Active Chilled Beam

OptimAir HF

Function

The OptimAir active chilled beam is a two-way induction type air-conditioning unit 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 with a standard width of 24 inches.
The coil is equipped with cooling function, or cooling and heating function. The visible front and side panels are powder coated (RAL 9003 as standard).
Air duct connection: Ø4, Ø5 and Ø6 inches, depending on the air volume.

Main features

- HF - High Flow (High Air Flow)
- Air flow of 150 CFM
- Ventilation, cooling and/or heating
- High cooling capacity
- Low installation height
- Adjustable nozzles (optional)
- Easy accessable front
- Integration in suspended ceilings
- ControlAir regulation system (optional)

Selection

Size, inches	72	96	120
Nozzle pressure, PSI	0.40 / 0.20	0.40 / 0.20	0.40 / 0.20
Air flow, CFM	64	85	106
Cooling capacity, water Δt=18°F	3415 / 3037	4637 / 4152	5831 / 5043
Cooling capacity, air Δt=18°F	1228	1638	2047
Total cooling capacity, BTUH	4644 / 4265	6275 / 5790	7878 / 7090

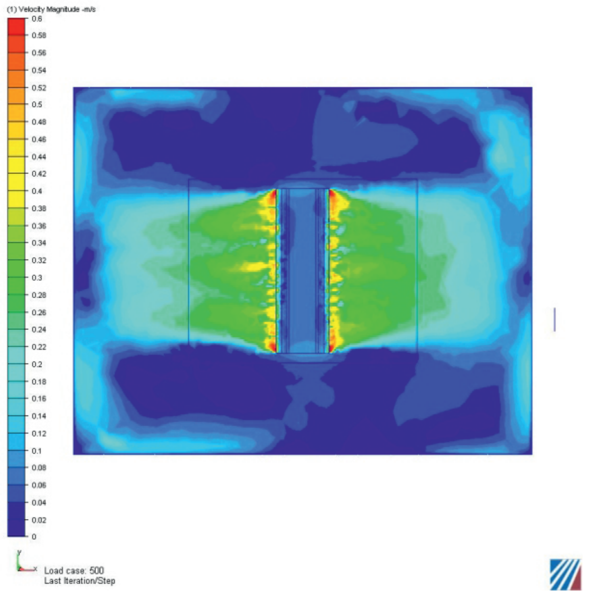
Materials

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 colour (or in any other RAL colour requested by the customer). The coil lamellas are made of aluminium and the pipes are made of copper. The AirFlex© air deflectors are made of Polyamid plastic.

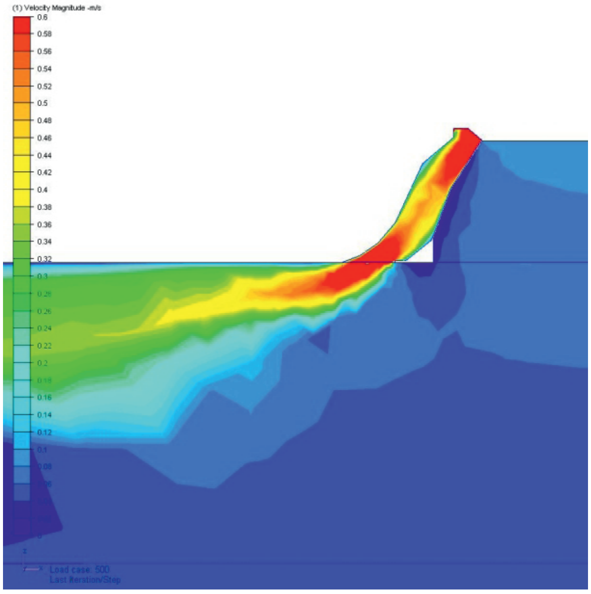
Fields of application

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

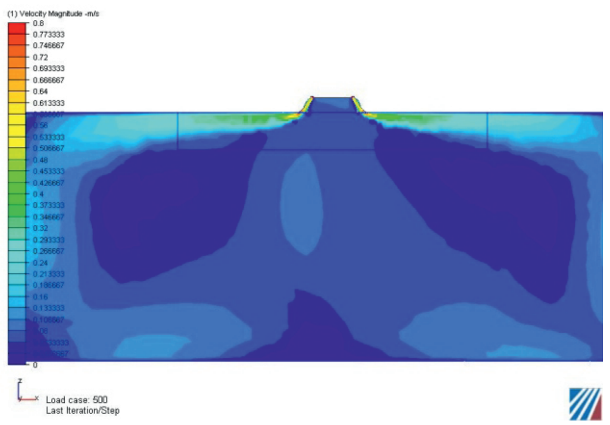
OptimAir CFD modelling



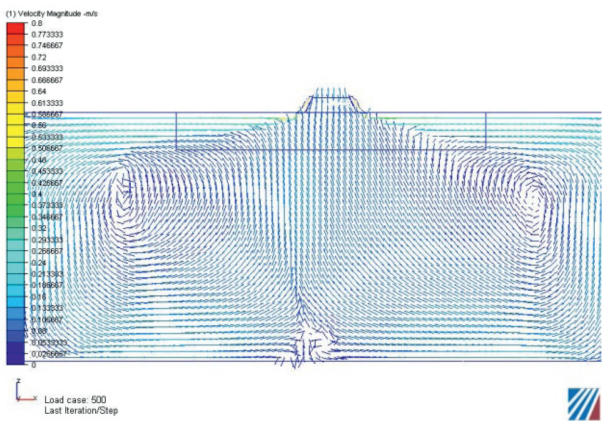
Top View



Air DistributionPattern – Detail



Section View



Vector Model

AirFlex© adjustable air deflectors (optional)

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

Figure 3.1

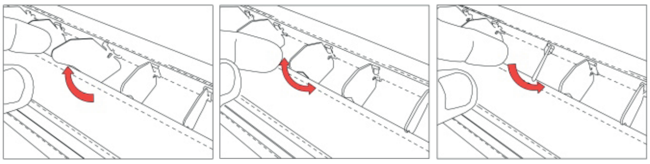


Figure 3.2

Adjustable nozzles (optional)

If required the OptimAir chilled beam can be supplied with adjustable nozzles as well. This function allows the customer 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 independent 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!

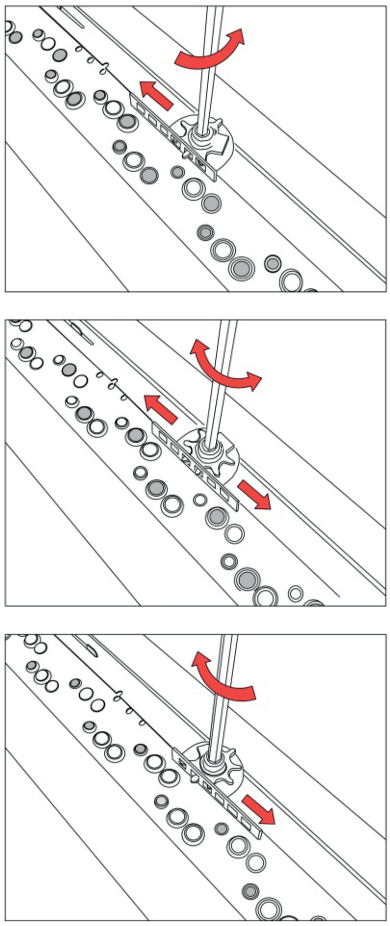


Figure 3.3

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)

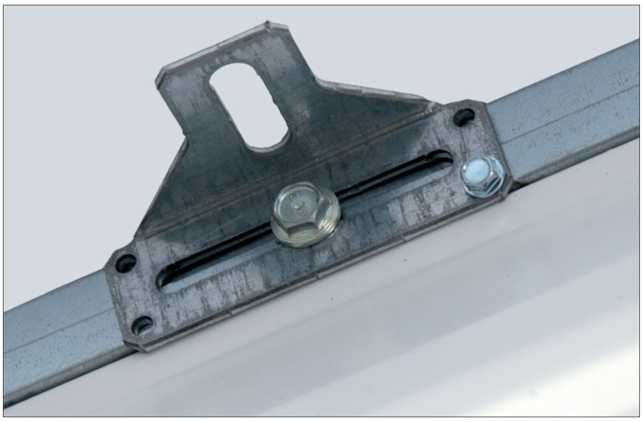


Figure 4.1

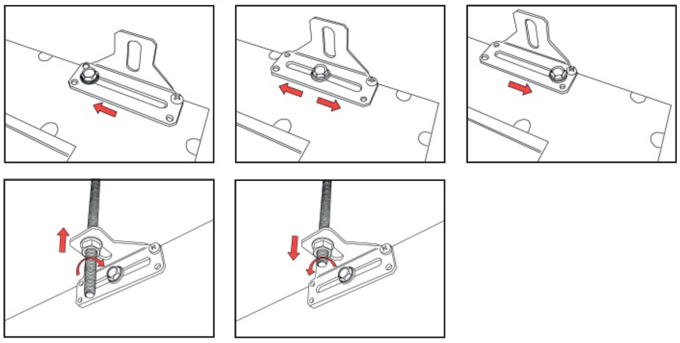


Figure 4.2

Maintenance

The perforated front panel of the active chilled beam can be folded down allowing easy access for 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 does not get damaged. The front panels and parts that are out of reach for the vacuum cleaner 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 checked.
Maintenance has to be carried out at least twice a year.

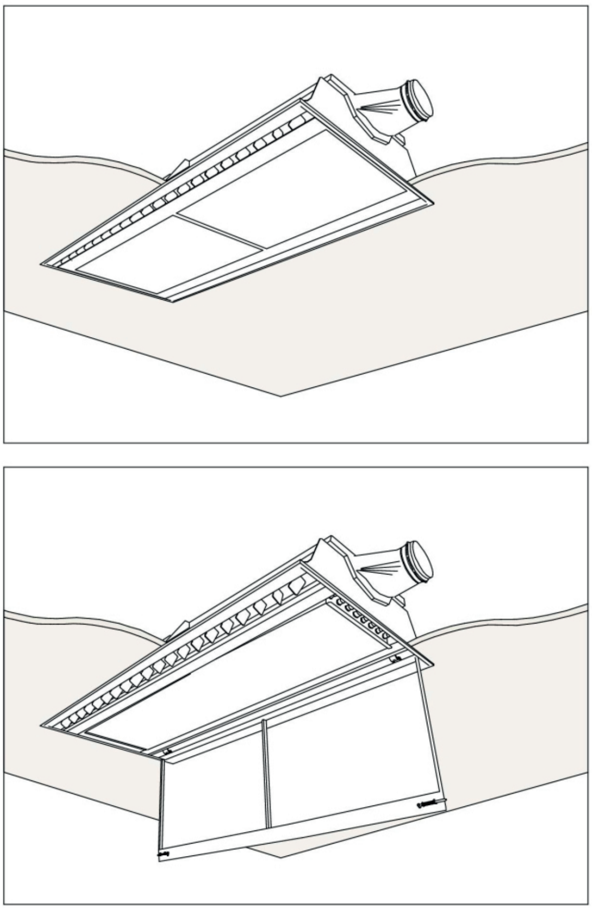


Figure 4.3

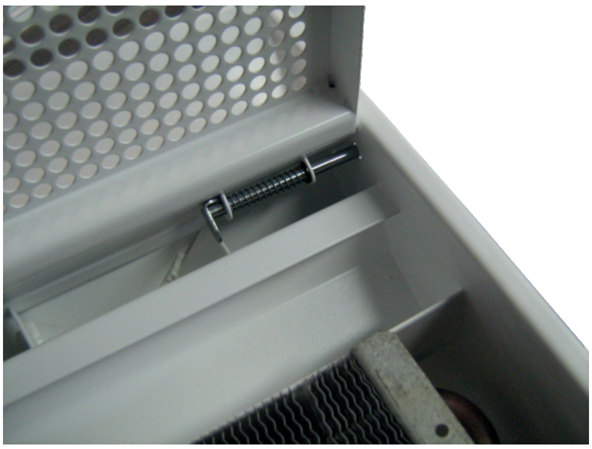
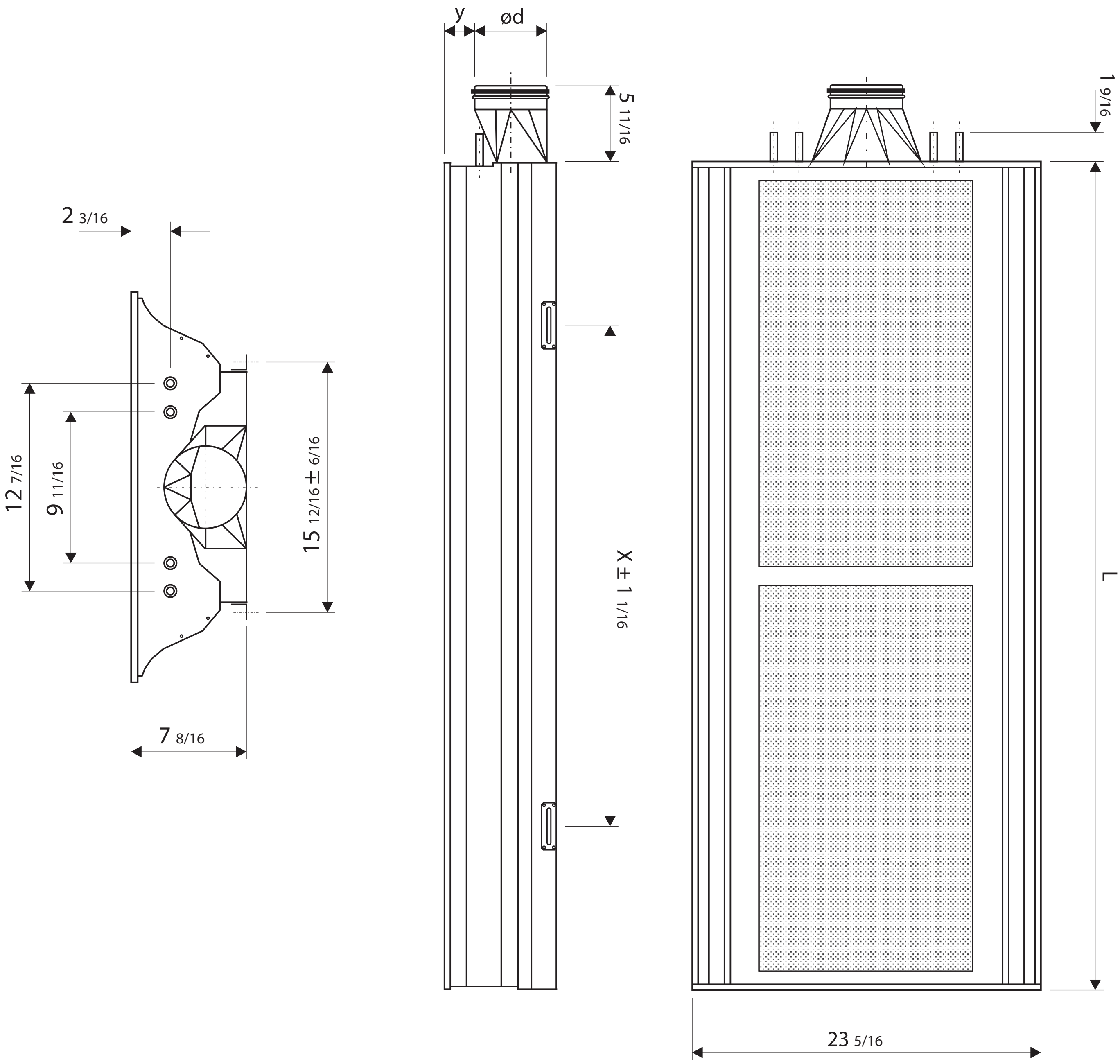


Figure 4.4



Size OptimAir HF

Length	ød	L	X	Y	Weight (lb)	Water quantity (gal)
72	4 14/16	70.5	43	2 3/16	80	0.08
96	4 14/16	94	59	2 3/16	106	0.69
120	6 4/16	118	71	13/16	130	0.87

Table 1
Pipe sizes

Number of water circuits	72	96	120
1	Ø12	Ø12	Ø12
2	Ø15	Ø15	Ø15

Primary air, CFM	Length	Cooling capacity of water 0.4 inches of water, 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
42	72	1,669	2,002	2,336	2,670	3,003	455	546	637	728	819
	96	1,842	2,211	2,580	2,949	3,318	455	546	637	728	819
	120	2,003	2,403	2,803	3,203	3,603	455	546	637	728	819
53	72	1,900	2,279	2,658	3,037	3,416	569	683	796	910	1,024
	96	2,108	2,530	2,952	3,374	3,796	569	683	796	910	1,024
	120	2,382	2,858	3,334	3,810	4,286	569	683	796	910	1,024
64	72	2,108	2,530	2,952	3,374	3,796	683	819	956	1,092	1,229
	96	2,355	2,825	3,295	3,765	4,236	683	819	956	1,092	1,229
	120	2,548	3,058	3,568	4,078	4,588	683	819	956	1,092	1,229
85	72	2,491	2,989	3,488	3,987	4,485	910	1,092	1,274	1,456	1,638
	96	2,800	3,359	3,918	4,478	5,037	910	1,092	1,274	1,456	1,638
	120	3,027	3,632	4,237	4,842	5,446	910	1,092	1,274	1,456	1,638
106	96	3,201	3,842	4,483	5,124	5,765	1,138	1,365	1,593	1,820	2,048
	120	3,454	4,145	4,837	5,528	6,219	1,138	1,365	1,593	1,820	2,048
127	120	3,853	4,622	5,392	6,162	6,932	1,365	1,638	1,911	2,184	2,457
148	120	4,222	5,065	5,909	6,753	7,597	1,593	1,911	2,230	2,548	2,867

Cooling capacity: at a water flow of 1.05 GPM

Primary air, CFM	Length	Cooling capacity of water 0.3 inches of water, 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
42	72	1,571	1,884	2,198	2,512	2,825	455	546	637	728	819
	96	1,741	2,089	2,437	2,785	3,132	455	546	637	728	819
	120	1,846	2,216	2,585	2,955	3,325	455	546	637	728	819
53	72	1,795	2,153	2,511	2,870	3,228	569	683	796	910	1,024
	96	1,994	2,393	2,793	3,192	3,591	569	683	796	910	1,024
	120	2,117	2,540	2,963	3,385	3,808	569	683	796	910	1,024
64	72	1,998	2,398	2,798	3,198	3,598	683	819	956	1,092	1,229
	96	2,229	2,674	3,120	3,565	4,011	683	819	956	1,092	1,229
	120	2,365	2,837	3,310	3,783	4,256	683	819	956	1,092	1,229
85	72	2,370	2,844	3,318	3,792	4,266	910	1,092	1,274	1,456	1,638
	96	2,655	3,186	3,716	4,247	4,778	910	1,092	1,274	1,456	1,638
	120	2,818	3,382	3,945	4,508	5,071	910	1,092	1,274	1,456	1,638
106	96	3,041	3,649	4,258	4,867	5,475	1,138	1,365	1,593	1,820	2,048
	120	3,227	3,871	4,516	5,161	5,806	1,138	1,365	1,593	1,820	2,048
127	120	3,606	4,327	5,049	5,771	6,492	1,365	1,638	1,911	2,184	2,457
148	120	3,959	4,752	5,545	6,337	7,130	1,593	1,911	2,230	2,548	2,867

Cooling capacity: at a water flow of 1.05 GPM

Primary air, CFM	Length	Cooling capacity of water 0.3 inches of water, 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
42	72	1,472	1,766	2,060	2,354	2,648	455	546	637	728	819
	96	1,636	1,964	2,291	2,618	2,945	455	546	637	728	819
	120	1,691	2,028	2,366	2,703	3,041	455	546	637	728	819
53	72	1,688	2,025	2,363	2,700	3,038	569	683	796	910	1,024
	96	1,881	2,256	2,631	3,007	3,382	569	683	796	910	1,024
	120	1,944	2,333	2,722	3,110	3,499	569	683	796	910	1,024
64	72	1,887	2,265	2,642	3,019	3,397	683	819	956	1,092	1,229
	96	2,101	2,522	2,943	3,364	3,785	683	819	956	1,092	1,229
	120	2,177	2,613	3,049	3,485	3,921	683	819	956	1,092	1,229
85	72	2,251	2,701	3,151	3,601	4,051	910	1,092	1,274	1,456	1,638
	96	2,510	3,012	3,514	4,017	4,519	910	1,092	1,274	1,456	1,638
	120	2,608	3,129	3,651	4,172	4,694	910	1,092	1,274	1,456	1,638
106	96	2,882	3,459	4,035	4,611	5,188	1,138	1,365	1,593	1,820	2,048
	120	2,999	3,598	4,198	4,797	5,396	1,138	1,365	1,593	1,820	2,048
127	120	3,359	4,031	4,704	5,376	6,049	1,365	1,638	1,911	2,184	2,457
148	120	3,701	4,440	5,180	5,919	6,659	1,593	1,911	2,230	2,548	2,867

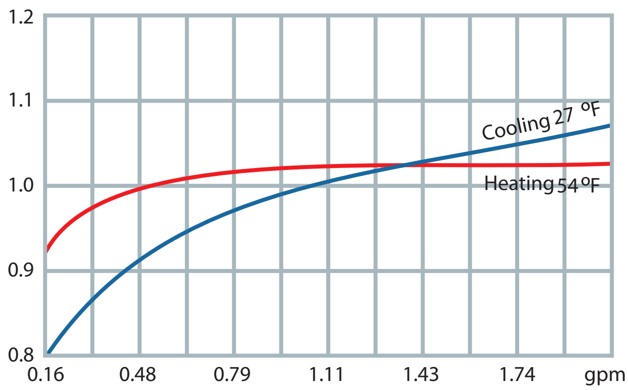
Cooling capacity: at a water flow of 1.05 GPM

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

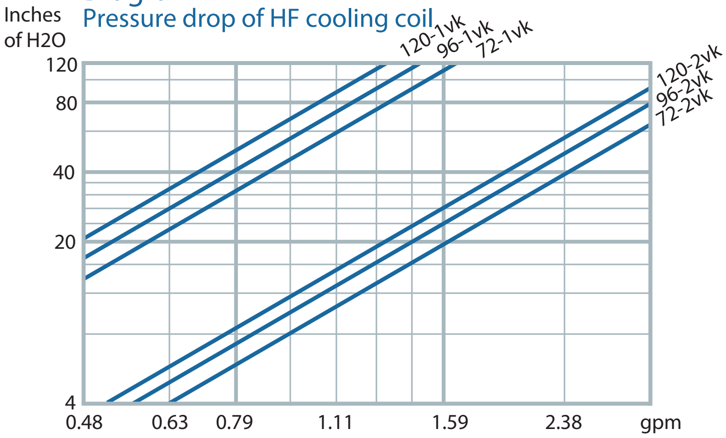
Example:
The unit OA 120 HF gives a cooling capacity of 5,161 BTUH at 106 CFM, 0.3'' H2O and Δ t (room temp. – average temp. of the cooling water) 16°F. Water flow at Δ t 7°F: 5161/(499.8x7)=1.4 gpm. In case of one water circuit the pressure drop is above 80 inches of H2O (please note that this value is too high!), and for the two water circuits, it is 19 inches of 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 0.7 gpm from the diagram 1.
Diagram 1 gives a correction factor of about 0.96 and, thereby, the cooling capacity of the water is 5,161x0.96 = 4,955 BTUH.The cooling capacity of the air at about Δt 16°F is 1,860 BTUH. This gives the following total capacity: 4,955+1,860 = 6,815 BTUH.

Diagram 1
water flow correction** (at other water flow rate)



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

Diagram 2
Pressure drop of HF cooling coil



1 = 1 water circuit, 2 = 2 water circuit

Primary air, CFM	Length	Cooling capacity of water 0.4 inches of water, 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
42	72	1,562	2,343	3,124	3,904	4,685	182	273	364	410	455
	96	1,724	2,587	3,450	4,313	5,175	182	273	364	410	455
	120	1,874	2,811	3,748	4,685	5,622	182	273	364	410	455
53	72	1,777	2,666	3,554	4,442	5,330	228	341	455	512	569
	96	1,972	2,959	3,947	4,934	5,922	228	341	455	512	569
	120	2,229	3,344	4,458	5,573	6,687	228	341	455	512	569
64	72	1,972	2,959	3,947	4,934	5,922	273	410	546	614	683
	96	2,202	3,304	4,405	5,506	6,608	273	410	546	614	683
	120	2,385	3,578	4,771	5,964	7,156	273	410	546	614	683
85	72	2,332	3,498	4,664	5,830	6,997	364	546	728	819	910
	96	2,620	3,930	5,240	6,550	7,860	364	546	728	819	910
	120	2,833	4,249	5,666	7,082	8,499	364	546	728	819	910
106	96	2,997	4,496	5,995	7,495	8,994	455	683	910	1,024	1,138
	120	3,233	4,850	6,467	8,084	9,701	455	683	910	1,024	1,138
127	120	3,604	5,406	7,208	9,010	10,812	546	819	1,092	1,229	1,365
148	120	3,951	5,926	7,902	9,877	11,852	637	956	1,274	1,433	1,593

Cooling capacity: at a water flow of 1.05 GPM

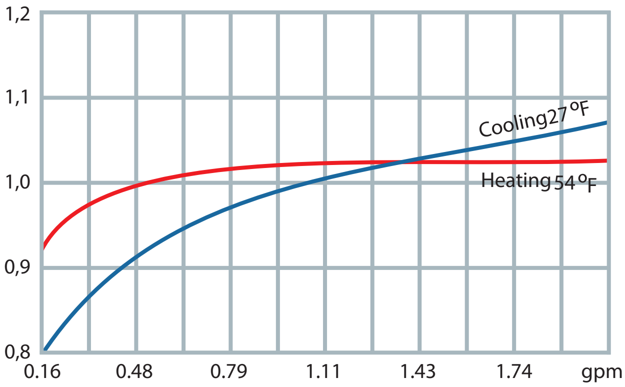
Primary air, CFM	Length	Cooling capacity of water 0.3 inches of water, Δt					Cooling capacity of air				
		Δt 18 °F	Δt 27 °F	Δt 36 °F	Δt 45 °F	Δt 54 °F	Δt 3 °F	Δt 5 °F	Δt 7 °F	Δt 9 °F	Δt 10 °F
42	72	1,470	2,205	2,939	3,674	4,408	182	273	364	410	455
	96	1,629	2,443	3,258	4,073	4,887	182	273	364	410	455
	120	1,728	2,593	3,457	4,321	5,185	182	273	364	410	455
53	72	1,679	2,519	3,358	4,198	5,038	228	341	455	512	569
	96	1,868	2,801	3,735	4,668	5,602	228	341	455	512	569
	120	1,980	2,970	3,961	4,952	5,943	228	341	455	512	569
64	72	1,870	2,806	3,741	4,676	5,611	273	410	546	614	683
	96	2,086	3,129	4,171	5,214	6,257	273	410	546	614	683
	120	2,213	3,319	4,426	5,532	6,639	273	410	546	614	683
85	72	2,219	3,328	4,437	5,546	6,656	364	546	728	819	910
	96	2,485	3,727	4,969	6,212	7,454	364	546	728	819	910
	120	2,638	3,956	5,274	6,593	7,911	364	546	728	819	910
106	96	2,847	4,270	5,693	7,116	8,540	455	683	910	1,024	1,138
	120	3,020	4,529	6,038	7,547	9,057	455	683	910	1,024	1,138
127	120	3,376	5,064	6,752	8,440	10,127	546	819	1,092	1,229	1,365
148	120	3,706	5,561	7,415	9,269	11,124	637	956	1,274	1,433	1,593

Cooling capacity: at a water flow of 1.05 GPM

Primary air, CFM	Length	Cooling capacity of water 0.2 inches of water, Δt					Cooling capacity of air Δt				
		Δt 18 °F	Δt 27 °F	Δt 36 °F	Δt 45 °F	Δt 54 °F	Δt 3°F	Δt 5°F	Δt 7°F	Δt 9 °F	Δt 10°F
42	72	1,377	2,066	2,755	3,444	4,132	182	273	364	410	455
	96	1,532	2,298	3,064	3,829	4,595	182	273	364	410	455
	120	1,581	2,372	3,162	3,953	4,744	182	273	364	410	455
53	72	1,580	2,370	3,159	3,948	4,738	228	341	455	512	569
	96	1,758	2,638	3,517	4,397	5,277	228	341	455	512	569
	120	1,820	2,729	3,639	4,548	5,458	228	341	455	512	569
64	72	1,765	2,648	3,532	4,415	5,298	273	410	546	614	683
	96	1,969	2,953	3,937	4,921	5,905	273	410	546	614	683
	120	2,038	3,058	4,078	5,098	6,117	273	410	546	614	683
85	72	2,106	3,160	4,213	5,267	6,320	364	546	728	819	910
	96	2,350	3,524	4,699	5,874	7,049	364	546	728	819	910
	120	2,441	3,661	4,881	6,101	7,321	364	546	728	819	910
106	96	2,691	4,040	5,388	6,737	8,086	455	683	910	1,024	1,138
	120	2,805	4,208	5,611	7,014	8,416	455	683	910	1,024	1,138
127	120	3,144	4,717	6,290	7,862	9,435	546	819	1,092	1,229	1,365
148	120	3,537	5,244	6,950	8,657	10,363	637	956	1,274	1,433	1,593

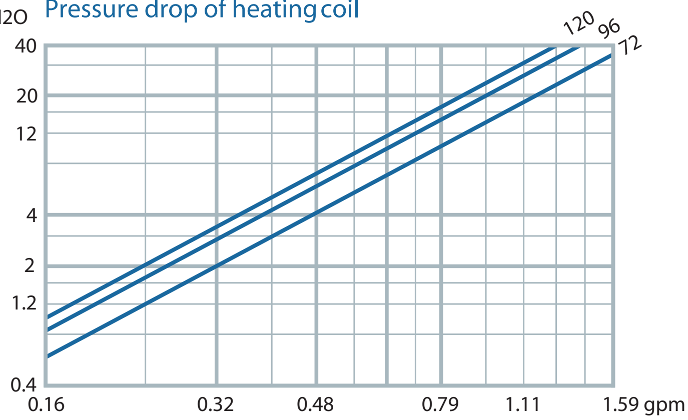
Cooling capacity: at a water flow of 1.05 GPM

Diagram 1
Correction for the different water flows



k * = correction factor

Diagram 3
Pressure drop of heating coil



The sound 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 3 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 dB
883 ft³	attenuated	-2 dB
5297 ft³	hard	-3 dB
5297 ft³	normal	-5 dB
5297 ft³	attenuated	-7 dB

Diagram 4
OptimAir HF 72

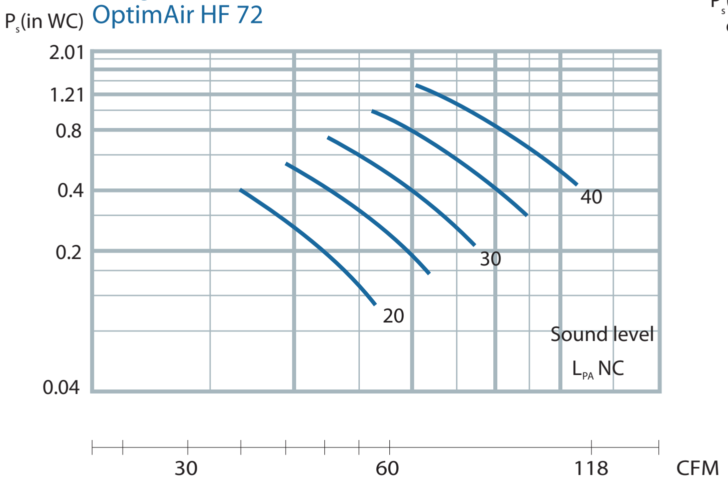


Diagram 5
OptimAir HF 96

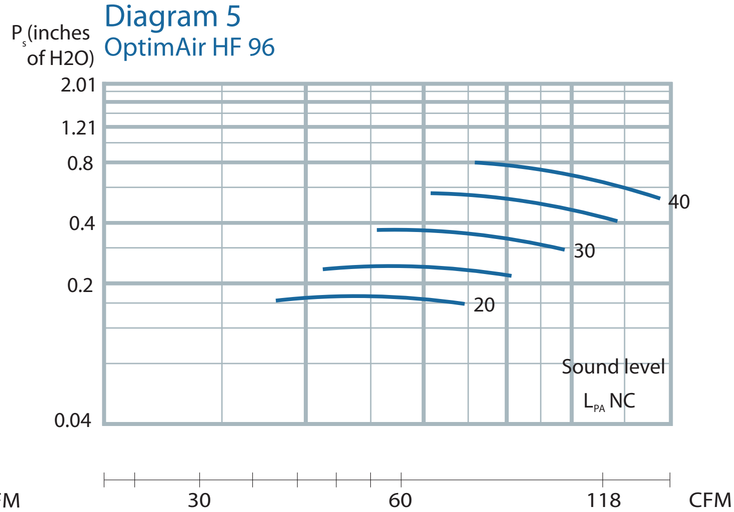
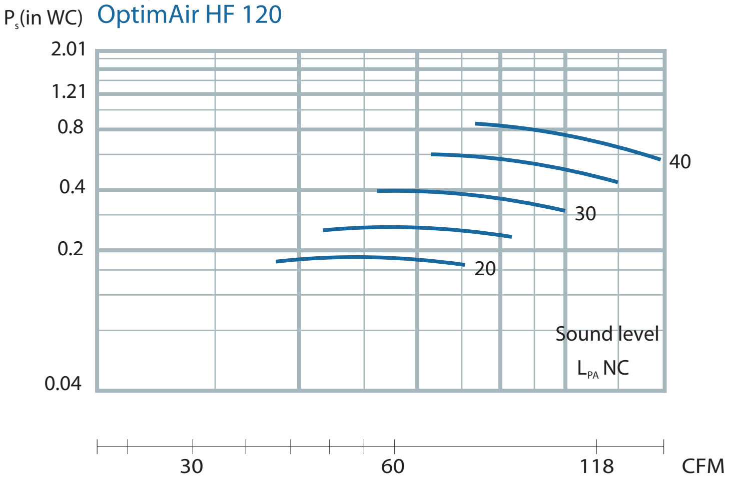


Diagram 6
OptimAir HF 120



Technical data

Sound power level: L_w NC

Sound level: L_W NC
(see diagrams 4-8)

Correction factor: K_0 NC from table 2

$L_W = L_{PA} + K_0$
Sound self-attenuation from table 3.

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

Table 2
Correction K_0 NC for OptimAir HF

Length	Mid-frequency (Octave band) Hz							
	63	125	250	500	1000	2000	4000	8000
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 HF

Length	Mid-frequency (Octave band) Hz							
	63	125	250	500	1000	2000	4000	8000
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