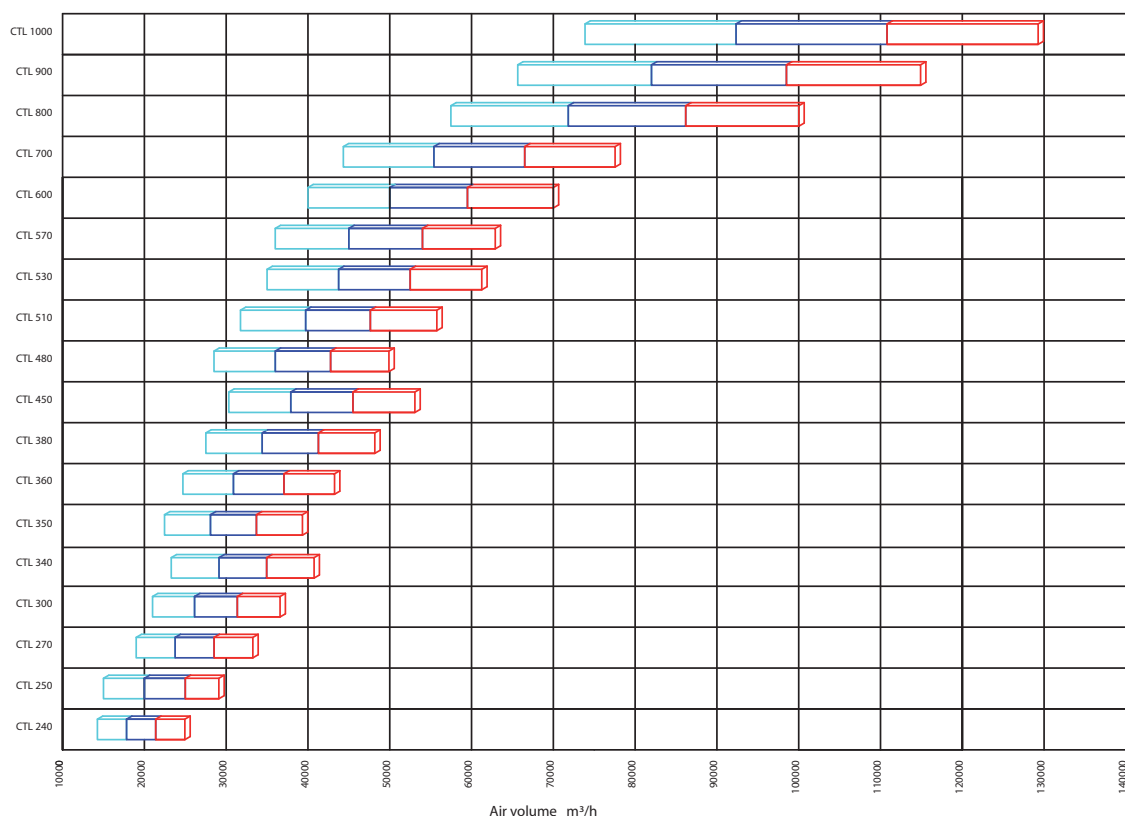
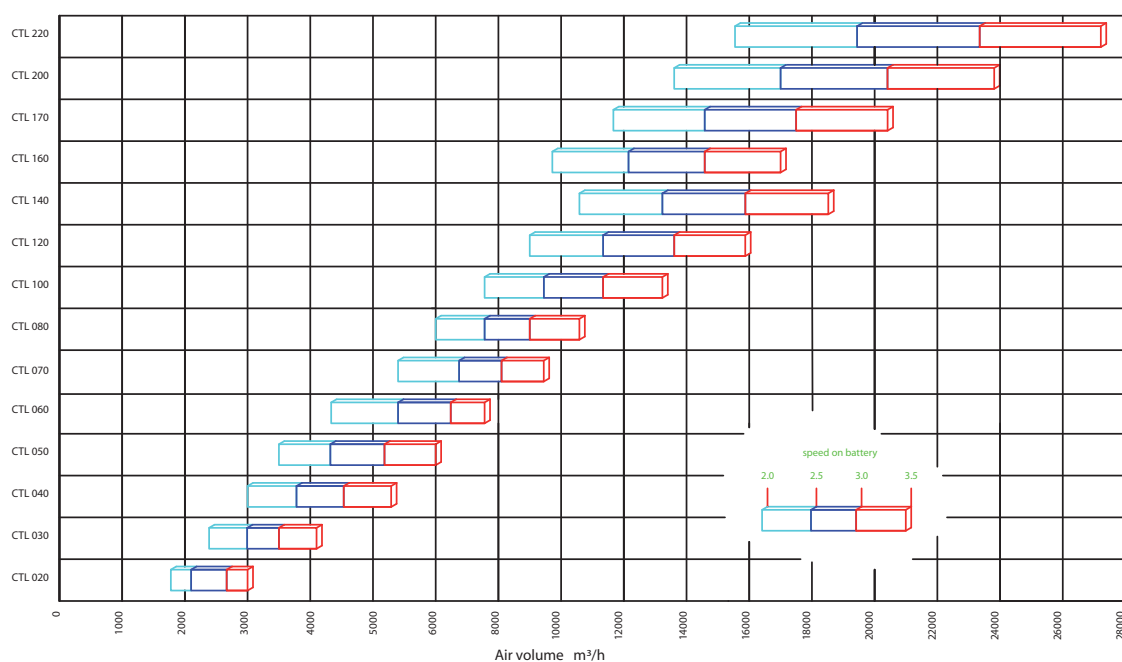
Air handling units are sized by selecting the components that meet the system's thermo-mechanical design requirements. The unit is selected according to air flow and air velocity through the coils.

The following values are recommended:

ventilation section (no filters, no heat exchangers)	max 4,0 m/sec
heating coil	max 3,5 m/sec
cooling coil	max 2,8 m/sec

The CTL range is available in 32 sizes for nominal air flow from 1,000 to 100,000 m³/h.

The tables show the possible choices based on these two main parameters.



SIZE

For greater clarity, the table below illustrates:

CTL: CTL model

H: Unit height, excluding the base (add 95/150 mm)

L: Section width

Sb: Coil face surface area

V: Air flow m³/h

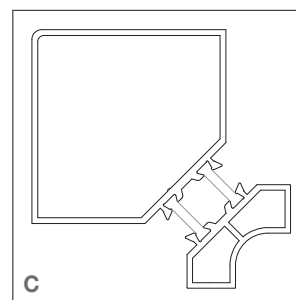
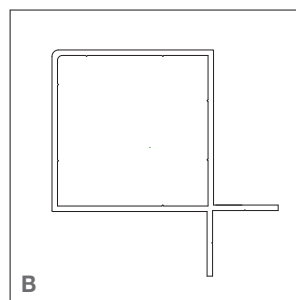
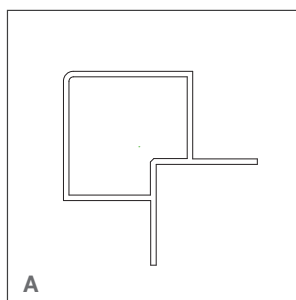
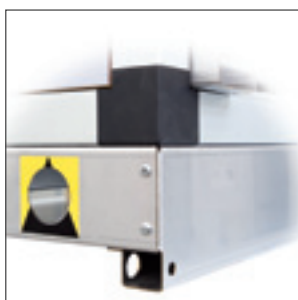
Sections

SIZE		Dimensions L x H mm	Section Sb mq	2	2,25	2,5	2,75	Air flow x V (m/sec)				
								3	3,25	3,5	3,75	4
CTL	20	800 x 650	0,24	1.754	1.973	2.192	2.412	2.631	2.850	3.069	3.289	3.508
CTL	30	1050 x 650	0,33	2.389	2.688	2.986	3.285	3.583	3.882	4.181	4.479	4.778
CTL	40	1300 x 700	0,42	3.024	3.402	3.780	4.158	4.536	4.914	5.292	5.670	6.048
CTL	50	1050 x 800	0,48	3.456	3.888	4.320	4.752	5.184	5.616	6.048	6.480	6.912
CTL	60	1300 x 800	0,60	4.320	4.860	5.400	5.940	6.480	7.020	7.560	8.100	8.640
CTL	70	1550 x 800	0,75	5.400	6.075	6.750	7.425	8.100	8.775	9.450	10.125	10.800
CTL	80	1300 x 1050	0,84	6.048	6.804	7.560	8.316	9.072	9.828	10.584	11.340	12.096
CTL	100	1550 x 1050	1,05	7.560	8.505	9.450	10.395	11.340	12.285	13.230	14.175	15.120
CTL	120	1800 x 1050	1,26	9.072	10.206	11.340	12.474	13.608	14.742	15.876	17.010	18.144
CTL	140	2050 x 1050	1,47	10.584	11.907	13.230	14.553	15.876	17.199	18.522	19.845	21.168
CTL	160	1550 x 1300	1,35	9.720	10.935	12.150	13.365	14.580	15.795	17.010	18.225	19.440
CTL	170	1800 x 1300	1,62	11.664	13.122	14.580	16.038	17.496	18.954	20.412	21.870	23.328
CTL	200	2050 x 1300	1,89	13.608	15.309	17.010	18.711	20.412	22.113	23.814	25.515	27.216
CTL	220	2300 x 1300	2,16	15.552	17.496	19.440	21.384	23.328	25.272	27.216	29.160	31.104
CTL	240	1800 x 1550	1,98	14.256	16.038	17.820	19.602	21.384	23.166	24.948	26.730	28.512
CTL	250	2050 x 1550	2,31	16.632	18.711	20.790	22.869	24.948	27.027	29.106	31.185	33.264
CTL	270	2300 x 1550	2,64	19.008	21.384	23.760	26.136	28.512	30.888	33.264	35.640	38.016
CTL	300	2550 x 1550	2,90	20.909	23.522	26.136	28.750	31.363	33.977	36.590	39.204	41.818
CTL	340	2800 x 1550	3,23	23.285	26.195	29.106	32.017	34.927	37.838	40.748	43.659	46.570
CTL	350	2300 x 1800	3,12	22.464	25.272	28.080	30.888	33.696	36.504	39.312	42.120	44.928
CTL	360	2550 x 1800	3,43	24.710	27.799	30.888	33.977	37.066	40.154	43.243	46.332	49.421
CTL	380	2800 x 1800	3,82	27.518	30.958	34.398	37.838	41.278	44.717	48.157	51.597	55.037
CTL	450	3050 x 1800	4,21	30.326	34.117	37.908	41.699	45.490	49.280	53.071	56.862	60.653
CTL	480	2550 x 2050	3,96	28.512	32.076	35.640	39.204	42.768	46.332	49.896	53.460	57.024
CTL	510	2800 x 2050	4,41	31.752	35.721	39.690	43.659	47.628	51.597	55.566	59.535	63.504
CTL	530	3050 x 2050	4,86	34.992	39.366	43.740	48.114	52.488	56.862	61.236	65.610	69.984
CTL	570	2800 x 2300	5,00	35.986	40.484	44.982	49.480	53.978	58.477	62.975	67.473	71.971
CTL	600	3050 x 2300	5,51	39.658	44.615	49.572	54.529	59.486	64.444	69.401	74.358	79.315
CTL	700	3050 x 2550	6,16	44.323	49.864	55.404	60.944	66.485	72.025	77.566	83.106	88.646
CTL	800	3800 x 2550	7,98	57.456	64.638	71.820	79.002	86.184	93.366	100.548	107.730	114.912
CTL	900	4300 x 2550	9,12	65.664	73.872	82.080	90.288	98.496	106.704	114.912	123.120	131.328
CTL	1000	4800 x 2550	10,26	73.872	83.106	92.340	101.574	110.808	120.042	129.276	138.510	147.744

DESCRIPTION OF THE UNIT

Structure

- The structural casing of the air handling units is made from anodised aluminium section bars with aluminium corner joints, sheet metal sandwich panels with thermal and acoustic insulation on the inside, and a thick press formed sheet metal base.
- **Base:** base made from thick press formed sheet metal longitudinal members, either galvanised or AISI 304 stainless steel. These are fastened to the four sides of each section, with the unit resting on the ground on the shorter sides. Each base comes complete with suitably sized holes for inserting lifting bars. The type of sections bars and the thickness of the sheet metal used ensure high structural rigidity both during transport and as regards safety when handling on site. The various sections can be joined together using the holes drilled on the longitudinal members.
- **Frame:** the frame is made using a modular system of extruded anodised aluminium alloy section bars (in accordance with UNI 9006/1), joined by die-cast aluminium corners, or for thermal break sections, fibreglass-reinforced nylon corners.
Three types of section bars are used to make the units.
A: 40 mm section bar for 23 mm panel
B: 50 mm section bar for 48 mm panel
C: Thermal break section bar for 48/63 mm panel.
The latter is used in special applications where the temperature difference or high humidity require absence of thermal bridges.



- **Panels:** different types of sandwich panels are available, both as regards overall thickness (23/48/63 mm), insulation materials and thickness of the sheet metal.
The following types of metal are used to make the panels:
- COATED SHEET METAL (EN 10169)
Hot galvanised steel base: reference standard EN 10327, Z100 coating. Standard protection involves application of a 25 micron dry film (tolerance ± 3 mm) on the top face and a 7/10 micron dry film on the bottom face, in accordance with EN 13523.
FEATURES: Gloss 30/35 - Condensation resistance 1000 h no blistering - Resistance to salt spray 360 h no blistering - Resistance to fluorescent UV light and water condensation 2000 h UVA residual gloss 50% no blistering. - Min. surface hardness F Thicknesses available: 6-8-10 /10 mm.
- GALVANISED SHEET METAL
DXD51-Z200 galvanised rolled sheet for cold forming and stamping (EN 10142). Thicknesses available: 6-8-10-15/10 mm.
- PERALUMAN SHEET METAL
5754 H111 aluminium magnesium alloy, featuring excellent corrosion resistance in marine environments. Thicknesses available: 8-12/10 mm.
- STAINLESS STEEL SHEET
Cold rolled AISI 304 austenitic stainless steel sheet (EN 10088/97) with 2B gloss finish.
Mainly used in environments where sanitisation treatment is needed or with specific atmospheric characteristics. AISI 316 can also be used.
Thicknesses available: 6-8-10/10 mm.



23 mm thickness



48 mm thickness



Thermal break profile
48 mm thickness



Thermal break profile
63 mm thickness

DESCRIPTION OF THE UNIT

- **Internal insulation:** the following types of thermal and acoustic insulation can be used:

- Polyurethane foam, density 40+/-5 kg/m³, thermal conductivity 0.022 (W/mk). Reaction to fire in accordance with ISO 3582 DIN 4102:B3.
- Mineral wool, as well as being a natural material with good thermal insulation properties, has an open cell structure that makes it an excellent soundproofing material; indeed it combines five fundamental features, including thermal-acoustic insulation and excellent reaction to fire. Density 90/100 kg/m³, thermal conductivity 0.045 (W/mk).

■ Sound attenuation

23 mm polyurethane foam panel

Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Sound attenuation	dB	2	9	9	11	12	12	22	30

48 mm polyurethane foam panel



Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Sound attenuation	dB	3	9	9	11	13	12	26	32

23 mm mineral wool panel

Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Sound attenuation	dB	2	13	16	24	23	23	22	30

48 mm mineral wool panel



Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Sound attenuation	dB	4	13	18	24	24	23	26	30

63 mm mineral wool panel



Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Sound attenuation	dB	4	16	21	27	27	28	31	39

- **Rain cover:** required for installations outside of the equipment room, made from:

- coated sheet metal, 6/10 mm thick
- galvanised sheet metal, 6/10 mm thick
- Peraluman sheet metal, 8/10 mm thick

Secured directly onto the sections using suitably insulated and sealed screws.

DESCRIPTION OF THE UNIT

Dampers

- In the standard version, these have an aluminium frame, aluminium louvers with airfoil blades, 100 mm pitch. The specially-shaped blades ensure tightness when closed. Upon request, these can be fitted with seal gaskets on the sides and on the louvers.



All dampers come with 12 mm diameter motor drive shaft for manual or electrical servo control. Can be installed both outside and inside the unit.

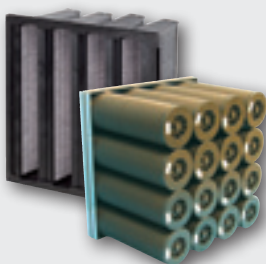

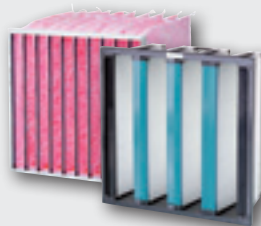

Filters

- The air filter section is a fundamental part of the air handling unit, as it removes any contaminants from the air flow. Before choosing a filter, several points need to be assessed, including:
 - type of application

- efficiency
- dust accumulation
- pressure drop

The following table helps select the best filter.

- Filtration guide

Molecular filtration	Final stage, Clean Room filters Class according to Fed. Std 209 E	Second stage and/or final stage for rooms without specific needs	First stage
	<div><div>10.000</div><div>from 1 to 10</div><div>from 100 to 1.000</div><div>100.000</div></div>	Pre-filter stage for HEPA/ULPA filters	
	Ultra high efficiency	High efficiency	Middle efficiency
	ULPA/HEPA NaCl - 0,65 µm ≥ 95% ≥ 99,9% ≥ 99,97% ≥ 99,99% ≥ 99,999%	Fine filters	Coarse filters
	EN 1822	EN 779:2002, Dust spot on 0.4 µm	EN 779:2002, Arrestance
Cartridge filters, deodorising filters, rigid or soft bags.	MMPS (Most penetrating Particle Size) H11 ≥ 95% H13 ≥ 99,95% H14 ≥ 99,995%	Fine filters F5 ≥ 40% F6 ≥ 60% F7 ≥ 80% F8 ≥ 90% F9 ≥ 95%	Coarse filters G2 ≥ 65% G3 ≥ 80% G4 ≥ 90%
			

DESCRIPTION OF THE UNIT

- **Middle efficiency filters:** Middle efficiency or coarse filters are used as the first or second filter stage.

Filter class in accordance with EN 779-2002:

G2 Weighted average efficiency $\geq 65\%$

G3 Weighted average efficiency $\geq 80\%$

G4 Weighted average efficiency $\geq 90\%$

Type of filters:

G2 Corrugated mesh filter cells (stainless/galvanised steel)

G3 Drum filter with progressive density synthetic media

G4 Corrugated filter cells with synthetic media, galvanised steel frame, welded galvanised steel wire protective grill.

- **High efficiency filters:** High efficiency filters or fine filters are used as the second or final filter stage in places without specific needs. Also used as pre-filters for HEPA / ULPA.

Filter class in accordance with EN 779-2002:

F5 Average dust spot efficiency $\geq 40\%$

F6 Average dust spot efficiency $\geq 60\%$

F7 Average dust spot efficiency $\geq 80\%$

F8 Average dust spot efficiency $\geq 90\%$

F9 Average dust spot efficiency $\geq 95\%$

Type of filters:

F5

- Corrugated filter cells with synthetic media, galvanised steel frame, welded galvanised steel wire protective grill. Recommended maximum pressure drop 200 Pa.

- Soft pocket filters with large glass fibre filtering surface. Galvanised steel frame.

Recommended maximum pressure drop 250 Pa.

F6 / F7 / F9 (fig. 2)

- Soft pocket filters with large glass fibre filtering surface. Galvanised steel frame Length 380 mm.

Upon request the filtering surface area can be increased by extending the length of the filter to 535 or 635 mm.

Recommended pressure drop 250 Pa.

- Rigid glass fibre pocket filter, polypropylene/ABS frame. Recommended maximum pressure drop 250 Pa (fig. 1).

- **Ultra high efficiency filters:** Ultra high efficiency filters are used as the final stage to ensure high air purity. Mainly installed in places that need to remain aseptic, such as clean rooms, hospital environments, pharmaceutical or electronics facilities. The type of installation of these filters is essential, being housed in special galvanised or stainless steel frames fitted with gaskets to ensure the filter is not bypassed (fig. 3).

Filter class in accordance with EN 1822:

H 11 Efficiency $\geq 95\%$

H 13 Efficiency $\geq 99.95\%$

H 14 Efficiency $\geq 99.995\%$

H 11 / 13 / 14

Absolute HEPA filter, galvanised steel frame and micron-sized glass fibre filter media.

Recommended maximum pressure drop 600 Pa.

- **Molecular filtration:** These filters were originally designed for trapping gaseous pollutants (molecules) such as vehicle exhausts, industrial emissions from combustion processes or simple cigarette smoke. Their trapping capacity depends on the type of molecule being filtered.

Can be used in combination with dust filters.

Type:

- Soft pocket with activated carbon for double action: filtration of dust (EN 779 filtration class F7) and gaseous pollutants. Installed to replace existing pocket filters, with no further filtering systems required. Made from glass fibre media plus activated carbon.

- Rigid pocket with activated carbon for double action: filtration of dust (EN 779 filtration class F7) and gaseous pollutants. Installed to replace existing pocket filters, with no further filtering systems required. Made from glass fibre media plus activated carbon (fig. 4).

- Cartridges containing activated carbon, ideal for service and industrial applications where deodorising is required. Fitted on galvanised metal plates with bayonet mount (fig. 5).



fig. 1



fig. 2



fig. 3

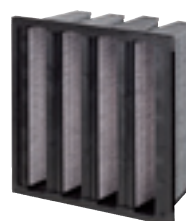


fig. 4



fig. 5



DESCRIPTION OF THE UNIT

Heat exchange coils

- Heat exchange coils are the principal elements bringing about changes in air temperature and humidity. Heat exchange is indirect; a primary fluid such as hot or cold water, or hot or cold gas that flows through the coils interacts with the secondary fluid, in this case the process air. The coils are finned tubes made from different materials with continuous fins featuring a collar to adjust and evenly space the fins. The tubes are mechanically expanded to ensure perfect coupling between tube and fin and consequently perfect heat exchange. The fins have a corrugated surface to ensure rigidity and create air turbulence, increasing the heat exchange coefficient. All coils can be removed both from the side with fittings and the opposite side. The heat exchanger construction materials are chosen based on the primary and secondary fluids; the following options are available:

Materials

Copper tube	Aluminium fins
Copper tube	Copper fins
Copper tube	Tinned copper fins
Copper tube	Coated aluminium fins
Iron tube	Aluminium fins
Stainless steel tube	Aluminium fins
Stainless steel tube	Stainless steel fins

Configurations

PT 60	60x30 ø 5/8 tube
PT 30	30x30 ø 5/8 tube
PT 30	30x26 ø 3/8 tube
PT 40	40x30 ø 5/8 tube

Fin pitch mm

1,8	2,0	2,5	3,0	4,0	5,0	6,0
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Operation

Hot water
Cold water
Superheated water
Steam
Direct expansion of Freon
Condensation of Freon

The number of rows, circuit configuration and materials can be easily determined using the VORTICE selection program and with the help of the company's technical department.

When sizing the unit, as well as air velocity, a number of minimum and maximum limits also been to be taken into account, based on experience and practical considerations.

TYPE OF PROCESS	MINIMUM LIMIT	MAXIMUM LIMIT	
		m/sec	m/sec
Cooling and condensation without droplet separator	1.6	2.5	
Cooling and condensation with droplet separator	1.6	3.2	
Heating	1.6	4.1	



DESCRIPTION OF THE UNIT

- **Electric coils:** electric coils are made from finned tubular air heating elements with single- or multi-stage operation.

The standard configuration features iron tubes and galvanised iron fins, the heating elements are fastened to a galvanised sheet metal sheath by insulated bushes complete with vibration-damping gasket.

Complete with mechanical thermoregulator with two changeover contacts, range 20°/120°C.

Power supply 400 V 3 Phase 50 Hz.

Terminal block protection IP 55.

For correct operation, air velocity must not be less than 2.6 m/sec.

The electric coil should be installed downstream of the fan to avoid overheating the motor.

If used in humid environments with steam production or frequent washing, the heater contacts can be sealed for protection.

A wide range of heat outputs is available, depending on the type of process performed.

- **Coil dimensions**

SIZE		Section dimensions base x height 50 mm thick	Coil dimensions		60x30 config. tubes	30x30 config. tubes	30x26 config. tubes	40x30 config. tubes
			W x H	section mq				
CTL	20	800 x 650	580 x 420	0,24	7	14	14	10
CTL	30	1050 x 650	790 x 420	0,33	7	14	14	10
CTL	40	1300 x 700	1000 x 420	0,42	7	14	14	10
CTL	50	1050 x 800	800 x 600	0,48	10	20	20	15
CTL	60	1300 x 800	1000 x 600	0,60	10	20	20	15
CTL	70	1550 x 800	1250 x 600	0,75	10	20	20	15
CTL	80	1300 x 1050	1000 x 840	0,84	14	28	28	21
CTL	100	1550 x 1050	1250 x 840	1,05	14	28	28	21
CTL	120	1800 x 1050	1500 x 840	1,26	14	28	28	21
CTL	140	2050 x 1050	1750 x 840	1,47	14	28	28	21
CTL	160	1550 x 1300	1250 x 1080	1,35	18	36	36	27
CTL	170	1800 x 1300	1500 x 1080	1,62	18	36	36	27
CTL	200	2050 x 1300	1750 x 1080	1,89	18	36	36	27
CTL	220	2300 x 1300	2000 x 1080	2,16	18	36	36	27
CTL	240	1800 x 1550	1500 x 1320	1,98	22	44	44	33
CTL	250	2050 x 1550	1750 x 1320	2,31	22	44	44	33
CTL	270	2300 x 1550	2000 x 1320	2,64	22	44	44	33
CTL	300	2550 x 1550	2200 x 1320	2,90	22	44	44	33
CTL	340	2800 x 1550	2450 x 1320	3,23	22	44	44	33
CTL	350	2300 x 1800	2000 x 1560	3,12	26	52	52	39
CTL	360	2550 x 1800	2200 x 1560	3,43	26	52	52	39
CTL	380	2800 x 1800	2450 x 1560	3,82	26	52	52	39
CTL	450	3050 x 1800	2700 x 1560	4,21	26	52	52	39
CTL	480	2550 x 2050	2200 x 1800	3,96	30	60	60	45
CTL	510	2800 x 2050	2450 x 1800	4,41	30	60	60	45
CTL	530	3050 x 2050	2700 x 1800	4,86	30	60	60	45
CTL	570	2800 x 2300	2450 x 2040	5,00	34	68	68	51
CTL	600	3050 x 2300	2700 x 2040	5,51	34	68	68	51
CTL	700	3050 x 2550	2700 x 2280	6,16	38	76	76	57
CTL	800	3800 x 2550	3500 x 2280	7,98	38	76	76	57
CTL	900	4300 x 2550	4000 x 2280	9,12	38	76	76	57
CTL	1000	4800 x 2250	4500 x 2280	10,26	38	76	76	57

DESCRIPTION OF THE UNIT

Humidifier sections

- Air humidification plays a fundamental role in normal air-conditioning processes, as the humidity level needs to be kept constant to ensure personal comfort in air-conditioned spaces. The most common solutions are:

- Adiabatic humidification with wetted media
- Water spray humidification with one or two nozzle racks
- Steam humidification

The features of each are described below.

Wetted media humidifier

Evaporative humidification uses specially-shaped wetted media with a honeycomb-like structure, made from sheets of resin-impregnated absorbent paper to ensure the right consistency and structural strength, protect against decomposition and prevent mould formation. The media is formed using sheets of cross corrugated cellulose glued together using atoxic adhesives; no phenolic resins are used. This arrangement ensures a large contact surface between the air and water, meaning high efficiency. The operating principle is simple, and involves uniformly wetting the media using a special distribution system to avoid dry areas that would cause a decline in efficiency. The air flowing through the media is humidified and cooled to an extent that varies depending on the conditions.

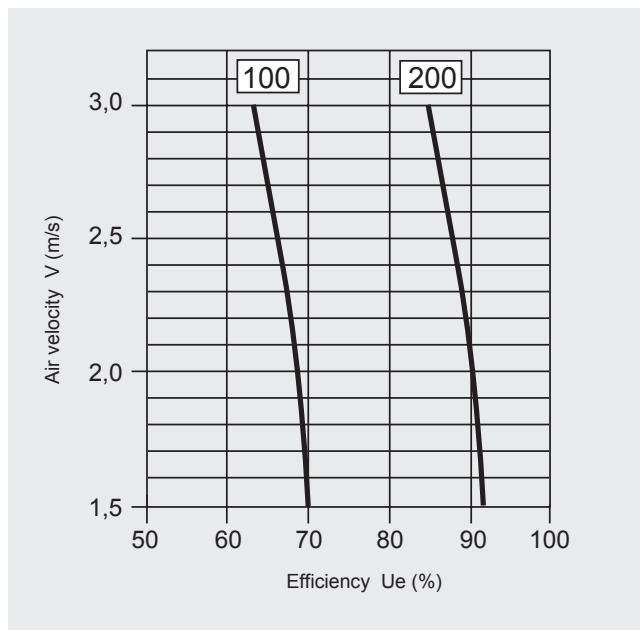
Main features of the cellulose media include:

- Excellent efficiency
- Low pressure drop
- Low running costs
- Fast installation

To achieve good efficiency and correct hygiene, the conditions of the humidifier sections in civil air-conditioning systems need to be checked periodically.

The following types of application are available:

- 100 mm honeycomb media with once-through water
- 200 mm honeycomb media with once-through water
- 100 mm honeycomb media with recirculating pump
- 200 mm honeycomb media with recirculating pump



Water spray humidifier with one or two nozzle racks

Adiabatic humidifier made up of a series of spray nozzles operating at low pressure, supplied via a manifold connected to the water mains or a pumping system. This type of humidifier can also be used for evaporative cooling or as a washer. In this case, two rows of nozzles are used with flow in both the same and the opposite directions, creating turbulence that causes the dust to precipitate. These systems have a multitude of applications; naturally, demineralised water must be used for sterile and aseptic environments. Main features of the spray system include:

- Reasonably good efficiency
- Low pressure drop
- Low running costs

The following types of application are available:

Low pressure nozzles

- Humidifier with 1 low press. nozzle rack and once-through water
- Humidifier with 2 low press. nozzle racks and once-through water
- Humidifier with 1 low press. nozzle rack and recirculating pump
- Humidifier with 2 low press. nozzle racks and recirculating pump



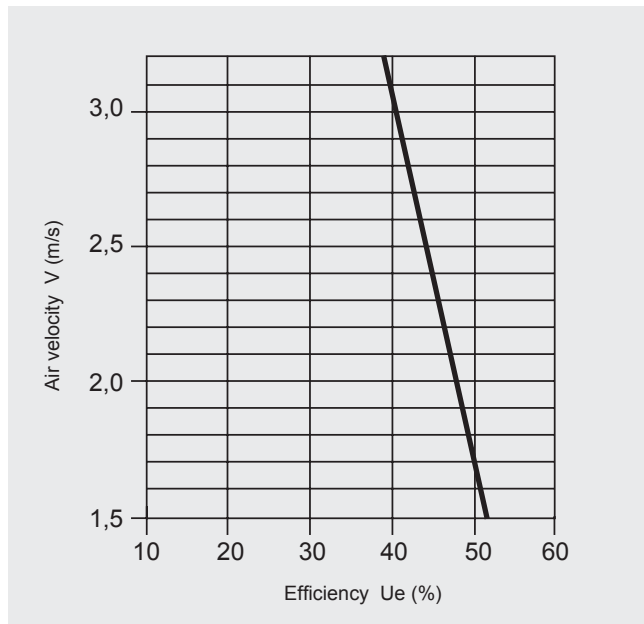
Wetted media humidifier



Water spray humidifier

DESCRIPTION OF THE UNIT

■ Spray humidification efficiency



- **Atomising humidifier** (fig. 6): this type of humidifier represents a new generation of economical appliances, with power consumption of just 4 watts for each l/h of water atomised. Ideal for all applications where high humidification capacities are required, up to 500 kg/h. The appliance uses a special pump to deliver water at high pressure through stainless steel nozzles and produce a very fine and uniform fog. The droplets generated then spontaneously evaporate, humidifying and cooling the air. This air/water system does not require the use of a compressor or installation of a compressed air line. In addition, as a further guarantee of hygiene, the appliance does not atomise recirculated water, in compliance with the main international guidelines and standards (ASHRAE 12-2000, VDI6022, VDI3803, L8).
EFFICIENCY: Absorption efficiency is 85-87%.

- **Steam humidifier:** isothermal humidifier made using one or more perforated stainless steel steam pipes, complete with additional concentric pipes for draining condensate.

The humidifier section is sized to ensure maximum air/steam interaction. Main features of the steam system include:

- Very high efficiency
- Low pressure drop
- Multiple applications
- Easy to install

Naturally, running costs are regards energy consumption are higher when compared against the systems described previously.

This type of humidifier can be supplied as follows:

- unit configured for humidifier installation by the customer
- steam distributor only (if a source of steam is already available)
- distribution system and immersed electrode steam generator

EFFICIENCY: Efficiency is around 90%.

Droplet separators (fig. 7)

- These are designed to trap as many droplets of water as possible generated inside the unit by air dehumidification or humidification systems. These must be installed:
 - when the air velocity across the cooling coil exceeds 2.5 m/sec
 - downstream of all the humidification systems described previously
 - in certain applications downstream of plate heat recovery exchangers where a high amount of condensation takes place

The following materials and types can be selected:

- 2 changes in direction, extruded polypropylene
- 4 changes in direction, extruded polypropylene
- 2 changes in direction, extruded aluminium
- 3 changes in direction, press formed stainless steel sheet

Drain tank

- Condensate collection tanks are provided near the following components: Cooling coil - Heat recovery coils - Cross-flow heat recovery units - Heat wheels - Humidifier sections - Droplet separators Made from thick press formed and welded AISI 304/316 stainless steel or galvanised iron sheet. Featuring drain opening and hose connector to simplify water connection on site. For sanitisable air handling units, tanks are provided with higher inclines to assist complete drainage of the water (fig. 8).



fig. 6

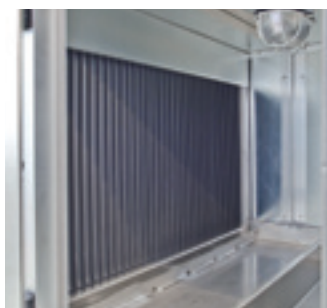


fig. 7

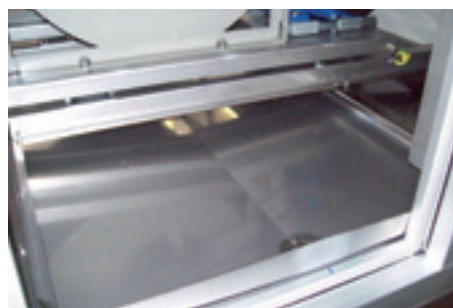


fig. 8

DESCRIPTION OF THE UNIT

Heat recovery units

- Heat recovery units are widely used to partially recover waste or exhaust energy, bringing significant savings in system running costs. The following types are available:
 - Plate heat recovery exchangers
 - Heat wheels
 - Heat recovery coils
 - Heat pipe heat exchangers
 (contact the technical department for sizing)

- Plate heat recovery exchangers:** plate heat recovery units are heat exchangers that transfer heat between two air flows due to the difference in temperature. These units allow significant savings in running costs of air-conditioning systems by recovering energy that otherwise would be lost in the form of heat.

Essential features

- low installation and running costs
- complete separation of air flows
- no moving parts
- low pressure drop
- high efficiency
- easy cleaning and minimum maintenance
- effective noise abatement.

These can be made from aluminium, aluminium with atoxic corrosion-resistant coating or AISI 316L stainless steel.

- Heat wheels** (fig. 10): rotary air-to-air heat exchangers consist of a rotating cylinder containing thousands of pockets with a very large surface area, a housing frame (comp. with brush gaskets to minimise leaks between ventilation and exhaust air flows), and a drive system made up of an electric motor with speed control where necessary.

Essential features

- The very high heat exchange surface in relation to the volume of air ensures much higher performance than other types of heat recovery units, reaching efficiency of up to 85%.
- This high efficiency plus the possibility to recovery moisture as well as heat (enthalpy wheel) mean the capacity of the units installed can be reduced considerably.
- Possibility to transfer heat latent.

- Low pressure drop.

Can be made from aluminium or aluminium with atoxic coating. Enthalpy wheels can be supplied for the recovery of latent heat.

- Heat recovery coils:** these are made in the same way as normal heat exchange coils, installed in the exhaust air and fresh air sections and connected via a circulating pump, generally with a water-glycol mix, creating heat exchange with efficiency less than 50%. These units are mainly used in environments where there must be no contamination between air flows.
- Heat pipe heat exchangers:** heat recovery units are made up of a heat exchanger, similar to a finned coil and generally with copper pipes and aluminium fins, divided into two adjacent sections. The pipes are filled with refrigerant (typically R134a) that changes state, from liquid to vapour and vice-versa, when the temperature changes. The partition between the sections, generally placed in the centre of the heat exchanger, separates the fresh air flow from the exhaust air. A tilt control device is available for seasonal changeover in operating mode.

Silencers

- Noise pollution is a problem that increasingly often needs to be faced during the design process. Sound emissions are generated by the fans, and the only noise abatement system involves placing silencers upstream or downstream, depending on requirements. These are made from 100/200 mm thick mineral wool, protected by a layer of fabric or, on request, heat shrink plastic film, to ensure a perfect seal. The mineral wool is housed in a galvanised metal frame, with galvanised iron retaining mesh.

- Baffle lengths:** 700, 950, 1200, 1450, 1750, 1950 mm.

- Sound attenuation**

HZ/ Length	63	125	250	500	1000	2000	4000	8000
700	6	10	14	23	32	26	20	15
950	9	14	25	42	39	37	31	21
1200	9	15	27	44	40	39	32	21
1450	10	17	30	47	44	42	36	23
1750	12	19	35	48	47	47	42	26
1950	13	21	39	48	49	49	45	28

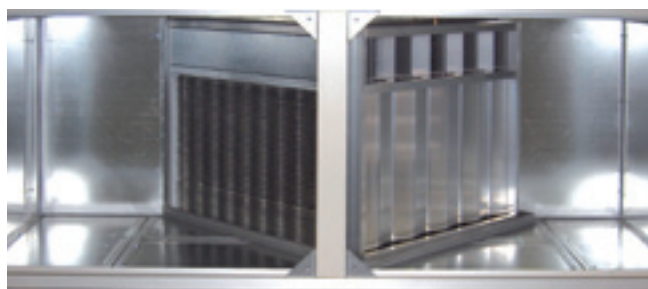


fig.9

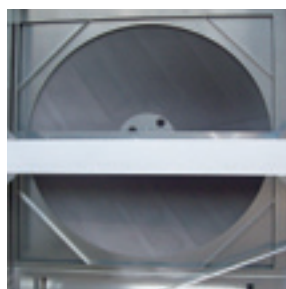


fig.10

DESCRIPTION OF THE UNIT

Ventilation sections

- These consist of: fan, motor, supports and dampers.
- **Fans:** centrifugal fans can be installed with the following configurations:

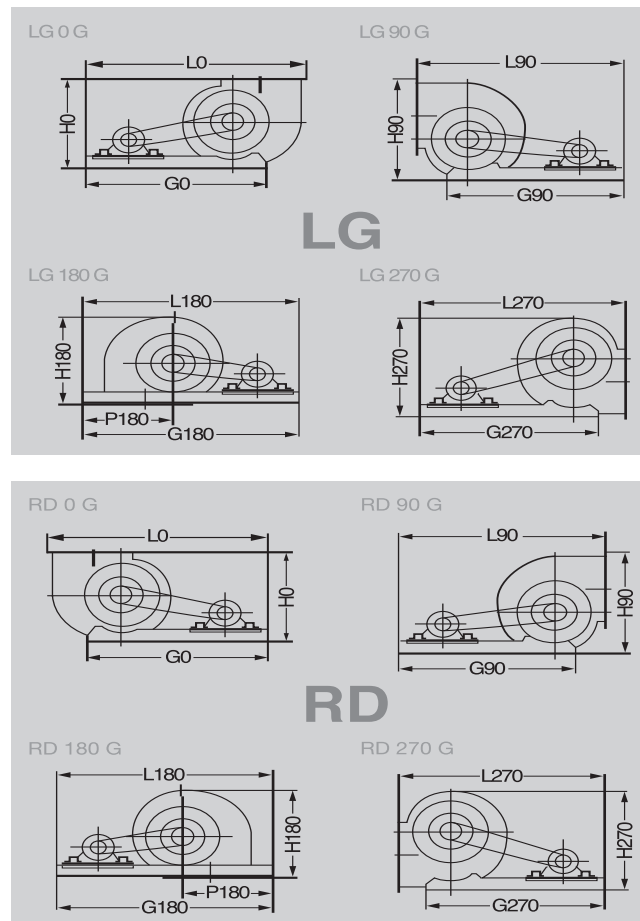
- forward curved blades
- backward curved blades
- backward curved without scroll (plug fan)
- backward curved airfoil blades

The impellers are statically and dynamically balanced in accordance with the standards in force. Series R uses an individual sealed ball bearing ring, with lifetime lubrication, while the other versions have bearings with grease nipples. The bearings are rated for a lifespan of at least 40,000 hours. The type is selected according to the required performance, efficiency and sound emissions.

- **Accessories:**

- Painting, completely painted versions can be made upon request.
- Explosion proof configuration, with aluminium alloy, copper or raised copper edge intake openings.
- Condensate drain.
- Inspection opening.

- **Orientation**





DESCRIPTION OF THE UNIT

Ventilation sections

- The following tables illustrate the fans available with reference to the size of the unit.

Size		Fans with forward curved / backward curved / airfoil blades							
CTL 20	225*								
CTL 30	225*								
CTL 40	225*	250*							
CTL 50	225*	250*	315						
CTL 60	225*	250*	315						
CTL 70	225*	250*	315						
CTL 80		250*	315	450					
CTL 100		250*	315	450					
CTL 120		250*	315	450					
CTL 140		250*	315	450					
CTL 160		250*	315	450	560				
CTL 170		250*	315	450	560				
CTL 200		250*	315	450	560				
CTL 220		250*	315	450	560				
CTL 240		250*	315	450	560	710			
CTL 250		250*	315	450	560	710			
CTL 270		250*	315	450	560	710			
CTL 300		250*	315	450	560	710			
CTL 340		250*	315	450	560	710			
CTL 350		250*	315	450	560	710	800		
CTL 360		250*	315	450	560	710	800		
CTL 380		250*	315	450	560	710	800		
CTL 450		250*	315	450	560	710	800		
CTL 480		250*	315	450	560	710	800	900	
CTL 510		250*	315	450	560	710	800	900	
CTL 530		250*	315	450	560	710	800	900	
CTL 570		250*	315	450	560	710	800	900	1000
CTL 600		250*	315	450	560	710	800	900	1000
CTL 700		250*	315	450	560	710	800	900	1000
CTL 800									1120
CTL 900	* not available in the airfoil version								1120
CTL 1000									1120

DESCRIPTION OF THE UNIT

- Sizes referring to plug fans.

Size	Plug fans							
CTL 20	315							
CTL 30	315							
CTL 40	315	355						
CTL 50	315	355	400					
CTL 60	315	355	400					
CTL 70	315	355	400					
CTL 80	315	355	400	630				
CTL 100	315	355	400	630				
CTL 120	315	355	400	630				
CTL 140	315	355	400	630				
CTL 160	315	355	400	630	800			
CTL 170	315	355	400	630	800			
CTL 200	315	355	400	630	800			
CTL 220	315	355	400	630	800			
CTL 240	315	355	400	630	800	1000		
CTL 250	315	355	400	630	800	1000		
CTL 270	315	355	400	630	800	1000		
CTL 300	315	355	400	630	800	1000		
CTL 340	315	355	400	630	800	1000		
CTL 350	315	355	400	630	800	1000	1100	
CTL 360	315	355	400	630	800	1000	1100	
CTL 380	315	355	400	630	800	1000	1100	
CTL 450	315	355	400	630	800	1000	1100	
CTL 480	315	355	400	630	800	1000	1100	
CTL 510	315	355	400	630	800	1000	1100	
CTL 530	315	355	400	630	800	1000	1100	
CTL 570	315	355	400	630	800	1000	1100	
CTL 600	315	355	400	630	800	1000	1100	
CTL 700	315	355	400	630	800	1000	1100	
CTL 800	315	355	400	630	800	1000	1100	
CTL 900	315	355	400	630	800	1000	1100	
CTL 1000	315	355	400	630	800	1000	1100	

DESCRIPTION OF THE UNIT

Ventilation sections

- **Motors:** the motors installed are three-phase asynchronous, with closed construction, fan cooled, squirrel cage rotor, compliant with IEC 60072-1, IEC 60034, and featuring:

- Index of protection	IP 55
- Insulation class	F
- Temperature limits compatible with class B	
- Max room temperature	40° C
- Construction	B3
- Single pole	2-4-6
- Two pole	2/4
	4/6
	4/8

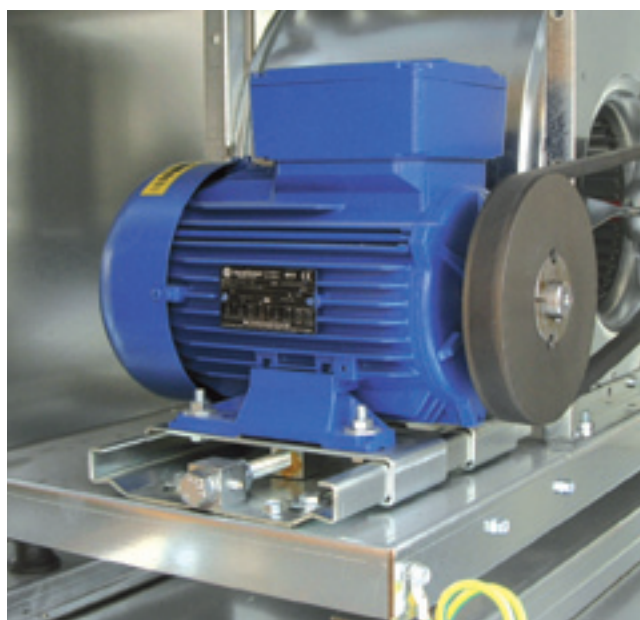
- **Efficiency IE2**

- **Drive:** pulley and V-belt drive with conical tightening bush. Made from cast iron with galvanic surface treatment, SPB or SPA grooves. Variable speed pulleys can be selected for optimum system control. The motor is installed on a belt tensioner made from thick galvanised sheet metal, allowing correct belt tension to be adjusted; stainless steel tensioners are available on request.

- **Vibration-damping supports:** the fan-motor assembly is installed on a press formed sheet metal frame; this is in turn generally secured to the bottom of the unit via vibration-damping supports. As standard the vibration dampers are made from oil resistant synthetic rubber or natural rubber with high energy dissipation, created using compounds especially designed for this type of product; hardness is 60°Sh. Upon request vibration dampers with all-metal springs can be installed, suitably sized to eliminate all possible vibrations.

- **Standard components:** the following are installed as standard on all ventilation sections:

- Safety microswitch
- Specially-sized safety mesh made from welded galvanised wire, fixed to the inspection opening on the fan-motor assembly
- Earth wire between motor support and base frame
- Flexible joint suitable for connecting the fan to the system, reducing noise and vibrations, made from polyester fabric with galvanised metal flange



ACCESSORIES

- All VORTICE air handling units can be installed with the following accessories, upon request:
 - External compartments for housing valves or electrical panels, made-to-measure where required. Made from the same 23 mm sandwich panel as the air handling unit.
 - Vibration damper joints on return air, fresh air inlet and ventilation air sections.
 - Fresh air and return air intake grills made from aluminium with fixed louvers.
 - Closed panels to be drilled on site.
 - IP 65 light fitting.
 - IP 65 light fitting with wiring.
 - Column pressure gauge, Magnehlic pressure gauge, differential pressure switch.
 - Pressure test points.
- Completely wired control systems and electrical panels can also be supplied. Testing can be performed directly on site.

