VHF-3

Duct Type Fan Coils



CE

INSTALATION, USE AND MAINTENACE MANUAL

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Technical characteristics

Introduction

VHF-3 air treatment terminal units are available in eight different models with air flow rates of 800 to 4000m3/h.
They have been designed for residential and commercial use, their important characteristics being their small size and ease of assembly.
Their size and structure make them suitable for installation in false ceilings, and their fans are designed for use with ducts with medium static pressure and acceptable air flow rates.
These units can only work in horizontal position.
The accessories most commonly used in this type of installation, which are described later in this manual, are available. The unit is basically composed of the following parts:

- Support structure or body
- Fan
- Thermal exchange battery with the corresponding air drain
- Connection terminal
- Collection tray for condensed water

General technical characteristics

The unit body is made of galvanized sheet.

The inner insulation is made of synthetic thermal foam, to prevent condensation on the outer part of the body.

The water batteries are made of inner grooved and expanded copper pipes, with specially designed aluminium fins, obtaining high efficiency in thermal exchange.

The battery connections are always gas thread type, male connection.

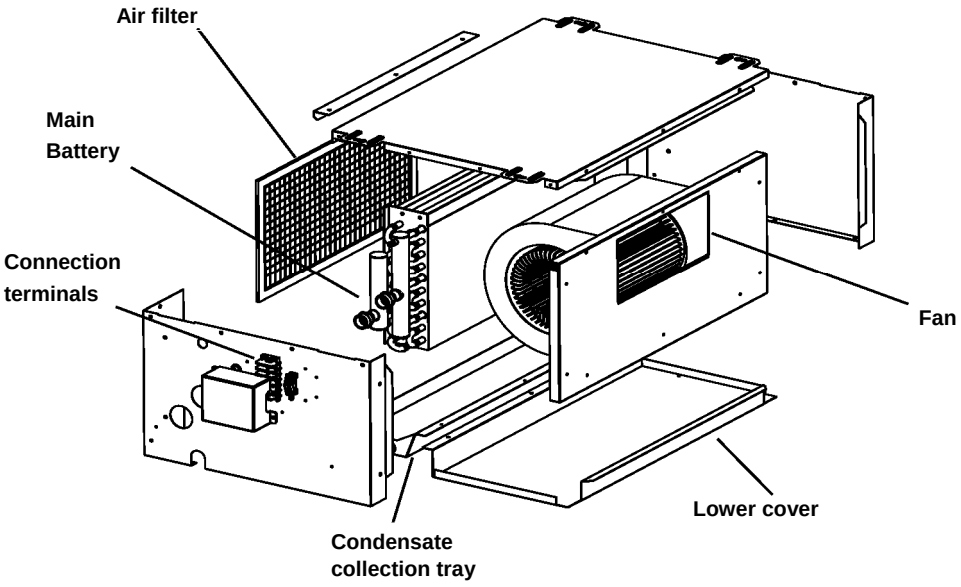
All units are equipped with a large tray for collection of condensed water from the battery fins and collectors.

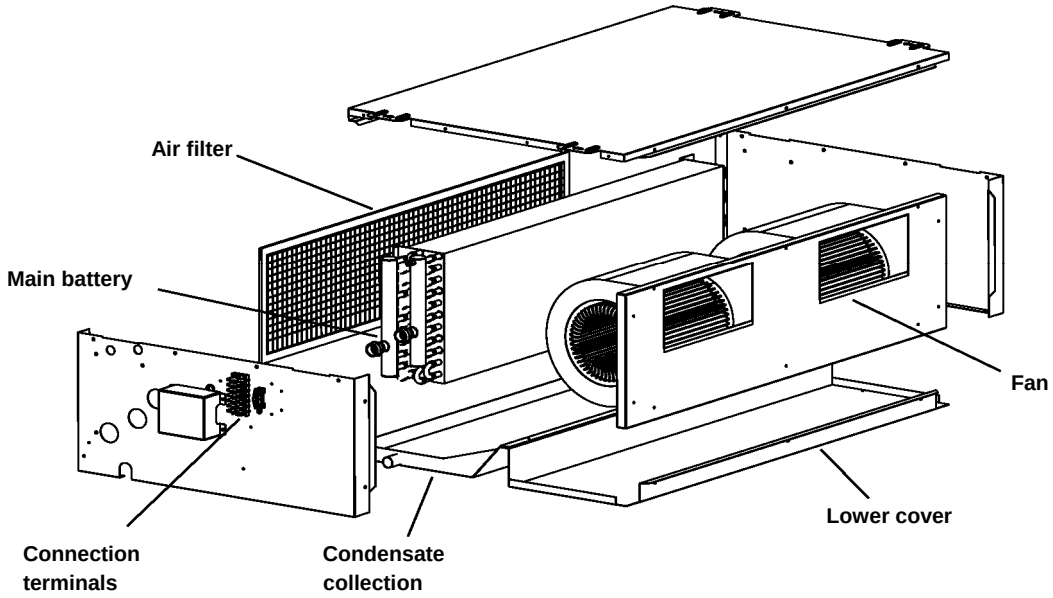
The air filters (accessories) are easily removable from underneath as well as from the side. They can be cleaned with either compressed air or with lukewarm water.

The fans are three-speed centrifugal type, and are perfectly balanced to achieve a reduced sound level in the unit. The selection of speeds can be manual or automatic depending on the type of control used (see related chapter). The connection terminals connect directly to the inputs of the fan motor speed.

These units have been designed to be used with medium-high static pressure type air ducts; therefore, to eliminate noise problems in the installation, it is recommended that ducts be used with medium soundproofing, which is considered to be sufficient.

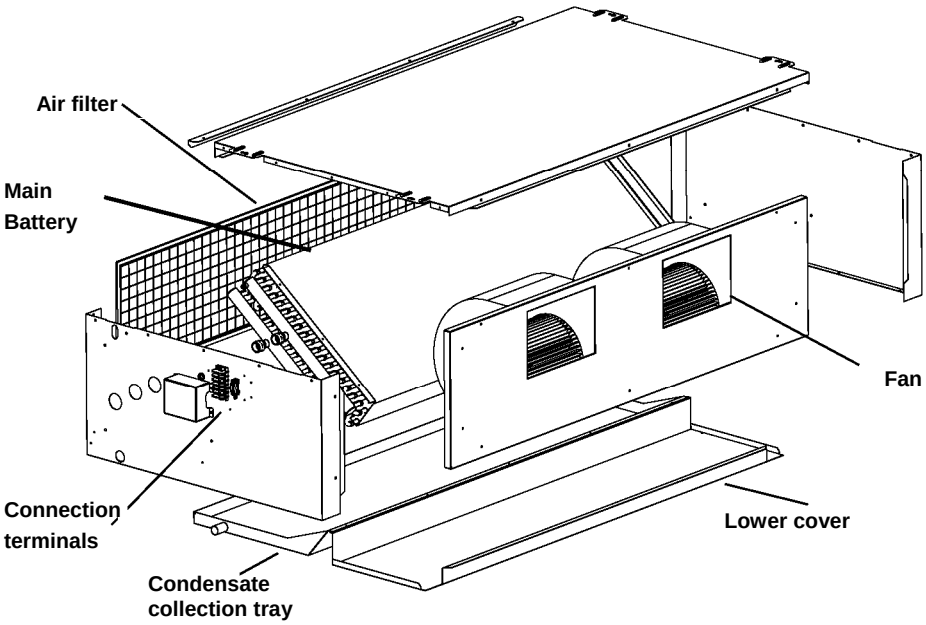
Components of the unit





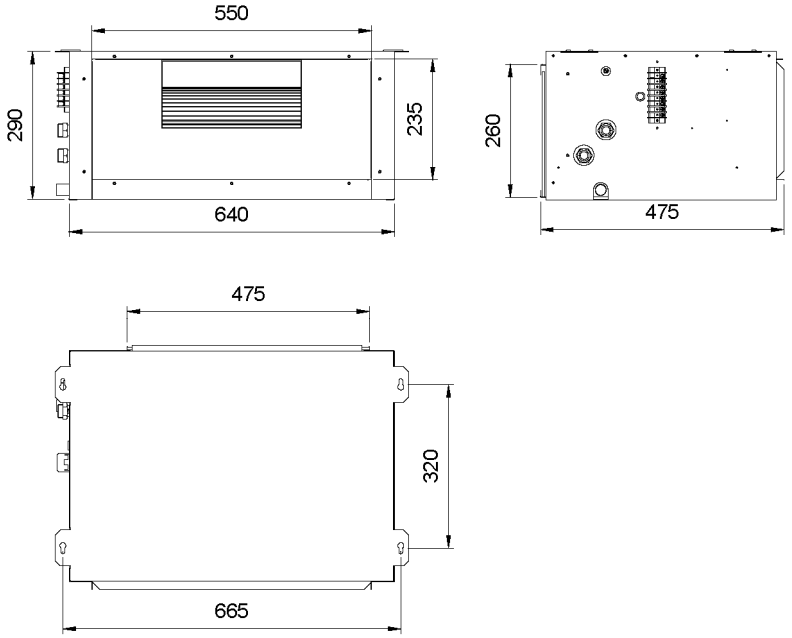
Components of the unit

Models 12 - 14 -23 - 28

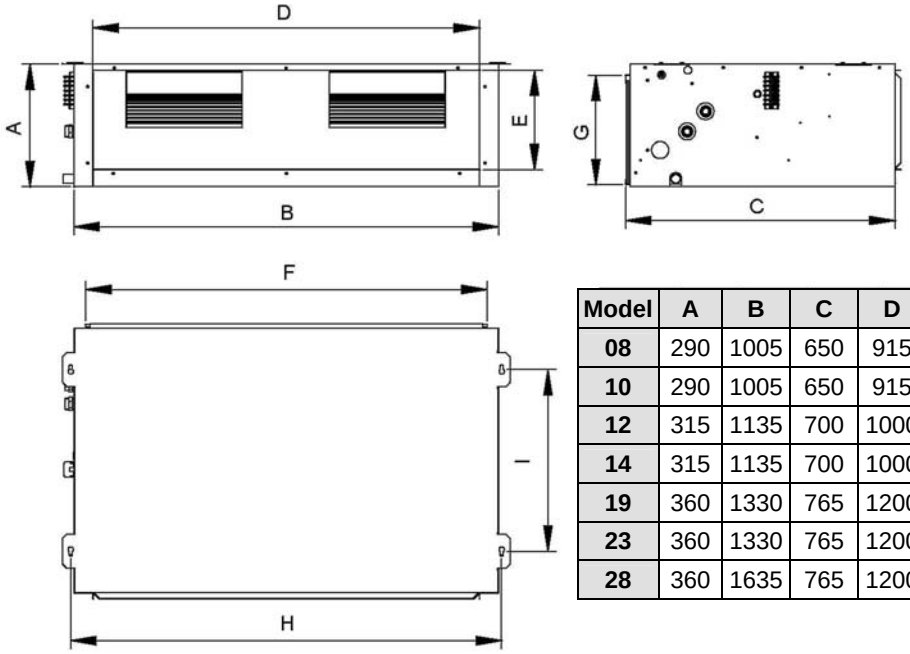


Unit dimensions

Model 05



Models 08 a 28



Model	A	B	C	D	E	F	G	H	I	Uds.
08	290	1005	650	915	235	950	260	1030	430	mm
10	290	1005	650	915	235	950	260	1030	430	mm
12	315	1135	700	1000	260	950	260	1160	480	mm
14	315	1135	700	1000	260	950	260	1160	480	mm
19	360	1330	765	1200	300	1300	320	1355	540	mm
23	360	1330	765	1200	300	1300	320	1355	540	mm
28	360	1635	765	1200	300	1300	320	1660	540	mm

Installation of the unit

The VHF-3 units have only been designed for installation in a horizontal ceiling.

- The positions of the battery plugs cannot be exchanged
- Special attention must be given to the correct levelling of the unit, to ensure adequate collection and evacuation of condensed water from both the main battery and the condensed water collection tray of the cross valve kit (optional).

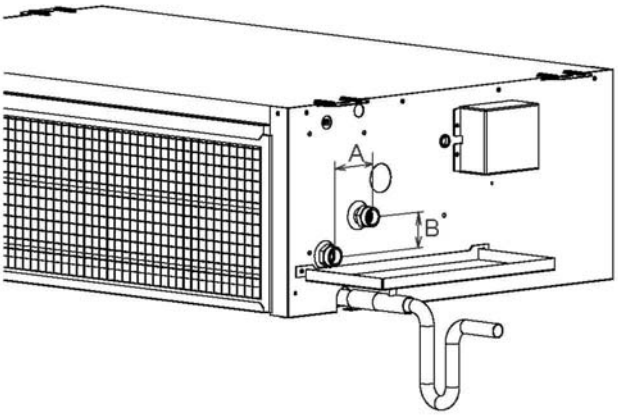


- Likewise, the horizontal route, with drop of the condensed water collection pipe, must be checked, to prevent overflowing of the tray.
- The condensed water outlet pipe must never exceed the height of the condensate collection tray.
- The external diameter of the outlet pipe is 22.2mm
- The installation of a siphon at the outlet of the condensate tray is important.

Hydraulic connections main battery

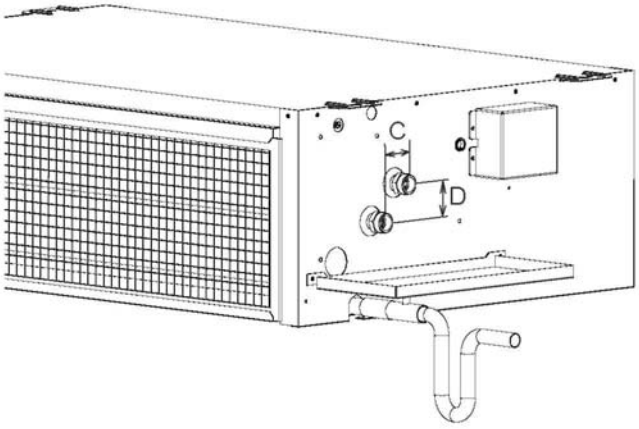
Model 05 - 08 - 12 - 19

Model	A	B	Uds.
05	45	50	mm
08	65	50	mm
12	65	50	mm
19	65	50	mm



Model 10 - 14 - 23 - 28

Model	C	D	Uds.
10	45	50	mm
14	50	45	mm
23	60	35	mm
28	60	35	mm

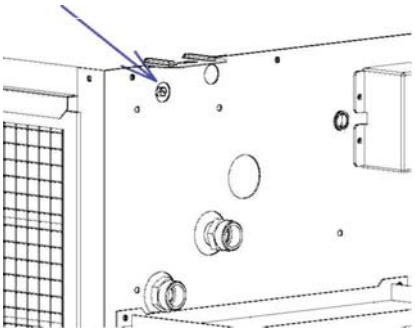


Purging of air from the water battery

In filling the installation with water, special attention must be given to the purging of air from the batteries. For this purpose, there is an access to the air drain on the upper part of the side of the unit. The purging is manual. Access to air drain.

Main Batery

BLEEDER



Technical specifications of the units

MODEL		VHF-3 SP		05	08	10	12	14	19	23	28
Heating Capacity *		Max	[W]	**5.800**	**9.900**	**10.900**	**14.300**	**16.100**	**22.300**	**27.200**	**32.600**
		Med	[W]	4.850	7.850	8.550	9.650	10.500	19.200	23.400	29.900
		Min	[W]	3.600	6.050	6.700	6.900	7.200	15.700	20.200	26.200
Flow rate		Max	[l/h]	826	1.393	1.703	2.116	2.356	3.285	3.922	4.799
Water Press Drop			[Kpa]	29	32	40	46	34	42	37	38
Cooling Capacity **	Total	Max	[W]	**4.800**	**8.100**	**9.900**	**12.300**	**13.700**	**19.100**	**22.800**	**27.900**
	Sensible	Max	[W]	3.460	5.600	6.800	8.590	9.540	13.400	16.400	19.700
	Total	Med	[W]	**4.200**	**7.150**	**7.800**	**9.100**	**9.800**	**16.800**	**20.100**	**25.600**
	Sensible	Med	[W]	2.950	4.830	5.240	6.100	6.650	11.550	14.100	17.900
	Total	Min	[W]	**3.250**	**5.700**	**6.150**	**6.500**	**6.950**	**14.200**	**17.800**	**23.700**
	Sensible	Min	[W]	2.200	3.780	4.050	4.280	4.550	9.560	12.250	16.330
Flow rate		Max	[l/h]	826	1.393	1.703	2.116	2.356	3.285	3.922	4.799
Water Press Drop			[Kpa]	35	39	49	56	42	52	45	47
Air flow		Max	[m^3/h]	800	1.100	1.300	1.750	1.800	2.700	3.400	4.000
		Med	[m^3/h]	630	850	950	1.100	1.150	2.250	2.700	3.400
		Min	[m^3/h]	430	630	730	750	800	1.700	2.100	2.900
Avaliable Pressure ***			[Pa]	50	50	50	50	50	50	50	50
Supply			V-Ph-Hz	230-1-50							
Fan number			N°	1	2	2	2	2	2	2	2
Fan Motor Number			N°	1	1	1	1	1	1	1	1
Speed motor			N°	3	3	3	3	3	3	3	3
Fan Motor Input			[W]	100	109	115	220	225	345	450	730
Heat Exchanger Coil Row Number			N°	3	4	4	4	4	4	4	4
Coil Water Volume			[l]	1,11	2,63	3,11	3,34	4,45	4,67	6	7,51
Sound Pressure****	*Suction/Side-Discharge side*	Max	dBA								
Coil fitting		TD	["]	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"

NOTE:

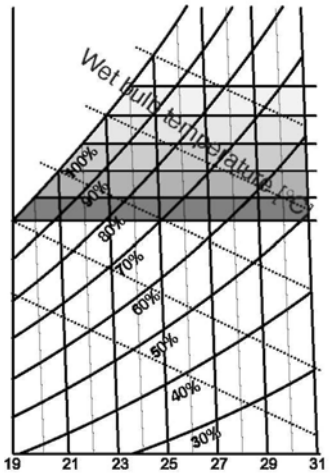
Supply: 230-1-50 [V-F-Hz]

- **Heating Capacity:**
- Ambient temperature: **20°C.**
- Inlet water temperature**50°C** same water flow rate as in the cooling mode..
  Fan speed: **Max Med, Min.**
- **Cooling Capacity:**
- Ambient temperature: **27°C D.B 19 °C W.B.**
- Inlet water temperature**7 A**t **5°C °C** water flow rate at the maximum fan speed. The water flow rate for medium and minimum fan speeds are the same at the maximum fan speed Fan speed: **Max Med, Min. ***Available static pressure:**
- Units without any filter.
- Fan speed: **Max Med, Min ****Sound pressure:**
- at 1 m distance from suction and outlet air. Units without any duct

LIMITS TO OPERATION

The main limits to operation for the appliances in question are given in the following table:

MODEL	UM	05	08	10	12	14	19	23	28
Max. temperature limits	(°C)	80							
Max pressure limits	(bar)	8							
Min.flow	(l/h)	300	500	600	700	1000	1600	1600	1700
Max.flow	(l/h)	1200	2000	2200	2800	4000	6400	6400	6800

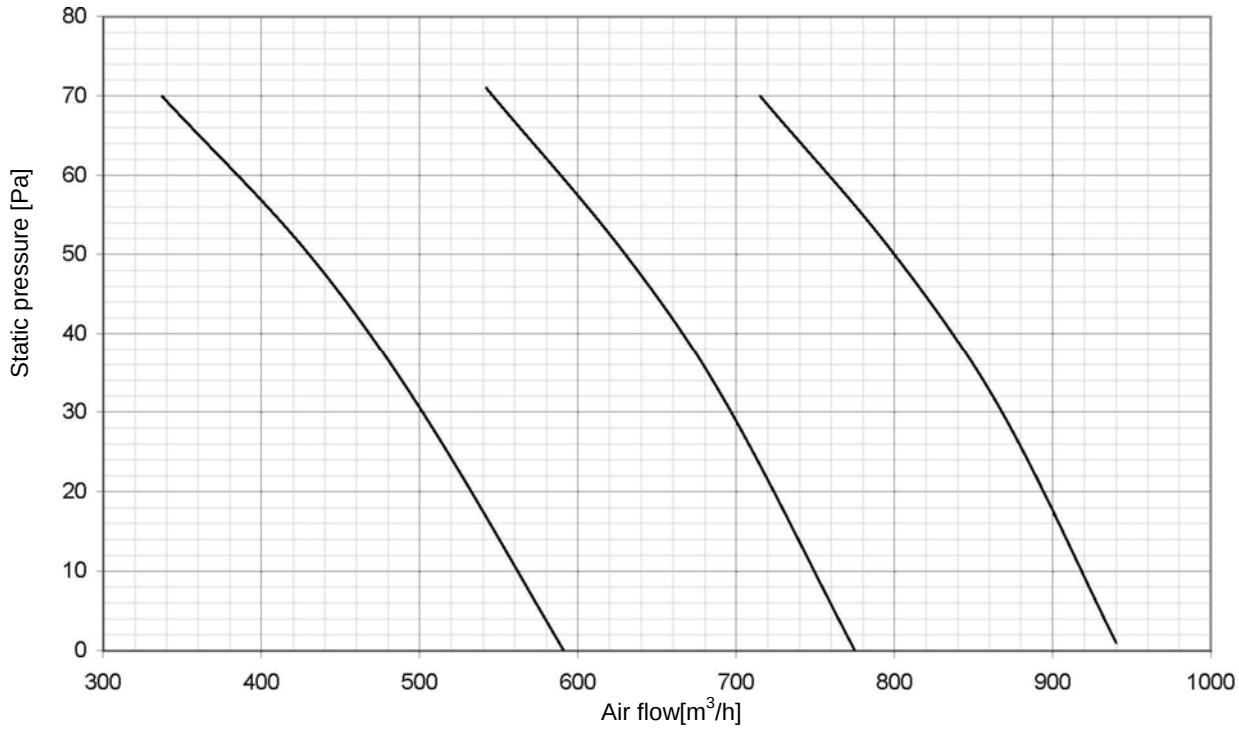




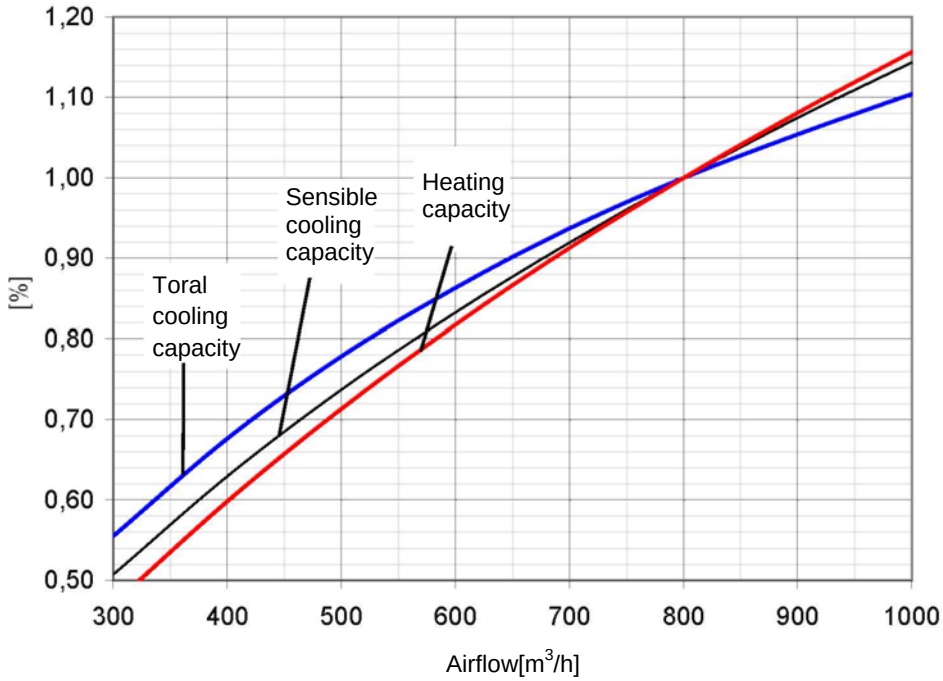
Minimum temperature of inlet water

To prevent condensation from forming on the external structure of the appliance, the minimum temperature of the water must not be lower than the limits given in the graph on the left, which depend on the thermo-hygrometric conditions of the surrounding air.
The above limits refer to operation at minimum speed.

Air flow graf. Mod. 05



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	4059	0	0	0	0
	5	3110	4403	5901	7458	0
	7	0	3291	4715	6412	8146
6	**3**	3567	4817	0	0	0
	5	2727	3892	5376	6640	0
	7	0	2905	4133	5842	7596
7	**3**	3117	4381	0	0	0
	5	2385	3414	**4800**	6397	8049
	7	0	2581	3576	5210	7004
8	**3**	2728	2148	0	0	0
	5	2205	2974	4243	5826	7505
	7	0	0	3154	4605	6385
9	**3**	2443	3352	4735	0	0
	5	1905	2594	3723	5227	6927
	7	0	0	2774	4007	5734
10	**3**	2205	2921	4157	0	0
	5	0	2295	3232	4617	6322
	7	0	0	2467	3459	5079
11	**3**	1960	2572	3610	0	0
	5	0	2036	2829	4041	5699
	7	0	0	0	2990	4450

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
2840	3440	3854	4257	4646	5086
2450	2957	3450	3892	4315	4720
2055	2455	2889	3406	3899	4343
2746	3200	3641	4050	4445	4825
2202	2729	3218	3680	4108	4518
1868	2255	2680	3169	3685	4132
2518	2984	3436	3844	4242	4630
1982	2491	2977	**3460**	3895	4312
1682	2055	2481	2921	3441	3918
2271	2753	3200	3635	4039	4429
1776	2239	2755	3228	3688	4106
1494	1868	2269	2699	3203	3703
2048	2526	2984	3427	3834	4228
1567	2000	2524	2992	3463	3893
1305	1682	2059	2495	2717	2898
1823	2284	2755	3197	3624	4024
1369	1789	2292	2775	3233	3681
1112	1494	1866	2294	2724	3227
1593	2058	2533	2982	3417	3820
1183	1581	2035	2546	3014	3463
917	1305	1680	2071	2512	3006

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	0	8008	6908	5820	4733
	10	8725	7594	6463	5335	4199
	14	8227	7047	5891	0	0
55	**6**	0	0	7960	6865	5782
	10	9795	8664	7558	6451	5335
	14	9358	8202	7047	5893	0
60	**6**	0	0	0	7905	6829
	10	10853	9722	8616	7510	6427
	14	10439	9308	8177	7047	5904
65	**6**	0	0	0	0	7856
	10	11902	10767	9661	8566	7473
	14	11509	10378	9260	8154	7035
70	**6**	0	0	0	0	0
	10	12942	11806	10694	**9600**	8518
	14	12572	11436	10317	9211	8116

- Temperature data in°C
- Capacity data in Watt

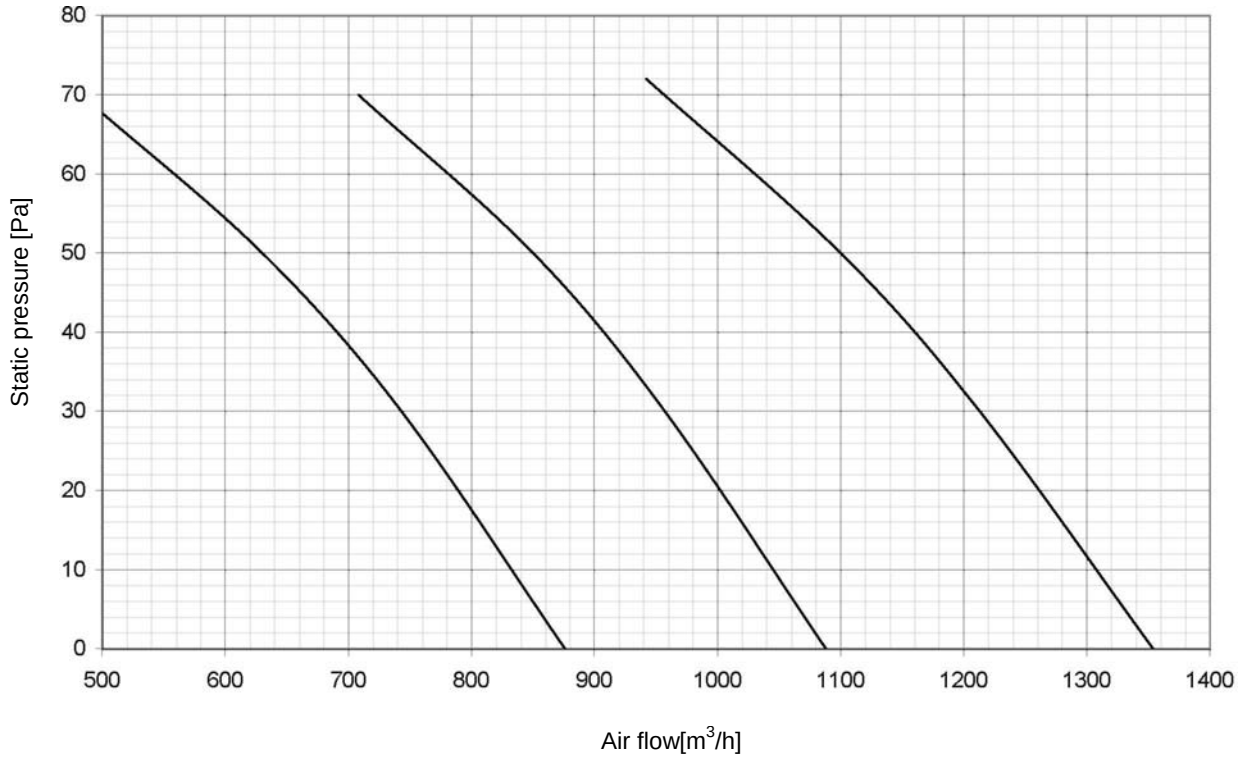
NOTE

-The table is referred to the max air flow condition at 50Pa.
In case we work at same water temperature and water flow to the max condition but with different air
flow,, use the graf ..... to estimate the effect on the air
flow on the performances

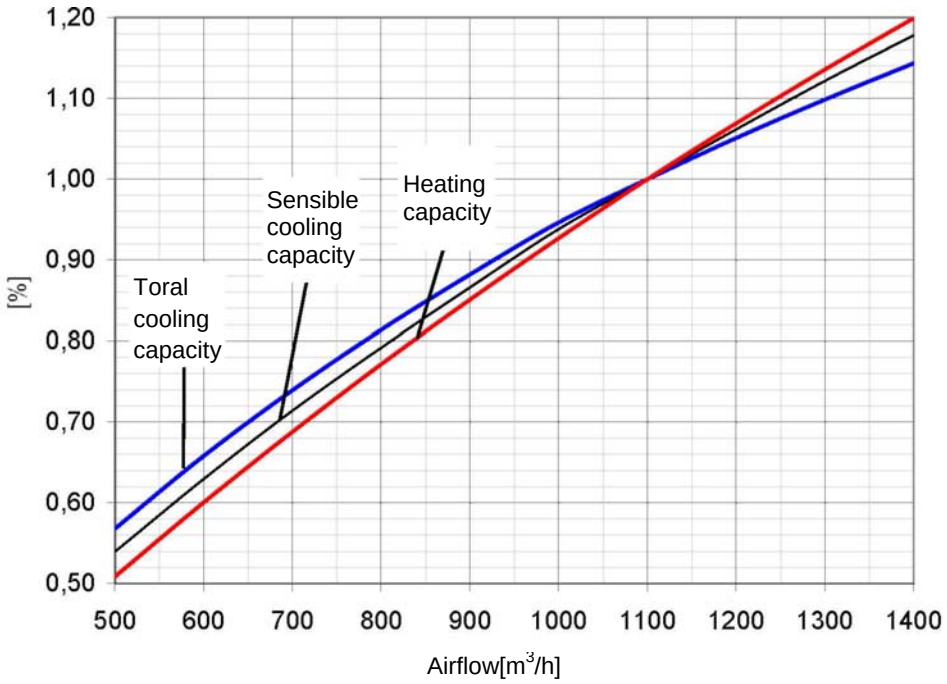
-Sensible efficiency values exceeding the total efficiency value should be interpreted as an absence of dehumidification. Only the sensible efficiency values should be considered.

-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 08



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	6850	0	0	0	0
	5	5248	7429	9958	0	0
	7	4106	5553	7957	10821	13747
6	**3**	6019	0	0	0	0
	5	4602	6568	9072	11205	0
	7	0	4902	6975	9858	12818
7	**3**	5261	0	0	0	0
	5	4024	5761	**8100**	10795	0
	7	0	4355	6035	8791	11819
8	**3**	4604	3626	0	0	0
	5	3722	5019	7160	9831	0
	7	0	0	5323	7772	10774
9	**3**	4123	5656	0	0	0
	5	3214	4378	6282	8821	0
	7	0	0	4681	6761	9676
10	**3**	3722	4929	0	0	0
	5	0	3873	5453	7791	10668
	7	0	0	4162	5837	8571
11	**3**	3308	4339	6092	0	0
	5	0	3436	4773	6819	9618
	7	0	0	0	5046	7510

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
4597	5568	6238	6889	7519	8232
3965	4786	5583	6299	6984	7640
3326	3974	4676	5513	6311	7029
4444	5178	5893	6556	7194	7809
3564	4418	5208	5957	6649	7313
3024	3650	4337	5129	5965	6688
4075	4830	5561	6221	6865	7493
3208	4031	4819	**5600**	6303	6979
2723	3326	4016	4728	5569	6341
3675	4455	5179	5884	6537	7169
2875	3624	4460	5225	5968	6646
2417	3024	3672	4369	5185	5993
3315	4088	4829	5547	6205	6843
2536	3237	4085	4843	5606	6302
2112	2723	3333	4039	4398	4690
2950	3697	4458	5174	5866	6512
2216	2896	3710	4491	5232	5958
1800	2417	3020	3713	4409	5223
2578	3331	4100	4826	5531	6183
1915	2558	3293	4121	4879	5604
1484	2112	2720	3352	4065	4865

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	0	13638	11765	9912	8061
	10	14859	12933	11007	9086	7151
	14	14011	12001	10034	0	0
55	**6**	0	0	13556	11692	9848
	10	16681	14755	12872	10988	9086
	14	15937	13969	12001	10036	0
60	**6**	0	0	0	13463	11630
	10	18483	16558	14674	12790	10946
	14	17779	15853	13927	12001	10056
65	**6**	0	0	0	0	13379
	10	20270	18338	16454	14590	12728
	14	19601	17675	15771	13887	11981
70	**6**	0	0	0	0	0
	10	22041	20107	18214	**16350**	14508
	14	21412	19477	17571	15687	13823

- Temperature data in°C
- Capacity data in Watt

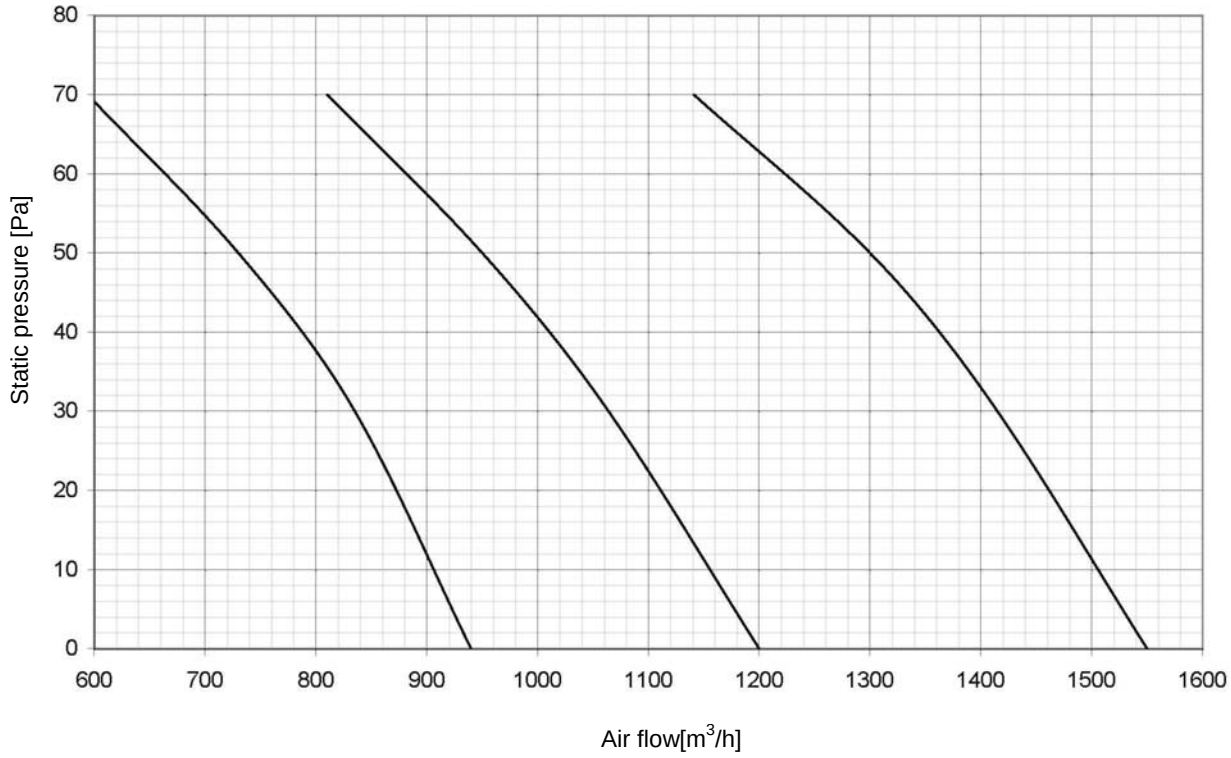
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In case we work at same water temperature and water flow to the max condition but with different air
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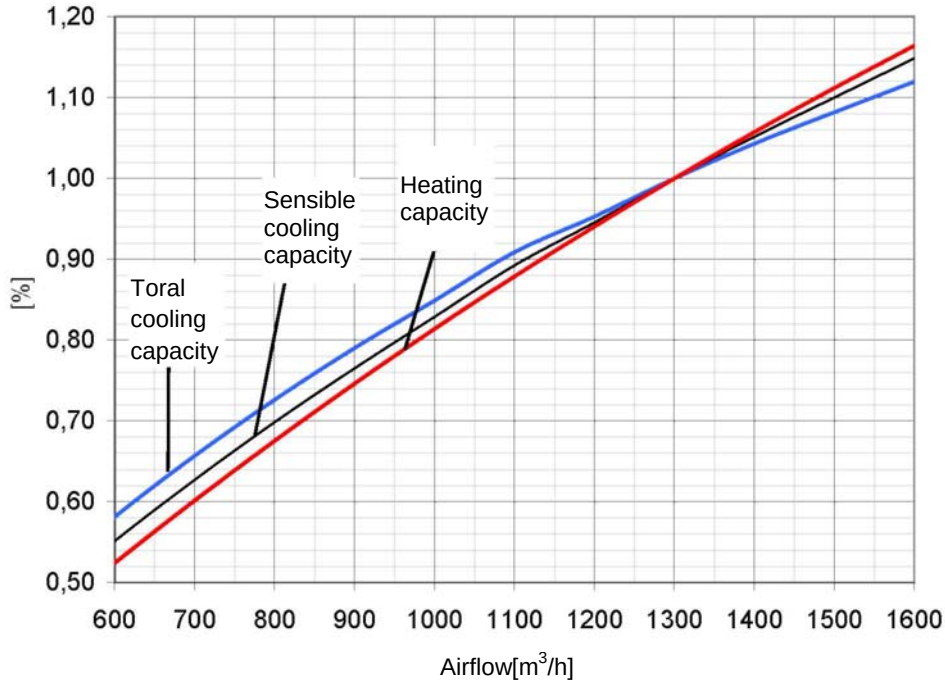
-Sensible efficiency values exceeding the total efficiency value should be interpreted as an absence of dehumidification. Only the sensible efficiency values should be considered.

-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 10



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	8372	0	0	0	0
	5	6414	9080	12171	0	0
	7	5018	6787	9725	13225	16802
6	**3**	7357	0	0	0	0
	5	5624	8027	11088	13695	0
	7	4551	5992	8525	12049	15667
7	**3**	6430	0	0	0	0
	5	4918	7042	**9900**	13194	0
	7	0	5323	7376	10745	14445
8	**3**	5627	4431	0	0	0
	5	4549	6135	8752	12016	0
	7	0	4772	6506	9499	13169
9	**3**	5039	6913	0	0	0
	5	3928	5350	7678	10781	0
	7	0	4257	5721	8264	11827
10	**3**	4549	6024	0	0	0
	5	3465	4733	6665	9523	13038
	7	0	0	5087	7134	10475
11	**3**	4043	5304	7445	0	0
	5	0	4200	5834	8335	11755
	7	0	0	0	6167	9179

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
5582	6761	7575	8365	9131	9996
4815	5812	6780	7649	8481	9277
4039	4825	5678	6694	7664	8535
5396	6288	7156	7960	8736	9483
4328	5364	6324	7233	8073	8880
3672	4432	5267	6228	7243	8121
4948	5865	6753	7554	8336	9099
3896	4895	5852	**6800**	7654	8475
3307	4039	4877	5741	6763	7700
4463	5410	6289	7144	7937	8705
3491	4401	5415	6344	7247	8070
2935	3672	4459	5305	6296	7277
4025	4964	5864	6735	7535	8310
3079	3931	4960	5881	6807	7652
2565	3307	4047	4904	5341	5695
3582	4489	5414	6283	7123	7908
2691	3516	4505	5453	6354	7235
2186	2935	3668	4509	5354	6342
3130	4045	4979	5860	6716	7507
2326	3106	3999	5004	5924	6805
1802	2565	3302	4071	4937	5908

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

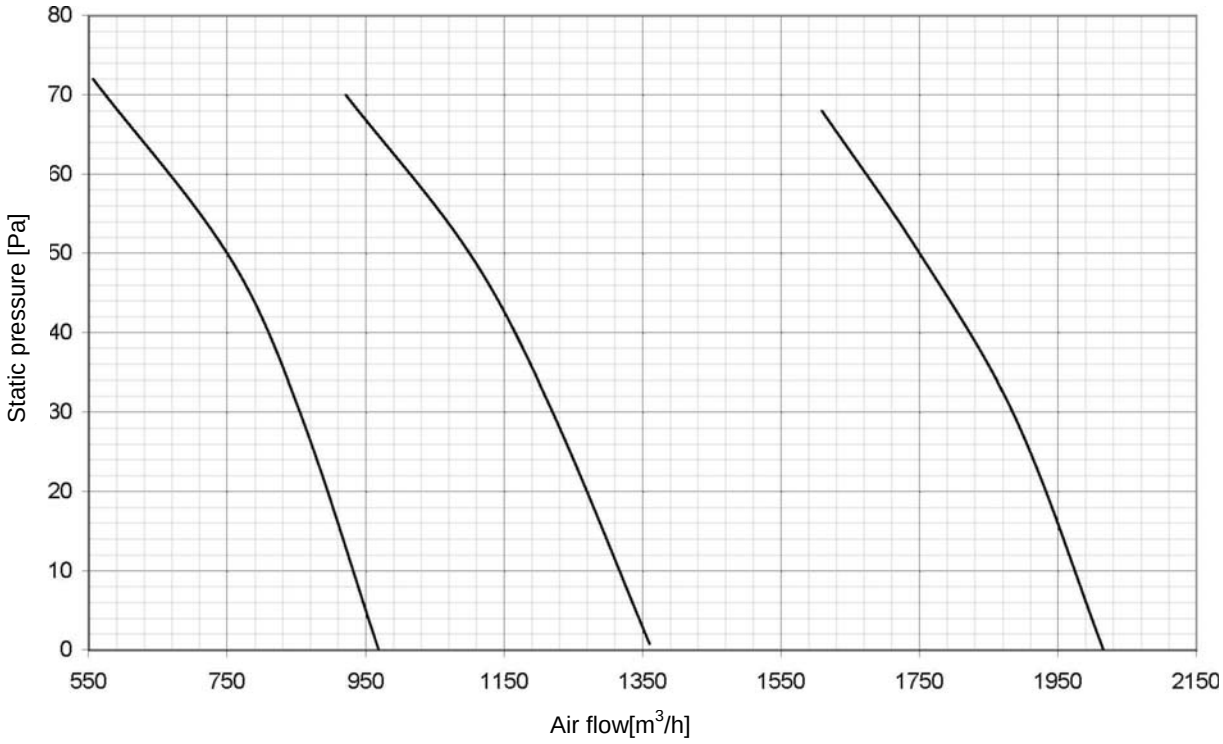
Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	0	14847	12808	10791	8776
	10	16177	14080	11984	9892	7786
	14	15254	13066	10923	0	0
55	**6**	0	0	14758	12729	10721
	10	18161	16064	14013	11962	9892
	14	17350	15208	13066	10926	0
60	**6**	0	0	0	14657	12662
	10	20123	18026	15975	13924	11916
	14	19356	17259	15162	13066	10947
65	**6**	0	0	0	0	14566
	10	22068	19964	17913	15884	13857
	14	21339	19243	17170	15119	13044
70	**6**	0	0	0	0	0
	10	23996	21890	19829	**17800**	15795
	14	23311	21205	19130	17079	15049

- Temperature data in°C
- Capacity data in Watt

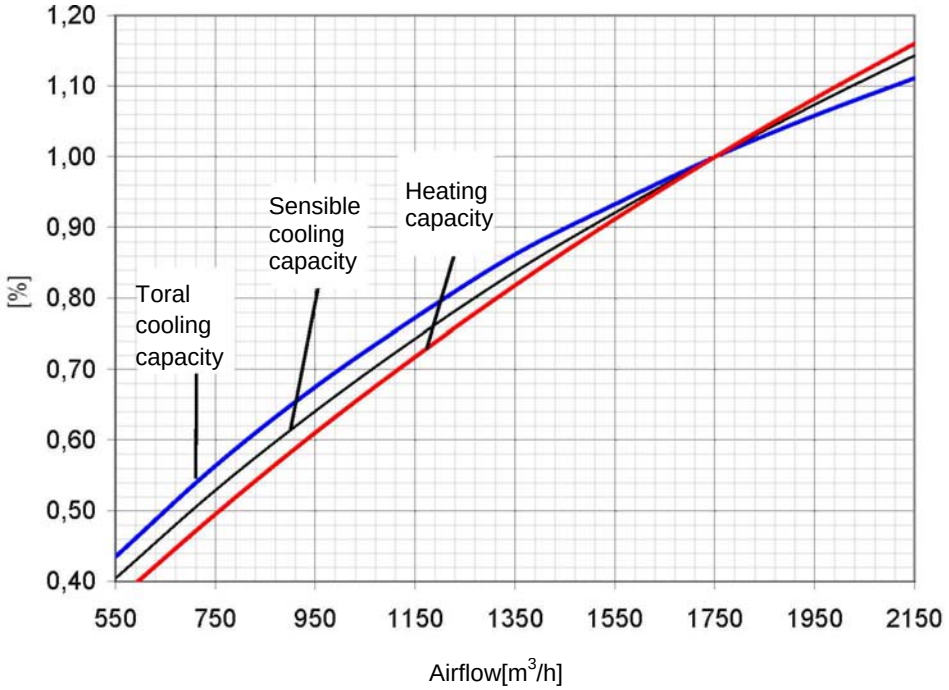
NOTE

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In case we work at same water temperature and water flow to the max condition but with different air
flow,, use the graf ..... to estimate the effect on the air
flow on the performances
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-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 12



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	3	10402	0	0	0	0
	5	7969	11282	15121	0	0
	7	6234	8433	12083	16431	20875
6	3	9140	0	0	0	0
	5	6988	9973	13776	17016	0
	7	0	7444	10591	14969	19465
7	3	7988	0	0	0	0
	5	6111	8749	**12300**	16392	0
	7	0	6613	9165	13350	17947
8	3	6992	5505	0	0	0
	5	5651	7622	10873	14929	0
	7	0	5929	8083	11802	16361
9	3	6261	8589	0	0	0
	5	4881	6648	9540	13394	0
	7	0	0	7108	10267	14694
10	3	5651	7485	0	0	0
	5	4305	5881	8281	11831	16199
	7	0	0	6321	8864	13015
11	3	5024	6590	9250	0	0
	5	0	5218	7249	10355	14605
	7	0	0	0	7662	11404

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
7052	8541	9569	1056	1153	1262
6082	7341	8565	9663	1071	1171
5102	6095	7172	8456	9681	1078
6817	7943	9039	1005	1103	1197
5467	6776	7988	9137	1019	1121
4638	5598	6653	7868	9150	1025
6251	7409	8530	9543	1053	1149
4921	6184	7392	**8590**	9669	1070
4177	5102	6161	7252	8543	9726
5638	6834	7944	9025	1002	1099
4410	5559	6841	8014	9155	1019
3708	4638	5633	6701	7953	9193
5085	6270	7407	8508	9518	1049
3890	4965	6266	7429	8599	9666
3240	4177	5113	6195	6746	7194
4525	5670	6839	7937	8998	9989
3399	4442	5691	6888	8026	9140
2762	3708	4633	5696	6764	8011
3954	5110	6289	7402	8484	9484
2938	3924	5052	6321	7484	8597
2277	3240	4172	5142	6236	7463

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

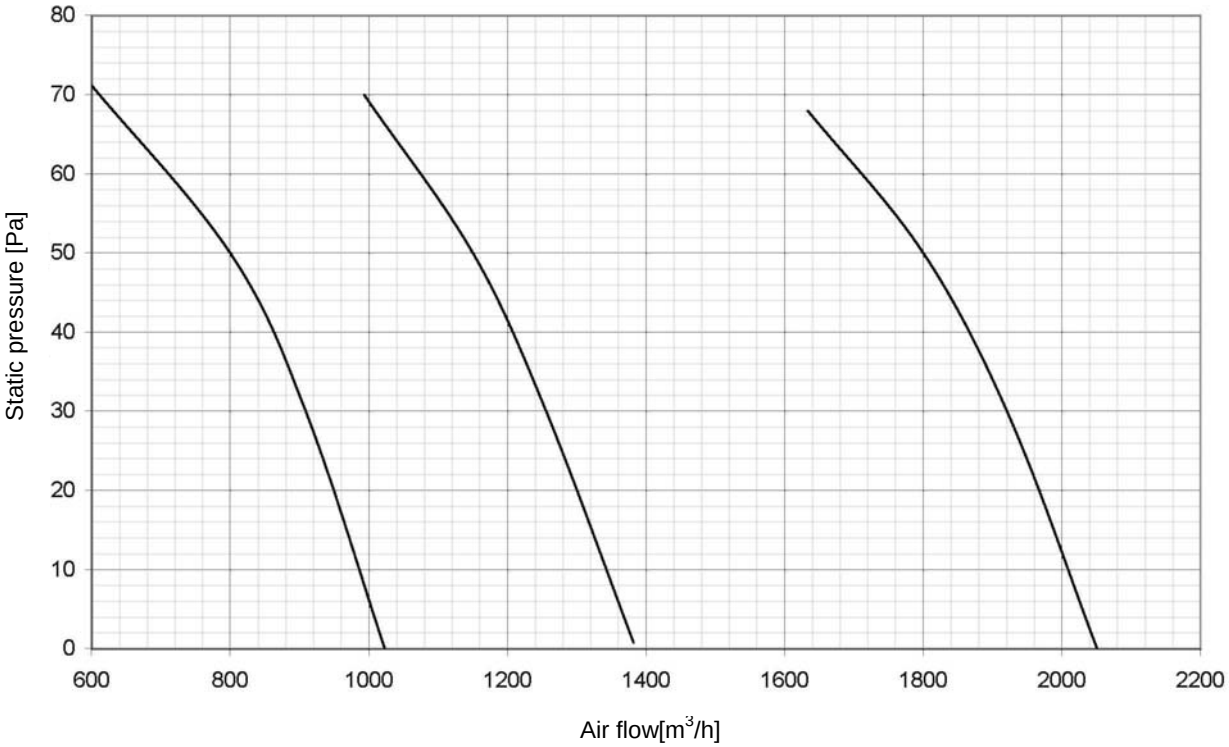
Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	6	0	0	16910	14247	11587
	10	21357	18589	15821	13059	10279
	14	20138	17250	14421	11444	0
55	6	0	0	19484	16805	14155
	10	23976	21208	18500	15793	13059
	14	22906	20078	17250	14424	11545
60	6	0	0	0	19351	16716
	10	26566	23798	21091	18383	15732
	14	25554	22786	20018	17250	14453
65	6	0	0	0	0	19230
	10	29135	26357	23649	20970	18294
	14	28173	25405	22668	19961	17221
70	6	0	0	0	0	0
	10	31680	28900	26179	**23500**	20853
	14	30776	27995	25255	22548	19868

- Temperature data in°C
- Capacity data in Watt

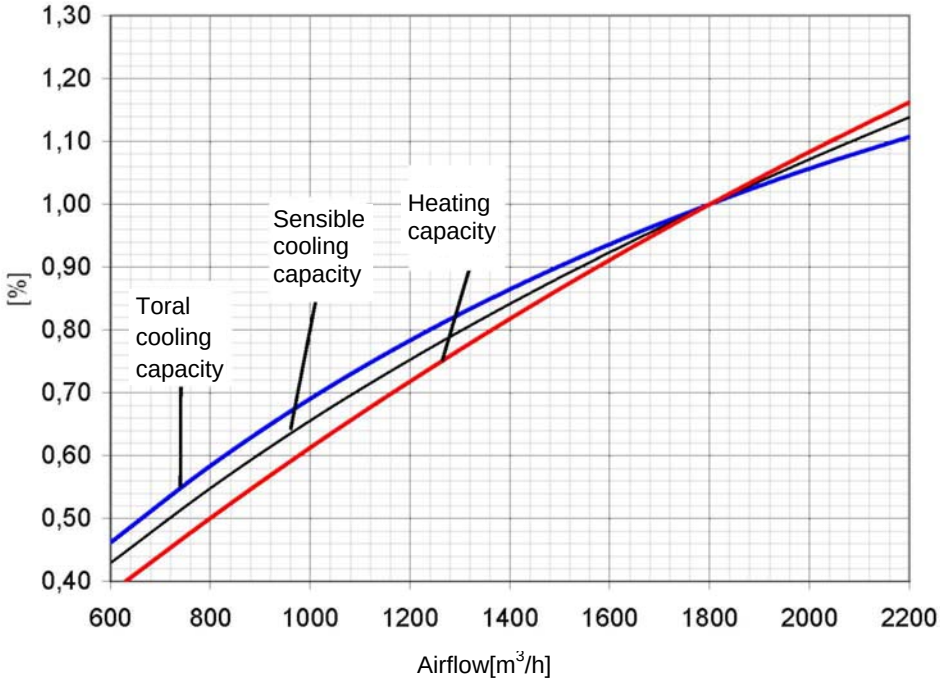
NOTE

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flow,, use the graf ..... to estimate the effect on the air
flow on the performances
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-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 14



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	11586	0	0	0	0
	5	8876	12566	16842	21285	0
	7	6944	9392	13458	18301	23251
6	**3**	10181	13748	0	0	0
	5	7783	11108	15344	18952	0
	7	0	8292	11797	16673	21680
7	**3**	8898	12505	0	0	0
	5	6806	9744	**13700**	18258	22974
	7	0	7366	10208	14869	19990
8	**3**	7787	6132	0	0	0
	5	6295	8490	12111	16628	21422
	7	0	6604	9003	13145	18223
9	**3**	6973	9567	13513	0	0
	5	5436	7404	10626	14919	19770
	7	0	0	7918	11435	16366
10	**3**	6295	8337	11866	0	0
	5	4795	6550	9223	13178	18043
	7	0	0	7040	9873	14496
11	**3**	5595	7340	10303	0	0
	5	0	5812	8074	11534	16267
	7	0	0	0	8534	12702

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
7832	9486	1062	1173	1281	1402
6755	8153	9512	1073	1189	1301
5666	6769	7965	9391	1075	1197
7571	8822	1003	1116	1225	1330
6072	7526	8872	1014	1132	1245
5151	6217	7389	8738	1016	1139
6942	8228	9474	1059	1169	1276
5466	6868	8209	**9540**	1073	1189
4639	5666	6842	8054	9487	1080
6261	7590	8823	1002	1113	1221
4898	6174	7597	8900	1016	1132
4118	5151	6256	7442	8833	1020
5647	6964	8227	9449	1057	1165
4320	5514	6959	8251	9550	1073
3598	4639	5678	6880	7493	7989
5025	6297	7595	8814	9993	1109
3775	4933	6320	7650	8914	1015
3067	4118	5146	6326	7512	8897
4391	5675	6985	8221	9422	1053
3263	4358	5610	7020	8311	9548
2528	3598	4633	5711	6926	8288

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

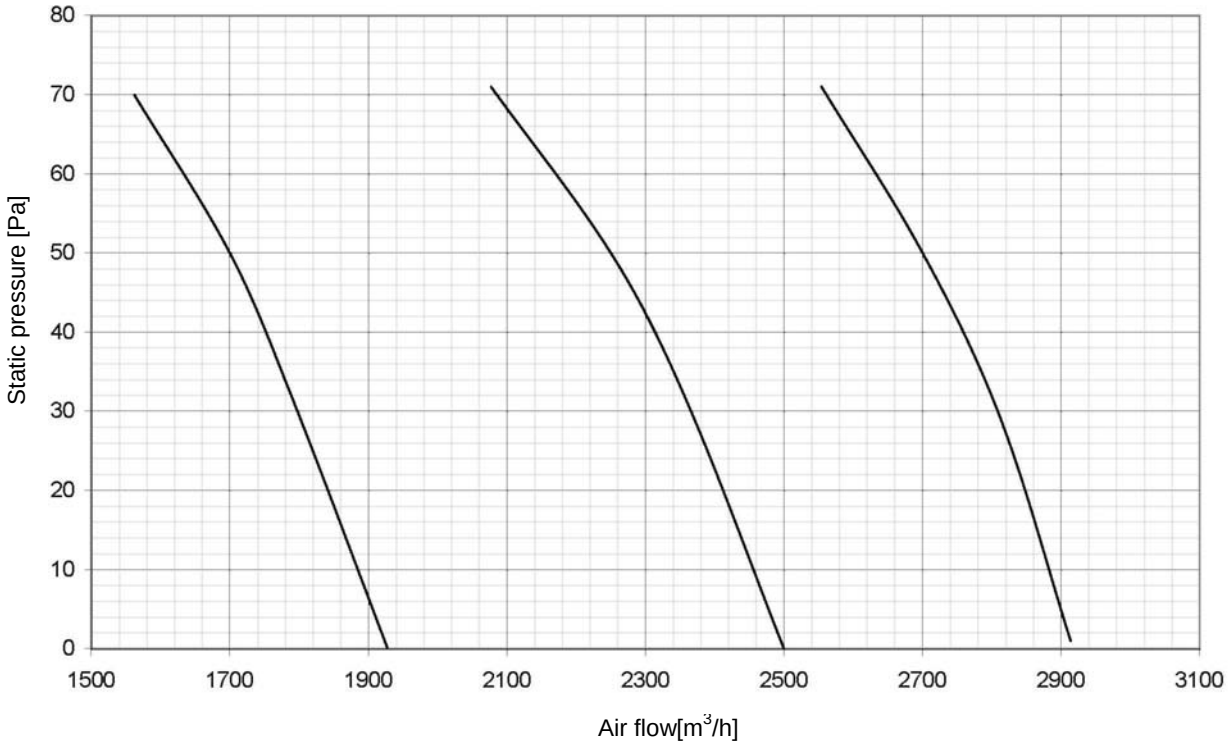
Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	25226	22104	19069	16065	13066
	10	24084	20962	17841	14727	0
	14	22709	19452	0	0	0
55	**6**	0	25025	21972	18951	15962
	10	27037	23916	20862	17809	14727
	14	25831	22641	19452	0	0
60	**6**	0	0	24821	21821	18850
	10	29958	26836	23783	20730	17741
	14	28816	25695	22573	19452	16298
65	**6**	0	0	27674	24656	21685
	10	32854	29722	26668	23647	20629
	14	31769	28648	25562	22509	19419
70	**6**	0	0	0	27506	24520
	10	35725	32589	29521	**26500**	23515
	14	34705	31569	28480	25426	22405

- Temperature data in°C
- Capacity data in Watt

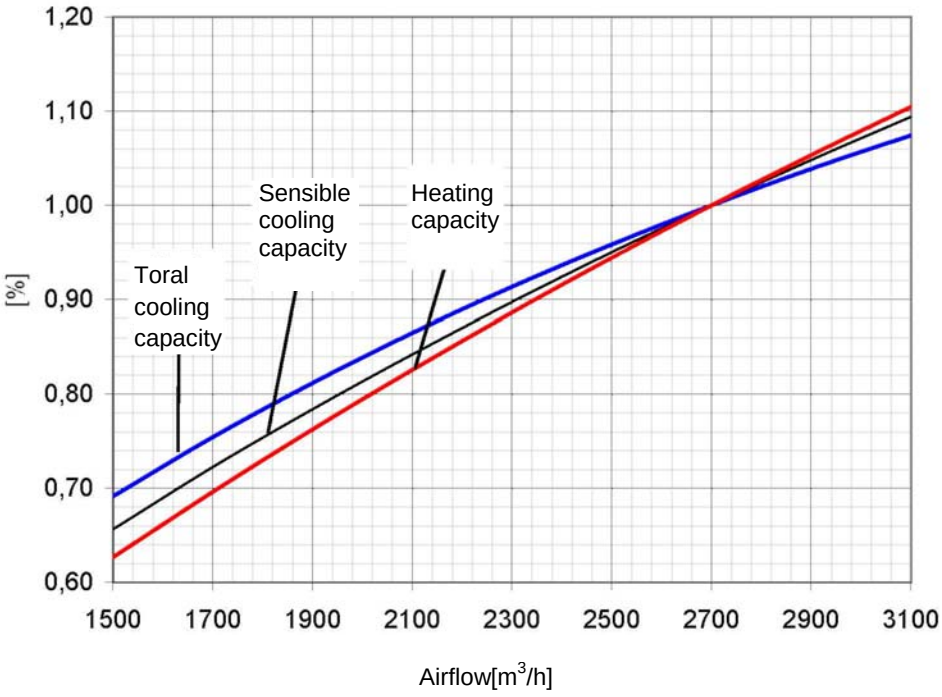
NOTE

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-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 19



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	16152	21583	0	0	0
	5	12375	17519	23481	29675	36290
	7	0	13095	18763	25515	32415
6	**3**	14194	19166	0	0	0
	5	10851	15487	21392	26423	34197
	7	0	11560	16447	23245	30226
7	**3**	12405	17433	0	0	0
	5	9489	13585	**19100**	25454	32029
	7	0	10269	14231	20730	27869
8	**3**	10857	8549	20979	0	0
	5	8776	11836	16884	23182	29865
	7	0	0	12552	18326	25406
9	**3**	9722	13338	18840	0	0
	5	7579	10323	14814	20800	27563
	7	0	0	11038	15943	22817
10	**3**	8776	11623	16543	0	0
	5	0	9132	12859	18372	25155
	7	0	0	9815	13765	20210
11	**3**	7801	10233	14364	20254	0
	5	0	8103	11256	16080	22679
	7	0	0	0	11898	17709

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
11001	13324	14927	16485	17993	19698
9488	11452	13360	15073	16712	18281
7959	9508	11188	13191	15102	16819
10634	12391	14101	15687	17215	18687
8529	10571	12461	14254	15909	17498
7235	8733	10379	12273	14273	16004
9751	11557	13307	14886	16428	17930
7677	9647	11531	**13400**	15083	16700
6516	7959	9610	11313	13326	15173
8795	10660	12392	14079	15641	17153
6880	8672	10671	12502	14281	15903
5785	7235	8787	10454	12407	14340
7932	9781	11555	13272	14848	16375
6068	7746	9775	11589	13413	15079
5054	6516	7976	9664	10524	11222
7059	8845	10668	12381	14036	15583
5303	6929	8878	10745	12520	14258
4308	5785	7228	8885	10551	12497
6168	7971	9811	11547	13235	14794
4583	6121	7880	9861	11674	13411
3552	5054	6508	8021	9728	11642

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

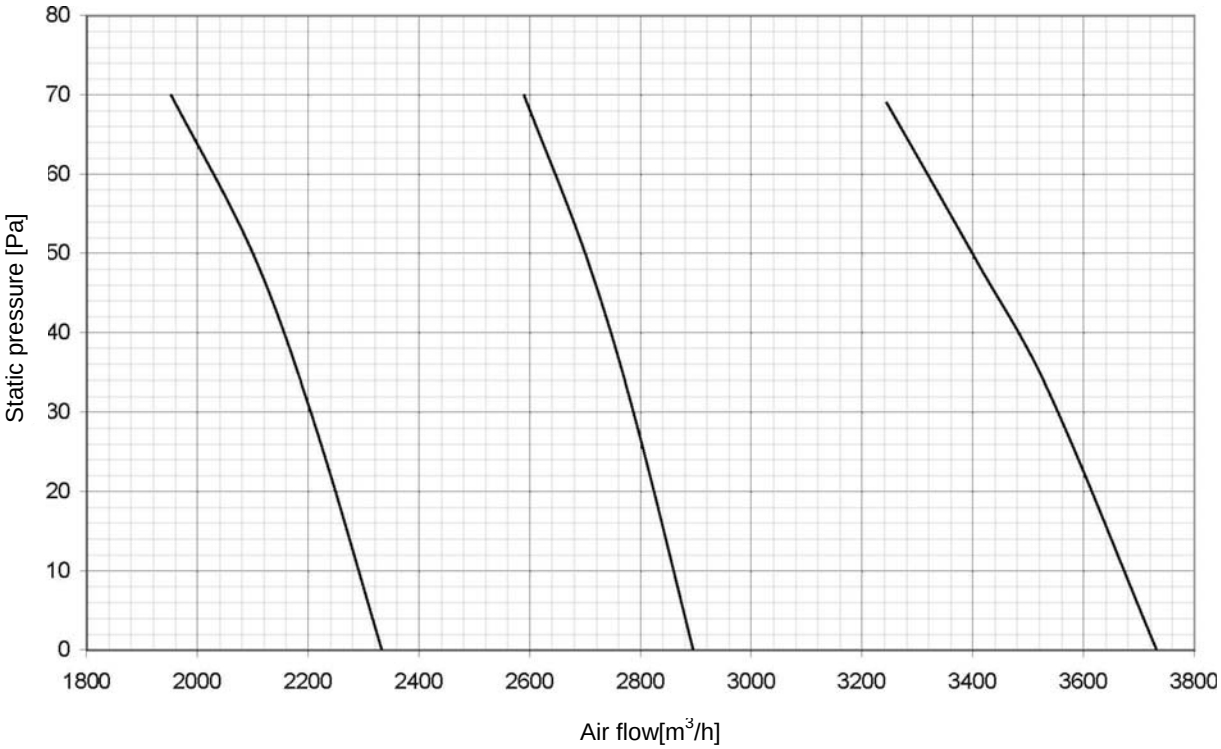
Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	34888	30571	26372	22219	18070
	10	33308	28991	24674	20367	0
	14	31407	26902	0	0	0
55	**6**	38878	34610	30387	26209	22075
	10	37393	33076	28853	24630	20367
	14	35724	31313	26902	0	0
60	**6**	42868	38601	34328	30179	26070
	10	41432	37115	32892	28669	24536
	14	39853	35536	31219	26902	0
65	**6**	0	42546	38274	34100	29991
	10	45437	41106	36883	32704	28531
	14	43937	39620	35353	31130	26858
70	**6**	0	0	42175	38041	33912
	10	49408	45071	40828	**36650**	32521
	14	47997	43660	39388	35165	30986

- Temperature data in°C
- Capacity data in Watt

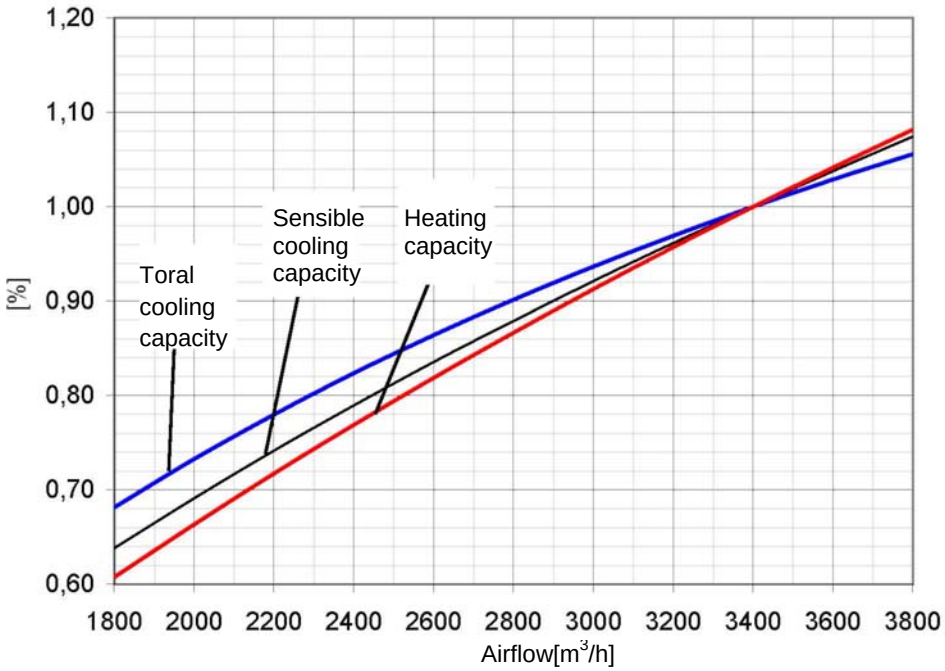
NOTE

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flow on the performances
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-Values that are not given refer to operating conditions beyond the operating limits.

Air flow graf. Mod. 23



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	19281	0	0	0	0
	5	14772	20912	28029	35423	0
	7	11556	15631	22398	30458	38694
6	**3**	16943	0	0	0	0
	5	12953	18487	25536	31541	0
	7	10480	13799	19632	27748	36081
7	**3**	14808	20811	0	0	0
	5	11327	16217	**22800**	30385	0
	7	0	12258	16988	24746	33268
8	**3**	12960	10205	0	0	0
	5	10476	14129	20155	27673	35651
	7	0	10991	14983	21876	30327
9	**3**	11605	15922	0	0	0
	5	9047	12322	17684	24829	32902
	7	0	9804	13177	19031	27237
10	**3**	10476	13875	19747	0	0
	5	7980	10901	15350	21932	30028
	7	0	0	11717	16431	24124
11	**3**	9312	12215	17147	0	0
	5	0	9673	13436	19195	27072
	7	0	0	0	14202	21139

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
13463	16307	18269	20175	22021	24108
11612	14016	16352	18448	20454	22374
9741	11637	13693	16144	18483	20584
13015	15165	17257	19199	21069	22870
10438	12937	15251	17445	19471	21415
8855	10688	12702	15021	17468	19586
11934	14145	16286	18219	20106	21944
9396	11806	14113	**16400**	18460	20439
7975	9741	11762	13846	16310	18570
10764	13047	15167	17231	19143	20994
8420	10614	13060	15301	17478	19463
7080	8855	10754	12794	15184	17550
9708	11971	14142	16243	18172	20041
7427	9480	11963	14184	16416	18455
6186	7975	9761	11827	12880	13734
8639	10826	13056	15152	17178	19071
6490	8480	10865	13151	15323	17450
5272	7080	8846	10874	12913	15295
7549	9755	12008	14132	16198	18106
5609	7492	9645	12068	14288	16413
4347	6186	7965	9817	11906	14248

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

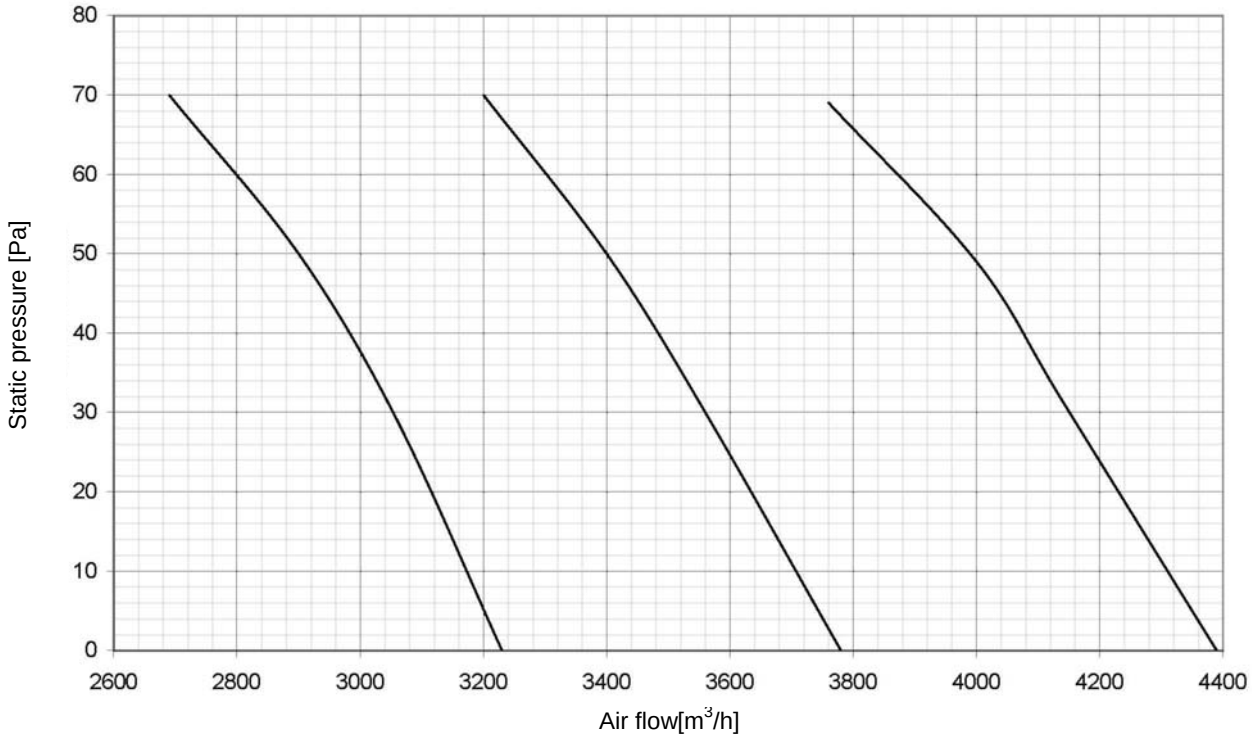
Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	42646	37369	32237	27160	22088
	10	40715	35438	30161	24896	19595
	14	38391	32884	27492	0	0
55	**6**	0	42307	37145	32037	26984
	10	45708	40431	35269	30107	24896
	14	43668	38276	32884	27498	0
60	**6**	0	0	41962	36891	31868
	10	50646	45369	40207	35045	29992
	14	48715	43438	38161	32884	27553
65	**6**	0	0	0	41683	36661
	10	55542	50246	45084	39977	34875
	14	53708	48431	43214	38052	32830
70	**6**	0	0	0	0	41453
	10	60395	55094	49908	**44800**	39753
	14	58670	53369	48147	42985	37877

- Temperature data in°C
- Capacity data in Watt

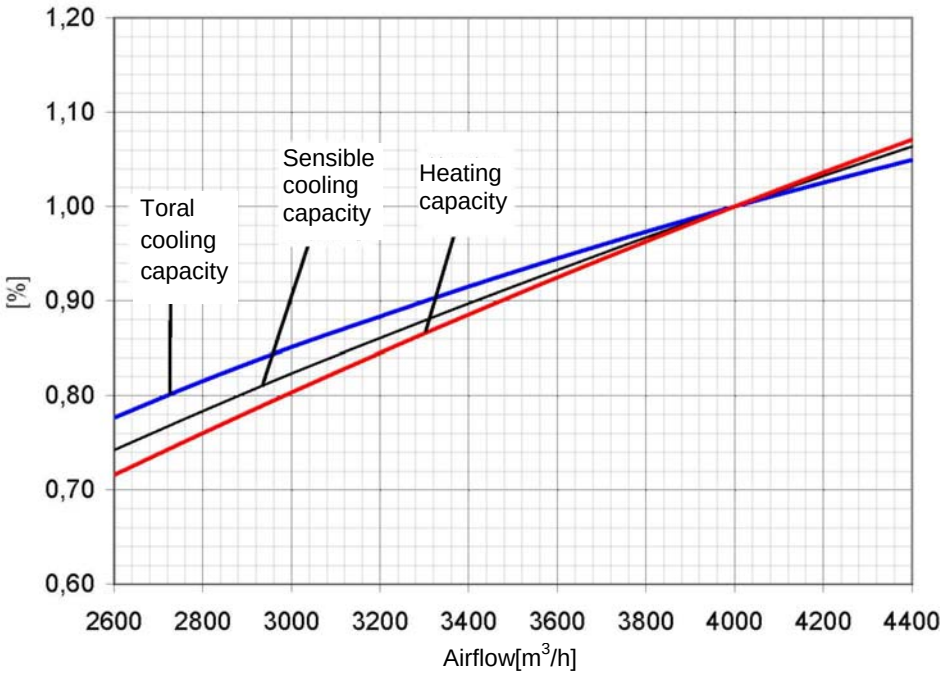
NOTE

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Air flow graf. Mod. 28



Effect of air flow on unit's performance



Hydraulic connections main battery

		Total cooling Capacity				
Water		Air temp inlet W.B				
Temp inlet	DT	15	17	19	21	23
5	**3**	23594	0	0	0	0
	5	18077	25590	34299	0	0
	7	14141	19128	27408	37271	47350
6	**3**	20733	0	0	0	0
	5	15850	22622	31248	38596	0
	7	0	16886	24024	33955	44151
7	**3**	18120	0	0	0	0
	5	13861	19845	**27900**	37182	0
	7	0	15000	20788	30281	40710
8	**3**	15859	12488	0	0	0
	5	12819	17289	24664	33863	0
	7	0	0	18335	26769	37111
9	**3**	14201	19483	0	0	0
	5	11071	15079	21639	30383	0
	7	0	0	16124	23288	33330
10	**3**	12819	16978	0	0	0
	5	0	13340	18783	26837	36744
	7	0	0	14337	20106	29521
11	**3**	11395	14947	20982	0	0
	5	0	11837	16442	23489	33128
	7	0	0	0	17379	25868

Senible cooling Capacity					
Air temp inlet D.B					
21	23	25	27	29	31
16172	19588	21945	24235	26452	28959
13949	16836	19642	22160	24569	26876
11701	13979	16449	19393	22202	24726
15634	18217	20730	23062	25308	27472
12538	15540	18320	20955	23389	25725
10637	12839	15258	18043	20983	23528
14335	16991	19563	21885	24151	26359
11286	14182	16952	**19700**	22174	24552
9579	11701	14129	16632	19592	22306
12929	15672	18219	20698	22995	25218
10114	12750	15688	18379	20995	23380
8504	10637	12918	15368	18239	21082
11661	14380	16988	19512	21828	24074
8921	11387	14370	17038	19720	22168
7431	9579	11725	14207	15472	16497
10377	13004	15683	18201	20635	22909
7796	10187	13051	15797	18407	20961
6333	8504	10626	13063	15512	18373
9068	11718	14424	16976	19457	21749
6738	8999	11585	14497	17163	19716
5221	7431	9568	11793	14302	17115

- Temperature data in°C
- Capacity data in Watt

Heating capacity table

Water		Air temp inlet D.B				
Temp inlet	DT	5	10	15	20	25
50	**6**	0	44792	38641	32555	26476
	10	48804	42478	36153	29842	23488
	14	46018	39417	32954	0	0
55	**6**	0	0	44524	38402	32345
	10	54788	48463	42275	36088	29842
	14	52344	45880	39417	32961	0
60	**6**	0	0	0	44219	38199
	10	60707	54382	48194	42007	35950
	14	58393	52068	45743	39417	33027
65	**6**	0	0	0	49964	43944
	10	66576	60228	54041	47919	41804
	14	64378	58052	51800	45612	39352
70	**6**	0	0	0	0	49689
	10	72393	66039	59822	**53700**	47650
	14	70326	63971	57711	51524	45402

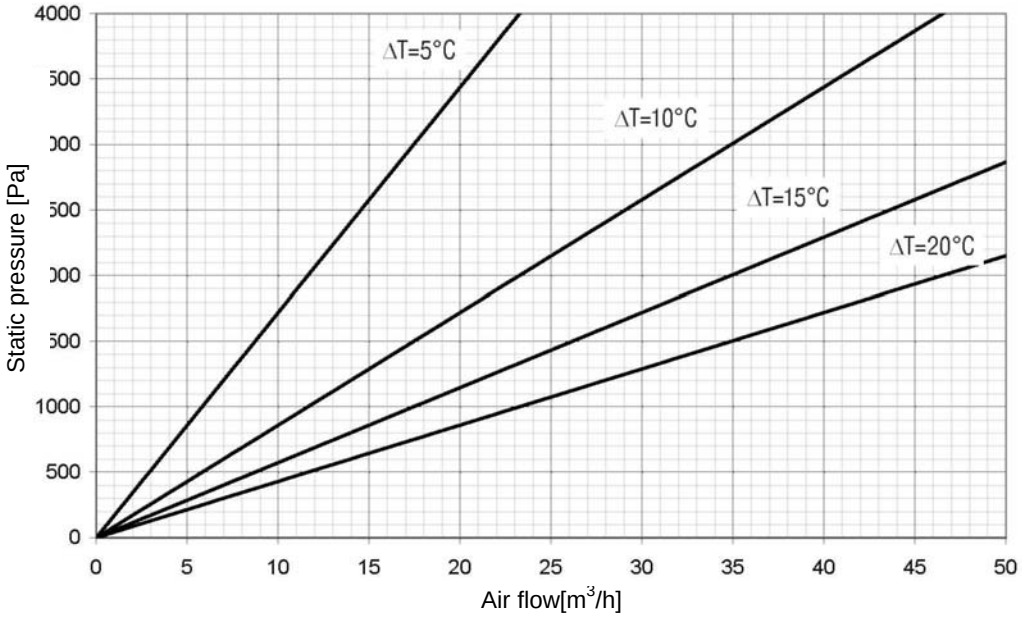
- Temperature data in°C
- Capacity data in Watt

NOTE

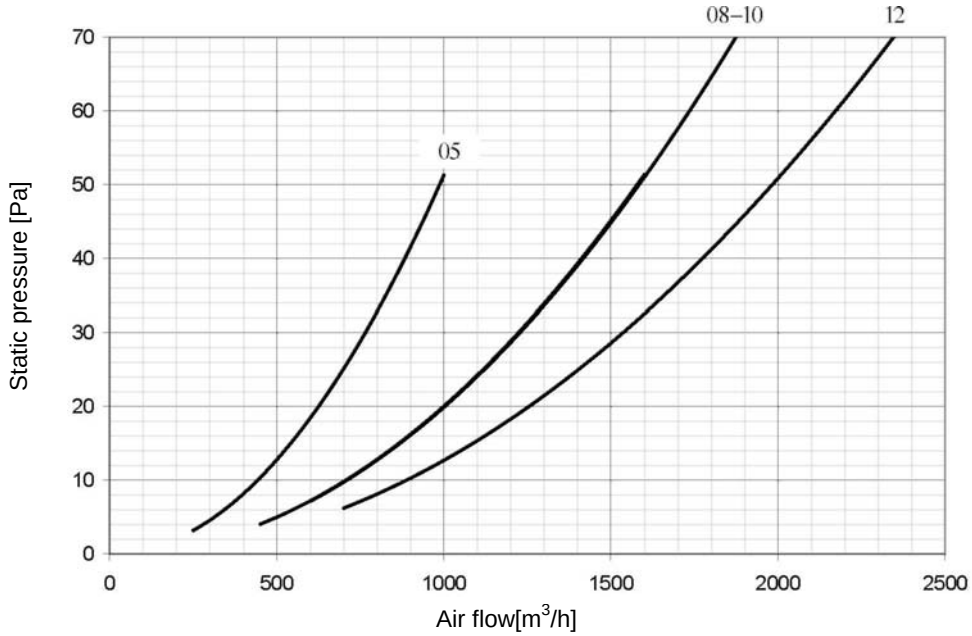
-The table is referred to the max air flow condition at 50Pa.
In case we work at same water temperature and water flow to the max condition but with different air
flow,, use the graf ..... to estimate the effect on the air
flow on the performances
-Sensible efficiency values exceeding the total efficiency value should be interpreted as an absence of dehumidification. Only the sensible efficiency values should be considered.
-Values that are not given refer to operating conditions beyond the operating limits.

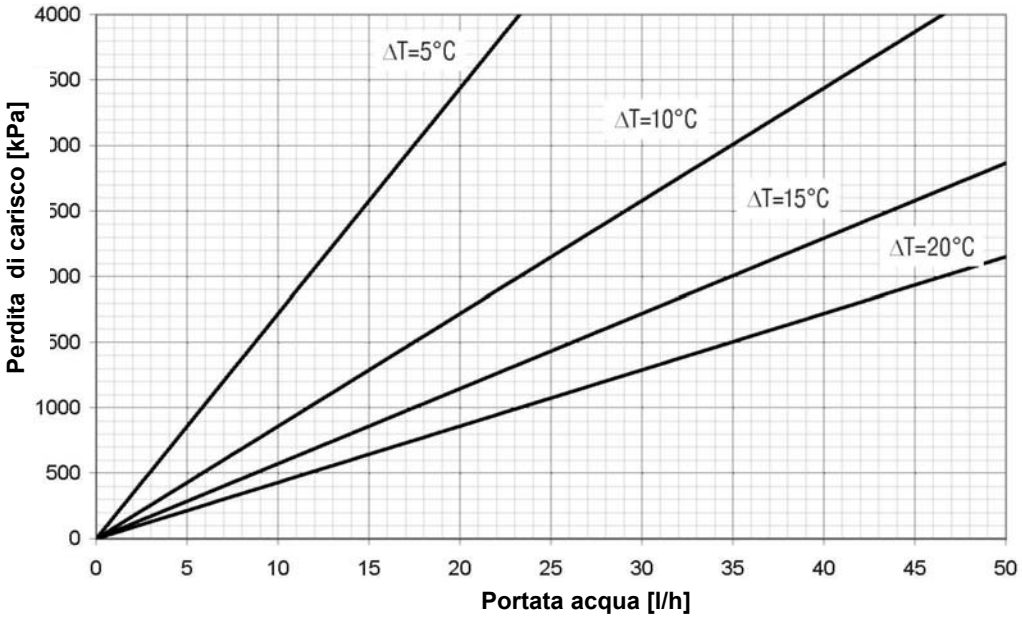
Head loss water side main battery

To calculate the loss of charge of the standard battery supplied with the VHF-3 unit, the water flow volume must first be calculated; in order to do this we shall use the following curves, which, depending on the capacity of the unit and the desired thermal difference, we obtain the water flow volume.



Entering this flow volume into the following diagrams, we obtain the loss of charge of the main battery, working with a mean water temperature of 10°C.





For a water temperature other than 10°C, the loss of charge can be calculated with the following formula:

$$\Delta P_C = \Delta P_{cnom} \times K$$

Where:

DPcnom: is the head loss calculated in the diagram

AP_C: is the head loss under conditions different from the previous ones

K: is the value obtained on the following tables.

K CORRECTION FACTOR							
Mean water temperature	5	10	15	20	50	60	70
K correction factor	1.05	1.00	0.97	0.95	0.8	0.75	0.71

Remote controls

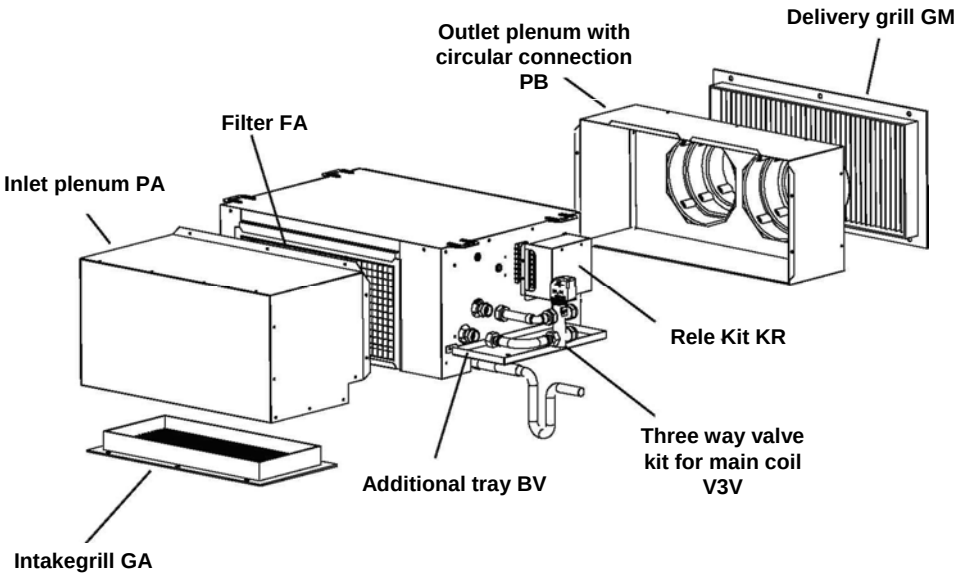
The available accessories, his name and possible combination with the different units models are describe in the annex table

Description	Model	Abbinabile a Modello							
		5	8	10	12	14	19	23	28
Base air filter	FA F1	√							
	FA F2		√	√	√	√			
	FA F4						√	√	√
G2 Air filter	FG2 F1	√							
	FG2 F2		√	√	√	√			
	FG2 F4						√	√	√
Three way valve kit for main coil	V3V	√	√	√	√				
	V3V1					√	√	√	√
Additional tray	BV	√	√	√	√	√	√	√	√
Outlet plenum with circular connection	PB F1	√							
	PB F2		√	√					
	PB F3				√	√			
	PB F4						√	√	√
Inlet plenum	PA F1	√							
	PA F2		√	√	√	√			
	PA F4						√	√	√
Delivery grill	GM F1	√							
	GM F2		√	√					
	GM F3				√	√			
	GM F4						√	√	√
Intake grill	GA F1	√							
	GA F2		√	√	√	√			
	GA F4						√	√	√
Remote control switch	CMR-F	√	√	√	√	√	√	√	√
Enabling thermostat (*)	TC-F	√	√	√	√	√	√	√	√
Basic remote controlled thermostat	TAR-F	√	√	√	√	√	√	√	√
Upgraded remote controlled thermostat	TER-F	√	√	√	√	√	√	√	√
Rele Kit (**)	KR	√	√	√	√	√	√	√	√

(*) used with the Remote control switch

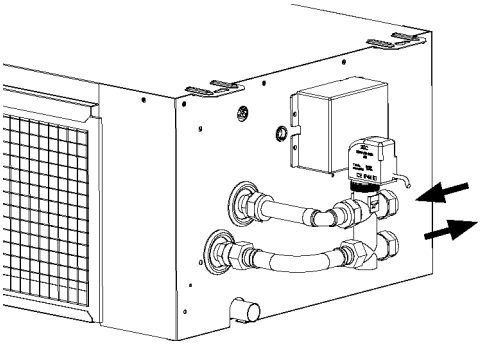
(**) used with the Basic and Upgraded thermostat

The following scheme show the range of accessories and the possible combination



Circular delivery plenum

Its purpose is to supply the main battery of the VHF-3 unit with cold or hot water, or make a by-pass.
It is composed of the body of the valve, the actuator, and a set of nuts with sealing gaskets and flexible copper sleeves. To collect the condensation produced on its surface using cold water, the condensate tray must be used.



MODEL	V3V	V3V1	UM
Supply	230-1-50		V-Ph-Hz
Opening power input	50	50	VA
Working power input	1,8	1,8	VA
Force	90	140	N
Opening time *	60	90	sec
Working temperature	2 ÷ 50		°C
Protection level	44		IP

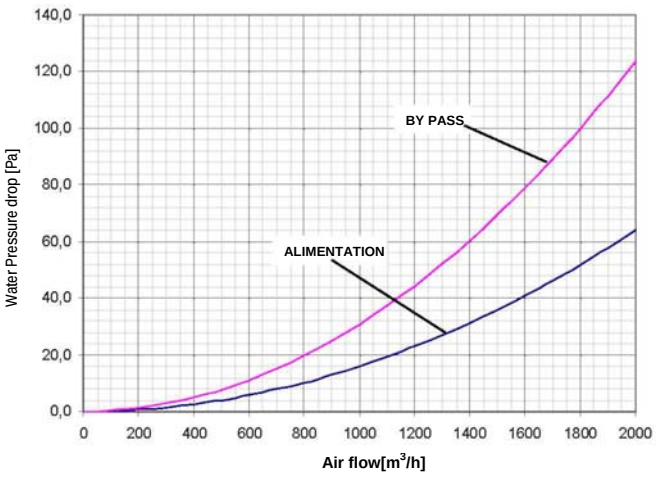
* : first opening with t amb 20°C

Valve mod. Unit	V3V	V3V1
05-08-10	√	
12-14-19-23-28		√

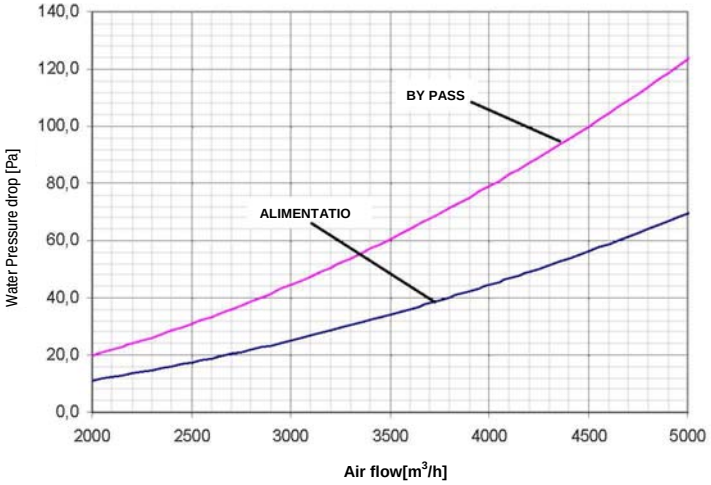
MODEL	V3V	V3V1	UM
Water connection	G 3/4 M		\
Water temperature	5 ÷ 95		°C
Maximum static pressure	1600		kPa
Flow switch			
With valve supplied			
With valve not supplied			
Actuator	2,5	2,5	mm
Kvs when supplied	2,5	6	\
kvs in by-pass mode	1,6	4	\

Water Pressure drop

Water Pressure drop valve type V3v

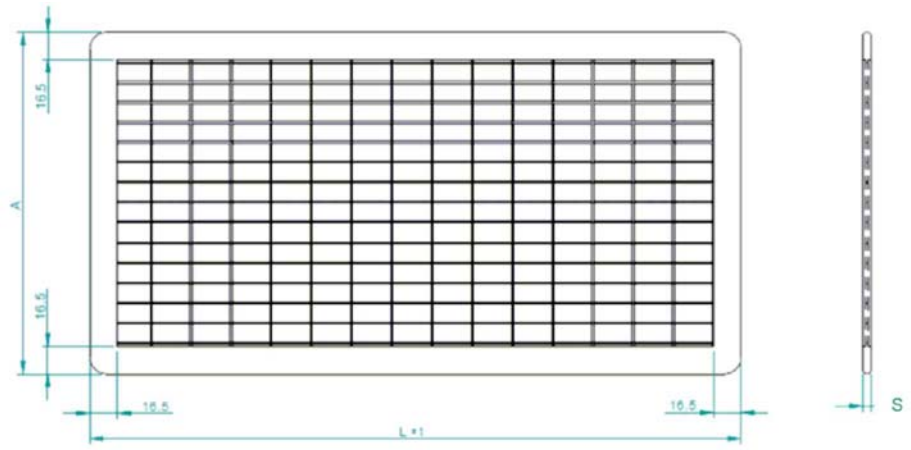


WaterPressuredrop valve type V3v1



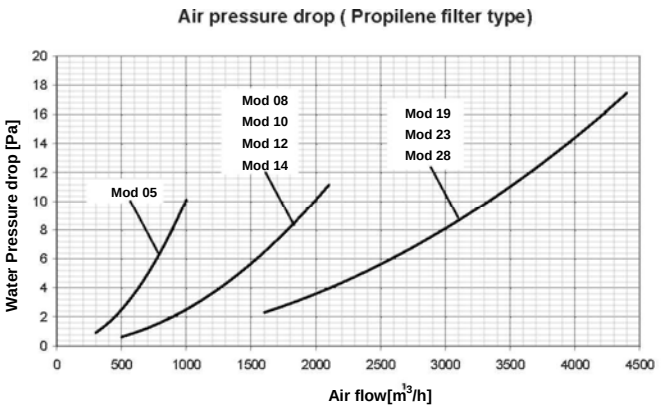
Filter

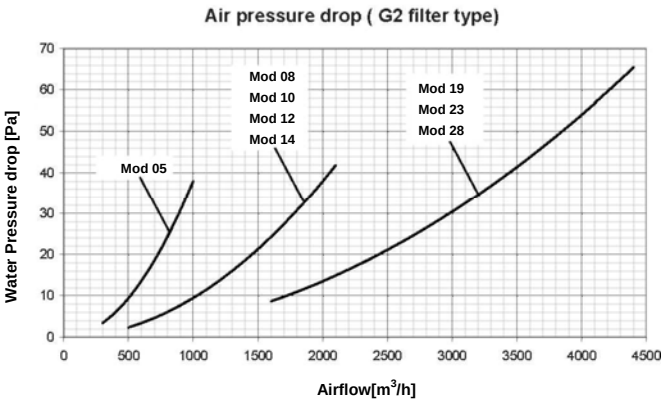
Two filter type are available . The first one is a pre-filter type in Polypropylene material. The second one has G2 class in Polyester fibre.
Below are described the two type filter features



Type	Propilene filter type	G2filtertype	UM
Series	**F0**	**F2**	
Class	\	G2	
Thikness	5	10	mm
Efficiency	48	79,5	%
Speed	1,5	1,5	m/s
Initial Pressure drop	4	15	Pa
Chassis	Galvanizedsheetsteel		
Rete	Elettrosaldatadiametro0,6mm		

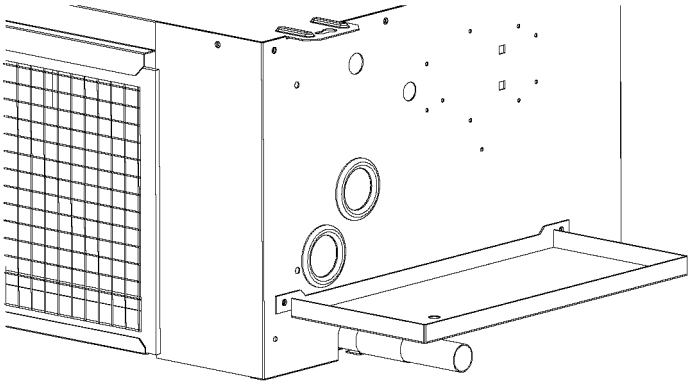
MODELS	5	8	10	12	14	19	23	28	UM
A	475	950	950	950	950	1300	1300	1300	mm
L	245	245	245	245	245	300	300	300	mm





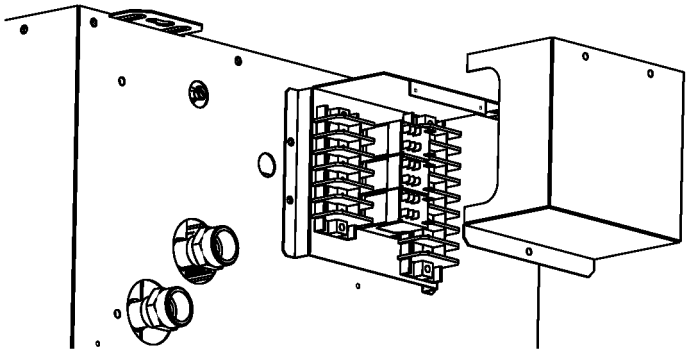
Condensate collection tray

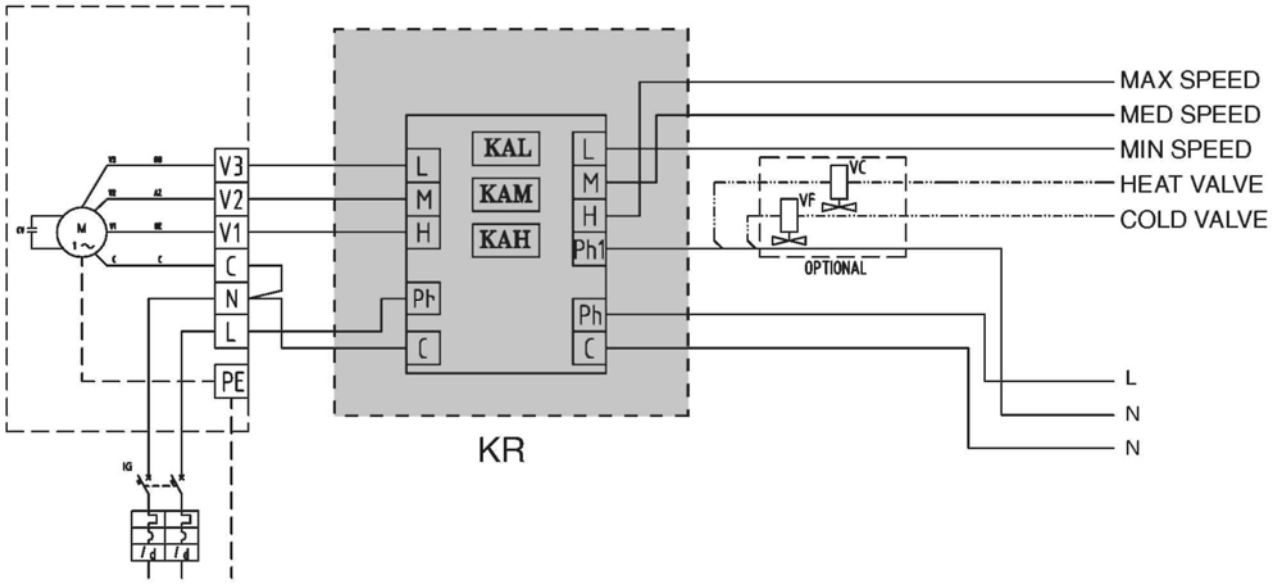
Built of galvanized sheet metal, with outer treatment of powder-coated polyester paint, its purpose is to collect the condensed water from the hydraulic connections of the VHF-3 and of the cross valve of the main battery, when the unit is in cooling mode.
During the installation process, the drop of the drain pipe must be controlled.



Kit fan relays

It lets to use the standarized Ferroli fancoil controllers (see electrical diagrams in this manual). The relays are supplied assembled on a metal plate with a cover made of metallic galvanized sheet, including the corresponding wires and electrical connections, easy to replace by the standard electrical box originally supplied with the unit.
See the electrical diagram included in this manual, in order to connect it.



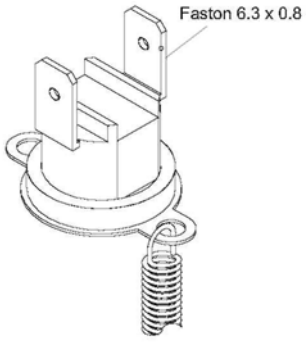


KR= Rele Kit

Accessories

Minimun temperature thermostat

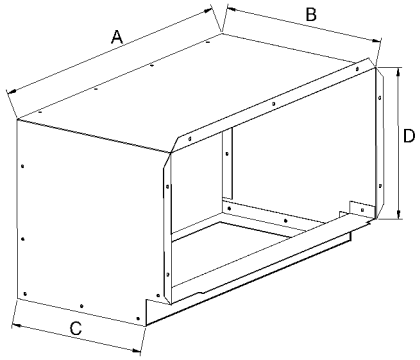
This accessory can be used with the fan switchboard controller to inhibit fan operation in heating mode if the inlet water temperature fails to reach a minimum value.
See the electrical diagram included in this manual, in order to connect it.



Intake plenum

Made of galvanized metal sheet, it's used to take directly the air, when it's not used any intake duct. It can be used with the intake grille.

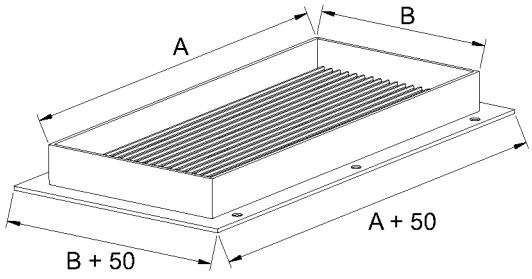
Model	A	B	C	D	Uds.
05	588	301	250	240	mm
08-10-12-14	993	301	250	240	mm
19/21/23	1280	301	250	300	mm



Intake grille

Made of anodized aluminium, includes an air filter that can be easily removed.

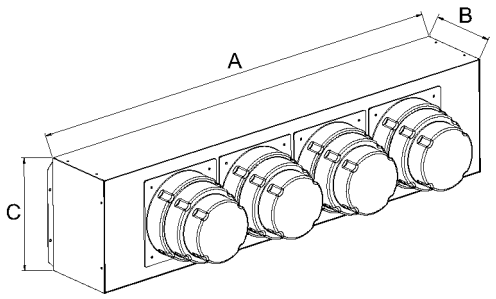
Model	A	B	Uds.
05	450	200	mm
08-10-12-14	850	200	mm
19-23-28	1135	200	mm



Circular delivery plenum

Made of galvanized plate, it's used to direct air to the room by means of tube ducts.
It has round plastic flanges, and can be easily cut in order to be used with one or another connection diameter.

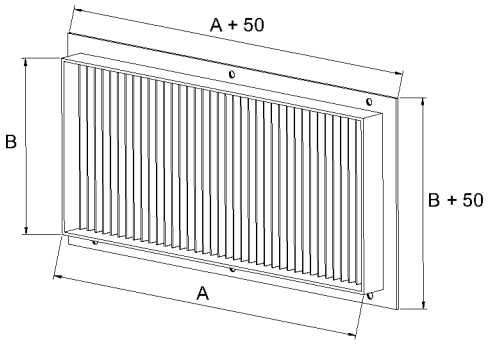
Model	A	B	Uds.
05	450	200	mm
07/11/13	850	200	mm
19/21/23	1135	200	mm
05	450	200	mm



Delivery grille

Made of anodized aluminium, it lets to direct manually the air direction both horizontally or vertically by means of the position of the louvers.

Model	A	B	Uds.
05	564	253	mm
07/11	931	245	mm
13/17	1017	275	mm
19/21/23	1215	315	mm



Hot water battery

Its purpose is to heat, using water from a boiler (four-pipe unit).
The standard battery will be used to cool (two pipes), and the supplementary battery of the water battery (the other two pipes) to heat the building.
The water battery is supplied in a plenum, which is screwed directly on the discharge nozzle of the unit.
The battery is made with expanded copper tubes and aluminium fins.
The batter is equipped with an air drain

Remote controls

Three types of wall controls are offered:

- Switch CMR-F
- Thermostat TAR-F
- Complete thermostat TER-F

Functions

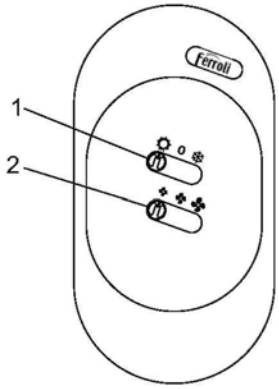
For a more rapid selection of the control model between the three types, the various functions available are listed as follows. Said functions are described in the following pages.

FUNCTIONS	SWITCH	THERMOSTAT	COMPLETE THERMOSTAT
General control of unit			
General ON-OFF	•	•	•
Temperature control			
Thermostatic temperature control		•	•
Modification set point with Economy key			•
Ventilation control			
Manual fan speed selection	•	•	•
Automatic fan speed selection			•
Season operation control VER / INV			
Manual operation selection VER / INV on the control		•	•
Automatic operation selection VER/INV on the control		•	•
Remote operation selection VER/INV			•
Management valve accessories			
Cross valve main battery		•	•
Cross valve auxiliary battery			•
Configurable functions in installation phase			
Thermostatic management fan ON / OFF / Continuous		•	•
Correction reading probe		•	•
Unit - installation configuration with 2 pipes		•	•
Unit - installation configuration with 4 pipes (*)		•	•
Resistance management	•	•	•
Definition dead zone			•
Integration with possible accessories			
Bimetal minimum temperature probe	•		•

(*) Standar unit + hot water battery

Accessories

Switch description (CMR-F)

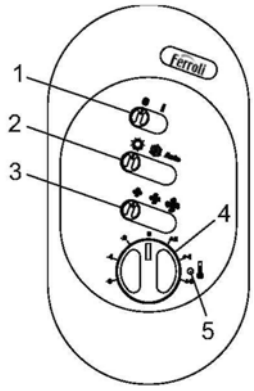


Switch (CMR-F)

1. Selector 1 in position 0 indicates control off; switching to the sun symbol, heating is activated, while switching to the snow symbol, cooling is activated.
2. Selector 2 selects the minimum, medium or maximum fan speed.

In case of using CMR-F switch with units for hot water, it is recommended to use the minimum temperature thermostat TC-F (optional).

Base Thermostat description (TAR-F)

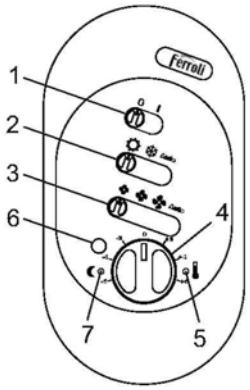


Base Thermostat (TAR-F)

1. **ON / OFF cursor**
2. **Season selector; Switching to the sun symbol, heating is activated while the snow symbol activates cooling. If auto is selected, the control selects the mode of operation automatically depending on the ambient temperature.**
3. **With selector 3, the minimum, medium, or maximum fan speed is selected.**
4. **With knob 4, the desired temperatures are defined. The temperature corresponding to position 0 is 20°C in heating and25°C in cooling.**
5. **The red LED lights up when the control is working with the thermostat.**

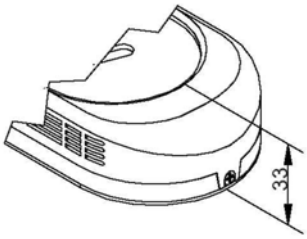
Complete Thermostat description (TER-F)

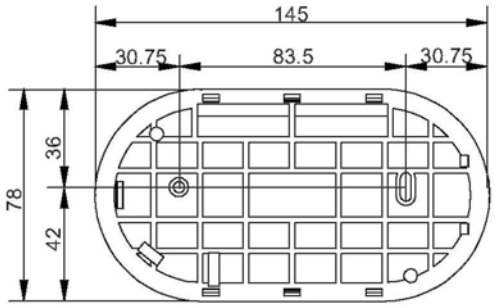
Complete Thermostat (TER-F)



1. ON / OFF cursor
2. Season selector; Switching to the sun symbol, heating is activated while the snow symbol activates cooling. If auto is selected, the control selects the mode of operation automatically depending on the ambient temperature.
3. With selector 3, the minimum, medium, or maximum fan speed is selected. In automatic, the control automatically selects the suitable speed.
4. With knob 4, the desired temperatures are defined. The temperature corresponding to position 0 is 20°C in heating and25°C in cooling.
5. The red LED lights up when the control is working with the thermostat.
6. The Economy key allows the winter and summer set points to be varied. Pressing the key, the green LED lights up (7) and the ventilation changes to the minimum speed. Simultaneously, the temperature of position 0 is modified to 17°C in heating and 28°C in cooling.

Main dimensions of control panel





Information and technical specifications of control

ELECTRICAL CHARACTERISTICS	
Power supply voltage	230V ± 10%
Power supply frequency	50 Hz
Maximum capacity absorbed	-
Degree of protection	Lower than IP 40
Ambient operating temperature	0 4 50°C
Non-condensing ambient humidity	10 4 90%
Storage temperature	-20 4 85°C
Non-condensing storage humidity	10 4 90%
Maximum current cross valve outlet terminals	0.5A
Maximum current fan outlet terminals	1A
PROBES	
Air probe NTC 10k -25°C - precision err < 1°C between +5°C and 50°C	Mounted on air intake - Length 600mm
Air probe NTC 10k -25°C - precision err < 1°C between +5°C and 50°C	Mounted in contact with the water battery - Length 1800mm

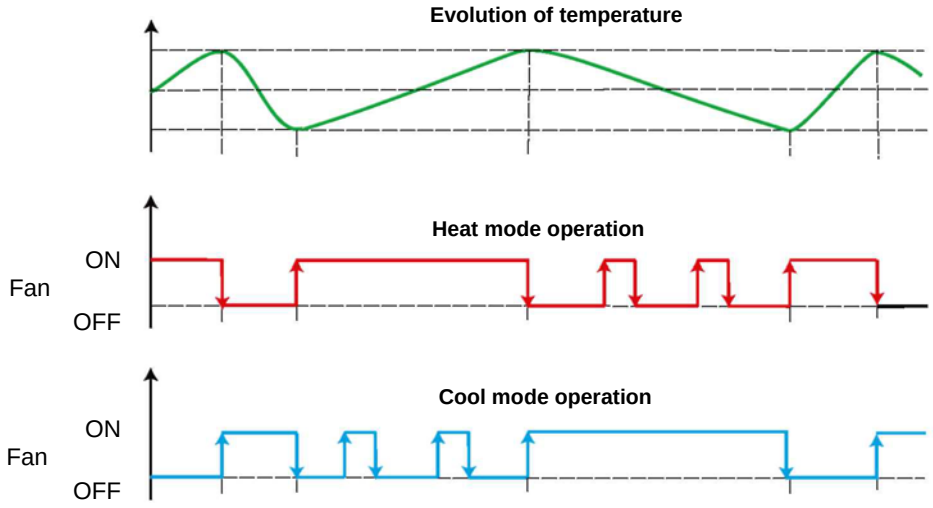
Installation options

In the installation the base and complete controls can be configured according to the option:
Configuration of type of machine: This operation, with some dip switches, allows the selection of the control application type.

TYPE OF APPLICATION	BASE THERMOSTAT	COMPLET THERMOSTAT
4 Pipe machine		•
2 Pipe machine	•	•
Thermostat regulation on the valve	•	•
Thermostat regulation on the fan	•	•
Dead zone 1 (2°C)	•	•
Dead zone 2(5°C)	•	•
Remote activation summer/winter function		•

Thermostatic regulation of the fan

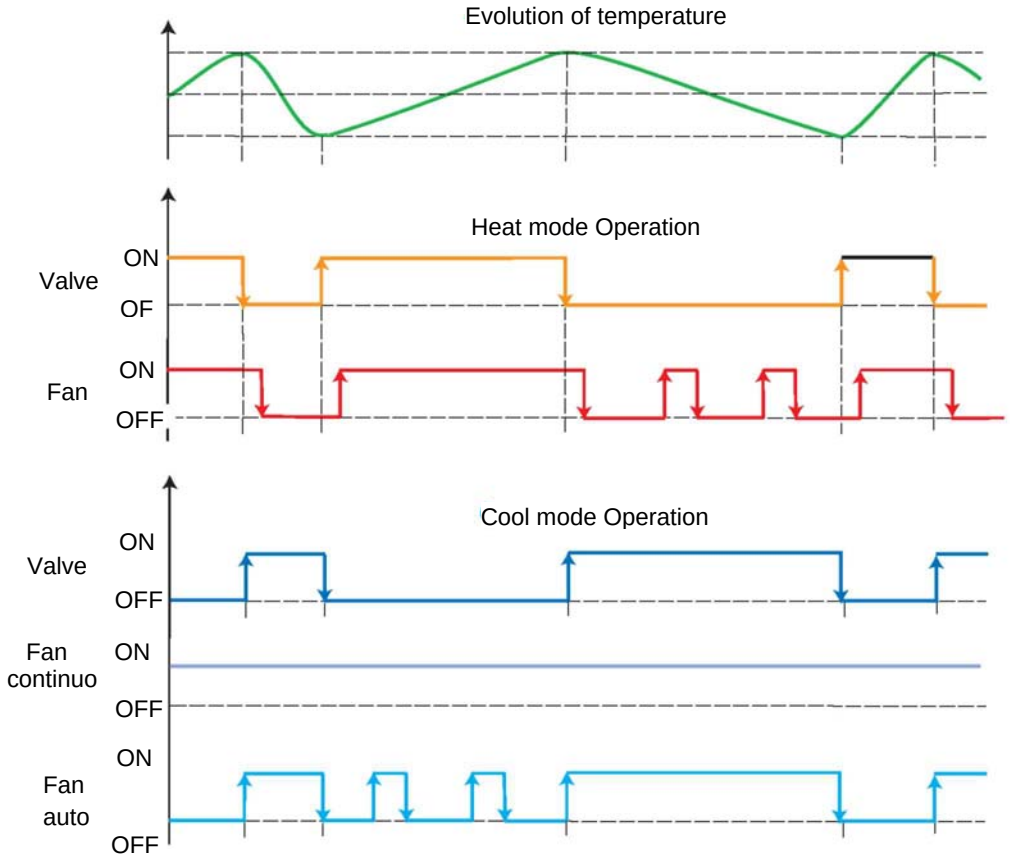
In this case, the cross valve is not used (the hot or cold water passes freely in the battery), and the regulation of the thermostat is carried out by turning the fan on or off. This regulation is associated with both the heating and the cooling mode. To prevent errors in the readings of the ambient probe, the PERIODIC VENTILATION function was provided, activated both in cool and in heat.



Thermostatic regulation of the cross valve

In this case, the management of the fans differs depending on operation in heating or cooling, as explained below:

- **Cooling**: Thermostatic regulation opens / closes the valve according to demand, while the fan is always active, even when the thermostatic regulation has reached the temperature(min, med, or max position) or starts and stops according to demand (auto position) and periodic ventilation.
- **Heating**: The thermostatic regulation opens/closes the valve while the fan is controlling the HOT START and PERIODIC VENTILATION functions with the corresponding delay times.

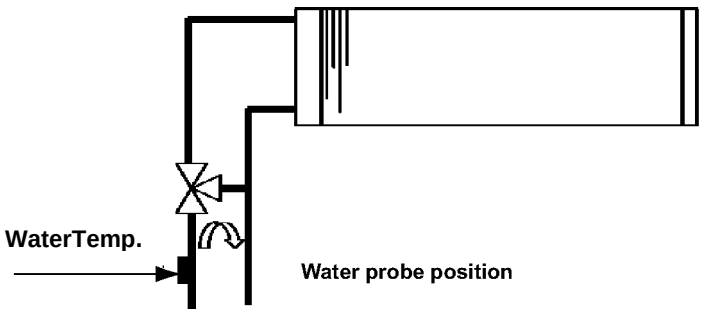


Heating/ cooling with thermostatic regulation in the cross valve

The management of the cross valve carries out an ON / OFF control with indicator of valve closure on reaching the set point, depending on the hysteresis cycles of the heating / cooling diagrams. The valves to be used are of the normally closed type, with electrothermic actuators with opening/closing times of approximately three minutes.

The fan is controlled by timer as explained in the paragraph VENTILATION CONTROL, to constantly capture the ambient temperature.

Position of the water probe.



Hysteresis of thermostat regulation modes

For the unit controls, the hysteresis is 1°C, while for wall controls, it is 0.6°C.



Ventilation control

In the base and complete thermostat, the management of the ventilation depends on the mode of operation selected (cool, heat):

- **Fan speed**

  If the fan is activated, its speed can be:
  - » Defined manually by the user
  - » Defined automatically, if the fan switch is in auto position (only advanced thermostat).
- **Thermostatic regulation of the ventilation**

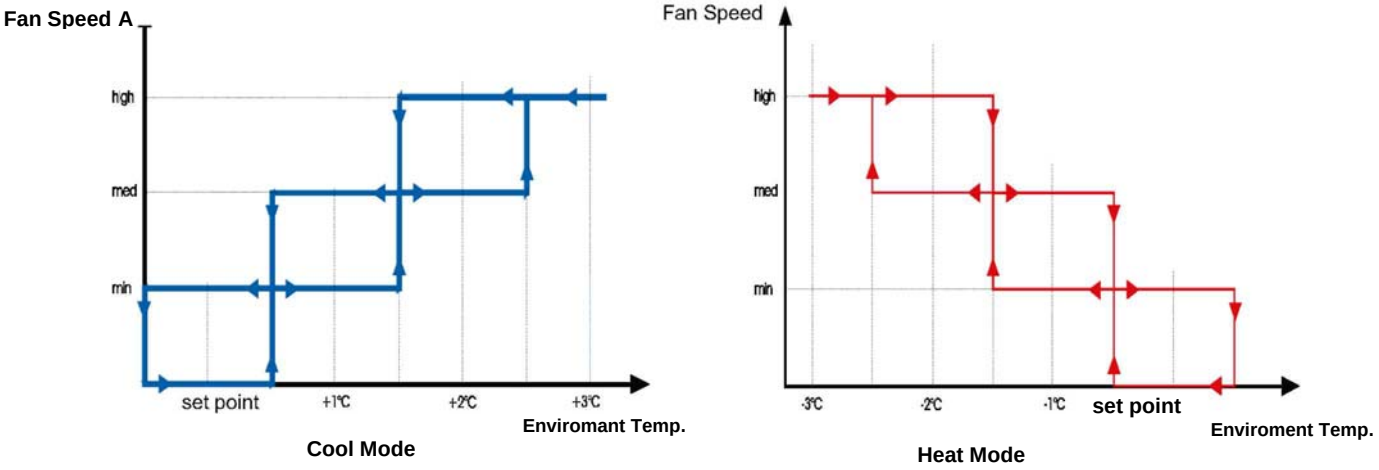
  EI n this case the fan will activate and de-activate as described on page 20
- **Thermostatic regulation in the valve**

  EIn the case that thermostatic regulation is configured in the valve, the fan is automatically programmed with modes of continuous operation in cooling (fans always turned on), while in heating (as the probe at the entrance of the valve cannot control the intake of cold air) timing of the fan is provided:
  - » Fan ON after 180 seconds gives the order to close the valve.
  - » Fan OFF after 180 seconds gives the order to close the valve. The hot start function is always active (in heating) for water temperatures lower than 39°C.
- **Automatic ventilation**

  Fan speed is regulated on the basis of the variation of the ambient temperature and the temperature programmed by the set point. Said variation depends on the hysteresis programmed in the regulator which is:
  - » 0.6°C for the wall controls
  - » 1°C for the unit controls

In the following figure, the variation values of the controller on the machine are explained. . To fit the diagrams to the wall model, the variation values must be substituted in the following manner:

- Cooling mode: the values +1, +2, +3 change to +0.6, +1.2, +1.8
- Heating mode: the values -1, -2, -3 change to -0.6, -1.2, -1.8



Note: The set point stated on the axis of abscissas of the diagrams refers to the value programmed in the potentiometer by the user.

Enviroment Temp.

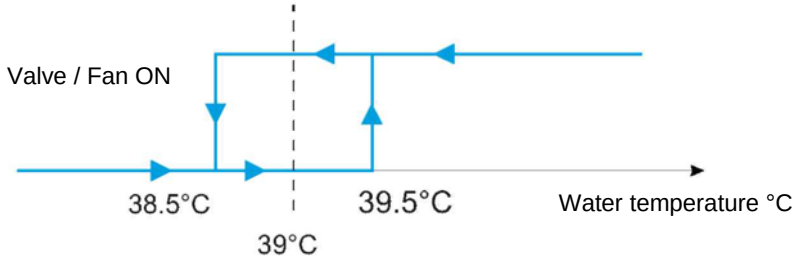
Periodic ventilation

In the case in which the control is imbedded in the machine, when the fan is turned off due to having reaching thermostatic regulation, ON / OFF cycles of the fan shall be carried out, to allow the air probe to capture the actual ambient temperature. Said function is activated both in the heating and cooling mode.

HOT START function

This consists of the pre-heating of the battery prior to starting the fan. This function is only active in heating mode and can be done in two ways:

- Ventilation time delay: for controls with thermostatic regulation in the cross valve there is a fixed delay timing of 180 seconds between the activation of the heat regulator and the activation of the ventilation, to allow the valve to open completely. After 180 seconds the fan will start up when the water probe reaches a temperature greater than or equal to 39.5°C. This function does not exist in the controls with thermostatic regulation in the fan.
- Ventilation start-up: The fan starts up when the water temperature is greater than 39.5°C; this function exists in both the controls as thermostatic regulation in the valve and in the fan.

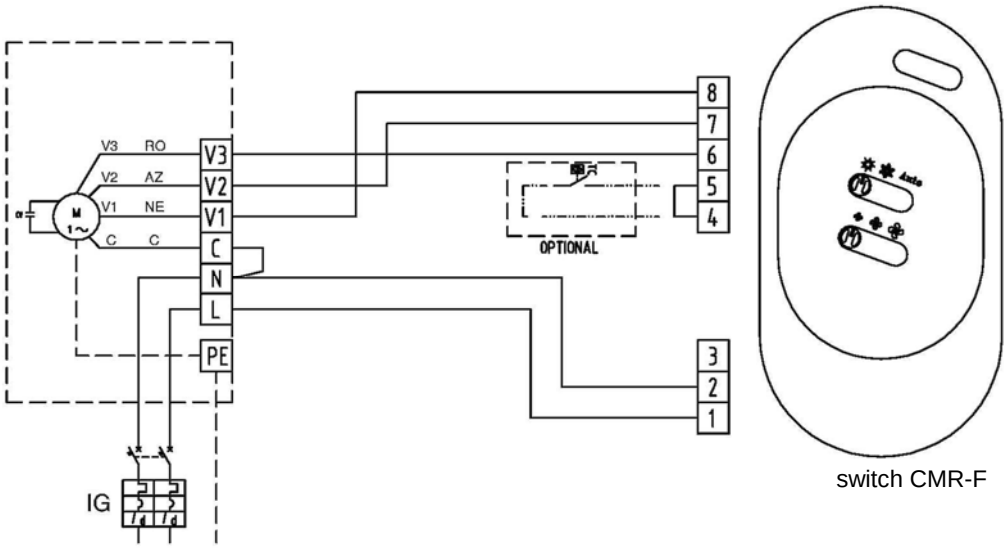


Hysteresis diagram of the thermostatic regulation (valve or fan, depending on the type of controller).

Post-ventilation

After disconnection by thermostat of the electric elements, ventilation continues in operation for 90 seconds, in order to cool the elements.

SWITCH CMR-F
VHF-3

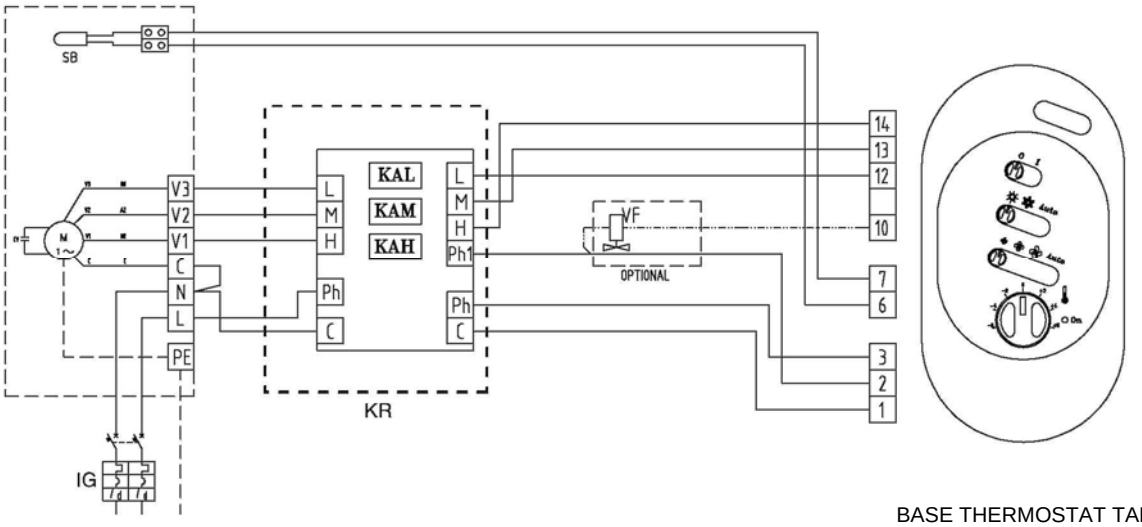


switch CMR-F

TC: Minimum temperature thermostat
IG: Circuit braker (to be put in by installar)

Observation: relays kit is neccessary

BASE THERMOSTAT TAR-F
VHF-3

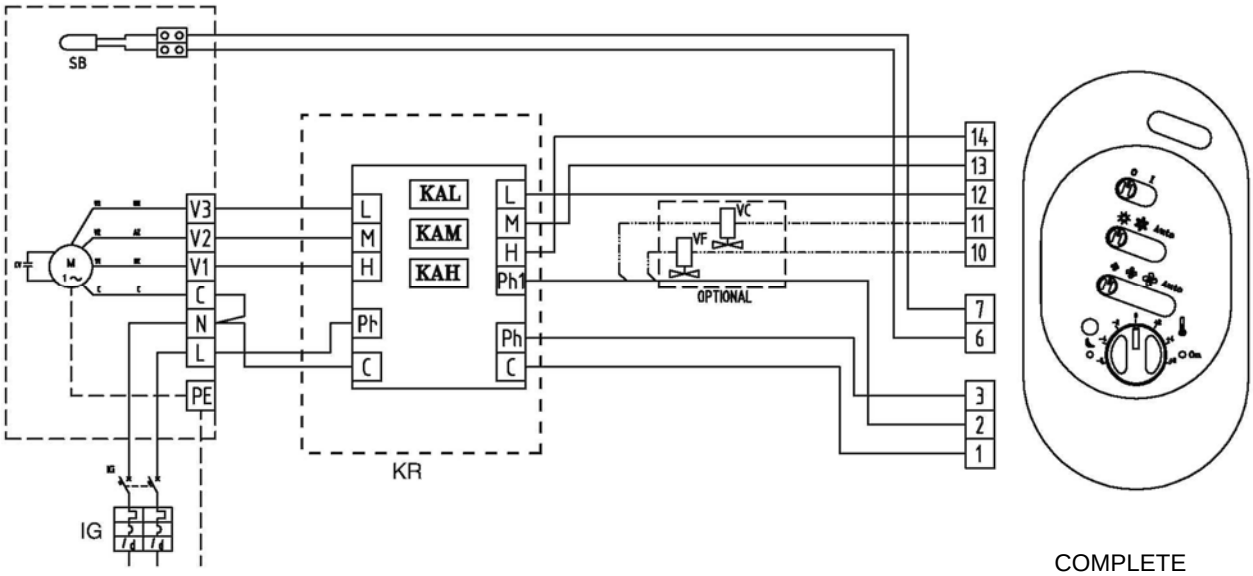


BASE THERMOSTAT TAR-F

SB: Inlet water battery probe
VF: Cold water battery valve
IG: Circuit braker (to be put in by installar)
KR: Rele Kit

Observation: relays kit is neccessary

COMPLETE THERMOSTAT TER-F
VHF-3



COMPLETE
THERMOSTAT TER-F

SB: Inlet water battery probe
VF: Cold water battery valve
VC: Hot water battery valve
IG: Circuit braker (to be put in by installar)
KR: Rele Kit

Observation: relays kit is neccessary

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