Active Chilled Beam

OptimAir NF

Functions

The OptimAir active chilled beam is a two-way induction type air-conditioningunit that is designed for integrated installation, mounted directly in suspended ceilings. Excellently suitable for ventilation, cooling and heating. The primary air from the air handling unit is injected into the plenum box and through the specially shaped nozzles, discharged into the room along the ceiling. Causing induction of the room air to flow through the cooling and/or heating coil, which then mixed with the primary air flows back into the room through the integrated linear slot openings on the two sides of the beam. The conditioned/mixed air discharged along the ceiling provides the optimal coanda effect that is always the objective when the occupied zone requires low air velocities.

Description

The standard primary plenum air box has two separate fixed nozzle blades per direction with one nozzle size. In this case the airflow and pressure requested by the customer is set at the factory. There is a possibility to reduce the airflow by plugging the nozzles.
OptimAir is designed to fit most types of suspended ceiling framework on the market.
The coil is equipped with cooling function, or cooling and heating function. The visible front and side panels are powder coated (RAL 9010 as standard).
Air duct connection: from Ø4 inches to Ø6 inches, depending on the air volume.

Main features

- NF - Normal Flow (Normal Air Flow)
- Ventilation, cooling and/or heating
- Air flow of 75 CFM
- High cooling capacity
- Slim installation size
- Adjustable row of nozzles (optional)
- Fold-down front panel allowing easy access
- Mounted in suspended ceiling

Selection

Size, inches	24	48	72	96	120
Nozzle pressure, PSI	0.40 / 0.20	0.40 / 0.20	0.40 / 0.20	0.40 / 0.20	0.40 / 0.20
Air flow, CFM	21	32	42	53	64
Cooling capacity, water Δt=18° F	1225 / 1064	2225 / 1935	3098 / 2695	4074 / 3545	5050 / 4395
Cooling capacity, air Δt=18°F	410	615	820	1025	1230
Total cooling capacity, BTUH	1635 / 1474	2839 / 2549	3917 / 3514	5098 / 4569	6278 / 5622

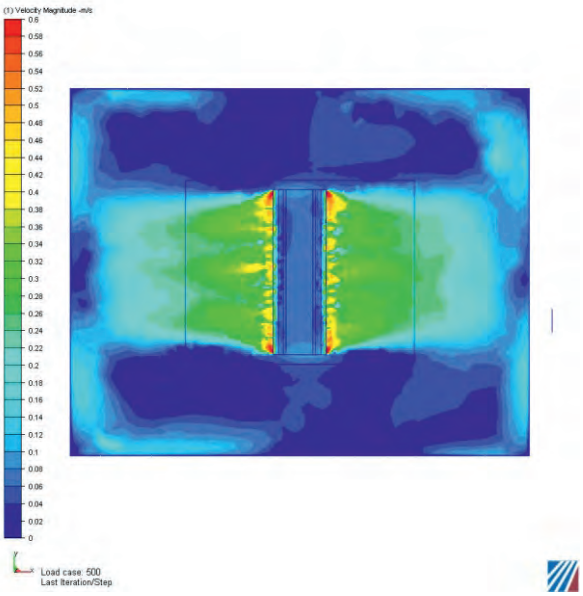
Materials

The duct and plenum air box are made of galvanized steel. The visible front plate and side panels are powder coated aluminium and sheetsteel painted in standard white RAL 9003 color (or in any other RAL colour requested by the customer). The coil fins are made of aluminium and the pipes are made of copper. The AirFlex© air deflectors are made of polyamide plastic.

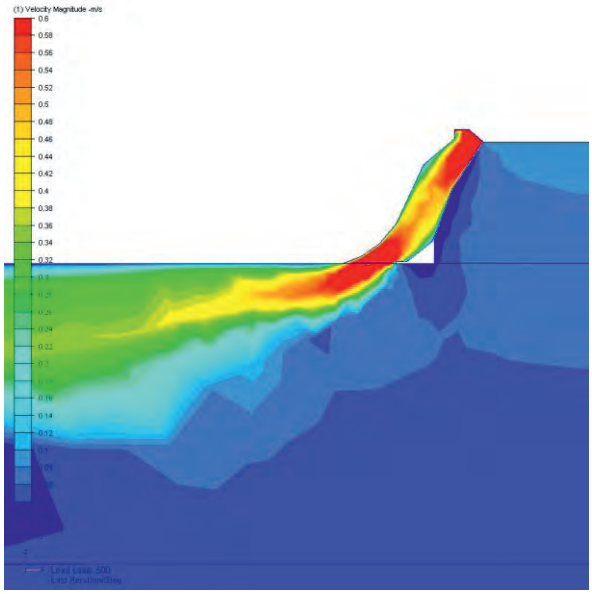
Fields of application

- Offices
- Classrooms
- Hospitals
- Department stores
- Airports
- Hotels
- Conference rooms
- Restaurants etc.

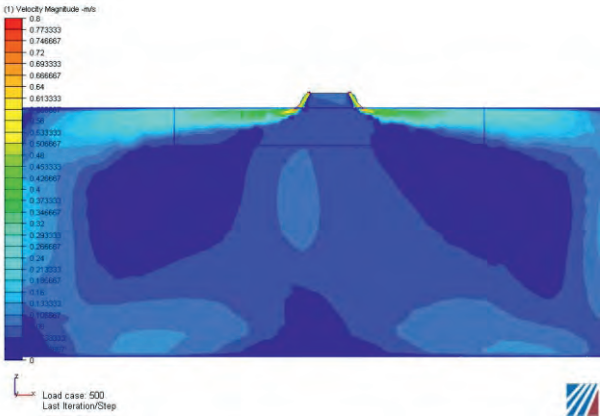
OptimAir CFD modeling



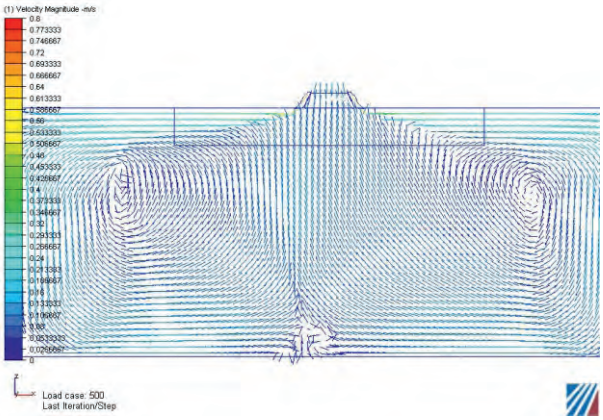
Top View



Air Distribution Pattern – Detail



Section View



Vector Model

Adjustable AirFlex® air deflectors (optional)

OptimAir can also be selected with AirFlex® which are manually and individually adjustable air deflectors. These flexible fins, allows the user to easily adjust the direction and the throw of the supply air.
With the fine adjustment of the deflectors, it is possible to provide a pleasant and draft-free indoor climate (see Figures 3.1 and 3.2).

Figure 3.1

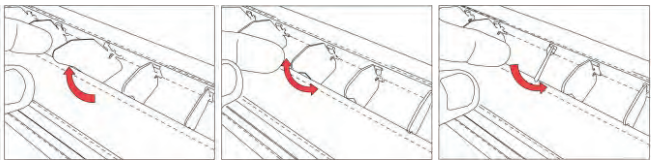


Figure 3.2

Adjustable nozzles (optional)

If required the OptimAir chilled beam can be supplied with adjustable nozzles as well. This function allows the user to easily adjust and set the required air-flow or to fulfill any future demands or adjustments of the room climate.
The nozzles are positioned on both sides of the beam and can be set independently from one another. With the use of a long key wrench (size 3/16'') the air-flow can be adjusted in three steps, by covering and uncovering the nozzle blades (see fig.3.3)
When selected together with the optional AirFlex® air deflectors it is possible to achieve a very pleasant indoor climate with high flexibility.
When the adjustable nozzle option is selected, the air flow in the respective selection chart will not be valid. Please contact the nearest sales office for more information!

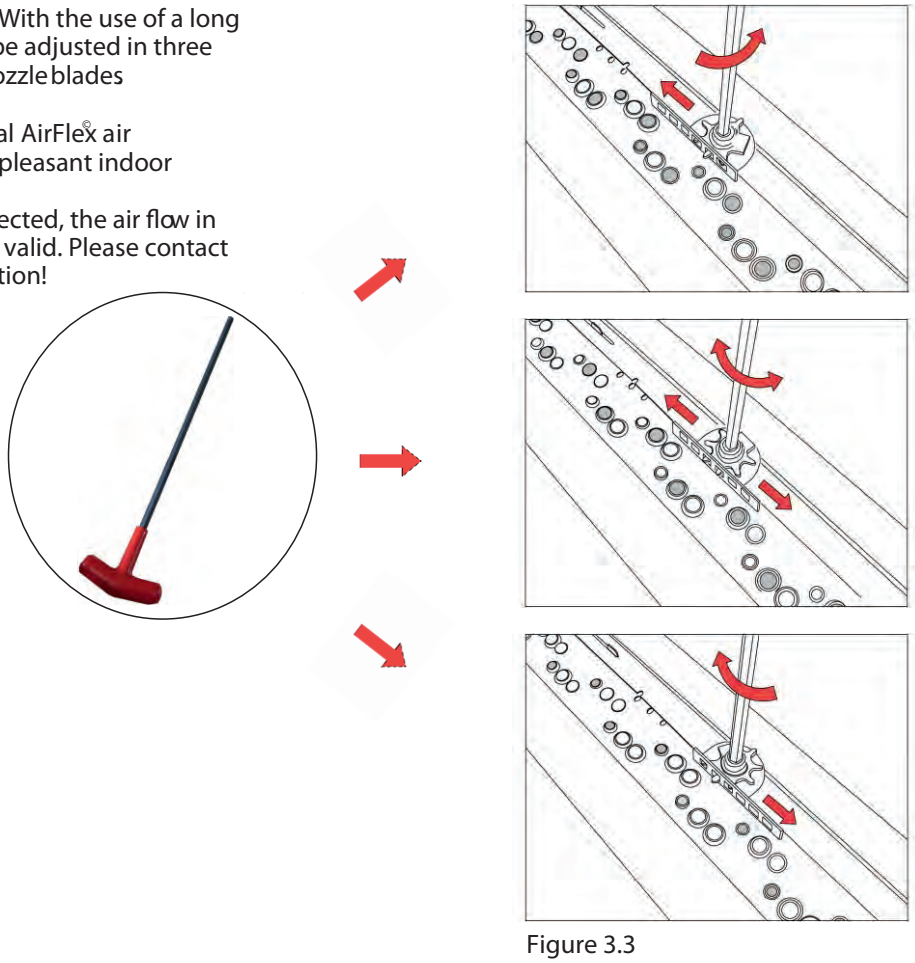


Figure 3.3

Suspension

The length and width of OptimAir is designed to fit in most T-grid ceiling framework. The units are delivered with four factory mounted suspension elements (one in every corner), which can be adjusted separately in four directions.
Step 1. The mounting elements needs to be fastened with a standard bolt.
Step 2. Then fix the required height by adjusting the threaded bolt vertically.
(see figures 4.1 and 4.2)

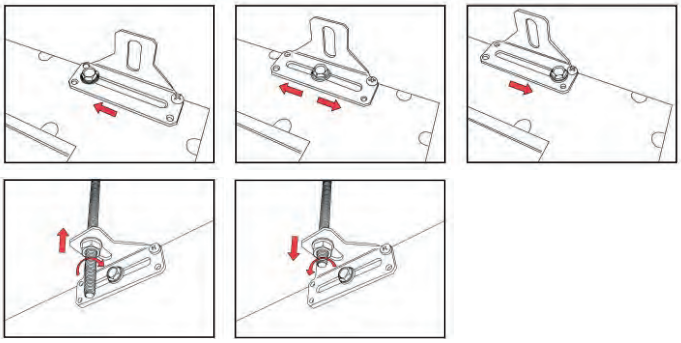


Figure 4.2

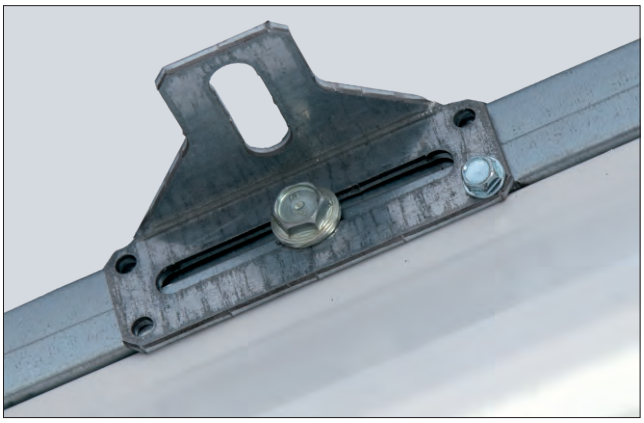


Figure 4.1

Maintenance

The perforated front panel of the active chilled beam can be folded down allowing easy access f or maintenance (see figures 4.3 and 4.4). The air chambers and the heat exchanger have to be cleaned by carefully using a vacuum so that the fins and the copper tubes do not get damaged. The front panels and parts that are out of reach for the vacuum have to be wiped off with a soft cloth. If required, mild preferably neutral cleaning detergent should be used. The electrical parts have to be maintained in accordance with the relevant prescriptions.
The points of connection/shock protection and the functional ability of the components must be check
Maintenance has to be carried out at least twice a year.

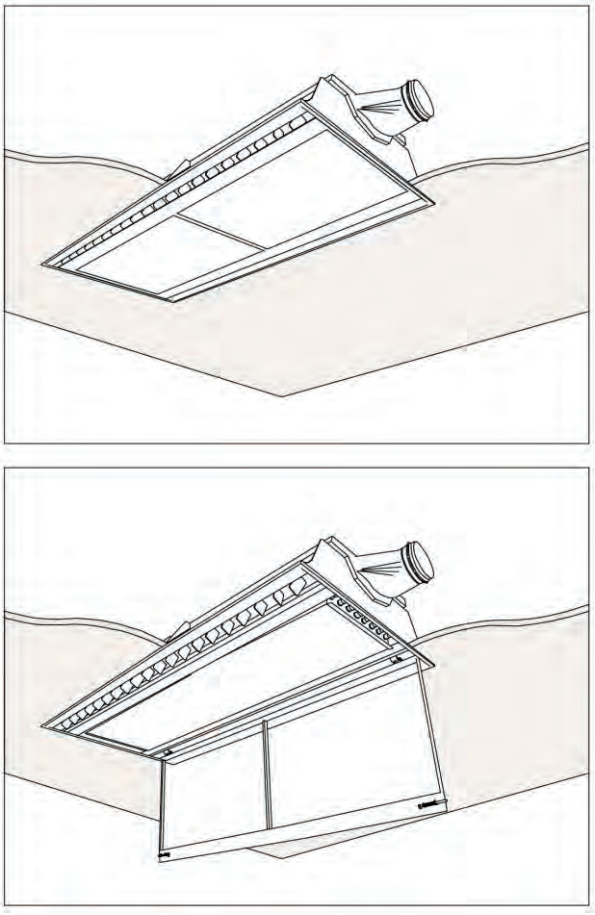


Figure 4.3

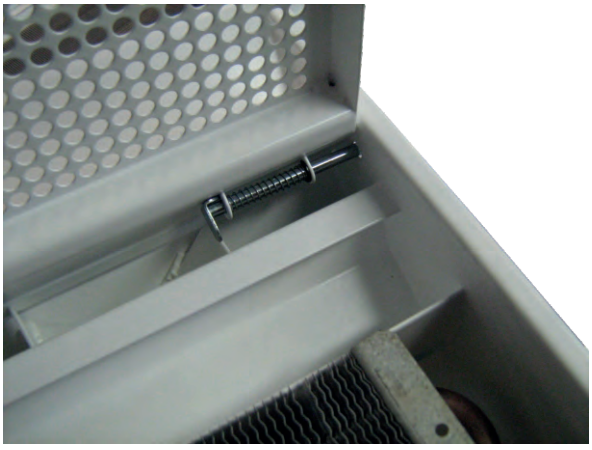
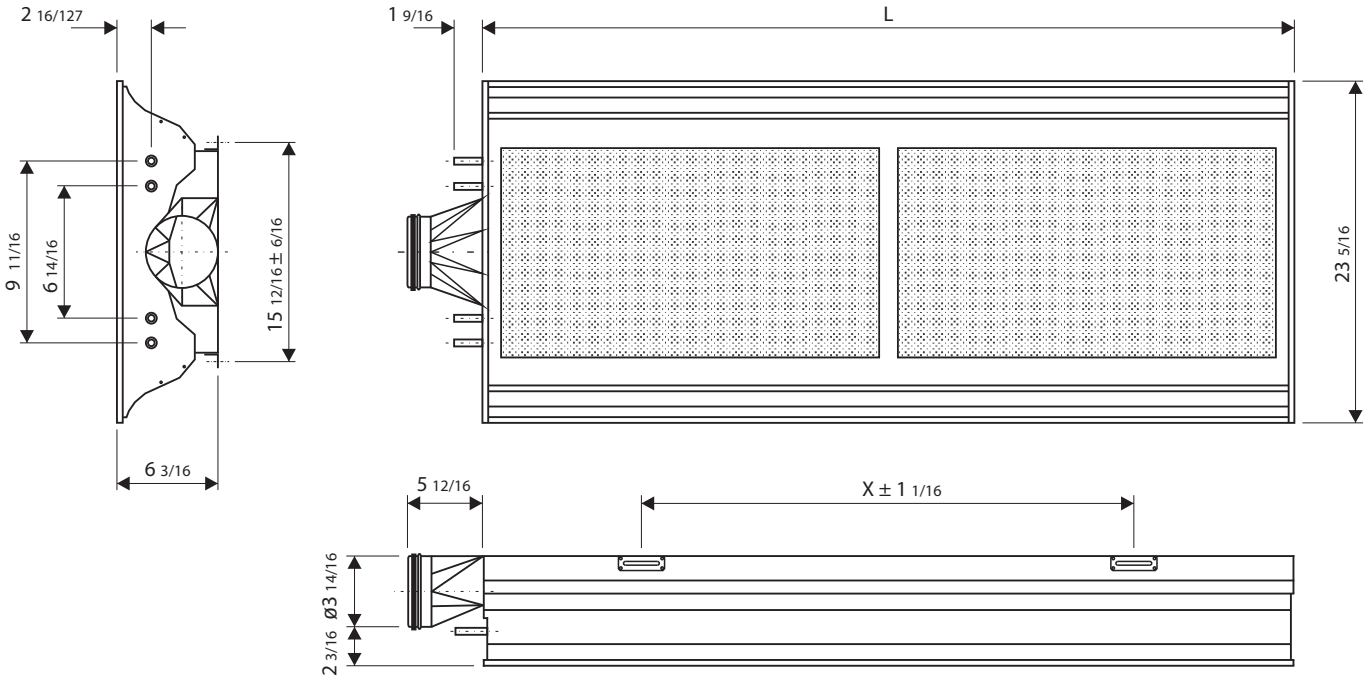


Figure 4.4

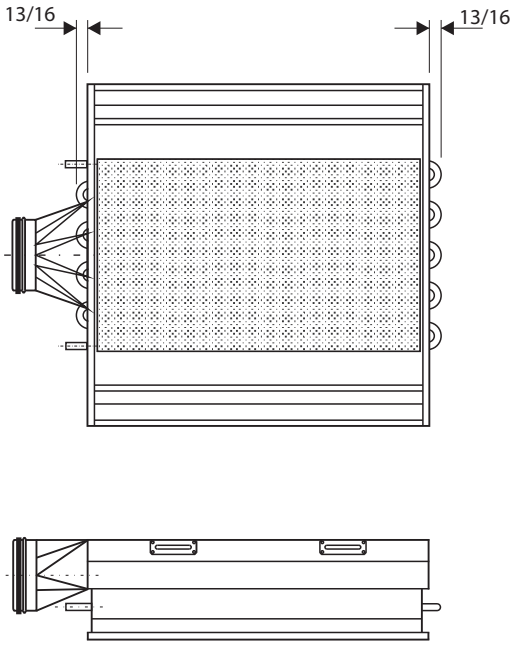


Size OptimAir NF

Length	L	X	Weight (lb)	Water quantity (gal)
24	23 5/16	19	26.5	0.422
48	46 15/16	30	53	0.077
72	70 9/16	44	75	0.111
96	94 3/16	59	99.2	0.153
120	118	71	123.5	0.187

Table 1
Pipe sizes

Number of water circuits	24	48	72	96	120
1	Ø12	Ø12	Ø12	Ø12	Ø12
2	-	-	Ø15	Ø15	Ø15



The copper elbow sections shown on the coil only apply to sizes 24" and 48", having one cooling circuit. In all other versions, the elbow sections can be found within the painted frame (see the drawing).

Primary air, CFM	Length	Cooling capacity of water 0.4 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F	Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F
21	24	679	816	952	1,089	1,225	228	273	319	364	410
	48	1,049	1,258	1,468	1,678	1,887	228	273	319	364	410
	72	1,302	1,561	1,821	2,081	2,341	228	273	319	364	410
32	24	802	962	1,123	1,283	1,444	341	410	478	546	614
	48	1,235	1,483	1,731	1,978	2,226	341	410	478	546	614
	72	1,533	1,839	2,145	2,451	2,757	341	410	478	546	614
	96	1,842	2,211	2,580	2,949	3,318	341	410	478	546	614
42	24	901	1,081	1,262	1,442	1,622	455	546	637	728	819
	48	1,384	1,661	1,938	2,215	2,492	455	546	637	728	819
	72	1,723	2,066	2,410	2,754	3,098	455	546	637	728	819
	96	2,070	2,484	2,897	3,310	3,724	455	546	637	728	819
	120	2,382	2,858	3,334	3,810	4,286	455	546	637	728	819
53	48	1,520	1,824	2,127	2,430	2,734	569	683	796	910	1024
	72	1,883	2,259	2,636	3,012	3,389	569	683	796	910	1024
	96	2,263	2,716	3,170	3,623	4,076	569	683	796	910	1024
	120	2,608	3,129	3,651	4,172	4,694	569	683	796	910	1024
64	48	1,634	1,961	2,288	2,615	2,943	683	819	956	1092	1229
	72	2,025	2,431	2,837	3,243	3,648	683	819	956	1092	1229
	96	2,439	2,927	3,414	3,901	4,388	683	819	956	1092	1229
	120	2,806	3,367	3,929	4,490	5,051	683	819	956	1092	1229
74	72	2,159	2,590	3,021	3,452	3,883	796	956	1115	1274	1433
	96	2,595	3,113	3,632	4,150	4,668	796	956	1115	1274	1433
	120	2,987	3,584	4,182	4,779	5,376	796	956	1115	1274	1433

Cooling capacity: at a water flow of 1.05 GPM
If the sizes 24''and 48'' are equipped with cooling and heating, the cooling capacity will diminish by 10%.

Primary air, CFM	Length	Cooling capacity of water 0.3 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F	Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F
21	24	638	765	892	1,019	1,146	228	273	319	364	410
	48	980	1,176	1,372	1,568	1,765	228	273	319	364	410
	72	1,217	1,460	1,702	1,945	2,188	228	273	319	364	410
32	24	752	901	1,051	1,201	1,351	341	410	478	546	614
	48	1,157	1,388	1,619	1,851	2,082	341	410	478	546	614
	72	1,432	1,719	2,005	2,291	2,578	341	410	478	546	614
	96	1,722	2,067	2,412	2,757	3,102	341	410	478	546	614
42	24	841	1,010	1,179	1,347	1,516	455	546	637	728	819
	48	1,295	1,554	1,813	2,072	2,331	455	546	637	728	819
	72	1,608	1,931	2,253	2,575	2,898	455	546	637	728	819
	96	1,934	2,321	2,708	3,094	3,481	455	546	637	728	819
	120	2,225	2,671	3,116	3,562	4,007	455	546	637	728	819
53	48	1,419	1,703	1,988	2,272	2,556	569	683	796	910	1,024
	72	1,760	2,112	2,464	2,815	3,167	569	683	796	910	1,024
	96	2,117	2,540	2,963	3,385	3,808	569	683	796	910	1,024
	120	2,439	2,927	3,414	3,901	4,388	569	683	796	910	1,024
64	48	1,529	1,834	2,140	2,445	2,750	683	819	956	1,092	1,229
	72	1,896	2,275	2,655	3,034	3,413	683	819	956	1,092	1,229
	96	2,278	2,734	3,191	3,647	4,103	683	819	956	1,092	1,229
	120	2,623	3,149	3,674	4,199	4,724	683	819	956	1,092	1,229
74	72	2,017	2,421	2,824	3,228	3,632	683	819	956	1,092	1,229
	96	2,424	2,909	3,394	3,880	4,365	796	956	1,115	1,274	1,433
	120	2,793	3,352	3,910	4,469	5,027	796	956	1,115	1,274	1,433

Cooling capacity: at a water flow of 1.05 gpm
If the sizes 24''and 48'' are equipped with cooling and heating, the cooling capacity will diminish by 10%.

Primary air, CFM	Length	Cooling capacity of water 0.2 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F	Δt 10 °F	Δt 12 °F	Δt 14 °F	Δt 16 °F	Δt 18 °F
21	24	591	709	828	947	1,066	228	273	319	364	410
	48	914	1,096	1,278	1,460	1,642	228	273	319	364	410
	72	1,132	1,358	1,585	1,811	2,038	228	273	319	364	410
32	24	699	838	977	1,116	1,255	341	410	478	546	614
	48	1,075	1,290	1,505	1,720	1,935	341	410	478	546	614
	72	1,333	1,600	1,866	2,133	2,399	341	410	478	546	614
	96	1,605	1,925	2,246	2,566	2,887	341	410	478	546	614
42	24	783	940	1,096	1,253	1,410	455	546	637	728	819
	48	1,205	1,445	1,686	1,927	2,168	455	546	637	728	819
	72	1,498	1,797	2,097	2,397	2,696	455	546	637	728	819
	96	1,798	2,158	2,518	2,879	3,239	455	546	637	728	819
	120	2,072	2,487	2,901	3,316	3,730	455	546	637	728	819
53	48	1,322	1,586	1,850	2,115	2,379	569	683	796	910	1,024
	72	1,637	1,965	2,293	2,621	2,949	569	683	796	910	1,024
	96	1,969	2,363	2,757	3,152	3,546	569	683	796	910	1,024
	120	2,269	2,722	3,175	3,628	4,081	569	683	796	910	1,024
64	48	1,422	1,707	1,991	2,275	2,560	683	819	956	1,092	1,229
	72	1,422	1,707	1,991	2,275	2,560	683	819	956	1,092	1,229
	96	1,763	2,116	2,469	2,821	3,174	683	819	956	1,092	1,229
	120	2,120	2,545	2,970	3,394	3,819	683	819	956	1,092	1,229
74	72	1,877	2,253	2,628	3,004	3,379	796	956	1,115	1,274	1,433
	96	2,256	2,708	3,159	3,610	4,062	796	956	1,115	1,274	1,433
	120	2,598	3,117	3,637	4,156	4,676	796	956	1,115	1,274	1,433

Cooling capacity: at a water flow of 1.05gpm
If the sizes 24'' and 48'' are equipped with cooling and heating, the cooling capacity will diminish by 10%.

Example for designing

Search the cooling capacity of water at the current air flow, pressure and Δt, room temperature - average temp. of cooling water . Check the pressure drop in the water circuit (Diagram 2). Then adjust it by the turbulence intensity, *k of cooling coil in Diagram 1 and add the cooling capacity of the air.
The water flow can be calculated, given the Δt of the current cooling water, with the following formula:
Cooling capacity (BTUH) = Δt (return water - supply water temperature) x 499.8 x GPM
Example:
The unit OA 96 NF gives a cooling capacity of 3,647 BTUH, 64 CFM, 0.3'' of H2O and Δt (room temp. – average temp. of the cooling water) 16°F. Water flow at Δt 5°F: 3647/(499.8x5) = 1.46 gpm. In case of one water circuit the pressure drop is above 60'' H2O(please note that this value is too high!), and for the two water circuits, it is 12'' H2O. Therefore, it is more advisable to select the two-circuit version where the water flow is divided into two circuits and the relevant correction factor has to be determined at a water flow of 0.73 gpm from the Diagram 1.
The Diagram 1 gives a correction factor of about 0.96 and, thereby, the cooling capacity of the water is 3,647x0.96=3,501BTUH
The cooling capacity of the air at about Δ 16°F is 1,092BTUH. This gives the following total capacities:
3,501+1,092=4,593 BTUH.

Diagram 1

k * water flow correction** (at other water flow rate)

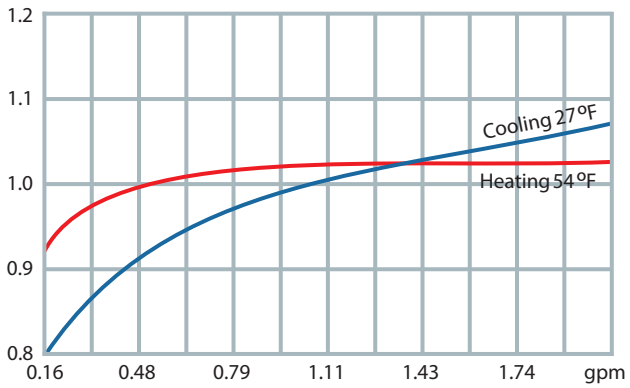
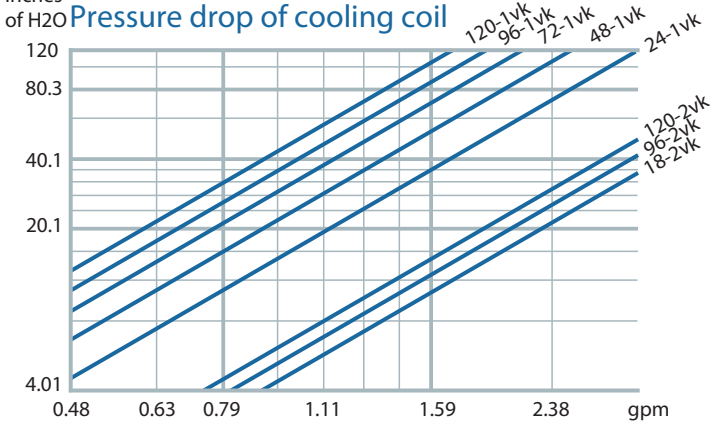


Diagram 2

inches of H2O Pressure drop of cooling coil



k * = correction factor
1 = 1 water circuit, 2 = 2 water circuits
** Applies to one water circuit; in case of two water circuits, the water amount is halved.

Primary air, CFM	Length	Cooling capacity of water 0.4 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 18 °F	Δt 27 °F	Δt 36 °F	Δt 45 °F	Δt 54 °F	Δt 4 °F	Δt 6 °F	Δt 8 °F	Δt 9 °F	Δt 10 °F
21	24	638	956	1,273	1,594	1,911	91	137	182	205	228
	48	983	1,474	1,962	2,454	2,945	91	137	182	205	228
	72	1,218	1,826	2,433	3,044	3,652	91	137	182	205	228
32	24	751	1,126	1,502	1,877	2,253	137	205	273	307	341
	48	1,157	1,737	2,314	2,894	3,471	137	205	273	307	341
	72	1,433	2,150	2,867	3,584	4,300	137	205	273	307	341
	96	1,724	2,587	3,451	4,311	5,174	137	205	273	307	341
42	24	843	1,266	1,686	2,109	2,529	182	273	364	410	455
	48	1,297	1,945	2,590	3,239	3,887	182	273	364	410	455
	72	1,611	2,416	3,222	4,027	4,986	182	273	364	410	455
	96	1,935	2,904	3,874	4,840	5,809	182	273	364	410	455
	120	2,229	3,345	4,457	5,573	6,686	182	273	364	410	455
53	48	1,423	2,133	2,843	3,556	4,266	228	341	455	512	569
	72	1,761	2,645	3,526	4,406	5,287	228	341	455	512	569
	96	2,119	3,181	4,239	5,300	6,358	228	341	455	512	569
	120	2,440	3,662	4,881	6,102	7,321	228	341	455	512	569
64	48	1,529	2,297	3,061	3,826	4,590	273	410	546	614	683
	72	1,898	2,846	3,795	4,744	5,693	273	410	546	614	683
	96	2,283	3,423	4,563	5,707	6,846	273	410	546	614	683
	120	2,628	3,942	5,253	6,567	7,881	273	410	546	614	683
74	72	2,020	3,031	4,038	5,048	6,058	319	478	637	717	796
	96	2,427	3,642	4,857	6,068	7,283	319	478	637	717	796
	120	2,795	4,195	5,590	6,990	8,386	319	478	637	717	796

Cooling capacity: at a water flow of 1.05gpm

Primary air, CFM	Length	Cooling capacity of water 0.3 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 18 °F	Δt 27 °F	Δt 36 °F	Δt 45 °F	Δt 54 °F	Δt 4 °F	Δt 6 °F	Δt 8 °F	Δt 9 °F	Δt 10 °F
21	24	597	894	1,191	1,491	1,788	91	137	182	205	228
	48	918	1,375	1,836	2,294	2,754	91	137	182	205	228
	72	1,137	1,707	2,276	2,843	3,413	91	137	182	205	228
32	24	703	1,055	1,406	1,758	2,109	137	205	273	307	341
	48	1,082	1,625	2,164	2,707	3,249	137	205	273	307	341
	72	1,341	2,010	2,679	3,352	4,021	137	205	273	307	341
	96	1,614	2,420	3,225	4,034	4,840	137	205	273	307	341
42	24	788	1,181	1,577	1,969	2,365	182	273	364	410	455
	48	1,212	1,819	2,423	3,031	3,635	182	273	364	410	455
	72	1,505	2,259	3,014	3,768	4,519	182	273	364	410	455
	96	1,809	2,717	3,621	4,526	5,430	182	273	364	410	455
	120	2,082	3,126	4,167	5,208	6,249	182	273	364	410	455
53	48	1,328	1,993	2,659	3,324	3,986	228	341	455	512	569
	72	1,648	2,471	3,294	4,116	4,942	228	341	455	512	569
	96	1,980	2,969	3,962	4,952	5,942	228	341	455	512	569
	120	2,283	3,526	4,563	5,707	6,846	228	341	455	512	569
64	48	1,430	2,147	2,860	3,577	4,290	273	410	546	614	683
	72	1,775	2,662	3,550	4,437	5,324	273	410	546	614	683
	96	2,133	3,201	4,266	5,335	6,399	273	410	546	614	683
	120	2,457	3,686	4,877	6,140	7,369	273	410	546	614	683
74	72	1,887	2,833	3,778	4,720	5,666	319	478	637	717	796
	96	2,270	3,406	4,539	5,676	6,809	319	478	637	717	796
	120	2,614	3,922	5,229	6,536	7,843	319	478	637	717	796

Cooling capacity: at a water flow of 1.05gpm

Primary air, CFM	Length	Cooling capacity of water 0.2 inches of H2O, Δt					Cooling capacity of air Δt				
		Δt 18 °F	Δt 27 °F	Δt 36 °F	Δt 45 °F	Δt 54 °F	Δt 4 °F	Δt 6 °F	Δt 8 °F	Δt 9 °F	Δt 10 °F
21	24	553	829	1,106	1,386	1,662	91	137	182	205	228
	48	853	1,280	1,707	2,133	2,560	91	137	182	205	228
	72	1,058	1,590	2,119	2,648	3,178	91	137	182	205	228
32	24	652	980	1,307	1,631	1,959	137	205	273	307	341
	48	1,007	1,509	2,014	2,515	3,021	137	205	273	307	341
	72	1,249	1,870	2,495	3,119	3,744	137	205	273	307	341
	96	1,502	2,253	3,003	3,754	4,505	137	205	273	307	341
42	24	734	1,099	1,468	1,833	2,198	182	273	364	410	455
	48	1,126	1,689	2,253	2,819	3,382	182	273	364	410	455
	72	1,403	2,102	2,805	3,505	4,205	182	273	364	410	455
	96	1,683	2,526	3,369	4,212	5,051	182	273	364	410	455
	120	1,939	2,911	3,881	4,850	5,819	182	273	364	410	455
53	48	1,236	1,857	2,474	3,092	3,710	228	341	455	512	569
	72	1,532	2,300	3,068	3,833	4,601	228	341	455	512	569
	96	1,843	2,765	3,689	4,611	5,532	228	341	455	512	569
	120	2,123	3,184	4,246	5,307	6,369	228	341	455	512	569
64	48	1,331	1,997	2,662	3,328	3,993	273	410	546	614	683
	72	1,652	2,474	3,300	4,126	4,952	273	410	546	614	683
	96	1,986	2,980	3,973	4,966	5,959	273	410	546	614	683
	120	2,287	3,430	4,573	5,713	6,857	273	410	546	614	683
74	72	1,758	2,635	3,515	4,393	5,270	319	478	637	717	796
	96	2,113	3,167	4,225	5,280	6,335	319	478	637	717	796
	120	2,430	3,648	4,864	6,079	7,294	319	478	637	717	796

Cooling capacity: at a water flow of 1.05gpm

Diagram 1

k * Correction for the different water flow

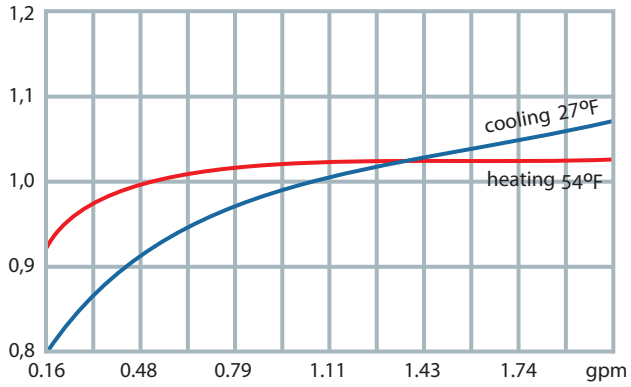
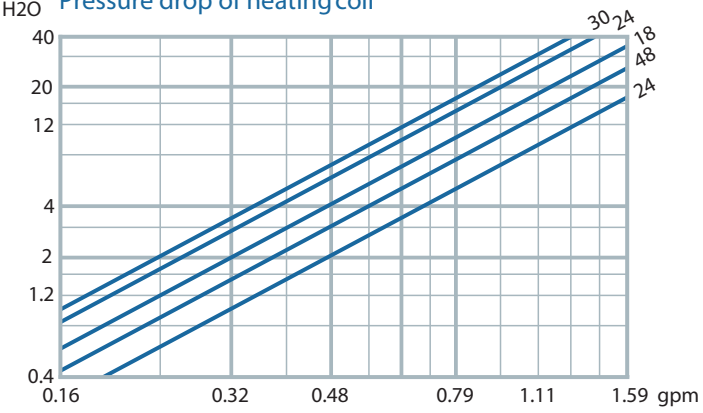


Diagram 3

Inches of H2O Pressure drop of heating coil



k * = correction factor

Technical data

Sound power level: L_w NC

Sound level: L_{PA} NC
(see diagrams 4-8)

Correction factor: K_0 dB from table 2, p.11

$L_W = L_{PA} + K_0$

Sound self-attenuation as per table 3, p.11

The lab measurements were conducted subject to the Standards ISO 9614.2 and ISO 11691:1995

The noise level, NC applies to an equivalent surface of 108 ft^2 as per the diagrams figure 4-6, which corresponds to an attenuation of 4 NC in a room with normal attenuation. The NC value of sound attenuation as per table no. 3 (p.11) is to be understood inclusive of the end reflection of the active chilled beam, from the air duct toward the room.

Room volume capacity	Room type	Correction
883 ft³	hard	+2 NC
883 ft³	attenuated	-2 NC
5297ft³	hard	-3 NC
5297ft³	normal	-5 NC
5297ft³	attenuated	-7 NC

Diagram 4
OptimAir NF 24

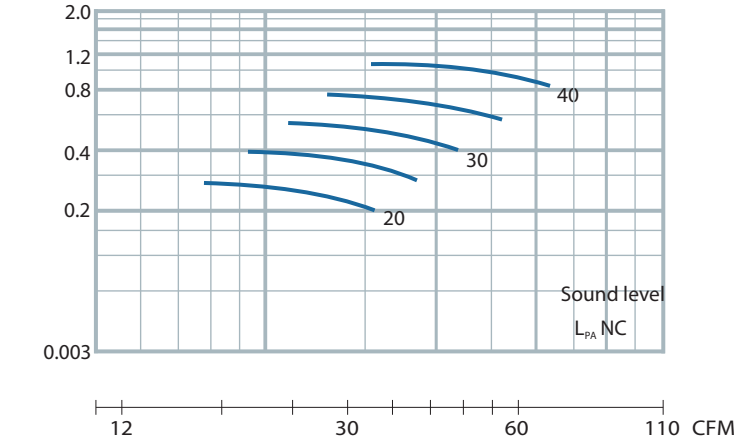


Diagram 5
OptimAir NF 48

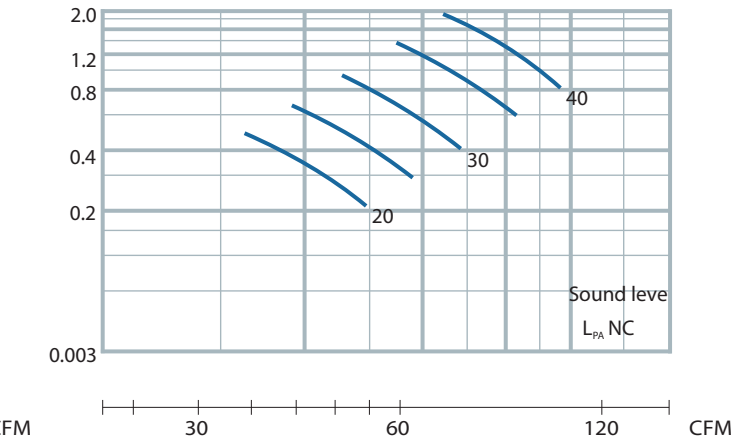


Diagram 6
OptimAir NF 72

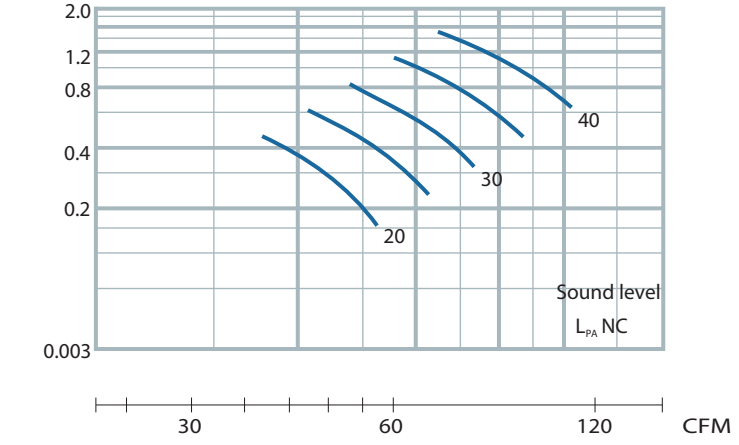


Diagram 7
OptimAir NF 96

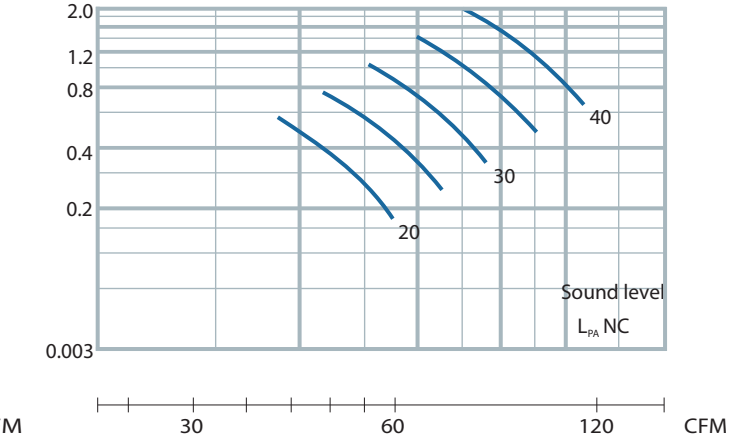


Diagram 8
OptimAir NF 120

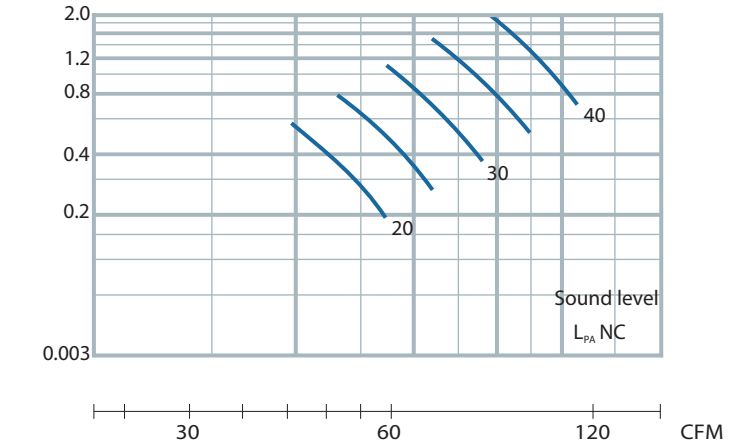


Table 2
Correction K_0 Nc for OptimAir NF

Length	Mid-frequency (Octave band) Hz							
	63	125	250	500	1000	2000	4000	8000
24	-3	-13	-4	-2	+1	-2	-17	-31
48	+2	-8	0	+2	0	-5	-11	-17
72	+4	-3	+1	+3	0	-5	-12	-20
96	+6	+2	+2	+3	0	-6	-14	-23
120	+7	+4	+2	+3	0	-7	-14	-24

Tol. ±3 NC

Table 3
Sound attenuation for OptimAir NF

Length	Mid-frequency (Octave band) Hz							
	63	125	250	500	1000	2000	4000	8000
24	22	12	8	6	10	15	18	18
48	22	12	7	5	9	15	18	18
72	20	10	8	7	11	16	18	20
96	20	9	8	8	13	17	18	19
120	20	9	8	9	15	18	18	19

Tol. ±3 NC