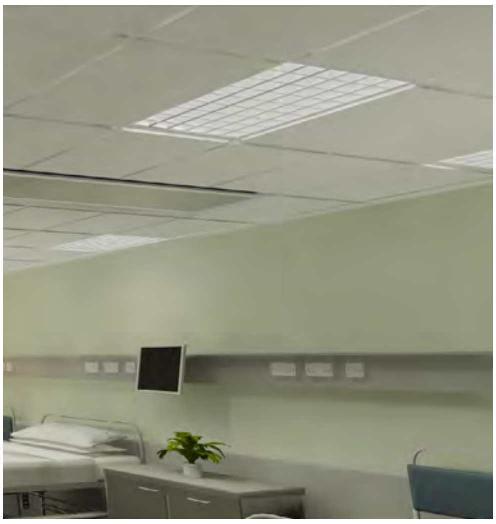
the future of space conditioning

Eco-Healthcare HQ™

active chilled beam





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Product Description

Eco-Healthcare HQ is one of Frenger's latest range of high performance Chilled Beams. Energy efficiency has been a key driver for such advancements in Frenger's Chilled Beam Technology.

Eco-Healthcare HQ is 230mm deep as standard and can be increased to **270mm for higher air volumes**.
Eco-Healthcare HQ can achieve **1121 watts per meter total cooling** (based on 10∆tk and 25 litrs/sec/m for a beam supplied at 16°C with a 100Pa).

The Eco-Healthcare HQ is constructed from "High Quality" extruded aluminium side profiles, powdercoat finish to all visible components that not only makes for a robust product that has precision interfaces, but also enhances performance. This beam also contains a number of **Frenger's Patent pending performance enhancing features** and as can be expected from the Frenger brand, the Eco-Healthcare HQ beam is also designed to be easily tailored to suit the unique parameters of individual project sites, for the optimum product / system efficiencies. This is partly achieved by Frenger's "burst nozzle" arrangement that not only encourages induction, but also reduces noise. Given the size and amount of burst nozzles being appropriately quantified for each project, this provides consistent jet velocities, equal distribution of the air discharge and continuous induction through the entire length of the heat exchanger (battery). There are no dead spots due to plugging back nozzles in the system to suit the amount of open standard nozzles sizes as associated with many competitors' active beams as dead spots and / or reduced jet velocities decrease their cooling capacities / efficiencies.

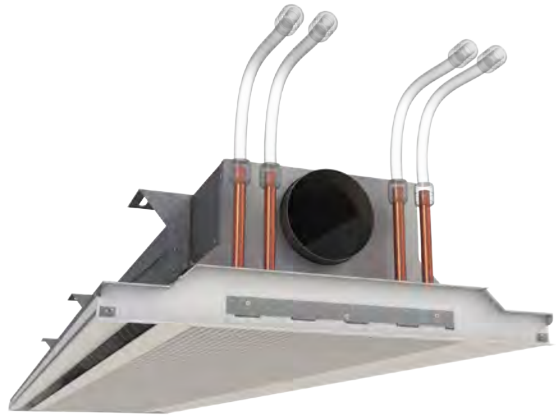
Frenger's heat exchanger batteries are also fitted with extruded aluminium profiles to not only enhance performance but also provide a continuous clip on facility for the underplate. This arrangement keeps the underplates true and flat for long lengths, even up to 3.6m.

Eco-Healthcare HQ is designed with hospital / healthcare environments in mind. The fin coil battery element can easily be lowered to allow cleaning of all four sides. Eco-Healthcare HQ units are **"powdercoat" finished** in RAL 9010 (20% Gloss) White as standard

Eco-Healthcare HQ is available in any length from 1.2m up to 3.6m in 0.1m increments and is constructed from a combination of zinc coated mild steel for non critical components, extruded aluminium where precision and a high quality robust construction is required.

The air chamber for Eco-Healthcare HQ is the largest in Frenger's product range and can accommodate up to 90 ltrs/sec with its 160mm diameter single air inlet connection point.

Eco-Healthcare HQ beams have a "closed back", thus meaning that all induced air (recirculated room air) is induced through the underplate within the room space to avoid any need for perimeter flash gaps and / or openings in the ceiling system. This also provides for a better quality of recirculated air as the recirculated air does not mix with any air from the ceiling void. The induction ratio of Eco-Healthcare HQ is typically 5 times that of the supply air (fresh air) rate.



In addition to Eco-Healthcare HQ's high cooling performance capability of in excess of 1000 watts per meter, **Eco-Healthcare HQ can operate well and induce at low air volumes, as little as 3 l/s/m and even with a low static pressure of just 40Pa. Likewise Eco-Healthcare HQ can handle high air volumes up to 30 l/s/m and up to 120Pa**. Please note however that there high air volumes should be avoided wherever possible and are the absolute maximum and should not ever be exceeded. As a "rule of thumb" 25 ltrs/sec/m from a 2 way discharge beam is the maximum for occupancy comfort compliance to BS EN 7730.

Eco-Healthcare HQ can have integrated heating with separate connections (2 pipe connections for cooling and 2 pipes for heating).

The maximum total supply air for the product is limited to 90 ltrs/sec, which equates to 25 ltrs/sec/m for a 3.6m long beam.

At a glance

- Drop down heat exchange battery for easy cleaning to all four sides of the heat exchanger.
- High output "**1121 W/m**".
- Can accommodate up to 90 ltrs/sec.
- Optimise discharge nozzles sizes and pitch factory set to best suit project requirements.
- Coanda effect is initiated within the beam.
- Discharge veins are concealed within the beam for improved aesthetics.
- **Fan shape distribution for increased occupancy comfort**.
- **Unique fast fixing of removable underplates that prevents any sagging even on long beam lengths of 3.6m**.
- **Various different perforation patterns available for removable underplates**.
- **Multiple manifold variants to enable reduced chilled** (and LTHW, if applicable) **water mass flow rates to be facilitated for increased energy efficiencies**.
- Operates well at "**Low Pressure**" and "**Low Air Volume**" for **increased energy efficiencies**.
- Provides indoor climate **in accordance with BS EN ISO 7730**.

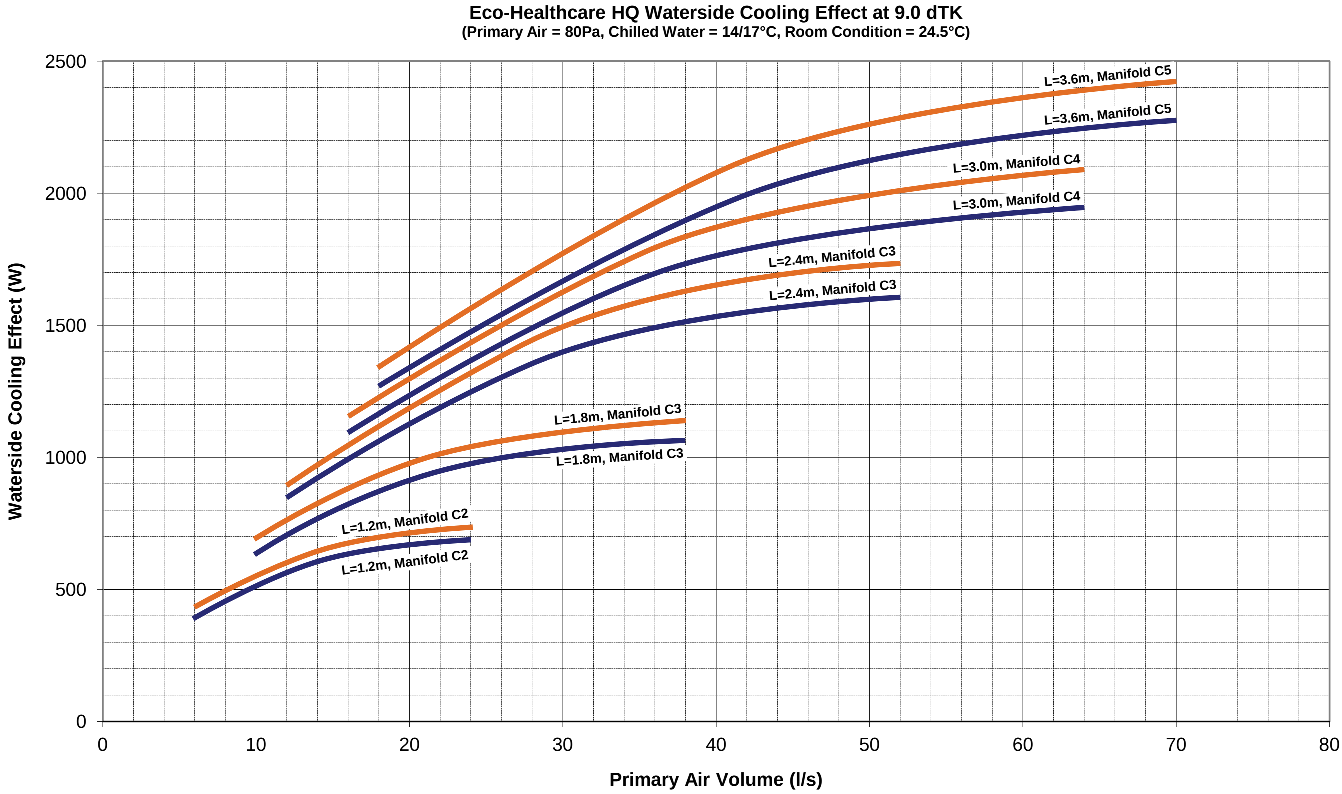
Hygiene

It is important to clean the product to ensure that it looks its best, that it operates at an optimum level, that it will last as long as possible and that it does not present an infection control risk. During development of the Frenger Eco-Healthcare HQ chilled beam the ease of cleaning was of the highest priority.

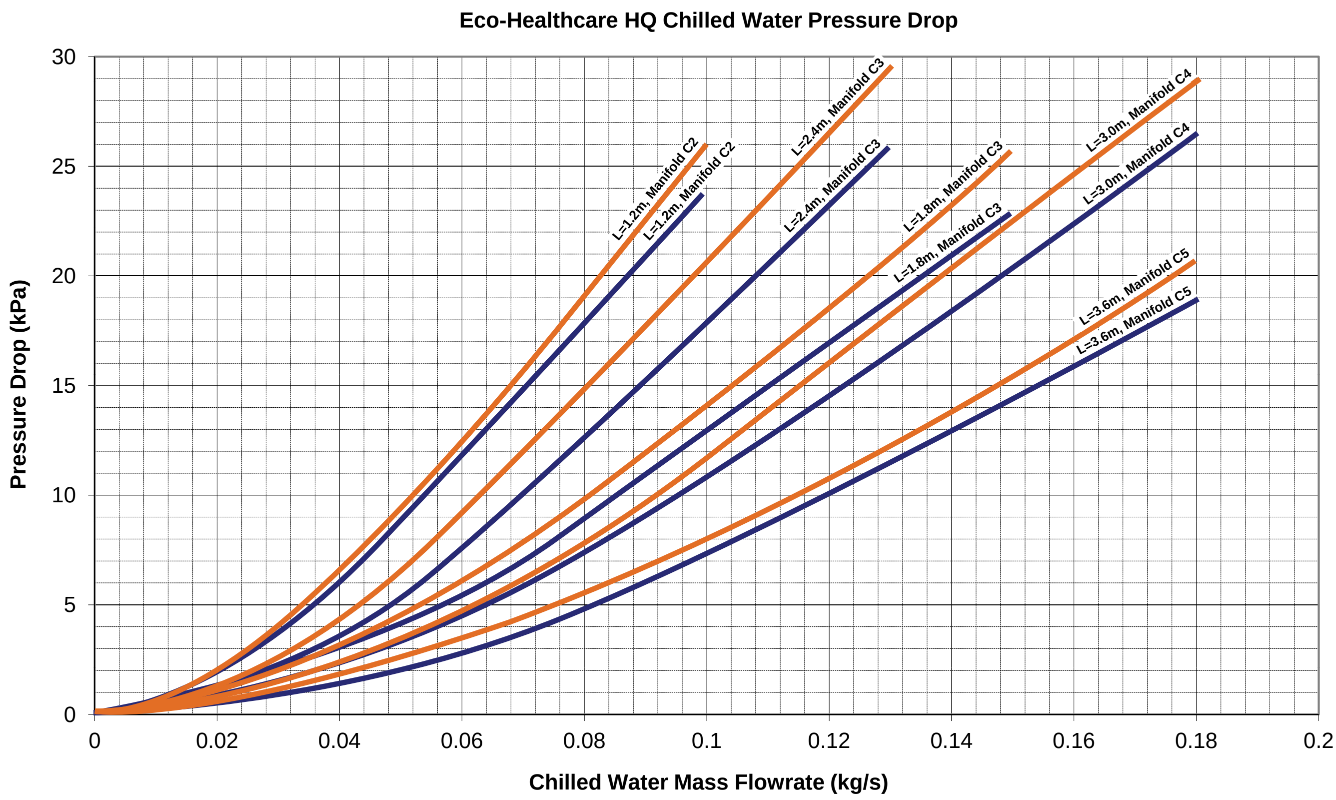
The underplate to the Eco-Healthcare HQ is simple to lower or totally remove. The underplate hooks onto a patent pending extruded aluminium section which is part of the fin coil battery. When “joggled” off the extrusion the underplate can hang on the factory fitted safety cords.

When the underplate is either hanging down on the safety cords or totally removed, the fin coil battery is accessible from below. The fin coil battery can be easily lowered by the removal of four retaining screws (pozi headed screwdriver) to enable 60mm clearance behind the fin coil battery and ample clearance to both sides where air pases.

Cooling Performance

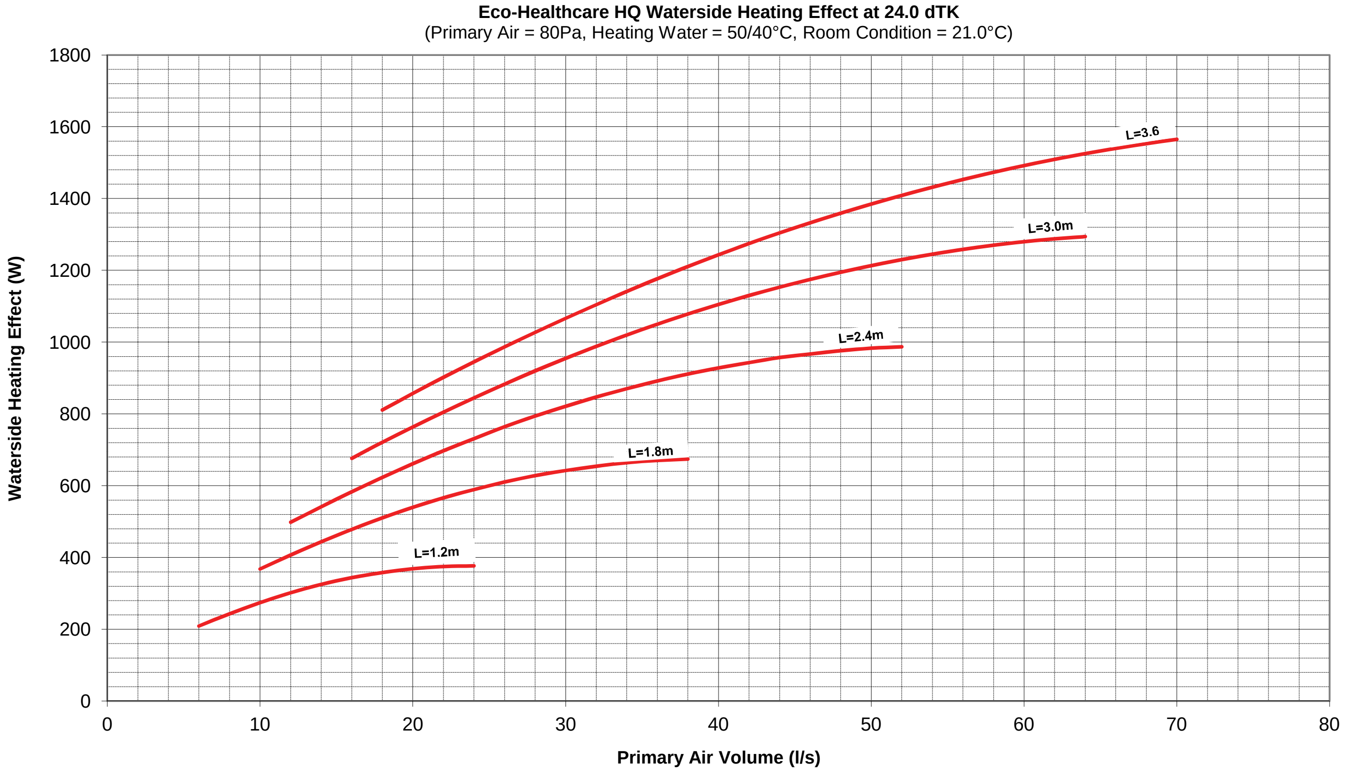


Pressure Drop

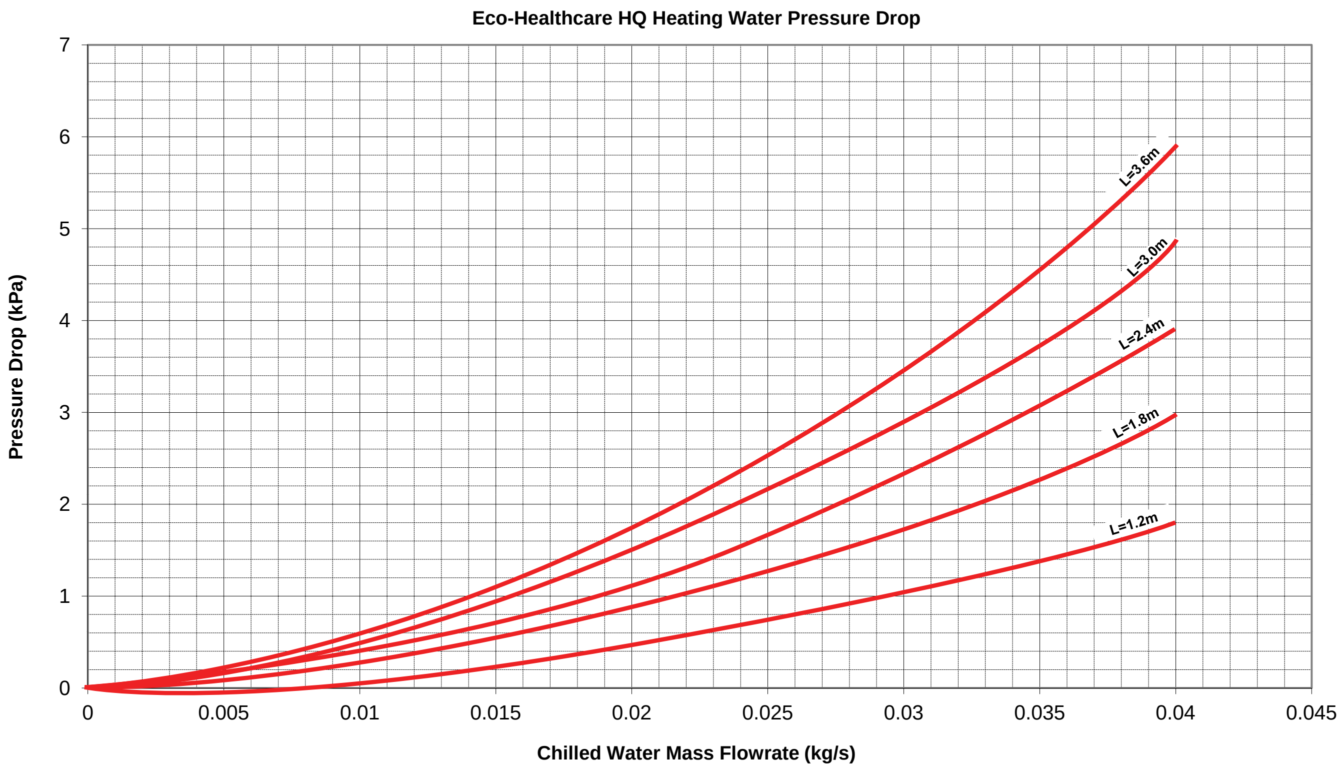


Legend:
= Cooling Only
= Cooling & Heating

Heating Performance



Pressure Drop



Cooling Selection Tables

Cooling only at 40Pa Nozzle Pressure

Nozzle Pressure 40 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	353	0.028	C2	3.6	418	0.033	C2	4.7	482	0.038	C2	6.0	545	0.043	C2	7.5
	1.8	475	0.038	C2	8.9	554	0.044	C2	11.6	636	0.051	C2	14.6	726	0.058	C2	18.1
	2.4	545	0.043	C2	15.1	635	0.051	C2	19.5	673	0.054	C3	7.2	760	0.061	C3	8.9
	3.0	547	0.044	C3	6.3	639	0.051	C3	8.2	731	0.058	C3	10.4	824	0.066	C3	12.8
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	675	0.054	C2	16.0	716	0.057	C3	5.9	827	0.066	C3	7.6	938	0.075	C3	9.4
	2.4	784	0.062	C3	9.3	917	0.073	C3	12.1	1065	0.085	C3	15.3	1251	0.100	C3	19.2
	3.0	917	0.073	C3	15.2	1084	0.086	C3	19.8	1157	0.092	C4	10.4	1313	0.104	C4	12.8
	3.6	962	0.077	C4	9.1	1120	0.089	C4	11.8	1287	0.102	C4	14.9	1472	0.117	C4	18.4
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	917	0.073	C3	12.0	1072	0.085	C3	15.7	1240	0.099	C3	19.8	1310	0.104	C4	10.1
	3.0	1052	0.084	C4	8.8	1232	0.098	C4	11.5	1427	0.114	C4	14.5	1659	0.132	C4	18.1
	3.6	1217	0.097	C4	13.5	1442	0.115	C4	17.7	1558	0.124	C5	11.2	1784	0.142	C5	13.9
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	1156	0.092	C4	10.2	1351	0.108	C4	13.4	1550	0.123	C4	16.9	1674	0.133	C5	10.5
	3.6	1378	0.110	C4	16.5	1530	0.122	C5	10.9	1765	0.141	C5	13.8	2031	0.162	C5	17.1

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 40 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling only at 60Pa Nozzle Pressure

Nozzle Pressure 60 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	383	0.030	C2	4.1	453	0.036	C2	5.4	523	0.042	C2	6.9	593	0.047	C2	8.6
	1.8	501	0.040	C2	9.8	583	0.046	C2	12.7	665	0.053	C2	15.9	754	0.060	C2	19.5
	2.4	582	0.046	C2	16.9	630	0.050	C3	6.4	723	0.058	C3	8.1	814	0.065	C3	10.0
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	515	0.041	C2	6.6	609	0.048	C2	8.8	699	0.056	C2	11.3	785	0.063	C2	13.9
	1.8	768	0.061	C2	19.7	813	0.065	C3	7.3	938	0.075	C3	9.3	1065	0.085	C3	11.6
	2.4	848	0.068	C3	10.6	992	0.079	C3	13.8	1148	0.091	C3	17.5	1211	0.096	C4	8.9
	3.0	968	0.077	C3	16.7	1069	0.085	C4	9.0	1222	0.097	C4	11.4	1381	0.110	C4	14.0
	3.6	1014	0.081	C4	10.0	1178	0.094	C4	12.9	1345	0.107	C4	16.2	1524	0.121	C4	19.9
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	794	0.063	C3	6.9	936	0.075	C3	9.2	1073	0.085	C3	11.8	1205	0.096	C3	14.5
	2.4	1053	0.084	C3	15.1	1237	0.098	C3	19.8	1328	0.106	C4	10.3	1505	0.120	C4	12.8
	3.0	1168	0.093	C4	10.4	1368	0.109	C4	13.6	1587	0.126	C4	17.3	1695	0.135	C5	10.7
	3.6	1314	0.105	C4	15.4	1551	0.123	C4	20.0	1682	0.134	C5	12.8	1919	0.153	C5	15.8
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	1143	0.091	C3	17.6	1264	0.101	C4	9.4	1446	0.115	C4	12.0	1624	0.129	C4	14.8
	3.0	1337	0.106	C4	13.0	1563	0.124	C4	17.0	1710	0.136	C5	10.8	1937	0.154	C5	13.4
	3.6	1475	0.117	C5	10.1	1730	0.138	C5	13.3	2003	0.159	C5	16.9	2324	0.185	C5	20.9

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 60 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling only at 80Pa Nozzle Pressure

Nozzle Pressure 80 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	419	0.033	C2	4.7	497	0.040	C2	6.3	573	0.046	C2	8.1	647	0.051	C2	10.0
	1.8	565	0.045	C2	12.0	651	0.052	C2	15.5	735	0.059	C2	19.2	790	0.063	C3	7.1
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	542	0.043	C2	7.2	640	0.051	C2	9.6	737	0.059	C2	12.2	839	0.067	C2	15.2
	1.8	743	0.059	C3	6.2	881	0.070	C3	8.3	1016	0.081	C3	10.6	1151	0.092	C3	13.2
	2.4	928	0.074	C3	12.3	1076	0.086	C3	16.0	1173	0.093	C4	8.4	1322	0.105	C4	10.4
	3.0	1061	0.084	C3	19.8	1185	0.094	C4	10.8	1345	0.107	C4	13.6	1505	0.120	C4	16.6
	3.6	1144	0.091	C4	12.3	1317	0.105	C4	15.8	1487	0.118	C4	19.6	1633	0.130	C5	12.5
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	835	0.066	C3	7.5	984	0.078	C3	10.0	1134	0.090	C3	12.8	1291	0.103	C3	15.8
	2.4	1129	0.090	C3	17.0	1236	0.098	C4	9.0	1423	0.113	C4	11.5	1615	0.129	C4	14.3
	3.0	1268	0.101	C4	11.9	1478	0.118	C4	15.6	1697	0.135	C4	19.7	1831	0.146	C5	12.3
	3.6	1427	0.114	C4	17.9	1600	0.127	C5	11.8	1823	0.145	C5	14.9	2053	0.163	C5	18.2
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	1216	0.097	C3	19.1	1329	0.106	C4	10.2	1531	0.122	C4	13.0	1744	0.139	C4	16.2
	3.0	1427	0.114	C4	14.5	1674	0.133	C4	19.0	1823	0.145	C5	12.1	2074	0.165	C5	15.0
	3.6	1598	0.127	C5	11.5	1869	0.149	C5	15.1	2155	0.172	C5	19.2	2482	0.198	C5	23.7

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 80 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling only at 100Pa Nozzle Pressure

Nozzle Pressure 100 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	445	0.035	C2	5.2	527	0.042	C2	6.9	606	0.048	C2	8.9	683	0.054	C2	11.0
	1.8	599	0.048	C2	13.3	690	0.055	C2	17.1	742	0.059	C3	6.3	838	0.067	C3	7.8
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	593	0.047	C2	8.3	700	0.056	C2	11.1	806	0.064	C2	14.2	918	0.073	C2	17.6
	1.8	792	0.063	C3	6.9	935	0.074	C3	9.2	1076	0.086	C3	11.7	1217	0.097	C3	14.5
	2.4	981	0.078	C3	13.6	1136	0.090	C3	17.6	1240	0.099	C4	9.3	1396	0.111	C4	11.4
	3.0	1079	0.086	C4	9.1	1253	0.100	C4	11.9	1422	0.113	C4	15.0	1592	0.127	C4	18.2
	3.6	1214	0.097	C4	13.6	1397	0.111	C4	17.5	1550	0.123	C5	11.3	1732	0.138	C5	13.8
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	913	0.073	C3	8.7	1075	0.086	C3	11.5	1239	0.099	C3	14.8	1412	0.112	C3	18.3
	2.4	1207	0.096	C3	19.0	1324	0.105	C4	10.1	1522	0.121	C4	12.9	1725	0.137	C4	16.0
	3.0	1342	0.107	C4	13.2	1561	0.124	C4	17.2	1716	0.137	C5	11.0	1935	0.154	C5	13.5
	3.6	1507	0.120	C4	19.6	1691	0.135	C5	13.0	1925	0.153	C5	16.3	2170	0.173	C5	20.0
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	955	0.076	C3	9.3	1124	0.089	C3	12.4	1297	0.103	C3	15.9	1488	0.118	C3	19.7
	2.4	1233	0.098	C4	8.9	1451	0.115	C4	11.8	1671	0.133	C4	15.1	1907	0.152	C4	18.7
	3.0	1534	0.122	C4	16.4	1707	0.136	C5	10.7	1963	0.156	C5	13.6	2229	0.177	C5	16.9
	3.6	1693	0.135	C5	12.7	1976	0.157	C5	16.7	2275	0.181	C5	21.1	2620	0.209	C5	26.0

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 100 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling & Heating at 40Pa Nozzle Pressure

Nozzle Pressure 40 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	301	0.024	C2	2.3	359	0.029	C2	3.1	416	0.033	C2	3.9	473	0.038	C2	4.9
	1.8	412	0.033	C2	5.8	482	0.038	C2	7.6	552	0.044	C2	9.6	624	0.050	C2	11.8
	2.4	475	0.038	C2	9.9	552	0.044	C2	12.9	633	0.050	C2	16.2	721	0.057	C2	20.0
	3.0	515	0.041	C2	14.3	599	0.048	C2	18.5	637	0.051	C3	7.2	719	0.057	C3	8.8
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	584	0.046	C2	10.4	685	0.054	C2	13.6	796	0.063	C2	17.3	812	0.065	C3	6.4
	2.4	680	0.054	C3	6.4	795	0.063	C3	8.3	857	0.068	C3	4.1	1044	0.083	C3	13.0
	3.0	796	0.063	C3	10.5	930	0.074	C3	13.6	1006	0.080	C4	6.8	1137	0.090	C4	8.4
	3.6	884	0.070	C3	15.0	1039	0.083	C3	19.6	1117	0.089	C4	9.8	1264	0.101	C4	12.1
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	793	0.063	C3	8.2	930	0.074	C3	10.7	1069	0.085	C3	13.6	1216	0.097	C3	16.9
	3.0	975	0.078	C3	14.6	1161	0.092	C3	19.1	1228	0.098	C4	9.5	1399	0.111	C4	11.7
	3.6	1056	0.084	C4	8.9	1235	0.098	C4	11.5	1436	0.114	C4	14.6	1691	0.135	C4	18.3
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	1067	0.085	C3	17.0	1173	0.093	C4	8.7	1347	0.107	C4	11.1	1523	0.121	C4	13.7
	3.6	1192	0.095	C4	10.8	1399	0.111	C4	14.1	1636	0.130	C4	17.9	1733	0.138	C5	11.1

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 40 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling & Heating at 60Pa Nozzle Pressure

Nozzle Pressure 60 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	325	0.026	C2	2.6	389	0.031	C2	3.5	452	0.036	C2	4.5	514	0.041	C2	5.6
	1.8	435	0.035	C2	6.4	508	0.040	C2	8.3	581	0.046	C2	10.5	654	0.052	C2	12.9
	2.4	509	0.040	C2	11.2	589	0.047	C2	14.4	671	0.053	C2	18.0	710	0.057	C3	6.9
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	438	0.035	C2	4.2	524	0.042	C2	5.6	607	0.048	C2	7.3	687	0.055	C2	9.1
	1.8	663	0.053	C2	12.8	780	0.062	C2	16.8	810	0.064	C3	6.3	921	0.073	C3	7.9
	2.4	735	0.059	C3	7.2	860	0.068	C3	9.5	988	0.079	C3	12.0	1126	0.090	C3	14.8
	3.0	843	0.067	C3	11.5	981	0.078	C3	15.0	1130	0.090	C3	18.8	1202	0.096	C4	9.2
	3.6	929	0.074	C3	16.4	1029	0.082	C4	8.5	1175	0.093	C4	10.7	1323	0.105	C4	13.1
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	755	0.060	C2	16.2	807	0.064	C3	6.2	933	0.074	C3	8.0	1055	0.084	C3	10.0
	2.4	912	0.073	C3	10.3	1068	0.085	C3	13.6	1232	0.098	C3	17.2	1304	0.104	C4	8.3
	3.0	1083	0.086	C3	17.4	1185	0.094	C4	8.9	1363	0.109	C4	11.3	1556	0.124	C4	14.0
	3.6	1141	0.091	C4	10.1	1333	0.106	C4	13.1	1545	0.123	C4	16.6	1652	0.131	C5	10.3
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	998	0.079	C3	12.0	1158	0.092	C3	15.8	1317	0.105	C3	19.8	1422	0.113	C4	9.7
	3.0	1157	0.092	C4	8.4	1356	0.108	C4	11.1	1558	0.124	C4	14.1	1774	0.141	C4	17.4
	3.6	1347	0.107	C4	13.2	1587	0.126	C4	17.3	1724	0.137	C5	11.0	1965	0.156	C5	13.6

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 60 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling & Heating at 80Pa Nozzle Pressure

Nozzle Pressure 80 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	355	0.028	C2	3.0	426	0.034	C2	4.0	495	0.039	C2	5.2	563	0.045	C2	6.5
	1.8	493	0.039	C2	7.9	573	0.046	C2	10.3	649	0.052	C2	12.8	724	0.058	C2	15.6
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	462	0.037	C2	4.6	551	0.044	C2	6.1	638	0.051	C2	7.9	724	0.058	C2	9.9
	1.8	717	0.057	C2	14.6	841	0.067	C2	19.2	878	0.070	C3	7.2	998	0.079	C3	9.0
	2.4	807	0.064	C3	8.4	941	0.075	C3	11.1	1073	0.085	C3	13.9	1208	0.096	C3	17.1
	3.0	933	0.074	C3	13.8	1075	0.086	C3	17.7	1181	0.094	C4	9.0	1324	0.105	C4	11.0
	3.6	1033	0.082	C3	20.0	1160	0.092	C4	10.5	1313	0.104	C4	13.1	1464	0.116	C4	15.9
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	802	0.064	C2	17.6	848	0.068	C3	6.8	981	0.078	C3	8.7	1114	0.089	C3	10.8
	2.4	978	0.078	C3	11.6	1146	0.091	C3	15.2	1324	0.105	C3	19.3	1398	0.111	C4	9.3
	3.0	1166	0.093	C3	19.9	1286	0.102	C4	10.2	1473	0.117	C4	12.9	1667	0.133	C4	15.9
	3.6	1249	0.099	C4	11.8	1447	0.115	C4	15.3	1651	0.131	C4	19.1	1793	0.143	C5	12.0
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	1051	0.084	C3	13.1	1234	0.098	C3	17.2	1324	0.105	C4	8.5	1503	0.120	C4	10.5
	3.0	1234	0.098	C4	9.4	1448	0.115	C4	12.4	1668	0.133	C4	15.7	1915	0.152	C4	19.5
	3.6	1456	0.116	C4	15.1	1708	0.136	C4	19.7	1863	0.148	C5	12.5	2115	0.168	C5	15.5

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 80 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Cooling & Heating at 100Pa Nozzle Pressure

Nozzle Pressure 100 Pa		Water															
Q (l/s)	Eco-H HQ	ΔtK - 7°C				ΔtK - 8°C				ΔtK - 9°C				ΔtK - 10°C			
	L (m)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)	P (w)	p(kg/s)	Manifold	p(kPa)
10	1.2	378	0.030	C2	3.3	452	0.036	C2	4.5	525	0.042	C2	5.7	596	0.047	C2	7.2
	1.8	523	0.042	C2	8.7	607	0.048	C2	11.3	687	0.055	C2	14.2	768	0.061	C2	17.2
	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	505	0.040	C2	5.3	602	0.048	C2	7.1	697	0.055	C2	9.2	792	0.063	C2	11.4
	1.8	759	0.060	C2	16.2	805	0.064	C3	6.2	932	0.074	C3	8.0	1057	0.084	C3	9.9
	2.4	854	0.068	C3	9.3	995	0.079	C3	12.2	1133	0.090	C3	15.3	1276	0.102	C3	18.8
	3.0	986	0.078	C3	15.2	1136	0.090	C3	19.5	1249	0.099	C4	9.9	1399	0.111	C4	12.1
	3.6	1062	0.085	C4	8.9	1230	0.098	C4	11.6	1392	0.111	C4	14.5	1555	0.124	C4	17.6
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	780	0.062	C3	5.8	927	0.074	C3	7.8	1072	0.085	C3	10.0	1217	0.097	C3	12.5
	2.4	1047	0.083	C3	13.0	1224	0.097	C3	17.0	1319	0.105	C4	8.4	1495	0.119	C4	10.5
	3.0	1164	0.093	C4	8.5	1361	0.108	C4	11.2	1556	0.124	C4	14.2	1760	0.140	C4	17.5
	3.6	1319	0.105	C4	12.9	1527	0.122	C4	16.8	1685	0.134	C5	10.8	1894	0.151	C5	13.2
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	816	0.065	C3	6.3	969	0.077	C3	8.4	1120	0.089	C3	10.8	1274	0.101	C3	13.5
	2.4	1148	0.091	C3	15.1	1348	0.107	C3	19.8	1446	0.115	C4	9.8	1642	0.131	C4	12.2
	3.0	1329	0.106	C4	10.6	1557	0.124	C4	14.0	1793	0.143	C4	17.7	1929	0.154	C5	11.0
	3.6	1540	0.123	C4	16.6	1718	0.137	C5	10.9	1969	0.157	C5	13.8	2233	0.178	C5	17.1

Flow-adjusted waterside cooling effect table. Cooling circuit Δt = 3°C (Water in-out), nozzle pressure of 100 Pa, 1 x Ø125 air connection.
For green values, a Ø22 manifold connection size is required.
Please refer to Frenger Technical Department for selections not covered within these tables.

Heating Selection Tables

Heating at 40Pa Nozzle Pressure

Nozzle Pressure 40 Pa		Water											
Q (l/s)	Eco-H HQ	ΔtK - 15°C			ΔtK - 20°C			ΔtK - 25°C			ΔtK - 30°C		
	L (m)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)
10	1.2	291	0.012	0.5	358	0.012	0.4	442	0.012	0.5	516	0.012	0.5
	1.8	349	0.012	0.7	446	0.012	0.8	546	0.013	0.9	675	0.016	1.2
	2.4	401	0.012	1.0	505	0.012	1.0	652	0.016	1.6	801	0.019	2.3
	3.0	447	0.012	1.3	581	0.014	1.6	747	0.018	2.5	915	0.022	3.6
	3.6	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	456	0.012	0.8	608	0.015	1.0	797	0.019	1.7	986	0.024	2.4
	2.4	528	0.013	1.1	746	0.018	2.0	966	0.023	3.2	1187	0.028	4.5
	3.0	613	0.015	1.8	856	0.020	3.2	1100	0.026	5.0	1343	0.032	7.1
	3.6	684	0.016	2.6	949	0.023	4.6	1214	0.029	7.1	1477	0.035	10.1
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	646	0.015	1.6	912	0.022	2.9	1178	0.028	4.5	1438	0.034	6.3
	3.0	766	0.018	2.6	1070	0.026	4.7	1369	0.033	7.3	1663	0.040	10.3
	3.6	862	0.021	3.9	1194	0.029	6.9	1521	0.036	10.6	1843	0.044	14.8
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	
	2.4	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	871	0.021	3.3	1212	0.029	5.9	1544	0.037	9.0	1871	0.045	12.6
	3.6	1002	0.024	5.1	1380	0.033	8.9	1750	0.042	13.5	-	-	-

Flow-adjusted waterside heating effect table. Heating circuit Δt = 10°C (Water in-out), nozzle pressure of 40 Pa, 1 x Ø125 air connection.
For red values, the flow rate has been adjusted to the recommended minimum flow of 0.012 kg/s.

Heating at 60Pa Nozzle Pressure

Nozzle Pressure 60 Pa		Water											
Q (l/s)	Eco-H HQ	ΔtK - 15°C			ΔtK - 20°C			ΔtK - 25°C			ΔtK - 30°C		
	L (m)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)
10	1.2	298	0.012	0.4	376	0.012	0.4	445	0.012	0.4	548	0.013	0.6
	1.8	362	0.012	0.7	452	0.012	0.7	580	0.014	1.0	718	0.017	1.4
	2.4	428	0.012	1.1	540	0.013	1.1	700	0.017	1.8	862	0.021	2.6
	3.0	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	359	0.012	0.4	448	0.012	0.4	586	0.014	0.6	738	0.018	0.9
	1.8	465	0.012	0.7	649	0.016	1.2	849	0.020	1.9	1048	0.025	2.7
	2.4	561	0.013	1.2	791	0.019	2.2	1023	0.025	3.5	1253	0.030	5.0
	3.0	650	0.016	2.0	908	0.022	3.6	1165	0.028	5.5	1419	0.034	7.8
	3.6	729	0.017	2.9	1011	0.024	5.2	1290	0.031	7.9	1565	0.037	11.1
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	525	0.013	0.8	756	0.018	1.5	990	0.024	2.4	1221	0.029	3.5
	2.4	692	0.017	1.8	975	0.023	3.2	1255	0.030	5.0	1531	0.037	7.1
	3.0	814	0.019	2.9	1133	0.027	5.2	1446	0.035	8.0	1755	0.042	11.3
	3.6	913	0.022	4.3	1261	0.030	7.6	1602	0.038	11.6	1938	0.046	16.2
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	765	0.018	2.1	1079	0.026	3.8	1387	0.033	5.9	1688	0.040	8.4
	3.0	934	0.022	3.7	1296	0.031	6.6	1649	0.040	10.1	1999	0.048	14.2
	3.6	1064	0.025	5.7	1462	0.035	9.9	1852	0.044	14.9	-	-	-

Flow-adjusted waterside heating effect table. Heating circuit Δt = 10°C (Water in-out), nozzle pressure of 60 Pa, 1 x Ø125 air connection.
For red values, the flow rate has been adjusted to the recommended minimum flow of 0.012 kg/s.

Heating at 80Pa Nozzle Pressure

Nozzle Pressure 80 Pa		Water											
Q (l/s)	Eco-H HQ	ΔtK - 15°C			ΔtK - 20°C			ΔtK - 25°C			ΔtK - 30°C		
	L (m)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)
10	1.2	316	0.012	0.5	393	0.012	0.5	463	0.012	0.4	580	0.014	0.6
	1.8	379	0.012	0.7	470	0.012	0.7	615	0.015	1.1	763	0.018	1.5
	2.4	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	385	0.012	0.4	480	0.012	0.4	642	0.015	0.7	807	0.019	1.1
	1.8	484	0.012	0.7	690	0.017	1.3	901	0.022	2.1	1111	0.027	3.0
	2.4	593	0.014	1.3	836	0.020	2.5	1079	0.026	3.8	1319	0.032	5.4
	3.0	688	0.016	2.2	960	0.023	3.9	1229	0.029	6.1	1493	0.036	8.5
	3.6	774	0.019	3.2	1072	0.026	5.7	1365	0.033	8.8	1651	0.040	12.2
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	573	0.014	0.9	825	0.020	1.8	1079	0.026	2.8	1330	0.032	4.1
	2.4	738	0.018	2.0	1037	0.025	3.6	1334	0.032	5.5	1625	0.039	7.8
	3.0	861	0.021	3.2	1195	0.029	5.8	1523	0.036	8.8	1847	0.044	12.3
	3.6	965	0.023	4.8	1327	0.032	8.3	1682	0.040	12.6	2034	0.049	17.6
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	-	-	-	-	-	-	-	-	-	-	-	-
	2.4	833	0.020	2.4	1174	0.028	4.4	1507	0.036	6.9	1833	0.044	9.7
	3.0	998	0.024	4.2	1381	0.033	7.4	1756	0.042	11.3	-	-	-
	3.6	1126	0.027	6.3	1544	0.037	10.9	1957	0.047	16.5	-	-	

Flow-adjusted waterside heating effect table. Heating circuit Δt = 10°C (Water in-out), nozzle pressure of 80 Pa, 1 x Ø125 air connection.
For red values, the flow rate has been adjusted to the recommended minimum flow of 0.012 kg/s.

Heating at 100Pa Nozzle Pressure

Nozzle Pressure 100 Pa		Water											
Q (l/s)	Eco-H HQ	ΔtK - 15°C			ΔtK - 20°C			ΔtK - 25°C			ΔtK - 30°C		
	L (m)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)	P (w)	p(kg/s)	p(kPa)
10	1.2	322	0.012	0.5	399	0.012	0.5	473	0.012	0.4	591	0.014	0.6
	1.8	386	0.012	0.7	480	0.012	0.7	629	0.015	1.1	781	0.019	1.6
	2.4	-	-	-	-	-	-	-	-	-	-	-	-
	3.0	-	-	-	-	-	-	-	-	-	-	-	-
	3.6	-	-	-	-	-	-	-	-	-	-	-	-
20	1.2	400	0.012	0.5	507	0.012	0.5	673	0.016	0.8	842	0.020	1.2
	1.8	496	0.012	0.7	705	0.017	1.3	918	0.022	2.1	1130	0.027	3.1
	2.4	605	0.014	1.4	852	0.020	2.5	1099	0.026	4.0	1343	0.032	5.6
	3.0	702	0.017	2.3	981	0.023	4.1	1257	0.030	6.3	1528	0.037	8.9
	3.6	793	0.019	3.4	1101	0.026	6.0	1403	0.034	9.2	1700	0.041	12.9
30	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	602	0.014	1.0	859	0.021	1.9	1117	0.027	3.0	1371	0.033	4.3
	2.4	756	0.018	2.1	1059	0.025	3.7	1357	0.033	5.7	1651	0.040	8.1
	3.0	877	0.021	3.3	1215	0.029	5.9	1547	0.037	9.1	1875	0.045	12.7
	3.6	982	0.024	4.9	1351	0.032	8.6	1713	0.041	13.0	-	-	-
40	1.2	-	-	-	-	-	-	-	-	-	-	-	-
	1.8	652	0.016	1.2	941	0.023	2.2	1228	0.029	3.6	1509	0.036	5.1
	2.4	866	0.021	2.6	1212	0.029	4.7	1550	0.037	7.2	1881	0.045	10.1
	3.0	1020	0.024	4.4	1406	0.034	7.7	1785	0.043	11.6	-	-	-
	3.6	1146	0.027	6.4	1567	0.038	11.2	1983	0.048	16.8	-	-	-

Flow-adjusted waterside heating effect table. Heating circuit Δt = 10°C (Water in-out), nozzle pressure of 100 Pa, 1 x Ø125 air connection.
For red values, the flow rate has been adjusted to the recommended minimum flow of 0.012 kg/s.

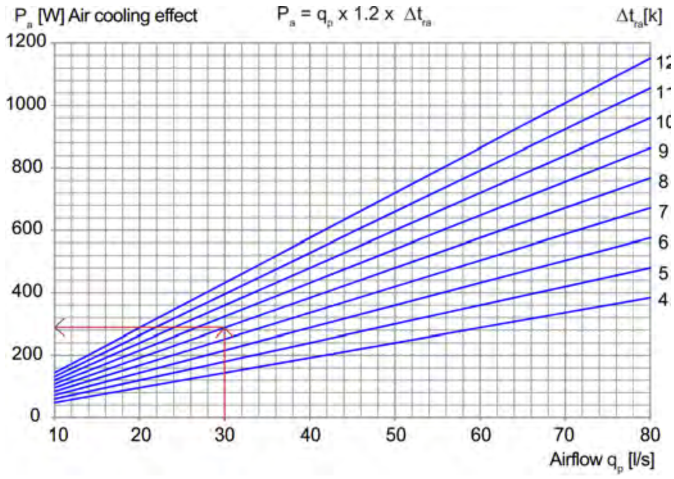
Air Cooling Effect

Cooling effect supplied in the ventilation air [W]

1. Start by calculating the required cooling effect that has to be supplied to the room in order to provide a certain temperature.
2. Calculate any cooling effect that is provided by the ventilation.
3. The remaining cooling effect has to be supplied by the beam.

Formula for air cooling effect: P = m ● Cp ● Δt
Where:
m = mass
Cp = specific heat capacity [J/(kg-K]
qp = air flow [l/s]
Δt = the difference between the temperature of the room and the temperature of the supply air [K].

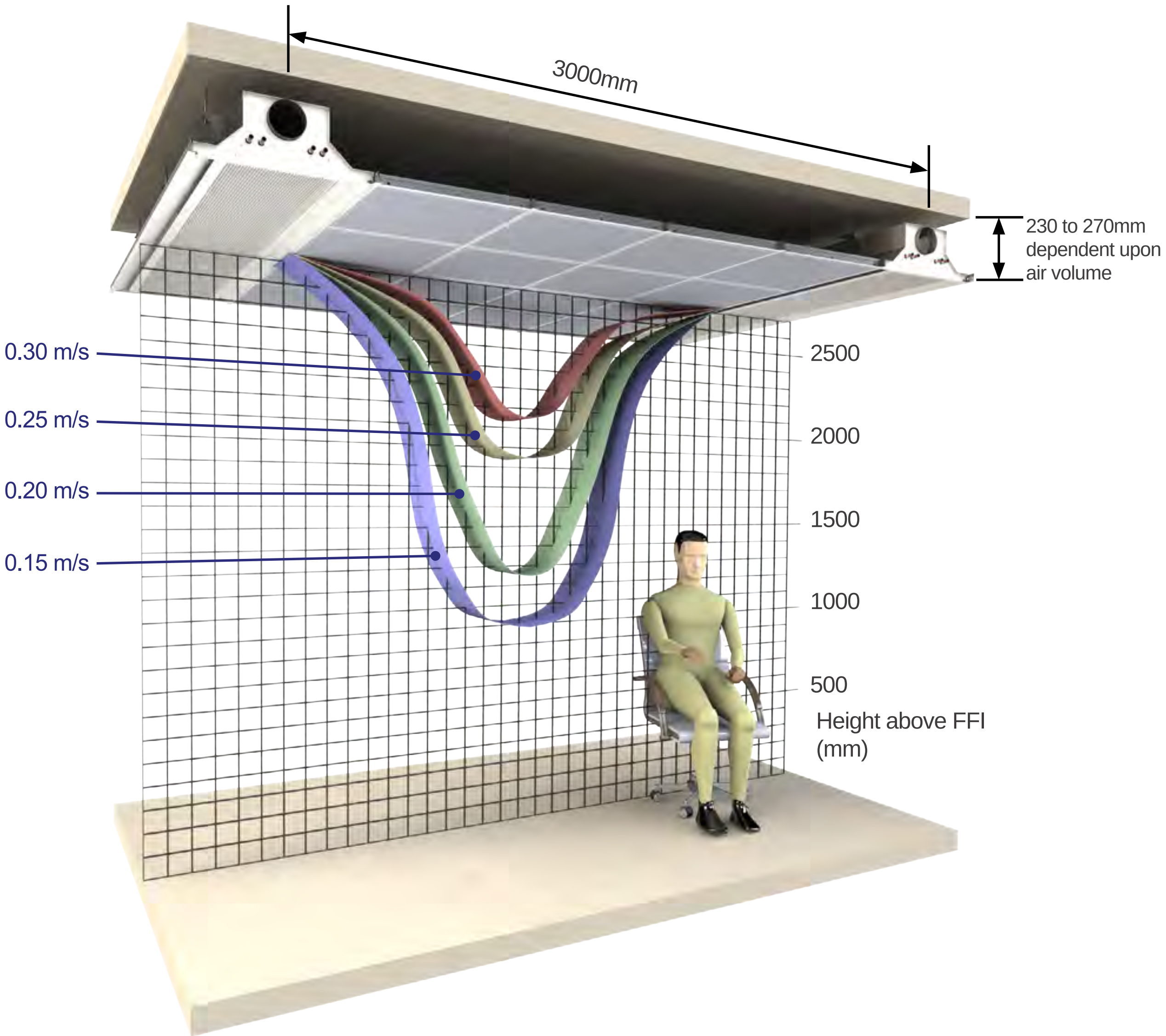
It is usually m ● Cp ≈ qp ● 1.2



Air cooling effect as a function of airflow. For example, if the air flow is 30 l/s and the under-temperature of the supply air is Δt_{ra}= 8K, the cooling effect from the graph is 290W.

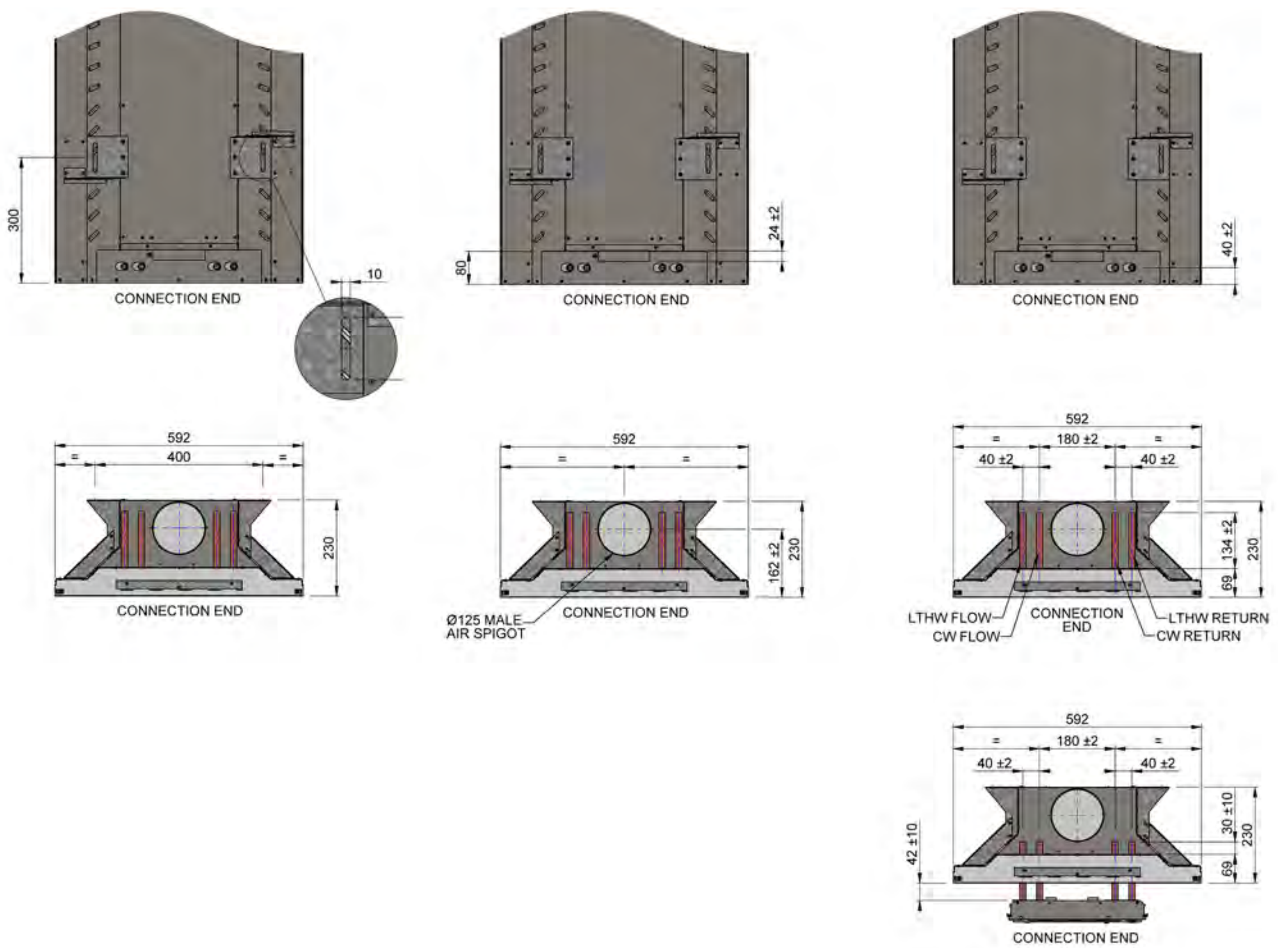
Scatter Diagram

Fresh Air Volume 22 l / s / Active m @ 80 Pa



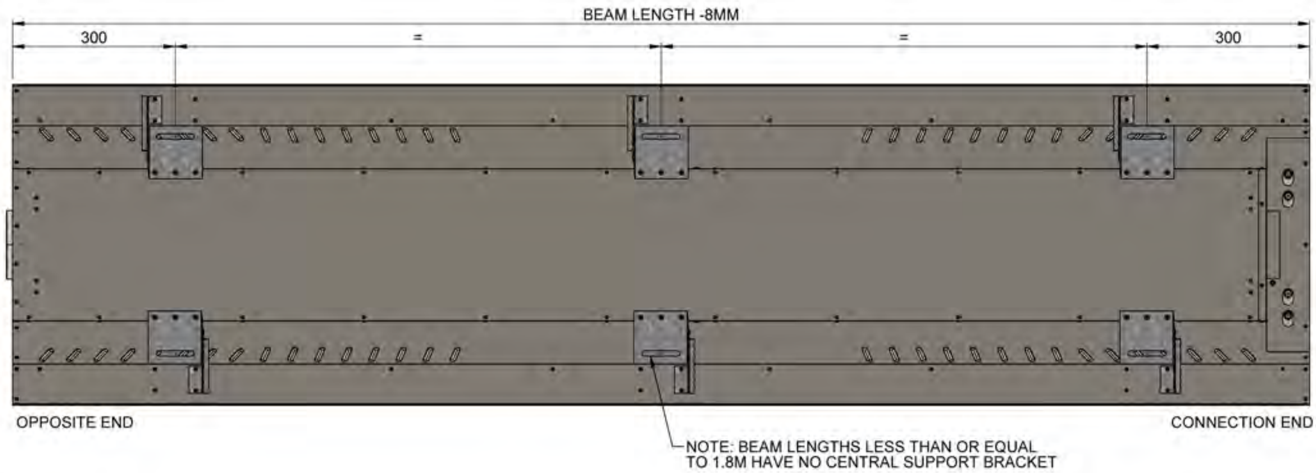
Product Dimensions

Eco-Healthcare HQ 125

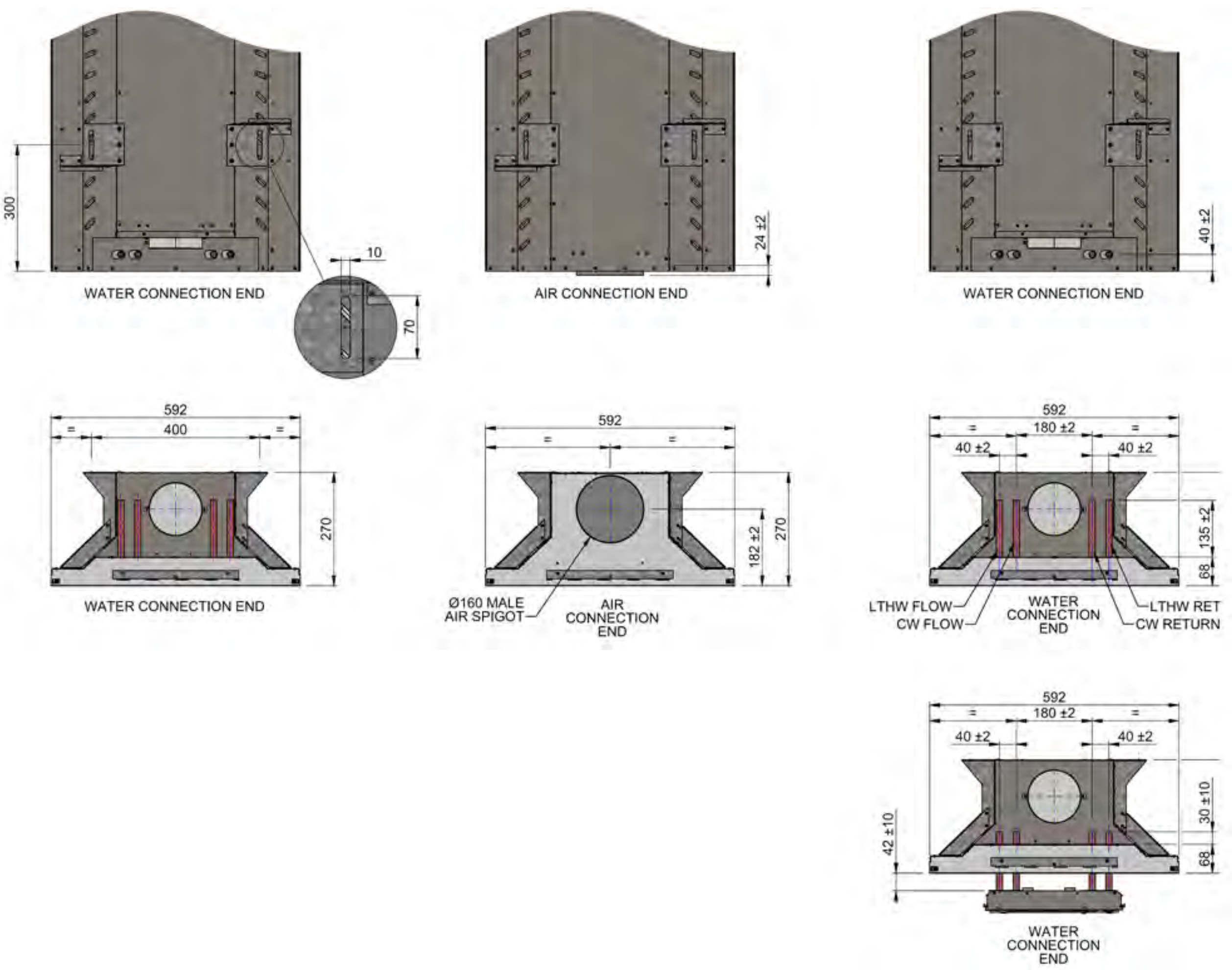


Mounting Details

Eco-Healthcare HQ 125

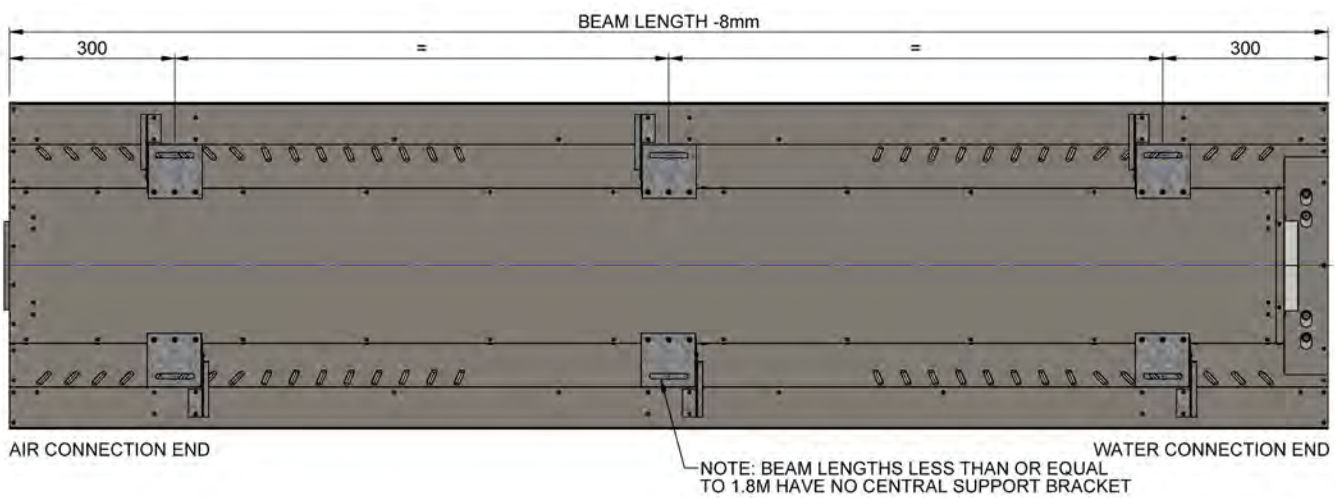


Eco-Healthcare HQ 125

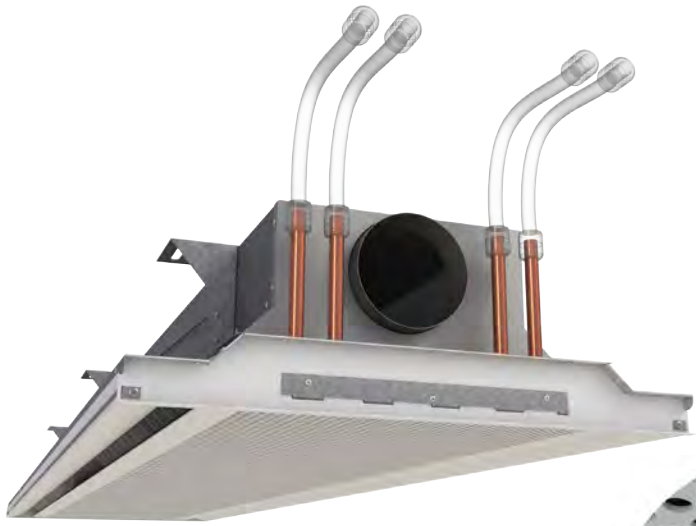


Mounting Details

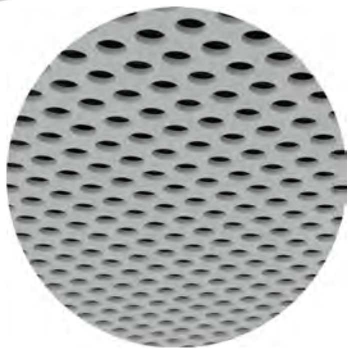
Eco-Healthcare HQ 125



Perforation Pattern Options



Slot Perforation
45% Free Area



Dot Perforation
33% Free Area

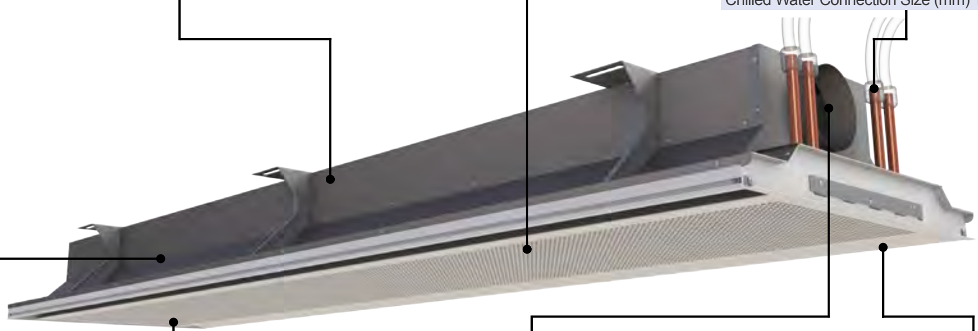
Double Dot Perforation
51% Free Area

Product Ordering Codes

2. Function
CO - Ceiling Int. Cooling Only
CH - Ceiling Int. Cooling & Heating

4. Underplate
7D - 7Ø & 4Ø Double Dot / 51% Free Area
4D - 4Ø DOT / 33% Free Area
5S - 5x35 Slot / 45% Free Area

6. Waterside Connection
Battery Manifold Types - C1/C2/C3/C4/C5
15 C3 H ← Orientation - V: Vertical
Chilled Water Connection Size (mm) 15 / 22



1. Beam Type
EH - Eco - Healthcare

3. Nominal Beam Length (mm)

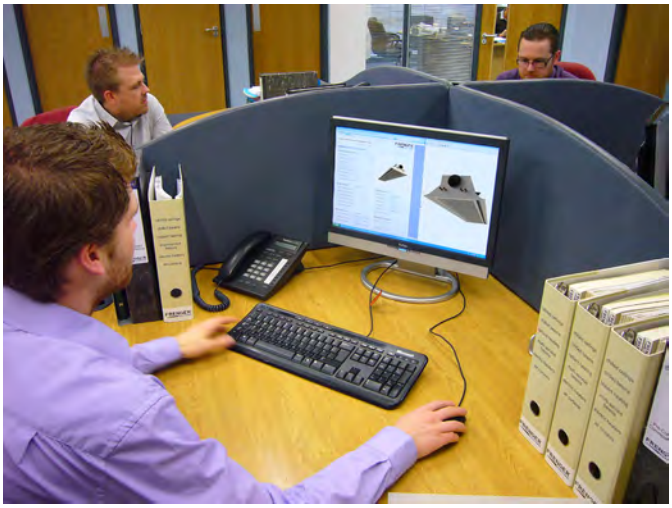
5. Airside Connection
Air Connection Qty
1 x 100 H ← Orientation - V: Vertical
Air Connection Spigot Size (mm) 125 / 160

7. Air Supply / Discharge
Air Supply Volume (l/s)
45 80 M
Air Discharge Characteristic -
L: Long Throw - No Discharge Vanes
M: Medium Throw - 10-18° Discharge Vanes
S: Short Throw - 18-35° Discharge Vanes
Air Supply Nozzle Pressure (Pa)

Example:

EH	CH	2400	7D	-	1 x 100V	15C3V	-	4580M
1	2	3	4		5	6		7

Calculation Program



Eco Active Beam Data

Beam Variant	Healthcare	
Air Connection	1x125	mm
Product Overall Length	2.4	m
Manifold Type	C4	
Air Discharge Throw	S	
Nozzle Static Pressure	80	Pa
Fresh Air Supply Volume	25	l/s
Heating Function	H4	
Underplate Perforation Type	51% OBR	

Frenger's calculation programme for Eco-Healthcare HQ is extremely user friendly.

Simply select from the drop down menu the "Air Connection" configuration. Air volumes in excess of 40 ltrs/sec and up to 50 ltrs/sec should be 2 x 80 diameter.

"Manifold Types" can be changed in the drop down menu for increased waterside cooling effect, however attention needs to be taken regarding resultant pressure drops (hydraulic resistance), If pressure drops need reducing, choose a higher numbered manifold (C5 being the highest and C2 being the lowest).

"Discharge Throw" can be S (short), M (medium) or L (long).

"Underplate Perforated" options can be found on page 14.

Design Conditions	Cooling		Heating	
Flow Water Temperature	14.0	°C	45.0	°C
Return Water Temperature	17.0	°C	35.0	°C
Air Supply Temperature	16.0	°C	16.0	°C
Average Room Condition	25.5	°C	16.0	°C
"Air On" Thermal Gradient	1.0	°C		
Room Relative Humidity	45.0	%		

Complete your project data in the "Design Conditions" section. Please note that the "Air On" Thermal Gradient should not be used in normal instances.

Performance Data	Cooling		Heating	
Room - Mean Water dT	10.00	K	24.00	K
Air On Coil - Mean Water dT	11.00	K	21.10	K
Waterside Performance	1201	W	1011	W
Waterside Mass Flowrate	0.096	kg/s	0.024	kg/s
Waterside Pressure Drop	7.2	kPa	3.4	kPa
Airside Performance	285	W	0	W
Total Sensible Performance	**1486**	**W**	**1011**	**W**
Sound Effect Lw	<35	dB(A)		

"Performance Data" will then automatically be calculated. Likewise "Dimensional Date" will be also automatically calculated.

Finally, the "Design Check" should read "OK" in green, or detail some warning in red.
Calculation programs for Eco-Healthcare HQ are available upon request.

Contact our technical department or complete an application request form from www.frenger.co.uk from the relevant link on our home page.

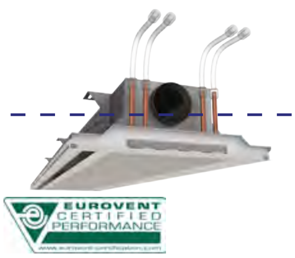
Active Chilled Beam Calculation Tool FRENGER® systems

Is this the latest version?

version 1.3.3

Project Ref.

Eco HQ Active Beam Data		
Beam Variant	Healthcare	
Air Connection	1X125	mm
Product Overall Length	2.4	m
Manifold Type	C4	
Air Discharge Throw	S	
Nozzle Static Pressure	80	Pa
Fresh Air Supply Volume	25	l/s
Heating Function	H4	
Underplate Perforation Type	51% DOT	



Design Conditions	Cooling		Heating	
Flow Water Temperature	14.0	°C	45.0	°C
Return Water Temperature	17.0	°C	35.0	°C
Air Supply Temperature	16.0	°C	16.0	°C
Average Room Condition	25.5	°C	16.0	°C
"Air On" Thermal Gradient	1.0	°C		
Room Relative Humidity	45.0	%		

Dimensional Data		
Width x Depth	592 x 230	mm
Overall Length	2392	mm
Water Volume	3	
Dry Weight	46	kg
CW Connection	Ø15	mm
LTHW Connection	Ø15	mm

Performance Data	Cooling		Heating	
Room - Mean Water dT	10.00	K	24.00	K
Air On Coil - Mean Water dT	11.00	K	21.10	K
Waterside Performance	1201	W	1011	W
Water Mass Flowrate	0.096	kg/s	0.024	kg/s
Waterside Pressure Drop	7.2	kPa	3.4	kPa
Airside Performance	285	W	0	W
Total Sensible Performance	**1486**	**W**	**1011**	**W**
Sound Effect LW	< 35	dB(A)		

Design Check (Warnings)		
Air Discharge	OK	
Supply Air	OK	
Cooling Circuit	OK	
Heating Circuit	OK	
Turn Down Vol @ 40Pa	17.7	°C
Calculated Dew Point	12.7	°C

Model Ref: EHHQCH24007D-125H15C4H4-2580S

Notes:
1) Performance calculations are based upon normal clean potable water; it is the system engineer's responsibility to allow for any reduction in cooling or heating performance due to additives that may reduce the water systems heat transfer coefficent.

2) Pressure drop calculations are based upon CIBSE guides using clean potable water and exclude any additional looses associated with entry / exit losses, pipe fouling or changes in water quality; it is the system engineer's responsibility to use good engineering practice.

Project Specific Testing Facility

The 3 number state-of-the-art Climatic Testing Laboratories at Frenger's Derby based technical centre, have internal dimensions of 6.3 x 5.7 x 3.3m high and includes a thermal wall so that both core and perimeter zones can be modelled. The test facilities are fixed in overall size and construction therefore simulation of a buildings specific thermall mass cannot be completed, it should, however be noted that a specific project can be simulated more accurately by recessing the floor and reducing the height as necessary.

Project Specific Testing

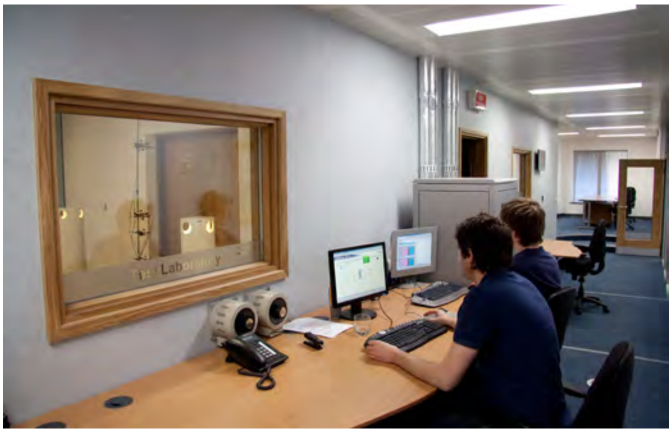
Project specific mock-up testing is a valuable tool which allows the Client to fully asses the proposed system and determine the resulting indoor quality and comfort conditions; the physical modeling is achieved by installing a full scale representation of a building zone complete with internal & external heat gains (Lighting, Small Power, Occupancy & Solar Gains).

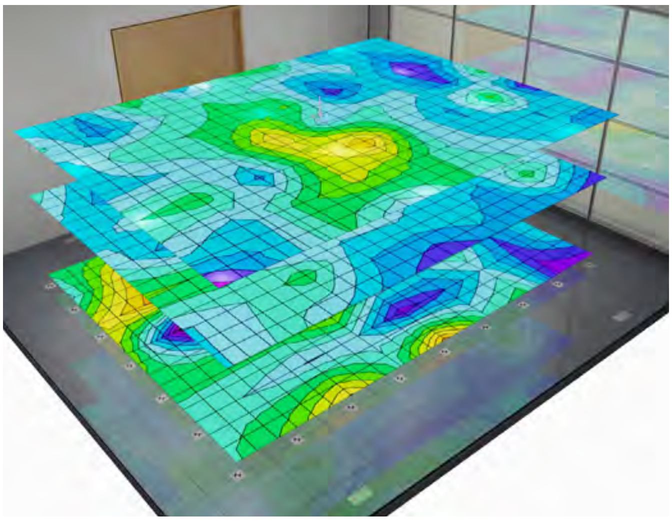
The installed mock-up enables the client to verify the following:

- Product performance under project specific conditions.
- Spatial air temperature distribution.
- Spatial air velocities.
- Experience thermal comfort.
- Project specific aesthetics.
- Experience lighting levels (where relevant).
- Investigate the specific design and allow the system to be enhanced.

The project-specific installation and test is noramlly conducted to verify:

- Product capacity under design conditions.
- Comfort levels -air temperature distribution
  - -thermal stratification
  - -draft risk
  - -radiant temperature analysis
- Smoke test video illustrating air movement.





Photometric Testing Facility

The photometric test laboratories at Frenger Systems are used to evaluate the performance of luminaires. To measure the performance, it is necessary to obtain values of light intensity distribution from the luminaire. These light intensity distributions are used to mathematically model the lighting distribution envelope of a particular luminaire. This distribution along with the luminaires efficacy allows for the generation of a digital distribution that is the basis of the usual industry standard electronic file format. In order to assess the efficacy of the luminaire it is a requirement to compare the performance of the luminaire against either a calibrated light source for absolute output or against the “bare” light source for a relative performance ratio.

The industry uses both methods. Generally absolute lumen outputs are used for solid state lighting sources and relative lighting output ratios (LOR) are used for the more traditional sources. Where the LOR method is chosen then published lamp manufacturer’s data is used to calculate actual lighting levels in a scheme.

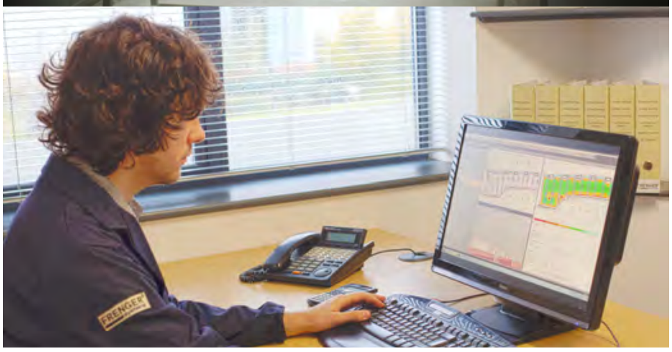
The intensity distribution is obtained by the use of a Goniophotometer to measure the intesity of light emitted from the surface of the fitting at pre-determined angles. The light intensity is measured using either a photometer with a corrective spectral response filter to match the CIE standard observer curves or our spectrometer for LED sources.

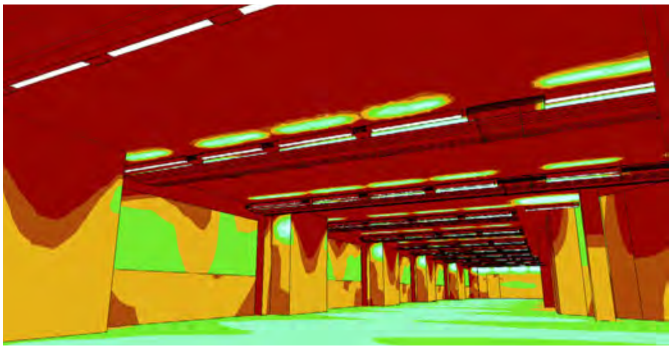
Luminaire ouputs are measured using our integrating sphere from smalled luminaires or our large integrator room for large fittings and Multi Service Chilled Beams. For both methods we can use traceable calibrated radiant flux standards for absolute comparisons.

All tests use appropriate equipment to measure and control the characteristics of the luminaire and include air temperature measurements, luminaire supply voltage, luminaire current and power. Thermal characteristics of luminaire components can be recorded during the testing process as required.

A full rest report is compiled and supplied in “locked” PDF format. Data is collected and correlated using applicable software and is presented electronically to suit, usually in Eulumdat, CIBSE TM14 or IESN standard file format.

Frenger conduct photometric test in accordance with CIE 127:2007 and BS EN 13032-1 and sound engineering practice as applicable. During the course of these tests suitable temperature measurements of parts of LED’s can be recorded. These recorded and plotted temperature distributions can be used to provide feedback and help optimise the light output of solid state light source based on luminaires which are often found to be sensitive to junction temperatures.





Acoustic Testing Facility

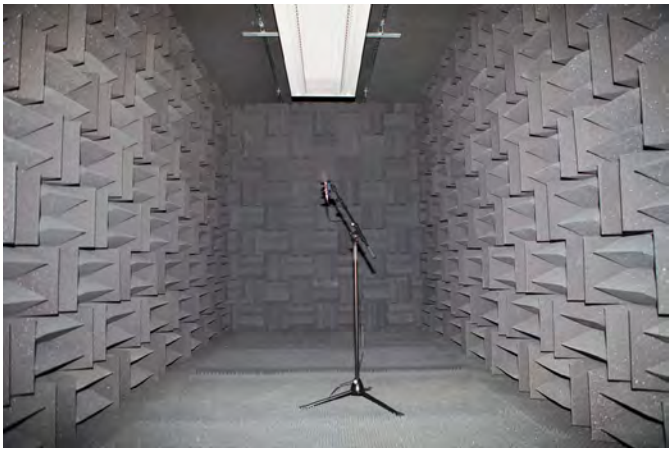
The Acoustic Test Room at Frenger is a hemi-anechoic chamber which utilises sound absorbing acoustic foam material in the shape of wedges to provide an echo free zone for acoustic measurements; the height of the acoustic foam wedges has a direct relationship with the maximum absorption frequency, hence Frenger has the wedges specifically designed to optimise the sound absorption at the peak frequency normally found with our active chilled beam products.

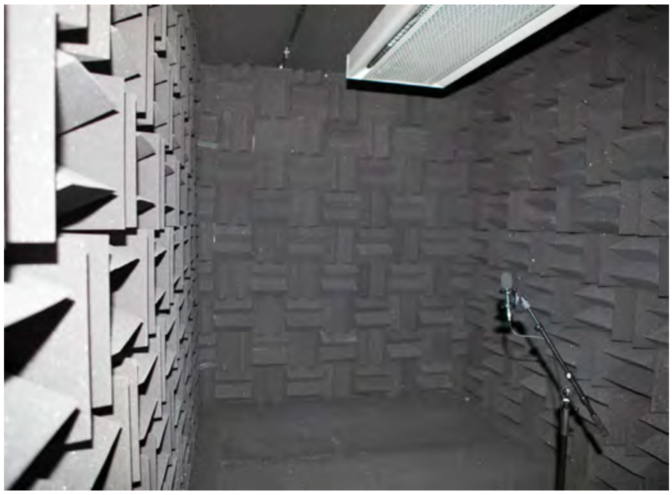
The use of acoustic absorbing material within the test room provides the simulation of a quiet open space without “reflections” which helps to ensure sound measurements from the sound source are accurate, in addition the acoustic material also helps reduce external noise entering the test room meaning that relatively low levels of sound can be accurately measured.

The acoustic facilities allow Frenger to provide express in-house sound evaluation so that all products, even project specific designs can be assessed and optimised.

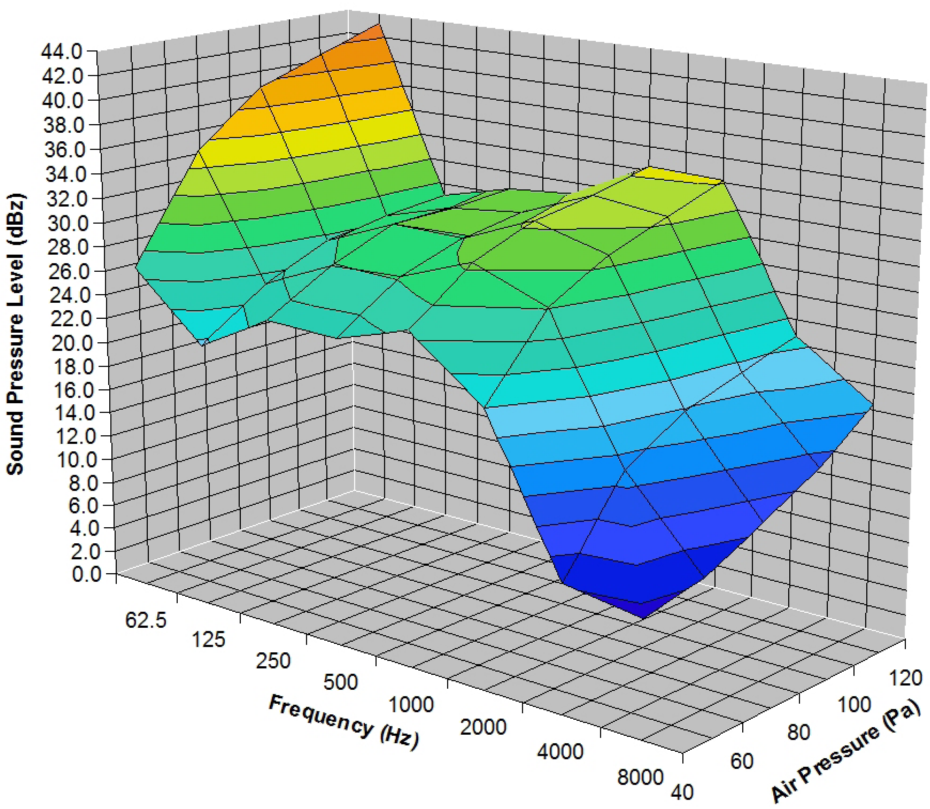
To ensure accuracy Frenger only uses Class 1 measurements equipment which allows sound level measurements to be taken at 11 different ⅓ octave bands between 16 Hz to 16 kHz, with A, C and Z (un-weighted) simultaneous weightings.

In addition to the above, Frenger also send their new products for specialist third party Acoustic Testing. The results of which are very close and within measurement tolerances to that of Frenger’s in-house measurement of sound.





Unweighted Sound Pressure Level



Frenger Systems participates in the ECC programme for Chilled Beams.
Check ongoing validity of certificate:
www.eurovent-certification.com or
www.certiflash.com

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