G.I. INDUSTRIAL HOLDING

TECHNICAL BROCHURE

CTA

CTA FLAT

CTA SQUARED

AIR HANDLING UNITS

ErP LOT6 - 2016

ErP LOT6 - 2018

EUROVENT CERTIFIED PERFORMANCE
AHU - 15.05.002
CTA
www.eurovent-certification.com

NOVAIR
TRATTAMENTO ARIA

INDEX

1 CTA: THE CUSTOMISED AIR HANDLING UNITS

CTA is the wide range of NOVAIR branded Air Handling Units. The range covers airflow from 1.000 to 143.000 m³/h (650-84.170 cfm) and is customisable in every aspect, from layout, components or performance point of view.
NOVAIR Air Handling Units are certified for the highest performance standards.
The EUROVENT certification on CTA units proves the reliability and correctness of declared performance data and features.
CTA units and all internal components are compliant to ErP EcoDesign 2016 (2018) LOT6 Regulation and already designed for ErP EcoDesign 2018 LOT6 compliance.
The compliance of CTA units to UNI EN 1886 European Regulation about structure thermal and mechanical performance is also certified by Eurovent. CTA units reach, in THERMAL BREAK and SANIX version, T2 and TB2 classes for thermal performances of casing: T2 for thermal transmittance and TB2 for thermal bridges. The L1, D1 and F9 classes confirm the excellent mechanical resistance and anti-leakage tighness of casing and filters with both positive (+700 Pa / 2.81 in WG) and negative pressures (-400 Pa / -1.61 in WG).

1.1 CTA FAMILIES

This catalogue includes models:

- **CTA.** 36 models fully customisable in every aspect, with air flow from 1.000 to 112.000 m³/h (590-65.920 cfm).
- **CTA FLAT.** 23 models with reduced height, with air flow from 1.800 to 143.000 m³/h (1.060-84.170 cfm).
- **CTA SQUARED.** 24 models with reduced width, with air flow from 1.100 to 92.000 m³/h (650-54.150 cfm).

EUROVENT CERTIFIED PERFORMANCE
ENERGY EFFICIENCY
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15.05.002
A+ 2017
A+
A
B
C
D
E
Report to performance data

ErP LOT6 - 2016

ErP LOT6 - 2018

T2 UNI EN 1886 EUROVENT Certified

TB2 UNI EN 1886 EUROVENT Certified

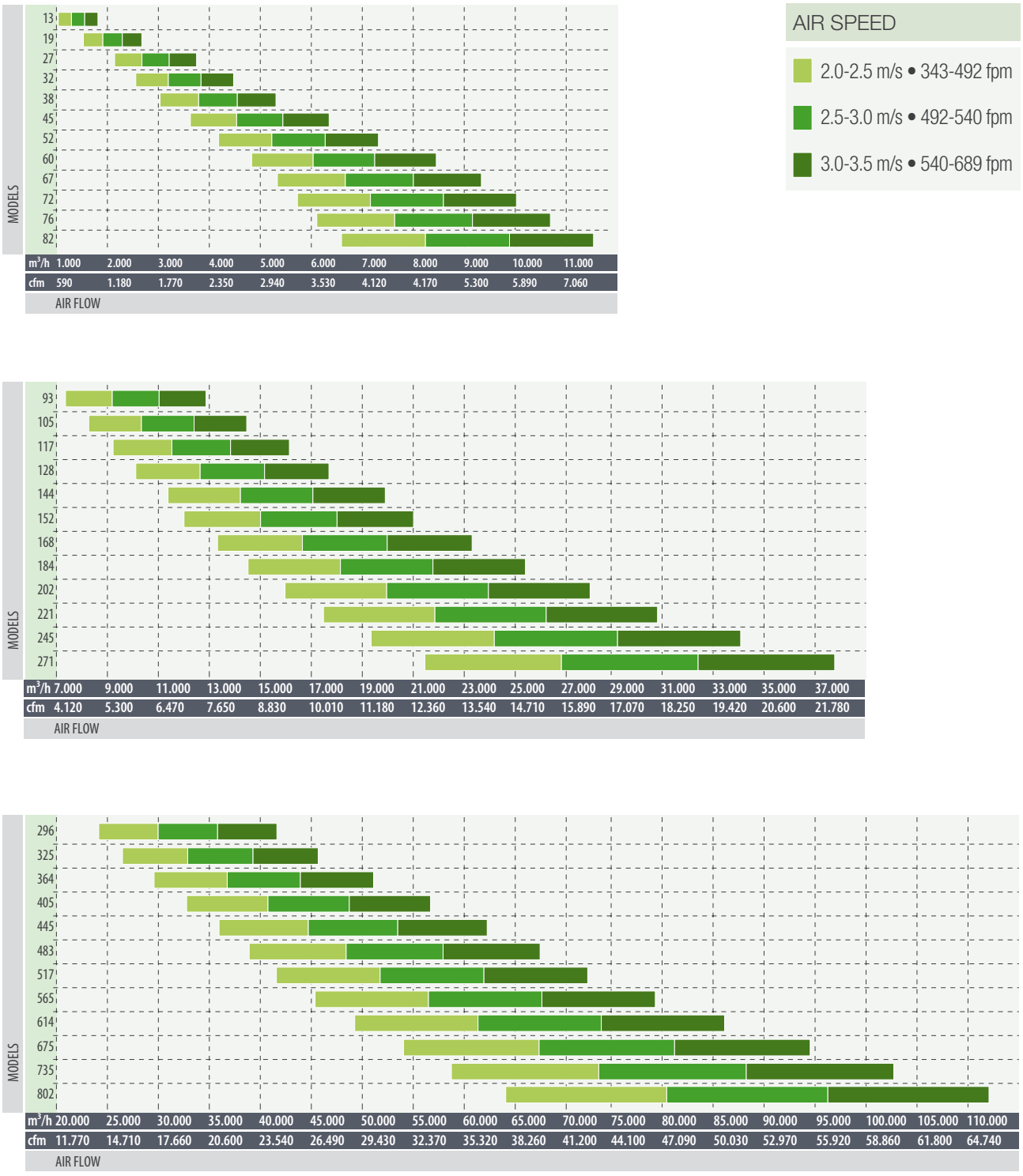
L1-F9 UNI EN 1886 EUROVENT Certified

D1 UNI EN 1886 EUROVENT Certified

CTA

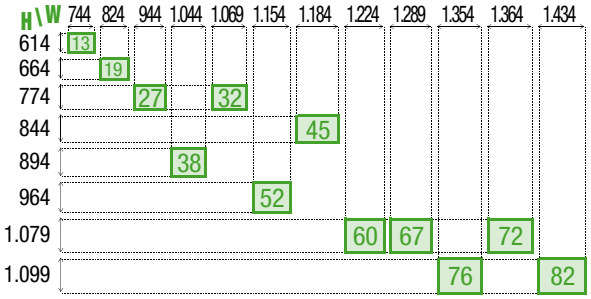
CTA. 36 models fully customisable in every aspect, with air flow from 1.000 to 112.000 m³/h (590-65.920 cfm).

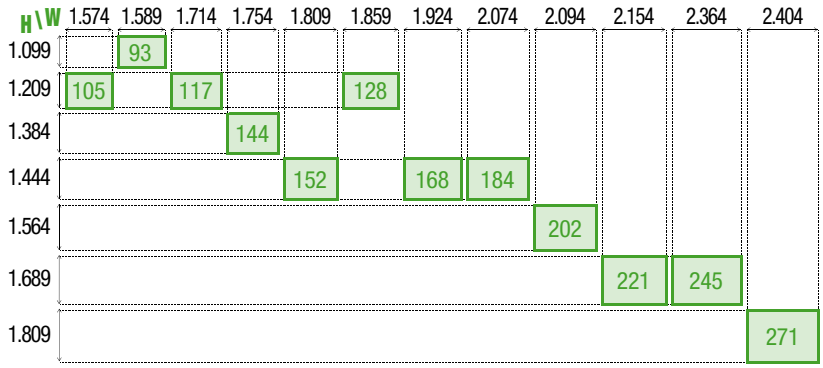
QUICK REFERENCE DIAGRAM

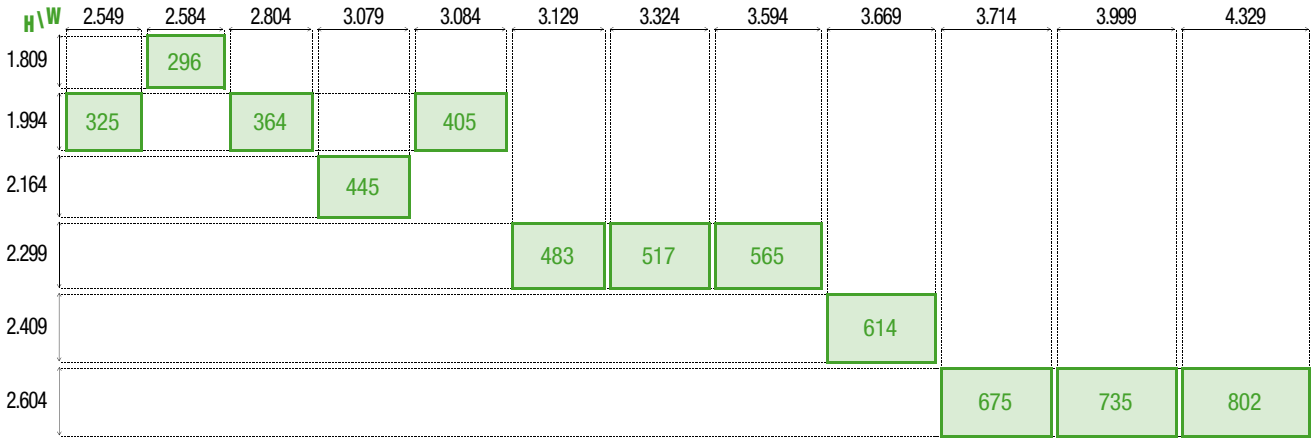


CTA

OUTER FRONT DIMENSIONS (mm). Unit with 62 mm profile and 50 mm panel





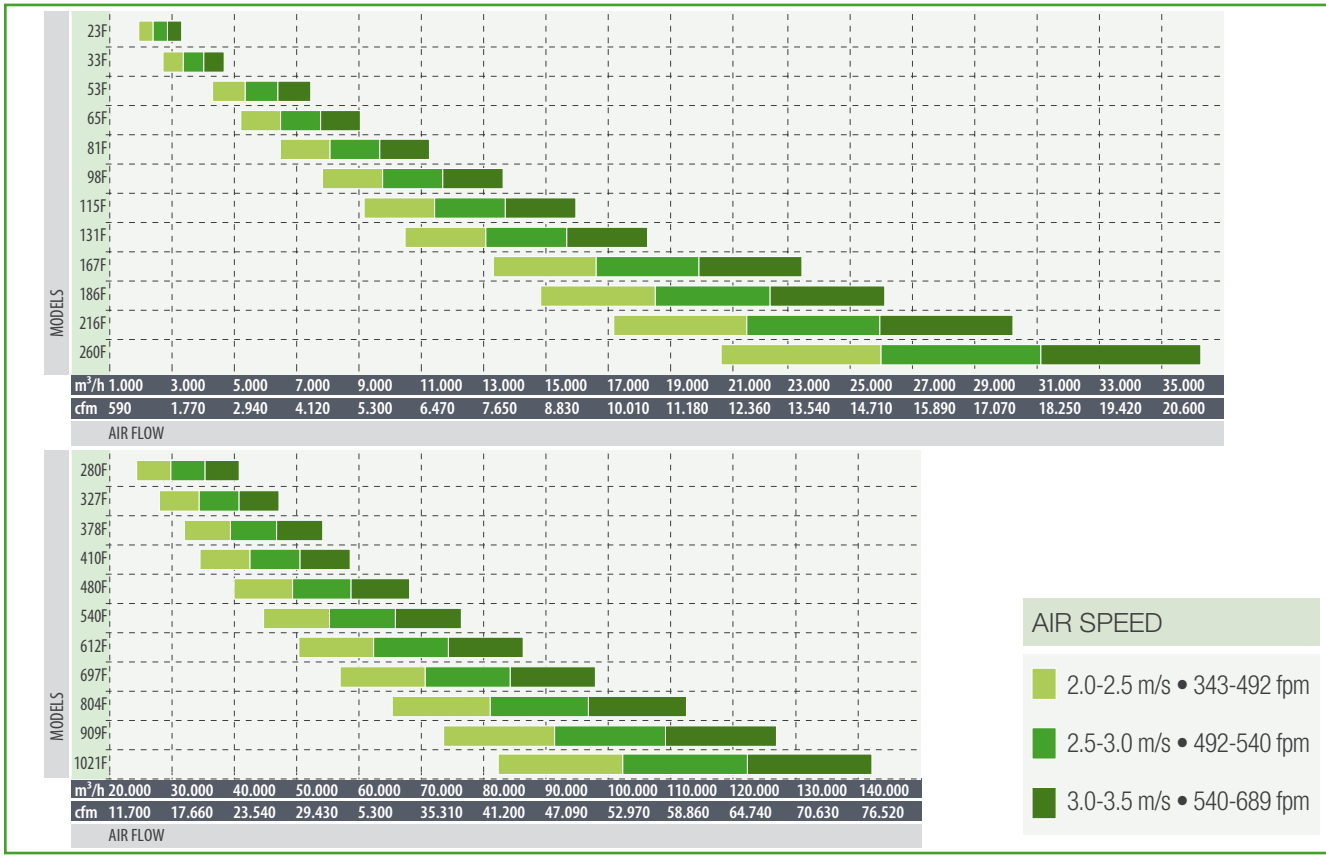


The units with 25 mm panel have width and height reduced by 50 mm
W = width, **H** = height

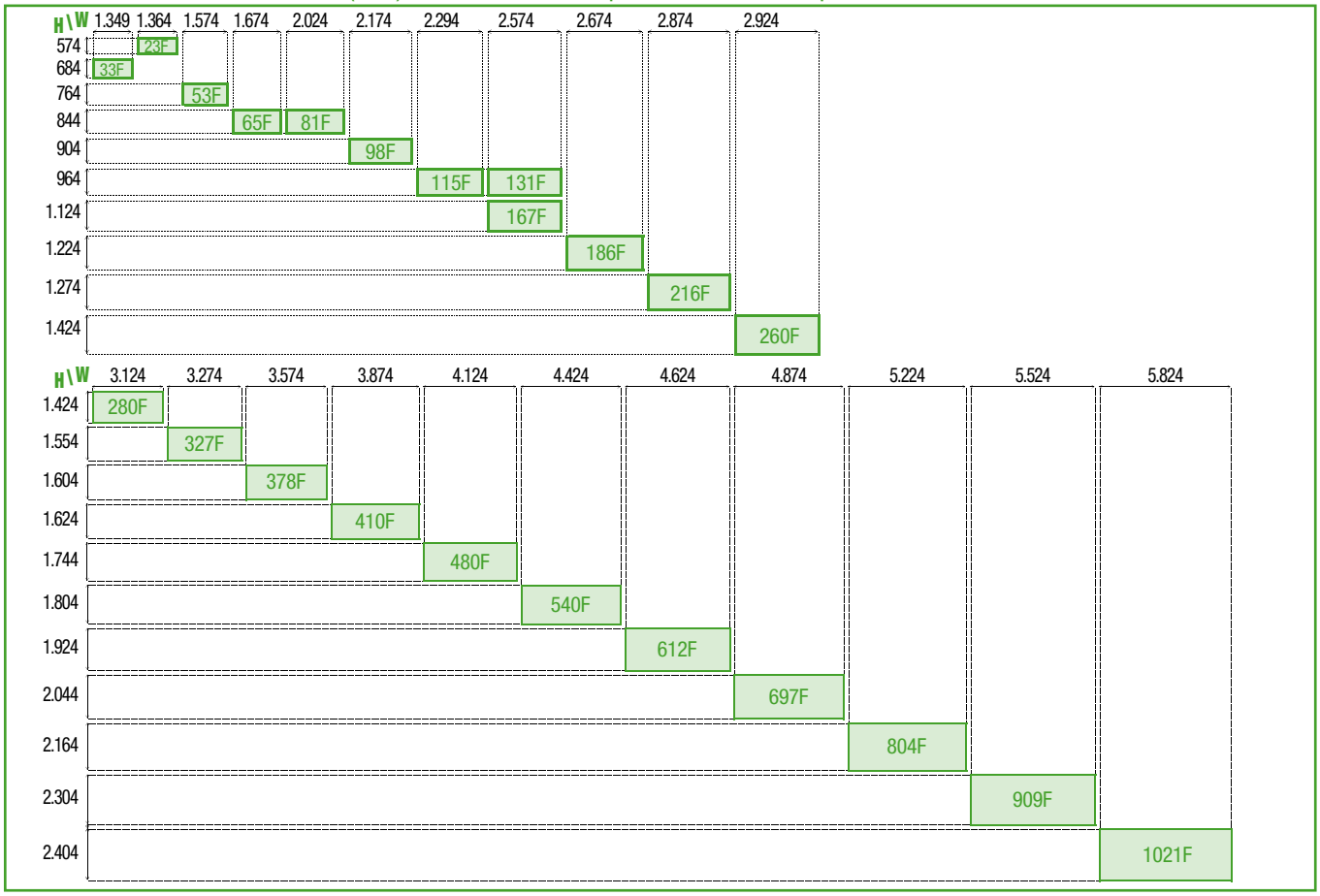
CTA FLAT

CTA FLAT. 23 models with reduced height, with air flow from 1.800 to 143.000 m³/h (1.060-84.170 cfm).

QUICK REFERENCE DIAGRAM



OUTER FRONT DIMENSIONS (mm). Unit with 62 mm profile and 50 mm panel

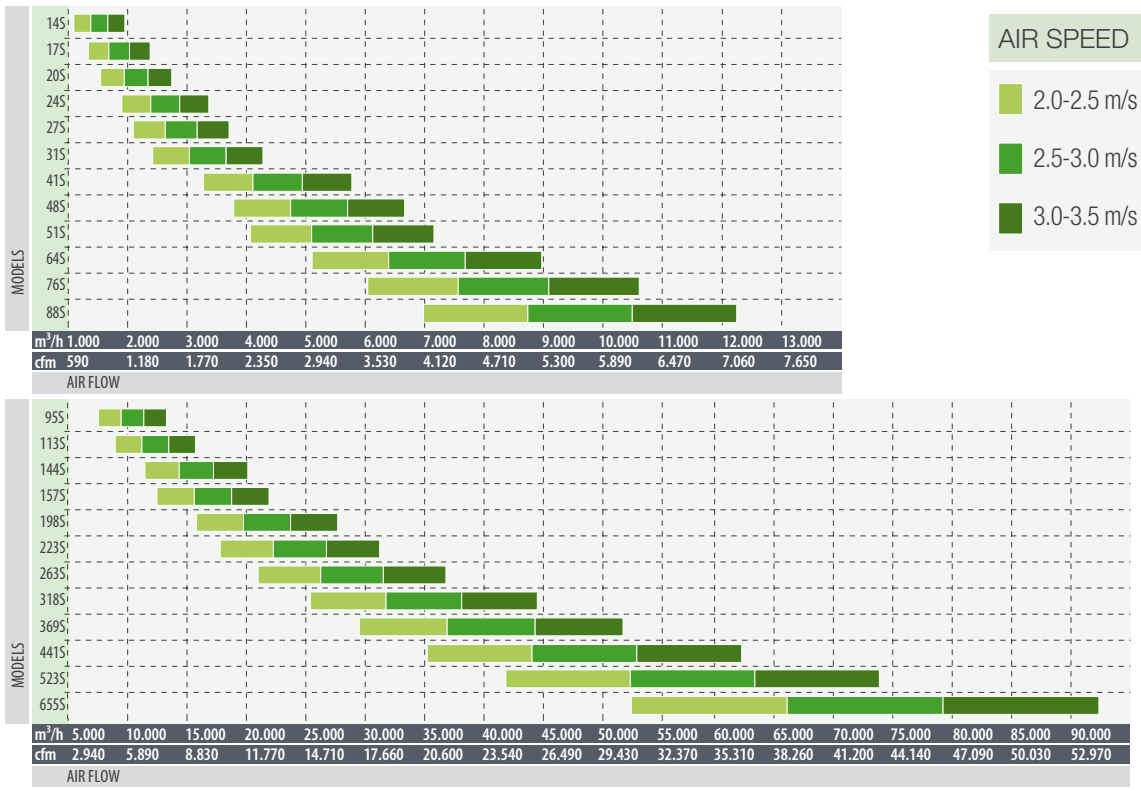


The units with 25 mm panel have width and height reduced by 50 mm
W = width, **H** = height

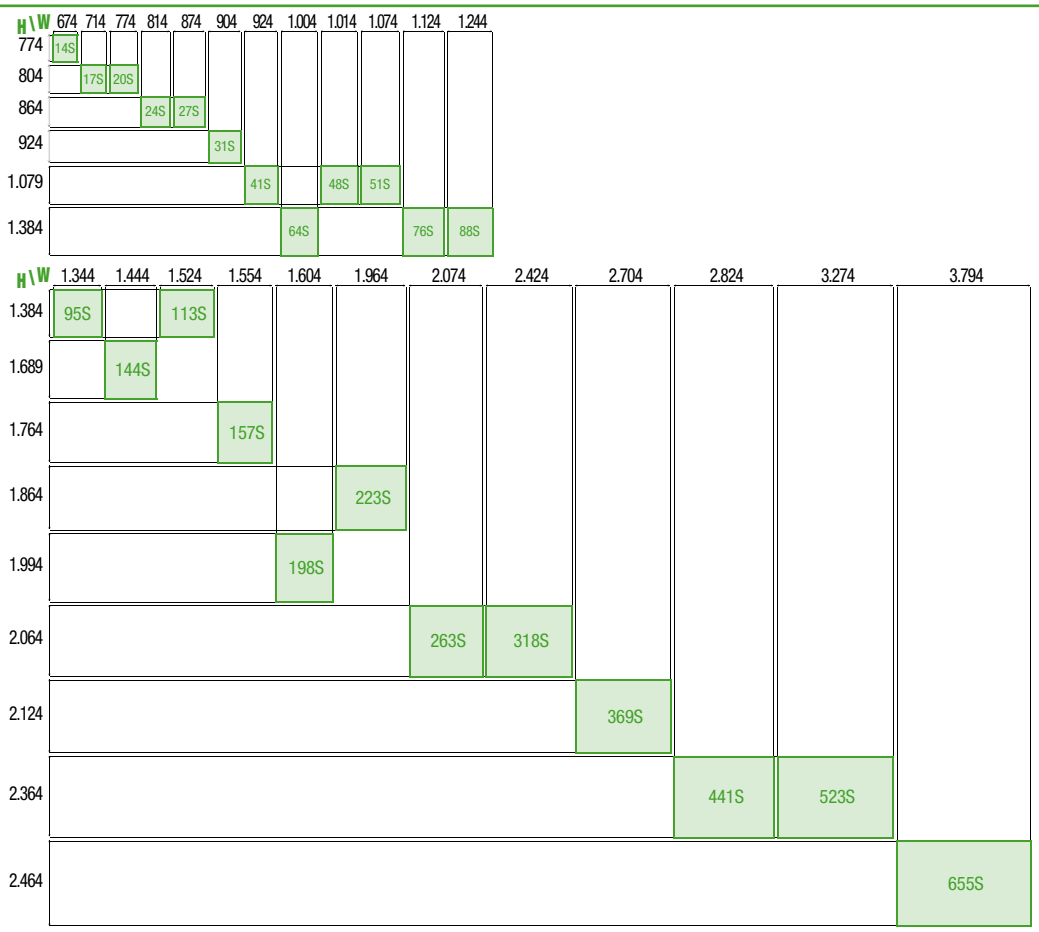
CTA SQUARED

CTA SQUARED. 24 models with reduced width, with air flow from 1.100 to 92.000 m³/h (650-54.150 cfm).

QUICK REFERENCE DIAGRAM



OUTER FRONT DIMENSIONS (mm). Unit with 62 mm profile and 50 mm panel



The units with 25 mm panel have width and height reduced by 50 mm
W = width, **H** = height

1.2 SIZE CHOICE PARAMETERS

The choice of the size of an Air Handling Unit is mostly made according to two parameters: the air quantity to handle in m^3/h (cfm) and the speed through the coil in m/s (fpm), as shown on the selection diagram here above.
In order to guarantee the proper functionality of the components contained into the Air Handling Units (coils, filters, droplet eliminators, dampers, supply or return grids, etc.), we suggest to adopt the following parameters for the crossing speed of the component shown in Fig. 1.
The restrictions imposed by this chart are mostly due to the following reasons:

a) creation of moisture and water drops in cooling handlings with humidification or de-humidification;
b) short life of filtering components and their short efficiency;
c) water entrainment, in case of rain, through the non-ducted air inlets;
d) noise caused by the air crossing on grids or dampers;

1.3 AIR FLOWS

The sizes of the standard units and the air volumes referred to different crossing speeds are shown in the tables on page 9 and pag. 10:

CTA - Unit size
W - External and internal width (mm)
H - External and internal height (mm) excluding the supporting basement

Fig. 1: Limits of crossing speed

COMPONENT INSIDE THE UNIT	MAX FRONTAL SPEED SUGGESTED	
	(m/s)	(fpm)
Heating coil	3,5	689
Cooling coil with high condensation without droplet eliminator	2,3	453
Cooling coil with low condensation without droplet eliminator	2,5	492
Coil with high or low condensation and droplet eliminator	2,5 ÷ 3	492÷591
Medium and high efficiency filter	2,8 ÷ 3	551÷591
HEPA filter	2,0	394
Dampers installed at inlet side with grid	2,0 ÷ 2,5	394÷492

CTA	OUTER FRONT DIMENSIONS*		INTERNAL FRONT DIMENSIONS*		AIR FLOW (m³/h-cfm)													
					Coil crossing speed (m/s - fpm)													
					m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm
	W(mm)	H(mm)	W(mm)	H(mm)	2,0	394	2,2	433	2,5	492	2,8	551	3,0	591	3,2	630	3,5	689
13	744	614	620	490	1.037	610	1.140	671	1.296	762	1.452	854	1.555	915	1.659	976	1.814	1.067
19	824	664	700	540	1.529	900	1.682	990	1.912	1.124	2.141	1.259	2.294	1.349	2.447	1.439	2.676	1.574
27	944	774	820	650	2.143	1.260	2.357	1.386	2.678	1.576	3.000	1.765	3.214	1.891	3.428	2.017	3.750	2.206
32	1.069	774	945	650	2.557	1.504	2.813	1.655	3.197	1.880	3.580	2.106	3.836	2.257	4.092	2.407	4.476	2.633
38	1.044	894	920	770	3.033	1.784	3.336	1.962	3.791	2.230	4.246	2.497	4.549	2.676	4.852	2.854	5.307	3.122
45	1.184	844	1.060	720	3.629	2.135	3.992	2.348	4.536	2.668	5.080	2.988	5.443	3.202	5.806	3.415	6.350	3.736
52	1.154	964	1.030	840	4.182	2.460	4.600	2.706	5.227	3.075	5.854	3.444	6.273	3.690	6.691	3.936	7.318	4.305
60	1.224	1.079	1.100	955	4.830	2.841	5.313	3.125	6.037	3.551	6.762	3.977	7.245	4.262	7.728	4.546	8.452	4.972
67	1.289	1.079	1.165	955	5.335	3.138	5.869	3.452	6.669	3.923	7.469	4.394	8.003	4.708	8.536	5.021	9.337	5.492
72	1.364	1.079	1.240	955	5.728	3.370	6.301	3.707	7.160	4.212	8.020	4.717	8.592	5.054	9.165	5.391	10.025	5.897
76	1.354	1.099	1.230	975	6.108	3.593	6.719	3.953	7.636	4.492	8.552	5.031	9.163	5.390	9.774	5.749	10.690	6.288
82	1.434	1.099	1.310	975	6.592	3.878	7.252	4.266	8.240	4.847	9.229	5.429	9.888	5.817	10.548	6.205	11.537	6.786
93	1.589	1.099	1.465	975	7.439	4.376	8.183	4.813	9.299	5.470	10.415	6.126	11.159	6.564	11.902	7.001	13.018	7.658
105	1.574	1.209	1.450	1.085	8.364	4.920	9.200	5.412	10.454	6.150	11.709	6.888	12.545	7.380	13.382	7.872	14.636	8.610
117	1.714	1.209	1.590	1.085	9.331	5.489	10.264	6.038	11.664	6.861	13.064	7.685	13.997	8.233	14.930	8.782	16.330	9.606
128	1.859	1.209	1.735	1.085	10.230	6.018	11.253	6.619	12.787	7.522	14.322	8.425	15.345	9.026	16.368	9.628	17.902	10.531
144	1.754	1.384	1.630	1.260	11.508	6.770	12.659	7.447	14.386	8.462	16.112	9.478	17.263	10.155	18.414	10.832	20.140	11.847
152	1.809	1.444	1.685	1.320	12.148	7.146	13.363	7.860	15.185	8.932	17.007	10.004	18.222	10.719	19.437	11.433	21.259	12.505
168	1.924	1.444	1.800	1.320	13.478	7.928	14.826	8.721	16.848	9.911	18.870	11.100	20.218	11.893	21.565	12.686	23.587	13.875
184	2.074	1.444	1.950	1.320	14.688	8.640	16.157	9.504	18.360	10.800	20.563	12.096	22.032	12.960	23.501	13.824	25.704	15.120
202	2.094	1.564	1.970	1.440	16.157	9.504	17.772	10.454	20.196	11.880	22.620	13.306	24.235	14.256	25.851	15.206	28.274	16.632
221	2.154	1.689	2.030	1.565	17.686	10.404	19.455	11.444	22.108	13.004	24.761	14.565	26.529	15.605	28.298	16.646	30.951	18.206
245	2.364	1.689	2.240	1.565	19.574	11.514	21.531	12.665	24.467	14.393	27.403	16.120	29.361	17.271	31.318	18.423	34.254	20.150
271	2.404	1.809	2.280	1.685	21.708	12.769	23.879	14.046	27.135	15.962	30.391	17.877	32.562	19.154	34.733	20.431	37.989	22.346
296	2.584	1.809	2.460	1.685	23.652	13.913	26.017	15.304	29.565	17.391	33.113	19.478	35.478	20.869	37.843	22.261	41.391	24.348
325	2.549	1.994	2.425	1.870	26.006	15.298	28.607	16.828	32.508	19.122	36.409	21.417	39.010	22.947	41.610	24.477	45.511	26.771
364	2.804	1.994	2.680	1.870	29.151	17.148	32.066	18.863	36.439	21.435	40.812	24.007	43.727	25.722	46.642	27.437	51.015	30.009
405	3.084	1.994	2.960	1.870	32.400	19.059	35.640	20.965	40.500	23.824	45.360	26.682	48.600	28.588	51.840	30.494	56.700	33.353
445	3.079	2.164	2.955	2.040	35.623	20.955	39.185	23.050	44.528	26.193	49.872	29.336	53.434	31.432	56.996	33.527	62.340	36.670
483	3.129	2.299	3.005	2.175	38.634	22.726	42.497	24.998	48.292	28.407	54.087	31.816	57.951	34.089	61.814	36.361	67.609	39.770
517	3.324	2.299	3.200	2.175	41.342	24.319	45.477	26.751	51.678	30.399	57.879	34.047	62.014	36.479	66.148	38.910	72.349	42.558
565	3.594	2.299	3.470	2.175	45.192	26.583	49.711	29.242	56.489	33.229	63.268	37.217	67.787	39.875	72.306	42.533	79.085	46.521
614	3.669	2.409	3.545	2.285	49.140	28.906	54.054	31.796	61.425	36.132	68.796	40.468	73.710	43.359	78.624	46.249	85.995	50.585
675	3.714	2.604	3.590	2.480	54.009	31.770	59.410	34.947	67.511	39.712	75.612	44.478	81.013	47.655	86.414	50.832	94.515	55.597
735	3.999	2.604	3.875	2.480	58.769	34.570	64.646	38.027	73.462	43.213	82.277	48.398	88.154	51.855	94.031	55.312	102.846	60.498
802	4.329	2.604	4.205	2.480	64.187	37.757	70.605	41.532	80.233	47.196	89.861	52.860	96.280	56.635	102.698	60.411	112.326	66.074

* Unit with 62 mm profile and 50 mm panel. The units with 25 mm panel have width and height reduced by 50 mm

CTA FLAT	OUTER FRONT DIMENSIONS*		INTERNAL FRONT DIMENSIONS*		AIR FLOW (m³/h-cfm)													
					Coil crossing speed (m/s)													
					m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm
	W(mm)	H(mm)	W(mm)	H(mm)	2,0	394	2,2	433	2,5	492	2,8	551	3,0	591	3,2	630	3,5	689
23F	1.364	574	1.240	450	1.858	1.093	2.043	1.202	2.322	1.366	2.601	1.530	2.786	1.639	2.972	1.748	3.251	1.912
33F	1.349	684	1.225	560	2.644	1.555	2.908	1.711	3.305	1.944	3.701	2.177	3.966	2.333	4.230	2.488	4.627	2.722
53F	1.574	764	1.450	640	4.251	2.501	4.676	2.751	5.314	3.126	5.951	3.501	6.376	3.751	6.801	4.001	7.439	4.376
65F	1.674	844	1.550	720	5.171	3.042	5.688	3.346	6.464	3.802	7.239	4.259	7.757	4.563	8.274	4.867	9.049	5.323
81F	2.024	844	1.900	720	6.454	3.797	7.099	4.176	8.068	4.746	9.036	5.315	9.681	5.695	10.327	6.074	11.295	6.644
98F	2.174	904	2.050	780	7.819	4.600	8.601	5.059	9.774	5.749	10.947	6.439	11.729	6.899	12.511	7.359	13.684	8.049
115F	2.294	964	2.170	840	9.171	5.395	10.088	5.934	11.464	6.744	12.840	7.553	13.757	8.092	14.674	8.632	16.050	9.441
131F	2.574	964	2.450	840	10.502	6.178	11.552	6.795	13.127	7.722	14.703	8.649	15.753	9.266	16.803	9.884	18.378	10.811
167F	2.574	1.124	2.450	1.000	13.366	7.862	14.703	8.649	16.708	9.828	18.713	11.007	20.049	11.794	21.386	12.580	23.391	13.759
186F	2.674	1.224	2.550	1.100	14.904	8.767	16.394	9.644	18.630	10.959	20.866	12.274	22.356	13.151	23.846	14.027	26.082	15.342
216F	2.874	1.274	2.750	1.150	17.280	10.165	19.008	11.181	21.600	12.706	24.192	14.231	25.920	15.247	27.648	16.264	30.240	17.788
260F	2.924	1.424	2.800	1.300	20.766	12.215	22.843	13.437	25.958	15.269	29.073	17.102	31.149	18.323	33.226	19.545	36.341	21.377
280F	3.124	1.424	3.000	1.300	22.408	13.181	24.649	14.499	28.010	16.476	31.371	18.454	33.612	19.772	35.853	21.090	39.214	23.067
327F	3.274	1.554	3.150	1.430	26.127	15.369	28.740	16.906	32.659	19.211	36.578	21.517	39.191	23.054	41.804	24.590	45.723	26.896
378F	3.574	1.604	3.450	1.480	30.223	17.778	33.245	19.556	37.778	22.223	42.312	24.889	45.334	26.667	48.356	28.445	52.890	31.112
410F	3.874	1.624	3.750	1.500	32.789	19.288	36.068	21.216	40.986	24.109	45.904	27.003	49.183	28.931	52.462	30.860	57.380	33.753
480F	4.124	1.744	4.000	1.620	38.362	22.566	42.198	24.822	47.952	28.207	53.706	31.592	57.542	33.848	61.379	36.105	67.133	39.490
540F	4.424	1.804	4.300	1.680	43.200	25.412	47.520	27.953	54.000	31.765	60.480	35.576	64.800	38.118	69.120	40.659	75.600	44.471
612F	4.624	1.924	4.500	1.800	48.989	28.817	53.888	31.699	61.236	36.021	68.584	40.344	73.483	43.225	78.382	46.107	85.730	50.430
697F	4.874	2.044	4.750	1.920	55.750	32.794	61.325	36.073	69.687	40.992	78.049	45.911	83.624	49.191	89.199	52.470	97.562	57.389
804F	5.224	2.164	5.100	2.040	64.282	37.813	70.710	41.594	80.352	47.266	89.994	52.938	96.422	56.719	102.851	60.500	112.493	66.172
909F	5.524	2.304	5.400	2.180	72.706	42.768	79.976	47.045	90.882	53.460	101.788	59.875	109.058	64.152	116.329	68.429	127.235	74.844
1021F	5.824	2.404	5.700	2.280	81.648	48.028	89.813	52.831	102.060	60.035	114.307	67.240	122.472	72.042	130.637	76.845	142.884	84.049

CTA SQUARED	OUTER FRONT DIMENSIONS*		INTERNAL FRONT DIMENSIONS*		AIR FLOW (m³/h-cfm)													
					Coil crossing speed (m/s)													
					m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm	m/s	fpm
	W(mm)	H(mm)	W(mm)	H(mm)	2,0	394	2,2	433	2,5	492	2,8	551	3,0	591	3,2	630	3,5	689
14S	674	774	550	650	1.140	671	1.255	738	1.426	839	1.597	939	1.711	1.006	1.825	1.073	1.996	1.174
17S	714	804	590	680	1.382	813	1.521	894	1.728	1.016	1.935	1.138	2.074	1.220	2.212	1.301	2.419	1.423
20S	774	804	650	680	1.590	935	1.749	1.029	1.987	1.169	2.226	1.309	2.385	1.403	2.544	1.496	2.782	1.637
24S	814	864	690	740	1.944	1.144	2.138	1.258	2.430	1.429	2.722	1.601	2.916	1.715	3.110	1.830	3.402	2.001
27S	874	864	750	740	2.138	1.258	2.352	1.384	2.673	1.572	2.994	1.761	3.208	1.887	3.421	2.013	3.742	2.201
31S	904	924	780	800	2.462	1.448	2.709	1.593	3.078	1.811	3.447	2.028	3.694	2.173	3.940	2.318	4.309	2.535
41S	924	1.079	800	955	3.313	1.949	3.645	2.144	4.142	2.436	4.639	2.729	4.970	2.924	5.302	3.119	5.799	3.411
48S	1.014	1.079	890	955	3.819	2.246	4.201	2.471	4.774	2.808	5.346	3.145	5.728	3.370	6.110	3.594	6.683	3.931
51S	1.074	1.079	950	955	4.100	2.412	4.510	2.653	5.125	3.014	5.740	3.376	6.150	3.617	6.559	3.859	7.174	4.220
64S	1.004	1.384	880	1260	5.132	3.019	5.645	3.321	6.415	3.774	7.185	4.226	7.698	4.528	8.211	4.830	8.981	5.283
76S	1.124	1.384	1000	1260	6.065	3.568	6.672	3.925	7.582	4.460	8.491	4.995	9.098	5.352	9.704	5.708	10.614	6.244
88S	1.244	1.384	1120	1260	6.998	4.117	7.698	4.528	8.748	5.146	9.798	5.763	10.498	6.175	11.197	6.587	12.247	7.204
95S	1.344	1.384	1220	1260	7.620	4.483	8.383	4.931	9.526	5.603	10.669	6.276	11.431	6.724	12.193	7.172	13.336	7.845
113S	1.524	1.384	1400	1260	9.020	5.306	9.922	5.837	11.275	6.632	12.628	7.428	13.530	7.959	14.432	8.490	15.785	9.285
144S	1.444	1.689	1320	1565	11.526	6.780	12.678	7.458	14.407	8.475	16.136	9.492	17.289	10.170	18.441	10.848	20.170	11.865
157S	1.554	1.764	1430	1640	12.545	7.380	13.800	8.118	15.682	9.224	17.563	10.331	18.818	11.069	20.072	11.807	21.954	12.914
198S	1.604	1.994	1480	1870	15.846	9.321	17.430	10.253	19.807	11.651	22.184	13.049	23.769	13.982	25.353	14.914	27.730	16.312
223S	1.964	1.864	1840	1740	17.859	10.505	19.645	11.556	22.324	13.132	25.002	14.707	26.788	15.758	28.574	16.808	31.253	18.384
263S	2.074	2.064	1950	1940	21.047	12.381	23.152	13.619	26.309	15.476	29.466	17.333	31.571	18.571	33.675	19.809	36.832	21.666
318S	2.424	2.064	2300	1940	25.432	14.960	27.975	16.456	31.790	18.700	35.605	20.944	38.148	22.440	40.691	23.936	44.506	26.180
369S	2.704	2.124	2580	2000	29.549	17.382	32.504	19.120	36.936	21.727	41.368	24.334	44.323	26.072	47.278	27.811	51.710	30.418
441S	2.824	2.364	2700	2240	35.251	20.736	38.776	22.810	44.064	25.920	49.352	29.030	52.877	31.104	56.402	33.178	61.690	36.288
523S	3.274	2.364	3150	2240	41.861	24.624	46.047	27.086	52.326	30.780	58.605	34.474	62.791	36.936	66.977	39.398	73.256	43.092
655S	3.794	2.464	3670	2340	52.410	30.830	57.651	33.913	65.513	38.537	73.374	43.161	78.615	46.244	83.856	49.327	91.718	53.952

* Unit with 62 mm profile and 50 mm panel. The units with 25 mm panel have width and height reduced by 50 mm

2. CONFIGURATION

2.1 BEARING STRUCTURE

The Air Handling Units series CTA are manufactured with bearing framework and sandwich paneling.
The frame is made of extruded Anticorodal aluminium alloy profiles (from Fig. 2 to Fig. 7), usually of type AlMgSi 0,6 - UNI 9006/1 (Fig. 8).

2.1.1 NOVAIR EXCLUSIVE PROFILE

The exclusive bearing structure made by NOVAIR, having actual dimensions of 37 x 25 mm and 62 x 50 mm, uses the lock panel system in aluminium (SNAP-IN system). This system permits to reach paneling tightnesses beyond 2500 Pa (10 in WG), because of the homogeneity of the pressure over the paneling perimeter, not achievable with the traditional system (self-drilling screw fastening). This profile doesn't require the aid of internal and external screws, giving therefore a solider and aesthetically more pleasant appearance. Because of the dimensions of the profile, the used panel has actual dimensions of 25/50 mm. The profile hasn't got external sharp edges, as foreseen by the safety and accident-prevention rules in force.

Fig. 2: Section of extruded profile 37 x 25 mm (SNAP-IN system)

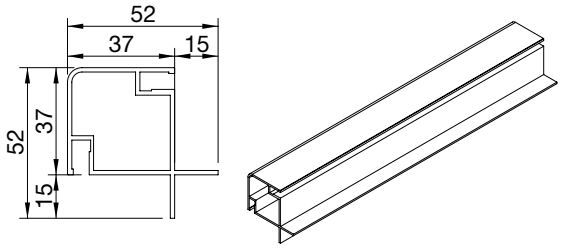


Fig. 3: Section of extruded profile 62 x 50 mm (SNAP-IN system)

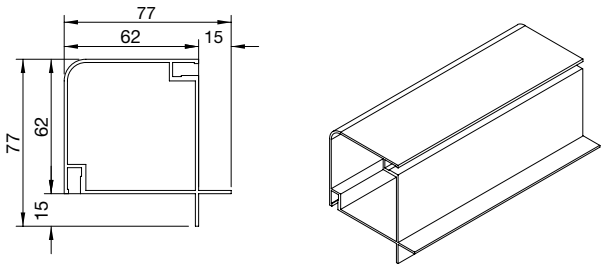


Fig. 4: Thermal Break profile 62 x 50 mm (SNAP-IN system)

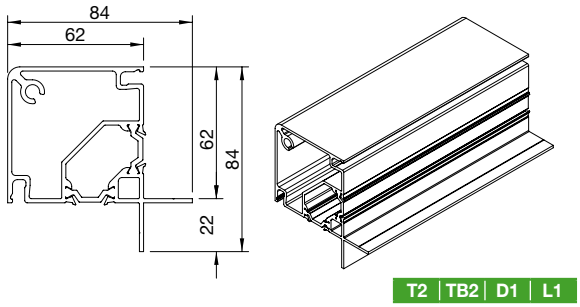


Fig. 5: Thermal Break profile 62 x 50 mm for sanitizing execution - SANIX (SNAP-IN system)

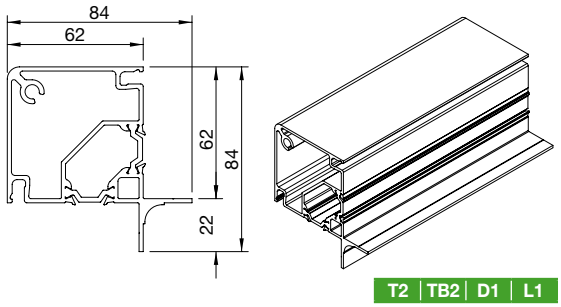


Fig. 6: Thermal Break profile 60 x 46 mm (option)
Thermal Break profile 60 x 63 mm (option)

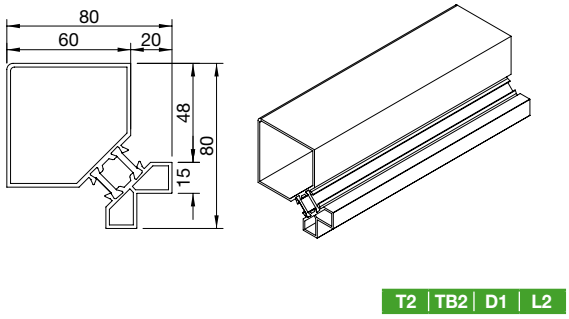


Fig. 7: Thermal Break profile 60 x 63 mm for sanitizing execution - SANIX (option)

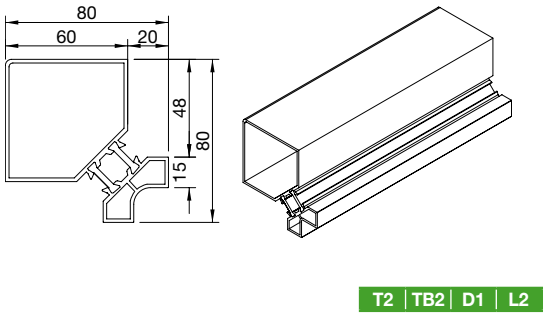


Fig. 8: Mechanical characteristics of extruded aluminum alloy

DENOMINATION	Specific weight (Kg/dm³)	Unitary load of traction break R (kg/mm²)	Yielding load S (0,2) (kg/mm²)	Stretch (%)	Brinell hardness (kg/mm²)
ANTICORODAL 050 UNI 9006/1 EX UNI 3569 (6060) ISO = Al Mg Si 0.5	2,70	20 ÷ 23	16 ÷ 20	12 ÷ 15	60 ÷ 70

2.1.2 OPTIONS

- frame made of anodized Anticorodal aluminium alloy.
- frame with Thermal Break profile 60 x 46 mm and 60 x 63 mm (Fig. 6) with high thermal performances.
- frame with Thermal Break profile 60 x 63 mm (Fig. 7) with high thermal performances (T2/TB2) for sanitizing execution - SANIX.

2.2 PANELING

The paneling is double skin sandwich type made of galvanized sheet, with insulation polyurethane foam of minimum density 45 kg/m^3, actual thickness:

- 25 mm up to size 105 (CTA), 53F (CTA FLAT) and 113S (CTA SQUARED)
- 50 mm for all sizes
- 46 mm for Thermal Break units (option)
- 50 mm for Thermal Break units
- 63 mm for Thermal Break units (option)
- 50 mm for all sizes for sanitizing execution - SANIX
- 63 mm for units for sanitizing execution - SANIX (option)

Standard panels are made as follows:

INNER SKIN:
hot dipped galvanized sheet (galvanization not less than 140 g/m^2), 0,6 mm thick.

INSULATION:
rigid polyurethane foam minimum density 45 kg/m^3, thermal conductivity 0,018÷0,024 W/m^2 °C.

OUTER SKIN:
hot dipped prepainted sheet, 0,6 mm thick (Fig. 9).
The physical characteristics of the panel so manufactured are the following:

- thermal transmittance factor: 0,45 - 0,49 W/m^2 °C
- fire reaction: class 1

The fastening of panels on the bearing structure is done with a SNAP-IN system or with galvanized steel screws.

2.2.1 OPTIONS

- sandwich panels with skins made of: galvanized steel, pre-plastified galvanized steel, peraluman, stainless steel as per specifications hereinafter (Par. 2.2.2).
- insulation with mineral wool density 80 - 100 kg/m^3.
- panels fastening:
  - by stainless steel screws for Thermal Break profile 60 x 46 mm and 60 x 63 mm
  - by stainless steel screws for units for sanitizing execution - SANIX

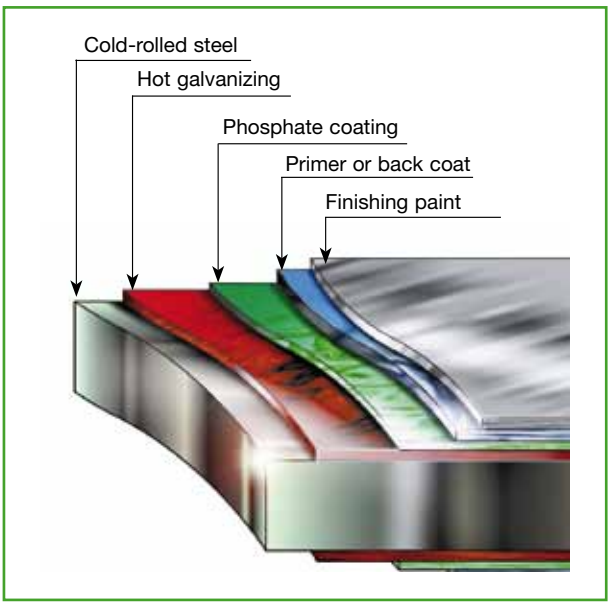
2.2.2 CHARACTERISTICS OF STEEL SHEETS USED

- hot dipped galvanized steel sheet type Fe P02 GZ 140 UNI En 10142 with galvanization not less than 140 g/m^2. The thickness is 0,6 mm for standard paneling. On request other thicknesses are available.
- prepainted steel sheet with base support made of hot dipped galvanized steel EURONORM 142-79 and coating, white-grey colour for a special resistance to weathering. The protective system consists of a dry film of 25 µm on the exposed skin and of a dry film of 5 µm on the non-exposed skin. Hardness of film: F on the Koh - i - Noor's scale. Other chemical-physical characteristics:
  - resistance beyond 250 h in salty mist (ECCA T8)
  - resistance beyond 1.000 h in high humidity conditions (ASTM D 714)
  - film resistance to the cleaving and adhesion after bending (ECCA T7).

A self-adhesive PVC film is laid on the steel sheet exposed surface in order to avoid damages during the manufacturing procedures and transport.

- pre-plastified steel sheet with base support made of hot dipped galvanized steel type Fe P02 GZ 140 UNI EN 10142 with galvanization not less than 140 g/m^2 and plastic coating film of semirigid polyvinyl chloride (PVC) 140 µm thick.
  The sheets are usually available of white-grey colour. The thickness is 0,6 mm.
  On the external surface there is besides a protective film made of low density polyethylene, with anti-UV treatment in order to avoid damages during the manufacturing procedures and transport.
- aluminium alloy sheet called peraluman P-Al Mg 2 Mn 0,8; if compared to other "Al" alloys types, it is particularly suitable when a good mechanical and corrosion resistance in marine environments are required. The thickness is 0,8 mm.
  On request other thicknesses are available.
  A self-adhesive PVC film is laid on the sheet exposed surface in order to avoid damages during the manufacturing procedures and transport.
- stainless steel sheet:
  - AISI 304 (or AISI 316) for a better resistance to chemical and weather agents

Fig. 9: Prepainted steel sheet



This type of stainless steels is particularly suitable for all those applications where it is necessary to fight against the most aggressive weather agents and is fit for all the washing and hygienic treatments without alterations during the time (for instance food industry, chemical industry, swimming pools, laboratories, etc.). The thickness is 0,6 mm. On request other thicknesses are available.

2.3 BASEFRAME

The bearing baseframe is made of galvanized steel with pressure bent, bolted or welded profile, according to the configuration of the unit.
It is arranged for the sections lifting and suitable for water piping passage and drain.
Perimeter baseframes heights and profiles are usually dimensioned as follows (Fig. 8):

- H = 100 mm with bolted C profile for all units except those for sanitizing execution (SANIX)
- H = 150 mm with bolted C profile for sanitizing execution (SANIX)

The baseframes of all the above solutions are made of galvanized steel sheet with minimum thickness 2,0 mm.
On request baseframes or support feet can be supplied with different shapes, dimensions and materials.

2.4 COVERING

The units that have to be installed outside or anyway exposed to weathering are supplied with covering roof, as accessory element.
Different solutions are available, according to the requests or to actual needs:

- pre-painted galvanized sheet type minimum thickness 1,0 mm; also available with precoated galvanized steel.
- flat peraluman sheet (Par. 2.2.2) minimum thickness 1,5 mm.
- AISI 304 stainless steel.

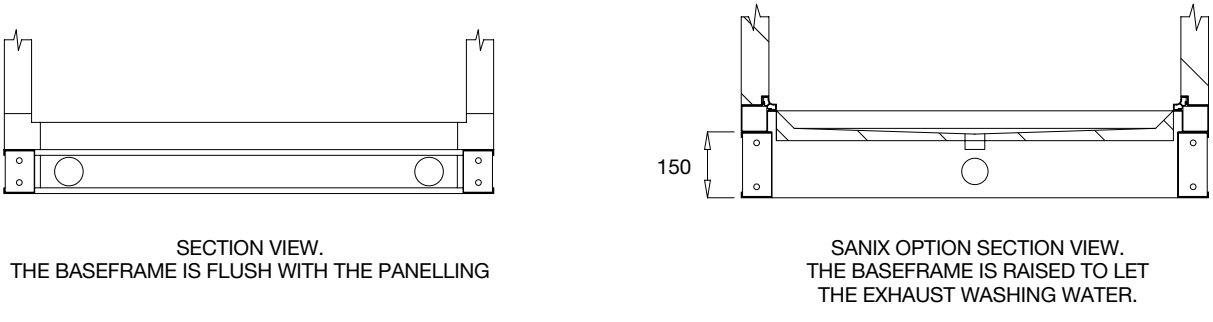
The roof protrusion, as regards the external dimensions of the unit, is around 50 mm. Small units or monoblock type units are usually supplied with roof already fastened to the casing. Big units are supplied with separate pre-assembled roof. For these last ones the roof has to be installed with some inclination, in order to allow the flowing of rain.
The roof corners are equipped with suitable protection for accident prevention.

2.5 SOUND ABSORPTION

In an air conditioning plant, if noise sources are not controlled, they can determine unacceptable environmental acoustical conditions.
When it is necessary to reduce the propagation of the sound waves coming from the unit through the air ducts, we suggest the following additional internal coating, which are different in type and sound absorption:

- microstretched galvanized sheet + mineral wool, density 80-100 Kg/m^3, covered with an antiscaling film. Minimum thickness 25-50 mm (non washable material). This solution is also used to reduce the sound outside the unit: we suggest a soundproofing panel, certified by a qualified institution.

Fig. 10: Baseframe types



SECTION VIEW.
THE BASEFRAME IS FLUSH WITH THE PANELLING

SANIX OPTION SECTION VIEW.
THE BASEFRAME IS RAISED TO LET
THE EXHAUST WASHING WATER.

2.6 ACCESS AND INSPECTION DOORS

Inspection doors on Air Handling Units allow the access and inspection while ensuring an easy opening and sure airtightness. Standard width is 460÷600 mm.

SECTIONS UNDER NEGATIVE PRESSURE:
doors are fastened to the frame with hinges and handles made of nylon reinforced with fiberglass, of NOVAIR design, allowing an easy opening even from the inside of sections.

SECTIONS UNDER POSITIVE PRESSURE:
closure systems are suitably selected to withstand operating pressures.
On demand it's possible to mount hinged type access doors with inward opening.
Each access to fan section is usually equipped with the following safety devices:

- safety net
- microswitch 24 V feed
- internal earthing cable

Door for negative pressure

Door for positive pressure

2.7 ACCESSORIES

On request each unit can be equipped with the following accessories:

- covering (Par. 2.4)
- sound insulation (Par. 2.5)
- side technical boxes, made of 25 mm thick sandwich panels, made in the same material and color of the unit to which they are applied and without bottom panel, for housing of hydraulic, electrical and other components.
- return or exhaust grid with protection net made of galvanized steel sheet, painted galvanized steel sheet or aluminium
- anti-vibration joints installed outside the units on the fan outlets to be connected to ducts
- pressure connections
- dial or liquid type differential manometers or differential pressure - switch, mounted and connected to the pressure pipes (Par. 4.6)
- double chamber polycarbonate porthole in the inspectionable sections
- light fixture with tight ceiling lamp IP 55 and IP 65 feed
- lamp wiring with external switch
- motor wiring with electric disconnecting switch

Technical Dept. reserves itself to deem the use of different manufacturing models, according to the complexity and configuration of the unit.

3 INLET, RECIRCULATION AND EXHAUST AIR SECTIONS

3.1 DAMPERS

Dampers are made of extruded Anticorodal aluminium with aerofoil blades and gasket.
The movement is opposed type and is made by ABS gears protected from the airflow. Dampers are usually supplied with motorizable pivot.
On request the actuator can be of manual type (see Par. 3.1.4)

TECHNICAL NOTES:

- working temperature limit 80 °C, compatibly with the resistance of the other internal components of the unit.
- air crossing speed:
  - return and exhaust dampers: 4÷6 m/s (787÷1181 fpm).
- when required by dimensions, the dampers are equipped with two connected pivots reducing the opening effort.

3.1.1 SECTIONS WITH ONE DAMPER

These are foreseen when the unit takes the whole air volume from the outside or from the room.
The standard composition of the section includes:

- location: on any side of the section
- air flow: 100% of nominal air flow.

3.1.2 SECTIONS WITH TWO DAMPERS (MIXING BOX)

These are foreseen when there's the need of mixing two air flows. The standard composition of the section includes:

- location:
  on any side of the section
- air flow:
  100%+100% of nominal air flow
  100%+50% of nominal air flow
  50%+50% of nominal air flow

3.1.3 SECTIONS WITH THREE DAMPERS (MIXING BOX)

The standard 3-way configuration of sections for fresh air intake and/or room return foresees:

- a motorizable damper for room air exhaust
- a motorizable damper for external air intake
- an internal motorized damper for air recirculation
- location: on any side of the section for exhaust and fresh air intake dampers
- air flow: 100%+100%+100% of nominal air flow or changeable according to the needs.

3.1.4. ACCESSORIES

- each damper or group of dampers can be equipped, on request, with the following actuators:
  - manual type, equipped with lever and stop knob
  - with drive pivot D= 12 mm and 100 mm overhang without levers
  - with electric servomotor
  - with pivots with interconnection drives
- rainhoods or return and exhaust grids with protection net made of galvanized steel sheet, aluminium, stainless steel
- flexible connections directly fastened to the unit dampers, with maximum dimension 150 mm manufactured with two galvanized steel flanges and having a 23 mm fastening edge with airtight antivibration canvas.

3.1.5 OPTIONS

- overpressure dampers with galvanized steel frame and aluminium blades with pitch 100 mm. These type of dampers are suitable either for exhaust or air inlet assuring the gravity closing at the flow stop.

3.2 RETURN GRIDS

Grids are made of galvanized steel or aluminium with fixed inclined horizontal fins against rain. The grid can be directly fastened to the damper installing a containing stub pipe between them, or directly fastened on the panel.
Grids are available with 50 mm fins spacing and are all equipped with metallic birdscreen.

3.3 OPEN SECTION

Unless different requirement, the delivery section have an aperture sized based on the air flow rate.

3.3.1 OPTIONS

- rectangular supply and return flanges
- closing panel on delivery section and recirculation

4 FILTERING SECTIONS

Air filtration is as important as thermohygrometric handling. For this reason should be taken care of different filters choice and proposal, with high attention to crossing speeds in order to ensure a longer efficiency and life.
Filters on the market are distinguished in several classes. The European Normative Committee (CEN) has established, through the final proof of revision of regulation EN 779 (1-2012), the classification of filters into three groups according to their filtering efficiency: filters for rough dust (G group), tested on gravimetric basis, filters for medium dust (M group) and filters for fine dust (F group), tested on spectral basis.
According to the medium efficiency value, respectively ponderal and fractional, filters are then divided in filtering classes with numerical value from 1 to 9 (Fig. 11).
The regulation UNI 10339 indicates at medium efficiency (M) the filters of class 1 to 4 and at high efficiency (A) those of class 5 to 9, pointing out that these last have to be preceded by filters of the previous class.
The committee CEN has defined the classification of absolute filters by the regulation EN 1822 (2009), based on DIN 24183, permitting to test the filtering efficiency in two phases. The first phase determines the critical size of the particles of maximun penetration (MPPS).
The second phase tests the filter in order to determine the filtering efficiency against the MPPS particles; this way the absolute filter can be classed of HEPA (H) class, as per chart here below (Fig. 12).
The regulation UNI 10339 defines of high efficiency filtering elements also the absolute filters (AS) and recommends before them the use of pre-filters type M and A as per previous description.
The purpose of ANSI / ASHRAE Standard 52.2P is to summarize the standard where it applies to particle counting and define the role of particle counters in this application. This standard addresses air cleaner performance characteristics of importance to the users, the ability of a device to remove particles from the airstream and its resistance to airflow. A sample of air from a general ventilation system contains particles with a broad range of sizes having varied effects, sometimes dependent on particle size. When air cleaners are tested and rated for efficiency in accordance with this standard, there is a basis for comparison and selection for specific tasks. The test procedure uses laboratory generated potassium chloride particles dispersed into the airstream as the test aerosol. A particle counter measures and counts the particles in 12 size ranges both upstream and downstream for the efficiency determinations.

Fig. 11: Filtering efficiency

EN 779 (1-2012)			ANSI / ASHRAE 52.2 P				UNI 10339	
Filter Class	Ponderal medium efficiency Am (%)	Colorimetric medium efficiency for 0,4 (µm) Em (%)	Filter Class	Minimum efficiency for particles diameters Emn (%)			Filter Class	Filtering efficiency
				µm 0,30-1,14	µm 1,14-3,46	µm 3,46-10,0		
G1	Am < 65	-	MERV 1	-	-	Emn< 20	1	M
G2	65 ≤ Am < 70	-	MERV 2	-	-	Emn< 20	2	M
G3	70 ≤ Am < 75	-	MERV 3	-	-	Emn< 20	3	M
G4	Am ≥ 75	-	MERV 4	-	-	Emn< 20	4	M
M5	-	40 ≤ Em < 60	MERV 9 MERV 10	-	Emn < 30 30 < Emn < 45	80 < Emn	5	A
M6	-	60 ≤ Em < 80	MERV 11 MERV 12	-	45 < Emn < 95 65 < Emn < 90	80 < Emn	6	A
F7	-	80 ≤ Em < 90	MERV 13	Emn < 65	90 < Emn	90 < Emn	7	A
F8	-	90 ≤ Em < 95	MERV 14	65 < Emn < 85	90 < Emn	90 < Emn	8	A
F9	-	Em ≥ 95	MERV 15 MERV 16	85 < Emn < 95 95 < Emn	90 < Emn	90 < Emn	9	A

Fig. 12: Filtering efficiency for absolute filters

Filter Class	Global / integral efficiency MPPS E (%)	Global / integral penetration MPPS P (%)	Local efficiency MPPS E (%)	Local penetration MPPS P (%)	Filter Class UNI 10339	Filtering efficiency
E10	85	15	-	-	10	AS
E11	95	5	-	-	11	AS
E12	99,5	0,5	-	-	12	AS
H13	99,95	0,05	99,75	0,25	13	AS
H14	99,995	0,005	99,975	0,025	14	AS

It is important to follow the sequence of efficiencies (Fig. 13) when choosing the filters. This way it is possible to reduce the operating costs due to the irreparable clogging of the filtering area which is cause of the unavoidable increase of pressure drops and bad working of the unit.
The regulation UNI 10339 prescribes for air conditioning and ventilating units that filtration has to be made either on fresh air or on recirculated air.
By way of example see the Fig. 14 for filter choice.

4.1 PANEL FILTERS

They filter the air at a low and medium efficiency. They are commonly used as prefilters in order to keep a longer efficiency of filters installed downstream.
Panel filters are highly used because of the following features:

- easy removal
- easy availability on spare parts market
- regenerability (they can be washed some times with warm water and soap or common domestic detergents)

Usually panel filters are made of:

- galvanized steel sheet frame 48 mm thickness.
- support containing net made of galvanized electrowelded wire
- filtering stuff made of synthetic fiber with G4 filtration efficiency, housed in a folded shape or metallic (galvanized steel) wool with G2 filtration efficiency, housed in a flat shape (in order to obtain more compact meshes) or folded shape (in order to obtain a larger filtering area).

Panel filters are installed on guides fastened inside the unit. In this case the air by-pass is minimum.

Fig. 13: Sequence of filtering efficiency

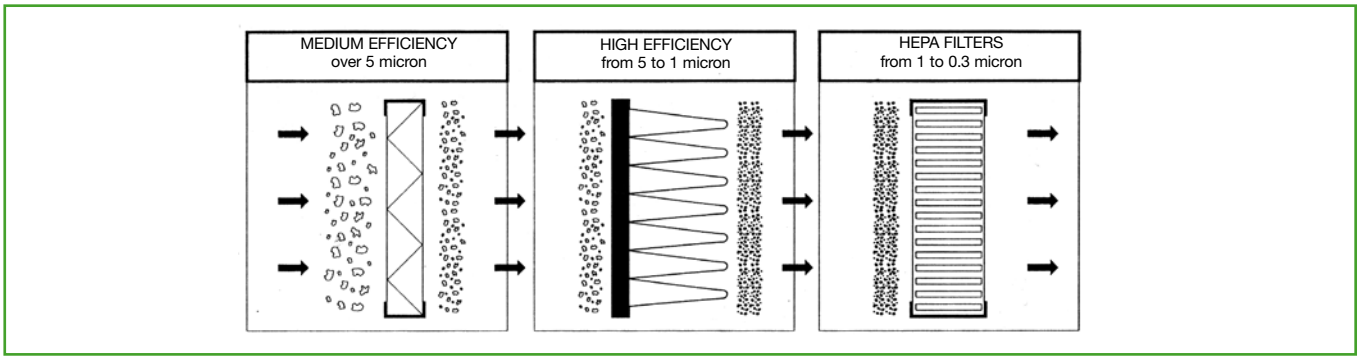


Fig. 14: Choice of filters

Filters class UNI 10339	Installations
	PREFILTERS OR PRIMARY FILTERS
1	For oily and humid environments
2	For kitchens
3	General ventilation systems suitable for gyms, swimming pools, ice rinks, garages, industries, industrial laundries, plant rooms
4	General ventilation systems suitable for auditorium, courhouses, TV studios, laundries, trade centres, kitchens, stations waiting rooms
	MEDIUM AND HIGH EFFICIENCY FILTERS
5	General ventilation systems for finer particles filtration. Suitable for auditorium, foyer, locker rooms, courthouses, TV studios, pubs-halls, restaurants, libraries, gymns, storehouses, trade centres, supermarkets, hotel kitchens
6	General ventilation systems for foyer, locker rooms, pubs-halls, restaurants, libraries, offices, banks, storehous es, supermarkets, hotels, airports
7	General ventilation systems for foyer, locker rooms, pubs-halls, restaurants, libraries, museums- art galleries, offices, computer rooms, banks, storehouses, supermarkets, airports
8	General ventilation systems for museums-art galleries, computer rooms, research labs.
9	General ventilation systems for hospitals, research labs, clean production areas.
	HIGH EFFICIENCY AND HEPA FILTERS
10 11 12 13 14	General ventilation systems for hospitals, nuclear plants, electronic items and computer manufacturing plants (cleanrooms), pharmaceutical and research labs, operating rooms.

A metallic counterframe with gasket and fastening clips is used when panel filters are installed with medium and high efficiency filters. In this case air by-pass is considerably reduced.
Metallic filters that have to filtrate air containing oily steams are usually equipped with drain pan and for extreme cases (kitchens steams exhaust) they are equipped with droplet eliminator.

4.1.1 OPTIONS

- panel filters with AISI 304 stainless steel frame
- metallic filters made of aluminium frame, blanket and net or stainless steel mesh.

4.2 HIGH EFFICIENCY BAG FILTERS

These filters, both soft or rigid bag type, have the characteristic of giving a wide filtering area thanks to their bag shape and therefore they highly reduce the crossing air speed.
The bags are installed on suitable supporting counterframes made of galvanized steel sheet or, on request, stainless steel and they are held by a locking spring system. In order to ensure the airtightness and avoid any non-handled air by-pass, a neoprene tight gasket is installed between filter and counterframe. This filtering section includes the access door, whose standard width is 460 mm.

4.2.1 TYPOLOGIES

- Soft bag filters:
  - efficiency M6, F7
  - fiberglass filtering stuff
  - galvanized steel sheet frame
  - working temperature limit 70 °C, depending on the resistance of the other components installed inside the unit
  - limit relative humidity 100%
- Rigid bag filters:
  - efficiency M6, F7, F8, F9
  - fiberglass paper filtering stuff
  - polypropylene frame
  - working temperature limit 70 °C, depending on the resistance of the other components installed inside the unit.

4.2.2 OPTIONS

- AISI 304 (or AISI 316) stainless steel counterframes
- longer depth of soft bag filters (increase of filtering area)
- other efficiencies.

4.3 HIGH EFFICIENCY FILTERS IN PANEL

Compact bag filters have the characteristic of a very reduced cells thickness, while assuring a wide filtering area.
The cells are installed on a counterframe made of galvanized steel sheet and held by a quick tumbler locking system of NOVAIR design assuring a perfect tightening. In order to increase airtightness and avoid any non-handled air by-pass, a rubber gasket is fastened between filter and counterframe.
This filtering section includes the access door whose standard width is 460 mm.
This type of filter is often asked in the specifications in order to obtain a shorter unit.

TECHNICAL NOTES:
- fiberglass filtering stuff
- efficiency M6, F7, F8, F9
- water resistant paperboard frame
- 80% of the material is recyclable
- working temperature limit 70 °C, depending on the resistance of the other components installed inside the unit
- limit relative humidity 100%

4.3.1 OPTIONS

- filters bigger thickness; max 635 mm

PANEL FILTER

SOFT BAG FILTER

RIGID BAG FILTER

4.4 ABSOLUTE FILTERS

Absolute filters are used where there is the need of taking care of contamination existing in the air to inlet or exhaust from rooms. Therefore it is not by chance that this type of filter is used in hospitals, chemical and electronical industries.
These special filters are installed in the final part of the unit after the supply or return fan, in case of extraction.
In order to extend their life and reduce the operating costs of the unit it is important to adopt a filtration sequence carefully planned, using medium efficiency protective prefilters (for example synthetic prefilter and bag filter Fig. 13 at pag. 17).
This filtering section includes the access door of standard width 460 mm.
A wide range of absolute filters is available on the market and they are different either for dimensions or filtering stuff or frame material.

TECHNICAL NOTES:
- paper fiberglass filtering stuff
- E10 (85%), E11 (95%), E12 (99,5%), H13 (99,95%) or H14 (99,995%) efficiency
- galvanized steel sheet frame

4.4.1 OPTIONS

- other efficiencies
- AISI 304 stainless steel or seawood frame
- AISI 304 (or AISI 316) stainless steel counterframe.

4.5 ACTIVATED CARBON FILTERS

Filtration through activated carbons consists in the physical adsorption of a substance on carbon surface. Carbon is subjected to an activation treatment giving an exceptional porosity and, consequently, an adsorbing capacity. This special type of filtration is foreseen for adsorption of gas, fumes and particular smells existing in the air to handle or to exhaust outside.

The system normally used consists of supporting plates and cartridges rechargeable type, in order to use a larger filtering area. This system reduces besides the pressure drops usually existing.
Plates and cartridges are made of galvanized steel coated by electropowder painting.
This filtering section includes the access door whose width depends on the unit size.

TECHNICAL NOTES:
- working temperature limit 50 °C.
- relative humidity lower than 70%
- low crossing speed
- it is necessary a careful pre-filtration to prevent carbons from being quickly clogged by dust.

4.6 ACCESSORIES

- each filtering section (prefilters, bag filters, absolute filters) can be equipped with the following accessories:
  - differential manometer dial type (scale 0 - 500 Pa / 0-2 in WG)
  - differential manometer liquid type (scale 0 - 800 Pa / 0-3,2 in WG)
  - differential pressure-switch (adjustable scale from 50 to 500 Pa / 0,2 to 2 in WG).

Any other air handling typology, different from the above mentioned, are defined each time by our Technical Dept., in order to ensure the proper efficiency of the system

5 THERMAL EXCHANGE SECTIONS

These modular sections are manufactured in order to house the coils for thermal exchange between the air and the heating and/or cooling fluid.
The sections are equipped with galvanized steel sheet guides allowing the introduction of the coil and its removal from both sides of the AHU.
A galvanized steel sheet or, on request, Aisi 304 (or AISI 316) stainless steel drain pan is provided for cooling and dehumidification handlings, insulated by an anti-condesation pad.

PRE-HEATING COIL:
its main aim is to pre-heat the air or, more frequently, to make humidification possible up to the requested values. Their standard execution has copper tubes and packed aluminium fins.

COOLING AND DEHUMIDIFICATION COILS:
the aim of this type of coil is to handle the air removing from it the sensible and latent heat, making it suitable to balance the room thermal loads. Their standard execution has copper tubes and packed aluminium fins.

POST-HEATING COILS:
they are used in all the plants where a fine control on temperature and relative humidity is required. Construction features are similar to pre-heating coils.

5.1 WATER COILS

The dimensioning of all thermal exchange coils is made, each time, by our Technical Dept., according to the efficiency and thermohygrometrical conditions required.

TECHNICAL NOTES:
- water coils with 6016 geometry (5/8” copper tubes)
- water coils with 3016 geometry (5/8” copper tubes)
- direct expansion coils with 2510 geometry (3/8” copper tubes)
- aluminium fins
- galvanized steel sheet frame
- copper headers and brass connections (threaded or flanged), having holes with lock screw on top and bottom sides respectively for air vent and for coil drain (Fig. 15)
- normal and glycol water working
- coils tightness test is made at 24 bar (800 ft WG) air pressure under water dipping
- coils circuit is made in order to obtain a counterflow water-air circulation, with water inlet from the bottom and outlet from the top.

5.1.1 OPTIONS

The following coil types are available on request:

- iron or AISI 304 (or AISI 316) stainless steel tubes with ARC or TIG welding on headers and thicknesses up to 1,5 mm, for hot water or steam coils
- painted aluminium, copper, tinned copper, stainless steel fins
- Aisi 304 (or AISI 316) stainless steel frame
- painted steel or AISI 304 (or AISI 316) headers and connections (threaded or flanged)
- working with overheated water, steam, diathermic oil
- surface treatments:
  - Heresite
  - Black epoxy
  - Blygold
  - Electrofin

5.2 ELECTRIC HEATERS

Electric heaters are used as alternative to hot water coils for the execution of heating and post-heating handlings or antifreeze systems immediately after the fresh air intake.
They are manufactured as follows:

- galvanized steel sheet flanged containing frame
- finned steel tubular heaters on base insulators
- safety fix thermostat with manual reset

The electrical heaters are sized with a number of stages selected according to the required power

5.2.1 OPTIONS

The following variations are available on request, for special project needs:

- IP 55 terminal block containing the heaters terminals, installed outside the unit and wired
- AISI 304 (or AISI 316) stainless steel frame
- AISI 304 stainless steel tubular heaters
- safety adjustable thermostat with automatic reset.

Fig. 15: Headers diameters

Maximum flow	(l/h)	1.000	3.500	6.500	10.000	20.000	32.000	54.000	90.000
	(gpm)	4	15	29	44	88	141	238	396
Diameter	(inch)	1/2”	1”	1½”	2”	2½”	3”	4”	4”

6 HUMIDIFICATION SECTIONS

Air humidification plays a very important part either in improving environmental conditions, and therefore people comfort, or in performing many industrial activities.
In industrial field, humidification is necessary for many hygroscopic materials (wood, paper, textile fibers, etc.) because these tend to deteriorate when stored in a room where the relative humidity value is not appropriate. Besides dry air can cause static electricity and therefore produce troubles on electronic devices (computers, regulating and control units), as well as represent a serious problem in rooms with explosion risk.
The typology of the humidification system suggested by NOVAIR takes into consideration the cases of use (types of ambients served), the available fluid and the required efficiency degree.

6.1 SPRAYED HONEYCOMB PACK HUMIDIFICATION

It is the most used system in Air Handling Units serving air-conditioned rooms, where a sterile humidification is not required.
The pack is composed by special multilayer sheets, through which the air gets in close contact with a small circulating water volume.
The efficiency of this humidification system depends, other parameters being equal (water-air temperatures, pack thickness, water volume, etc.), only on air crossing speed. From 2,0 to 2,5 m/s (394 to 492 fpm) air speeds, the humidification types have the following features:

- 100 mm cellulose pack and disposable water
- 100 mm cellulose pack and recirculation pump

} efficiency 60 - 70 (%)

- 200 mm cellulose pack and disposable water
- 200 mm cellulose pack and recirculation pump

} efficiency 75 - 80 (%)

The complete system includes:
- distributor panel placed on pack top, to obtain a uniform water stream on the whole exchanging surface
- pack housing on galvanized steel sheet frame and guides for an easy side removal
- galvanized steel sheet droplet eliminator (except in case of special types of units)
- water recirculation pump (for humidifications with recirculation only)
- intercepting and regulating water tap
- system with float tap for water restoring (for humidifications with recirculation pump only)
- water bottom drain pan made of galvanized steel sheet thickness 1,2 mm
- usually the bottom drain is Ø1”
- overflow drain

TECHNICAL NOTES:
- the cellulose honeycomb humidification pack is made of:
  - pleated paper sheets, impregnated with water resistant resins, having a good self-holding. Their characteristic is to be totally phenolic resins free, therefore scentless
- for both pack types it is suggested an air crossing speed from 2,0 to 2,8 m/s (394 to 551 fpm).
  The speed of 2,5 m/s (492 fpm) is considered the most correct to obtain the best pressure drop and high humidification efficiencies
- it is advisable to keep pH between 6 and 8 and do not exceed the hardness of 40 °f.
  In case the water exceeds these values, it is necessary to adopt a handling system (softener, inverse osmosis, etc.)
- the recirculation system is equipped with electric submergible centrifugal pump with filter and plastic float usually running with 230V/1Ph/50-60Hz motor having a thermal-amperometric protection.

6.1.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel sheet, polypropylene, peraluman droplet eliminator
- AISI 304 (or AISI 316) stainless steel drain pan
- water drain system with bleed-off (for humidification only with recirculation pump)
- humidity check
- solenoid valve (for disposable water system only)
- antifreeze electrical heater inside drain pan.

6.2 SPRAYED WATER HUMIDIFICATION

It is one of the most used systems in Air Handling Units serving rooms where it is important to warrant a high humidification efficiency or an adiabatic cooling. The efficiency of an atomized water humidifier depends on different factors:

- air crossing speed inside the section (lower speed = higher efficiency)
- section length (causing the air-water contact time)
- sprayed water volume
- number of ramps and spraying nozzles

Complete section arranged for the fitting of an atomized water humidifier system. Atomizing humidifier systems utilize a high pressure (70 bar / 1.000 psi) pumping system to pressurize treated water and pump it to the atomizing nozzles. The nozzles then reduce the water jet into a very fine water droplet (10-20 micron). Due to the fine droplet size, the water can easily change its state into vapor. The energy required for this transformation in state is provided by the ambient air. For this reason there is a decrease in temperature which may be useful in many applications (adiabatic transformation).

6.2.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel drain pan
- AISI 304 (or AISI 316) stainless steel sheet, polypropylene, peraluman droplet eliminator

6.3 STEAM HUMIDIFICATION

It is the humidification system that provides the highest efficiency values (95-100%) and the total sterility of handling process.
This system can use:

- net steam
- autonomous steam producer.

The two systems are analogous, while the first exploits the net steam existing in the plant (normally in industrial ambients, hospitals or similar) and the second uses its own steam producer with immersed electrodes, exploiting the transformation of water into steam through electric current.

6.3.1 HUMIDIFICATION WITH NET STEAM

The net steam humidification (Fig. 16) is usually made with a maximum pressure of 3 bar (133 ft WG). The number of distributors depends on steam quantity to blow into the section in order to ensure a uniform and homogeneous handling.

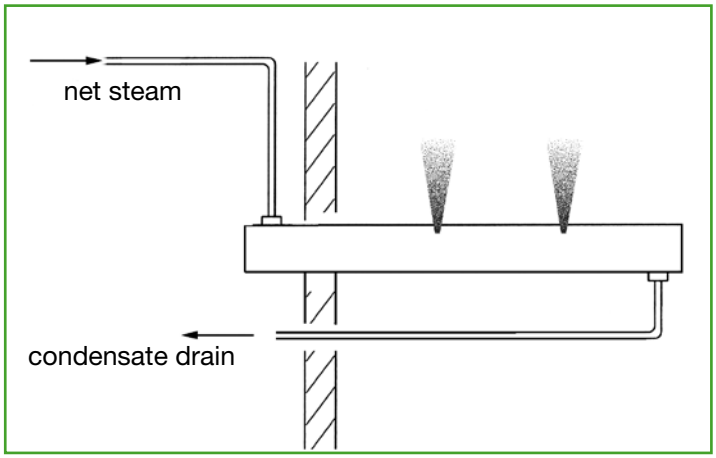
TECHNICAL NOTES:

- this system includes:
  - galvanized steel sheet single droplet eliminator
  - galvanized steel sheet water drain pan with minimum thickness 1,2 mm
- the section length, useful for a proper steam distribution, is suggested to be not less than 750 mm and, anyway, depending on the steam quantity to spread and on air speed
- multiple distributors are suggested when:
  - air temperature is lower than 64 °C.
  - air speed higher than 4 m/s (787 fpm).

6.3.1.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel sheet or peraluman droplet eliminator
- AISI 304 (or AISI 316) stainless steel sheet water drain pan

Fig. 16: Humidification with net steam

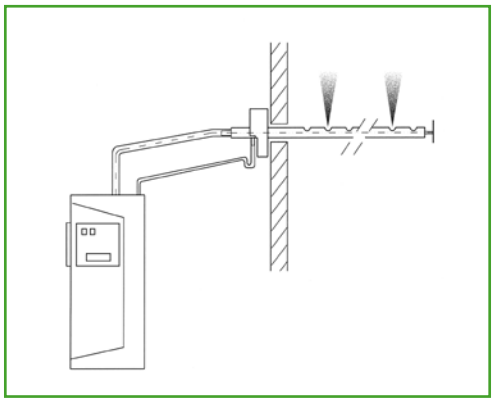


6.3.2 HUMIDIFICATION WITH STEAM PRODUCER

This humidifier is immersed electrodes type and is composed by an hydraulic part for steam production (including steam cylinder with electrodes), electrovalves for water feed and drain, electric board and electronic control (Fig. 17).
The steam is conveyed to one or more distributors in the humidification section. The supply voltage can be 230V/1Ph/50-60Hz, 400V/3Ph/50-60Hz, 380V/3Ph/60Hz or 460V/3Ph/60Hz, with modulating signal. This system includes:

- galvanized steel sheet single droplet eliminator
- galvanized steel sheet water drain pan, minimum thickness 1,2 mm
- steam producer unit.

Fig. 17: Humidification with steam producer



TECHNICAL NOTES:

- the section length, useful for a proper steam distribution, is suggested to be not less than 750 mm and, anyway, depending on the steam quantity to spread and on air speed
- all units with autonomous humidification system (cabinet), as standard version, include:
  - steam producer cabinet with modulating out-put, designed for working with humidity signal coming from external modulating control
  - AISI 304 stainless steel distributor whose length meets the AHU internal dimension
  - flexible pipe for steam feed (cabinet/distributor) of length not less than 2 m
  - condensate drain pipe of length not less than 2 m
- supply voltage:
  - single-phase: 230V/1Ph/50-60Hz by 3 kg/h
  - three-phase: 400V/3Ph/50-60Hz, 380V/3Ph/60Hz or 460V/3Ph/60Hz from 5 to 60 kg/h.

6.3.2.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel sheet or aluminium sheet droplet eliminator
- AISI 304 (or AISI 316) stainless steel sheet drain pan
- According to the needs, it is possible to supply electronic interface for external regulators and humidity probes.

7 DROPLET ELIMINATORS

Droplet eliminators have the function of preventing the propagation of possible water drops inside the unit coming from cooling coils condensation or humidification system. They are particularly suggested when air speed on coil is higher than 2,5 m/s (492 fpm).
Droplet eliminator fins are made of galvanized steel sheet in a single fold configuration, housed into a galvanized steel sheet frame sliding on guides inside the unit, allowing the side removal.

7.1 OPTIONS

- droplet eliminators with three-fold galvanized steel sheet profile
- AISI 304 (or AISI 316) stainless steel droplet eliminators, with fins made of:
  - single-fold aluminium sheet
  - single-fold AISI 304 (or AISI 316) stainless steel sheet
  - single-fold polypropylene

8 HEAT RECOVERY SECTIONS

The most significant way to obtain an energy saving, using Air Handling Units, is the use of heat recovery systems between the room return air (exhaust) and renewal air (supply).
The systems normally used permits the recovery of sensible heat only, while in some cases it is necessary to use heat exchangers with total recovery (sensible + latent heat).
The efficiency of all recovery systems is based on the following features:

- humidity content in warmer air
- heat exchange area
- air crossing speed
- geometrical configuration
- volume of the two masses exchanging heat
- flows directions (equiflow, counterflow, crossed flow)
- exchangers cleanliness
- temperatures.

8.1 FIXED PLATES RECOVERY UNITS

The fixed plates static recovery units are air to air type, without moving parts, therefore working in a reliable and safe way. The air movement is in a crossed flow with heat transfer directly from higher temperature flow to the lower temperature one. The recovery unit efficiency has values up to 85%.
This type of heat exchanger is made of pressed aluminium sheets, housed in a variable spacing depending on the use type.
Sealings are made along the edges in order to prevent contamination on renewal air from polluting agents contained in exhaust air.
The normal supply foresees:

- recovery units with aluminium fins working from -30 °C to 90 °C, depending on the resistance of the other internal components, whose fins have good characteristics of corrosion resistance and long life
- cell prefilters G4 type (85% eff.) (Par. 4.1) on fresh air side.
- galvanized steel sheet drain pan to collect possible condensation.

TECHNICAL NOTES:

- in order to ensure compliance with the ErP Directive, sizing is carried out according to the following limits:
  - maximum pressure drop on the air side: 230 Pa
  - minimum efficiency ErP 2016: 67%
  - minimum efficiency ErP 2018: 73%

8.1.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel moisture drain pan

8.1.2 RECOVERY SECTIONS WITHOUT DAMPER

The plate heat recovery unit is installed with recovery unit housed in DIAGONAL AXIS

8.1.3 RECOVERY SECTIONS WITH BY-PASS DAMPER

The section is composed by the plate heat recovery unit housed in DIAGONAL AXIS and a by-pass damper placed on the recovery unit itself. Installation typologies.
The use of heat recovery units with by-pass damper is foreseen when it is necessary to exclude temporarily the energy recovery between the exhaust and return air (Free-Cooling effect).
In these cases, a single damper with double arrangement of blades excludes the air passage from the recovery unit and at the same time conveys it to a side passage inside the section.

TECHNICAL NOTES:

- the dimensioning of this type of section foresees a balancing of pressure drops respectively in by-pass section and through the recovery unit
- the recovery system with by-pass can also be used on configuration typologies foreseeing the recirculation damper.

Fig. 18: Applications

8.1.4 SECTIONS WITH RECIRCULATION (MIXING) DAMPER

The section is composed by the plate heat recovery unit housed in DIAGONAL AXIS placed inside a three dampers group:

- motorizable damper for fresh air inlet
- motorizable damper for room air exhaust
- one or two coupled internal dampers for room air recirculation. In case of double damper, the first, with manual actuator, is needed for the air volume regulation; the second, motorizable, for recirculating air volume regulation.

Usually dampers are dimensioned as per description in Par. 3.1.

TECHNICAL NOTES:

- recirculation dampers can be installed in vertical line with the recovery unit or in horizontal line, according to the position of supply and return sections on the same floor or different floors.

8.1.5 OPTIONS

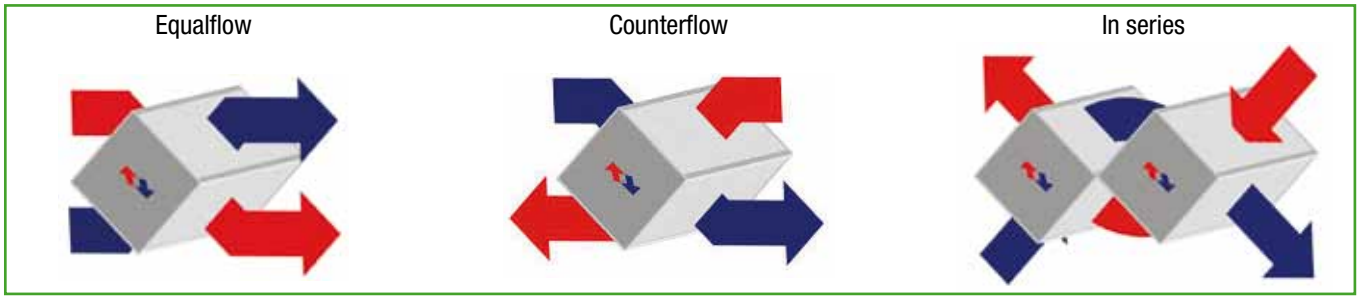
- painted aluminium, AISI 304 (or AISI 316) stainless steel recovery unit
- AISI 304 (or AISI 316) stainless steel sheet drain pan.

8.1.6 APPLICATIONS EXAMPLES

Fig. 18 shows some application examples of recovery systems.
Air flow direction is not so important, however it is suggested that the exhaust air crosses the recovery unit from top to bottom, when a big quantity of condensate is foreseen.
The above chart (Fig. 19) shows some examples of air flows directions, using a single recovery unit.

APPLICATION FIELD	
Air conditioning and ventilation	Pre-heating and pre-cooling
Hospitals	Recovery on air changes without mixing between flows
Swimming - pools	Air pre-heating
Suction hoods	Recovery from fumes and steams for room heating
Driers	Air pre-heating inside drier and room heating
Printeries	Recovery from solvets and room heating
Recovery from combustion fumes	Recovery for air re-heating at burners entrance and room heating

Fig. 19: Cross-flow heat recovery air flow directions



8.2 HEAT WHEEL RECOVERY UNITS

The working principle is the following (Fig. 20): the exhaust air crosses half circular rotor sector and gives part of its heat to the metallic mass. This, slowly wheeling, is invested from cold renewal air crossing in counterflow the other half of the exchanger, taking the heat given from the exhaust air. When rotor is hygroscopic type, also humidity contained into the exhaust air will be partially transferred to the renewal air.
The words “warm air” and “cold air” of the above description are valid for winter working cycle; in summer cycle the functions of transfer and absorption of heat and humidity are evidently inverted.
The efficiency values are between 50% and 80% when referred to sensible heat only, while they are between 55% and 85% when referred to total heat (hygroscopic heat wheel recovery unit).
Usually these type of recovery units are made as follows:

- aluminium rotor (working limits -30÷90 °C, depending on the resistance of the other components inside the unit)
- galvanized steel sheet frame
- constant speed electric gearmotor

TECHNICAL NOTES:

- in order to ensure compliance with the ErP Directive, sizing is carried out according to the following limits:
  - maximum pressure drop on the air side: 230 Pa
  - minimum efficiency ErP 2016: 67%
  - minimum efficiency ErP 2018: 73%

8.2.1 OPTIONS

- hygroscopic rotor, whose aluminium surface is treated in order to hold the humidity contained in the air crossing the rotor
- rotor with absorption treatment
- corrosion resistant prepainted aluminium rotor
- gearmotor with regulation and control of rotation speed

8.3 CLOSED CIRCUIT RECOVERY COILS

This system involves the use of a pair of water coils, one placed on the air discharge side and the other on the expulsion side, which are connected together with a closed circuit and a circulating pump (Fig. 21). This solution has two main benefits:

- The complete absence of air flow contamination unlike other recovery systems.
- Greater positioning freedom of the CTA intake and discharge sections, which must not necessarily be leaned against each other.

TECHNICAL NOTES:

- in order to ensure compliance with the ErP Directive, sizing is carried out according to the following limits:
  - maximum pressure drop on the air side: 230 Pa
  - minimum efficiency ErP 2016: 63%
  - minimum efficiency ErP 2018: 68%

Fig. 21: Round- around water coil heat recovery

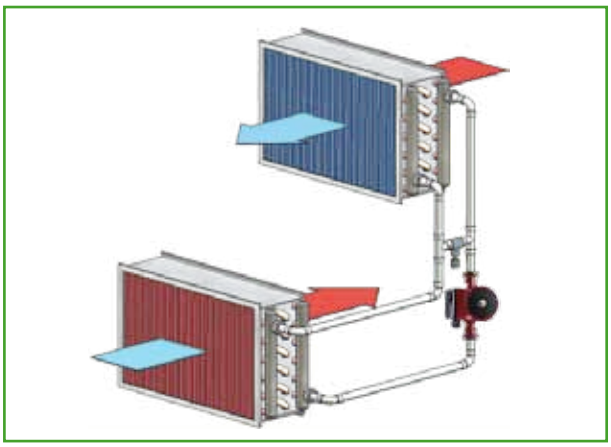
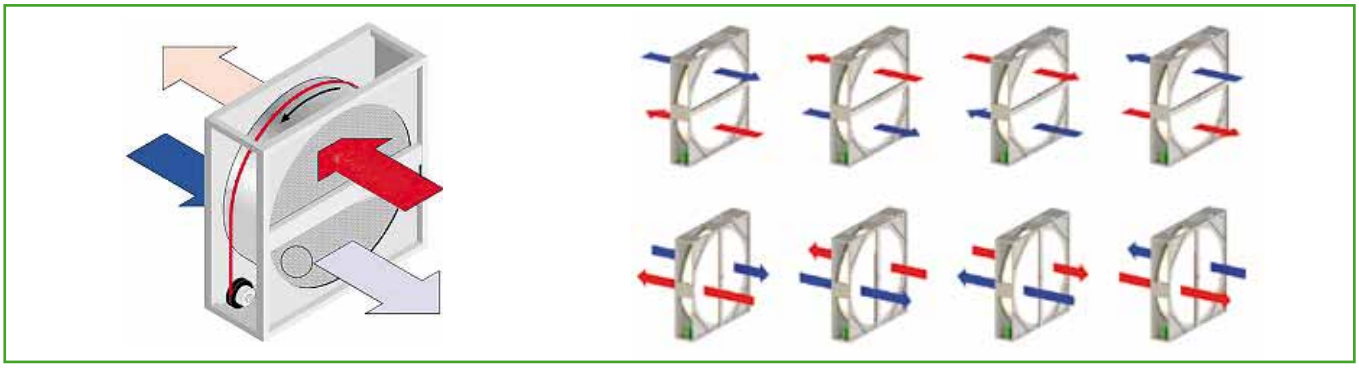


Fig. 20: Heat wheel recovery air flow direction



9 FAN SECTIONS

Different choice possibilities are available, for each Air Handling Unit, regarding type and size of fan to install, as well as motor capacity. In this way it is possible to satisfy any possible request of efficiency, sound level and working flexibility.
Each fan section is equipped with:

- motor and fan support
- fan
- electric motor
- transmission
- standard safety devices (Par. 2.6)
- accessories (Par. 2.7)

9.1 SHOCK ABSORBERS

Each fan-motor set is placed on a “cradle” made of galvanized steel profiles suitably shaped, minimum thickness 2,0 mm.
The type of shock absorbers for load distribution is:

- rubber type, with dimensions and variable rubber hardness according to the size of fan-motor set
- spring type with minimum efficiency 80% and linear elastic characteristics, ensuring an optimal insulation to medium frequencies. As the distribution of spring antivibrating supports is determinant for the correct insulation of the unit, their location is decided according to the whole fan-motor set barycenter.
- a flexible joint having the same features shown on Par 3.1.4 is besides foreseen on fan outlet

9.1.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel motor-fan support.

9.2 FANS

9.2.1 RADIAL FAN

Radial fans are double inlet type with square outlet, manufactured with galvanized steel sheet containing frame and long life ball be-arings.
Unless different specification, the statically and dynamically balanced impeller is supplied in the following versions:

- **forward curved blades** for total pressures lower than 1.000 Pa (4 in WG). These fans have lower efficiency than backward curved blades fans, but anyway higher than 50 %.
  The characteristic curve show an instability zone, even if this is eliminated while planning, considering only the normal working field.
  The absorbed power curve is always growing with air volume increase; therefore these fans have to be carefully analysed, especially to avoid a possible motor overload.
- **backward curved blades** for total pressures usually higher than 1.000 Pa (4 in WG). They offer a very high efficiency (more than 60 - 65%), stable characteristic curves and capacity curve with a maximum corresponding to the maximum efficiency, then decreasing. This last feature prevents the motor from overload. These fans have high rotation speed.

Forward curved blades

Backward curved blades

Plug-Fan

EC INVERTER Plug-Fan

9.2.2 PLUG-FAN

Complete assembled module with high system efficiency, specifically developed and optimized for use without a spiral casing. High performance impeller with optimized shape and high efficiency, inclined blade leading edges from impeller shroud to backplate, for optimal impact over the entire width of the blade.
Co-rotating radial diffuser with optimized exit curving on the cover disc to enhance efficiency.

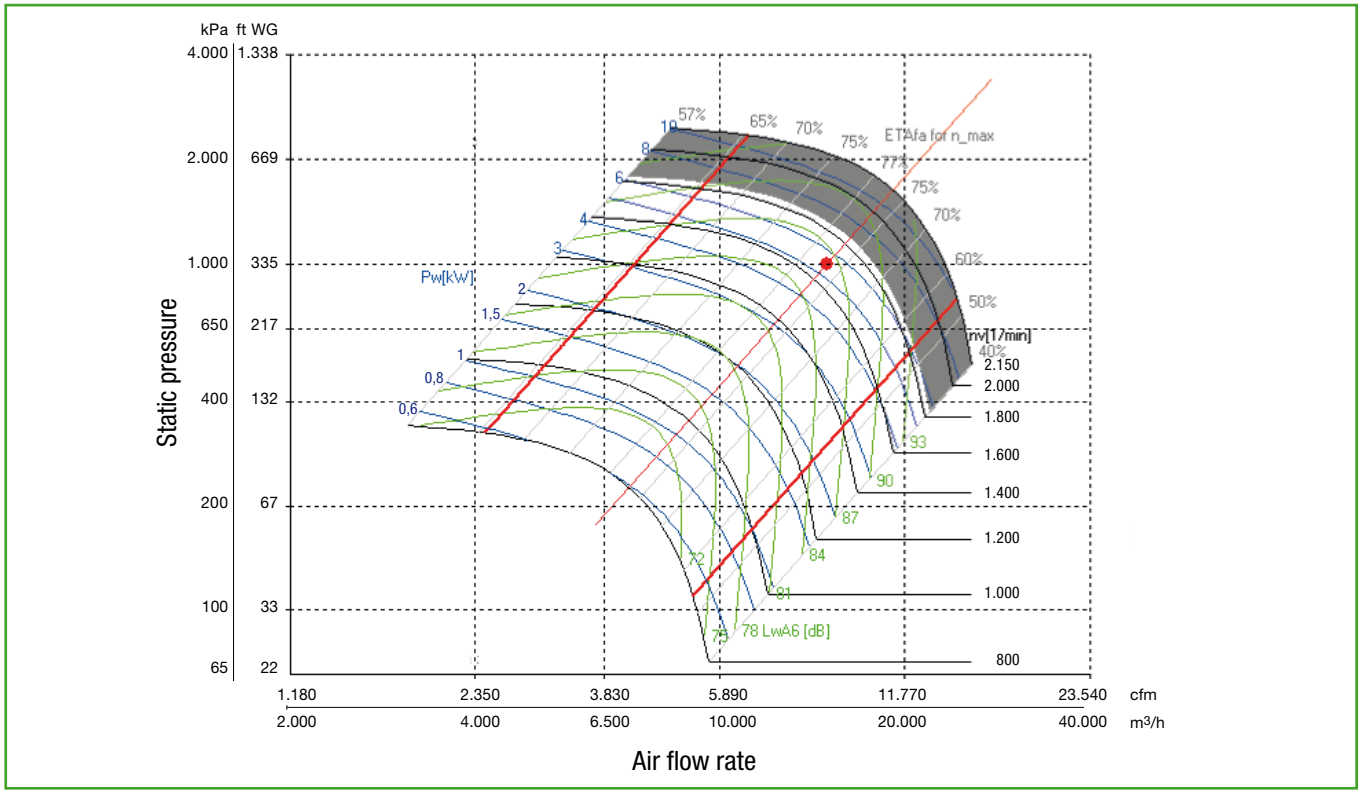
9.2.3 EC INVERTER PLUG-FANS

Total high efficiency Plug-Fan, specifically developed and optimised for use without wheels, equipped with high-performing fan, optimised geometry for high efficiency and external rotor DC brushless motor with built-in logic control unit and continuous speed variation.

TECHNICAL NOTES:

- when a fan is working in a circuit having its own characteristics, the air volume supplied is the one for which the total pressure, given by the fan, is equal to the total pressure drop of the circuit for that volume. This is shown by a red point in the diagram (Air volume – Static Pressure). The checking of this diagram is very useful because enables us to make considerations on the working of an aeraulic circuit. See below (Fig. 22) a typical fan curve with its working point. In order to get the best performance in terms of efficiency and noise, the working point must be in the central area delimited by the two red lines.
- these considerations enable us to assert that it is necessary to calculate with the highest precision the circuit pressure drops in order to choose motor and fan in a correct way.

Fig. 22: Fan characteristic curves



9.2.4 OPTIONS

- backward curved blades radial fans with aerofoil profile from impeller size 200 mm, having characteristics similar to the standard ones but higher efficiencies due to the particular blades profile
- painted and AISI 304 (or AISI 316) stainless steel fans
- bearings with grease cup, dimensioned for longer life
- regulation dampers
- fans with ATEX certificate.

9.3 ELECTRIC MOTOR

The electric motors used have the following features:

- complying with CEI - UNEL regulations and IEC international regulations
- closed construction and external ventilation
- squirrel cage rotor
- three-phase asynchronous with winding:
  - 230/380/400V 50-60Hz up to capacity of 4 kW included
  - 400/460/690V 50-60Hz for bigger capacities
- single polarity (usually 4 poles) or, unless different request:
  - 2 poles for fans with rotation speed higher than 2.800 rpm
  - 6 poles for fans with rotation speed lower than 650 rpm
- B3 shape – horizontal shaft application
- Class F thermical insulation
- IP 55 protection rating.

TECHNICAL NOTES:

- for the insulation class F, chosen by NOVAIR as standard, the temperature increase cannot exceed 80 K, provided that the room temperature does not exceed + 40 °C and altitude up to 1.000 m on sea level. For different environmental conditions, the given capacities change and this has to be considered through a corrective factor, as per following chart (Fig. 23 - Fig 24)
- the protection rating IP 55 warrants total protection against contacts with parts under tension or moving parts inside the casing and protects against harmful dust coatings. Besides it ensures a protection against water sprayed from a nozzle on the unit from any direction.
- an overdimensioning, also according to the notes shown on Par. 9.2, consists of giving an excess power of minimum 15% between absorbed and installed power.

9.3.1 OPTIONS

- 230V/1Ph/50-60Hz asynchronous motor for capacities up to 1,5 kW
- double polarity motors (2/4 and 4/8 poles) with single winding and Dahlander connection and double polarity motors (4/6 and 6/8 poles) with double winding
- IP20 or IP 55 INVERTER controller for radial fans and Plug-Fans
- IP 65 explosion-proof motors with certificate ATEX EEx-d type having a safety execution against explosion
- motor with thermal protection.

9.4 TRANSMISSION

The coupling between motor and fan is made by belts and pulleys. Usually pulleys are made of cast iron with trapezoidal races. The number of grooves, and so of belts, depends on the power to transmit.
Belt tension can be adjusted by the belt stretcher slide on which the motor is installed.The pulleys used are statically and dynamically balanced and are all supplied with “Taper-Lock” conical bush assuring an easy shaft removal in case of replacement.

9.4.1 OPTIONS

- variable diameter pulleys, allowing an air volume modification of ±10÷15%, as regards the medium regulation pitch diameter.

9.5 ACCESSORIES

- air volume meter
- differential manometer or pressure-gauge (Par. 4.5)
- hot galvanized steel walkable grating
- sound absorption (Par. 2.5)

Fig. 23: Capacity corrective factors according to ambient temperature

Ambient temperature (C°)	40	45	50	55	60	70
Standard motor nominal capacity (%)	100	96,5	93,0	90,0	86,5	79,0

Fig. 24: Capacity corrective factors according to altitude

Altitude on see level (m)	1.000	1.250	1.500	1.750	2.000	2.250	2.500
Standard motor nominal capacity (%)	100	98,6	97,0	95,9	94,5	93,2	92,0

10 SOUND ATTENUATOR SECTIONS

When it is necessary to attenuate the noise produced by the fan, the Air Handling Unit can be equipped with sound insulating blankets sections. These blankets are installed immediately after the supply fan section or before the return fan section. They are manufactured of a galvanized steel sheet containing frame and soundproofing mineral wool with minimum density 80 kg/m^3. The blanket is protected by an antiscaling film and a galvanized steel microstretched sheet. The thickness and number of blankets is variable depending on the acoustical characteristics of noise to cushion and on the unit dimensions.

TECHNICAL NOTES:

- between the supply fan section and the sound proofing blankets it is usually better to foresee empty sections (plenum) with minimum length 500 mm referring to an air crossing speed lower than 10 m/s (1.970 fpm) on fan outlet, in order to convey the air without turbolences.

10.1 OPTIONS

- AISI 304 (or AISI 316) stainless steel flanged containing frame
- lining with polyester film

10.2 LENGTHS

The choice of sound attenuators length depends only on the value of sound level that is required after the Air Handling Unit.
The standard manufacturing sections lengths are:

- 750 mm
- 1.000 mm
- 1.250 mm
- 1.500 mm
- 1.750 mm

11 EMPTY SECTIONS

Empty sections having the function of distance spacers with lengths multiple of 250 mm can be supplied when it is necessary to warrant a bigger flexibility to AHUs composition or the installation of special components (temperature probes, antifreeze resistances, sound attenuator plenum, etc.) or to allow access to different components for an easy servicing (for example coils washing).

12 TECHNICAL BOXES

Technical boxes are considered accessory elements for the units and are usually supplied with AHUs for external use. Their function is to house inside the coils regulation valves, electric control devices and possible plant accessories. They are manufactured with the same profile used for Air Handling Units and sandwich paneling 25 and 50 mm (Par. 2.2), without bottom panel and basement to allow the passage of coils and humidifications feeding pipes.

13 INTEGRATED REGULATION SYSTEM

The Air Handling Units with integrated regulation system are equipped by a power supply electrical panel, fully wired and tested in factory. The unit only requires on-site connection electrical and hydraulic power.
Thanks to the microprocessor installed in the unit, it's possible to many different air handling unit's configuration types. The system allows to manage a number of elements and devices such as supply and return fans, temperature, humidity, hot and cold liquid heat exchangers, electric heaters, dampers and energy recovery devices in all their possible applications and compositions.

Series	
CTA	
Issue	Supersedes
05.17	09.15
Catalogue	
NVB 111 B	

The data indicated in this manual is purely indicative. The manufacturer reserves the right to modify the data whenever it is considered necessary.

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