AERMEC
La prima per il clima

English

NCD

TECHNICAL - INSTALLATION – MAINTENANCE MANUAL

Central air handling units

900 m3/h ÷ 111280 m3/h

INCDUY. 0901. 6180761_00

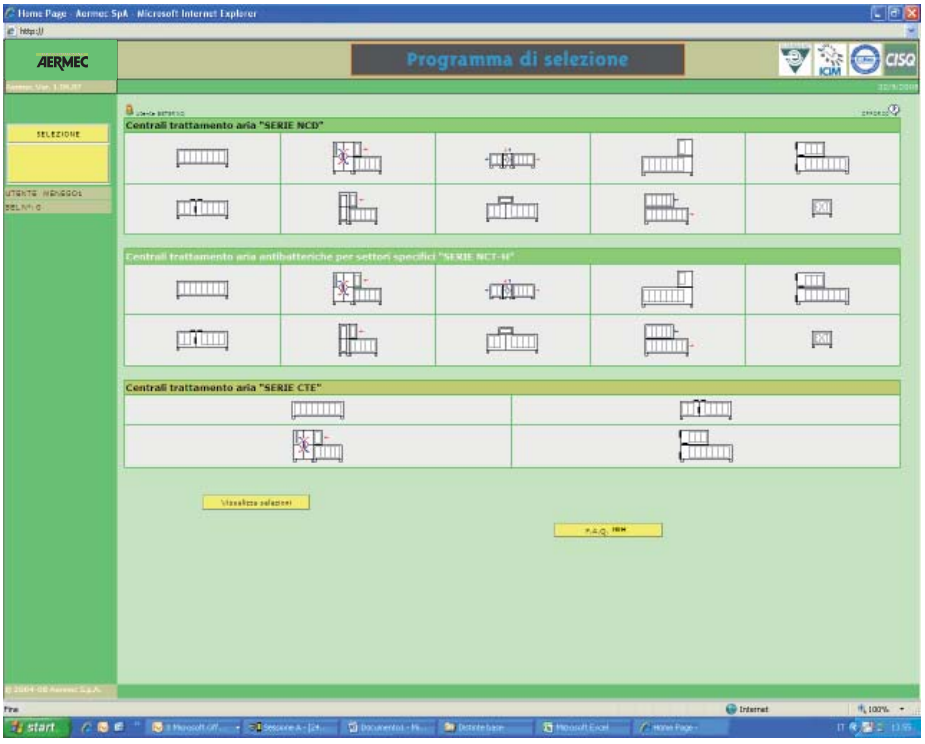
PREMISE

The fundamental premise when consulting this manual is that all stated represents a non-binding reference point.
The prerogative is, in fact, that of presenting our range of Central Air Handling Units, illustrating their main features and at the same time guaranteeing particular and exclusive realisations. The quality of the constructions and components used are a guarantee of reliability, functionality and efficiency.

NOTE

A "SELECTION PROGRAM" is at agent's disposal for more precise indications and for selection of the machine and the various combinations and set-ups available. It is realised to propose a functional, constructive and economic outline of the central air handling unit requested with extreme simplicity. AERMEC specialised staff is also available for clarifications regarding use of this software.

"SELECTION PROGRAM" MASK PHOTO



Dear Customer,
Thank you for choosing an AERMEC product. This product is the result of many years of experience and in-depth engineering research, and it is built using top quality materials and advanced technologies.
In addition, the CE mark guarantees that our appliances fully comply with the requirements of the European Machinery Directive in terms of safety. We constantly monitor the quality level of our products, and as a result AERMEC products are synonymous with Safety, Quality, and Reliability.

Product data may be subject to modifications deemed necessary for improving the product without the obligation to give prior notice.

Thank you again.
AERMEC S.p.A

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For the installation of the appliance, please follow the safety rules and regulations contained in this instruction manual


Moving parts hazard


Danger: Disconnect voltage


High temperature hazard


Generic danger


Voltage hazard


Useful information and warnings

1. WARNINGS REGARDING DOCUMENTATION

1.1. USE IN COMPLIANCE WITH THE DOCUMENTATION

The AERMEC NCD air handling units are constructed according to the recognised technical standards and safety regulations. However, dangers to the user or third parties may arise, as well as damage to the appliance and other objects, in the event of improper use not in compliance with the type of use envisaged.
The NCD range air handling units represent the summary of experience, studies and experiments in the specific aeraulic machines sector. The target is that of supplying the customer with a highly industrialised flexible product, with all the advantages that this choice brings in relation to quality and reliability. The NCD range adapts to all system specific needs, both regarding functionality and concerning clearance, allowing to satisfy different requirements in the air handling sector. Any use not expressly indicated in this manual is not permitted. Consequently **AERMEC will not assume any responsibility for damage that may occur due to failure to comply with these instructions.**

1.2. PRESERVATION OF THE DOCUMENTATION

The installation instructions along with all the related documentation must be given to the user of the system, who assumes the responsibility to keep the instructions so that they are always at hand in case of need. **READ THIS DOCUMENT CAREFULLY:** the installation of the appliance must be carried out by qualified and suitably prepared staff in compliance with the national legislation effective in the country of destination. The appliance must be installed in such a way as to enable maintenance and/or repairs to be carried out. The appliance warranty does not cover the costs for ladder trucks, scaffolding, or other elevation systems that may become necessary for carrying out servicing under warranty.

The validity of the warranty shall become null and void in the event of failure to comply with the above-mentioned indications.

2. FUNDAMENTAL SAFETY RULES

We remind you that the use of products that employ electrical energy and water requires that a number of essential safety rules be followed, including:

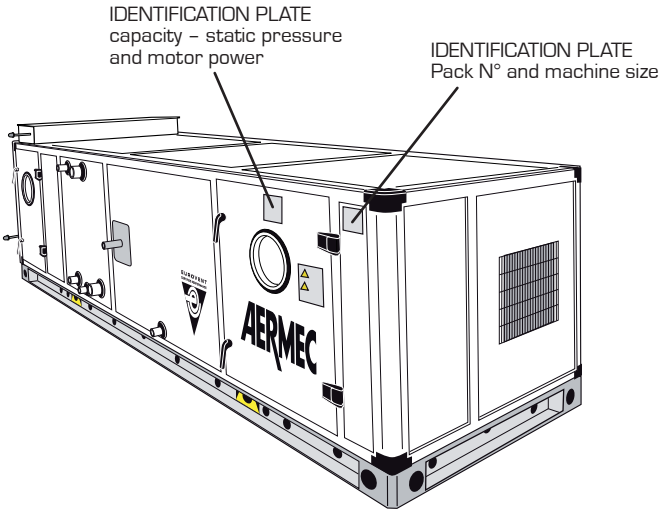
- This appliance is not suitable for use by persons (including children) with limited physical, sensory, or mental capacities or those lacking experience or knowledge, unless they are supervised or instructed regarding the use of the appliance by a person who is responsible for their safety. Children must always be supervised to ensure they do not play with the appliance.
- It is prohibited to carry out any technical or maintenance operation before the unit has been disconnected from the electrical mains by switching off the master switch of the system and the main power switch on the control panel.
- It is prohibited to modify the safety or adjustment devices without the manufacturer's authorisation and precise instructions
- It is prohibited to pull, detach, or twist the electrical cables coming from the unit even if it is disconnected from the electrical mains.
- It is prohibited to leave containers and flammable substances near to the central air handling unit.
- It is prohibited to touch the appliance when you are barefoot and with parts of the body that are wet or damp.
- It is prohibited to open the doors for accessing the internal parts of the appliance without first having switched off the master switch of the system.
- It is prohibited to disperse, abandon or leave the packing materials within the reach of children, as they are a potential source of danger.

3. PRODUCT IDENTIFICATION

The NCD central air handling unit can be identified by:

- **Identification plate**
  positioned on the flow fan inspection door

NOTE
Tampering, removal, lack of the identification plate or other does not allow the safe identification of the product and will make any installation or maintenance operation to be performed difficult.



4. DESCRIPTION OF THE UNIT

The structure of the central air handling units has a new, softer, ergonomic line realised in aluminium sections with external and internal rounded edges. This prevents the accumulation of dust and dirt, typical of sections with sharp edges, favouring better quality and salubrity of the air handled and making cleaning operations of the entire machine easier.

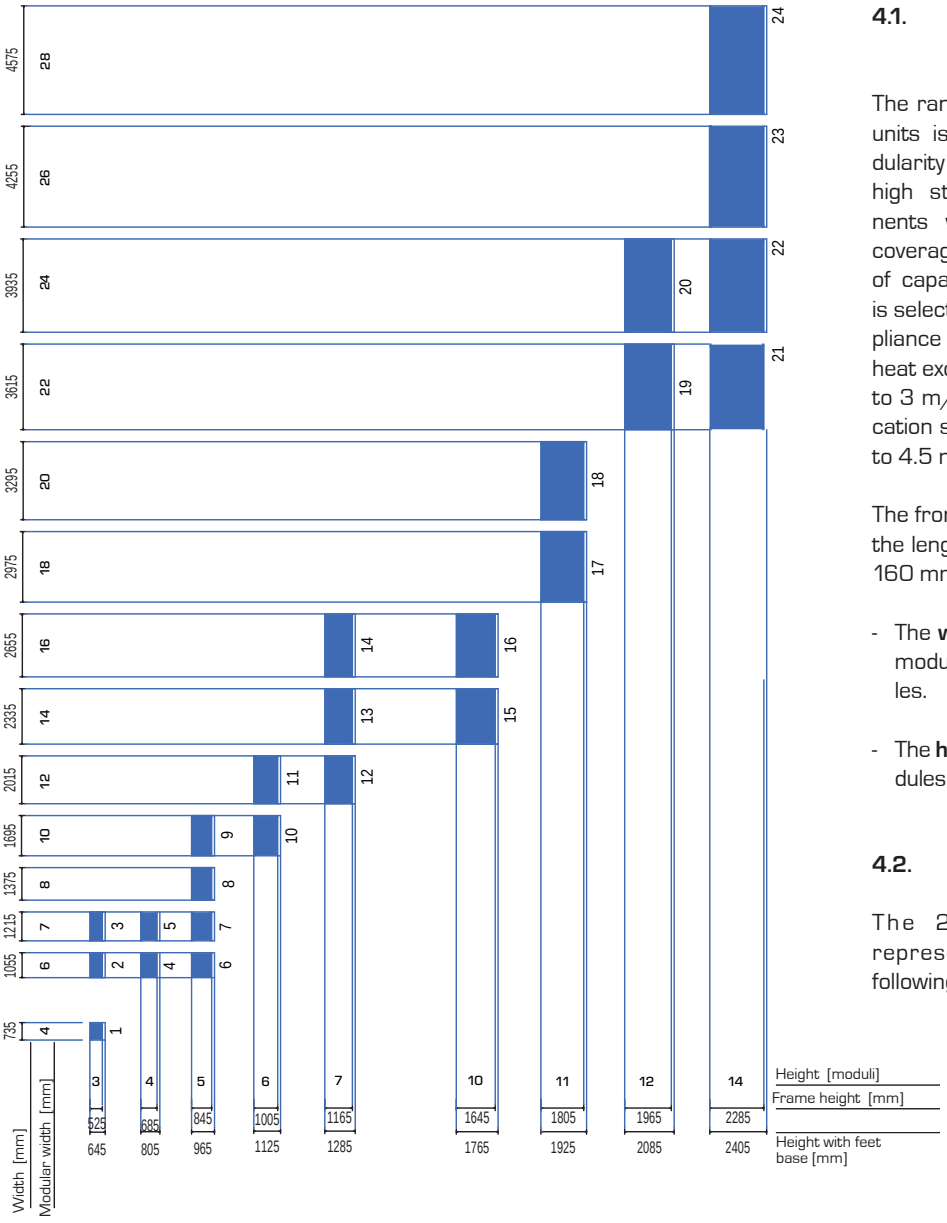
As well as the pleasing aspect of the finished product the NCD range also includes the following characteristic elements:

- aluminium section support structure;
- nylon angulars reinforced in fibreglass;
- connected panelling with effective thickness of 50 mm, built using the best materials (galvanised sheet steel - painted galvanised steel - 3105 aluminium alloy- stainless steel) and insulation materials (injected polyurethane and mineral wool);
- innovative systems for humidification devices with particular attention to the salubrity of the air handled, preventing the formation of mould and bacteria and with the objective of reducing the waste of water used to a minimum;
- all components are inside the casing and therefore the flow of air handled is perfectly isolated from external atmospheric agents, which may penalize the functionality and performance of the air handling units;
- a wide range of accessories and setups complete the units to give the customer and immediate view and check of all functioning conditions of the central air handling unit.

The NCD range is built with full respect to the EN 1886 Standard regarding mechanical resistance, the seepage of air, heat performance and noise insulation.

The precise coupling of the frame panelling allows to reach air seepage values that lie within the values of class B of the EN 1866 Standard with certification by the TÜV laboratories.

The performance declared is confirmed by EUROVENT certification. Specific features and functional details are represented in the following chapters.



4.1. MODULARITY AND SIZES

The range of NCD central air handling units is dimensioned following a modularity criterion that allows to obtain high standardisation of the components while offering comprehensive coverage of the entire envisioned field of capacities. The corresponding size is selected by choosing the unit in compliance with the air speed through the heat exchange coils (maximum speed ≤ to 3 m/s per cooling coil and humidification systems and maximum speed ≤ to 4.5 m/s for heating coils).

The frontal dimensions of the units and the lengths are modular in multiples of 160 mm (1/4 of a module):

- The **widths** go from a minimum of 4 modules to a maximum of 28 modules.

- The **heights** from a minimum of 3 modules to a maximum of 14 modules.

4.2. SIZES

The 24 sizes envisioned are represented in a front view in the following layout.

5. TECHNICAL DATA

NCD	Width	Height	External dim.		Internal dim.		Coil pack dim.		Coil surface	Air flow rate (m^3/h)			
			Width	Height	Width	Height	Base	Height		Frontal speed (m/s)			
	Modules	Modules	mm	mm	mm	mm	mm	mm	m^2	2	2,5	3	3,5
1	1	0,75	735	525	620	410	420	300	0,13	907	1134	1361	1588
2	1,5	0,75	1055	525	940	410	725	300	0,22	1566	1958	2349	2741
3	1,75	0,75	1215	525	1100	410	885	300	0,27	1912	2390	2867	3345
4	1,5	1	1055	685	940	570	725	480	0,35	2506	3132	3758	4385
5	1,75	1	1215	685	1100	570	885	480	0,42	3059	3823	4588	5352
6	1,5	1,25	1055	845	940	730	725	660	0,48	3445	4307	5168	6029
7	1,75	1,25	1215	845	1100	730	885	660	0,58	4206	5257	6308	7360
8	2	1,25	1375	845	1260	730	1045	660	0,69	4966	6207	7449	8690
9	2,5	1,25	1695	845	1580	730	1350	660	0,89	6415	8019	9623	11227
10	2,5	1,5	1695	1005	1580	890	1350	780	1,05	7582	9477	11372	13268
11	3	1,5	2015	1005	1900	890	1645	780	1,28	9238	11548	13857	16167
12	3	1,75	2015	1165	1900	1050	1645	960	1,58	11370	14213	17055	19898
13	3,5	1,75	2335	1165	2220	1050	1965	960	1,89	13582	16978	20373	23769
14	4	1,75	2655	1165	2540	1050	2285	960	2,19	15794	19742	23691	27639
15	3	3	2015	1965	1900	1850	1645	1740	2,86	20609	25761	30913	36065
16	3,5	3	2335	1965	2220	1850	1965	1740	3,42	24618	30772	36926	43081
17	3,5	3,5	2335	2285	2220	2170	1965	2100	4,13	29711	37139	44566	51994
18	4	3,5	2655	2285	2540	2170	2285	2100	4,80	34549	43187	51824	60461
19	4,5	3,5	2975	2285	2860	2170	2605	2100	5,47	39388	49235	59081	68928
20	5	3,5	3295	2285	3180	2170	2925	2100	6,14	44226	55283	66339	77396
21	5,5	3,5	3615	2285	3500	2170	3245	2100	6,81	49064	61331	73597	85863
22	6	3,5	3935	2285	3820	2170	3565	2100	7,49	53903	67379	80854	94330
23	6,5	3,5	4255	2285	4140	2170	3885	2100	8,16	58741	73427	88112	102797
24	7	3,5	4575	2285	4460	2170	4205	2100	8,83	63580	79475	95369	111264

EUROVENT CERTIFICATION

The EN 1886 Standard classifies the following aspects of the central air handling units:

- resmechanical resistance of the casing
- seepage of air through the casing;
- seepage of air around the filters frame;
- heat performance of the casing;
- noise insulation of the casing.

The accurate design of the structure is particularly effective regarding the above-listed features.

The features declared are certified according to the EUROVENT program by TÜV laboratories.

EUROVENT CERTIFIED PERFORMANCE

EUROVENT classification feature	Table	Class	EN 1886 values
Mechanical resistance of the containment box	1	2A	Max. relative flexure: 4 mm/m
Box seepage with pressure test -400 Pa	2	B	Max. seepage: 0.44 l/sm^2
Box seepage with pressure test +700 Pa	3	B	Max. seepage: 0.63 l/sm^2
Filters by-pass	4	F9	Total drop K: 0.5%
Heat conductivity U	5	T3	$1 < U \leq 1.4$ W/K m^2
Standard version heat bridges	6	TB3	$0.45 < k_b \leq 0.6$

6. DESCRIPTION OF THE COMPONENTS

6.1. PANELS

The casing has a supporting frame and buffer panels. The panels have a thickness of 50 mm and are fixed to the frame using special locking profiles that are embedded into the frame.
This system ensures:

- uniform pressure on the gasket between panel and frame;
- greater sealing of the air with pressurised or depressurised system.

The panels are envisioned in the standard versions stated in the following tables.

The panels can also be supplied with mineral wool insulation, with density of 80 - 100 kg/m3 and different sheet steel thickness. Special panels can be studied to soundproof the ventilating sections. In this case, contact the Sales Technical Dept.

Set-up	External Panel	Insulation	Internal Panel
PZP	Pre-painted Galvanised steel	Injected polyurethane	Galvanised steel
	Thickness 0.6 mm	Density 42 kg/m3	Thickness 0.6 mm
AAP	3105 Aluminium alloy	Injected polyurethane	3105 Aluminium alloy
	Thickness 0.8 mm	Density 42 kg/m3	Thickness 0.6 mm
XXP	STAINLESS steel Aisi 304	Injected polyurethane	STAINLESS steel Aisi 304
	Thickness 0.6 mm	Density 42 kg/m3	Thickness 0.6 mm
PXP	Pre-painted Galvanised steel	Injected polyurethane	STAINLESS steel Aisi 304
	Thickness 0.6 mm	Density 42 kg/m3	Thickness 0.6 mm
XZP	Aisi STAINLESS steel 304	Injected polyurethane	Galvanised steel
	Thickness 0.6 mm	Density 42 kg/m3	Thickness 0.6 mm
AXP	Aluminium alloy 3105	Injected polyurethane	STAINLESS steel Aisi 304
	Thickness 0.8 mm	Density 42 kg/m3	Thickness 0.6 mm

Set-up	External Panel	Insulation	Internal Panel
PZL	Pre-painted Galvanised steel	Mineral wool	Galvanised steel
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm
AAL	3105 Aluminium alloy	Mineral wool	3105 Aluminium alloy
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm
XXL	Aisi STAINLESS steel 304	Mineral wool	STAINLESS steel Aisi 304
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm
PXL	Pre-painted Galvanised steel	Mineral wool	STAINLESS steel Aisi 304
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm
XZL	STAINLESS steel Aisi 304	Mineral wool	Galvanised steel
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm
AXL	Aluminium alloy 3105	Mineral wool	STAINLESS steel Aisi 304
	Thickness 1.2 mm	Density 40 kg/m3	Thickness 0.6 mm

Example of codes:

PZL: **P** = Pre-painted galvanised steel, **Z** = Galvanised steel, **L** = Mineral wool

PXP: **P** = Pre-painted galvanised steel, **X** = STAINLESS steel, **P** = Injected polyurethane

CODES KEY	
1ª letter	*external panel*
2ª letter	*internal panel*
3ª letter	*insulation*

N.B. The letter **P** can have two meanings: Pre-painted or polyurethane

6.1.1. Features of the pre-painted galvanised sheet steel

Hot galvanised sheet steel (UNI EN 10142 EN 10147) pre-painted on HDG support with polyester resin (antislip), with self-adhesive protective plastic film to prevent damage to the panels during handling in the workshop and during transport of the air handling unit and positioning on site.
The features of the sheet steel are given in **tab. 1** below. The internal surface of the panels undergo further treatment to facilitate clinching of the injected polyurethane foam.

6.1.2. Aluminium alloy 3105 sheet steel features

3105 aluminium alloy sheet steel with self-adhesive protective plastic film to prevent damage during handling of the panels in the workshop and during transport of the air handling unit and when positioning on site.

6.1.3. Stainless steel sheet steel features

AISI 304 sheet steel protected by plastic film as described above. This type of steel is particularly resistant to the most aggressive atmospheric agents and is suitable, without undergoing alterations, for all types of washing and sanitization, for specific uses in hospital plants and in the food, chemical and pharmaceutical industries etc.
The perfect match between panel edges and frame makes the internal surface of the air handling unit completely smooth with consequent benefits in terms of reduced dust deposits inside the unit and easier cleaning and maintenance. The panels are sized so that the air handling unit has no horizontal joints on the sides, where possible, thus improving overall strength.
The inspection doors are supported by two nylon hinges with fibreglass reinforcement and steel pin. They are blocked by two or three handles in the same material, depending on the height of the unit.

Thickness of the film	μ m 25 (ECCA T-1)
Mirror gloss angle 60°	40 (EN 13523-2)
Pencil hardness (Koh-i-noor scale)	Grade "F" (ECCA T-1)
Bend test (without cracking)	3.0 T (ECCA T-7)
Bend test (adherence)	1.5 T (ECCA T-7)
Degree of reticulation MEK	100 d.c. (AICC n°23)
Resistance to saline mist	500 h blister max 8, max. penetration 3 mm (ECCA T-8)
Humidity resistance	1000 h blister max 8 (ASTM D2247)
Resistance to ageing Q.U.V.B	400 h (EN 13523-10)

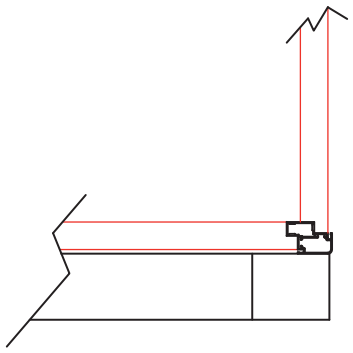
tab. 1

6.2. FRAME

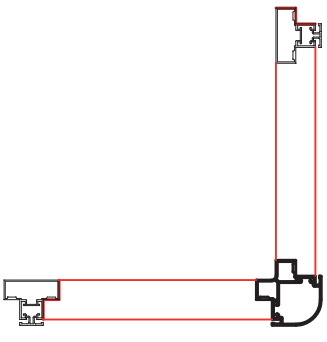
The frame is built of UNI 6060 extruded aluminium alloy profiles connected to each other by fibreglass reinforced nylon corner pieces and self-tapping screws. The tubulars that make up the frame are completely closed and therefore the heat bridges are reduced and the air by-passes around the components inside the central air handling unit are eliminated. For heavy duty operating conditions (temperatures of the handled air very low and environments with very high relative humidity), the frame can also be supplied in the version with heat bridge cut-off, even for just a part of the unit. The frame is also available in UNI 6060 anodized aluminium with or without heat cut-off. The shape of the sections and panels is illustrated in the following drawing and gives the layout:

- **frontal**: the basic horizontal section with base panel and an intermediate vertical upright;
- **ground view**: the vertical corner section and the intermediate section viewed in cross-section, the base section viewed from above.

6.2.1. Frontal



6.2.2. Ground view



6.3. BASE

- Feet are envisioned on the four corners for units with external lengths or widths greater than 1375 mm (the continuous base is envisioned in the case of humidification sections).
- A continuous base is envisioned for larger dimensions in steel sections with height of 120 mm.
- The sections that contain air washers envision a tank with height of 400 mm, which acts as a base.

6.4. ROOF

On request it is realised to our standard in 12/10 pre-painted galvanised sheet steel, with the same features previously illustrated for the galvanised sheet steel. Realisations in other materials can also be envisioned (aluminium - STAINLESS STEEL). The roof projects by 50 mm on every side with respect to the dimension of the control unit.

6.5. AIR INLET

- Aluminium shutters with wing-shaped blades are envisioned for the inlet of air.
- On request they can be supplied with sealing gaskets on the sides and on the blade section.

In the first case the seepage is less than 5% of the capacity for an upstream and downstream pressure differential of 1000 Pa.
In the second case the shutter can be considered the sealing type.
In outdoor installation the shutters are screwed to the central unit frame. In indoor installation the shutters are screwed to the relative panel.

6.5.1. Shutters

The types of envisioned shutters are given in the table below **(tab. 1)**
The shutter cannot be requested: alternatively the intake may be an opening, a flange or a blank panel in which a hole of the desired size must be made on site.

6.5.2. Mixing chamber

The envisioned configurations are given in the table below **(tab. 2)**
The shutters do not have to be requested: alternatively the vents can be envisioned as simple openings, with flange or blank panels on which an opening of the desired size must be made on site.

6.5.3. 3 shutter units

The configurations for the three-way mixing chambers are the following:
- two upper shutters and one internal for circulation;
- two front shutters and one internal horizontal shutter for circulation (for stacked units);
- two internal lateral shutters and one for circulation (configuration for expulsion and intake of non-ducted fresh air).

The shutters do not have to be requested: alternatively the vents can be envisioned as simple openings, with flange or blank panels on which an opening of the desired size must be made on site.

SHUTTER POSITION	DIMENSION	ISTALLATION
Frontal	the entire section	external
Frontal	partial	external or internal
Upper	partial	external or internal
Lower	partial	internal
Right side	partial	external
Left lateral	partial	external

(tab. 1) Shutter set-ups

SHUTTERS POSITION	ISTALLATION
Frontal and upper	external or internal
Frontal and lower	internal
Upper and right lateral	external
Upper and left lateral	external
Frontal and right lateral	external
Frontal and left lateral	external
Lateral and lateral	external
Frontal and frontal	external

(tab. 2) Shutter set-ups in the mixing chambers

7. FILTRATION

The choice of the filter is a determining factor in order to obtain good quality of the air handled and correct hygiene in the entire ducted air distribution system.
Below find the description of the identification tables of the various filtering systems. The plant designer makes this choice considering:
- the system specific requirements;
- the data of the air to be handled;
- the periodic maintenance that the filtering systems must undergo.

The filtering systems can also be supplied with accessories such as differential pressure switch indicators, with alarm signal to check the state of efficiency even at a distance (and with machine running).
A filter classification table is given as an example **(tab.1)**:

(tab. 1) Filter classification

Classification according to the EN 779 Standard			
Initial colorimetric efficiency (EA)		EA < 20 %	EA >= 20 %
Features		Average weight efficiency	Average colorimetric efficiency
		Am (%)	Em (%)
Filter unit	Class of filter	Class limit	
Large granule dust (G)	G 1	Am < 65	-
	G 2	65 <= Am < 80	-
	G 4	Am >= 90	-
Fine granule dust (F)	F 5	-	40 <= Em < 60
	F 6	-	60 <= Em < 80
	F 7	-	80 <= Em < 90
	F 8	-	90 <= Em < 95
	F 9	-	Em >= 95

HEPA and ULPA filters classification according to the EN 1822 Standard		
Filter class	Average efficiency of the entire filter surface (Overall efficiency value)	Efficiency in a specific point of the filter (Local efficiency value)
	Efficiency (%)	Efficiency (%)
H 10	85	-
H 11	95	-
H 12	99,5	-
H 13	99,95	99,75
H 14	99,995	99,975
U 15	99,9995	99,9975
U 16	99,99995	99,99975
U 17	99,999995	99,9999

7.1. CELL PRE-FILTERS

The removable cell pre-filters are the most widely used in the central air handling units owing to their practicality, renewability and because they are easy to find on the spare parts market. The cells with average degree of efficiency can be synthetic or metal depending on their use and in compliance with the efficiency requested in the specifications. The filtering cells can generally be regenerated by simple immersion into soapy water and can be re-used after rinsing. Only metal filters, (generally used for air flows with greasy vapours) can be alternatively washed using solvents and dried with compressed air.

The quantity and the dimensions of the cells used are those indicated in the following tables **(tab. 1)**:

(tab. 1)

Mod. NCD	FILTER 290 x 595	FILTER 490 x 595	FILTER 595 x 595	FILTER 290 x 290	FILTER 490 x 290	Sur. [m^2]
1	1					0,17
2	1			1		0,26
3	1				1	0,31
4		1			1	0,43
5		1			1	0,43
6	1		1			0,53
7		1	1			0,65
8			2			0,71
9	1		2			0,88
10		2			4	1,08
11	3	3				1,39
12		6				1,75

Mod. NCD	FILTER 290 x 595	FILTER 490 x 595	FILTER 595 x 595	FILTER 290 x 290	FILTER 490 x 290	Sur. [m^2]
13		6			2	2,03
14		8				2,33
15		9				3,19
16	3	9				3,70
17	6	9				4,22
18	4	12				4,94
19	7	12				5,46
20	5	15				6,17
21	8	15				6,69
22	6	18				7,41
23	9	18				7,93
24	7	21				8,64

7.2. ROLL FILTERS

The roll filters are generally used as an alternative to cell filters, when the selected filtering system is to be given a long duration without short term periodical maintenance. They have the great advantage of renewing themselves automatically in compliance with an automatic signal (differential pressure switch), which allows to roll up the dirty part of the filter onto a roll and place the clean part in the airflow.

Duration of the filter, which cannot be regenerated, is tightly linked to the dust in the air. Allows maintenance at long intervals (see chapter 17 Maintenance), which is indicated by an optical or acoustic alarm signal that can also be sent to a remote control system (to the plant's wall diagram).

The roll filter is normally supplied complete with wired control equipment, ready to work.

Roll filter dimensions

NCD	External dim. (mm)		Internal dim. (mm)		Filter dimensions (mm)	N° filters	Position
1	735	525	620	410	not available	-	-
2	1055	525	940	410	not available	-	-
3	1215	525	1100	410	not available	-	-
4	1055	685	940	570	not available	-	-
5	1215	685	1100	570	not available	-	-
6	1055	845	940	730	not available	-	-
7	1215	845	1100	730	1000 X 630	1	horizontal
8	1375	845	1260	730	1200 X 630	1	horizontal
9	1695	845	1580	730	1500 X 630	1	horizontal
10	1695	1005	1580	890	1500 X 830	1	horizontal
11	2015	1005	1900	890	1800 X 830	1	horizontal
12	2015	1165	1900	1050	1800 X 930	1	horizontal
13	2335	1165	2220	1050	2200 X 930	1	horizontal
14	2655	1165	2540	1050	2500 X 930	1	horizontal
15	2015	1965	1900	1850	1800 X 1830	1	vertical
16	1335	1965	1220	1850	1800 X 2130	1	vertical
17	2335	2285	2220	2170	2100 X 2130	1	vertical
18	2655	2285	2540	2170	2100 X 1230	2	vertical
19	2975	2285	2860	2170	2100 X 1530	2	vertical
20	3295	2285	3180	2170	2100 X 1530	2	vertical
21	3615	2285	3500	2170	2100 X 1830	2	vertical
22	3935	2285	3820	2170	2100 X 1830	2	vertical
23	4255	2285	4140	2170	2100 X 2130	2	vertical
24	4575	2285	4460	2170	2100 X 2130	2	vertical

7.3. BAG FILTERS

The bag filters are the soft or rigid types in compliance with design choices. They are generally preceded by regenerable cell or roll pre-filters that increase their duration by stopping larger polluting particles and can be followed by even greater efficiency filters.
The bag filtering cells are fixed to a relevant support frame using hermetic sealing systems to prevent any by-pass of untreated air and they can be extracted from the relevant inspection compartment upstream from the cells, which has dimensions suitable for access of staff in charge of maintenance. Special versions of cell filters for specific uses in the hospital sector and chemical industry etc. (anti-contamination systems) can be studied on specific request.

7.4. ABSOLUTE FILTERS

The absolute filters are generally used where it is necessary to guarantee purity of the air and high-level aseptic conditions. They are most widely used in hospitals (operating theatres and similar) along with machines destined for the chemical and electronics industries.
These types of filters are generally positioned in flow conditions, after the ventilating sections, and are preceded by progressive efficiency filtering systems (cell filters plus bag filters). A differential pressure switch must be supplied with the absolute filters, which indicates the degree of cleanliness and so allows the cells to be replaced in due time. Particular care is taken in the realisation of the cells housing system in order to prevent any possibility of air by-pass and to make cell replacement in the maintenance phase easier.

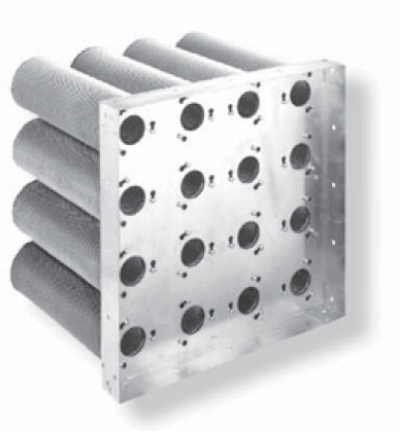
The following tables indicate the quantities and dimensions of the cells used.
The data is valid for both the bag and absolute filters.

NCD	FILTER 290 x 595	FILTER 490 x 595	FILTER 595 x 595	FILTER 490 x 290	Surface m^2
1	1				0,17
2	1				0,17
3				2	0,28
4		1		1	0,43
5		1		1	0,43
6	1		1		0,53
7	1		1		0,53
8			2		0,71
9	1		2		0,88
10	2	2		1	1,07
11	3	3			1,39
12	3		3		1,58

NCD	FILTER 290 x 595	FILTER 490 x 595	FILTER 595 x 595	FILTER 490 x 290	Surface m^2
13	4		3		1,75
14	4		4		2,11
15			9		3,19
16	3		9		3,70
17	6		9		4,22
18	4		12		4,94
19	7		12		5,46
20	5		15		6,17
21	8		15		6,69
22	6		18		7,41
23	9		18		7,93
24	7		21		8,64

7.5. ACTIVATED CARBON FILTERS

The activated carbon filters are used for the absorption of odours and toxic substances present in the air to be handled, whether it be air to be introduced into rooms or air to be expelled from polluted rooms (e.g. odours released by the human body, odours coming from kitchens, some components of smoke of any origin, hydrocarbon vapours dissolved in the air etc.). These filtering systems must be appropriately protected by high-efficiency pre-filters that extend their duration and guarantee maximum efficiency for this entire duration. The containment sections can be perfectly accesses for efficient maintenance and disposal or renewable type cells can be used.



NCD	CELL 610 X 305	CELL 305 X 508	CELL 508 X 610	CELL 610 X 610	N° CYLINDERS
1	1				8
2	1				8
3		2			12
4		1	1		18
5		1	1		18
6	1			1	24
7	1			1	24
8				2	32
9	1			1	24
10	3		2		48
11	3		3		60
12	3			3	72

NCD	CELL 610 X 305	CELL 305 X 508	CELL 508 X 610	CELL 610 X 610	N° CYLINDERS
13	4			3	80
14	4			4	96
15				9	144
16	3			9	168
17	6			9	192
18	4			12	224
19	7			12	248
20	5			15	280
21	8			15	304
22	6			18	336
23	9			18	360
24	7			21	392

7.6. ELECTROSTATIC FILTERS

The electrostatic filters are used when high filtrating performances are requested, even on very small particles, together with limited pressure drops.
The system uses positively loaded polarised electrodes powered with about 10,000V and metal plates loaded with the opposite charge. The creation of an intense electrostatic field generates positive ions that capture the polluting particles present in the air.
The advantages deriving from the use of electrostatic filters are:

- reduced maintenance requirements,
- low energy consumption,
- the possibility to use them in very high working temperatures.

7.7. GERMICIDAL LAMPS

They are generally used in sequence with very high efficiency filter systems and their use is recommended when bacteria and germs, always present in the air, must be kept under control in the airflow to the rooms to be treated and in the exhaust air from rooms with possible pollutants. The power and positioning of the germicidal lamps have been defined to satisfy usual uses, while targeted solutions can be designed for specific uses. The sections are complete with lamps that are already wired and terminal box for connection to the mains supply.

On specific request previously unmentioned filtering systems can also be examined that are suitable for filtering in particular industrial situations with very low air temperatures (anti-freeze systems) or in the presence of desert sands (inertia filters).

8. COILS

8.1. HEAT EXCHANGE COILS

The heat exchange coils are the most important elements that make up the air handling units, since it is in these elements that the heat exchange takes place between:
- primary fluid (hot or cold water, hot or cold gas),
- secondary fluid (air to be handled in the central unit).

The coils must be dimensioned:
- on the basis of the amount of air to be handled,
- with respect to the technical parameters that regard construction materials, in order to guarantee the requested mechanical resistance.
- in compliance with a range of features which include the design features, (this fact allows good standardisation of the sizes, as will be specified successively).

For executions of coils not envisioned by this manual, particular projects can be examined on request.

Standard execution:
• P6030 geometry in copper-aluminium;

Optional executions:
• Copper-copper;
• Copper-tinned copper;
• Copper-pre-painted aluminium;
• Fe-Al;

Functioning:
• Water;
• Heated water;
• Steam;
• Direct expansion.

Extractability:
Lateral (with the condensate drip tray for the cooling coils).

Condensate drip tray:
Built in 3105 aluminium alloy or in stainless steel with lateral 1" G drain (on the panel). They are used only for the coils and therefore, in the case of cold coil followed by humidification, there will be two 3105 aluminium alloy trays connected to each other.

Rows:
The coils are available as standard from 1 to 8 rows and different circuits as shown in detail in the following tables. For different n° rows, circuits, louver pitch, consult the Sales Technical Dept.

NCD	SINGLE ZONE			
	Frontal sur.	Height	Length	Pipes/Row
	[m2]	[mm]	[mm]	[n°]
1	0,126	300	420	5
2	0,218	300	725	5
3	0,266	300	885	5
4	0,348	480	725	8
5	0,425	480	885	8
6	0,479	660	725	11
7	0,584	660	885	11
8	0,690	660	1045	11
9	0,891	660	1350	11
10	1,053	780	1350	13
11	1,283	780	1645	13
12	1,579	960	1645	16

NCD	SINGLE ZONE			
	Frontal sur.	Height	Length	Pipes/Row
	[m2]	[mm]	[mm]	[n°]
13	1,886	960	1965	16
14	2,194	960	2285	16
15	2,862	1740	1645	29
16	3,419	1740	1965	29
17	4,127	2100	1965	35
18	4,799	2100	2285	35
19	5,471	2100	2605	35
20	6,143	2100	2925	35
21	6,815	2100	3245	35
22	7,487	2100	3565	35
23	8,159	2100	3885	35
24	8,831	2100	4205	35

8.2. WATER COILS

The features are given in the following table (P6030 geometry).

8.2.1. Collectors diameter for single zone water coils with 60x30 geometry

NCD	Diam. (R1,2)	Diam. (R2,2)	Diam. (R3,2)	Diam. (R4,1)	Diam. (R4,2)	Diam. (R6,1)	Diam. (R6,2)	Diam. (R8,1)	Diam. (R8,2)
1	1"	1"	1"	1"	1"	1"	1"	1"	1"
2	1"	1"	1"	1"	1"	1"	1"	1"	1"
3	1"	1"	1"	1"	1"	1"	1"	1"	1"
4	1"	1"	1"	1"	1"	1"	1"	1"	1"
5	1"	1"	1"	1" 1/2	1" 1/2	1" 1/2	1" 1/2	1" 1/2	1" 1/2
6	1"	1"	1"	1" 1/2	1" 1/2	1" 1/2	1" 1/2	2"	2"
7	1"	1"	1"	1" 1/2	1" 1/2	1" 1/2	1" 1/2	2"	2"
8	1"	1"	1"	1" 1/2	1" 1/2	1" 1/2	1" 1/2	2"	2"
9	1"	1"	1" 1/2	1" 1/2	1" 1/2	1" 1/2	1" 1/2	2"	2"
10	1"	1"	1" 1/2	1"1/2	1"1/2	1" 1/2	1" 1/2	2" 1/2	2" 1/2
11	1"	1" 1/2	1" 1/2	2"	2"	1"1/2	1"1/2	2" 1/2	2" 1/2
12	1"	1" 1/2	1" 1/2	2"	2"	2"	2"	2" 1/2	2" 1/2
13	1"	1" 1/2	1" 1/2	2"	2"	2"	2"	3"	3"
14	1"	1" 1/2	1" 1/2	2"	2"	2"	2"	3"	3"
15	1" 1/2	2" 1/2	2"	2" 1/2	2" 1/2	3"	3"	4"	4"
16	1" 1/2	2" 1/2	3"	2" 1/2	2" 1/2	3"	3"	4"	4"
17	2"	2" 1/2	3"	3"	3"	3"	3"	4"	4"
18	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
19	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
20	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
21	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
22	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
23	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"
24	2"	2" 1/2	3"	3"	3"	4"	4"	4"	4"

8.3. DIRECT EXPANSION COILS

The geometrical features are given in the following table.

NCD	Frontal sur.	Height	Length	Pipes/ row	Circuits							
	[m2]	[mm]	[mm]	[n°]	R 3.1	R 3.2	R 4.1	R 4.2	R 6.1	R 6.2	R 8.1	R 8.2
1	0,126	300	420	12	3	6	3	6	4	6	6	12
2	0,218	300	725	12	3	4	6	3	4	6	5	6
3	0,266	300	885	12	3	4	6	4	5	6	6	8
4	0,326	450	725	18	6	9	6	9	9	18	9	12
5	0,398	450	885	18	6	9	6	9	9	18	12	18
6	0,435	600	725	24	5	7	6	6	8	10	10	14
7	0,531	600	885	24	6	8	10	7	10	13	12	16
8	0,627	600	1045	24	7	9	10	8	11	15	14	18
9	0,810	600	1350	24	9	12	15	10	14	18	16	22
10	1,013	750	1350	30	9	15	15	20	22	30	24	30
11	1,234	750	1645	30	12	15	22	15	20	28	26	34
12	1,481	900	1645	36	14	18	22	18	26	32	30	38
13	1,769	900	1965	36	17	21	29	22	30	38	38	44
14	2,057	900	2285	36	20	24	29	24	34	42	42	52
15	2,879	1750	1645	70	35	52	35	70	52	70	70	140
16	3,439	1750	1965	70	35	52	46	70	70	105	70	140
17	4,127	2100	1965	35	10	17	14	35	21	35	28	35
18	4,799	2100	2285	35	17	26	17	35	21	35	35	70
19	5,471	2100	2605	35	17	26	23	35	35	52	35	70
20	6,143	2100	2925	35	17	26	23	35	35	52	35	70
21	6,815	2100	3245	35	26	52	23	35	35	52	46	70
22	7,487	2100	3565	35	26	52	23	35	35	52	46	70
23	8,159	2100	3885	35	26	52	35	70	35	105	46	70
24	8,831	2100	4205	35	26	52	35	70	35	105	46	70

8.4. ELECTRIC COILS

The electric power supply coils are often used for small heating loads in small and medium sized central air handling units, mainly for summer post-heating when it is not possible (or convenient) to activate the traditional hot water production system. The electric coils can also be used as an anti-freeze device for protection of the filters or water coils without glycol.

- They are manufactured with armoured resistances in finned steel pipes and powered at 380 V
- They are equipped with an automatic rearm limit thermostat and manual rearm safety thermostat.

The powers and number of stages are indicated in the following table.

The heat drops (Dt) refer to the nominal capacity corresponding to a front speed on the coils of 2.5 m/s.

NCD	1st Stage			2nd Stage			3rd Stage			4th Stage		
	Elements	Power	Dt	Elements	Power	Dt	Elements	Power	Dt	Elements	Power	Dt
	[n°]	[W]	[°C]	[n°]	[W]	[°C]	[n°]	[W]	[°C]	[n°]	[W]	[°C]
1	3	2100	6	6	4200	11	9	6300	17	12	8400	22
2	3	2100	3	9	6300	10	12	8400	14	18	12600	21
3	3	3000	4	9	9000	11	12	12000	14	18	18000	21
4	3	3600	3	9	10800	10	12	14400	14	18	21600	21
5	3	3900	3	9	11700	9	12	15600	12	18	23400	18
6	3	4500	3	9	13500	9	15	22500	15	21	31500	21
7	6	7200	4	15	18000	11	21	25200	15	27	32400	19
8	6	7800	4	18	23400	11	24	31200	15	33	42900	21
9	6	9000	4	18	27000	11	24	36000	15	33	49500	20
10	6	10800	3	18	32400	10	27	48600	15	36	64800	20
11	9	13500	4	27	40500	11	36	54000	15	45	67500	19
12	9	18000	4	27	54000	12	36	72000	15	45	90000	19
13	12	24000	4	30	60000	10	45	90000	15	60	120000	20

9. HUMIDIFICATION

The humidification treatment of the air is a very important component for creating a well-being climate in air-conditioned rooms. The humidification systems described below must be aimed at the specific use for which they are destined in compliance with the fluid available. It is obvious that the fact that moulds and bacteria find a favourable environment on humid surfaces and in stagnant water must be taken into consideration. The following have been envisioned to limit this problem:
- draining condensate drip trays,
- small pump traps.

The evaporator packs have anti-mould treatment and can be supplied with a sensor that allows small water consumption, shutting-off the flow of water as soon as the pack is completely wet. The steam system is recommended for small capacities and use where the salubrity of the air is particularly required (e.g. in hospitals).

9.1. EVAPORATOR PACK HUMIDIFICATION

The following types can be envisioned:
a) 100 mm paper wet pack and non-returnable water;
b) with 200 mm paper wet pack and non-returnable water;
c) with 100 mm paper wet pack and circulation pump;
d) with 200 mm paper wet pack and circulation pump;
e) with 100 mm PVC wet pack and circulation pump;
f) with 200 mm PVC wet pack and circulation pump;
g) 100 mm paper wet pack with supply water control by means of sensor on the pack and solenoid valve;
h) with 200 mm paper wet pack with supply water control by means of sensor on the pack and solenoid valve.

9.2. STEAM HUMIDIFICATION

The following types can be envisioned:
- with just steam distribution ramp supplied;
- with immersed electrodes steam generator.

9.3. AIR WASHERS

The system is made up by two opposite ramps to which nebulizing nozzles are fixed. These are contained in a water-proof polypropylene chamber inside the casing of the air handling unit. The system is complete with fittings and pump/s support tank measuring 400 mm high with drain hole, overflow hole, filter, float valve, drop eliminators before and after the ramps. The type with two nozzle ramps and a circulation pump may be envisioned or with two nozzle ramps and two circulation pumps.

9.4. WATER AND COMPRESSED AIR HUMIDIFICATION

The system is made up of special atomising nozzles, fed with water and compressed air in separate lines. The accurate installation and respect of the minimum distances with successive components in the air flow allow to nebulise the water into very fine drops, thus preventing the risk of condensation. In this way very elevate performances are obtained and, thanks to the automatic cleaning of the nebulizing heads, also low maintenance costs.
The system is supplied with all components necessary for correct functioning (ramp, self-cleaning nozzles, pipes and supply cabinet with modulating adjustment).

9.5. CONDENSATE DRIPTRAYS

- For water and compressed air humidification and steam humidification: internal condensate drip tray (height equal to 50 mm) in 3105 aluminium alloy or stainless steel with 1" G drain;
- for evaporator pack humidification (type **a, b** in **paragraph 9.1**): internal condensate drip tray (height equal to 50 mm) in 3105 aluminium alloy or stainless steel and reinforced polypropylene tank trap with 1" GJ drain and 1" GJ supply;
- for evaporator pack humidification (type **g, h** in **paragraph 9.1**): internal condensate drip tray (height equal to 50 mm) in 3105 aluminium alloy or stainless steel and reinforced polypropylene tank trap with 1" GJ drain and supply via solenoid valve;
- for evaporator pack humidification (type **c, d, e, f** in **paragraph 9.1**): vasca internal condensate drip tray (height equal to 50 mm) in 3105 aluminium alloy or stainless steel and reinforced polypropylene tank trap with 1" GJ drain and supply via float valve;
- for air washing humidification: stainless steel tray (height equal to 400 mm).

For NCD 13, NCD 20 and NCD 28 sizes the tank trap is manufactured in 3105 aluminium alloy.

9.6. DROP ELIMINATORS

The drop eliminator is carefully designed to allow the maximum efficiency in withholding the drops of water generated inside the air handling unit, for specific treatments requested (humidification and dehumidification). It is offered as an optional and mandatory component. They can always be removed laterally.
Use is mandatory in the following cases:
- cooling coil:
  air speed above 2.6 m/s;
- wet pack humidifiers:
  air speed above 2.6 m/s;
- steam and water-compressed air humidifiers;
- washers (with inlet flow rectifier).

Materials used:
- galvanised steel (standard);
- aluminium alloy 3105;
- AISI 304 stainless steel;
- polypropylene (in the case of air washer humidification).

10. VENTILATING SECTIONS

10.1. FANS

The fans are among the most important components for the central air handling units as the fan-motor unit constitutes the only continuously moving part in the machine. As such, it is subject to problems of wear, noise, maintenance, safety devices etc.
A correct dimensional and technological choice guarantees the good functioning of the machine through time. The possibility has therefore been created to use a large number of fans with different features in the same sized central air handling unit. These can adapt to real situations of the design thus optimising yield, sound levels and functioning flexibility.

- **Series:** The fans envisioned are in compliance with the DIN 323 R20 series (square mouth) of the following types:
• forward curved blade;
• backward curved blade;
• wing-shaped backward curved blade.

- **Sizes:** the size of the fan is selected on the basis of the capacity and static pressure requested. The sizes listed in **tab 10.2** are available for each control unit size. The codes indicate the external diameter of the rotor in mm;

- **Directions:** the directions envisioned for the fans are illustrated in the layout **(chap. 10.3)**.
- The directions with even final number refer to the right hand unit direction;
- with odd final number, they refer to the left hand unit direction.
The choice of direction depends on the real plant situation in the room in which the unit is positioned and must consider, apart from the fan-motor inspection side, also the small pressure drops that can be obtained in the fitting between the unit and the ducting.

- **Anti-vibration mounts:** standard versions have rubber anti-vibration mounts (60°Sh) and anti-vibration seals on the flow vent. The use of spring supports is envisioned as an option with minimum efficiency of 80% (in this case the dimensions may undergo variations with respect to those indicated). This option is available starting from and including fan size 450 (please contact our Sales Technical Department).

The ventilating sections are supplied as standard with:

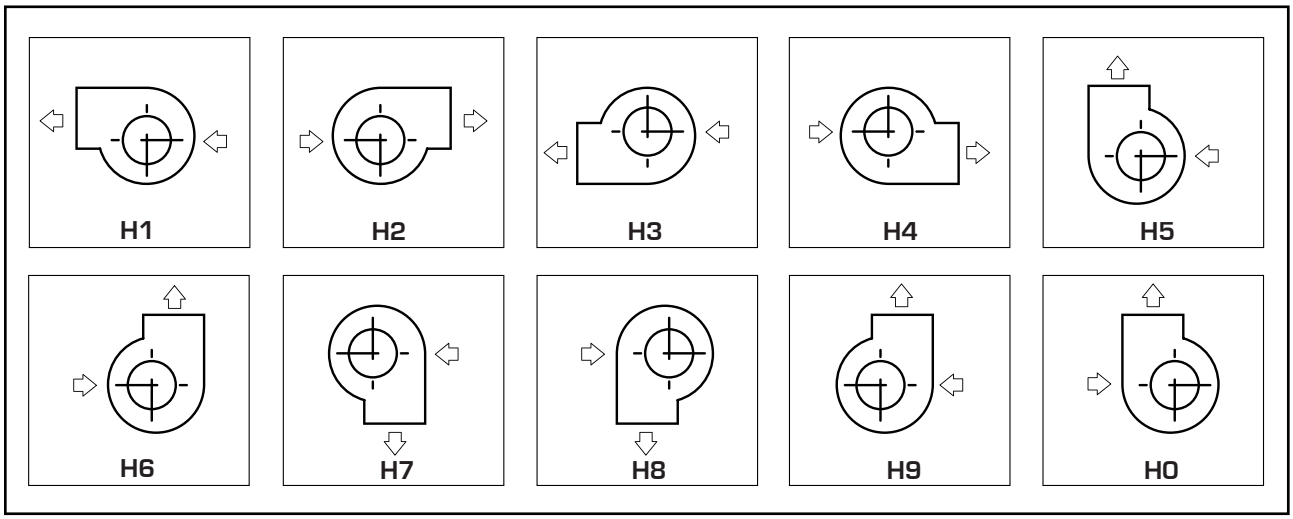
• accident-prevention grid behind the inspection door replacing the sump;

• earth wire between motor cradle and base frame.

10.2. FANS/CENTRAL UNIT COMPATIBILITY TABLE

CENTAL UNIT SIZE	FAN SIZE																
	180	200	225	250	280	315	355	400	450	500	560	630	710	800	900	1000	1120
1	■																
2	■																
3	■																
4		■	■	■	■												
5			■	■	■												
6				■	■	■											
7				■	■	■											
8					■	■											
9						■											
10							■	■									
11							■	■									
12									■	■							
13									■	■							
14										■							
15											■	■	■	■			
16												■	■	■	■		
17												■	■	■	■		
18													■	■			
19													■	■	■		
20														■	■	■	
21															■	■	
22															■	■	
23															■	■	
24															■	■	

10.3. FANS DIRECTION LAYOUT



11. MOTORS

Motors are three-phase asynchronous with squirrel cage rotor, totally enclosed design with external cooling with electrical features in compliance with:
- IEC 60034-1 (general provisions for electrical machinery),
- IEC 60072-1 (dimensional features)
- IEC 34-7 (mounting arrangements IM B3 - IM1001).

- **Protection rating:** IP55
- **Stator winding class:** F

The motors are envisioned with single polarity (2, 4, 6 poles depending on fan speed) and, on request, with double polarity 4/6, 4/8 poles with simple winding. The motors can be supplied with inverter.

11.1. TRANSMISSION

The pulleys can be fixed or variable for improved calibration of the fan speed in the system.
The transmission belts can be the SPA, SPB or SPC type.
The pulleys are supplied with "Taperlock" tapered locking set and are statically and dynamically balanced. The belt-tensioner system guarantees easy periodical maintenance.

11.2. SILENCERS

Noise must be considered as one of the many polluting factors produced by modern technological machines. It is therefore important to take care in limiting noise emission from the fans with an accurate choice of the fan working point. Silencers can be installed in intake and flow of the ventilating section in order to further reduce noise levels.

Baffle lengths:
- 560 mm
- 880 mm
- 1200 mm
- 1520 mm

Baffle thickness:
- 200 mm

Air passage width:
- min. 105 mm
- max. 114 mm

Construction:
Mineral wool with surfaces in contact with the air protected with polyester film and contained between expanded galvanised steel sheets. Sound attenuation at various frequencies is shown in the table below.

	Sound attenuation [dB]							
Length [mm]	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**
560	2	5	10	17	18	22	26	13
880	5	10	18	26	29	39	41	20
1200	7	14	24	35	39	48	48	28
1520	9	16	30	44	45	48	48	31

11.3. MULTI ZONE/DOUBLE DUCT

The multizone or double duct sections are generally used where air temperatures are controlled by acting on the on-off shutters of two airflows with hot and cold temperatures, also in a differentiated manner between the different areas to be treated with the same unit.
The multizone section:
- contains the hot and cold coil with adequate power, in two separate flows
- it has the same amount of connected shutters as the zones to be treated, as requested by the plant design.

The double duct section is similar to the multizone section. However, it does not have the connected shutters in the flow position. This is because the mixture to introduce controlled-temperature air flows into rooms can be obtained by appropriate terminal appliances positioned in the rooms themselves.
When selecting the machines it is necessary to be aware of:
- how many zones must be treated,
- the relative air flow rate of each one,
- their position on the front surface of the multizone unit.

11.4. RECUPERATORS

The recuperators are used even more where, for indoor air quality or for particular industrial processes, it is necessary to use high volumes of fresh air rather than re-circulated air. The use of recuperators is more valid for large volumes of fresh air to be treated and the greater the heat drop between the temperature of the exhaust and fresh air.

Types envisioned:
- static cross flow with synthetic pleated filters and condensate drip tray in 3105 aluminium alloy;
- static cross flow with by-pass shutter (for exclusion of the recuperator in "free cooling" mode), with synthetic pleated filters and 3105 aluminium alloy condensate drip tray;
- static cross flow with recirculation shutter (set of 3 shutters with recuperator), with pleated synthetic filters and condensate drip tray in 3105 aluminium alloy.

Other types for which it is necessary to consult the Sales Technical Dept:
- with heat pipes;
- rotary (sensitive or sensitive + latent recovery);
- with double coil.

Efficiency:
- Three sizes of cross flow recovery systems with different efficiency are available for each air handling unit.

Standard installation:
- With horizontal axis

Configuration of the central air handling unit:
- recovery and flow in line;
- stacked recovery and flow (from and including NCD 13 to NCD 154 sizes).

11.5. EMPTY SECTIONS

Empty sections a re envisioned to allow the insertion of anti-freeze probes, access for inspection of components and to perform maintenance. They have the features listed below:

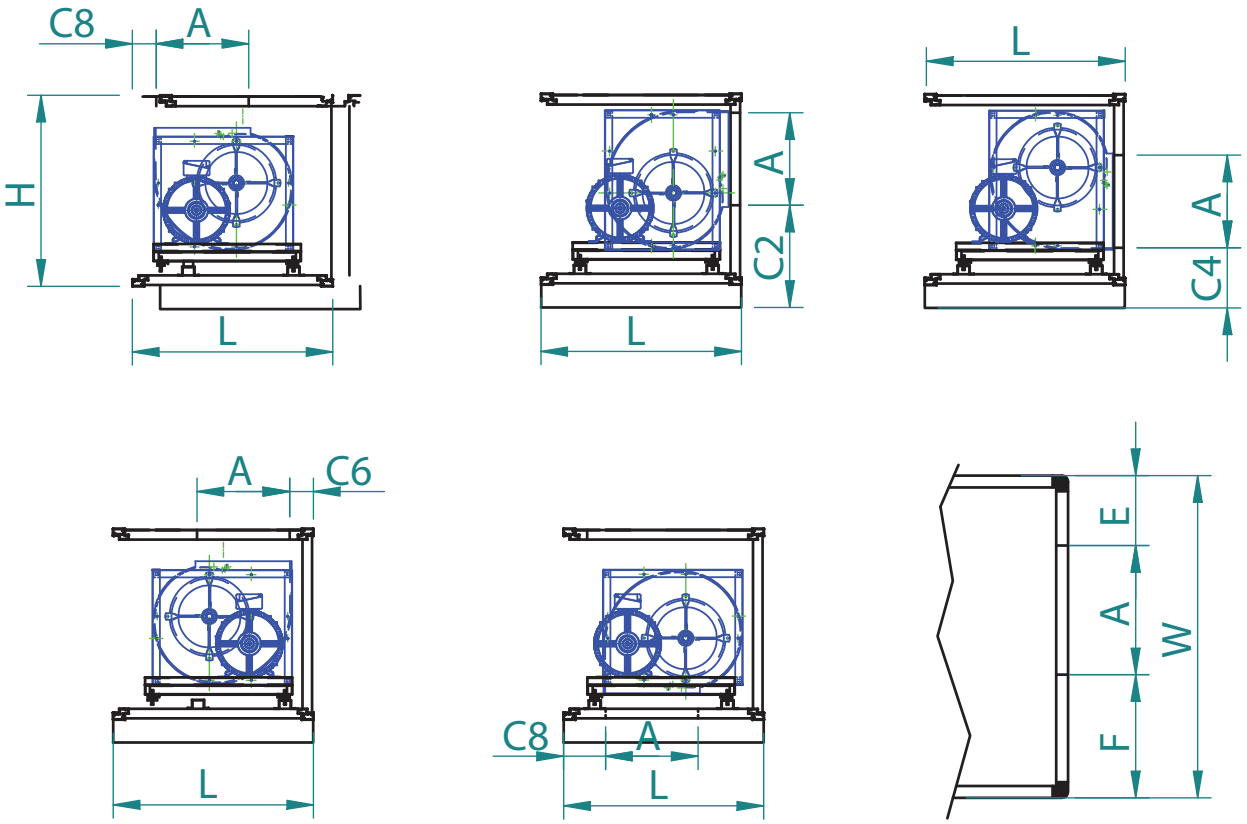
Lengths:
- 320 mm
- 640 mm
- 960 mm

Versions:
- simple;
- with condensate drip tray in 3105 aluminium alloy with height equal to 50 mm and lateral drain;
- with inspection door.

12. DIMENSIONS

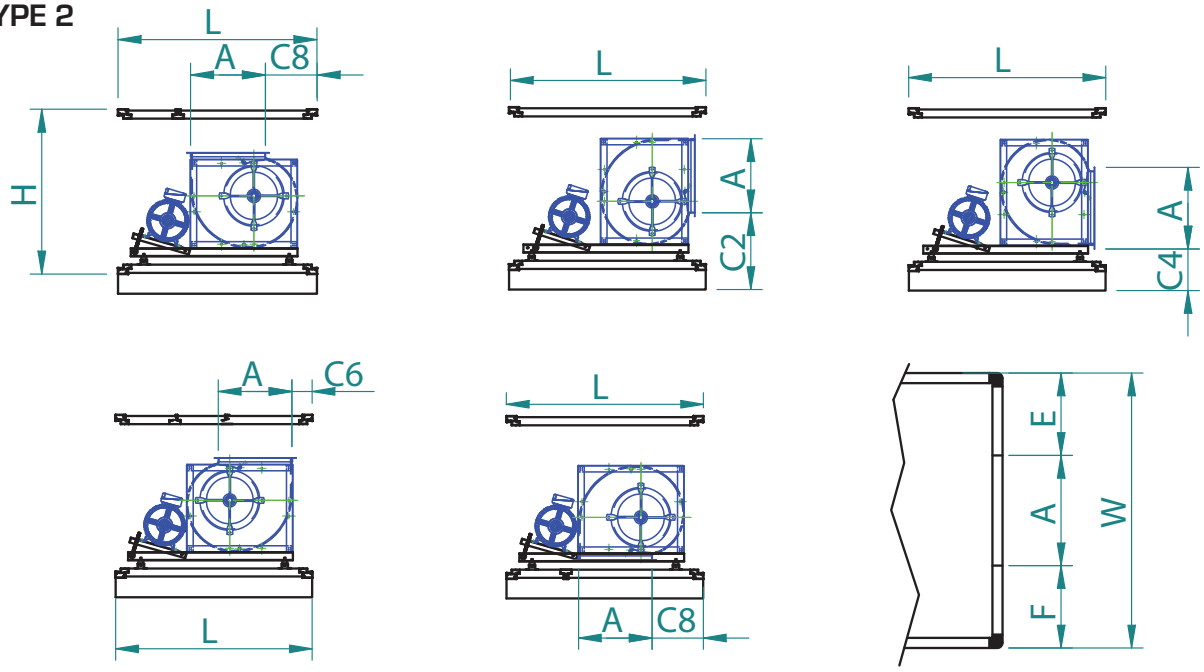
12.1. VENTILATING UNIT SECTIONS

TYPE 1



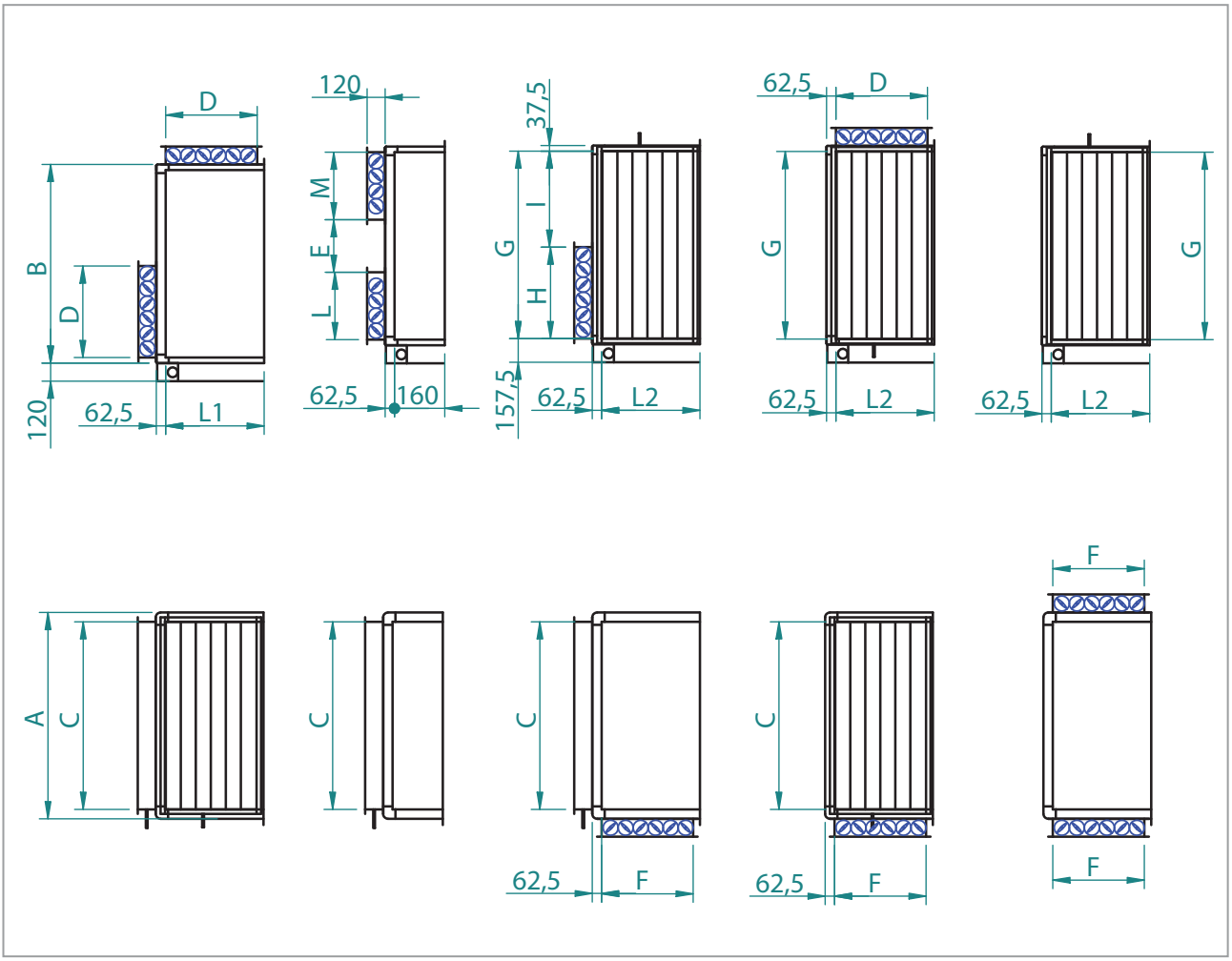
Mod. NCD	Fan Sizes	Type	W (mm)	H (mm)	L (mm)	A (mm)	C0 (mm)	C2 (mm)	C4 (mm)	C6 (mm)	C8 (mm)	E (mm)	F (mm)
2	180	1	1055	645	640	209	268	353	215	108	268	263	583
3	180	1	1215	645	640	209	268	353	215	108	268	263	743
4	200	1	1055	805	640	236	236,5	357,5	331,5	132,5	236,5	249,5	569,5
	225	1	1055	805	800	268	344,5	439,5	320,5	122,5	344,5	233,5	553,5
	250	1	1055	805	800	302	292,5	395,5	266,5	132,5	292,5	216,5	536,5
5	225	1	1215	805	800	268	344,5	439,5	320,5	122,5	344,5	233,5	713,5
	250	1	1215	805	800	302	292,5	395,5	320,5	132,5	292,5	296,5	616,5
6	250	1	1055	965	800	302	292,5	395,5	320,5	132,5	292,5	296,5	456,5
7	250	1	1215	965	800	302	292,5	395,5	320,5	132,5	292,5	296,5	616,5
	280	1	1215	965	800	341	236,5	412,5	267,5	236,5	236,5	277	597
8	280	1	1375	965	800	341	236,5	412,5	267,5	236,5	236,5	357	677
	315	1	1375	965	960	384	297	469	300	137	297	335,5	655,5
9	315	1	1695	965	960	387	297	469	300	137	297	495,5	812,5
11	355	1	2015	1005	960	433	223,5	493,5	303,5	223,5	223,5	791	791
	400	1	2015	1005	960	487	125,5	537,5	316,5	125,5	125,5	524,0	1004
12	450	1	2015	1165	1120	569	136,5	604,5	375,5	136,5	280,5	483	963
	500	1	2015	1165	1280	638	142,5	529,5	260,5	142,5	302,5	368,5	1008,5
13	450	1	2335	1245	1120	569	136,5	604,5	375,5	136,5	280,5	803	963
	500	1	2335	1245	1280	638	142,5	529,5	260,5	142,5	302,5	688,5	1008,5
14	500	1	2655	1245	1280	638	142,5	529,5	260,5	142,5	302,5	1008,5	1008,5

TYPE 2



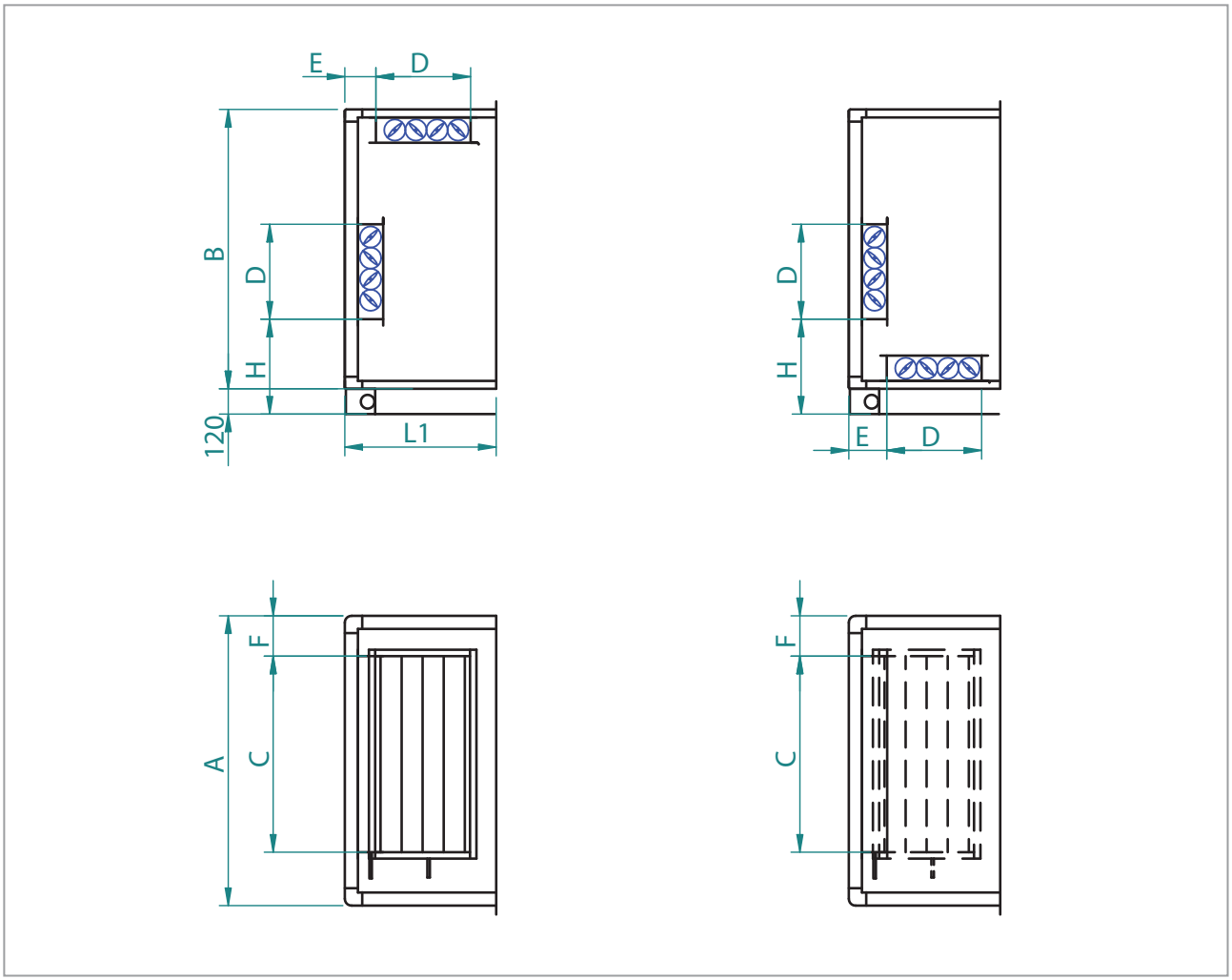
Mod. NCD	Fan Sizes	Type	W (mm)	H (mm)	L (mm)	A (mm)	C0 (mm)	C2 (mm)	C4 (mm)	C6 (mm)	C8 (mm)	E (mm)	F (mm)
1	180	2	735	645	800	209	-	332	224	129	237	263	263
4	280	2	1055	805	960	341	-	356,5	212,5	117,5	267,5	357	357
5	280	2	1215	805	960	341	-	356,5	212,5	117,5	267,5	437	437
6	280	2	1055	965	960	341	-	356,5	212,5	117,5	267,5	357	357
	315	2	1055	965	1120	384	-	449,5	279,5	132,5	302,5	335,5	335,5
7	315	2	1215	965	1120	384	-	449,5	279,5	132,5	302,5	415,5	415,5
10	355	2	1695	1005	1120	433	-						
	400	2	1695	1005	1280	487	-	528	306	133	355	604	604
15	560	2	2015	2085	1600	715	-	554,5	250,5	121	425	650	650
	630	2	2015	2085	1920	801	-	595,5	251,5	122,5	466	607	607
	710	2	2015	2085	2080	898	-	644,5	250,5	121,5	491,5	558,5	558,5
	800	2	2015	2085	2080	1007	-	895	451	185	566,5	504	504
16	630	2	2335	2085	1920	801	-	595,5	251,5	122,5	466	767	767
	710	2	2335	2085	2080	898	-	644,5	250,5	121,5	491,5	718,5	718,5
	800	2	2335	2085	2080	1007	-	895	451	185	566,5	664	664
	900	2	2335	2085	2560	1130	-	844,5	338,5	135,5	641,5	602,5	602,5
17	630	2	2335	2405	1920	801	-	595,5	251,5	122,5	466	767	767
	710	2	2335	2405	2080	898	-	644,5	250,5	121,5	491,5	718,5	718,5
	800	2	2335	2405	2080	1007	-	895	451	185	566,5	664	664
	900	2	2335	2405	2560	1130	-	844,5	338,5	135,5	641,5	602,5	602,5
18	710	2	2655	2405	2080	898	-	644,5	250,5	121,5	491,5	878,5	878,5
	800	2	2655	2405	2080	1007	-	895	451	185	566,5	824	824
19	710	2	2975	2405	2080	898	-	644,5	250,5	121,5	491,5	1038,5	1038,5
	800	2	2975	2405	2080	1007	-	895	451	185	566,5	984	984
	900	2	2975	2405	2240	1920	-	899,5	393,5	162,5	443,5	602,5	1242,5
20	800	2	3295	2405	2080	1007	-	895	451	185	566,5	1144	1144
	900	2	3295	2405	1920	1120	-	899,5	393,5	162,5	643,5	922,5	1242,5
	1000	2	3295	2405	2080	1267	-	924	394	239	829	694	1334
21	900	2	3615	2405	1920	1130	-	899,5	393,5	162,5	643,5	1242,5	1242,5
	1000	2	1014	2405	2080	1267	-	3615	924	394	239	829	1334
22	900	2	3935	2405	1920	1130	-	899,5	393,5	162,5	643,5	1402,5	1402,5
	1000	2	3935	2405	2080	1267	-	924	394	239	829	1174	1494
23	900	2	4255	2405	1920	1130	-	899,5	393,5	162,5	643,5	1562,5	1562,5
	1000	2	4255	2405	2080	1267	-	924	394	239	829	1494	1494
24	900	2	4575	2405	1920	1130	-	899,5	393,5	162,5	643,5	1722,5	1722,5
	1000	2	4575	2405	2080	1267	-	924	394	239	829	1654	1654

12.2. MIXING CHAMBER WITH EXTERNAL SHUTTERS



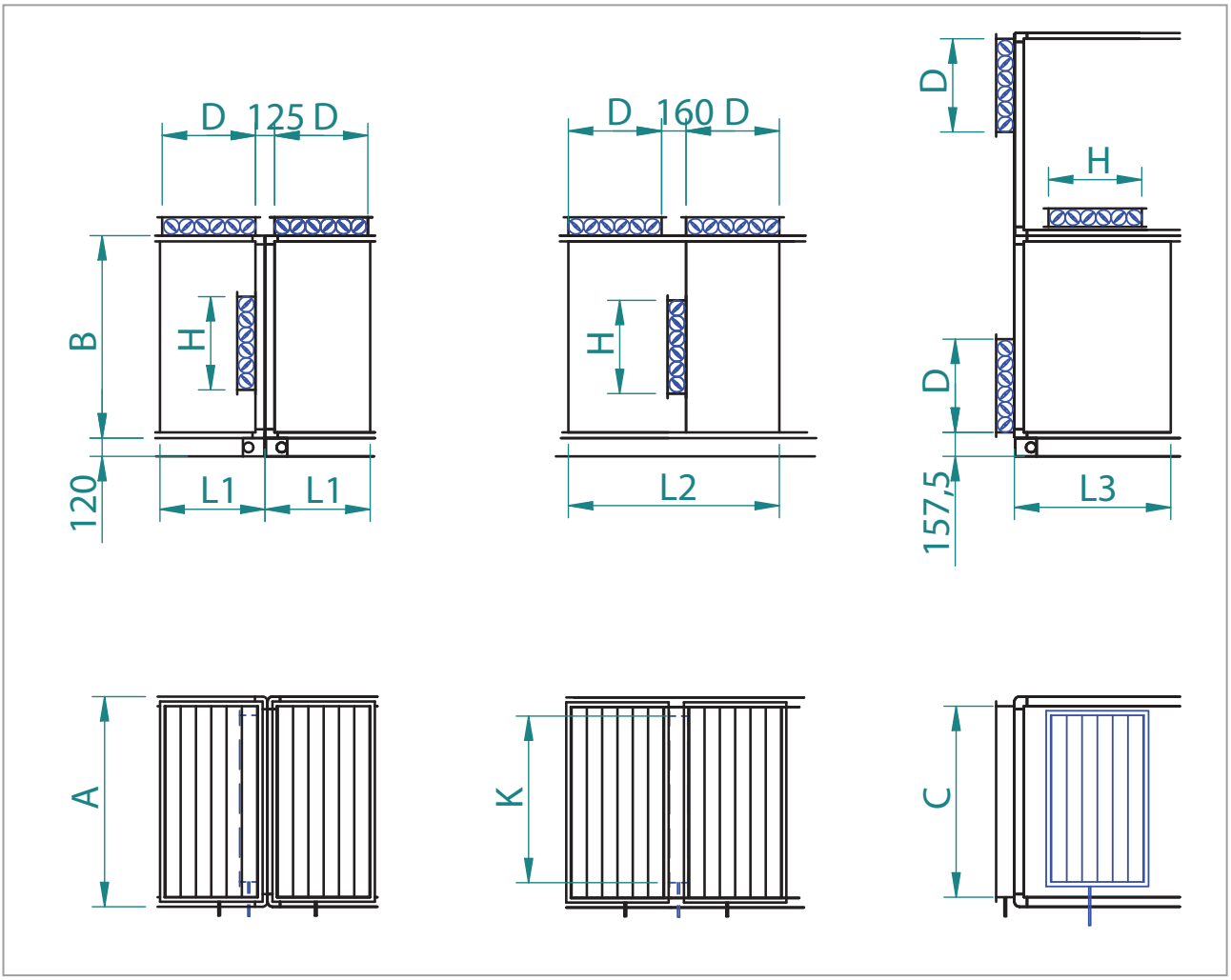
Mod. NCD	A	B	C	D	E	F	G	H	I	L	M	L1	L2
1	735	525	610	300	60	300	450	300	150	200	200	320	320
2	1055	525	930	300	60	300	450	300	150	200	200	320	320
3	1215	525	1090	300	60	300	450	300	150	200	200	320	320
4	1055	685	930	300	60	300	610	300	310	250	300	320	320
5	1215	685	1090	300	60	300	610	300	310	250	300	320	320
6	1055	845	930	300	160	300	770	300	470	300	300	320	320
7	1215	845	1090	300	160	300	770	300	470	300	300	320	320
8	1375	845	1250	300	160	450	770	300	470	300	300	320	480
9	1695	845	1570	300	160	450	770	300	470	300	300	320	480
10	1695	1005	1570	300	320	450	930	300	630	300	300	320	480
11	2015	1005	1890	450	160	610	930	450	480	450	450	480	640
12	2015	1165	1890	450	160	610	1090	450	640	450	450	480	640
13	2335	1165	2210	450	160	770	1090	450	640	450	450	480	800
14	2655	1165	2530	610	60	770	1090	610	480	530	500	640	800
15	2015	1965	1890	930	350	930	1890	930	960	770	770	960	960
16	2335	1965	2210	930	350	1250	1890	930	960	770	770	960	1280
17	2335	2285	2210	930	350	930	2210	930	1280	930	930	960	960
18	2655	2285	2530	930	350	1250	2210	930	1280	930	930	960	1280
19	2975	2285	2850	930	350	1250	2210	930	1280	930	930	960	1280
20	3295	2285	3170	930	350	1250	2210	930	1280	930	930	960	1280
21	3615	2285	3490	930	350	1250	2210	930	1280	930	930	960	1280
22	3935	2285	3810	930	350	1250	2210	930	1280	930	930	960	1280
23	4255	2285	4130	930	350	1250	2210	930	1280	930	930	960	1280
24	4575	2285	4450	930	350	1250	2210	930	1280	930	930	960	1280

12.3. MIXING CHAMBER WITH INTERNAL SHUTTERS



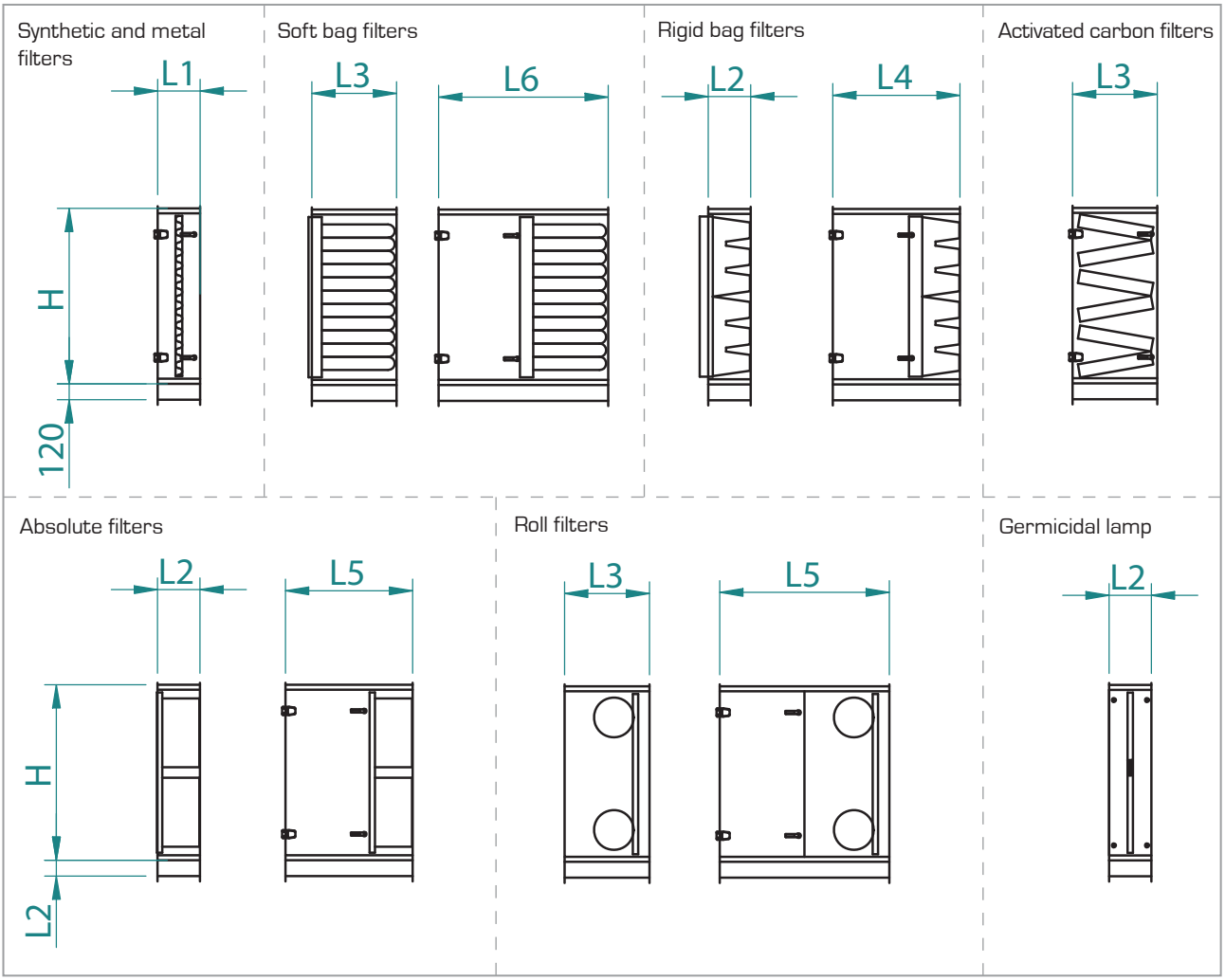
Mod. NCD	A	B	C	D	E	F	H	L1
1	735	525	450	300	222,5	122,5	232,5	640
2	1055	525	610	300	222,5	122,5	232,5	640
3	1215	525	930	300	222,5	122,5	232,5	640
4	1055	685	770	300	137,5	122,5	312,5	480
5	1215	685	930	300	137,5	122,5	312,5	480
6	1055	845	610	450	142,5	122,5	317,5	640
7	1215	845	610	450	142,5	122,5	317,5	640
8	1375	845	930	450	142,5	222,5	317,5	640
9	1695	845	1250	450	142,5	222,5	317,5	640
10	1695	1005	1250	610	142,5	222,5	317,5	800
11	2015	1005	1570	610	142,5	222,5	317,5	800
12	2015	1165	1570	770	142,5	222,5	477,5	960
13	2335	1165	1890	770	142,5	222,5	477,5	960
14	2655	1165	2210	770	222,5	222,5	477,5	960
15	2015	1965	1570	1570	222,5	122,5	317,5	1280
16	2335	1965	1890	1570	222,5	122,5	317,5	1280
17	2335	2285	1890	1890	222,5	122,5	317,5	1280
18	2655	2285	2210	1890	222,5	222,5	317,5	1280
19	2975	2285	2530	1890	222,5	222,5	317,5	1280
20	3295	2285	2850	1890	222,5	222,5	317,5	1280
21	3615	2285	3170	1890	222,5	222,5	317,5	1280
22	3935	2285	3490	1890	222,5	222,5	317,5	1280
23	4255	2285	3810	1890	222,5	222,5	317,5	1280
24	4575	2285	4130	1890	222,5	222,5	317,5	1280

12.4. 3 SHUTTER UNITS



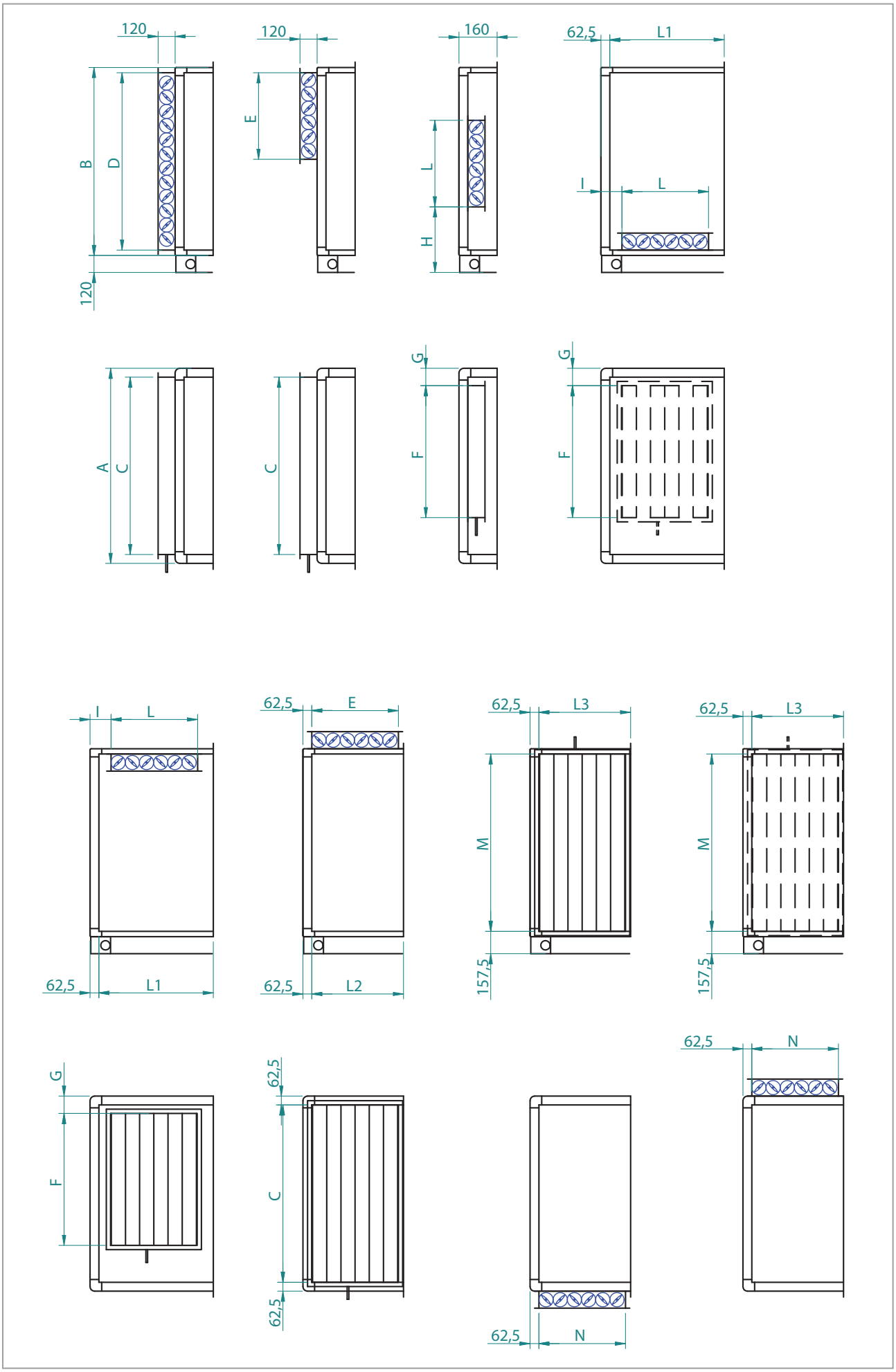
Mod. NCD	A	B	C	D	K	H	L1	L2	L3
1	735	525	610	300	450	300	320	800	480
2	1055	525	930	300	610	300	320	800	480
3	1215	525	1090	300	930	300	320	800	480
4	1055	685	930	300	770	300	320	800	480
5	1215	685	1090	300	930	300	320	800	480
6	1055	845	930	300	770	610	320	800	800
7	1215	845	1090	300	930	610	320	800	800
8	1375	845	1250	300	1090	610	320	800	800
9	1695	845	1570	300	1250	610	320	800	800
10	1695	1005	1570	450	1250	610	480	1120	800
11	2015	1005	1890	450	1570	610	480	1120	800
12	2015	1165	1890	450	1570	610	480	1120	800
13	2335	1165	2210	450	1890	610	480	1120	800
14	2655	1165	2530	450	2210	610	480	1120	800
15	2015	1965	1890	930	1570	930	960	2240	1280
16	2335	1965	2210	930	1890	930	960	2240	1280
17	2335	2285	2210	930	1890	930	960	2240	1280
18	2655	2285	2530	930	2210	930	960	2240	1280
19	2975	2285	2850	930	2530	930	960	2240	1280
20	3295	2285	3170	930	2850	930	960	2240	1280
21	3615	2285	3490	930	3170	930	960	2240	1280
22	3935	2285	3810	930	3490	930	960	2240	1280
23	4255	2285	4130	930	3810	930	960	2240	1280
24	4575	2285	4450	930	4130	930	960	2240	1280

12.5. FILTER SECTIONS



Mod. NCD	H	L1	L2	L3	L4	L5	L6
1	525	160	320	640	800	960	1120
2	525	160	320	640	800	960	1120
3	525	160	320	640	800	960	1120
4	685	160	320	640	800	960	1120
5	685	160	320	640	800	960	1120
6	845	160	320	640	800	960	1120
7	845	160	320	640	800	960	1120
8	845	160	320	640	800	960	1120
9	845	160	320	640	800	960	1120
10	1005	160	320	640	800	960	1120
11	1005	160	320	640	800	960	1120
12	1165	160	320	640	800	960	1120
13	1165	160	320	640	800	960	1120
14	1165	160	320	640	800	960	1120
15	1965	160	320	640	800	960	1120
16	1965	160	320	640	800	960	1120
17	2285	160	320	640	800	960	1120
18	2285	160	320	640	800	960	1120
19	2285	160	320	640	800	960	1120
20	2285	160	320	640	800	960	1120
21	2285	160	320	640	800	960	1120
22	2285	160	320	640	800	960	1120
23	2285	160	320	640	800	960	1120
24	2285	160	320	640	800	960	1120

12.6. INTAKE VENTS



Mod. NCD	A	B	C	D	E	F	L	G	H	I	M	N	L1	L2	L3
1	735	525	610	450	300	450	300	122,5	232,5	137,5	450	300	480	320	320
2	1055	525	930	450	300	770	300	122,5	232,5	137,5	450	300	480	320	320
3	1215	525	1090	450	300	930	300	122,5	232,5	137,5	450	450	480	320	480
4	1055	685	930	610	300	770	450	122,5	237,5	142,5	610	450	640	320	480
5	1215	685	1090	610	300	930	450	122,5	237,5	142,5	610	610	640	480	640
6	1055	845	930	770	450	770	610	122,5	237,5	142,5	770	610	800	480	640
7	1215	845	1090	770	450	930	610	122,5	237,5	142,5	770	610	800	480	640
8	1375	845	1250	770	450	1090	610	122,5	237,5	142,5	770	610	800	480	640
9	1695	845	1570	770	450	1410	610	122,5	237,5	142,5	770	770	800	480	800
10	1695	1005	1570	930	610	1410	610	122,5	317,5	142,5	930	610	800	640	800
11	2015	1005	1890	930	450	1730	770	122,5	237,5	142,5	930	770	960	480	960
12	2015	1165	1890	1090	450	1570	770	222,5	317,5	142,5	1090	930	960	480	960
13	2335	1165	2210	1090	770	1890	770	222,5	317,5	142,5	1090	930	960	800	960
14	2655	1165	2530	1090	610	2210	770	222,5	317,5	142,5	1090	930	960	640	960
15	2015	1965	1890	1890	1250	1570	930	222,5	318	223	1890	1250	1280	800	1280
16	2335	1965	2210	1890	1250	1890	930	222,5	318	223	1890	1250	1280	800	1280
17	2335	2285	2210	2210	1570	1890	930	222,5	318	223	2210	1250	1280	960	1600
18	2655	2285	2530	2210	1570	2210	930	222,5	318	223	2210	1570	1280	960	1600
19	2975	2285	2850	2210	2210	2530	930	222,5	318	223	2210	1570	1280	1120	1600
20	3295	2285	3170	2210	2210	2850	930	222,5	318	223	2210	1570	1280	1120	1600
21	3615	2285	3490	2210	2210	3170	930	222,5	318	223	2210	1570	1280	1280	1600
22	3935	2285	3810	2210	2210	3490	930	222,5	318	223	2210	1570	1280	1280	1600
23	4255	2285	4130	2210	2210	3810	930	222,5	318	223	2210	1570	1280	1280	1600
24	4575	2285	4450	2210	2210	4130	930	222,5	318	223	2210	1570	1280	1280	1600

13. HANDLING

13.1. PACKAGING

The NCD range central air handling units are normally supplied without packaging, except for the high or absolute efficiency filter cells and mounting accessories, which are supplied in cardboard boxes and must be installed by the customer. On request the units can be supplied packaged using polyethylene film, on pallets plus polyethylene film, in cages or in crates.

13.2. TRANSPORT

The transportability of the units from a dimensional point of view is highlighted in the Technical Data table **(chap.5)**.

Transport must be performed with the following precautions:

- suitable blocking onto the lorry deck;
- protection to prevent blows of the projecting parts such as the coil hydraulic attachments, drains, shutters, handles;
- protection of the load using tarpaulin;
- protection using wooden elements between one unit and another if they are stacked for transport.

13.3. RECEIPT OF THE MATERIAL AND CHECKS

On **receipt** of the unit or individual sections a visual control must be carried out to check no damage has occurred during transport. If damage has occurred it must be highlighted on the accompanying transport document.

The following **checks** must be performed:

- **filters**: check quantity and type;
- **fan-motor units**: check fixing to the control unit;
- check the integrity of:
  panelling and base;
  roof;
  collectors and finned pack, if in view (for that regarding the finned coils);
  pins, louvers and gears (regarding the shutters).

13.4. STORAGE ON SITE

The units without rain protection roof must be stored in a covered area. The flow and recovery vents without shutters must be protected to prevent the entry of dust and foreign bodies and the shutters must be kept closed (and sealed with nylon if stored outdoors) until the units are connected to the recovery and flow ducts. The units supplied in several sections must be stored close to each other in the sequence envisioned to prevent the entry of water or foreign bodies.

14. INSTALLATION

SAFETY PRECAUTIONS AND REGULATIONS

The following safety standards must be respected during installation, start-up, use and maintenance of the central air handling units:

- Pay attention when lifting the unit as its centre of gravity may be greatly out of axis.
- Pay attention when locking the lifting ropes/hooks.
- Do not start the central unit until it has been connected to the building's earth plant along with its components.
- Do not start the unit unless the fan vent has been connected to a duct or protected using an accident-prevention net.
- Do not use the control unit to support other machinery.
- Do not use the unit as a walk-way or work platform.
- Do not use the unit to store equipment, spare parts etc.
- Before accessing the unit, make sure that all electrical utilities have been shut-off. In particular, before opening the inspection doors make sure that the fan is off and cannot be switched on again without the person intervening on the central treatment unit knowing.
- Do not open the inspection doors with the fan functioning especially in pressurised parts of the unit.
- Always remount the fan section protection sump before re-starting the fan.
- Do not leave the doors partially closed. Make sure that all handles or knobs are perfectly closed.
- Pay attention to the sheet steel edges inside the central unit.
- Pay attention to the corners of the roof in outdoor central units.
- Pay attention to burns deriving from the heating coils.
- Pay attention to scalding deriving from steam humidification systems.
- Pay attention to servo-controlled shutters that could close unexpectedly.

14.1. LIFTING AND POSITIONING

The NCD range central units are prepared for lifting with a hook from below. When present, the corner feet and the continuous base have holes for lifting using ropes according to the following methods:

- **Sections with corner feet only:** lifting can be performed with hooks to be anchored in the holes indicated by **(B)** in the figure **(fig. n. 14.1.1)** or with ropes to be anchored to two 2" pipes passing from one side to the other of the section through hole **(B)**.
- **Sections with continuous base:** lifting can be performed with ropes to be anchored to two 2" pipes passing from one side to the other of the section through the hole **(A)**.

For units without feet or continuous base brackets are prepared that are anchored to the frame (indicated by **C** in the figure) which, must be removed after movement.

Positioning can be performed using two transpallets, one for each side of the section, preferably acting on the longest sides.

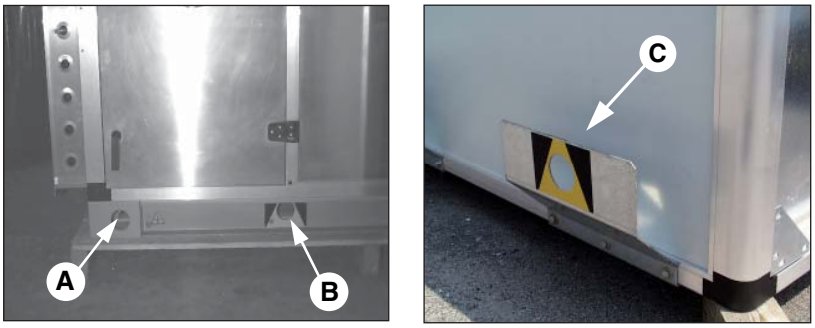
Alternatively, positioning can be performed by making the central unit run on pipes acting as rollers.

The sections without continuous base can be made to slide directly over the floor. The fan-motor units are assembled on anti-vibration mounts; (it is however recommended to place an anti-vibration covering between the base of the central air handling unit and the floor of the technical room).

WARNING!
Anchorage must always take place using the holes marked by the yellow/black label. The centre of gravity of the central unit may be out of axis.

WARNING!
Use a beam or place a strut between the ropes to annul the horizontal pull component that could deform the roof of the central air handling unit. When lifting, pay attention not to damage projecting components such as the shutters, collectors, drains and handles.

14.1.1. Anchorage points



14.2. MINIMUM TECHNICAL SPACES

When positioning the central air handling unit the space necessary for routine and extraordinary maintenance must be respected.

The optimal situation is obtained:

- by envisioning a corridor measuring a minimum of 700 mm on the inspection and collectors side
- On the opposite side leave a distance equal to the width of the central unit plus 100 mm, in order to extract the coils from the opposite side to the collectors without having to dismount the valves unit **(fig. A)**
- if the unit must be placed near a wall, leave a corridor on the inspection and collectors side equal to the width of the unit plus 100 mm **(fig. B).**

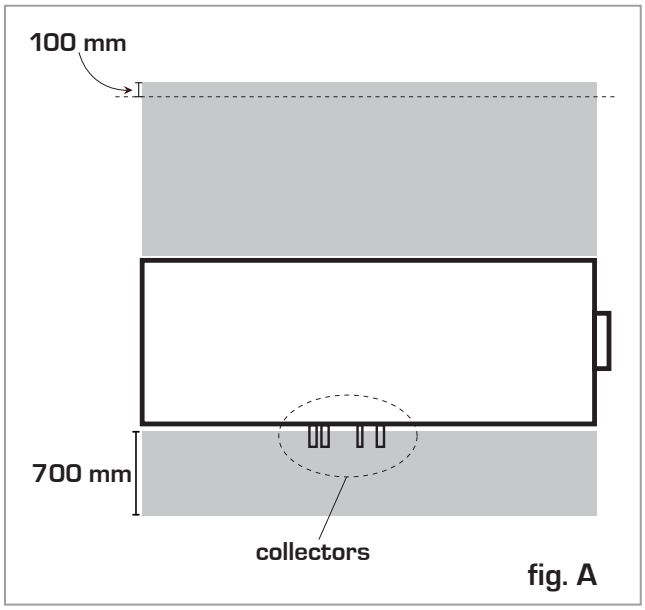


fig. A

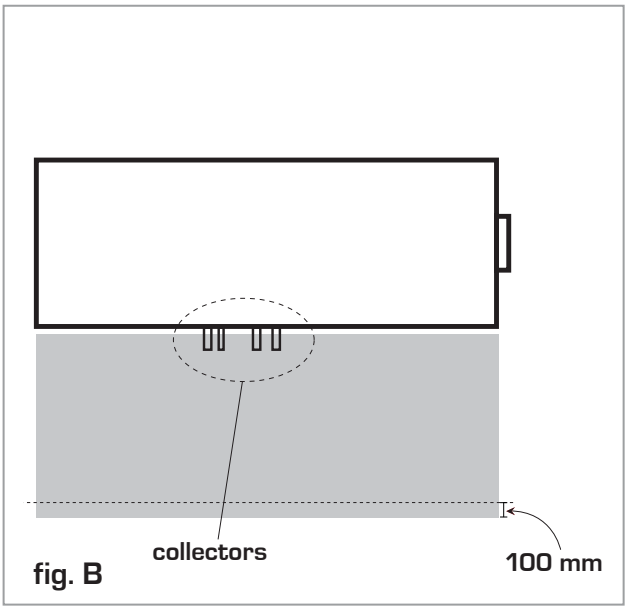


fig. B

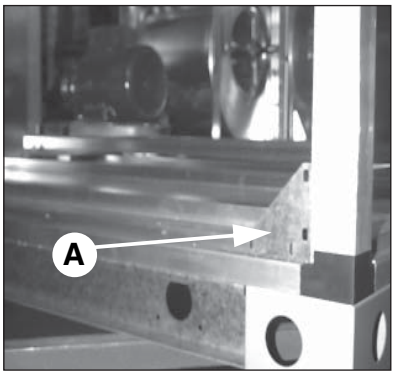
14.3. JOINING THE SECTIONS

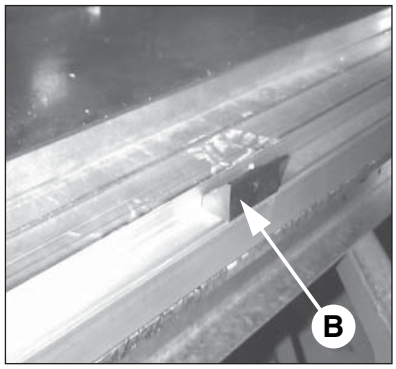
The units supplied in several sections must be assembled following the attached drawing (which will be different depending on the selected configuration), using the supplied materials contained in a box (generally in the ventilating section).

Before joining the sections:

- insert the adhesive neoprene gasket,
- place them together and join them using two bolts for each corner of the slots made in the corner details highlighted in the figure by the letter **(A)**.

Depending on the size of the central unit, nylon brackets may also be supplied, which are identified in the figure by the letter **(B)**. The brackets are distributed in pairs on the perimeter of the gasket between the two sections, fixed to the two frames with self-threading screws and to each other using bolts.





15. CONNECTIONS

15.1. AERAULIC CONNECTIONS

IMPORTANT!

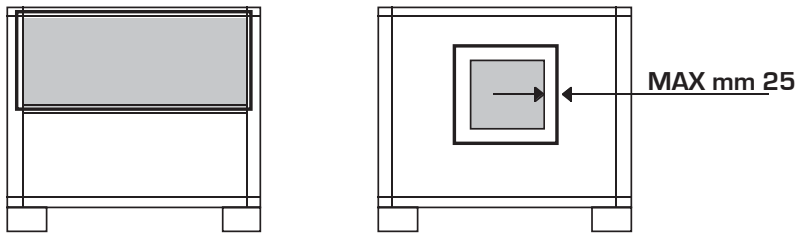
It is prohibited to start the central air handling unit if the fan vents are not ducted or protected using an accident-prevention net.

- The flow and recovery vents **(chap. 15.1.1)** must be connected to the ducts inserting an anti-vibration joint. The anti-vibration joint is connected to the unit by screwing it to the flange or the shutter, when present. If these are not present, the anti-vibration joint is screwed to the unit using self-tapping screws, to the unit frame in the case of recovery vents and to the panel in the case of flow vents as shown in the following layout.
- Electric equipotentiality must be guaranteed between the duct and the central air handling unit using an earth cable that acts as a jumper on the anti-vibration joint.
- Prepare, (before curves, branches, etc.), the flow duct with a straight tract measuring at least 2.5 times the smallest side of the duct to prevent loss of performance of the duct.
- Make sure that the ducting does not have inclinations in the branching tracts that exceed 7°C.

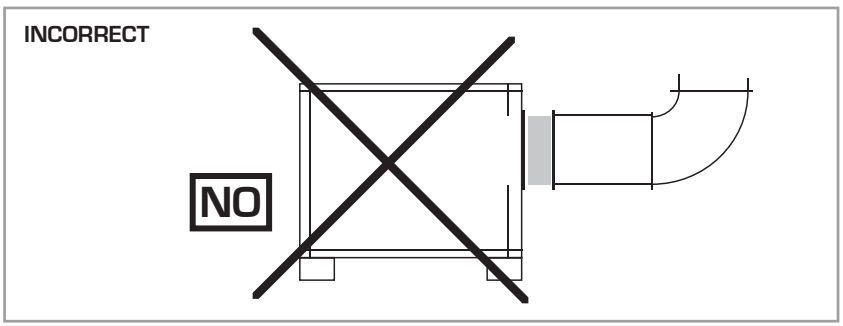
The fan direction must be chosen in conformity with the course of the first curve as illustrated in the layout **(chap. 10.3)**. The directions with equal even final number refer to right hand unit direction; those with an odd final number refer to the left hand unit direction.

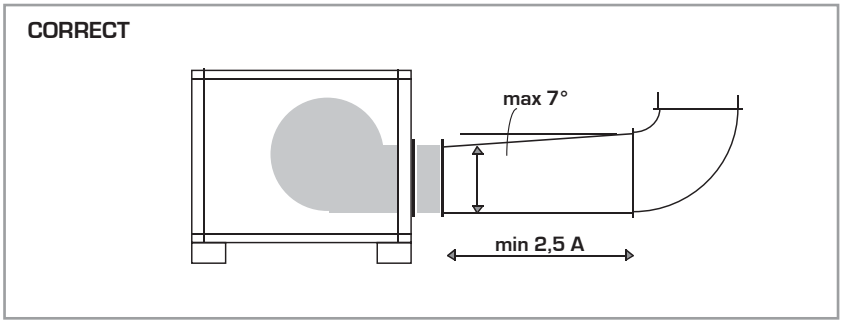
To make the fan flow position clearer, refer to the figure at the side:

15.1.1. Recovery and flow vents



15.1.2. Flow duct position





15.2. HYDRAULIC CONNECTIONS

a) <u>Water coil connections</u>

The heat exchange coils have collectors with female threaded attachment (for water inlet/outlet). Where flanged attachment is requested, threaded flanges must be used to allow the extraction of the coil, which implies the escape of the collectors from the lateral panel of the central unit.

Follow the indications given below for correct coil connection:

- The route of the pipes must be studied in a way not to create obstacles in the coil should be extracted and not to interfere with the unit inspection doors.
- **Water inlet/outlet must be such to allow counter-current heat exchange: therefore follow the indications on the WATER INLET and WATER OUTLET plates (see fig.1 and fig. 2). Generally, the coils with right connections are fed from below, while those with left connections from above.**
- Clamp the pipes adequately to the outside of the unit to prevent the weight being unloaded onto the coil.
- When tightening the coil collectors to the system hydraulic circuit, do not use force, which could damage the coil itself;
- Envision a top vent valve and a drain valve below.
- Envision on-off valves to isolate the coil from the rest of the circuit in the case of extraordinary maintenance.
- When connection has been concluded, push the external gasket well against the panel to prevent seepage of air and the possible formation of condensate.
- When adjusting, envision the interception of the pipes side coil with fan off to prevent overheating inside the central air handling unit with possible damage to several components.
- Envision anti-freeze devices for the control units with external air intake.

15.2.1. Water INLET - OUTLET connections position

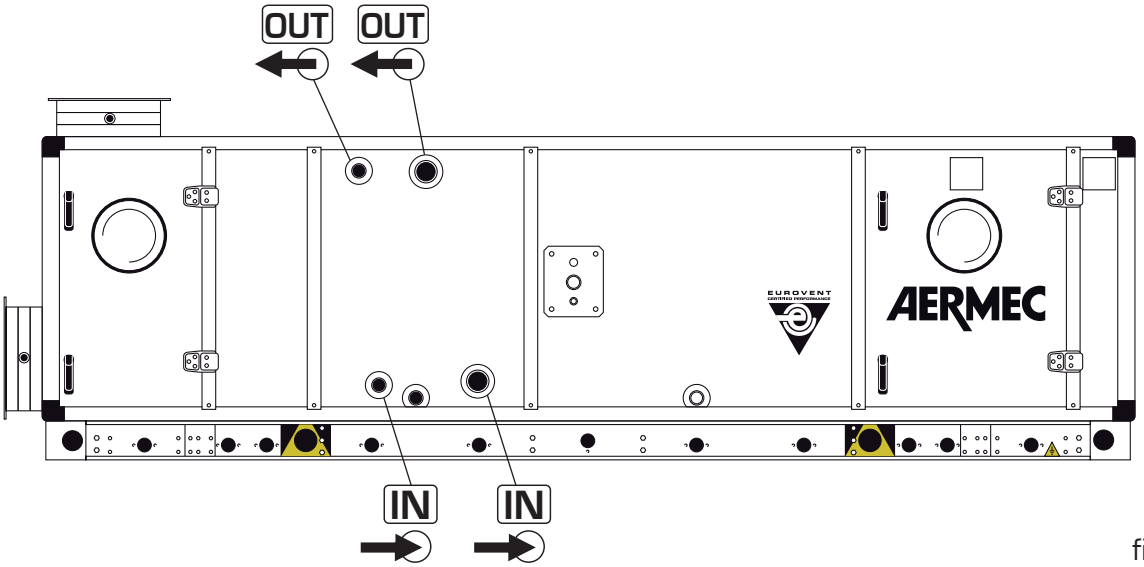


fig. 1

The image at the side gives an example of a unit with right connection coils

The coils with left connections are fed from above.

N.B. To define the right or left side always look at the unit from the air flow and recovery side.

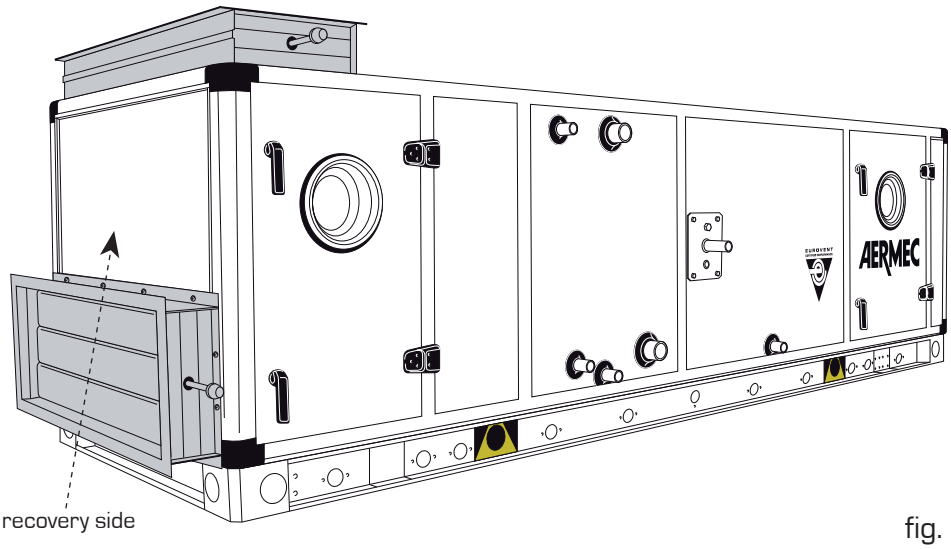


fig. 2

b) Direct expansion coil connection

Follow the indications given below for correct direct expansion coil connection to the cooling circuit:

- Make sure that counter-current exchange takes place in the coil;
- the cooling circuit must be equipped with all adjustment and safety devices in a way to prevent any damage to the coil (according to the UNI - EN 278 1234 Standard);
- the pipes must be dimensioned, insulated and equipped with suitable siphons in a way to allow the circulation of oil so as to guarantee lubrication of the compressors;
- pay attention to the vibrations transmitted to the direct expansion coil as they may be a cause of damage.

c) Humidification connection with evaporator pack and disposable water

This type of humidification implies the connection of the water supply pipe and the drain. The supply must be intercepted by a solenoid valve (not supplied) controlled by a room humidistat and an eventual limit humidistat on the flow duct (not supplied). The drain must be connected with the criteria stated in **paragraph 15.6**. The attachments for supply and draining are found under the tray in the thickness of the unit base.

- **Supply attachment diameter:** 1" GJ
- **Drain attachment diameter :** 1" GJ

d) Evaporator pack humidification connection and supply control

This type of humidification implies the connection of the water supply pipe and the drain. The supply must be intercepted by a supplied solenoid valve controlled by an electronic supply control device connected in series to a room humidistat and an eventual limit humidistat on the flow duct (humidistats not supplied). The drain must be connected with the criteria stated in **paragraph 15.6.** The attachments for supply and draining are found under the tray in the thickness of the unit base.

- **Supply attachment diameter:** 1 -1/2" GJ
- **Drain attachment diameter :** 1" GJ

e) Evaporator pack humidification connection and pump

This type of humidification implies the connection of the water supply pipe and the drain.
The supply must be intercepted by a valve (not supplied) for maintenance, while during normal functioning it is adjusted by a float valve (**C** in the figure). A pump (**D** in the figure) controlled by a room humidistat and an eventual limit humidistat on the flow duct (not supplied) feed the evaporator pack. The drain must be connected with the criteria stated in **paragraph 15.6**. The attachments for supply and draining are found under the tray in the thickness of the unit base.

- **Supply attachment diameter:** 1" GJ
- **Drain attachment diameter :** 1" GJ

Preliminary operations :

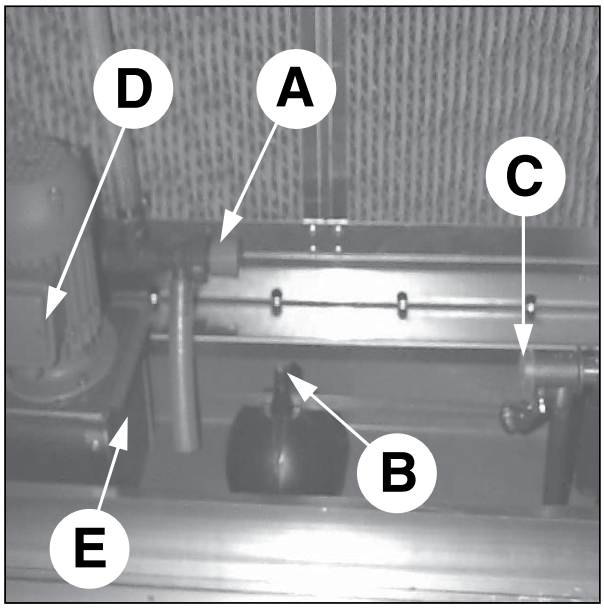
- Check positioning of the evaporator pack **(F)** and any separator **(G)**, which can both be extracted. The evaporator pack is laterally protected by spray guards **(H)**;

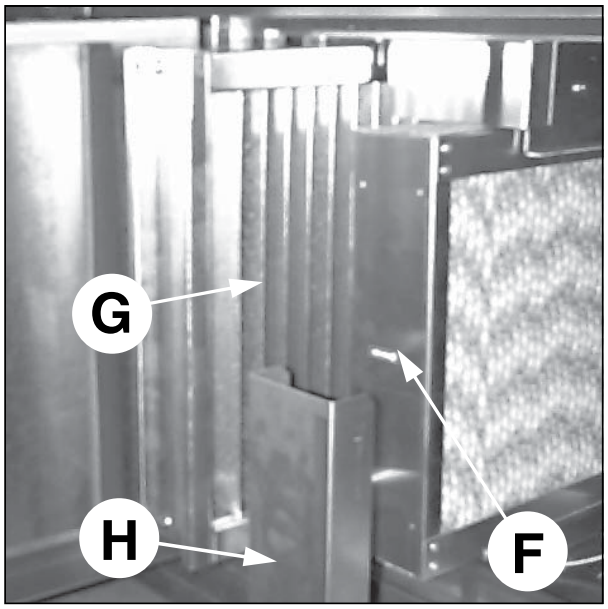
- check that the entire height of the filtering mesh **(E)** is inserted onto the pump support guides;

- connect the pump (three-phase - see **paragraph 15.4**);

- check that the level of the water is about 20 mm below the surface of the metal tank; if this is not the case, adjust the float valve by acting on screw **(C)** and/or on the position of the float **(B)** on the control rod;

- adjust the water flow rate on the pack by acting on the by-pass valve **(A)** in a way that the pack is wet without causing spouts of water.





f) Washer humidification connection

- due to the weight of water contained in the tank, the air washers require that the lower surface of the tank is supported continuously. The other sections of the central air handling unit must be aligned with the washer section, which has a height of 400 mm;
- the pumps are supplied disassembled and must be connected to the intake and flow attachments using the accessories supplied;
- the pumps must be fixed to the floor at the same height as the control unit base;
- the float valve must be adjusted in a way that the level of water is about 20 mm below the overflow.

g) Steam humidification connection

The steam humidification sections are supplied in standard executions only with the steam distributor pipe. This pipe has a 1" G attachment for the supply of steam and a 3/8" GJ attachment for the recovery of condensate.
Adjustment valves can be connected to this distributor pipe for centralised steam production or immersed electrode steam generators. If the latter is purchased as an accessory to the central air handling unit, it is normally supplied mounted on the side of the machine and already hydraulically connected (steam and condensate). For maintenance, refer to the manufacturer's manual attached to the appliance.
The steam humidification sections are supplied with a drop eliminator and condensate drip tray with 1" G drain to be connected following the criteria stated in **paragraph 15.6**

15.3. ELECTRIC CONNECTIONS

The central air handling units are normally supplied with the electrical appliances not wired. The installer must wire the:

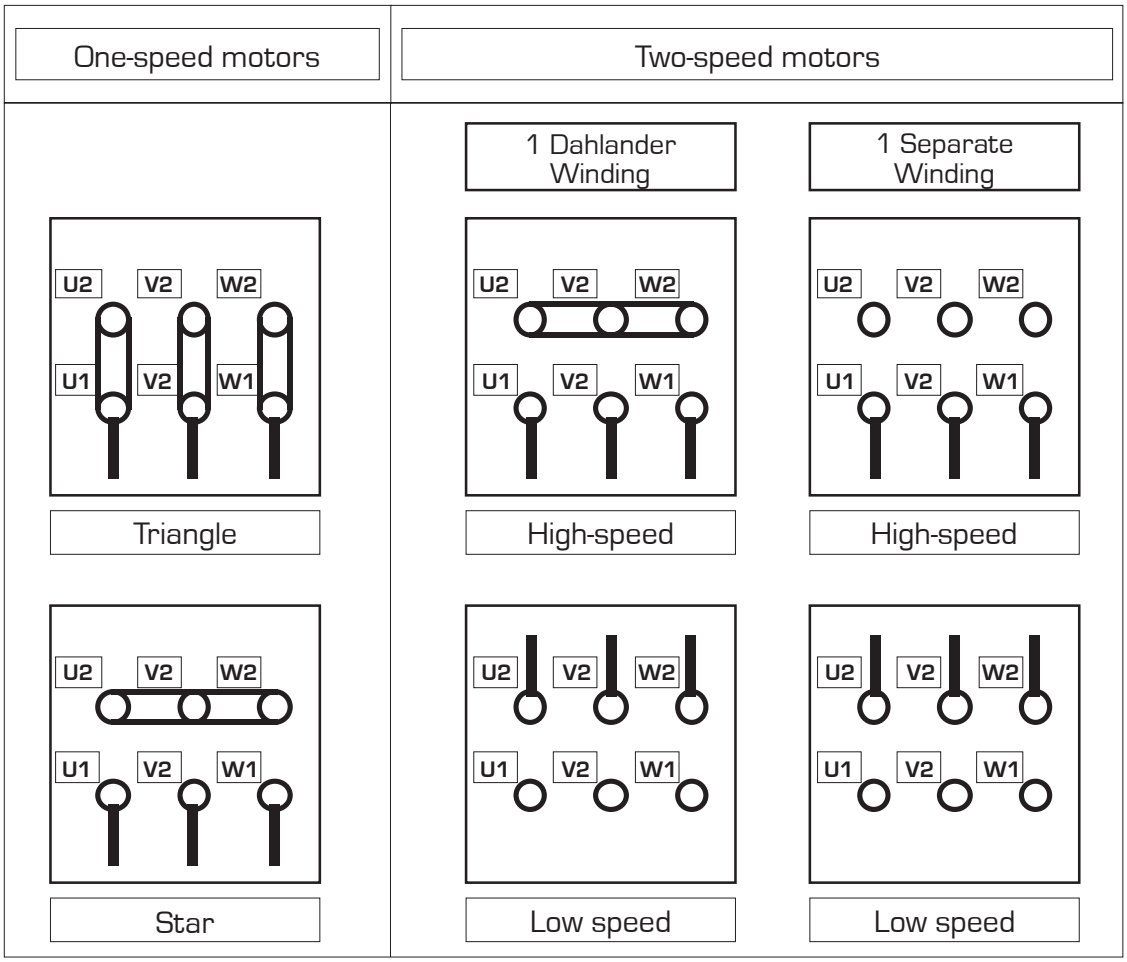
- fan motors;
- humidification pumps;
- roll filters;
- motor reducer,
- end run,
- pressure switch,
- pressure switches;
- lighting points;
- electric coils

15.4. MOTOR CONNECTIONS

Motors are three-phase asynchronous with squirrel cage rotor, totally enclosed design with external cooling with electrical features in compliance with IEC 34-1 and IEC 2-3 n°111 and dimensional features in compliance with the IEC 72 and UNEL 13113-71-IM B3 Standards.

Protection rating: IP55
Stator winding class: B

The motors are envisioned with single polarity (2, 4, 6 poles depending on fan speed) and, on request, with double polarity 4/6, 4/8 poles with simple winding.
The typical connection layouts of the three-phase electric motors are indicated in the following general diagram. (It is however recommended to consult the diagram contained inside the motor terminal board or applied to the back of the terminal board cover).



The one-speed and two power supply voltage electric motors with direct start-up must be connected:
- as a triangle if it is the least,
- as a star if the network voltage is the greatest.

220/380 V motor:
- triangle connection for 220V power supply,
- star connection for 380V power supply,

380/660 V motor:
- triangle connection for 380V power supply.
- All motors can function indifferently in both directions. The direction of rotation can be inverted by exchanging the two line connections to the stator clamps.
- For two-speed motors always check the layout supplied.

15.5. ELECTRIC PUMPS CONNECTION

The evaporator pack humidification electric pumps have a 220/380 V motor, therefore they are connected:
- as a triangle for 220V power supply,
- as a star for 380V power supply.

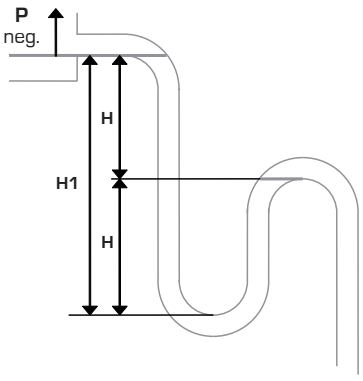
For connection of the air washer electric pumps, refer to that stated in **paragraph 15.4.**

NOTE:
Regarding the roll filters connection and the connection of electric coils, refer to the wiring diagram attached to each individual coil.

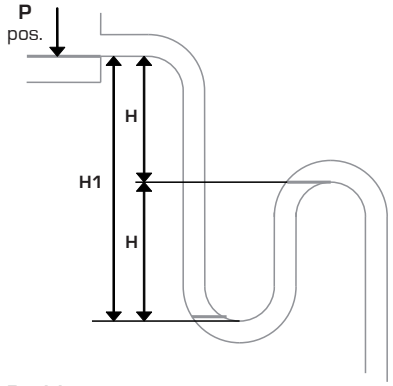
15.6. CONDENSATE DRAIN

A drain system must envision a suitable siphon to:
- allow free condensate draining;
- prevent the undesired entry of air into the depression systems;
- prevent the undesired exit of air from the pressure systems;
- prevent the infiltration of smells or insects.

Below find the rules to follow for the sizing and version of the siphons in the case of depressurised or pressurised tank.



Negative pressure:
H1 = 2P
H2= H1 / 2



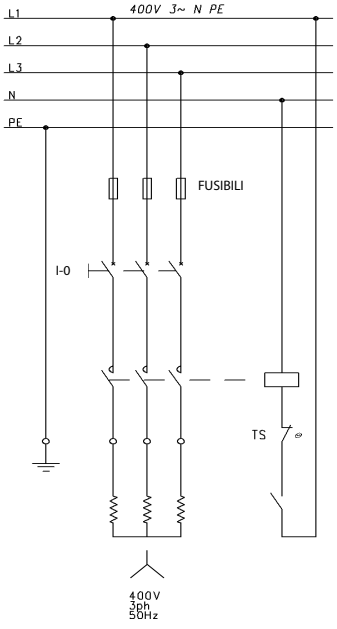
Positive pressure
H1 = 2P
H2 = H1 / 2

Where **P** is the pressure expressed in mm of a column of water (1 mm c.w. = 9.81 Pa). The siphon must have a cap for cleaning the lower part or must however allow quick disassembly for cleaning.

15.7. ELECTRIC COILS CONNECTION

Below find several prescriptions necessary for the correct connection of the electric coils:
- on wiring, make sure that the nuts, washers and crimped connectors are fixed well to the terminal of the heating element;
- make sure that the cables used have suitable section (on average 1 - 2 mm 6 amp absorption);
- check that the line voltage is compatible with the data embossed on the data plate positioned above the terminal board or on the coil flange;
- do not open the electric coil cover before having disconnected the electric power supply;
- during routine maintenance check the status of the ceramic insulators and tightness of the nuts;
- when adjusting, interlock the electric coil with the fan to prevent overheating inside the central air handling unit with possible damage to several components.
- when adjusting, switch the central air handling unit off with a delay of 5 minutes with respect to switch-off of the electric coil.

For the electric connection, refer to the main wiring diagram at the side or that attached to each individual coil.

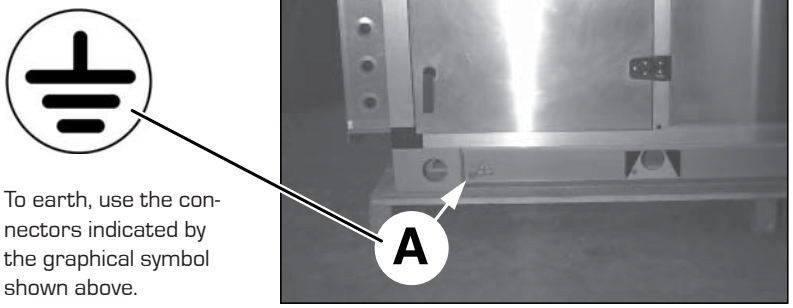


15.7.1. Example of a wiring diagram

15.8. EARTH

Every electrical utility and every section of the central air handling unit must be connected to the system earth plant.

To do this each section is equipped with a M8 screw for connection to the system earth plant. The screw, identified by a plate, is located near to one of the section feet as indicated by the letter **(A)** in the following figure.



To earth, use the connectors indicated by the graphical symbol shown above.

15.9. MOUNTING THE FILTERING CELLS

- **Mounting the pre-filters** (synthetic or metal):
  They are normally supplied already mounted. If this is not the case they must be made to run along guides taking care to join them to each other using the relevant supplied metal hook in a way to make successive removal for maintenance easy.

- **Mounting pre-filters with bag filters** (synthetic or metal):
  They are normally delivered in boxes housed inside the central unit. They must be inserted from the front onto the frames and fixed to them using the supplied clips (**A** in the figure).

Extract the filters as follows:

- loosen the screws of the upper and lower brackets that hold the filter-holder frame blocked **(B in the figure)**;
- move the brackets slightly out of the original position;
- extract the frame paying attention not to ruin the sealing gasket.

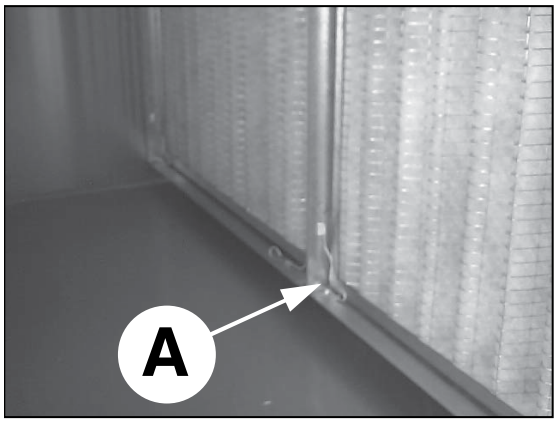
- **Mounting absolute filters**:
  They are always delivered in boxes housed inside the central air handling unit. They must be inserted from the front onto the frames and fixed to them using the supplied clips (**A** in the figure).

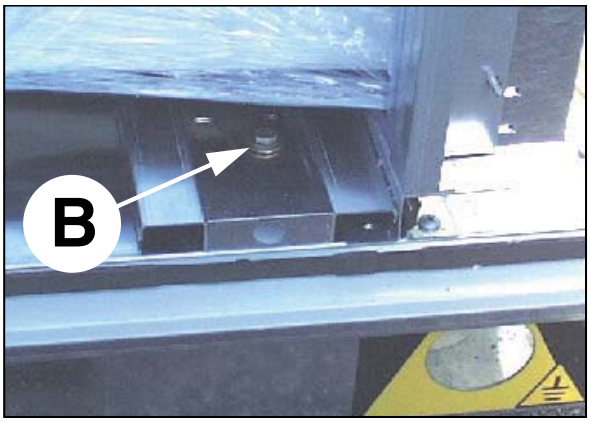
Extract the filters as follows:

- loosen the screws of the upper and lower brackets that hold the filter-holder frame blocked **(B in the figure)**;
- move the brackets slightly out of the original position;
- extract the frame paying attention not to ruin the sealing gasket.

- **Mounting the roll filters**:
  The rolls are normally supplied already mounted. For disassembly and successive re-assembly, refer to the manufacturer's instructions supplied.

- **Mounting the carbon filters**:
  The cartridges are normally supplied already mounted on the frame. Mounting is performed by inserting the cartridge in the relevant seat and turning it clockwise for about 5°.





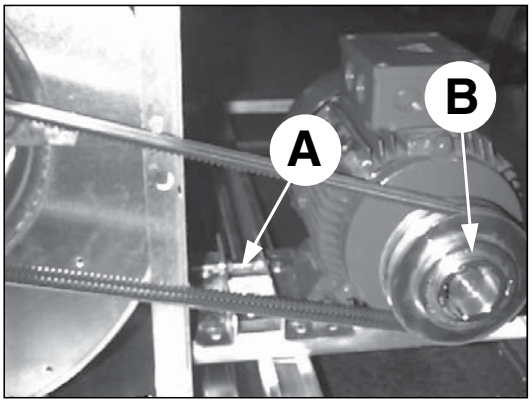
16. START-UP

WARNING
The following aspects must be checked before starting the central air handling unit and during commissioning:

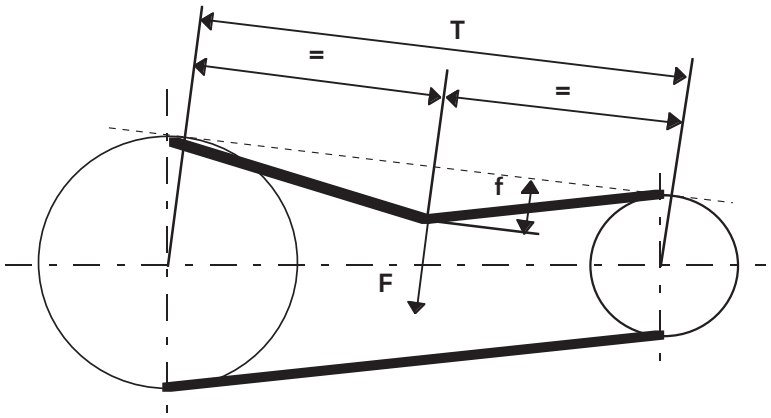
16.1. FANS

Check:

- **screw tightness** of the fan-motor unit;
- **tightness of the pulleys** onto their locking sets;
- **alignment of the pulleys;**
- **free rotation of the fan and motor; disassembly of any safety retainers** prepared in the case of set-up using springs;
- **belt tension:** belt tension must be checked again after a few hours according to the schematized procedure;
- **direction of rotation:** the fan rotor must turn in the direction indicated by the arrow on the fan auger; if the direction of rotation is incorrect, invert the two phases on the motor terminal board;
- **electrical absorption:** calibrate the heat protections on the control board regarding the plate absorption of the motor and use an ammeter to check that the current absorbed does not exceed this value. If absorption is excessive it is probable that the air distribution pressure drops have been over-estimated and the capacity is over-abundant. In this case, introduce an additional resistance with a calibration shutter or, preferably, reduce the fan rotation speed by changing transmission. In central air handling units with variable pitch pulley the speed is varied by changing the pitch **(B in figure 16.1.1)**. This problem may occur particularly in forward curved blade fans.



16.1.1. Belt tension



- Measure the free tract T.
- Use a dynamometer to apply a force F to a belt perpendicularly at half of T. This must be able to cause an arrow f of 1.5 mm for every 100 mm of T.
- Compare the value of F supplied by the dynamometer with the values of F' and F" given the table **(paragraph 16.1.2)** that follows:
  - If **F<F'** the belt must be tensioned.
  - If **F>F"** it must be loosened.
- As there is a rapid decrease of tension in the running in period of new transmissions, with new belts it is a good idea to tension them in a way that the force **F** in order to obtain the arrow **f** is 1.3 times the value **F"** indicated in the table. Belt tension is adjusted by acting on the motor slide screws (**A in the figure)**.

16.1.2. Table of dynamometer values

Belt section	Smaller pulley external diameter (mm)	N° revs. - Smaller pulley [revs/min.]	F' minimum (N)	F" maximum (N)
SPZ	50 - 90	1200 - 5000	10	15
	100 - 150	900 - 1800	20	30
	155 - 180	600 - 1200	25	35
SPA	90 - 145	900 - 1800	25	35
	150 - 195	600 - 1200	30	45
	200 - 250	400 - 900	35	50
SPB	170 - 235	900 - 1800	35	45
	250 - 320	600 - 1500	40	60
	330 - 400	400 - 900	45	65
SPC	250 - 320	900 - 1800	70	100
	330 - 400	600 - 1200	80	115
	440 - 420	400 - 900	90	130

16.2. HEAT EXCHANGE COILS

Before any check of the heat production of the heat exchange coils, it is recommended to:

- check correct coils connection (**paragraph 15.2**);
- check the temperature of the fluids;
- check the correct functioning of the adjustment logic and adjustment parts (3-way valves servomotors, etc.)

16.3. ELECTRIC PUMPS

- direction of rotation:
- calibration of heat protections,
- electrical absorption:
- adjustment of the by-pass valve.

16.4. FILTERS

- correct positioning and fixing of the cells,
- cleaning the cells and inside the central unit.

16.5. HUMIDIFICATION

- correct positioning of the evaporator pack,
- correct connection to the network and adjustment of the float valve.

16.6. SHUTTERS

- functioning (manual and automatic if envisioned),
- position: remember that start-up with closed shutters cannot be possible for fans with a maximum static pressure exceeding 2000 Pa if not envisioned explicitly in the order phase.

17. MAINTENANCE

The components installed must undergo the operations described in the following table with the indicated frequency. The frequency indicated is approximate (average): particularly for the filters, the dirtying of which is very different according to function of the central air handling unit. The intervals may be shorter for the fans in the case of continuous functioning.

Component	Operation	Type of control	Instrument	Limit value	Frequency
Ventilating section	• Check belt tension, • Check belt wear, • Check pulleys functioning, • Check rotor cleanliness, • Check bearings noise.	• Instrumental • Visual • Visual • Visual • Visual	Dynamometer		• twice a month • twice a month • twice a month • twice a month • twice a month
• Synthetic filters, • Bag filters, • Absolute filters, • Roll filters.	• Check dirtying, • Check dirtying, • Check dirtying, • Reel end check.	• Visual • Instrumental • Instrumental • Visual	Pressure gauge Pressure gauge	300 Pa 600 Pa	• every two weeks • every two weeks • every two weeks • on indication
Evaporator pack humidification	• Check pack blocking, • Tank cleanliness, • Cleaning the water filter, • Tank emptying, • Water level.	• Visual • Visual			• every two months • every two months • every two months • at the end of the season • every two months
Washer humidification	• Check nozzles functioning, • Tank cleanliness, • Cleaning the water filter, • Water level.	• Visual • Visual			• every two months • every two months • every two months • every two months
Heat exchange coils	• Check pack cleanliness, • Check condensate tray cleanliness.	• Visual • Visual			• yearly • yearly

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