

**"ACTICOOL"** – High induction, high performance active chilled beam

Advanced Air

# Advanced Air RD Company Profile



Advanced Air UK factory and technical centre of just over 60,000 sq ft

Advanced Air are part of the Nailor Industries Group in the USA and some of the key factors are:-

Turnover	£80m
Employees	750
Laboratories and Test Cells	6
Total factory area	600,000 ft <sup>2</sup>

In the UK Advanced Air manufacture:-

- Chilled Beams
- Fan Coil Units
- Grilles and Diffusers
- Fire and Smoke Dampers
- Volume Control Dampers
- Electrical Control Panels
- VAV Terminal Units

The investment in R & D means there is a continuous flow of new products and upgrades to existing units. Specialist customer testing and mock ups undertaken in Advanced Airs specialist laboratories



#### R & D Facilities

## Chilled Beam Overview

Advanced Air and Nailor Industries have over 40 years experience in the design development and manufacture of terminal air conditioning products and systems. Through Advanced Air's continuing investment in research and development facilities an extensive range of chilled beams has been created.

Advanced air is one of only a few UK manufacturers who have developed their beams in the UK, specifically for the UK market.



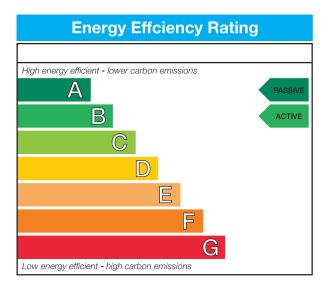
A high induction active beam with specially designed nozzles to create higher cooling outputs.

Advanced Air pursues a policy of continuous product development and we therefore reserve the right to change any of the information in this publication without notice. Please consult your local Advanced Air representative to verify current information.

## Active Chilled Beam - Benefits

With the introduction of high induction active chilled beams a wide range of cooling loads can be achieved up to 200w/m2 which in today's modern buildings should cover virtually all the cooling loads. When load above 120w/m2 are being considered the air distribution within the occupied space needs to be checked by specialist air distribution engineers such as Advanced Air. The chilled beam can therefore replace the fan coil unit and bring about significant benefits.

Display Energy Certificates (DEC) show the specific buildings carbon emissions as calculated by approved software. The appearance is similar to the energy labelling of domestic electrical appliances. If a similar labelling system was used for individual components in an air conditioning system the ratings for chilled beams could look like the label below.





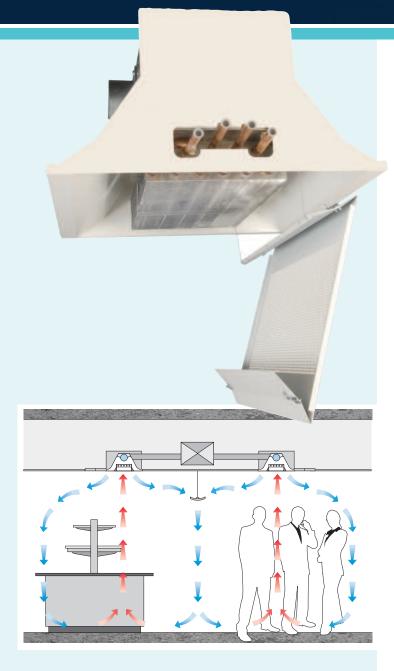
## Energy

The chilled beam has two important energy considerations when compared to the fan coil unit.

Firstly there is no secondary or terminal fan unit since the beam operates by inducing air with nozzles (active). Usually a large quantity of fan coils are used even on an average sized project so the total kW consumption of these terminal fan units can be significant particularly where they are left running all the time (i.e. constant speed as opposed to variable volume VAV fan coils).

Secondly elevated chilled water temperatures of 14/17<sup>°</sup> are utilised as opposed to 9/14<sup>°</sup> usually associated with fan coils. This provides a further opportunity for "free cooling" thereby reducing energy usage.

## Active Chilled Beams - Benefits



## Comfort Levels

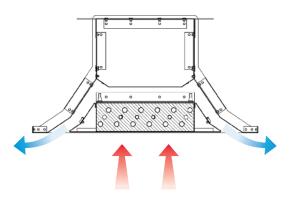
Very good comfort levels can be achieved utilising chilled beams. The air velocities are low within the occupied space and since the supply air temperature is around 16° there is not a high temperature gradient with chilled beams.

Noise levels are also very low with NR35 being easily achieved in the absence of a fan in the unit.

## Maintenance and Whole Life Costs

One of the main advantages of chilled beams is the low level of maintenance required. This generally leads to low whole life costs as can be seen in the summary below:-

- No condensate pump
- No fans
- No motors
- No moving parts
- No filter
- No consumables
- Simple on/off control valves
- 3 year inspection
- 20 year life span



## Chilled Beam Operation

As can be seen from the diagram the operation of the active chilled beams is relatively simple. Fresh air is supplied along a horizontal duct at the top of the unit. The air is forced through nozzles which are mounted in this horizontal duct and positioned to get maximum air entrainment.

As these jets of air dissipate in the chilled beam exit diffuser they induce room air to pass through the centrally mounted perforated diffuser and over the coils. These coils are normally used for cooling but they can provide heating as well. The 4 pipe heating and cooling chilled beam has coils with twin circuits. Since cooling is the main requirement the coil is designed to meet the maximum cooling load. On the heating cycle the hot water is conveyed to the centre of the coil by a separate micro bore copper pipe and achieves the relevant heating with no impact on the cooling potential.

## Active Chilled Beams - Technology

## Induction Nozzles

These are probably the most critical part of the beam since they control the induction rate which needs to be as high as possible. The induction rate for a given airflow is a measure of the efficiency of the beam and ultimately the overall cooling which can be achieved.

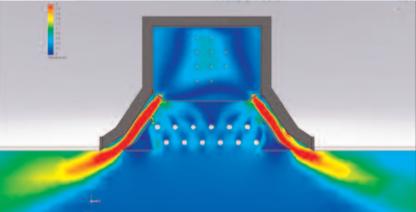
To say the nozzle can come in various "shapes and sizes" is somewhat of an understatement when the induction rate can be influenced by many factors in the nozzle design which include:-

- Shape e.g. circular, oval, slot, star shape, etc
- Diameter measurement of nozzle
- Spacing distance between nozzles
- Configuration pattern of an array of nozzles
- Position in relation to the beam discharge slot
- Angle the angle of discharge

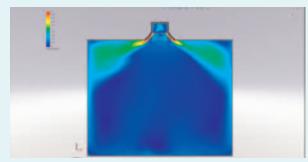
If there were 10 options for each category there would be 1 million variations that needed to be tested to explore the most effective combination.

Engineering fluid dynamics EFD was used to narrow the wide range of option and to create a short list of the most effective combinations for actual testing. It was found later that the EFD predictions on beam velocities, beam temperatures and room velocities were very close to those measured in actual test.





Beam velocity map



Beam function within a room

## Active Chilled Beams - Technology



## Coil Design

Another very important component is the coil where the objective is to maximise the cooling output and minimise the energy consumption.

The coils used are not a standard "off the shelf" component but have been specially developed jointly by the coil manufacturer and the Advanced Air technical centre. To achieve the objective mentioned above many issues had to be investigated typically:-

- Coil circuits
- Copper pipe diameter
- Fin design and shape
- Fin spacing
- Pipe spacing
- Reynolds number

Each coil configuration was tested against a specific airflow and the output and pressure drop were measured. The best of these were fitted and tested in the beam so that the most effective coil configuration could be selected.

## Air Distribution

The discharge air slot needs careful design to minimise any aerodynamic resistance whilst still maintaining coanda effect on the ceiling. In addition the discharge velocities have to be sufficient to give the beam a reasonable throw and maintain comfort conditions within the room at a typical 2-3m spacing.

> The air distribution can be significantly affected by the shape and dimension of the slot and it is therefore essential all beams have been tested in specialist air distribution laboratories BSRIA approved similar to those in the Advanced Air Technical Centre.



Return Air24.5 °CRoom Air24.0 °CPrimary Air14.0 °CSupply Water14.0 °CReturn Water17.0 °CSupply Water Heating45.0 °CReturn Water Heating35.0 °C35.0 °C

Beam	Primary Air I/s	6 l/s	8 l/s	10 l/s	12 l/s	14 l/s				
Length (mm)	_									
1200	W/M	268 W	357 W	444 W	524 W	606 W				
	Throw m	0.3-0.9-1.5	0.4-1.2-2.0	0.6-1.5-2.5	0.7-1.7-3.0	0.8-2.0-3.5				
	Static Pa	36	64	100	144	196				
	dB(A)	<20	20	24	29	32				
	Water W	245 W	326 W	405 W	475 W	548 W				
	Water Flow	70.3 l/h	93.5 l/h	116.1 l/h	136.2 l/h	157.1 l/h				
	Water <b>∆</b> P	0.5 KPa	0.9 KPa	1.3 KPa	1.9 KPa	2.5 KPa				
	Heating W	135 W	180 W	223 W	262 W	302 W				
	Total Air I/s	30 l/s	40 l/s	50 l/s	60 l/s	70 l/s				
	Primary Air W	77 W	102 W	128 W	154 W	179 W				
	Total W	322 W	429 W	533 W	629 W	727 W				
	Primary Air I/s	10 l/s	12 l/s	14 l/s	16 l/s	18 l/s	20 l/s	22 l/s		
1800	W/M	307 W	368 W	429 W	488 W	540 W	595 W	648 W		
	Throw m	0.4-1.0-1.7	0.5-1.2-2.1	0.5-1.4-2.4	0.6-1.6-2.8	0.7-1.8-3.1	0.8-2.0-3.4	0.8-2.2-3.7		
	Static Pa	44	64	87	114	144	178	215		
	dB(A)	23	26	29	31	34	36	37		
	Water W	425 W	509 W	592 W	674 W	741 W	814 W	885 W		
	Water Flow	121.8 l/h	145.8 l/h	169.8 l/h	193.2 l/h	212.5 l/h	233.4 l/h	253.8 l/h		
	Water $\Delta P$	1.9 KPa	2.7 KPa	3.7 KPa	4.8 KPa	5.8 KPa	7.0 KPa	8.3 KPa		
	Heating W	234 W	280 W	326 W	371 W	409 W	449 W	488 W		
	Total Air I/s	50 l/s	60 l/s	70 l/s	80 l/s	90 l/s	100 l/s	110 l/s		
	Primary Air W	128 W	154 W	179 W	205 W	231 W	256 W	282 W		
	Total W	553 W	663 W	772 W	879 W	972 W	1071 W	1167 W		
	Primary Air I/s	12 l/s	14 l/s	16 l/s	18 l/s	20 l/s	22 l/s	24 l/s	26 l/s	28 l/s
2400	W/M	287 W	335 W	382 W	429 W	475 W	518 W	560 W	606 W	647 W
2400	W/M Throw m	287 W 0.3-0.9-1.6	335 W 0.4-1.1-1.9	382 W 0.5-1.3-2.2	429 W 0.5-1.4-2.4	475 W 0.6-1.6-2.7	518 W 0.7-1.7-3.0	560 W 0.7-1.9-3.2	606 W 0.8-2.0-3.5	647 W 0.8-2.2-3.7
2400	W/M Throw m Static Pa	287 W 0.3-0.9-1.6 36	335 W 0.4-1.1-1.9 49	382 W 0.5-1.3-2.2 64	429 W 0.5-1.4-2.4 81	475 W 0.6-1.6-2.7 100	518 W 0.7-1.7-3.0 121	560 W 0.7-1.9-3.2 144	606 W 0.8-2.0-3.5 169	647 W 0.8-2.2-3.7 196
2400	W/M Throw m Static Pa dB(A)	287 W 0.3-0.9-1.6 36 23	335 W 0.4-1.1-1.9 49 24	382 W 0.5-1.3-2.2 64 26	429 W 0.5-1.4-2.4 81 28	475 W 0.6-1.6-2.7 100 30	518 W 0.7-1.7-3.0 121 33	560 W 0.7-1.9-3.2 144 35	606 W 0.8-2.0-3.5 169 36	647 W 0.8-2.2-3.7 196 38
2400	W/M Throw m Static Pa dB(A) Water W	287 W 0.3-0.9-1.6 36 23 534 W	335 W 0.4-1.1-1.9 49 24 624 W	382 W 0.5-1.3-2.2 64 26 711 W	429 W 0.5-1.4-2.4 81 28 798 W	475 W 0.6-1.6-2.7 100 30 883 W	518 W 0.7-1.7-3.0 121 33 960 W	560 W 0.7-1.9-3.2 144 35 1036 W	606 W 0.8-2.0-3.5 169 36 1122 W	647 W 0.8-2.2-3.7 196 38 1195 W
2400	W/M Throw m Static Pa dB(A) Water W Water Flow	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 I/h
2400	W/M Throw m Static Pa dB(A) Water W Water Flow Water CP	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa	429 W 0.5-1.4-2.4 81 28 798 W 228.8 I/h 8.8 KPa	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa
2400	W/M Throw m Static Pa dB(A) Water W Water Flow Water Flow Water <b>Δ</b> P Heating W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 I/h 10.8 KPa 487 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W
2400	W/M Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s
2400	W/M Throw m Static Pa dB(A) Water W Water Flow Water Flow Water ΔP Heating W Total Air I/s Primary Air W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W
2400	W/M Throw m Static Pa dB(A) Water W Water Flow Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W
	W/M Throw m Static Pa dB(A) Water W Water Flow Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W Primary Air I/s	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b>	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W <b>18 l/s</b>	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b>	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b>	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W <b>24 l/s</b>	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W <b>26 l/s</b>	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b>	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W <b>30 l/s</b>	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b>
2400	W/M   Throw m   Static Pa   dB(A)   Water W   Water Flow   Water ΔP   Heating W   Total Air I/s   Primary Air W   Total W   Primary Air I/s   W/M	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W 16 l/s 289 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W <b>18 l/s</b> 326 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W 22 l/s 401 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W 24 l/s 438 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W 26 l/s 476 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W <b>30 l/s</b> 543 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W
	W/M   Throw m   Static Pa   dB(A)   Water W   Water Flow   Water ΔP   Heating W   Total Air I/s   Primary Air W   Total W   Primary Air I/s   W/M   Throw m	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W 16 l/s 289 W 0.3-0.9-1.6	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 18 l/s 326 W 0.4-1.1-1.8	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W 20 J/s 364 W 0.4-1.2-2.1	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W 24 l/s 438 W 0.5-1.4-2.5	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W 26 l/s 476 W 0.6-1.6-2.7	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30 I/s</b> 543 W 0.7-1.8-3.1	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water AP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W 16 l/s 289 W 0.3-0.9-1.6 41	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 18 l/s 326 W 0.4-1.1-1.8 52	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W 20 J/s 364 W 0.4-1.2-2.1 64	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W 24 l/s 438 W 0.5-1.4-2.5 92	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W 26 l/s 476 W 0.6-1.6-2.7 108	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30 I/s</b> 543 W 0.7-1.8-3.1 144	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3 164
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water AP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W 16 l/s 289 W 0.3-0.9-1.6 41 22	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 18 l/s 326 W 0.4-1.1-1.8 52 25	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28	429 W 0.5-1.4-2.4 81 28 798 W 228.8 I/h 8.8 KPa 440 W 90 I/s 231 W 1029 W <b>22 I/s</b> 401 W 0.5-1.3-2.3 77 30	475 W 0.6-1.6-2.7 100 30 883 W 253.1 I/h 10.8 KPa 487 W 100 I/s 256 W 1139 W <b>24 I/s</b> 438 W 0.5-1.4-2.5 92 32	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W 26 l/s 476 W 0.6-1.6-2.7 108 33	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W <b>30 l/s</b> 543 W 0.7-1.8-3.1 144 37	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3 164 38
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water AP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)     Water W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 I/h 4.0 KPa 295 W 60 I/s 154 W 688 W <b>16 I/s</b> 289 W 0.3-0.9-1.6 41 22 798 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 803 W 18 l/s 326 W 0.4-1.1-1.8 52 25 896 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W 20 l/s 364 W 0.4-1.2-2.1 64 28 995 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 I/h 8.8 KPa 440 W 90 I/s 231 W 1029 W <b>22 I/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 I/h 10.8 KPa 487 W 100 I/s 256 W 1139 W 24 I/s 438 W 0.5-1.4-2.5 92 32 1187 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 I/h 12.8 KPa 529 W 110 I/s 282 W 1242 W 26 I/s 476 W 0.6-1.6-2.7 108 33 1286 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30</b> I/s 543 W 0.7-1.8-3.1 144 37 1450 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water AP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)     Water W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b> 289 W 0.3-0.9-1.6 41 22 798 W 228.8 l/h	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 803 W <b>18 l/s</b> 326 W 0.4-1.1-1.8 52 25 896 W 256.8 l/h	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28 995 W 285.3 l/h	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W 313.1 l/h	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W 24 l/s 438 W 0.5-1.4-2.5 92 32 1187 W 340.1 l/h	518 W 0.7-1.7-3.0 121 33 960 W 275.3 I/h 12.8 KPa 529 W 110 I/s 282 W 1242 W 26 I/s 476 W 0.6-1.6-2.7 108 33 1286 W 368.4 I/h	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W 392.4 l/h	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W <b>30 l/s</b> 543 W 0.7-1.8-3.1 144 37 1450 W 415.7 l/h	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W 443.4 l/h
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water Flow     Water Flow	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b> 289 W 0.3-0.9-1.6 41 22 798 W 228.8 l/h 10.7 KPa	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W 803 W 803 W 18 l/s 326 W 0.4-1.1-1.8 52 25 896 W 256.8 l/h 13.5 KPa	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28 995 W 285.3 l/h 16.6 KPa	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W 313.1 l/h 20.0 KPa	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W 24 l/s 438 W 0.5-1.4-2.5 92 32 1187 W 340.1 l/h 23.6 KPa	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W 26 l/s 476 W 0.6-1.6-2.7 108 33 1286 W 368.4 l/h 27.7 KPa	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W 392.4 l/h 31.4 KPa	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 l/h 17.5 KPa 618 W 130 l/s 333 W 1455 W <b>30 l/s</b> 543 W 0.7-1.8-3.1 144 37 1450 W 415.7 l/h 35.3 KPa	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 l/h 19.8 KPa 658 W 140 l/s 359 W 1554 W <b>32 l/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W 443.4 l/h 40.1 KPa
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water Flow     Water AP     Heating W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b> 289 W 0.3-0.9-1.6 41 22 798 W 228.8 l/h 10.7 KPa 440 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W <b>18 l/s</b> 326 W 0.4-1.1-1.8 52 25 896 W 256.8 l/h 13.5 KPa 494 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28 995 W 285.3 l/h 16.6 KPa 549 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W 313.1 l/h 20.0 KPa 602 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W <b>24 l/s</b> 438 W 0.5-1.4-2.5 92 32 1187 W 340.1 l/h 23.6 KPa 654 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W <b>26 l/s</b> 476 W 0.6-1.6-2.7 108 33 1286 W 368.4 l/h 27.7 KPa 708 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W 392.4 l/h 31.4 KPa 754 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30 I/s</b> 543 W 0.7-1.8-3.1 144 37 1450 W 415.7 I/h 35.3 KPa 799 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 I/h 19.8 KPa 658 W 140 I/s 359 W 1554 W <b>32 I/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W 443.4 I/h 40.1 KPa 853 W
	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b> 289 W 0.3-0.9-1.6 41 22 798 W 228.8 l/h 10.7 KPa 440 W 80 l/s	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W <b>18 l/s</b> 326 W 0.4-1.1-1.8 52 25 896 W 256.8 l/h 13.5 KPa 494 W 90 l/s	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28 995 W 285.3 l/h 16.6 KPa 549 W 100 l/s	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W 313.1 l/h 20.0 KPa 602 W 110 l/s	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W <b>24 l/s</b> 438 W 0.5-1.4-2.5 92 32 1187 W 340.1 l/h 23.6 KPa 654 W 120 l/s	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W <b>26 l/s</b> 476 W 0.6-1.6-2.7 108 33 1286 W 368.4 l/h 27.7 KPa 708 W 130 l/s	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W 392.4 l/h 31.4 KPa 754 W 140 l/s	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30 I/s</b> 543 W 0.7-1.8-3.1 144 37 1450 W 415.7 I/h 35.3 KPa 799 W 150 I/s	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 I/h 19.8 KPa 658 W 140 I/s 359 W 1554 W <b>32 I/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W 443.4 I/h 40.1 KPa 853 W 160 I/s
	W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W     Total Air I/s     Primary Air W     Total W     Primary Air I/s     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water Flow     Water AP     Heating W	287 W 0.3-0.9-1.6 36 23 534 W 153.2 l/h 4.0 KPa 295 W 60 l/s 154 W 688 W <b>16 l/s</b> 289 W 0.3-0.9-1.6 41 22 798 W 228.8 l/h 10.7 KPa 440 W	335 W 0.4-1.1-1.9 49 24 624 W 178.7 l/h 5.4 KPa 344 W 70 l/s 179 W 803 W <b>18 l/s</b> 326 W 0.4-1.1-1.8 52 25 896 W 256.8 l/h 13.5 KPa 494 W	382 W 0.5-1.3-2.2 64 26 711 W 203.8 l/h 7.0 KPa 392 W 80 l/s 205 W 916 W <b>20 l/s</b> 364 W 0.4-1.2-2.1 64 28 995 W 285.3 l/h 16.6 KPa 549 W	429 W 0.5-1.4-2.4 81 28 798 W 228.8 l/h 8.8 KPa 440 W 90 l/s 231 W 1029 W <b>22 l/s</b> 401 W 0.5-1.3-2.3 77 30 1093 W 313.1 l/h 20.0 KPa 602 W	475 W 0.6-1.6-2.7 100 30 883 W 253.1 l/h 10.8 KPa 487 W 100 l/s 256 W 1139 W <b>24 l/s</b> 438 W 0.5-1.4-2.5 92 32 1187 W 340.1 l/h 23.6 KPa 654 W	518 W 0.7-1.7-3.0 121 33 960 W 275.3 l/h 12.8 KPa 529 W 110 l/s 282 W 1242 W <b>26 l/s</b> 476 W 0.6-1.6-2.7 108 33 1286 W 368.4 l/h 27.7 KPa 708 W	560 W 0.7-1.9-3.2 144 35 1036 W 296.9 l/h 14.9 KPa 571 W 120 l/s 307 W 1343 W <b>28 l/s</b> 510 W 0.6-1.7-2.9 125 35 1369 W 392.4 l/h 31.4 KPa 754 W	606 W 0.8-2.0-3.5 169 36 1122 W 321.7 I/h 17.5 KPa 618 W 130 I/s 333 W 1455 W <b>30 I/s</b> 543 W 0.7-1.8-3.1 144 37 1450 W 415.7 I/h 35.3 KPa 799 W	647 W 0.8-2.2-3.7 196 38 1195 W 342.5 I/h 19.8 KPa 658 W 140 I/s 359 W 1554 W <b>32 I/s</b> 581 W 0.7-1.9-3.3 164 38 1547 W 443.4 I/h 40.1 KPa 853 W

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5  $^\circ\mathrm{C}$  above the average room for the values above.

#### Notations

W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam I/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

Correction	Table	
K	Water W	
11	1.22	
10.5	1.17	
10	1.11	
9.5	1.06	
9	1.00	
8.5	0.94	
8	0.89	
7.5	0.83	
7	0.78	

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

The thermal data is based on 9.0 K between mean water and return air to the beam.

Return Air 24.5 °C Room Air 24.0 °C Supply Water Heating 45.0 °C

Supply Water 14.0 °C 14.0 °C Return Water 17.0 °C Primary Air Return Water Heating 35.0 °C

Beam Length (mm)	Primary Air I/s	14 l/s	17 l/s	20 l/s	23 l/s	26 l/s	29 l/s			
1200	W/M	475 W	570 W	693 W	766 W	859 W	936 W	1014 W		
	Throw m	0.6-1.6-2.7	0.7-1.9-3.3	0.9-2.3-4.0	1.0-2.6-4.4	1.1-2.9-4.9	1.2-3.1-5.4	1.3-3.4-5.8		
	Static Pa	49	72	100	132	169	210	256		
	dB(A)	30	35	40	43	47	50	50		
	Water W	391 W	467 W	566 W	625 W	697 W	752 W	806 W		
	Water Flow	112.0 l/h	133.7 l/h	162.2 l/h	179.2 l/h	199.9 l/h	215.4 l/h	231.1 l/h		
	Water <b>D</b> P	1.3 KPa	1.8 KPa	2.6 KPa	3.2 KPa	4.0 KPa	4.6 KPa	5.3 KPa		
	Heating W	215 W	257 W	312 W	345 W	384 W	414 W	444 W		
	Total Air I/s	49 l/s	60 l/s	73 l/s	81 l/s	91 l/s	102 l/s	112 l/s		
	Primary Air W	179 W	218 W	256 W	295 W	333 W	371 W			
	Total W	570 W	684 W	832 W	920 W	1030 W	1123 W	1216 W		
		20 l/s	23 l/s	26 l/s	29 l/s	32 l/s	35 l/s	38 l/s	41 l/s	
1800	W/M	482 W	528 W	597 W	663 W	732 W	799 W	859 W	921 W	
	Throw m	0.6-1.6-2.7	0.7-1.8-3.0	0.8-2.0-3.4	0.9-2.2-3.8	0.9-2.4-4.2	1.0-2.7-4.6	1.1-2.9-4.9	1.2-3.1-5.3	
	Static Pa	44	59	75	93	114	136	160	187	
	dB(A)	32	36	40	42	45	47	50	52	
	Water W	602 W	657 W	742 W	822 W	908 W	989 W	1060 W	1132 W	
	Water Flow	172.6 l/h	188.2 l/h	212.7 l/h	235.7 l/h	260.1 l/h	283.6 l/h	303.8 l/h	324.5 l/h	
	Water <b>D</b> P	3.8 KPa	4.6 KPa	5.8 KPa	7.2 KPa	8.7 KPa	10.4 KPa	11.9 KPa	13.6 KPa	
	Heating W	332 W	362 W	409 W	453 W	500 W	545 W	584 W	624 W	
	Total Air I/s	73 l/s	81 l/s	91 l/s	102 l/s	112 l/s	123 l/s	133 l/s	144 l/s	
	Primary Air W	256 W	295 W	333 W	371 W	410 W	448 W	487 W	525 W	
	Total W	868 W	951 W	1075 W	1194 W	1317 W	1438 W	1547 W	1657 W	
		29 l/s	32 l/s	35 l/s	38 l/s	41 l/s	44 I/s	47 l/s	50 l/s	53 l/s
2400	W/M	516 W	570 W	623 W	677 W	727 W	778 W	831 W	880 W	922 W
	Throw m	0.7-1.7-2.9	0.7-1.9-3.3	0.8-2.1-3.6	0.9-2.3-3.9	0.9-2.4-4.2	1.0-2.6-4.5	1.1-2.8-4.8	1.2-3.0-5.1	1.2-3.1-5.3
	Static Pa	53	64	77	90	105	121	138	156	176
	dB(A)	37	40	43	45	46	48	50	52	54
	Water W	868 W	957 W	1047 W	1137 W	1219 W	1304 W	1392 W	1472 W	1534 W
	Water Flow	248.7 l/h	274.4 l/h	300.1 l/h	325.9 l/h	349.3 l/h	373.6 l/h	399.1 l/h	421.8 l/h	439.6 l/h
	Water <b>∆</b> P	10.4 KPa	12.7 KPa	15.2 KPa	17.9 KPa	20.6 KPa	23.5 KPa	26.9 KPa	30.0 KPa	32.6 KPa
	Heating W	478 W								
	-		528 W	577 W	627 W	672 W	718 W	767 W	811 W	845 W
	Total Air I/s	102 l/s	112 l/s	123 l/s	133 l/s	144 l/s	154 l/s	165 l/s	175 l/s	186 l/s
	Total Air I/s Primary Air W	102 l/s 371 W	112 l/s 410 W	123 l/s 448 W	133 l/s 487 W	144 l/s 525 W	154 l/s 564 W	165 l/s 602 W	175 l/s 641 W	186 l/s 679 W
	Total Air I/s	102 l/s 371 W 1239 W	112 l/s 410 W 1367 W	123 l/s 448 W 1496 W	133 l/s 487 W 1624 W	144 l/s 525 W 1744 W	154 l/s 564 W 1867 W	165 l/s 602 W 1995 W	175 l/s	186 l/s
	Total Air I/s Primary Air W Total W	102 l/s 371 W 1239 W <b>35 l/s</b>	112 l/s 410 W 1367 W <b>38 l/s</b>	123 l/s 448 W 1496 W <b>41 l/s</b>	133 l/s 487 W 1624 W <b>44 l/s</b>	144 l/s 525 W 1744 W <b>47 l/s</b>	154 l/s 564 W 1867 W <b>50 l/s</b>	165 l/s 602 W 1995 W <b>53 l/s</b>	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M	102 l/s 371 W 1239 W <b>35 l/s</b> 547 W	112 l/s 410 W 1367 W <b>38 l/s</b> 587 W	123 I/s 448 W 1496 W <b>41 I/s</b> 633 W	133 l/s 487 W 1624 W <b>44 l/s</b> 679 W	144 l/s 525 W 1744 W <b>47 l/s</b> 726 W	154 l/s 564 W 1867 W <b>50 l/s</b> 768 W	165 l/s 602 W 1995 W <b>53 l/s</b> 814 W	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m	102 l/s 371 W 1239 W <b>35 l/s</b> 547 W 0.7-1.8-3.1	112 l/s 410 W 1367 W <b>38 l/s</b> 587 W 0.8-2.0-3.4	123 l/s 448 W 1496 W <b>41 l/s</b> 633 W 0.8-2.1-3.6	133 l/s 487 W 1624 W <b>44 l/s</b> 679 W 0.9-2.3-3.9	144 l/s 525 W 1744 W 47 l/s 726 W 0.9-2.4-4.2	154 l/s 564 W 1867 W <b>50 l/s</b> 768 W 1.0-2.6-4.4	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m Static Pa	102 l/s 371 W 1239 W <b>35 l/s</b> 547 W 0.7-1.8-3.1 49	112 l/s 410 W 1367 W <b>38 l/s</b> 587 W 0.8-2.0-3.4 58	123 I/s 448 W 1496 W <b>41 I/s</b> 633 W 0.8-2.1-3.6 67	133 I/s 487 W 1624 W <b>44 I/s</b> 679 W 0.9-2.3-3.9 77	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88	154 I/s 564 W 1867 W 50 I/s 768 W 1.0-2.6-4.4 100	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A)	102 l/s 371 W 1239 W <b>35 l/s</b> 547 W 0.7-1.8-3.1 49 40	112 I/s 410 W 1367 W <b>38 I/s</b> 587 W 0.8-2.0-3.4 58 42	123 I/s 448 W 1496 W <b>41 I/s</b> 633 W 0.8-2.1-3.6 67 44	133 I/s 487 W 1624 W 44 I/s 679 W 0.9-2.3-3.9 77 46	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48	154 I/s 564 W 1867 W <b>50 I/s</b> 768 W 1.0-2.6-4.4 100 50	165 l/s 602 W 1995 W <b>53 l/s</b> 814 W 1.1-2.7-4.7 112 52	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W	102 I/s 371 W 1239 W <b>35 I/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W	133 I/s 487 W 1624 W 44 I/s 679 W 0.9-2.3-3.9 77 46 1474 W	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W	154 I/s 564 W 1867 W <b>50 I/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W	165 I/s 602 W 1995 W 53 I/s 814 W 1.1-2.7-4.7 112 52 1764 W	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow	102 l/s 371 W 1239 W <b>35 l/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W 341.7 l/h	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W 365.0 I/h	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W 393.8 I/h	133 l/s 487 W 1624 W 44 l/s 679 W 0.9-2.3-3.9 77 46 1474 W 422.6 l/h	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W 451.4 I/h	154 l/s 564 W 1867 W <b>50 l/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W 477.1 l/h	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112 52 1764 W 505.7 l/h	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water V Water Flow Water Flow	102 I/s 371 W 1239 W <b>35 I/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W 341.7 I/h 23.8 KPa	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W 365.0 I/h 27.2 KPa	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W 393.8 I/h 31.6 KPa	133 I/s 487 W 1624 W 44 I/s 679 W 0.9-2.3-3.9 77 46 1474 W 422.6 I/h 36.4 KPa	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W 451.4 I/h 41.6 KPa	154 l/s 564 W 1867 W <b>50 l/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W 477.1 l/h 46.5 KPa	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112 52 1764 W 505.7 l/h 52.2 KPa	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s     Primary Air W     Total W     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W	102 I/s 371 W 1239 W <b>35 I/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W 341.7 I/h 23.8 KPa 657 W	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W 365.0 I/h 27.2 KPa 702 W	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W 393.8 I/h 31.6 KPa 757 W	133 l/s 487 W 1624 W <b>44 l/s</b> 679 W 0.9-2.3-3.9 77 46 1474 W 422.6 l/h 36.4 KPa 813 W	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W 451.4 I/h 41.6 KPa 868 W	154 I/s 564 W 1867 W <b>50 I/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W 477.1 I/h 46.5 KPa 917 W	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112 52 1764 W 505.7 l/h 52.2 KPa 972 W	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s     Primary Air W     Total W     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water AP     Heating W     Total Air I/s	102 I/s 371 W 1239 W <b>35 I/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W 341.7 I/h 23.8 KPa 657 W 123 I/s	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W 365.0 I/h 27.2 KPa 702 W 133 I/s	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W 393.8 I/h 31.6 KPa 757 W 144 I/s	133 I/s 487 W 1624 W 44 I/s 679 W 0.9-2.3-3.9 77 46 1474 W 422.6 I/h 36.4 KPa 813 W 154 I/s	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W 451.4 I/h 41.6 KPa 868 W 165 I/s	154 I/s 564 W 1867 W <b>50 I/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W 477.1 I/h 46.5 KPa 917 W 175 I/s	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112 52 1764 W 505.7 l/h 52.2 KPa 972 W 186 l/s	175 l/s 641 W	186 l/s 679 W
3000	Total Air I/s     Primary Air W     Total W     W/M     Throw m     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W	102 I/s 371 W 1239 W <b>35 I/s</b> 547 W 0.7-1.8-3.1 49 40 1192 W 341.7 I/h 23.8 KPa 657 W	112 I/s 410 W 1367 W 38 I/s 587 W 0.8-2.0-3.4 58 42 1273 W 365.0 I/h 27.2 KPa 702 W	123 I/s 448 W 1496 W 41 I/s 633 W 0.8-2.1-3.6 67 44 1374 W 393.8 I/h 31.6 KPa 757 W	133 l/s 487 W 1624 W <b>44 l/s</b> 679 W 0.9-2.3-3.9 77 46 1474 W 422.6 l/h 36.4 KPa 813 W	144 I/s 525 W 1744 W <b>47 I/s</b> 726 W 0.9-2.4-4.2 88 48 1575 W 451.4 I/h 41.6 KPa 868 W	154 I/s 564 W 1867 W <b>50 I/s</b> 768 W 1.0-2.6-4.4 100 50 1665 W 477.1 I/h 46.5 KPa 917 W	165 l/s 602 W 1995 W 53 l/s 814 W 1.1-2.7-4.7 112 52 1764 W 505.7 l/h 52.2 KPa 972 W	175 l/s 641 W	186 l/s 679 W

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5 °C above the average room for the values above.

#### Notations

Hotadono	
W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam l/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

5

Correction	Table	
Κ	Water W	
11	1.22	
10.5	1.17	
10	1.11	
9.5	1.06	
9	1.00	
8.5	0.94	
8	0.89	
7.5	0.83	
7	0.78	

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

The thermal data is based on 9.0 K between mean water and return air to the beam.

Return Air24.5 °CRoom Air24.0 °CPrimary Air14.0 °CSupply Water14.0 °CReturn Water17.0 °CSupply Water Heating45.0 °CReturn Water Heating35.0 °C35.0 °C35.0 °C

Beam Length (mm)	Primary Air I/s	20 l/s	25 l/s	30 l/s	35 l/s	40 l/s			
1200	W/M	551 W	689 W	827 W	938 W	1027 W			
	Throw m	0.7-1.8-3.1	0.9-2.3-3.9	1.1-2.8-4.7	1.2-3.2-5.4	1.4-3.5-5.9			
	Static Pa	44	69	100	136	178			
	dB(A)	31	37	42	46	51			
	Water W	405 W	506 W	608 W	677 W	720 W			
	Water Flow	116.1 l/h	145.1 l/h	174.1 l/h	194.1 l/h	206.4 l/h			
	Water $\Delta P$	1.3 KPa	2.1 KPa	3.0 KPa	3.8 KPa	4.3 KPa			
	Heating W	223 W	279 W	335 W	373 W	397 W			
	Total Air I/s	56 l/s	70 l/s	84 l/s	98 l/s	112 l/s			
	Primary Air W	256 W	320 W	384 W	448 W	512 W			
	Total W	661 W	827 W	992 W	1126 W	1232 W			
		30 l/s	35 l/s	40 l/s	45 l/s	50 l/s	55 l/s	60 l/s	
1800	W/M	565 W	659 W	753 W	847 W	1110 W	992 W	1051 W	
	Throw m	0.7-1.9-3.2	0.8-2.2-3.8	1.0-2.5-4.3	1.1-2.8-4.9	1.5-3.7-6.4	1.3-3.3-5.7	1.4-3.5-6.1	
	Static Pa	44	60	79	100	123	149	178	
	dB(A)	35	40	43	46	50	52	54	
	Water W	632 W	737 W	842 W	948 W	1357 W	1081 W	1123 W	
	Water Flow	181.1 l/h	211.3 l/h	241.4 l/h	271.6 l/h	389.0 l/h	309.9 l/h	321.9 l/h	
	Water <b>D</b> P	4.2 KPa	5.8 KPa	7.5 KPa	9.5 KPa	19.5 KPa	12.4 KPa	13.4 KPa	
	Heating W	348 W	406 W	464 W	522 W	748 W	596 W	619 W	
	Total Air I/s	84 l/s	98 l/s	112 l/s	126 l/s	140 l/s	154 l/s	168 l/s	
	Primary Air W	384 W	448 W	512 W	576 W	641 W	705 W	769 W	
	Total W	1016 W	1185 W	1355 W	1524 W	1998 W	1786 W	1892 W	
		40 l/s	45 l/s	50 l/s	55 l/s	60 l/s	65 l/s	70 l/s	75 l/s
2400	W/M	581 W	654 W	727 W	799 W	872 W	1117 W	989 W	1044 W
	Throw m	0.7-1.9-3.3	0.8-2.2-3.7	0.9-2.4-4.2	1.0-2.7-4.6	1.1-2.9-5.0	1.5-3.8-6.4	1.3-3.3-5.7	1.4-3.5-6.0
	Static Pa	44	56	69	84	100	117	136	156
	dB(A)	41	44	47	50	51	54	57	59
	Water W	883 W	993 W	1104 W	1214 W	1324 W	1849 W	1476 W	1545 W
	Water Flow	253.1 l/h	284.7 l/h	316.3 l/h	347.9 l/h	379.6 l/h	530.0 l/h	423.2 l/h	442.8 l/h
	Water <b>D</b> P	10.8 KPa	13.7 KPa	16.9 KPa	20.4 KPa	24.3 KPa	47.4 KPa	30.2 KPa	33.1 KPa
	Heating W	487 W	547 W	608 W	669 W	730 W	1019 W	814 W	852 W
	Total Air I/s	112 l/s	126 l/s	140 l/s	154 l/s	168 l/s	182 l/s	196 l/s	210 l/s
	Primary Air W	512 W	576 W	641 W	705 W	769 W	833 W	897 W	961 W
	Total W	1395 W	1570 W	1744 W	1919 W	2093 W	2682 W	2373 W	2506 W
		50 l/s	55 l/s	60 l/s	65 l/s	70 l/s	75 l/s	80 l/s	85 l/s
3000	W/M	626 W	688 W	751 W	813 W	876 W	938 W	1191 W	1032 W
	Throw m	0.8-2.1-3.6	0.9-2.3-3.9	1.0-2.5-4.3	1.1-2.7-4.7	1.1-2.9-5.0	1.2-3.2-5.4	1.6-4.0-6.9	1.4-3.5-5.9
	Static Pa	44	54	64	75	87	100	114	128
	dB(A)	44	47	50	53	55	55	58	60
	Water W	1236 W	1360 W	1483 W	1607 W	1730 W	1854 W	2549 W	2008 W
	Water Flow	354.3 l/h	389.7 l/h	425.1 l/h	460.6 l/h	496.01/n	531.4 l/h	730.6 l/h	5/5.51/1
	Water Flow Water <b>D</b> P	354.3 l/h 25.6 KPa	389.7 l/h 31.0 KPa	425.1 l/h 36.9 KPa	460.6 l/h 43.3 KPa	496.0 l/h 50.2 KPa	531.4 l/h 57.6 KPa	730.6 l/h 108.9 KPa	575.5 l/h 67.6 KPa
	Water <b>D</b> P	25.6 KPa	31.0 KPa	36.9 KPa	43.3 KPa	50.2 KPa	57.6 KPa	108.9 KPa	67.6 KPa
	Water ΔP Heating W	25.6 KPa 681 W	31.0 KPa 749 W	36.9 KPa 817 W	43.3 KPa 886 W	50.2 KPa 954 W	57.6 KPa 1022 W	108.9 KPa 1405 W	67.6 KPa 1107 W
	Water ∆P Heating W Total Air I/s	25.6 KPa 681 W 140 l/s	31.0 KPa 749 W 154 l/s	36.9 KPa 817 W 168 l/s	43.3 KPa 886 W 182 l/s	50.2 KPa 954 W 196 l/s	57.6 KPa 1022 W 210 l/s	108.9 KPa 1405 W 224 I/s	67.6 KPa 1107 W 238 l/s
	Water ΔP Heating W	25.6 KPa 681 W	31.0 KPa 749 W	36.9 KPa 817 W	43.3 KPa 886 W	50.2 KPa 954 W	57.6 KPa 1022 W	108.9 KPa 1405 W	67.6 KPa 1107 W

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5  $^{\circ}\mathrm{C}$  above the average room for the values above.

#### Notations

Notations	
W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam l/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

Correction	Table	
Κ	Water W	
11	1.22	
10.5	1.17	
10	1.11	
9.5	1.06	
9	1.00	
8.5	0.94	
8	0.89	
7.5	0.83	
7	0.78	

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

The thermal data is based on 9.0 K between mean water and return air to the beam.

Return Air24.5 °CRoom Air24.0 °CPrimary Air14.0 °CSupply Water14.0 °CReturn Water17.0 °CSupply Water Heating45.0 °CReturn Water Heating35.0 °CStatement35.0 °C

Beam Length (mm)	Primary Air I/s	3 l/s	4 l/s	5 l/s	6 l/s	7 l/s				
1200	W/M	141 W	187 W	230 W	271 W	311 W				
	Throw m	0.3-0.9-1.6	0.5-1.2-2.1	0.6-1.5-2.6	0.7-1.8-3.1	0.8-2.1-3.6				
	Static Pa	36	64	100	144	196				
	dB(A)	<20	20	24	29	32				
	Water W	131 W	173 W	212 W	248 W	284 W				
	Water Flow	37.5 l/h	49.5 l/h	60.6 l/h	71.2 l/h	81.3 l/h				
	Water <b>D</b> P	0.1 KPa	0.2 KPa	0.4 KPa	0.5 KPa	0.7 KPa				
	Heating W	72 W	95 W	117 W	137 W	156 W				
	Total Air I/s	15 l/s	20 l/s	25 l/s	30 l/s	35 l/s				
	Primary Air W	38 W	51 W	64 W	77 W	90 W				
	Total W	169 W	224 W	276 W	325 W	373 W				
		5 l/s	6 l/s	7 l/s	8 l/s	9 l/s	10 l/s	11 l/s		
1800W/M	162 W	192 W	223 W	252 W	279 W	305 W	336 W			
	Throw m	0.4-1.1-1.8	0.5-1.3-2.2	0.6-1.5-2.5	0.6-1.7-2.9	0.7-1.9-3.2	0.8-2.0-3.5	0.9-2.2-3.8		
	Static Pa	44	64	87	114	144	178	215		
	dB(A)	23	26	26	31	34	36	37		
	Water W	227 W	270 W	311 W	352 W	388 W	421 W	463 W		
	Water Flow	65.1 l/h	77.3 l/h	89.2 l/h	100.9 l/h	111.1 l/h	120.7 l/h	132.8 l/h		
	Water <b>D</b> P	0.5 KPa	0.8 KPa	1.0 KPa	1.3 KPa	1.6 KPa	1.9 KPa	2.3 KPa		
	Heating W	125 W	149 W	172 W	194 W	214 W	232 W	255 W		
	Total Air I/s	25 l/s	30 l/s	35 l/s	40 l/s	45 l/s	50 l/s	55 l/s		
	Primary Air W	64 W	77 W	90 W	102 W	115 W	128 W	141 W		
	Total W	291 W	346 W	401 W	454 W	503 W	549 W	604 W		
		6 l/s	7 l/s	8 l/s	9 l/s	10 l/s	11 l/s	12 l/s	13 l/s	14 l/s
2400	W/M	151 W	176 W	200 W	223 W	245 W	268 W	290 W	314 W	332 W
	Throw m	0.4-1.0-1.7	0.4-1.2-2.0	0.5-1.3-2.3	0.6-1.5-2.5	0.6-1.6-2.8	0.7-1.8-3.1	0.7-1.9-3.3	0.8-2.1-3.6	0.9-2.2-3.8
	Static Pa	36	49	64	81	100	121	144	169	196
	dB(A)	23	24	26	28	30	33	35	36	38
	Water W	285 W	000.14/	07714/	419 W		500.14/	5 ( O ) N (		618 W
		200 VV	333 W	377 W	419 VV	461 W	502 W	542 W	587 W	010 10
	Water Flow	81.8 l/h	95.5 l/h	108.0 l/h	120.2 l/h	461 W 132.1 l/h	502 W 143.8 l/h	542 W 155.2 l/h	587 W 168.1 l/h	177.1 l/h
	Water Flow Water ΔP			-	-	-				
		81.8 l/h	95.5 l/h	108.0 l/h	120.2 l/h	132.1 l/h	143.8 l/h	155.2 l/h	168.1 l/h	177.1 l/h
	Water <b>D</b> P	81.8 l/h 1.1 KPa	95.5 l/h 1.5 KPa	108.0 l/h 2.0 KPa	120.2 l/h 2.4 KPa	132.1 l/h 2.9 KPa	143.8 l/h 3.5 KPa	155.2 l/h 4.1 KPa	168.1 l/h 4.8 KPa	177.1 l/h 5.3 KPa
	Water ΔP Heating W	81.8 l/h 1.1 KPa 157 W	95.5 l/h 1.5 KPa 184 W	108.0 l/h 2.0 KPa 208 W	120.2 l/h 2.4 KPa 231 W	132.1 l/h 2.9 KPa 254 W	143.8 l/h 3.5 KPa 277 W	155.2 l/h 4.1 KPa 298 W	168.1 l/h 4.8 KPa 323 W	177.1 l/h 5.3 KPa 341 W
	Water <b>∆</b> P Heating W Total Air I/s	81.8 l/h 1.1 KPa 157 W 30 l/s	95.5 l/h 1.5 KPa 184 W 35 l/s	108.0 l/h 2.0 KPa 208 W 40 l/s	120.2 l/h 2.4 KPa 231 W 45 l/s	132.1 l/h 2.9 KPa 254 W 50 l/s	143.8 l/h 3.5 KPa 277 W 55 l/s	155.2 l/h 4.1 KPa 298 W 60 l/s	168.1 l/h 4.8 KPa 323 W 65 l/s	177.1 l/h 5.3 KPa 341 W 70 l/s
	Water ∆P Heating W Total Air I/s Primary Air W	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W
3000	Water ∆P Heating W Total Air I/s Primary Air W	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W
3000	Water $\Delta P$ Heating W Total Air I/s Primary Air W Total W	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b>	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b>	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W 11 l/s	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W 12 l/s	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W <b>13 l/s</b>	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b>	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W <b>16 l/s</b>
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s 150 W	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W	120.2 <i>Vh</i> 2.4 KPa 231 W 45 <i>Vs</i> 115 W 535 W <b>11 <i>V</i>s</b> 204 W	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W <b>13 l/s</b> 241 W	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s 257 W	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b> 274 W	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W <b>16 l/s</b> 293 W
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s 150 W 0.4-1.0-1.7	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W <b>14 l/s</b> 257 W 0.7-1.7-2.9	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W 15 l/s 274 W 0.7-1.8-3.1	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W <b>16 l/s</b> 293 W 0.7-1.9-3.3
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw Static Pa	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s 150 W 0.4-1.0-1.7 41	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W 9 l/s 168 W 0.4-1.1-1.9 52	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W <b>14 l/s</b> 257 W 0.7-1.7-2.9 125	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W 15 l/s 274 W 0.7-1.8-3.1 144	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W <b>16 l/s</b> 293 W 0.7-1.9-3.3 164
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw Static Pa dB(A)	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s 150 W 0.4-1.0-1.7 41 22	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9 52 25	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64 28	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77 30	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92 32	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108 33	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W <b>14 l/s</b> 257 W 0.7-1.7-2.9 125 35	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W 15 l/s 274 W 0.7-1.8-3.1 144 37	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W 16 l/s 293 W 0.7-1.9-3.3 164 38
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw Static Pa dB(A) Water W	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W 8 l/s 150 W 0.4-1.0-1.7 41 22 426 W	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9 52 25 475 W	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64 28 527 W	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77 30 574 W	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92 32 620 W	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108 33 671 W	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s 257 W 0.7-1.7-2.9 125 35 715 W	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b> 274 W 0.7-1.8-3.1 144 37 758 W	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W 16 l/s 293 W 0.7-1.9-3.3 164 38
3000	Water ΔP     Heating W     Total Air I/s     Primary Air W     Total W     W/M     Throw     Static Pa     dB(A)     Water W     Water Flow	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W <b>8 l/s</b> 150 W 0.4-1.0-1.7 41 22 426 W 122.2 l/h	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9 52 25 475 W 136.0 l/h	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64 28 527 W 151.2 l/h	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77 30 574 W 164.5 l/h	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92 32 620 W 177.6 l/h	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108 33 671 W 192.4 l/h	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s 257 W 0.7-1.7-2.9 125 35 715 W 205.0 l/h	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b> 274 W 0.7-1.8-3.1 144 37 758 W 217.3 l/h	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W 16 l/s 293 W 0.7-1.9-3.3 164 38 809 W 231.8 l/h
3000	Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw Static Pa dB(A) Water W Water Flow Water ΔP	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W <b>8 l/s</b> 150 W 0.4-1.0-1.7 41 22 426 W 122.2 l/h 3.0 KPa	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9 52 25 475 W 136.0 l/h 3.8 KPa	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64 28 527 W 151.2 l/h 4.7 KPa	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77 30 574 W 164.5 l/h 5.5 KPa	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92 32 620 W 177.6 l/h 6.4 KPa	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108 33 671 W 192.4 l/h 7.6 KPa	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s 257 W 0.7-1.7-2.9 125 35 715 W 205.0 l/h 8.6 KPa	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b> 274 W 0.7-1.8-3.1 144 37 758 W 217.3 l/h 9.6 KPa	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W 16 l/s 293 W 0.7-1.9-3.3 164 38 809 W 231.8 l/h 11.0 KPa
3000	Water ΔP     Heating W     Total Air I/s     Primary Air W     Total W     W/M     Throw     Static Pa     dB(A)     Water W     Water Flow     Water ΔP     Heating W	81.8 l/h 1.1 KPa 157 W 30 l/s 77 W 362 W <b>8 l/s</b> 150 W 0.4-1.0-1.7 41 22 426 W 122.2 l/h 3.0 KPa 235 W	95.5 l/h 1.5 KPa 184 W 35 l/s 90 W 423 W <b>9 l/s</b> 168 W 0.4-1.1-1.9 52 25 475 W 136.0 l/h 3.8 KPa 262 W	108.0 l/h 2.0 KPa 208 W 40 l/s 102 W 479 W <b>10 l/s</b> 187 W 0.5-1.2-2.1 64 28 527 W 151.2 l/h 4.7 KPa 291 W	120.2 l/h 2.4 KPa 231 W 45 l/s 115 W 535 W <b>11 l/s</b> 204 W 0.5-1.3-2.3 77 30 574 W 164.5 l/h 5.5 KPa 316 W	132.1 l/h 2.9 KPa 254 W 50 l/s 128 W 589 W <b>12 l/s</b> 222 W 0.6-1.5-2.5 92 32 620 W 177.6 l/h 6.4 KPa 342 W	143.8 l/h 3.5 KPa 277 W 55 l/s 141 W 643 W 13 l/s 241 W 0.6-1.6-2.7 108 33 671 W 192.4 l/h 7.6 KPa 370 W	155.2 l/h 4.1 KPa 298 W 60 l/s 154 W 695 W 14 l/s 257 W 0.7-1.7-2.9 125 35 715 W 205.0 l/h 8.6 KPa 394 W	168.1 l/h 4.8 KPa 323 W 65 l/s 167 W 753 W <b>15 l/s</b> 274 W 0.7-1.8-3.1 144 37 758 W 217.3 l/h 9.6 KPa 418 W	177.1 l/h 5.3 KPa 341 W 70 l/s 179 W 797 W 16 l/s 293 W 0.7-1.9-3.3 164 38 809 W 231.8 l/h 11.0 KPa 446 W

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5  $^{\circ}\mathrm{C}$  above the average room for the values above.

#### Notations

Notations	
W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam l/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

Correction	Table	
K	Water W	
11	1.22	
10.5	1.17	
10	1.11	
9.5	1.06	
9	1.00	
8.5	0.94	
8	0.89	
7.5	0.83	
7	0.78	

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

The thermal data is based on 9.0 K between mean water and return air to the beam.

Return Air24.5 °CRoom Air24.0 °CPrimaSupply Water Heating45.0 °CReturn

Primary Air 14.0 °C Supply Water 14.0 °C Return Water 17.0 °C Return Water Heating 35.0 °C

Beam Length (mm)	Primary Air I/s	6 l/s	8 l/s	10 l/s	12 l/s	14 l/s	16 l/s		
1200	W/M	244 W	322 W	399 W	475 W	548 W	621 W		
	Throw m	0.6-1.6-2.8	0.8-2.2-3.7	1.0-2.7-4.6	1.2-3.2-5.5	1.4-3.7-6.3	1.6-4.2-7.2		
	Static Pa	36	64	100	144	196	256		
	dB(A)	28	34	40	44	49	53		
	Water W	216 W	284 W	351 W	416 W	479 W	540 W		
	Water Flow	61.9 l/h	81.5 l/h	100.6 l/h	119.2 l/h	137.2 l/h	154.8 l/h		
	Water ∆P	0.4 KPa	0.7 KPa	1.0 KPa	1.4 KPa	1.9 KPa	2.4 KPa		
	Heating W	119 W	157 W	193 W	229 W	264 W	298 W		
	Total Air I/s	25 l/s	34 l/s	42 l/s	50 l/s	59 l/s	67 l/s		
	Primary Air W	77 W	102 W	128 W	154 W	179 W	205 W		
	Total W	293 W	387 W	479 W	570 W	658 W	745 W		
		10 l/s	12 l/s	14 l/s	16 l/s	18 l/s	20 l/s	22 l/s	24 l/s
1800	W/M	279 W	332 W	387 W	438 W	488 W	538 W	591 W	639 W
	Throw m	0.7-1.9-3.2	0.9-2.2-3.8	1.0-2.6-4.4	1.1-2.9-5.0	1.3-3.3-5.6	1.4-3.6-6.2	1.6-4.0-6.8	1.7-4.3-7.4
	Static Pa	44	64	87	114	144	178	215	256
	dB(A)	32	37	40	45	48	51	53	56
	Water W	374 W	444 W	518 W	584 W	649 W	711 W	782 W	842 W
	Water Flow	107.3 l/h	127.2 l/h	148.4 l/h	167.4 l/h	185.9 l/h	203.9 l/h	224.3 l/h	241.4 l/h
	Water <b>D</b> P	1.5 KPa	2.1 KPa	2.8 KPa	3.6 KPa	4.5 KPa	5.4 KPa	6.5 KPa	7.5 KPa
	Heating W	206 W	245 W	285 W	322 W	357 W	392 W	431 W	464 W
	Total Air I/s	42 l/s	50 l/s	59 l/s	67 l/s	76 l/s	84 l/s	92 l/s	101 l/s
	Primary Air W	128 W	154 W	179 W	205 W	231 W	256 W	282 W	307 W
	Total W	503 W	597 W	697 W	789 W	879 W	968 W	1064 W	1150 W
		16 l/s	18 l/s	20 l/s	22 l/s	24 l/s	26 l/s	28 l/s	
2400	W/M	344 W	387 W	426 W	468 W	506 W	548 W	584 W	
2100	V V/ IVI	077 **	307 VV	420 VV	400 11	000 11	040 11	004 00	
2100	Throw m	0.9-2.3-3.9	1.0-2.6-4.4	1.1-2.9-4.9	1.2-3.1-5.4	1.3-3.4-5.8	1.4-3.7-6.3	1.5-3.9-6.7	
2100									
2.00	Throw m	0.9-2.3-3.9 64 40	1.0-2.6-4.4	1.1-2.9-4.9 100 45	1.2-3.1-5.4	1.3-3.4-5.8 144 50	1.4-3.7-6.3	1.5-3.9-6.7 196 58	
2.00	Throw m Static Pa	0.9-2.3-3.9 64	1.0-2.6-4.4 81	1.1-2.9-4.9 100	1.2-3.1-5.4 121	1.3-3.4-5.8 144	1.4-3.7-6.3 169	1.5-3.9-6.7 196	
	Throw m Static Pa dB(A)	0.9-2.3-3.9 64 40	1.0-2.6-4.4 81 44	1.1-2.9-4.9 100 45	1.2-3.1-5.4 121 48	1.3-3.4-5.8 144 50	1.4-3.7-6.3 169 54	1.5-3.9-6.7 196 58	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP	0.9-2.3-3.9 64 40 620 W	1.0-2.6-4.4 81 44 697 W	1.1-2.9-4.9 100 45 765 W	1.2-3.1-5.4 121 48 842 W	1.3-3.4-5.8 144 50 906 W	1.4-3.7-6.3 169 54 982 W	1.5-3.9-6.7 196 58 1044 W	
	Throw m Static Pa dB(A) Water W Water Flow	0.9-2.3-3.9 64 40 620 W 177.7 l/h	1.0-2.6-4.4 81 44 697 W 199.9 l/h	1.1-2.9-4.9 100 45 765 W 219.3 l/h	1.2-3.1-5.4 121 48 842 W 241.2 l/h	1.3-3.4-5.8 144 50 906 W 259.8 l/h	1.4-3.7-6.3 169 54 982 W 281.5 l/h	1.5-3.9-6.7 196 58 1044 W 299.2 l/h	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa	
	Throw m Static Pa dB(A) Water W Water Flow Water <b>Δ</b> P Heating W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W	
	Throw m Static Pa dB(A) Water W Water Flow Water <b>Δ</b> P Heating W Total Air I/s	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W <b>20 l/s</b>	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b>	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b>	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b>	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b>	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b>	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b>	
3000	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W <b>20 l/s</b> 375 W	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W 24 l/s 445 W	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W <b>20 l/s</b>	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b>	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b>	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b>	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b>	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b>	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b>	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 201/s 375 W 1.0-2.5-4.3 64	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b> 445 W 1.2-3.0-5.1 92	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A)	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77 46	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W 24 l/s 445 W 1.2-3.0-5.1 92 49	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144 58	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77 46 955 W	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b> 445 W 1.2-3.0-5.1 92 49 1028 W	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54 1200 W	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144 58 1269 W	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W	
	Throw m Static Pa dB(A) Water W Water Flow Water <b>Δ</b> P Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W 248.8 l/h	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W 22 l/s 412 W 1.1-2.8-4.7 77 46 955 W 273.7 l/h	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W 24 l/s 445 W 1.2-3.0-5.1 92 49 1028 W 294.8 l/h	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W 319.3 l/h	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54 1200 W 343.9 l/h	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W 30 l/s 551 W 1.5-3.7-6.3 144 58 1269 W 363.7 l/h	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W 388.0 l/h	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow Water ΔP	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W 248.8 l/h 12.6 KPa	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77 46 955 W 273.7 l/h 15.3 KPa	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b> 445 W 1.2-3.0-5.1 92 49 1028 W 294.8 l/h 17.7 KPa	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W 319.3 l/h 20.8 KPa	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54 1200 W 343.9 l/h 24.1 KPa	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144 58 1269 W 363.7 l/h 27.0 KPa	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W 388.0 l/h 30.7 KPa	
	Throw m Static Pa dB(A) Water W Water Flow Water <b>Δ</b> P Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W 248.8 l/h	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W 22 l/s 412 W 1.1-2.8-4.7 77 46 955 W 273.7 l/h	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W 24 l/s 445 W 1.2-3.0-5.1 92 49 1028 W 294.8 l/h	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W 319.3 l/h	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W 28 l/s 519 W 1.4-3.5-6.0 125 54 1200 W 343.9 l/h	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W 30 l/s 551 W 1.5-3.7-6.3 144 58 1269 W 363.7 l/h	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W 388.0 l/h	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow Water Flow Water ΔP Heating W Total Air I/s	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W 248.8 l/h 12.6 KPa 478 W 84 l/s	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77 46 955 W 273.7 l/h 15.3 KPa 526 W 92 l/s	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b> 445 W 1.2-3.0-5.1 92 49 1028 W 294.8 l/h 17.7 KPa 567 W 101 l/s	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W 319.3 l/h 20.8 KPa 614 W 109 l/s	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54 1200 W 343.9 l/h 24.1 KPa 661 W 118 l/s	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144 58 1269 W 363.7 l/h 27.0 KPa 699 W 126 l/s	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W 388.0 l/h 30.7 KPa 746 W 134 l/s	
	Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow Water ΔP Heating W	0.9-2.3-3.9 64 40 620 W 177.7 l/h 5.3 KPa 342 W 67 l/s 205 W 825 W 825 W 20 l/s 375 W 1.0-2.5-4.3 64 43 868 W 248.8 l/h 12.6 KPa 478 W	1.0-2.6-4.4 81 44 697 W 199.9 l/h 6.7 KPa 384 W 76 l/s 231 W 928 W <b>22 l/s</b> 412 W 1.1-2.8-4.7 77 46 955 W 273.7 l/h 15.3 KPa 526 W	1.1-2.9-4.9 100 45 765 W 219.3 l/h 8.1 KPa 422 W 84 l/s 256 W 1021 W <b>24 l/s</b> 445 W 1.2-3.0-5.1 92 49 1028 W 294.8 l/h 17.7 KPa 567 W	1.2-3.1-5.4 121 48 842 W 241.2 l/h 9.8 KPa 464 W 92 l/s 282 W 1124 W <b>26 l/s</b> 482 W 1.3-3.2-5.6 108 51 1114 W 319.3 l/h 20.8 KPa 614 W	1.3-3.4-5.8 144 50 906 W 259.8 l/h 11.4 KPa 500 W 101 l/s 307 W 1214 W <b>28 l/s</b> 519 W 1.4-3.5-6.0 125 54 1200 W 343.9 l/h 24.1 KPa 661 W	1.4-3.7-6.3 169 54 982 W 281.5 l/h 13.4 KPa 541 W 109 l/s 333 W 1315 W <b>30 l/s</b> 551 W 1.5-3.7-6.3 144 58 1269 W 363.7 l/h 27.0 KPa 699 W	1.5-3.9-6.7 196 58 1044 W 299.2 l/h 15.1 KPa 575 W 118 l/s 359 W 1402 W <b>32 l/s</b> 588 W 1.6-4.0-6.8 164 60 1354 W 388.0 l/h 30.7 KPa 746 W	

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5  $^{\circ}\mathrm{C}$  above the average room for the values above.

#### Notations

Notations	
W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam l/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

Correction Table			
K	Water W		
11	1.22		
10.5	1.17		
10	1.11		
9.5	1.06		
9	1.00		
8.5	0.94		
8	0.89		
7.5	0.83		
7	0.78		

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

The thermal data is based on 9.0 K between mean water and return air to the beam.

Return Air24.5 °CRoom Air24.0 °CPrimary AirSupply Water Heating45.0 °CReturn Water

Primary Air 14.0 °C Supply Water 14.0 °C Return Water 17.0 °C Return Water Heating 35.0 °C

Beam Length (mm)	Primary Air I/s	10 l/s	13 l/s	16 l/s	19 l/s	22 l/s	25 l/s		
1200	W/M	339 W	441 W	537 W	630 W	705 W	783 W		
	Throw m	0.9-2.3-3.9	1.2-3.0-5.1	1.4-3.6-6.2	1.7-4.3-7.3	1.9-4.8-8.1	2.1-5.3-9.0		
	Static Pa	44	75	114	160	215	278		
	dB(A)	31	37	42	48	53	57		
	Water W	279 W	363 W	439 W	513 W	564 W	619 W		
	Water Flow	80.0 l/h	104.0 l/h	125.9 l/h	147.0 l/h	161.7 l/h	177.3 l/h		
	Water <b>D</b> P	0.6 KPa	1.1 KPa	1.6 KPa	2.2 KPa	2.6 KPa	3.1 KPa		
	Heating W	154 W	200 W	242 W	283 W	311 W	341.0 KPa		
	Total Air I/s	34 l/s	44 l/s	54 l/s	65 l/s	75 l/s	85 l/s		
	Primary Air W	128 W	167 W	205 W	243 W	282 W	320 W		
	Total W	407 W	529 W	644 W	756 W	846 W	939 W		
		16 l/s	19 l/s	22 l/s	25 l/s	28 l/s	31 l/s	34 l/s	
1800	W/M	372 W	441 W	505 W	574 W	636 W	688 W	746 W	
	Throw m	1.0-2.5-4.3	1.2-3.0-5.1	1.3-3.4-5.8	1.5-3.9-6.6	1.7-4.3-7.3	1.8-4.7-7.9	2.0-5.0-8.6	
	Static Pa	51	71	96	123	155	190	228	
	dB(A)	45	42	45	50	52	55	60	
	Water W	464 W	551 W	628 W	714 W	786 W	841 W	907 W	
	Water Flow	133.1 l/h	158.0 l/h	180.0 l/h	204.6 l/h	225.3 l/h	241.2 l/h	260.0 l/h	
	Water <b>D</b> P	2.3 KPa	3.2 KPa	4.2 KPa	5.4 KPa	6.6 KPa	7.5 KPa	8.7 KPa	
	Heating W	256 W	304 W	346 W	393 W	433 W	464 W	500 W	
	Total Air I/s	54 l/s	65 l/s	75 l/s	85 l/s	95 l/s	105 l/s	116 l/s	
	Primary Air W	205 W	243 W	282 W	320 W	359 W	397 W	436 W	
	Total W	669 W	795 W	910 W	1034 W	1145 W	1239 W	1343 W	
		22 l/s	25 l/s	28 l/s	31 l/s	34 l/s	37 l/s	40 l/s	43 l/s
2400	W/M	396 W	450 W	504 W	552 W	598 W	651 W	696 W	739 W
	Throw m	1.0-2.7-4.6	1.2-3.0-5.2	1.3-3.4-5.8	1.5-3.7-6.4	1.6-4.0-6.9	1.7-4.4-7.5	1.9-4.7-8.0	2.0-5.0-8.5
	Static Pa	54	69	87	107	128	152	178	205
	dB(A)	42	47	50	52	56	58	61	64
									1000.14/
	Water W	669 W	760 W	852 W	928 W	1001 W	1089 W	1158 W	1223 W
	Water W Water Flow	669 W 191.8 l/h	760 W 217.9 l/h	852 W 244.1 l/h	928 W 265.8 l/h	1001 W 286.8 l/h	1089 W 312.1 l/h	1158 W 331.8 l/h	350.6 l/h
	Water Flow	191.8 l/h	217.9 l/h	244.1 l/h	265.8 l/h	286.8 l/h	312.1 l/h	331.8 l/h	350.6 l/h
	Water Flow Water ΔP	191.8 l/h 6.2 KPa	217.9 l/h 8.0 KPa	244.1 l/h 10.0 KPa	265.8 l/h 11.9 KPa	286.8 l/h 13.9 KPa	312.1 l/h 16.4 KPa	331.8 l/h 18.6 KPa	350.6 l/h 20.7 KPa
	Water Flow Water <b>∆</b> P Heating W	191.8 l/h 6.2 KPa 369 W	217.9 l/h 8.0 KPa 419 W	244.1 l/h 10.0 KPa 469 W	265.8 l/h 11.9 KPa 511 W	286.8 l/h 13.9 KPa 551 W	312.1 l/h 16.4 KPa 600 W	331.8 l/h 18.6 KPa 638 W	350.6 l/h 20.7 KPa 674 W
	Water Flow Water ΔP Heating W Total Air I/s	191.8 l/h 6.2 KPa 369 W 75 l/s	217.9 l/h 8.0 KPa 419 W 85 l/s	244.1 l/h 10.0 KPa 469 W 95 l/s	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W	286.8 l/h 13.9 KPa 551 W 116 l/s	312.1 l/h 16.4 KPa 600 W 126 l/s	331.8 l/h 18.6 KPa 638 W 136 l/s	350.6 l/h 20.7 KPa 674 W 146 l/s
	Water Flow Water ΔP Heating W Total Air I/s Primary Air W	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W	265.8 l/h 11.9 KPa 511 W 105 l/s	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b>	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b>	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b>	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b>	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W <b>40 l/s</b>	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W <b>43 l/s</b>	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W 46 l/s	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W 49 l/s
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W 46 l/s 702 W	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W 1.7-4.4-7.6	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W 46 l/s 702 W 1.9-4.7-8.1	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W 1.7-4.4-7.6 131	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W 46 l/s 702 W 1.9-4.7-8.1 150	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A)	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114 58	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W 1.7-4.4-7.6 131 60	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46 954 W	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50 1056 W	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54 1158 W	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54 1240 W	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114 58 1340 W	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W 1.7-4.4-7.6 131 60 1417 W	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63 1516 W 434.6 l/h	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65 1588 W 455.2 l/h
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water V Water Flow Water ΔP	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46 954 W 273.3 l/h	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50 1056 W 302.6 l/h	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54 1158 W 331.9 l/h	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54 1240 W 355.4 l/h	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114 58 1340 W 384.2 l/h	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W <b>43 l/s</b> 656 W 1.7-4.4-7.6 131 60 1417 W 406.2 l/h	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63 1516 W	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water W Water Flow	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46 954 W 273.3 l/h 15.2 KPa	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50 1056 W 302.6 l/h 18.7 KPa	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54 1158 W 331.9 l/h 22.5 KPa	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54 1240 W 355.4 l/h 25.8 KPa	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W <b>40 l/s</b> 618 W 1.6-4.2-7.1 114 58 1340 W 384.2 l/h 30.1 KPa	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W <b>43 l/s</b> 656 W 1.7-4.4-7.6 131 60 1417 W 406.2 l/h 33.7 KPa	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63 1516 W 434.6 l/h 38.5 KPa	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65 1588 W 455.2 l/h 42.3 KPa
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water V Water Klow Water Flow Water ΔP Heating W	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46 954 W 273.3 l/h 15.2 KPa 526 W	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50 1056 W 302.6 l/h 18.7 KPa 582 W	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54 1158 W 331.9 l/h 22.5 KPa 638 W	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54 1240 W 355.4 l/h 25.8 KPa 683 W	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114 58 1340 W 384.2 l/h 30.1 KPa 739 W	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W <b>43 l/s</b> 656 W 1.7-4.4-7.6 131 60 1417 W 406.2 l/h 33.7 KPa 781 W	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63 1516 W 434.6 l/h 38.5 KPa 836 W	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65 1588 W 455.2 l/h 42.3 KPa 875 W
3000	Water Flow Water ΔP Heating W Total Air I/s Primary Air W Total W W/M Throw m Static Pa dB(A) Water Pa Water Flow Water Flow Water ΔP Heating W Total Air I/s	191.8 l/h 6.2 KPa 369 W 75 l/s 282 W 951 W <b>28 l/s</b> 437 W 1.1-2.9-5.0 56 46 954 W 273.3 l/h 15.2 KPa 526 W 89 l/s	217.9 l/h 8.0 KPa 419 W 85 l/s 320 W 1081 W <b>31 l/s</b> 484 W 1.3-3.3-5.6 68 50 1056 W 302.6 l/h 18.7 KPa 582 W 104 l/s	244.1 l/h 10.0 KPa 469 W 95 l/s 359 W 1210 W <b>34 l/s</b> 531 W 1.4-3.6-6.1 82 54 1158 W 331.9 l/h 22.5 KPa 638 W 119 l/s	265.8 l/h 11.9 KPa 511 W 105 l/s 397 W 1325 W <b>37 l/s</b> 571 W 1.5-3.9-6.6 97 54 1240 W 355.4 l/h 25.8 KPa 683 W 135 l/s	286.8 l/h 13.9 KPa 551 W 116 l/s 436 W 1436 W 40 l/s 618 W 1.6-4.2-7.1 114 58 1340 W 384.2 l/h 30.1 KPa 739 W 152 l/s	312.1 l/h 16.4 KPa 600 W 126 l/s 474 W 1563 W 43 l/s 656 W 1.7-4.4-7.6 131 60 1417 W 406.2 l/h 33.7 KPa 781 W 169 l/s	331.8 l/h 18.6 KPa 638 W 136 l/s 512 W 1670 W <b>46 l/s</b> 702 W 1.9-4.7-8.1 150 63 1516 W 434.6 l/h 38.5 KPa 836 W 187 l/s	350.6 l/h 20.7 KPa 674 W 146 l/s 551 W 1774 W <b>49 l/s</b> 739 W 2.0-5.0-8.5 171 65 1588 W 455.2 l/h 42.3 KPa 875 W 206 l/s

Recommended maximum heating capacity for the above beams is equal to 50% of the indicated cooling potential.

The return air to the beam is taken as 0.5  $^{\circ}\mathrm{C}$  above the average room for the values above.

#### Notations

Notations	
W/M	Cooling capacity per linear meter
Throw m	Throw values are to 0.75 - 0.5 - and 0.25 m/s respectively.
Static Pa	Static pressure in beam plenum chamber Pascal's
dB(A)	Air regenerated sound power level
Water W	Cooling output of coil Watts
Water Flow	Water flow rate I/h
Water $\Delta P$	Coil pressure drop kPa
Total Air I/s	Total discharge air volume from beam l/s
Primary Air W	Cooling capacity of the primary air Watts
Total W	Total cooling capacity of the chilled beam Watts

Correction Table			
Κ	Water W		
11	1.22		
10.5	1.17		
10	1.11		
9.5	1.06		
9	1.00		
8.5	0.94		
8	0.89		
7.5	0.83		
7	0.78		

dB(A)	m/s
40	4
35	3.5
30	3
25	2.5
20	2
20	2

The sound power dB(A) levels are achieved by limiting the primary air spigot velocity as per the table above.

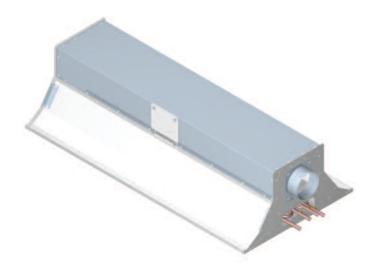
The thermal data is based on 9.0 K between mean water and return air to the beam.

## Active Chilled Beams

Nominal Size	Dim A (mm)	Wet Weight (Kg)
1200	1196.2	32
1800	1796.2	44
2400	2396.2	57
3000	2996.2	69







## Active Chilled Beams - Specification

## Frame & Casing

The frame is manufactured from 1.6mm thick galvanised mild steel and suitable for most ceiling types. The plenum section is fitted to the top of the unit manufactured from 1.0mm galvanised mild steel with a spigot connection mounted on the side or the end.

Fixed hanger supports brackets are mounted on the top of the unit as standard. Adjustable sliding brackets <sup>4</sup> are available as an option.

The unit is supplied with a powder coated finish RAL 9010 Semi Gloss as standard other colours are available as an option.

### Access Panel

Access panel is manufactured from 1.0mm thick galvanised mild steel.

The free area of the perforated sections are 50% & the whole size of the perforations is approx. 4.8.mm. The access panel has safety wires that are attached to the main body of the unit. These are designed to stop the panel falling & can also be used to suspend the panel for access to the coil for maintenance.

## Coil

Manufactured from copper tubes with mechanically bonded aluminium fins. Available in both 2 pipe, cooling only & 4 pipe, heating & cooling. The coil is supported at either end of the unit, on longer units the coil is also supported in the middle. Coils are supplied as standard with vent & drain points.

## Controls

Controls, including water valves can be factory fitted as required on individual projects. Free issue components can be fitted and/or full control packages can be supplied.

## Other products from Advanced Air

### Air Distribution Equipment

- Grilles and diffusers including louvre face diffusers
- Linear slot diffusers
- Linear bar grilles
- Eggcrate grilles and door transfer grilles
- A variety of finishes, powder coated to RAL9010 as standard, with other colours available
- Floor swirl diffusers which supply a low velocity, helical discharge air pattern
- "Twister" ceiling swirl diffuser
- External weather louvers suitable for most wall configurations

### VAV Terminal Units

- Single duct and dual duct units for different types of variable air volume systems
- Fan Powered VAV units that use advance Brushless DC motors to give lower energy consumption and simpler commissioning

### Air Control Products

- Low leakage fire smoke dampers, tested to BS ISO 10294
- Smoke and high temperature smoke dampers, which can be used up to 300°C for 120 minutes
- Curtain fire dampers provide a wide range of models suitable for most applications
- Control dampers from value solutions to a low leakage, low pressure drop, airfoil blade type

### Control Panels

- Fire smoke damper control panels are available to provide solutions to suit all requirements
- Bespoke units, which can be manufactured to suit specific customer requirements

For more information on these products, please contact Advanced Air Sales



# Advanced Air N

Burrell Way, Thetford, Norfolk, IP24 3QU, England. Sales Tel: +44 (0) 1842 855566 Fax: +44 (0) 1842 855546 email: sales@advancedair.co.uk

Customer Services Tel: +44 (0) 1842 753624 Fax: +44 (0) 1842 762032

website: www.advancedair.co.uk



Committed to reducing YOUR carbon footprint