

**Features**

Flush panelled extra rigid construction.

Low noise levels (down to NR25).

External resistances up to 80 Pa (Series PHW and PHA).

Easily removable condensate tray with fall to drain.

Externally mounted, ventilated control enclosure with illuminated on/off switch, and 3 speed selector switch.

Nine speed tapped transformer with pure sine wave fine adjustment for accurate commissioning.

High density class 'O' CFC and HFC free acoustic and thermal insulation.

Integral, multi-spigot, acoustically lined discharge plenum. (Series PHW & PHA)

Acoustically lined, multi-spigot inlet plenum option. (Series PHW & PHA)

Vacuum cleanable metal mesh filter or EU3 washable flame retardant, continuous filament filter options.

Recessed, slotted mounting points for easy installation and greater safety. (Series PHW & PHA)

All types of stand alone, BMS and commissioning controls available, fitted and wired.

Outputs available up to 8,45 kW cooling and 7.5kW heating.

Designed and Built in Britain

Patent Nos. Pending

**Actionair Hydropac**

Waterside Control Fan Coil Units  
For Horizontal and Vertical Applications

**Actionair Aeropac**

Airside Control Fan Coil Units  
For Horizontal Applications



**Horizontal Hydropac Illustrated**

*action*air

# Hydropac – Horizontal

## Introduction Packaged Horizontal Waterside

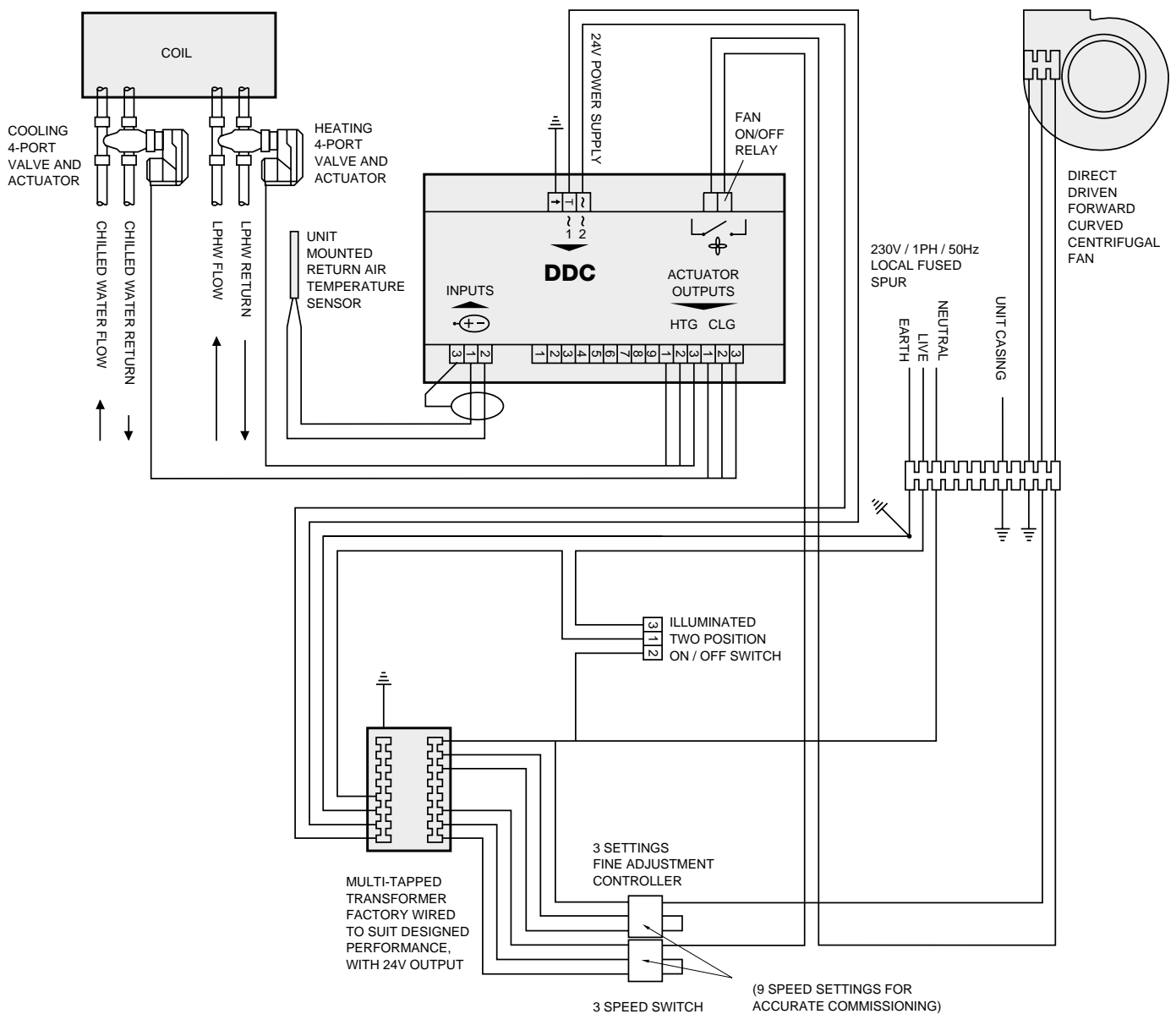
### Hydropac (Series PHW)

**Actionair Hydropac horizontal ceiling void mounted** type fan coils are waterside control, suitable for operation against moderate duct resistances, using chilled water cooling medium and low pressure hot water heating medium.

Temperature control is by means of modulating 4 – port diverting valves on heating and cooling, operated via stand alone or BMS temperature controller and room or return air sensor. Designated ‘PHW’, the series

consists of standard 230mm deep and slimline 170mm deep versions.

**General schematic wiring diagram detailing Hydropac waterside type Fan Coil Unit with optional D.D.C controller.** (Please refer to Technical Sales Office for individual wiring details to suit specific customer requirements)



**This wiring detail is for graphic purposes only.**

**All controls are optional extras and can be supplied fitted or fitted free issue supply.**

Refer to pages 4 and 5 for Hydropac horizontal specification details, page 6 for performance data on standard 230mm deep PHW 230 units, page 7 for NR guides and dimensional data standard 230mm deep PHW 230 units, page 8 for performance data on slimline 170mm deep PHW 170 units, page 9 for NR guides and dimensional data on slimline 170mm deep PHW 170 units.

## Introduction Packaged Horizontal Airside

### Aeropac (Series PHA)

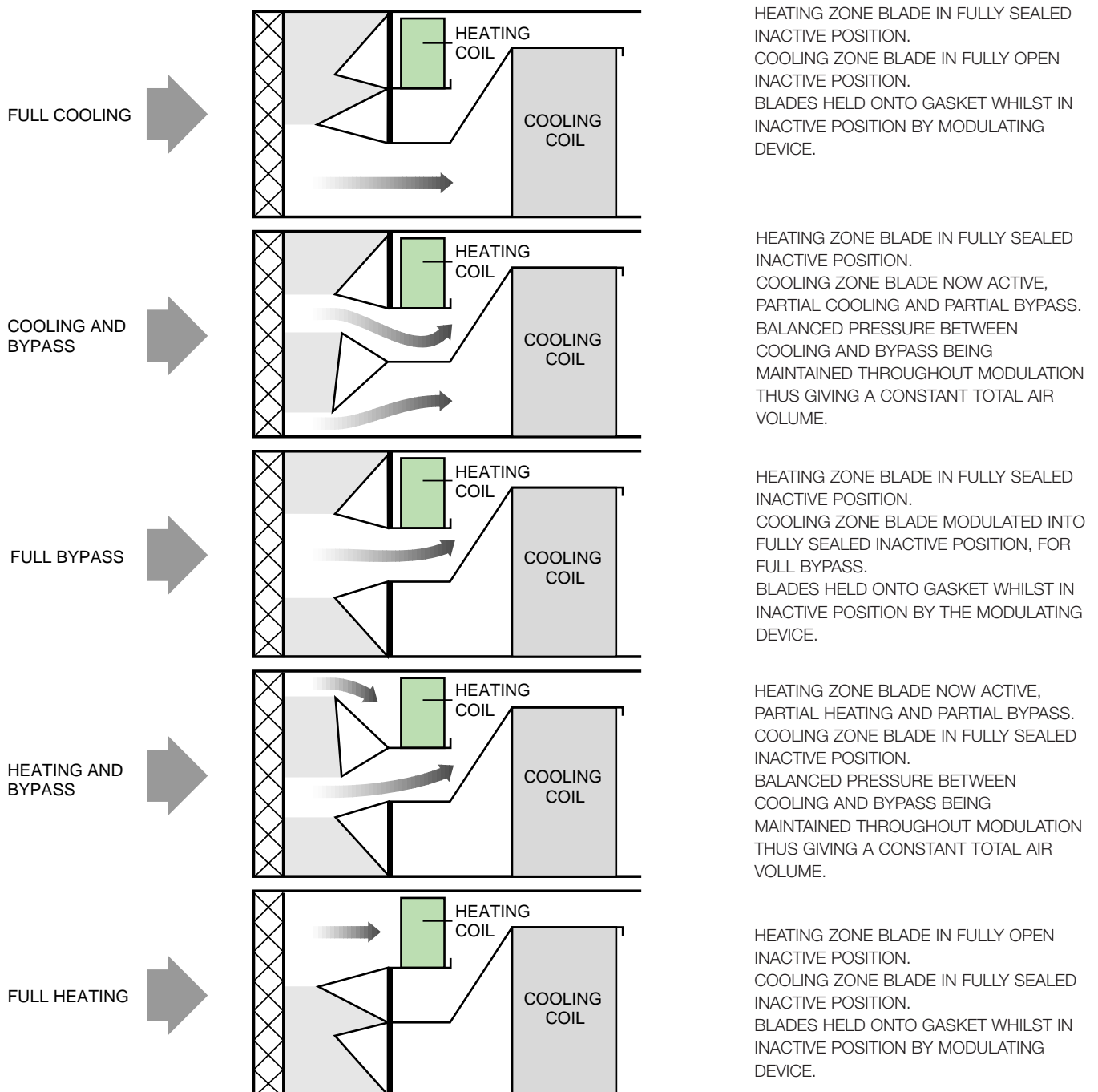
**Actionair Aeropac horizontal ceiling void mounted** type fan coils are airside control, similar in application to the Hydropac range, but incorporate a Zone Regulating Module (ZRM) to divert air through heating, by-pass and cooling zones

to control the temperature output. The unique patented tri – lateral aerofoils allow a constant volume of air to pass throughout their operation and provide a complete seal when closed, ensuring good control and maximum operating

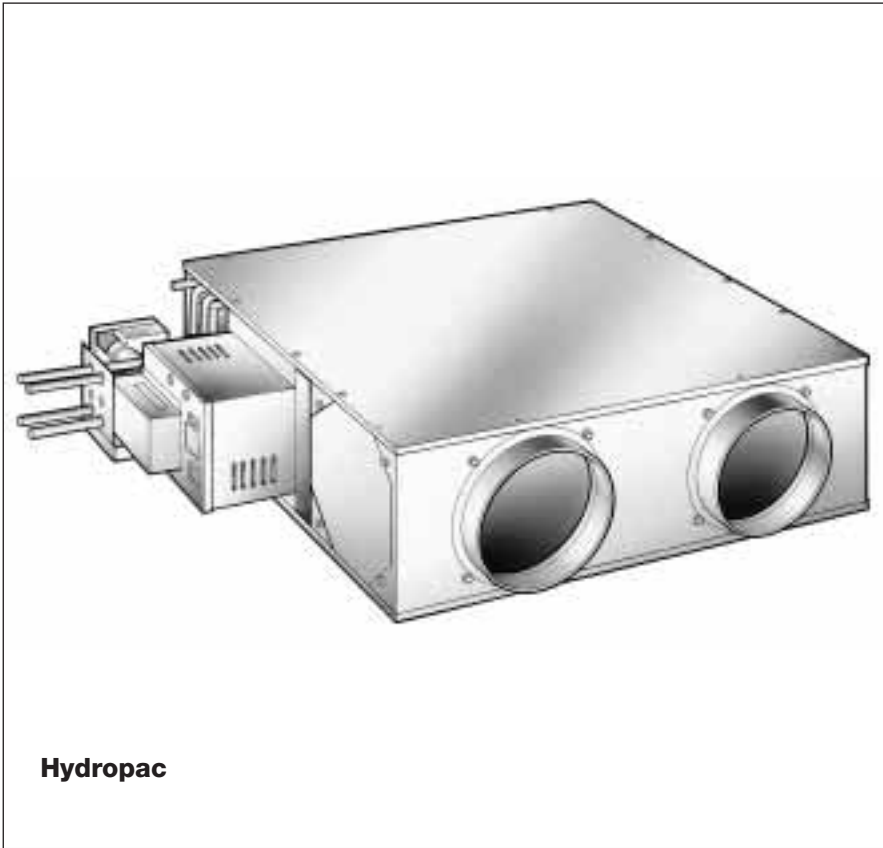
economy with silent operation.

Designated ‘PHA’, the series consists of a standard 230mm deep version.

**Diagram showing phases of modulation from cooling to heating using the ZRM regulation module control device on the Aeropac range.**



Refer to pages 4 and 5 for Aeropac horizontal specification details, page 10 for performance data on standard 230mm deep PHA 230 units, page 11 for NR guides and dimensional data standard 230mm deep PHA 230 units.



**Hydropac**

## Specification

### Chassis

The unit chassis shall be manufactured from 1.2mm galvanised sheet steel with 1.6mm fan decks and back plates for stiffness and durability. The construction shall produce a flush external finish to prevent exposure to bare edges or sharp objects, giving unhindered access to filters, controls and fitting of flexible or circular steel ductwork. Chassis shall incorporate recessed, reinforced slotted mounting points to facilitate fitting of drop-rods or mounting bolts within the overall width of the flush casework, with retaining feature to ensure secure location of nut/washers. An integral acoustically lined discharge plenum shall be fitted with easily interchangeable spun steel spigots and insulated blanking plates retained by M5 screws in threaded collars.

All fixings, where permanent, shall be rivetted or, where removable, screwed into a captive nut.

### Access

Access to fans/motors shall be via an insulated bottom panel with keyhole slots for accurate positioning and easy removal in restricted space.

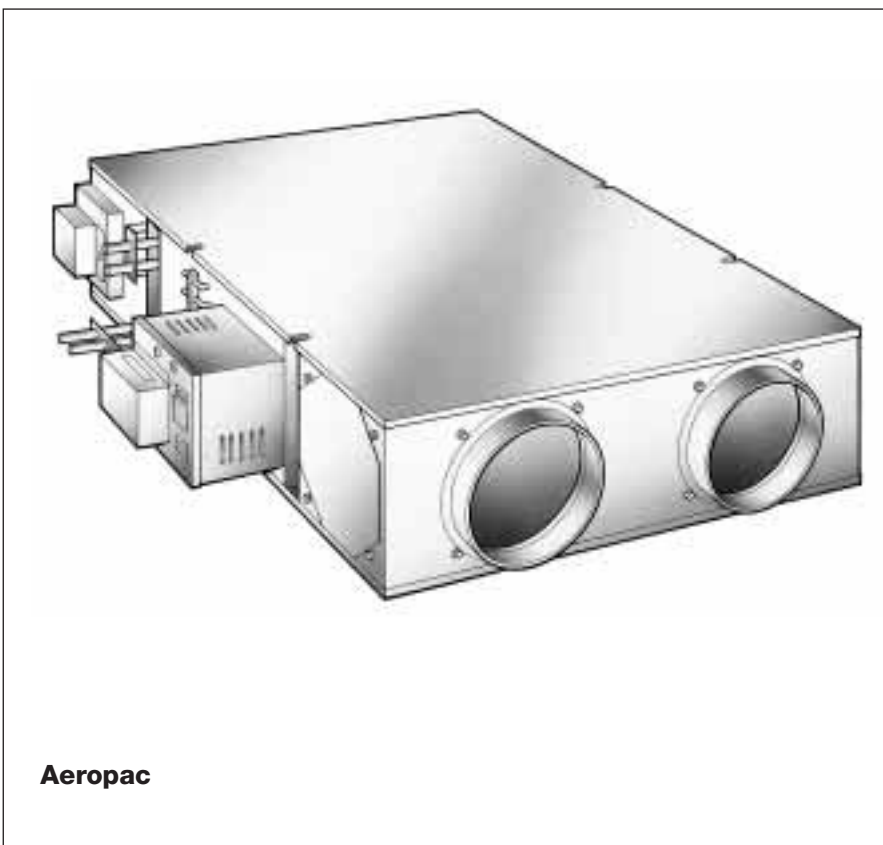
The panel shall be retained by M6 setscrews which shall be captive to prevent accidental loss.

### Insulation

100Kg/m<sup>3</sup> density, class 'O' CFC and HFC free open cell foam shall be utilised for both thermal and acoustic insulation.

Complying with 'Section 20' requirements and having a maximum thermal conductivity of 0.05 to 0.065 W/mk.

N.B. External condensate tray insulation shall be similar specification except closed cell type.



**Aeropac**

## Fans

Fans shall be double or single width, resiliently mounted, direct driven, forward curved centrifugal type with high efficiency, low noise multiblade galvanised sheet steel impellers housed within heavy gauge galvanised or synthetically treated steel scrolls.

Complete impeller/motor assemblies shall be statically and dynamically balanced in two planes, in accordance with BS5265 Part 1, 1979 to G2.5.

Fans shall be separately mounted on 1.6mm galvanised sheet steel easily removable decks.

## Motors

Motors shall be of the permanent split capacitor type external rotor, totally enclosed, speed controllable, high efficiency with a power factor of 0.9 or better.

Bearings shall be sealed for life, maintenance free ball type, having a minimum life expectancy of 50,000 hours, under normal operating conditions.

Auto resetting thermo-contactors shall be built into the windings to ensure overload protection.

Insulation shall be to class 'B' with enclosure to IP44, and electrical supply shall be 230V 1ph 50Hz.

## Speed Control

Speed control shall be by means of a multi-tapped transformer giving nine settings, three of which shall be pre-wired to a panel mounted selector switch.

Fine adjustment shall be provided utilising a pure sine wave method, obviating adjacent control interaction and electro-mechanical harmonics, and complying fully with BS800. (Radio interference suppression).

On/off control to fans shall be by means of a panel mounted illuminated two position switch.

## Coils

Coil matrix blocks shall be manufactured from seamless copper tube mechanically expanded into aluminium fins having die formed collars providing a tight bond to optimise heat transfer.

Circuitry design shall ensure correct contra flow and prevent air locking. Vents and drains shall be fitted as standard with easily accessible slotted/hexagonal plugs.

Coil pressure testing shall be by dry air under water, to 15 bar and valve assemblies by hydraulic test to manufacturers recommended maximum pressure.

A plate shall be provided to support and protect the valve assembly and connecting pipework.

## Electric Heating (optional)

Electric elements where included, shall be black heat, unfinned 'incoloy' sheaths around a resistance spiral wire insulated by compacted magnesium oxide powder and sealed with silicone rubber.

Overheat protection shall be by means of high temperature automatic or manually re-settable cutouts and switching shall be by means of electrical relays.

## Condensate Tray

Condensate trays shall be one piece, welded, galvanised sheet steel, synthetically treated, foam insulated and extended to cover the entire coil and valve assembly, and shall be easily removed for cleaning without disturbing hot and cold water pipework.

A positive fall to drain shall be provided with  $\frac{3}{4}$ " B.S.P. female connection at its lowest point on standard 230mm deep units, which shall also be the point of air pressure equilibrium. With a 15mm dia copper tail on slimline 170mm deep units.

## Filters

Filters shall be fine woven vacuum cleanable metal mesh or washable EU3, continuous filament media to Eurovent 4/5, with F1 fire resistance to DIN 53438 and a dust holding capacity of 380g/m<sup>2</sup>, in a galvanised steel channel frame with steel support mesh.

## Control Housing

A purpose designed, ventilated control housing shall be mounted on the side of the chassis for easy access and shall include a hinged/removable cover.

The housing shall incorporate the speed control transformer and switches plus a 1m flying lead, for connection to adjacent fused spur, and a 24V screened output for connection to a temperature controller.

All wiring shall be in accordance with current I.E.E. regulations.

## Waterside Control Method

### (HYDROPAC)

Temperature control shall be by means of modulating 4 – port diverting valves and actuators, operated via a stand alone or BMS temperature controller and room or return air sensor.

## Airside Control Method

### (AEROPAC)

Temperature control shall be by means of a zone regulating module, (ZRM), and cooling and heating coils incorporating an air bypass channel, giving a mechanical 'dead zone'.

Operation of the regulating module shall be by means of a single modulating, or positional actuator attached directly to the extended shaft.

When in full cooling, full heating or full bypass modes the mechanism shall form a positive seal ensuring full airflow through the designated zone at maximum demand.

# Hydropac – Horizontal

## Hydropac Series PHW 230 Waterside Control

### Horizontal Ceiling Mounted

Draw Through Chassis Fan Coil Units with Integral Multi-Spigotted Discharge Plenum.

**Performance Data** The information given is based upon the following Design Data.

**Design Data** Cooling E.A.T. 23 °C. DB, 16 °C. WB. Chilled Water @ 6/11 °C.

Heating E.A.T. 20 °C. L.T.H.W. @ 82/71 °C.

External Resistance, 30 Pa. Electrical Supply; 230V, 1-Phase, 50Hz.

Model	Speed Setting	Airflow I/s at 30Pa	Sensible Cooling Watts	Total Cooling Watts	Heating Watts	Input Watts	F.L.C Amps	S.C. Amps	N.R. Guide*
<b>PHW231</b>	1	50	673	799	829	22	0.2	0.6	25
	2	75	906	1038	1055	33	0.25	0.75	30
	3	85	991	1124	1131	47	0.3	0.9	32
	4	100	1118	1253	1241	57	0.32	0.96	35
	5	115	1241	1384	1346	66	0.33	0.99	37
	6	125	1325	1473	1416	78	0.35	1.05	40
<b>PHW232</b>	1	85	1192	1441	1679	33	0.3	0.9	25
	2	125	1636	1924	2132	51	0.38	1.14	30
	3	140	1802	2108	2285	68	0.44	1.32	32
	4	175	2182	2522	2583	89	0.5	1.5	35
	5	195	2405	2767	2750	110	0.55	1.65	37
	6	220	2684	3078	2949	144	0.65	1.95	40
<b>PHW232-X</b>	1	80	1137	1383	1621	44	0.4	1.2	25
	2	130	1693	1987	2188	60	0.5	1.5	30
	3	155	1963	2282	2413	75	0.57	1.71	32
	4	190	2349	2705	2708	114	0.64	1.92	35
	5	215	2628	3016	2910	125	0.65	1.95	37
	6	270	3019	3455	3182	160	0.70	2.10	40
<b>PHW233</b>	1	105	1521	1862	2238	67	0.6	1.8	25
	2	190	2549	3022	3188	107	0.8	2.4	30
	3	225	2975	3511	3523	140	0.9	2.7	32
	4	280	3628	4252	3976	178	1.0	3.0	35
	5	310	3985	4657	4219	220	1.1	3.3	37
	6	340	4334	5050	4448	267	1.2	3.6	40
<b>PHW234</b>	1	120	1739	2128	2640	65	0.6	1.8	25
	2	200	2770	3332	3767	105	0.8	2.4	30
	3	235	3219	3854	4164	140	0.9	2.7	32
	4	300	4058	4830	4830	220	1.1	3.3	35
	5	330	4426	5247	5095	275	1.3	3.9	37
	6	390	5153	6080	5601	370	1.8	5.4	40
<b>PHW234-X</b>	1	140	2028	2483	2505	100	0.9	2.7	25
	2	220	3024	3627	3238	167	1.25	3.75	30
	3	270	3680	4396	3684	202	1.3	3.9	32
	4	350	4669	5526	4241	240	1.35	4.05	35
	5	390	5153	6080	4505	300	1.5	4.5	37
	6	420	5513	6491	4702	356	1.6	4.8	40
<b>PHW235</b>	1	160	2318	2838	3562	100	0.9	2.7	25
	2	240	3357	4056	4671	165	1.25	3.75	30
	3	295	4083	4911	5308	200	1.30	3.90	32
	4	370	5078	6084	6114	290	1.45	4.35	35
	5	400	5450	6509	6376	365	1.65	4.95	37
	6	480	6437	7632	7067	495	2.35	7.05	40
<b>PHW235-X</b>	1	180	2608	3193	3957	144	1.3	3.9	25
	2	315	4352	5230	5537	227	1.7	5.1	30
	3	390	5327	6370	6289	288	1.85	5.55	32
	4	450	6066	7210	6809	364	2.05	6.15	35
	5	500	6676	7908	7237	440	2.2	6.6	37
	6	540	7156	8452	7571	556	2.5	7.5	40

(Please Note **X** denotes an additional Fan is incorporated to the respective Model)

**Note:** All cooling duties shown at minimum leaving air temperature of 11° C. For alternative design criteria please refer to our Technical Sales Office.

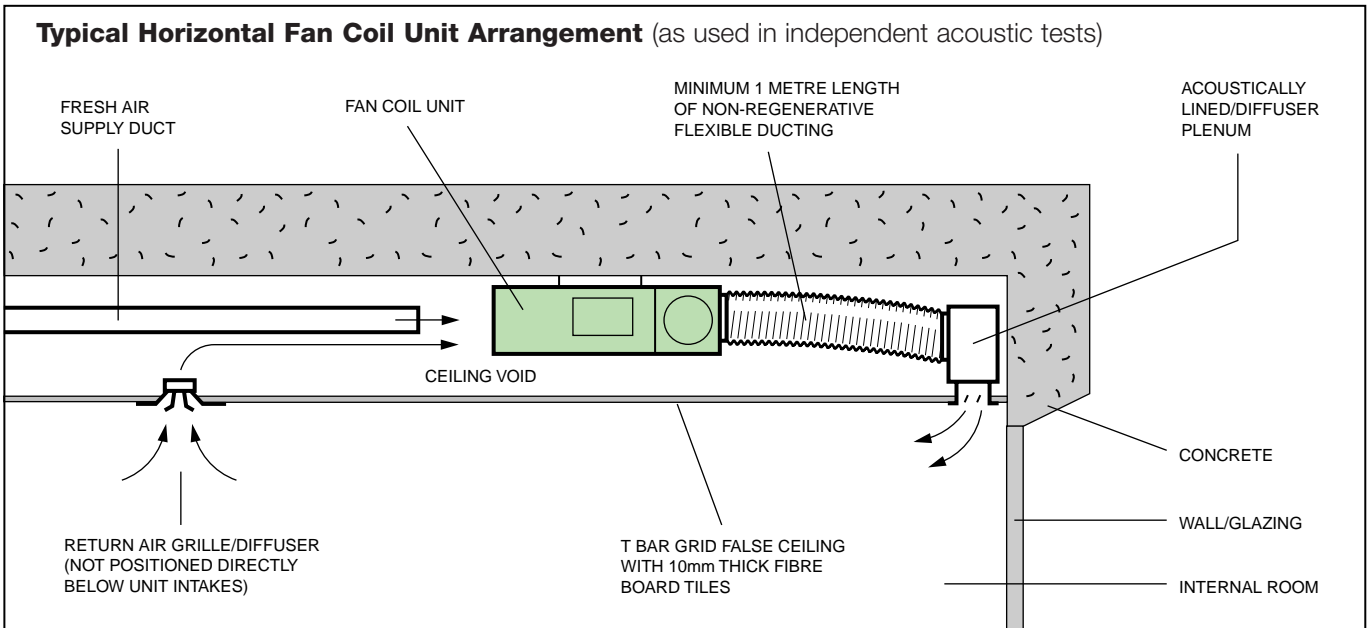
Sensible Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)									
C/W Flow Temp. °C									
C/W Δt	5	6	7	8	9	10	11	12	
4	1.00	1.00	0.99	0.94	0.88	0.82	0.72	0.65	
5	1.00	1.00	0.95	0.89	0.82	0.74	0.64	0.57	
6	0.99	0.96	0.88	0.81	0.73	0.65	0.57	0.51	
7	0.93	0.86	0.79	0.72	0.64	0.56	0.52	0.46	

Heating Duty Correction Factors At Speed 4								
H/W Flow Temp. °C								
H/W Δt	100	90	80	70	60	50	40	
5	-	-	-	-	0.67	0.47	0.30	
10	1.37	1.17	0.97	0.79	0.58	0.35	0.15	
15	1.29	1.10	0.89	0.70	0.43	0.20	0.10	
20	1.22	1.02	0.82	0.58	0.25	0.15	-	

Total Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)									
C/W Flow Temp. °C									
C/W Δt	5	6	7	8	9	10	11	12	
4	1.01	1.00	0.98	0.89	0.79	0.70	0.59	0.53	
5	1.01	1.00	0.94	0.85	0.75	0.65	0.52	0.47	
6	1.01	0.98	0.87	0.78	0.67	0.58	0.47	0.42	
7	1.01	0.89	0.79	0.70	0.60	0.50	0.43	0.38	

Thermal Correction Factors For Varying External Air Resistances								
Pa	20	30	40	50	60	70	80	
Cooling	1.02	1.00	0.97	0.95	0.92	0.89	0.86	
Heating	1.02	1.00	0.98	0.97	0.95	0.94	0.93	

## NR Guide



### \* Notes on 'NR' predictions

**'NR' predictions quoted are based upon extensive acoustic independent tests to the above arrangement and are intended as a guide to levels which can be expected.**

The following qualifications must apply:-

Units must be mounted correctly, using rubber washers, onto a solid structure.

The units should be mounted into a false ceiling of not less than 300mm deep, constructed of a standard 'T' bar grid with 10mm thick fibre board tiles.

Rooms of open plan or partitioned

design should be furnished, carpeted and have no more than 20% glass area with no highly reflective surfaces such as ceramic tiles etc.

Where a single unit is serving a room the dimensions should be based upon a cooling load of 120w/sq.m e.g a unit giving 1.2kW total cooling output should be serving a room with a floor area of not less than 10sq.m. In an open plan area units should be mounted at a minimum of 3m centres and no closer than 1.5m from a corner.

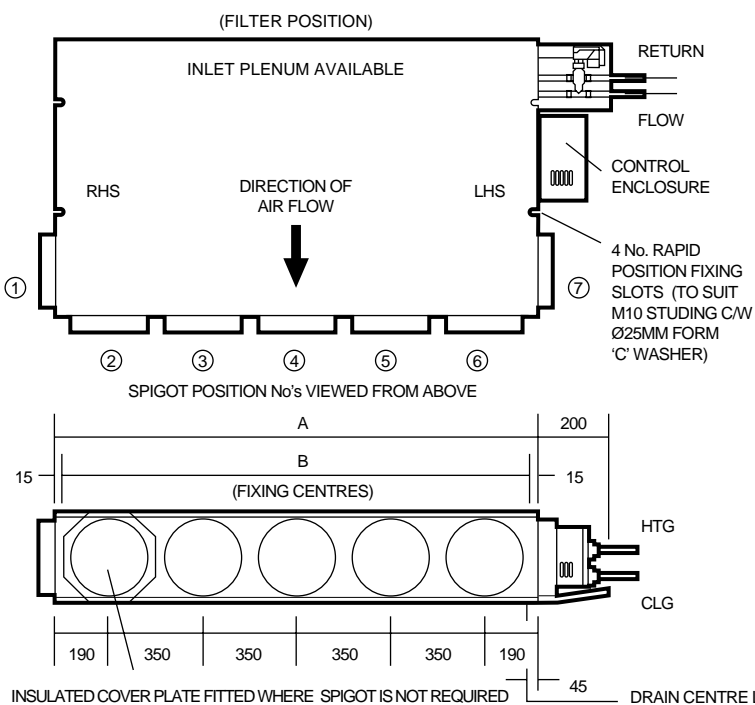
Return air grilles should not be positioned directly below unit intakes.

At least 1m of non-regenerative flexible ducting is used on each spigot outlet, with an acoustically lined diffuser plenum. A maximum air velocity of 3.0m/s per outlet spigot to achieve NR35.

The above should give the predicted Lp at 1.5m from the nearest diffuser. For accurate sound assessment, it may be necessary to obtain confirmation from an acoustics specialist.

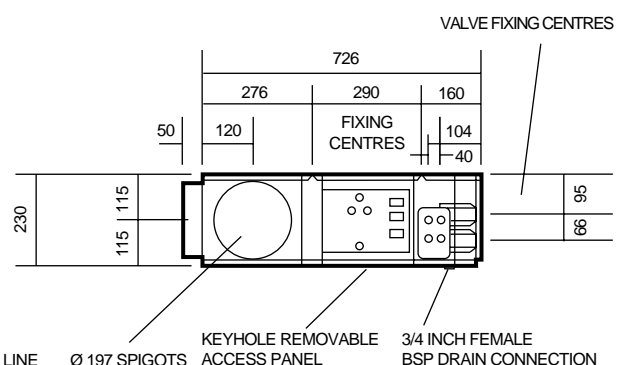
**For detailed acoustic data of Inlet/Casing Radiated and Discharge Sound Power Levels, please refer to Technical Sales Office.**

### Dimensional Data



Unit	Dim A	Dim B	Weight	Spigot Options	HTG Conns	CLG Conns
PHW 231	380	350	25 kg	1-,-,-4-,-,-7	Ø 15mm	Ø 15mm
PHW 232	730	700	35 kg	1-2-,-,-,-6-7	Ø 15mm	Ø 15mm
PHW 232-X	730	700	40 kg	1-2-,-,-,-6-7	Ø 15mm	Ø 15mm
PHW 233	1080	1050	50 kg	1-2-,-,-4-,-,-6-7	Ø 15mm	Ø 15/22mm
PHW 234	1430	1400	65 kg	1-2-3-,-,-5-6-7	Ø 15mm	Ø 22mm
PHW 234-X	1430	1400	70 kg	1-2-3-,-,-5-6-7	Ø 15mm	Ø 22mm
PHW 235	1780	1750	85 kg	1-2-3-4-5-6-7	Ø 15mm	Ø 22mm
PHW 235-X	1780	1750	90 kg	1-2-3-4-5-6-7	Ø 15mm	Ø 22mm

N.B. Max airflow per spigot to maintain N.R. 35 – 100l/s



# Hydropac – Horizontal

## Hydropac Series PHW 170 Waterside Control

### Horizontal Ceiling Mounted

Draw Through Chassis Fan Coil Units with Integral Multi-Spigotted Discharge Plenum.

**Performance Data** The information given is based upon the following Design Data.

**Design Data** Cooling E.A.T. 23 °C. DB, 16 °C. WB. Chilled Water @ 6/11 °C.

Heating E.A.T. 20 °C. L.T.H.W. @ 82/71 °C.

External Resistance, 30 Pa. Electrical Supply; 230V, 1-Phase, 50Hz.

Model	Speed Setting	Airflow l/s at 30Pa	Sensible Cooling Watts	Total Cooling Watts	Heating Watts	Input Watts	F.L.C Amps	S.C. Amps	N.R. Guide*
PHW171	1	40	580	709	1104	22	0.2	0.6	25
	2	60	849	1031	1535	31	0.23	0.69	30
	3	70	962	1154	1686	39	0.25	0.75	32
	4	85	1134	1342	1909	53	0.3	0.9	35
	5	95	1250	1473	2055	64	0.32	0.96	37
	6	110	1421	1683	2244	73	0.33	0.99	40
PHW172	1	60	849	1031	1535	28	0.25	0.75	25
	2	90	1192	1407	1982	40	0.3	0.9	30
	3	105	1385	1602	2187	50	0.32	0.96	32
	4	120	1532	1786	2357	62	0.35	1.05	35
	5	135	1701	1973	2525	74	0.37	1.11	37
	6	155	1928	2225	2742	89	0.4	1.2	40
PHW173	1	90	1254	1513	2281	50	0.45	1.35	25
	2	145	1893	2225	3081	80	0.6	1.8	30
	3	170	2187	2557	3390	101	0.65	1.95	32
	4	185	2380	2751	3555	130	0.73	2.19	35
	5	205	2592	3011	3772	150	0.75	2.25	37
	6	235	2941	3403	4092	178	0.8	2.4	40
PHW174	1	100	1449	1774	2758	56	0.5	1.5	25
	2	155	2237	2738	3655	80	0.6	1.8	30
	3	180	2573	3136	4028	101	0.65	1.95	32
	4	195	2774	3374	4246	133	0.75	2.25	35
	5	215	3035	3680	4519	160	0.8	2.4	37
	6	245	3399	4092	4861	189	0.85	2.55	40
PHW175	1	140	2028	2483	3809	78	0.7	2.1	25
	2	200	2825	3427	4740	113	0.85	2.55	30
	3	230	3228	3905	5191	143	0.92	2.76	32
	4	245	3429	4145	5415	187	1.05	3.15	35
	5	285	3696	4481	5706	224	1.12	3.36	37
	6	290	4002	4808	5997	267	1.2	3.6	40

**Note:** All cooling duties shown at minimum leaving air temperature of 11° C. For alternative design criteria please refer to our Technical Sales Office.

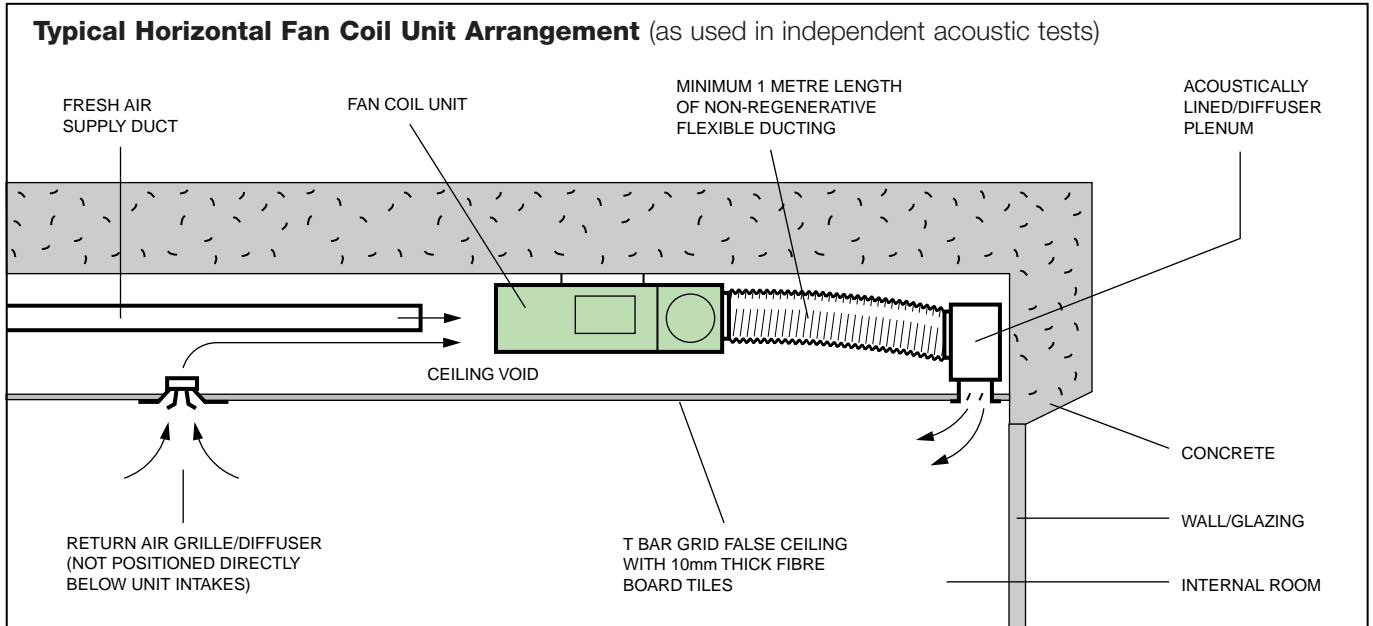
Sensible Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
C/W Flow Temp. °C								
C/W Δt	5	6	7	8	9	10	11	12
4	1.00	1.00	0.99	0.94	0.88	0.82	0.72	0.65
5	1.00	1.00	0.95	0.89	0.82	0.74	0.64	0.57
6	0.99	0.96	0.88	0.81	0.73	0.65	0.57	0.51
7	0.93	0.86	0.79	0.72	0.64	0.56	0.52	0.46

Heating Duty Correction Factors At Speed 4							
H/W Flow Temp. °C							
H/W Δt	100	90	80	70	60	50	40
5	-	-	-	-	0.67	0.47	0.30
10	1.37	1.17	0.97	0.79	0.58	0.35	0.15
15	1.29	1.10	0.89	0.70	0.43	0.20	0.10
20	1.22	1.02	0.82	0.58	0.25	0.15	-

Total Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
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C/W Δt	5	6	7	8	9	10	11	12
4	1.01	1.00	0.98	0.89	0.79	0.70	0.59	0.53
5	1.01	1.00	0.94	0.85	0.75	0.65	0.52	0.47
6	1.01	0.98	0.87	0.78	0.67	0.58	0.47	0.42
7	1.01	0.89	0.79	0.70	0.60	0.50	0.43	0.38

Thermal Correction Factors For Varying External Air Resistances							
Pa	20	30	40	50	60	70	80
Cooling	1.02	1.00	0.97	0.95	0.92	0.89	0.86
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## NR Guide



### \* Notes on 'NR' predictions

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The units should be mounted into a false ceiling of not less than 300mm deep, constructed of a standard 'T' bar grid with 10mm thick fibre board tiles.

Rooms of open plan or partitioned

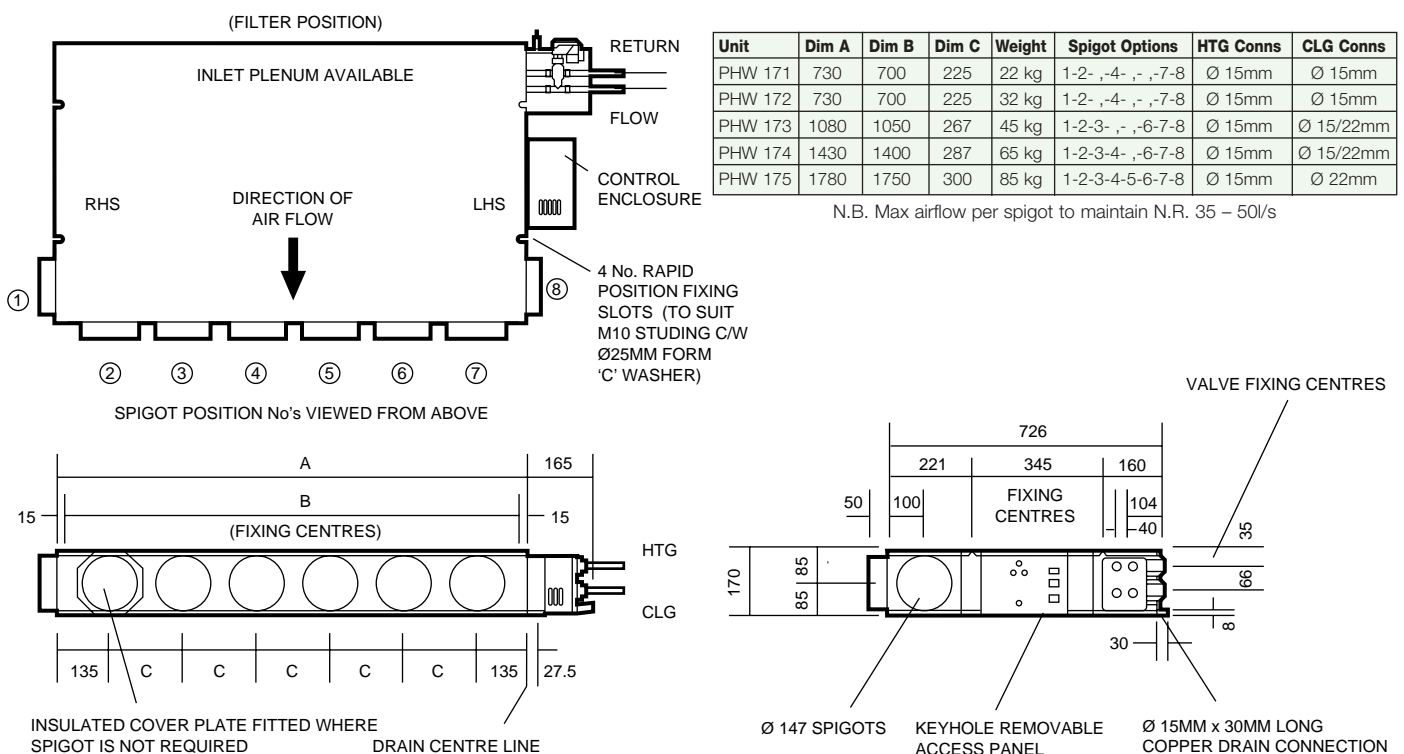
design should be furnished, carpeted and have no more than 20% glass area with no highly reflective surfaces such as ceramic tiles etc.

Where a single unit is serving a room the dimensions should be based upon a cooling load of 120w/sq.m e.g a unit giving 1.2kW total cooling output should be serving a room with a floor area of not less than 10sq.m. In an open plan area units should be mounted at a minimum of 3m centres and no closer than 1.5m from a corner. Return air grilles should not be positioned directly below unit intakes.

At least 1m of non-regenerative flexible ducting is used on each spigot outlet, with an acoustically lined diffuser plenum. A maximum air velocity of 3.0m/s per outlet spigot to achieve NR35. The above should give the predicted Lp at 1.5m from the nearest diffuser. For accurate sound assessment, it may be necessary to obtain confirmation from an acoustics specialist.

**For detailed acoustic data of Inlet/Casing Radiated and Discharge Sound Power Levels, please refer to Technical Sales Office.**

### Dimensional Data



## Aeropac Series PHA 230 Airside Control

### Horizontal Ceiling Mounted

Draw Through Chassis Fan Coil Units with Integral Multi-Spigotted Discharge Plenum.

**Performance Data** The information given is based upon the following Design Data.

**Design Data** Cooling E.A.T. 23 °C. DB, 16 °C. WB. Chilled Water @ 6/11 °C.

Heating E.A.T. 20 °C. L.T.H.W. @ 82/71 °C.

External Resistance, 30 Pa. Electrical Supply; 230V, 1-Phase, 50Hz.

Model	Speed Setting	Airflow l/s at 30Pa	Sensible Cooling Watts	Total Cooling Watts	Heating Watts	Input Watts	F.L.C Amps	S.C. Amps	N.R. Guide*
PHA231	1	50	587	642	931	33	0.25	0.75	25
	2	70	746	804	1129	47	0.3	0.9	30
	3	80	819	880	1220	57	0.32	0.96	32
	4	90	890	954	1306	68	0.34	1.02	35
	5	100	961	1027	1391	78	0.36	1.08	37
	6	110	1032	1102	1474	85	0.4	1.2	40
PHA232	1	80	993	1102	1790	55	0.4	1.2	25
	2	125	1432	1561	2371	70	0.45	1.35	30
	3	140	1572	1708	2524	90	0.5	1.5	32
	4	170	1880	2037	2826	110	0.55	1.65	35
	5	190	2059	2223	3018	125	0.6	1.8	37
	6	210	2258	2436	3205	144	0.85	1.95	40
PHA232-X	1	80	993	1102	1790	60	0.5	1.5	25
	2	120	1432	1572	2371	75	0.57	1.71	30
	3	150	1668	1809	2626	115	0.65	1.95	32
	4	185	2010	2171	2971	130	0.7	2.1	35
	5	215	2308	2490	3251	165	0.75	2.25	37
	6	240	2563	2764	3482	175	0.85	2.55	40
PHA233	1	100	1278	1429	2200	110	0.8	2.4	25
	2	185	2190	2400	3501	140	0.9	2.7	30
	3	220	2558	2795	3851	180	1.0	3.0	32
	4	270	3092	3370	4340	220	1.1	3.3	35
	5	300	3407	3708	4615	270	1.2	3.6	37
	6	330	3720	4044	4888	290	1.3	3.9	40
PHA234	1	115	1499	1690	2932	110	0.85	2.55	25
	2	195	2382	2632	4119	150	0.95	2.85	30
	3	230	2787	3073	4588	210	1.05	3.15	32
	4	290	3457	3794	5249	265	1.15	3.45	35
	5	320	3786	4148	5554	290	1.35	4.05	37
	6	380	4438	4853	6147	380	1.7	5.1	40
PHA234-X	1	130	1729	1964	3293	170	1.25	3.75	25
	2	215	2612	2882	4388	205	1.3	3.9	30
	3	265	3182	3499	4992	240	1.35	4.05	32
	4	340	4005	4385	5755	300	1.5	4.5	35
	5	380	4438	4853	6147	355	1.6	4.8	37
	6	410	4756	5195	6430	400	1.7	5.1	40
PHA235	1	155	2007	2256	3982	170	1.3	3.9	25
	2	235	2901	3215	5112	210	1.35	4.05	30
	3	290	3557	3935	5862	300	1.5	4.5	32
	4	360	4359	4805	6650	375	1.7	5.1	35
	5	390	4693	5164	6961	400	1.9	5.7	37
	6	470	5569	6103	7773	500	2.4	7.2	40
PHA235-X	1	175	2224	2483	4271	230	1.7	5.1	25
	2	310	3798	4200	6124	290	1.85	5.55	30
	3	385	4637	5104	6909	370	2.1	6.3	32
	4	440	5243	5753	7473	450	2.25	6.75	35
	5	490	5782	6332	7965	550	2.4	7.2	37
	6	530	6205	6787	8348	570	2.8	7.8	40

(Please Note **X** denotes an additional Fan is incorporated to the respective Model)

**Note:** All cooling duties shown at minimum leaving air temperature of 11° C. For alternative design criteria please refer to our Technical Sales Office.

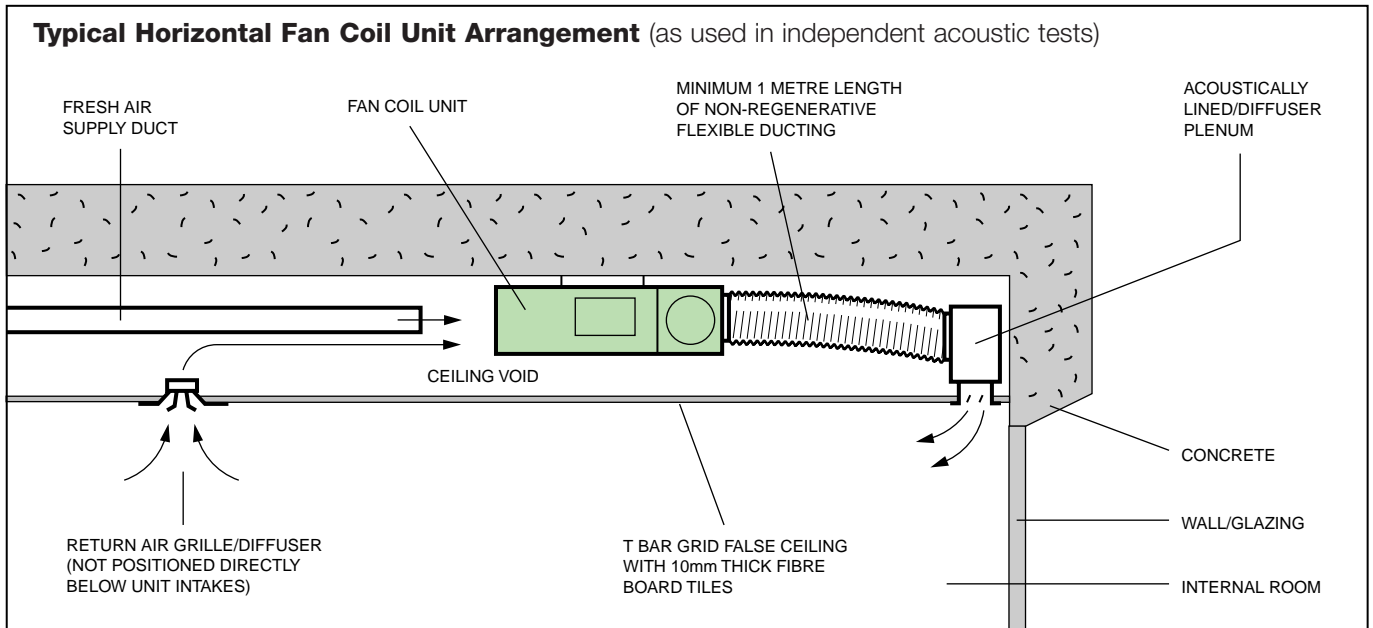
Sensible Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
C/W Flow Temp. °C								
C/W Δt	5	6	7	8	9	10	11	12
4	1.00	1.00	0.99	0.94	0.88	0.82	0.72	0.65
5	1.00	1.00	0.95	0.89	0.82	0.74	0.64	0.57
6	0.99	0.96	0.88	0.81	0.73	0.65	0.57	0.51
7	0.93	0.86	0.79	0.72	0.64	0.56	0.52	0.46

Heating Duty Correction Factors At Speed 4							
H/W Flow Temp. °C							
H/W Δt	100	90	80	70	60	50	40
5	–	–	–	–	0.67	0.47	0.30
10	1.37	1.17	0.97	0.79	0.58	0.35	0.15
15	1.29	1.10	0.89	0.70	0.43	0.20	0.10
20	1.22	1.02	0.82	0.58	0.25	0.15	–

Total Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
C/W Flow Temp. °C								
C/W Δt	5	6	7	8	9	10	11	12
4	1.01	1.00	0.98	0.89	0.79	0.70	0.59	0.53
5	1.01	1.00	0.94	0.85	0.75	0.65	0.52	0.47
6	1.01	0.98	0.87	0.78	0.67	0.58	0.47	0.42
7	1.01	0.89	0.79	0.70	0.60	0.50	0.43	0.38

Thermal Correction Factors For Varying External Air Resistances							
Pa	20	30	40	50	60	70	80
Cooling	1.02	1.00	0.97	0.95	0.92	0.89	0.86
Heating	1.02	1.00	0.98	0.97	0.95	0.94	0.93

## NR Guide



### \* Notes on 'NR' predictions

**'NR' predictions quoted are based upon extensive acoustic independent tests to the above arrangement and are intended as a guide to levels which can be expected.**

The following qualifications must apply:-

Units must be mounted correctly, using rubber washers, onto a solid structure.

The units should be mounted into a false ceiling of not less than 300mm deep, constructed of a standard 'T' bar grid with 10mm thick fibre board tiles.

Rooms of open plan or partitioned

design should be furnished, carpeted and have no more than 20% glass area with no highly reflective surfaces such as ceramic tiles etc.

Where a single unit is serving a room the dimensions should be based upon a cooling load of 120w/sq.m e.g a unit giving 1.2kW total cooling output should be serving a room with a floor area of not less than 10sq.m. In an open plan area units should be mounted at a minimum of 3m centres and no closer than 1.5m from a corner.

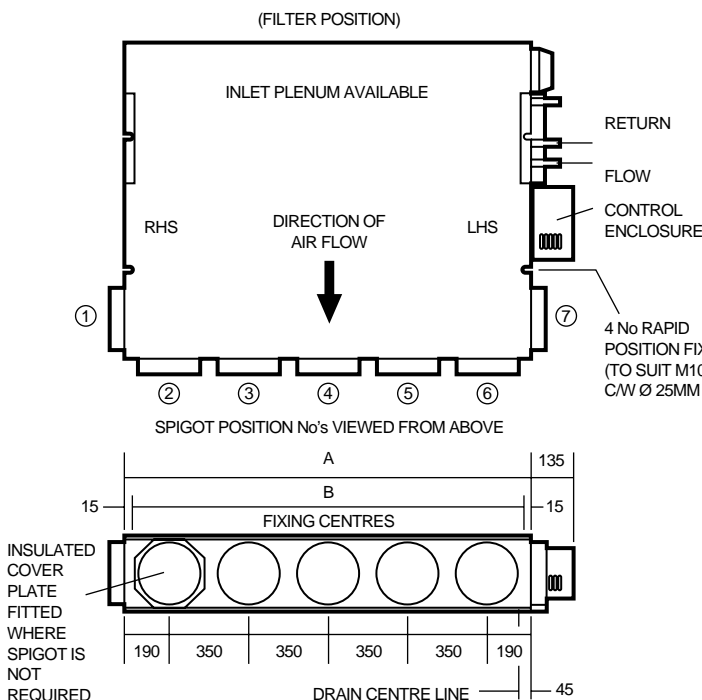
Return air grilles should not be positioned directly below unit intakes.

At least 1m of non-regenerative flexible ducting is used on each spigot outlet, with an acoustically lined diffuser plenum. A maximum air velocity of 3.0m/s per outlet spigot to achieve NR35.

The above should give the predicted Lp at 1.5m from the nearest diffuser. For accurate sound assessment, it may be necessary to obtain confirmation from an acoustics specialist.

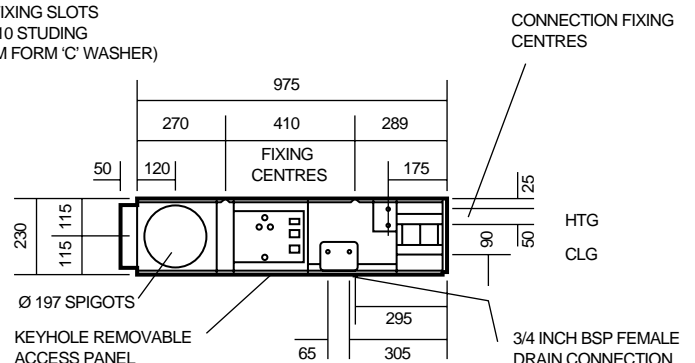
**For detailed acoustic data of Inlet/Casing Radiated and Discharge Sound Power Levels, please refer to Technical Sales Office.**

### Dimensional Data



Unit	Dim A	Dim B	Weight	Spigot Options	HTG Conns	CLG Conns
PHA 231	380	350	35 kg	1-,-,-4-,-,-7	Ø 15mm	Ø 15mm
PHA 232	730	700	50 kg	1-2-,-,-,-6-7	Ø 15mm	Ø 15mm
PHA 232-X	730	700	55 kg	1-2-,-,-,-6-7	Ø 15mm	Ø 15mm
PHA 233	1080	1050	70 kg	1-2-,-4-,-6-7	Ø 15mm	Ø 15/22mm
PHA 234	1430	1400	90 kg	1-2-3-,-5-6-7	Ø 15mm	Ø 22mm
PHA 234-X	1430	1400	95 kg	1-2-3-,-5-6-7	Ø 15mm	Ø 22mm
PHA 235	1780	1750	115 kg	1-2-3-4-5-6-7	Ø 15mm	Ø 22mm
PHA 235-X	1780	1750	120 kg	1-2-3-4-5-6-7	Ø 15mm	Ø 22mm

N.B. Max airflow per spigot to maintain N.R. 35 = 100l/s



## Introduction Packaged Vertical Waterside

### Hydropac (Series PVW)

**Actionair vertical chassis and cased wall mounted** fan coils are waterside control, suitable for free-blow, applications or vertical ducted arrangements operating up to 60 Pa external resistance, using chilled water cooling medium and low pressure hot water medium.

Temperature control is by means of modulating 4-port diverting valves on heating and cooling.

Designated PVW the series consists of five models 230mm deep, with six non-cased/cased variations.

#### Optional cases include:-

- Option NC – Non cased unit configuration.
- Option #0 – Non cased unit with spigot option.
- Option #1 – Low level cased unit with bottom inlet and top/front (angled) grilled outlet.
- Option #2 – Low level cased unit with front (low level) grilled inlet and top/front (angled) grilled outlet.
- Option #3 – High level cased unit with front (low level) grilled inlet and top/front (angled) grilled outlet.
- Option #4 – High level cased unit with bottom grilled inlet and front vertical (high level) grilled outlet.

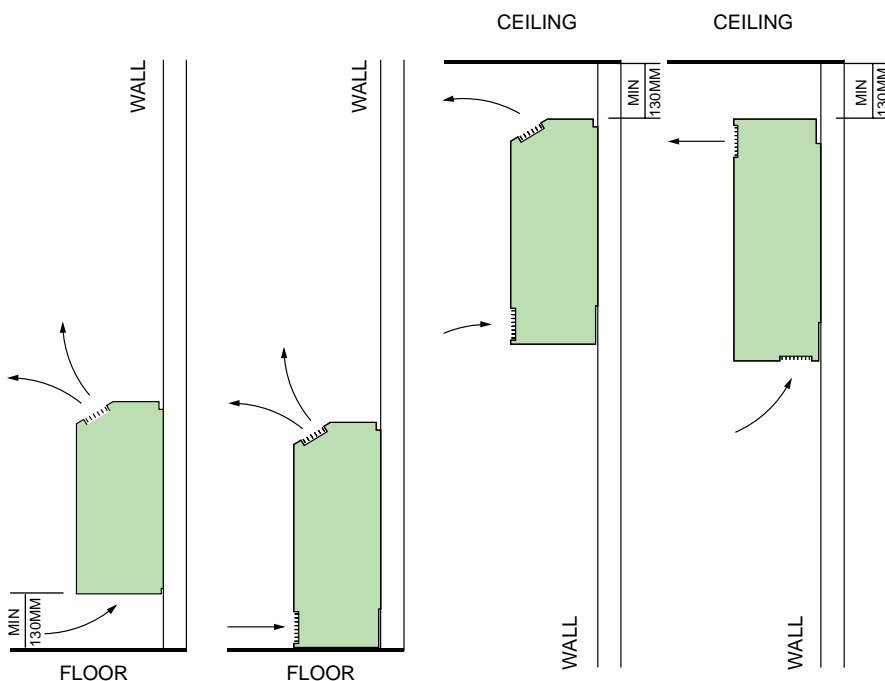
#### Cased option configurations

**Option #1**  
(low level)

**Option #2**  
(low level)

**Option #3**  
(high level)

**Option #4**  
(high level)



## Specification

### Chassis

The unit chassis shall be manufactured from 1.2mm galvanised sheet steel with 1.6mm fan decks and back plates for stiffness and durability. The construction shall produce a flush external finish to prevent exposure to bare edges or sharp objects, giving unhindered access to filters, controls and fitting of ductwork. Chassis shall incorporate keyslot mounting points to suit M8 fixings to facilitate fitting to wall.

All fixings, where permanent, shall be rivetted or, where removable, screwed into a captive nut.

### Access

Access to fans/motors shall be via an easy removal insulated panel.

### Insulation

100Kg/m<sup>3</sup> density, class 'O' CFC and HFC free open cell foam shall be utilised for both thermal and acoustic insulation.

Complying with 'Section 20' requirements and having a maximum thermal conductivity of 0.05 to 0.065 W/mk.

N.B. Condensate tray insulation shall be similar specification except closed cell type.

## Fans

Fans shall be double width, resiliently mounted, direct driven, forward curved centrifugal type with high efficiency, low noise multiblade galvanised sheet steel impellers housed within heavy gauge galvanised or synthetically treated steel scrolls.

Complete impeller/motor assemblies shall be statically and dynamically balanced in two planes, in accordance with BS5265 Part 1, 1979 to G2.5.

Fans shall be separately mounted on 1.6mm galvanised sheet steel easily removable decks.

## Motors

Motors shall be permanent split capacitor type external rotor, totally enclosed, speed controllable, high efficiency type with a power factor of 0.9 or better.

Bearings shall be sealed for life, maintenance free ball type, having a minimum life expectancy of 50,000 hours, under normal operating conditions.

Auto resetting thermo-contactors shall be built into the windings to ensure overload protection.

Insulation shall be to class 'B' with enclosure to IP44, and electrical supply shall be 230V 1ph 50Hz.

## Speed Control

Speed control shall be by means of a multi-tapped transformer giving nine settings, three of which shall be pre-wired to a panel mounted selector switch.

Fine adjustment shall be provided utilising a pure sine wave method, obviating adjacent control interaction and electro-mechanical harmonics, and complying fully with BS800. (Radio interference suppression).

On/off control to fans shall be by means of a panel mounted illuminated two position switch.

## Coils

Coil matrix blocks shall be manufactured from seamless copper tube mechanically expanded into aluminium fins having die formed collars providing a tight bond to optimise heat transfer.

Circuitry design shall ensure correct contra flow and prevent air locking.

Vents and drains shall be fitted as standard with easily accessible slotted/hexagonal plugs.

Coil pressure testing shall be by dry air under water, to 15 bar and valve assemblies by hydraulic test to manufacturers recommended maximum pressure.

A plate shall be provided to support and protect the valve assembly and connecting pipework.

## Electric Heating (optional)

Electric elements, where included, shall be black heat, unfinned 'Incaloy' sheaths around a resistance spiral wire insulated by compacted magnesium oxide powder and sealed with silicone rubber.

Overheat protection shall be by means of high temperature automatic or manually re-settable cutouts and switching shall be by means of electrical relays.

## Condensate Tray

Condensate trays shall be one piece, welded, galvanised sheet steel, synthetically treated, foam insulated and extended to cover the entire coil and valve assembly, and shall be easily removed for cleaning without disturbing hot and cold water pipework.

A positive fall to drain shall be provided with 15mm connection at its lowest point.

## Filters

Filters shall be fine woven vacuum cleanable metal mesh or washable EU3, continuous filament media to Eurovent 4/5, with F1 fire resistance to DIN 53438 and a dust holding capacity of 380g/m<sup>2</sup>, in a galvanised steel channel frame with steel support mesh.

## Control Housing

A purpose designed, ventilated control housing shall be mounted on the side of the chassis for easy access and shall include a hinged/removable cover.

The housing shall incorporate the speed control transformer and switches plus a 1m flying lead, for connection to adjacent fused spur, and a 24V screened output for connection to temperature controls. All wiring shall be in accordance with current I.E.E. regulations.

## Waterside Control Method

### (HYDROPAC – VERTICAL)

Temperature control shall be by means of modulating 4 – port diverting valves and actuators, operated via a stand alone or BMS temperature controller and room or return air sensor.

The information contained herein is subject to change without notice due to continuing research and development.

## Hydropac Series PVW 230 Waterside Control

**Vertical Cased and Chassis Wall Mounted**  
Blow Through Fan Coil Units.

### Performance Data

The information given is based upon the following Design Data.

### Design Data

Cooling E.A.T. 22 °C. DB, 15 °C. WB. Chilled Water @ 6/11 °C.

Heating E.A.T. 20 °C. L.T.H.W. @ 82/71 °C.

External Resistance, 10 Pa. Electrical Supply; 230V, 1-Phase, 50Hz.

Model	Speed Setting	Airflow l/s at 10Pa	Sensible Cooling Watts	Total Cooling Watts	Heating Watts	Input Watts	F.L.C Amps	S.C. Amps	N.R. Guide*
PVW231	1	35	383	427	642	15	0.15	0.45	25
	2	40	419	463	704	17	0.18	0.54	30
	3	50	489	534	829	20	0.19	0.57	32
	4	55	524	570	883	22	0.2	0.6	35
	5	60	557	605	934	25	0.22	0.66	37
	6	70	617	668	1017	28	0.24	0.72	40
PVW232	1	65	711	791	1424	26	0.22	0.66	25
	2	90	888	971	1737	32	0.3	0.9	30
	3	100	957	1041	1851	36	0.32	0.96	32
	4	110	1025	1113	1964	40	0.34	1.02	35
	5	120	1093	1185	2077	45	0.36	1.08	37
	6	130	1162	1259	2188	49	0.38	1.14	40
PVW233	1	75	831	927	1687	40	0.38	1.14	25
	2	115	1292	1446	2458	50	0.42	1.26	30
	3	140	1525	1695	2757	60	0.5	1.5	32
	4	160	1715	1898	2992	65	0.55	1.65	35
	5	180	1905	2105	3224	75	0.6	1.8	37
	6	215	2229	2455	3604	90	0.7	2.1	40
PVW234	1	120	1312	1459	2640	55	0.5	1.5	25
	2	140	1530	1701	3066	58	0.55	1.65	30
	3	160	1702	1881	3303	63	0.58	1.74	32
	4	200	2057	2263	3767	80	0.68	2.04	35
	5	220	2241	2463	3995	90	0.75	2.25	37
	6	240	2428	2866	4220	100	0.78	2.34	40
PVW235	1	130	1407	1560	2902	65	0.62	1.86	25
	2	185	1925	2122	4018	85	0.8	2.4	30
	3	220	2213	2428	4436	120	1.05	3.15	32
	4	250	2472	2706	4788	150	1.15	3.45	35
	5	275	2697	2949	5078	165	1.2	3.6	37
	6	320	3117	3404	5594	185	1.25	3.75	40

**Note:** All cooling duties shown at minimum leaving air temperature of 11 °C. For alternative design criteria please refer to our Technical Sales Office.

Sensible Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
C/W Flow Temp. °C								
C/W Δt	5	6	7	8	9	10	11	12
4	1.25	1.14	1.06	0.98	0.88	0.78	0.69	0.60
5	1.10	1.00	0.94	0.88	0.79	0.70	0.62	0.54
6	1.02	0.94	0.88	0.81	0.73	0.64	0.57	0.48
7	0.96	0.89	0.82	0.75	0.67	0.60	0.51	0.42

Heating Duty Correction Factors At Speed 4							
H/W Flow Temp. °C							
H/W Δt	100	90	80	70	60	50	40
5	1.48	1.25	1.07	0.87	0.67	0.47	0.27
10	1.37	1.17	1.05	0.79	0.59	0.30	0.15
15	1.30	1.10	0.98	0.70	0.37	0.22	0.10
20	1.25	1.02	0.89	0.51	0.28	0.17	–

Total Cooling Duty Correction Factors At Speed 4 (Min. Air Off = 11 °C)								
C/W Flow Temp. °C								
C/W Δt	5	6	7	8	9	10	11	12
4	1.23	1.12	1.02	0.90	0.81	0.72	0.64	0.55
5	1.09	1.00	0.90	0.81	0.73	0.65	0.58	0.50
6	1.00	0.91	0.84	0.75	0.68	0.60	0.52	0.44
7	0.94	0.86	0.78	0.69	0.62	0.55	0.47	0.39

Thermal Correction Factors For Varying External Air Resistances						
Pa	10	20	30	40	50	60
Cooling	1.00	0.97	0.93	0.90	0.87	0.84
Heating	1.00	0.97	0.94	0.91	0.89	0.86

## Hydropac Series PVW 230 Waterside Control

### \*Notes on ‘NR’ predictions

**‘NR’ predictions are based upon extensive acoustic independent tests and are intended as a guide to levels which can be expected, when measured at 2.0m.**

*The following qualifications apply:-*

Units must be mounted correctly, using fixing points provided onto a flat, solid surface, such as concrete or brick wall in such a way that they are not subjected to undue stress and are checked for accuracy of horizontal levelling.

Rooms of open plan or partitioned design should be furnished, carpeted and have no more than 20% glass area with no highly reflective surfaces such as ceramic tiles etc.

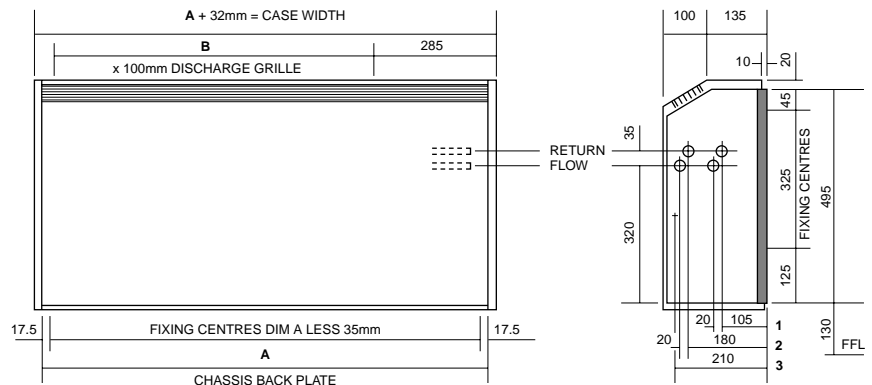
Where a single unit is serving a room the dimensions should be based upon a cooling load of 120w/sq.m e.g a unit giving 1.2kW total cooling output should be serving a room with a floor area of not less than 10sq.m. In an open plan area units should be mounted at a minimum of 3m centres and no closer than 1.5m from a corner.

Units installed in accordance with the above should give the predicted N.R. level when measured at a distance of 2.0m from any surrounding flat surface. For accuracy assessment it may be necessary to obtain confirmation from an independent acoustic specialist.

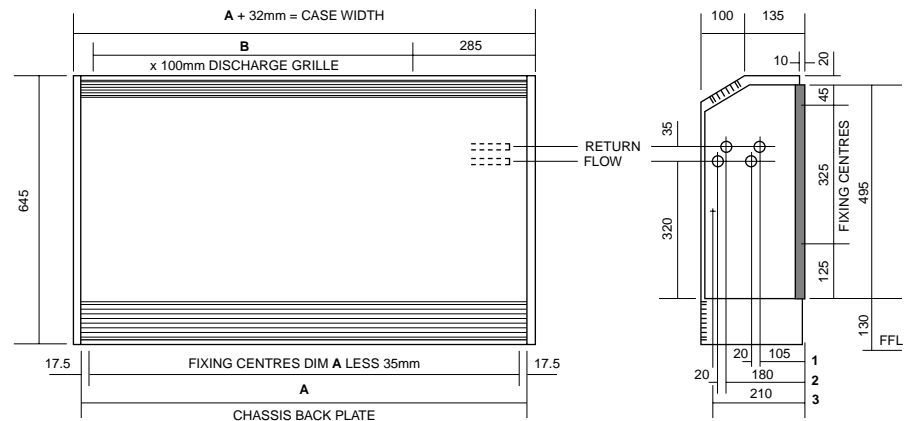
**For detailed acoustic data of Radiated Sound Power Levels, please refer to Technical Sales Office.**

### Dimensional Data

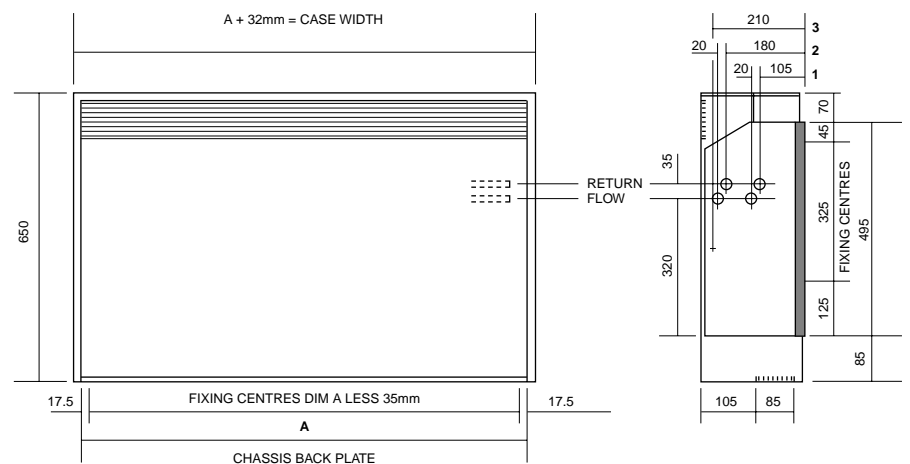
#### Option #1 (low level)



#### Option #2 (low level) and Option #3 (high level)



#### Option #4 (high level)



(Handings are determined by facing/looking at the unit)

Unit	Dim A	Dim B	Weight	HTG Cons	CLG Conns
PVW 231	785	310	30kg	Ø15mm	Ø15mm
PVW 232	1035	660	43kg	Ø15mm	Ø15mm
PVW 233	1385	1010	62kg	Ø15mm	Ø22mm
PVW 234	1735	1380	86kg	Ø15mm	Ø22mm
PVW 235	2086	1710	110kg	Ø15mm	Ø22mm

## Product Code Configuration

Model	<b>HYDROPAC</b>	<i>(Waterside Control Fan Coil Units)</i>
Series	<b>PHW</b> <b>PHW 230</b> <b>PHW 170</b>	<i>(Packaged Horizontal Waterside)</i> <i>(Standard 230mm deep)</i> <i>(Slimline 170mm deep)</i>
Model	<b>AEROPAC</b>	<i>(Airside Control Fan Coil Units)</i>
Series	<b>PHA</b> <b>PHA 230</b>	<i>(Packaged Horizontal Airside)</i> <i>(Standard 230mm deep)</i>
Model	<b>HYDROPAC</b>	<i>(Waterside Control Fan Coil Units)</i>
Series	<b>PVW</b> <b>PVW 230</b>	<i>(Packaged Vertical Waterside)</i> <i>(Standard 230mm deep)</i>
<small>(Customer to advise non cased/cased option)</small>		

## Selection Guidelines Example (e.g. Horizontal, Waterside, 230mm deep, size 2)

<b>1</b>	Model type and Series	<b>PHW 232</b>
<b>2</b>	Design Criteria:-	
	Duty: Sensible Cooling	<b>1636 Watts</b>
	Total Cooling	<b>1924 Watts</b>
	Heating	<b>2132 Watts</b>
	Airflow	<b>125 l/s</b>
	NR requirement	<b>30 NR</b>
	(Cooling – Entering Air Temperature)	<b>23 °C DB*</b>
	(Cooling – Entering Air Temperature)	<b>16 °C WB*</b>
	(Chilled Water – Flow)	<b>6 °C*</b>
	(Chilled Water – Return)	<b>11 °C*</b>
	(Heating – Entering Air Temperature)	<b>20 °C*</b>
	(LTHW – Flow)	<b>82 °C*</b>
	(LTHW – Return)	<b>71 °C*</b>
	(External Resistance)	<b>30 Pa*</b>
	Electrical Supply	<b>230V, 1-Phase, 50Hz*</b>
	<small>* (Denotes standard design data based upon catalogue selection for Horizontal type units)</small>	
<b>3</b>	Customer Unit Reference	<b>FCU/1/28</b>
<b>4</b>	Handing (pipework connections) <small>(Please refer to relevant catalogue drawing for orientation)</small>	<b>LH</b>
<b>5</b>	Controls and Options <small>(Please contact our Technical Sales Office)</small>	

## Technical Support

Baxi Air Management Limited provides quality products backed by a dedicated team committed to providing the very best in customer service.

Specialist response from the Technical Sales Team, administrative response from the Computerised Sales Office and product maintenance from the Team of Experienced Service Engineers, who understand fully the needs of the industry.

## Actionair Products

For information on our comprehensive range of Fire, Smoke and Air Control Dampers, as well as Application, Technical and Pricing Advice, please refer to our Technical Sales Office.

# actionair



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Assessed to ISO 9002

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Certificate No.  
FM1611

Actionair, South Street, Whitstable, Kent CT5 3DU England  
Tel: (01227) 276100 Fax: (01227) 264262 International Code: +441227  
Website: [www.actionair.co.uk](http://www.actionair.co.uk)

The information contained herein is subject to change without notice due to continuing research and development.