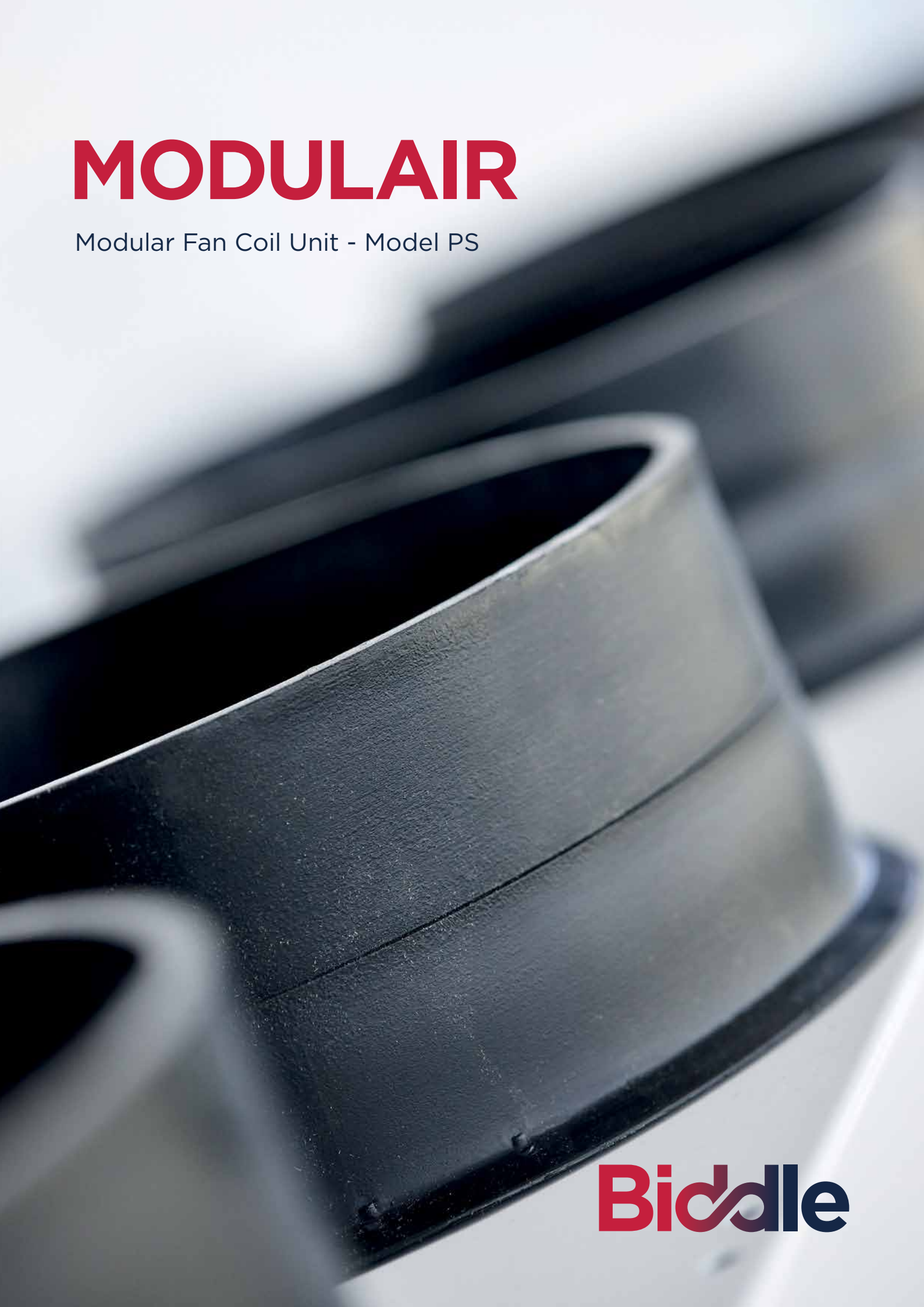
MODULAIR

Modular Fan Coil Unit - Model PS



Biddle

FOR THE PERFECT INDOOR CLIMATE

A pleasant indoor environment is largely determined by the room's climate. People often have very specific preferences regarding temperature and air quality. Comfortable surroundings help make visitors and staff feel welcome. Biddle's modular fan coil units enable draught-free cooling, heating and ventilation in every room. This allows users to control the temperature and ventilation themselves.

FLEXIBLE AIR CONDITIONING SYSTEM

The modular fan coil unit consists of multiple modules and is supplied with a patented suspension system. Biddle can create tailor-made climate-control systems to perfectly suit the clients' wishes. If the customer's needs change at a later date, then it is easy to adjust the composition of the modules.

For example, if the room is rearranged then the modules stay in place, but the ducts and discharge grilles can be easily relocated.

In addition to the basic cooling, heating and ventilation functions, the system offers many extra options. Thanks to the airtight structure of the modules and the negligible internal resistance, external pressure of between 50 and 250Pa can be built up (depending on the composition of the system). This enables extra filtering and soundproofing to be used. Furthermore, it enables optimal air distribution as multiple ducts and discharge grilles can be connected to the modular fan convector.

FEATURES AND BENEFITS:

- Pleasant indoor climate
- Fits into very compact spaces
- Flexible air conditioning control system
- Low noise levels
- Wide range of applications
- Variety of Biddle controls available
- Heating, cooling and/or ventilation
- Easy to install and maintain
- 5-year all-in guarantee

ENERGY CONSCIOUS

As the air is conditioned on a room-by-room basis, no energy is needed to transport the air to the rest of the building through ducts. Furthermore, no heating/cooling is lost during transport of the air. Ventilation is possible via wall or door vents. If desired, outside air can be used for cooling at night. When a Biddle control is installed in combination with a CO_2 sensor, the necessary ventilation air is automatically adjusted to suit the use of the room.

APPLICATIONS

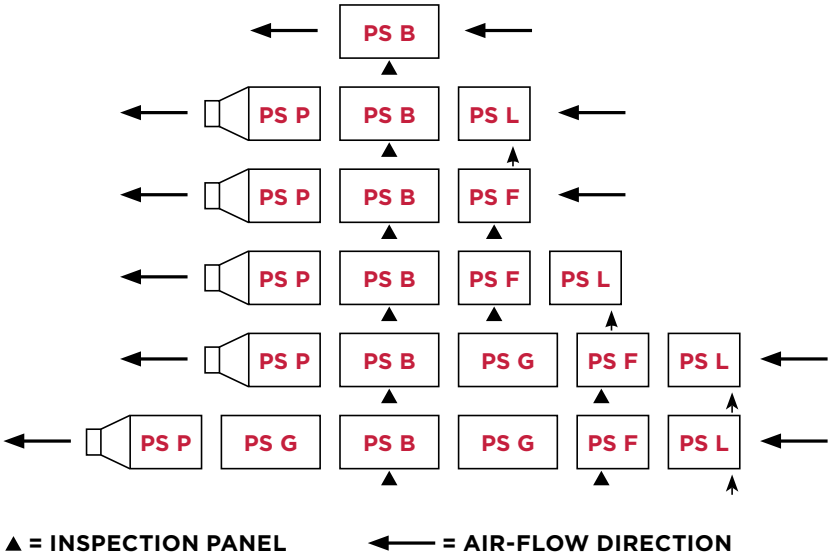
The modular fan coil units are particularly suitable for construction/renovation of office space, meeting rooms, hotels, schools, healthcare centres, hospitals, server rooms, shops, cinemas and museums.

All modules have an overall height of 230mm, enabling them to fit into the tiniest spaces above suspended ceilings. The height required for the mounted system is just 245mm. Once installed above a suspended ceiling, the only visible elements are the discharge grilles.

HOW IT WORKS

The modular system consists of a range of different modules.
All connection points (air and water-side, electric) are located on the right-hand side of the appliance (against the direction of the air-flow).

EXAMPLE CONFIGURATION OF MODULES



▲ = INSPECTION PANEL ⟵ = AIR-FLOW DIRECTION

The appliance is available in six different sizes: PS 20, PS 21, PS 40, PS 41, PS 60 and PS 61. These models produce an air-flow rate of up to 2,300m³/h. The PS model can heat, cool and or ventilate rooms as desired. Various configurations of the modules are also possible.

COMPOSITION OF THE MODULES

The base module consists of a battery, fan(s) and a flat-bed filter.
The modular system consists of the base module together with any combination of the following additional modules:

BASE MODULE: PS B

The base module (PS B) consists of a heating and/or cooling battery. The batteries are available in 2-pipe or 4-pipe varieties. Various combinations of heating and cooling are possible. The base module consists of a removable flat-bed filter (G3). Using the Biddle control, the room can be heated or cooled to the desired temperature and the ventilation rate can be adjusted. For PS B or PS H models with electric heating, the battery is equipped with a safety switch to prevent accidental activation, a residual-heat discharger and a temperature limiter. Electric heating is only available in combination with an air-side regulator (incorporated in the basic PS B module)

Base module

ADDITIONAL HEATING MODULE: PS H(E)

This module consists of an electric or heating battery.

ATTENUATOR MODULE: PS S

The attenuator module incorporates an aerodynamic fitting made from sound absorbent material.

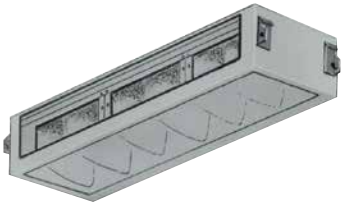
Attenuator module

PLENUM MODULE PS P

This module is equipped with round plastic duct connectors (ø200mm). The PS 20 and PS 21 have two nozzles, the PS 40 and 41 have four nozzles and the PS 60 and 61 have six nozzles.

FILTER MODULE: PS F/PS PF

The PS F is equipped with removable bag filters (choice ranges from class G3 to class F9). The PS PF is equipped with a removable pleated filter (class F7 or F9). The filter classes are in accordance with DIN 24185. If filter modules are installed together with the basic module, then the surface filter is not included in the base module.



Filter module

AIR MIXING MODULE: PS AV

The ventilation and air-recirculation valve is powered by a servomotor with spring return (available as an accessory). The air-valve module can be connected to a roof or exterior-wall grille. Both are available as accessories.

Air mixing module

EASY TO INSTALL AND MAINTAIN

The modules are installed using a special and patented suspension system. The suspension brackets are fixed to the modules, making assembly significantly easier. Furthermore, systems with integrated controls are delivered ready to use: just plug in & play! Inspection and maintenance of the system can be conducted via the easily accessible sliding inspection panel on the bottom of the basic and filter modules.

Modular fan coil unit

CONTROL OPTIONS

It is possible to expand the system with an air-side control or a combined air-side and water-side control (both include a user-friendly control panel). The controls ensure efficient heating and cooling with as little noise as possible. They include a weekly timer and a room thermostat and can be easily combined with a CO_2 sensor. With a CO_2 sensor, the amount of ventilation air is automatically adjusted to suit the needs of the room.

Model PS is available with three types of control, in order to make it suitable for every project.

BASIC MODEL (WITHOUT CONTROL)

The modular fan coil unit (only the recirculation model) is equipped with a tapped transformer set to a single fixed setting as standard.

AIR-SIDE CONTROLLER

This controller regulates the fan speed (3 speeds) in order to realise the desired room temperature. The desired room temperature is set via the control panel.

COMBINED AIR-SIDE AND WATER-SIDE CONTROLLER

This regulates both the fan speed and the discharge air temperature in order to realise the desired room temperature. The desired room temperature is set via the control panel. As standard, the ventilation units equipped with this controller.

CONTROL PANEL WITH LCD SCREEN

The control panel has a variety of touch keys and a user-friendly LCD screen. The desired room temperature can be set using the control panel, which is reached by either manually selecting one of the three fan speeds or allowing the system to automatically determine the appropriate speed. The buttons on the control panel can be locked to prevent unwanted operation.

One single control panel allows the user to interconnect and operate a maximum of ten units. The maximum length of the control cables within a control system is 100m. The control panel features a variety of menus for various purposes such as usage, installation, maintenance and setting the weekly timer.

AUTOMATIC OR MANUAL CONTROL

The control panel allows the user to select either the automatic or manual operation of the modular fan coil unit.

WEEKLY TIMER

As standard, the control panel is equipped with a weekly timer. This can automatically switch the unit on or off on specific days of the week.

CO_2 SENSOR

It is possible to fit ventilation units with a sensor that measures the room's CO_2 levels. The sensor ensures that the CO_2 level entered via the control panel is maintained by automatically increasing or reducing the ventilation flow.

INTEGRATED FROST PROTECTION AND AIR-VALVE CONTROL

The ventilation units are equipped with a controller that includes a built-in frost protection thermostat and air-valve control. The frost-protection device minimises the chances of the coil freezing (device set to 5°C). In the event of disruption or loss of power, the air valve will automatically switch to the recirculation mode.

PLUG & PLAY

The units with integrated controllers are delivered ready for use. The units are fitted with fixed power cables (approx. 2.5m in length) with a moulded and earthed plug. Via the connector plate and the connections in the casing, extra components can be added such as monitoring devices, control panels and inputs/outputs on the circuit board.

WHAT'S IN IT FOR ME?

STANDARD DELIVERY

As standard, the modular fan coil units are provided with:

- Removable air filters in the base module or filter module
- Suspension system consisting of a suspension rail, suspension/ connection brackets, hooks and securing brackets

ACCESSORIES

The following control accessories are available (see page 8)**:**

- Air-side controller
- Air-side and water-side controller
- Control panel
- CO_2 sensor
- Low-voltage cables (various lengths available)
- Ventilation module for direct coupling with extractor fan
- Frost protection (integrated into the Biddle regulator)

The following accessories are also available:

- Wall sleeve
- Wall grate
- Roof cap
- Flexible connection sleeves, both with and without duct-connection flanges
- Wall and ceiling grilles
- Condensation draining pump
- Servomotor for the air mixing module
- Right-angled duct connections
- External condensation-collection tray (applies only to cooling modules)

In consultation, a wide range of project-specific adjustments can be made to the appliances.

SPECIFICATIONS

CASING AND SUSPENSION SYSTEM

The casing (colour: RAL 9016) of the modules is made of Zincor plating and has been reinforced to prevent deformation and withstand vibrations. On the underside of the basic and filter models, you can find an inspection panel. A patented suspension system is provided with the modular fan coil units. The suspension system consists of a suspension rail, suspension/connection brackets, suspension hooks and securing brackets made of unpainted galvanised steel.

HEATING/COOLING COIL (LPHW/LPCW)

The high-efficiency coil is fabricated from 3/8" copper pipes and aluminium plates. The coils are available in 2 or 4-pipe models. The operating pressure is max. 6 Bar At 90°C.

FAN/MOTOR UNIT

The base module includes one or more (depending on the model) double-intake, free-hanging centrifugal fans, powered by an external rotor motor with ball bearings. The fan casing and rotor blade are made of Sendzimir-galvanised steel plating. The motor is constructed in accordance with DIN 40050, protection class IP44 and insulation class B. As standard, the motors and equipped with temperature limiters in the casing. The limiters break the electric circuit if the maximum permissible motor temperature is exceeded.

Model codes
PS B 20 H1

Modules	
PS B =	Base module
PS H(E) =	Additional heating module (water/electric)
PS S =	Attenuator module
PS P =	Plenum module
PS F =	Filter module (bag filters G3-F9)
PS PF =	Pleated filter module (F7 and F9)
PS AV =	Air-mixing module

Appliance dimensions	
PS 20 =	up to 600 m^3/h
PS 21 =	up to 800 m^3/h
PS 40 =	up to 1000 m^3/h
PS 41 =	up to 1600 m^3/h
PS 60 =	up to 1600 m^3/h
PS 61 =	up to 2300 m^3/h

Coil type		
2-pipe	H1, H2 =	Water heating*
4-pipe	H3, H4 =	Water heating*
	C3, C4 =	Water cooling*
	H1C3 =	Water heating and cooling**
	H2C2 =	Water heating and cooling**
	R4 =	Cooling (direct expansion)*
	HE =	Electric heating

* 2-pipe system ** 4-pipe system

Right-hand connection (against the direction of the air-flow). Details of the H3, HE and R4 models are available upon request.

MODULAIR

Technical Details

GENERAL TECHNICAL DATA

ELECTRICAL SUPPLY

- Motor: 230 V / 1 ph / 50Hz
- Electric heating: 400 V / 3 ph / 50 Hz

FAN DATA

Model	Fans per unit	Nom.* power W	Nom.* current A	Capacitor model µF	Transformer model A
PS B-20	1	100	0.46	2	1.5
PS B-21	1	300	1.31	8	1.5
PS B-40	2	200	0.92	2	1.5
PS B-41	2	600	2.62	8	4
PS B-60	3	300	1.38	2	1.5
PS B-61	3	900	3.93	8	4

*The values displayed are the nominal values indicated on the fans. In practical operation, these values can be considerably lower.

- Fan-protection class: IP 44
- Insulation class: B

Kv VALUES AND DIAMETER OF DUCTS

	Coil type													
	H1		H2		H3		H4		C2		C3		C4	
Unit	Kvs	DN	Kvs	DN	Kvs	DN	Kvs	DN	Kvs	DN	Kvs	DN	Kvs	DN
PS 20/PS 21	0.63	15	1	15	1.6	15	2.5	20	1	15	1.6	15	2.5	20
PS 40/PS 41	1.6	15	3	20	3	20	3	20	3	20	3	20	3	20
PS 60/PS 61	1.6	15	3	20	3	20	3	20	3	20	3	20	3	20

- Pipe diameter of DN 15 compression fitting: 15mm, DN 20: 22mm
- Kv values for the Biddle controller's 3-way valve

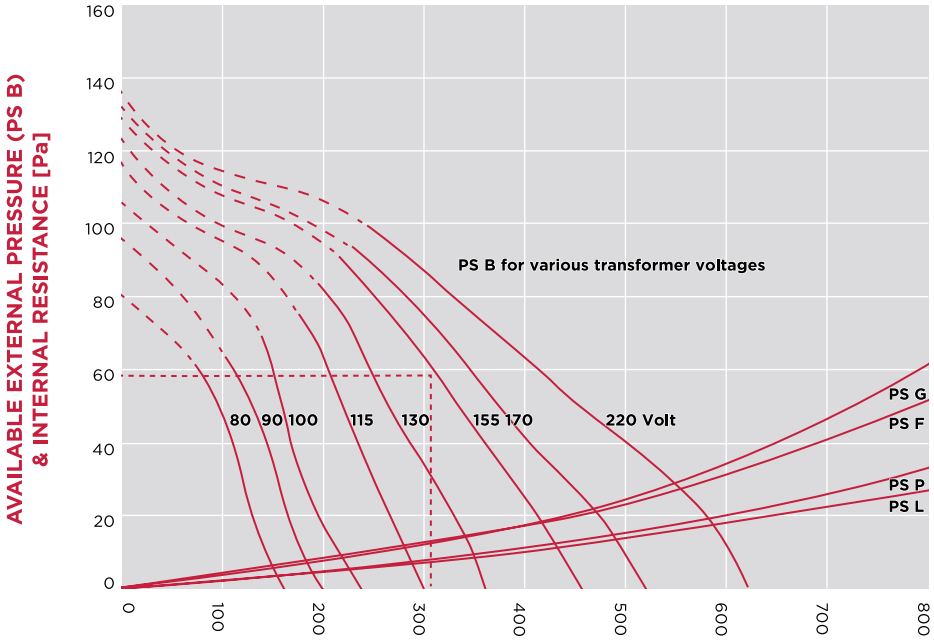
Kv VALUES AND DIAMETER OF DUCTS

Model	PS B	PS P	PS F	PS L	PS G	PS V
PS 20/PS 21	32	8	10	13	18	15
PS 40/PS 41	51	10	13	16	24	19
PS 60/PS 61	62	12	16	20	31	22

- The weights of the various models are given above in kg

MODULAIR PS 20

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 100, 130 and 170V as standard.

- - - - = example page 26

- PS G = Attenuator module
- PS F = Filter module (G4 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class G4 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ **[dB(A)]**

TOTAL PRESSURE REDUCTION [Pa]

110	38.5	39	39	39.5	-	-	-	-	-	-	-
100	38	38.5	39	39.5	-	-	-	-	-	-	-
90	37	37.5	38.5	39	39.5	-	-	-	-	-	
80	35.5	37	38	38.5	39	-	-	-	-	-	-
70	34.5	35.5	37	37.5	38.5	39.5		-	-	-	-
60	33.5	34.5	36	37	38	39	40	-	-	-	-
50	32	33	34.5	36	37.5	38.5	39.5	40.5	-	-	-
40	30	31	33	34	36	37.5	39	40	41.5	-	-
30	27	28.5	31	32.5	35	36.5	38	39.5	41	42	-
20	-	25.5	28	30.5	33	35.5	37.5	39	40.5	42	-
10	-	23	26	28.5	31.5	34.5	37	38.5	40	41.5	43
0	-	21	24.5	27	30	33.5	36	37.5	39.5	41.5	43
	100	150	200	250	300	350	400	450	500	550	600

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 20

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	0.46
Max. consumed power	W	100

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	100	200	300	400	500	600	100	200	300	400	500	600	100	200	300	400	500	600
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	2.1	3.7	5	6.2	7.1	8	2.8	5.2	7.2	9.1	10.8	12.5	1.8	3.5	5.2	6.7	8.1	9.5
Discharge temperature[2]	°C	47	39	34	31	28	26	64	59	54	51	48	45	38	37	36	35	33	32
Water flow rate	l/h	94	161	218	269	309	350	121	226	316	399	475	546	78	153	222	289	352	412
Water-side pressure loss[3]	kPa	2	6	11	15	19	24	1	3	6	9	12	16	0	1	1	2	2	3
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	1.8	3.1	4.2	5.2	6	6.8	2.3	4.4	6.1	7.7	9.2	10.5	1.4	2.7	3.9	5.1	6.2	7.2
Discharge temperature[2]	°C	50	43	39	36	33	31	65	60	56	53	51	49	38	37	36	35	34	33
Water flow rate	l/h	79	136	185	229	263	297	102	191	267	337	402	462	60	116	168	218	266	311
Water-side pressure loss[3]	kPa	2	5	8	11	15	18	1	2	4	7	9	12	0	0	1	1	1	2
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	1.5	2.6	3.5	4.3	5	5.6	1.9	3.6	5	6.4	7.6	8.7	1	1.9	2.7	3.5	4.3	5
Discharge temperature[2]	°C	53	47	44	41	39	37	65	62	58	56	54	52	38	37	36	35	35	34
Water flow rate	l/h	66	113	153	189	218	247	84	157	220	279	332	382	42	81	118	152	185	216
Water-side pressure loss[3]	kPa	1	3	6	8	11	13	1	2	3	5	6	8	0	0	0	1	1	1
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	1.2	2.1	2.8	3.5	4	4.5	1.5	2.9	4	5.1	6.1	7	0.6	1.1	1.5	1.9	2.3	2.7
Discharge temperature[2]	°C	56	51	48	46	44	42	66	63	60	58	56	55	37	36	35	34	34	34
Water flow rate	l/h	53	91	123	152	175	198	67	126	176	223	266	305	24	46	65	84	101	118
Water-side pressure loss[3]	kPa	1	2	4	6	7	9	0	1	2	3	4	6	0	0	0	0	0	0

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | CHW/LDKW 6/12 °C					
Air displacement[1]	m³/h	100	200	300	400	500	600	100	200	300	400	500	600	100	200	300	400	500	600
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	0.7	1.2	1.7	2.1	2.4	2.7	0.8	1.4	2	2.5	2.9	3.4	0.8	1.5	2.2	2.7	3.3	3.8
Cooling capacity sensible	kW	0.5	0.9	1.3	1.6	2	2.2	0.5	1	1.5	1.9	2.3	2.6	0.6	1.1	1.6	2	2.5	2.9
Discharge temperature[2]	°C	12	13	14	15	15	16	11	11	12	13	13	14	10	11	11	12	12	12
Water flow rate	l/h	101	177	241	295	343	385	110	203	284	356	421	479	115	217	309	393	470	542
Water-side pressure loss[3]	kPa	1.1	2.9	5	7.2	9.3	11.4	0.6	1.8	3.3	4.9	6.5	8.2	0.4	1.2	2.3	3.5	4.8	6.2

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power (connection to 230V is also possible current strength in that case is 13.9A)		
Heating capacity	kW	3
Power consumption per phase	A	4.8
High power		
Heating capacity	KW	6
Power consumption per phase	A	9.4

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

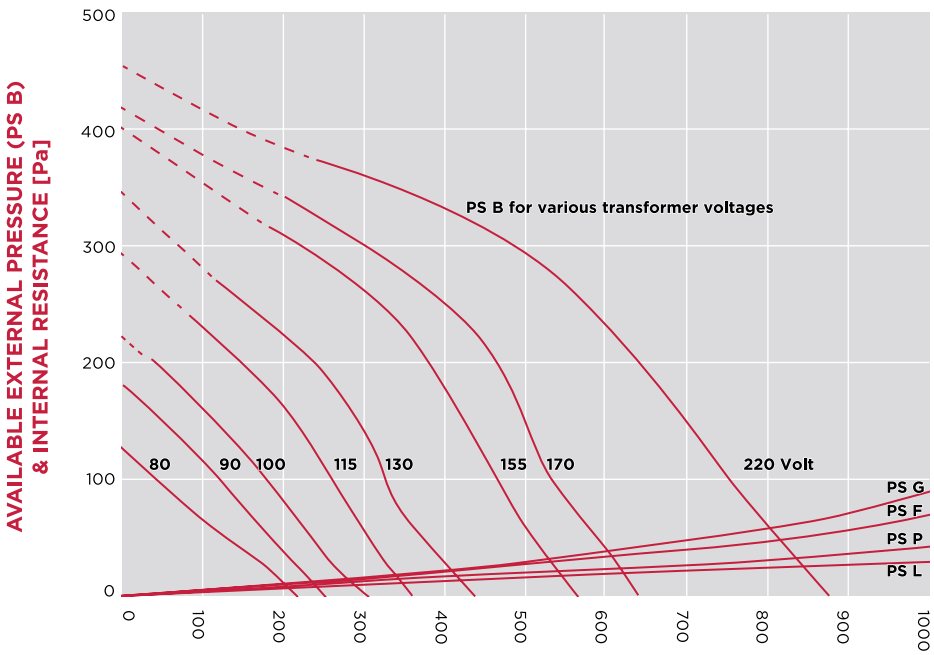
2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

MODULAIR PS 21

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 115, 155 and 220V as standard.

- PS G = Attenuator module
- PS F = Filter module (F5 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class F5 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ **[dB(A)]**

TOTAL PRESSURE REDUCTION [Pa]	100	200	300	400	500	600	700	800	900	1000
450	56	-	-	-	-	-	-	-	-	-
400	55	56	-	-	-	-	-	-	-	-
350	54.5	55.5	55	-	-	-	-	-	-	-
300	51.5	52.5	53.5	54	54	-	-	-	-	-
250	50	51	52	52.5	53	-	-	-	-	-
200	47	48.5	49.5	50.5	52	53	-	-	-	-
150	42	44	46	48	49.5	51	52.5	-	-	-
100	40	42	43	44	47	49	51	-	-	-
50	31	34	37	40	44	47.5	49.5	52	-	-
0	18	24	30	36	40	44	48	51	55	-

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 21

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	1.31
Max. consumed power	W	300

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	200	300	400	500	600	700	200	300	400	500	600	700	200	300	400	500	600	700
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	3.7	5	6.2	7.1	8	8.8	5.2	7.2	9.1	10.8	12.5	14	3.5	5.2	6.7	8.1	9.5	10.9
Discharge temperature[2]	°C	39	34	31	28	26	24	59	54	51	48	45	43	37	36	35	33	32	31
Water flow rate	l/h	161	218	269	309	350	387	226	316	399	475	546	612	153	222	289	352	412	469
Water-side pressure loss[3]	kPa	6	11	15	19	24	29	3	6	9	12	16	19	1	1	2	2	3	4
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	3.1	4.2	5.2	6	6.8	7.5	4.4	6.1	7.7	9.2	10.5	11.8	2.7	3.9	5.1	6.2	7.2	8.2
Discharge temperature[2]	°C	43	39	36	33	31	30	60	56	53	51	49	47	37	36	35	34	33	32
Water flow rate	l/h	136	185	229	263	297	329	191	267	337	402	462	518	116	168	218	266	311	354
Water-side pressure loss[3]	kPa	5	8	11	15	18	22	2	4	7	9	12	14	0	1	1	1	2	2
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	2.6	3.5	4.3	5	5.6	6.2	3.6	5	6.4	7.6	8.7	9.8	1.9	2.7	3.5	4.3	5	5.7
Discharge temperature[2]	°C	47	44	41	39	37	36	62	58	56	54	52	50	37	36	35	35	34	33
Water flow rate	l/h	113	153	189	218	247	273	157	220	279	332	382	428	81	118	152	185	216	245
Water-side pressure loss[3]	kPa	3	6	8	11	13	16	2	3	5	6	8	10	0	0	1	1	1	1
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	2.1	2.8	3.5	4	4.5	5	2.9	4	5.1	6.1	7	7.8	1.1	1.5	1.9	2.3	2.7	3.1
Discharge temperature[2]	°C	51	48	46	44	42	41	63	60	58	56	55	53	36	35	34	34	34	33
Water flow rate	l/h	91	123	152	175	198	219	126	176	223	266	305	343	46	65	84	101	118	133
Water-side pressure loss[3]	kPa	2	4	6	7	9	11	1	2	3	4	6	7	0	0	0	0	0	0

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | CHW/LDKW 6/12 °C					
Air displacement[1]	m³/h	200	300	400	500	600	700	200	300	400	500	600	700	200	300	400	500	600	700
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	1.2	1.7	2.1	2.4	2.7	3	1.4	2	2.5	2.9	3.4	3.7	1.5	2.2	2.7	3.3	3.8	4.3
Cooling capacity sensible	kW	0.9	1.3	1.6	2	2.2	2.5	1	1.5	1.9	2.3	2.6	3	1.1	1.6	2	2.5	2.9	3.3
Discharge temperature[2]	°C	13	14	15	15	16	16	11	12	13	13	14	14	11	11	12	12	12	13
Water flow rate	l/h	177	241	295	343	385	423	203	284	356	421	479	533	217	309	393	470	542	608
Water-side pressure loss[3]	kPa	2.9	5	7.2	9.3	11.4	13.4	1.8	3.3	4.9	6.5	8.2	9.9	1.2	2.3	3.5	4.8	6.2	7.5

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power (connection to 230V is also possible current strength in that case is 13.9A)		
Heating capacity	kW	3
Power consumption per phase	A	4.8
High power		
Heating capacity	KW	6
Power consumption per phase	A	9.4

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

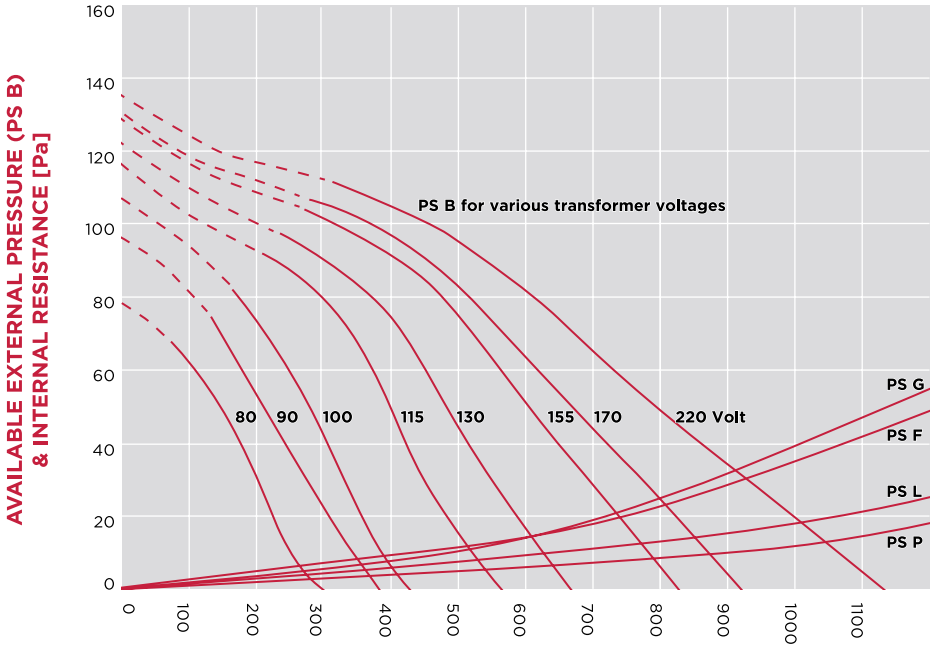
2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

MODULAIR PS 40

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 100, 130 and 170V as standard.

- PS G = Attenuator module
- PS F = Filter module (G4 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class G4 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ [dB(A)]

TOTAL PRESSURE REDUCTION [Pa]	200	300	400	500	600	700	800	900	1000	1100
100	41.5	42.5	42	44.5	-	-	-	-	-	-
90	41	41.5	42	44	-	-	-	-	-	-
80	40	41	41.5	43.5	43.5	-	-	-	-	-
70	38.5	39.5	41	42.5	43	-	-	-	-	-
60	37.5	38.5	40	42	42.5	46	-	-	-	-
50	36.5	38	39	41	42	45.5	-	-	-	-
40	35	37	37.5	39	41.5	45	49	-	-	-
30	33	35	37	37.5	41	44	48.5	49.5	-	-
20	30	32	34	35.5	40	43	48	49	51	-
10	-	29	31.5	34.5	39.5	42	47	48.5	50.5	52.5
0	-	26	29	32	37	41	46	48	50	52

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 40

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	0.92
Max. consumed power	W	200

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	300	400	500	600	700	900	300	400	500	600	700	900	300	400	500	600	700	900
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	5.6	6.9	8.1	9.3	10.4	12.1	7.8	9.9	11.9	13.7	15.5	18.8	5.3	6.9	8.5	10	11.4	14.2
Discharge temperature[2]	°C	39	36	33	31	30	26	59	56	53	51	49	46	37	36	35	34	34	32
Water flow rate	l/h	243	302	357	408	455	531	340	432	520	602	681	825	228	298	365	431	494	614
Water-side pressure loss[3]	kPa	3	4	5	7	8	10	1	2	3	4	5	7	0	0	1	1	1	1
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	4.7	5.8	6.9	7.9	8.8	10.3	6.5	8.3	10	11.6	13.1	15.9	4	5.2	6.4	7.5	8.6	10.7
Discharge temperature[2]	°C	43	40	38	36	35	32	60	58	55	54	52	49	37	36	35	35	34	33
Water flow rate	l/h	206	256	302	345	386	451	286	364	438	508	574	697	173	225	276	325	372	462
Water-side pressure loss[3]	kPa	2	3	4	5	6	8	1	2	2	3	4	5	0	0	0	0	1	1
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	3.9	4.8	5.7	6.5	7.3	8.5	5.4	6.8	8.2	9.6	10.8	13.1	2.8	3.6	4.4	5.2	5.9	7.4
Discharge temperature[2]	°C	47	45	43	41	40	37	62	59	57	56	54	52	37	36	35	35	34	34
Water flow rate	l/h	170	212	250	286	319	373	236	300	361	419	474	575	121	156	191	225	257	318
Water-side pressure loss[3]	kPa	1	2	3	4	4	6	1	1	2	2	3	4	0	0	0	0	0	0
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	3.1	3.9	4.6	5.2	5.8	6.8	4.3	5.5	6.6	7.6	8.6	10.5	1.6	2	2.4	2.8	3.2	4
Discharge temperature[2]	°C	51	49	47	46	45	43	63	61	59	58	57	55	35	35	34	34	34	33
Water flow rate	l/h	136	169	200	229	255	299	188	239	288	334	378	459	67	86	104	122	139	171
Water-side pressure loss[3]	kPa	1	1	2	2	3	4	1	1	1	1	2	2	0	0	0	0	0	0

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | CHW/LDKW 6/12 °C					
Air displacement[1]	m³/h	300	400	500	600	700	900	300	400	500	600	700	900	300	400	500	600	700	900
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	1.8	2.3	2.7	3	3.3	3.6	2.1	2.6	3.2	3.6	4.1	4.5	2.2	2.9	3.5	4	4.6	5
Cooling capacity sensible	kW	1.4	1.8	2.1	2.4	2.8	3.1	1.5	2	2.4	2.8	3.2	3.6	1.6	2.1	2.6	3	3.4	3.9
Discharge temperature[2]	°C	13	14	14	15	15	15	12	12	13	13	13	14	11	11	12	12	12	12
Water flow rate	l/h	260	323	380	431	479	522	298	378	452	521	584	644	319	410	495	576	652	724
Water-side pressure loss[3]	kPa	1.2	1.7	2.3	2.9	3.4	4	0.7	1.1	1.5	2	2.4	2.8	0.5	0.8	1.1	1.4	1.8	2.1

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power		
Heating capacity	kW	4.5
Power consumption per phase	A	7.4
High power		
Heating capacity	KW	9
Power consumption per phase	A	14.2

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

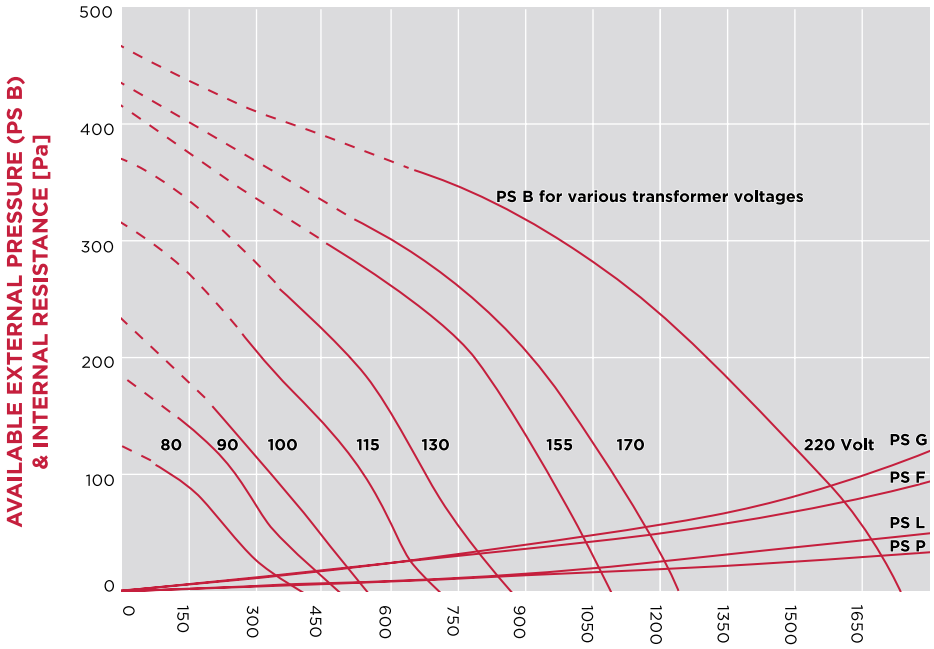
2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

MODULAIR PS 41

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 115, 155 and 220V as standard.

- PS G = Attenuator module
- PS F = Filter module (F5 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class F5 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ **[dB(A)]**

TOTAL PRESSURE REDUCTION [Pa]	150	300	450	600	750	900	1050	1200	1350	1500	1650
450	67	-	-	-	-	-	-	-	-		
400	65	65.5	-	-	-	-	-	-	-		
350	64.5	65	65	65	-	-	-	-	-		
300	61.5	62	63	63.5	64.5	65.5	-	-	-		
250	57.5	59	60	62	63	63.5	-	-	-		
200	55	55.5	57	59.5	60.5	61.5	62.5	64	-		
150	51.5	53	54.5	56	57.5	59	60.5	62	63.5		
100	45.5	47	48.5	50	52.5	55	58	60.5	62		
50	39.5	41.5	43.5	46.5	48.5	51.5	55	57	60	62.5	
0	-	24	33.5	40	45	49.5	53	56	59	61.5	63.5

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 41

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	2.62
Max. consumed power	W	600

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	450	600	750	900	1200	1500	450	600	750	900	1200	1500	450	600	750	900	1200	1500
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	7.5	9.3	10.7	12.1	14.6	16.9	10.9	13.7	16.4	18.8	23.3	27.3	7.7	10	12.1	14.2	18.1	21.7
Discharge temperature[2]	°C	35	31	28	26	23	20	55	51	48	46	42	39	36	34	33	32	30	29
Water flow rate	l/h	330	408	469	531	641	739	477	602	718	825	1020	1194	332	431	525	614	783	939
Water-side pressure loss[3]	kPa	5	7	8	10	14	18	3	4	5	7	10	13	0	1	1	1	2	3
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	6.4	7.9	9.2	10.3	12.4	14.3	9.2	11.6	13.8	15.9	19.7	23.1	5.8	7.5	9.2	10.7	13.6	16.3
Discharge temperature[2]	°C	39	36	34	32	29	27	56	54	51	49	45	43	36	35	34	33	31	30
Water flow rate	l/h	279	345	404	451	544	628	402	508	606	697	862	1010	251	325	395	462	588	704
Water-side pressure loss[3]	kPa	3	5	6.4	8	11	14	2	3	4	5	7	9	0	0	1	1	1	2
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	5.3	6.5	7.6	8.5	10.3	11.9	7.6	9.6	11.4	13.1	16.2	19	4	5.2	6.3	7.4	9.3	11.2
Discharge temperature[2]	°C	44	41	39	37	35	33	58	56	54	52	49	46	36	35	34	34	32	31
Water flow rate	l/h	231	286	335	373	451	521	331	419	500	575	712	835	174	225	273	318	403	482
Water-side pressure loss[3]	kPa	2	4	5	6	8	10	1	2	3	4	5	7	0	0	0	0	1	1
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	4.2	5.2	6.1	6.8	8.2	9.5	6	7.6	9.1	10.5	13	15.2	2.2	2.8	3.4	4	5	5.9
Discharge temperature[2]	°C	48	46	44	43	40	39	60	58	56	55	52	60	35	34	34	33	32	32
Water flow rate	l/h	185	229	268	299	361	417	264	334	399	459	568	666	95	122	147	171	215	255
Water-side pressure loss[3]	kPa	2	2	3	4	5	7	1	1	2	2	3	5	0	0	0	0	0	0

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | CHW/LDKW 6/12 °C					
Air displacement[1]	m³/h	450	600	750	900	1200	1500	450	600	750	900	1200	1500	450	600	750	900	1200	1500
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	2.5	3	3.5	3.9	4.7	5.3	2.9	3.6	4.3	4.9	5.9	6.8	3.2	4	4.8	5.5	6.8	8
Cooling capacity sensible	kW	1.9	2.4	2.9	3.3	4.1	4.9	2.2	2.8	3.4	3.9	4.9	5.9	2.3	3	3.6	4.3	5.4	6.5
Discharge temperature[2]	°C	14	15	15	16	17	17	12	13	13	14	15	15	11	12	12	13	13	14
Water flow rate	l/h	352	431	501	562	667	755	416	521	615	700	850	980	453	576	688	792	978	1142
Water-side pressure loss[3]	kPa	2	2.9	3.7	4.6	6.2	7.7	1.3	2	2.6	3.3	4.6	5.9	0.9	1.4	1.9	2.5	3.6	4.7

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power (connection to 230V is also possible current strength in that case is 13.9A)		
Heating capacity	kW	4.5
Power consumption per phase	A	7.4
High power		
Heating capacity	KW	9
Power consumption per phase	A	14.2

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

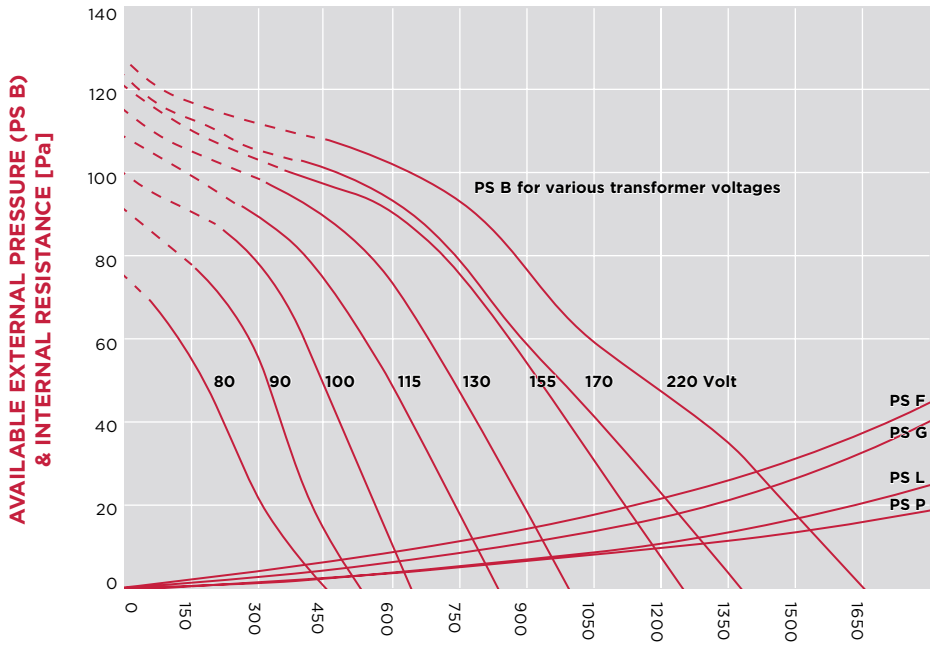
2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

MODULAIR PS 60

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 100, 130 and 170V as standard.

- PS G = Attenuator module
- PS F = Filter module (G4 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class G4 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ **[dB(A)]**

TOTAL PRESSURE REDUCTION [Pa]	300	450	600	750	900	1050	1200	1350	1500	1650
100	43.5	44.5	44	46.5	-	-	-	-	-	-
90	43	43.5	44	46	-	-	-	-	-	-
80	42	43	43.5	45.5	45.5	-	-	-	-	-
70	40.5	41.5	43	44.5	45	-	-	-	-	-
60	39.5	40.5	42	44	44.5	48	-	-	-	-
50	38.5	40	41	43	44	47.5	-	-	-	-
40	37	39	39.5	41	43.5	47	51	-	-	-
30	35	37	39	39.5	43	46	50.5	51.5	-	-
20	32	34	36	37.5	42	45	50	51	53	-
10	-	31	33.5	36.5	41.5	44	49	50.5	52.5	-
0	-	28	31	34	39	43	48	50	52	54

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 60

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	1.38
Max. consumed power	W	300

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	450	600	750	900	1200	1500	450	600	750	900	1200	1500	450	600	750	900	1200	1500
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	8.5	10.6	12.5	14.3	17.2	20	11.8	15	18.1	21	26.4	31.3	8	10.5	13	15.3	19.8	24.1
Discharge temperature[2]	°C	41	37	35	32	28	26	60	57	55	52	49	46	38	37	36	35	34	33
Water flow rate	l/h	373	464	548	627	756	878	518	659	795	922	1157	1371	348	455	560	662	857	1041
Water-side pressure loss[3]	kPa	8	12	15	20	27	35	4	6	9	11	17	23	1	1	2	2	3	5
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	7.2	9	10.6	12.2	14.7	17.1	10	12.7	15.3	17.8	22.3	26.5	6.1	8	9.9	11.6	15	18.3
Discharge temperature[2]	°C	44	42	39	37	34	32	61	59	56	55	52	49	38	37	36	36	35	34
Water flow rate	l/h	316	394	465	533	643	748	437	557	671	779	979	1161	264	346	425	502	650	789
Water-side pressure loss[3]	kPa	6	9	12	15	20	27	3	5	7	8	13	17	0	1	1	1	2	3
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	6	7.5	8.8	10.1	12.2	14.2	8.2	10.5	12.7	14.7	18.5	21.9	4.3	5.6	6.9	8.1	10.5	12.7
Discharge temperature[2]	°C	48	46	44	42	39	36	63	60	58	57	54	52	38	37	36	36	35	34
Water flow rate	l/h	262	327	386	442	534	622	360	460	555	644	810	961	186	243	298	352	454	550
Water-side pressure loss[3]	kPa	4	6	8	11	15	19	2	3	5	6	9	12	0	0	1	1	1	2
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	4.8	6	7.1	8.1	9.9	11.4	6.6	8.4	10.1	11.8	14.8	17.6	2.5	3.2	3.9	4.6	5.8	7.1
Discharge temperature[2]	°C	52	50	48	47	45	43	64	62	60	59	57	55	36	36	35	35	36	34
Water flow rate	l/h	211	262	310	355	436	500	288	368	444	516	649	771	106	137	168	197	252	305
Water-side pressure loss[3]	kPa	3	4	6	7	10	13	2	2	3	4	6	8	0	0	0	0	0	1

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | CHW/LDKW 6/12 °C					
Air displacement[1]	m³/h	450	600	750	900	1200	1500	450	600	750	900	1200	1500	450	600	750	900	1200	1500
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	2.9	3.7	4.3	5	6	7	3.3	4.2	5.1	5.9	7.4	8.7	3.5	4.5	5.5	6.5	8.2	9.8
Cooling capacity sensible	kW	2.2	2.8	3.3	3.8	4.8	5.7	2.4	3.1	3.7	4.4	5.6	6.7	2.5	3.2	4	4.7	6	7.3
Discharge temperature[2]	°C	12	13	14	14	15	16	11	11	12	12	13	13	10	11	11	11	12	12
Water flow rate	l/h	420	526	622	710	865	1000	475	607	730	845	1055	1241	502	650	791	925	1173	1399
Water-side pressure loss[3]	kPa	3.9	5.8	7.7	9.7	13.8	17.8	2.4	3.6	5	6.5	9.6	12.8	1.6	2.5	3.5	4.6	7	9.5

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power		
Heating capacity	kW	7.5
Power consumption per phase	A	9.9
High power		
Heating capacity	KW	15
Power consumption per phase	A	23.6

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

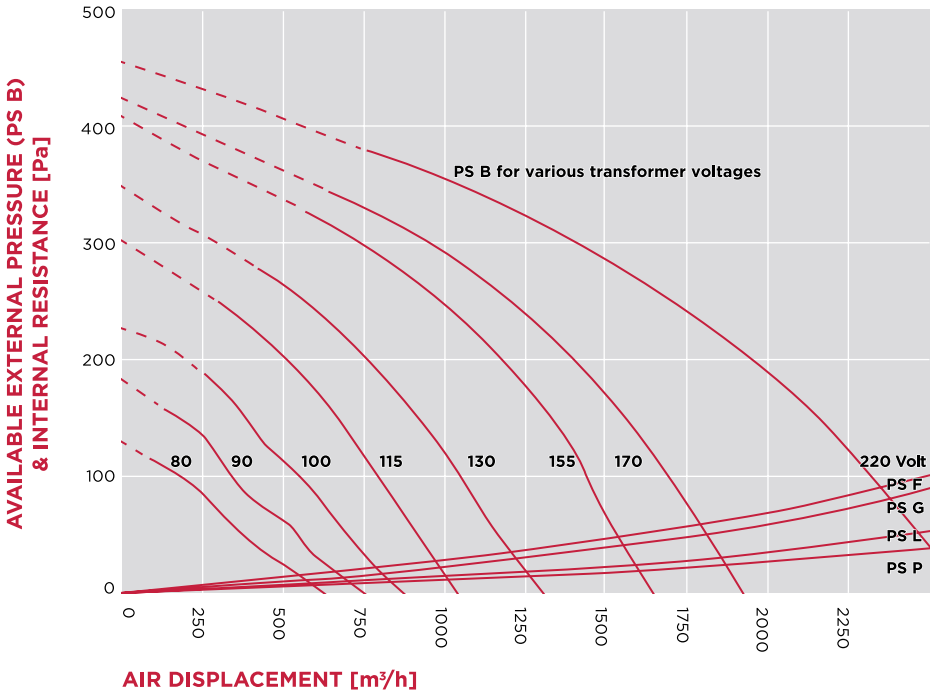
2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

MODULAIR PS 61

AIR DISPLACEMENT / EXTERNAL PRESSURE / NOISE LEVEL



When a Biddle controller is installed, the tapped voltage is set to 115, 155 and 220V as standard.

- PS G = Attenuator module
- PS F = Filter module (F5 filter)*
- PS P = Plenum module
- PS L = Air mixing module

*In the diagram, the resistance level for the PS F filter module is based on a class F5 filter.

DISCHARGE SOUND PRESSURE $L_P(u)$ **[dB(A)]**

TOTAL PRESSURE REDUCTION [Pa]

	250	500	750	1000	1250	1500	1750	2000	2250
450	67	-	-	-	-	-	-	-	-
400	65	65.5	-	-	-	-	-	-	-
350	64.5	65	65	-	-	-	-	-	-
300	61.5	62	63	64	64.5	-	-	-	-
250	58	59	61	62.5	63	64	-	-	-
200	55	55.5	58	60	61	62	63.5	-	-
150	51.5	53.5	55	56.5	58.5	60	61.5	63.5	-
100	45.5	47.5	49	51	53.5	57	60	62	-
50	39.5	41.5	44.5	47.5	50	54	56.5	59.5	62.5
0	-	28	37	43	48	52	55.5	58.5	61

AIR DISPLACEMENT [m³/h]

- The sound-pressure levels are based on a reverberation time of 0.5 seconds, a 350m³ testing area and a measurement distance of 1.5m from the source.

MODULAIR PS 61

INSTALLATION DATA

Electric supply	V/ph/Hz	230/1/50
Max. running current	A	3.93
Max. consumed power	W	900

Values do not include a water-side controller.

HEATING

		H1 | LPHW/LDWW 80/60 °C						H2 | LPHW/LDWW 80/60 °C						H4 | LPHW/LDWW 50/30 °C					
Air displacement[1]	m³/h	500	750	1000	1250	1500	2000	500	750	1000	1250	1500	2000	500	750	1000	1250	1500	2000
Air inlet temperature	°C	-10						-10						-10					
Heating capacity	kW	9.2	12.5	15.4	17.7	20	24.2	13	18.1	22.9	27.2	31.3	38.6	8.9	13	16.9	20.6	24.1	30.7
Discharge temperature[2]	°C	39	35	31	28	26	22	59	55	51	48	46	42	37	36	35	34	33	31
Water flow rate	l/h	404	548	677	777	878	1060	568	795	1003	1194	1371	1693	384	560	728	888	1041	1329
Water-side pressure loss[3]	kPa	9	15	22	29	35	49	5	9	13	18	23	33	1	2	3	4	5	7
Air inlet temperature	°C	0						0						0					
Heating capacity	kW	7.8	10.6	13.1	15.1	17.1	20.6	10.9	15.3	19.4	23.1	26.5	32.7	6.8	9.9	12.8	15.6	18.3	23.3
Discharge temperature[2]	°C	43	39	36	33	32	29	61	56	54	51	49	45	38	36	35	35	34	32
Water flow rate	l/h	343	465	575	661	748	903	479	671	848	1011	1161	1435	292	425	553	673	789	1006
Water-side pressure loss[3]	kPa	7	12	17	21	27	37	4	7	10	13	17	25	1	1	2	2	3	4
Air inlet temperature	°C	10						10						10					
Heating capacity	kW	6.5	8.8	10.9	12.5	14.2	17.1	9	12.7	16	19.1	21.9	27.1	4.8	6.9	8.9	10.9	12.7	16.2
Discharge temperature[2]	°C	47	44	41	39	37	35	62	58	56	54	52	49	37	36	36	35	34	33
Water flow rate	l/h	284	386	478	549	622	751	395	555	701	836	961	1189	205	298	386	470	550	699
Water-side pressure loss[3]	kPa	5	8	12	16	19	27	3	5	7	10	12	18	0	1	1	1	2	2
Air inlet temperature	°C	20						20						20					
Heating capacity	kW	5.2	7.1	8.8	10.1	11.4	13.8	7.2	10.1	12.8	15.3	17.6	21.8	2.7	3.9	5	6.1	7.1	8.9
Discharge temperature[2]	°C	51	48	46	44	43	41	63	60	58	56	55	52	36	35	35	34	34	33
Water flow rate	l/h	228	310	384	442	500	605	317	444	562	670	771	954	116	168	216	261	305	385
Water-side pressure loss[3]	kPa	3	6	8	11	13	18	2	3	5	7	8	12	0	0	0	0	1	1

COOLING

		C2[4] | CHW/LDKW 6/12 °C						C3 | CHW/LDKW 6/12 °C						C4 | LDKW 6/12 °C					
Air displacement[1]	m³/h	500	750	1000	1250	1500	2000	500	750	1000	1250	1500	2000	500	750	1000	1250	1500	2000
Air inlet temperature	°C	27						27						27					
Relative humidity	%	48						48						48					
Cooling capacity total	kW	3.2	4.3	5.3	6.2	7	8.3	3.6	5.1	6.4	7.6	8.7	10.6	3.9	5.5	7	8.5	9.8	12
Cooling capacity sensible	kW	2.4	3.3	4.2	5	5.7	7	2.6	3.7	4.8	5.8	6.7	8.5	2.7	4	5.1	6.3	7.3	9.3
Discharge temperature[2]	°C	13	14	14	15	16	16	11	12	12	13	13	14	11	11	11	12	12	12
Water flow rate	l/h	457	622	765	889	1000	1190	520	730	918	1087	1241	1513	552	791	1010	1212	1399	1736
Water-side pressure loss[3]	kPa	4.5	7.7	11.1	14.5	17.8	24.2	2.8	5	7.5	10.1	12.8	18.1	1.9	3.5	5.4	7.4	9.5	13.9

ELECTRIC HEATING

		HE
Electric supply	V/ph/Hz	400/3/50
Low power		
Heating capacity	kW	7.5
Power consumption per phase	A	9.9
High power		
Heating capacity	KW	15
Power consumption per phase	A	23.6

1 Air displacement is dependent on factors such as external resistance and configuration of the modules. Other air volumes available on request.

2 During heating, the Biddle control system limits the maximum discharge temperature to 50°C. The minimum discharge temperature can be programmed for both cooling and heating. These limits are not included in the above details.

3 The water-side pressure loss does not include the valve. For the Kv values of the valve, see page 13.

4 C2 only available in the combination H2C2.

FORMULAS EXPLAINED

AIR DISPLACEMENT / EXTERNAL PRESSURE

In the pressure/volume graphs on pages 14-24, you can see the pressures that the fans can produce and the corresponding transformer voltages. The data is based on the installation of a base module consisting of a coil, fan and flat-bed filter. When extra modules are installed, the resistance of these modules must be counted as external resistance.

EXAMPLE (see page 14)

Requested: Air displacement of 310m³/h with external pressure of 39Pa.

Desired: Modular fan coil unit consisting of the base, filter (class G4 bag filter), air-mixing and plenum modules.

Solution: Extra internal pressure for filter module (11Pa), air-mixing module (4Pa) and plenum module (4Pa) = 19Pa.

Total pressure = 39 + 19Pa = 58Pa,
so the 155V fan speeds must be selected.

WATER FLOW RATE

The water flow rate displayed in the tables on pages 15-25 are based on water temperature ranges of 80/60°C, 50/30°C or 6/12°C. If the values are different, then the water flow rate can be roughly calculated using the formula below. To do this, the capacity must be recalculated (see page 27).

$$m_W = \frac{Q}{\rho_W C_{pw} \Delta T_W} \cdot 3600\ [l/h]$$

m_w = water flow rate [l/h]
Q = capacity [kW]
ρw = density of water [kg/l]
C_{pw} = specific heat of water (=4.18) [kJ/kg°C]
ΔT_w = temperature difference water [°C]

WATER-SIDE PRESSURE LOSS

If the water temperatures are different to those displayed in the tables on pages 15-25, then the water-side pressure can be roughly calculated using the formula below. To do this, the water volume must first be calculated (see page 27).

$$\Delta p_{W_2} = \Delta p_{W_1} \left(\frac{m_{W_2}}{m_{W_1}} \right)^2 [kPa]$$

Δp_{w1} = water pressure loss table values [kPA]
Δp_{w2} = water pressure loss [kPA]
m_{w1} = water flow rate table values [l/h]
m_{w2} = water flow rate calculated using formula [l/h]

HEATING & COOLING CAPACITY

The heating and cooling capacities on pages 15-25 are based on six selected volumes of air. The actual capacity is dependent on the ventilation indicated in the pressure/volume graph and can be roughly calculated using the formula below.

$$Q_2 = 0.5 \cdot Q_1 \left(1 + \frac{V_2}{V_1} \right) [kW]$$

Q_1 = capacity of table [kW]
Q_2 = desired capacity [kW]
V_1 = air displacement of table [m³/h]
V_2 = desired air displacement [m³/h]

EXAMPLE

Ventilation rate: For the PS 20 model, the ventilation rate (V_2) for the 170V setting with a total pressure of 60 Pa is 350 m³/h.

Requested: Heating capacity (H2) for a water temperature of 80/60°C and an air inlet temperature of tLi = 20°C.

Solution: From the table, find the ventilation rate (V_1) closest to 350m³/h and the associated capacity (Q_1). Calculate the heating capacity (Q_2). V_2 350

$$0.5 \cdot Q_1 \ 1 + \left(\frac{V_2}{V_1} \right) \longrightarrow 0.5 \cdot 5.1 \ 1 + \left(\frac{350}{400} \right) = 4.8\ kW$$

V_1 = 400m³/h Q_1 = 5.1 kW

CORRECTION FACTORS

HEATING CAPACITY

The heating capacities for H1 and H2 coils displayed in the tables on pages 15-25 are based on a water-temperature range of 80/60°C. The heating capacities for type H4 coils are based on a water-temperature range of 50/30°C. If the water temperatures are different, then the heating capacity can be multiplied by the factors in the following table. These factors apply to the heating capacities displayed in the tables on pages 15-25 with an air inlet temperature of 20°C.

	Air inlet temperature °C							
	H1 & H2				H4			
LPHW/LDWW	-10°C	0°C	10°C	20°C	-10°C	0°C	10°C	20°C
90/70°C	2	1.8	1.5	1.2	7.1	6.1	5.1	4.2
80/60°C	1.8	1.5	1.2	1	6.2	5.2	4.3	3.4
70/50°C	1.5	1.3	1	0.8	5.4	4.4	3.5	2.7
60/40°C	1.3	1	0.8	0.5	4.5	3.6	2.7	1.9
50/30°C	1	0.8	0.5	0.3	3.6	2.7	1.9	1

NOTES

The correction coefficients apply to the capacities displayed in the tables on pages 15-25. They give an indication of the capacities in the event of different water temperatures and air conditions. For exact values, consult a Biddle employee. Correction coefficients for heating capacities of the coil types H1, H2, and H4.

CORRECTION FACTORS

COOLING CAPACITY

The cooling capacities for type C2, C3 and C4 coils displayed in the tables on pages 15-25 are based on a water-temperature range of 6/12°C with an air inlet temperature of 27°C and a relative humidity of 48%.

If the water temperatures or air inlet conditions are different, then the cooling capacities can be multiplied by the factors in the table below.

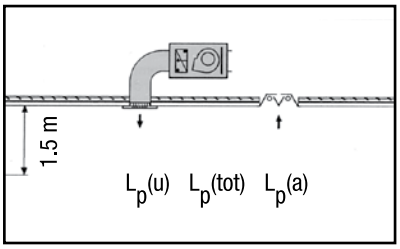
		Relative humidity					
		40% R.H.		48% R.H.		60% R.H.	
CHW/LDKW	Air inlet temperature	Q_t	Q_v	Q_t	Q_v	Q_t	Q_v
6/12 °C	22 °C	0.6	0.7	0.6	0.7	0.7	0.6
	24 °C	0.7	0.8	0.7	0.8	0.9	0.7
	27 °C	0.9	1	1	1	1.3	0.9
	28 °C	0.9	1	1.1	1	1.5	1
10/16 °C	22 °C	0.4	0.4	0.4	0.4	0.4	0.4
	24 °C	0.5	0.5	0.5	0.5	0.5	0.5
	27 °C	0.6	0.7	0.6	0.7	0.8	0.7
	28 °C	0.7	0.8	0.7	0.8	1	0.7
12/18 °C	22 °C	0.3	0.3	0.3	0.3	0.3	0.3
	24 °C	0.4	0.4	0.4	0.4	0.4	0.4
	27 °C	0.5	0.6	0.5	0.6	0.5	0.6
	28 °C	0.6	0.7	0.6	0.7	0.7	0.6

Correction coefficients for cooling capacities of the coil types C2, C3 and C4. Q_t = total cooling capacity Q_v = sensible cooling capacity.

FORMULAS EXPLAINED

BASIC SOUND LEVEL DETAILS

The tables on pages 14-24, indicate the sound-pressure levels on the discharge side of the base module in relation to the ventilation rate and external pressure. These values are based on the installation of a single modular fan coil unit in a 350m³ room with a reverberation time of 0.5 seconds. The sound levels are based on a system in which the air inlet is indirectly conducted via the plenum above a suspended ceiling or via an external air inlet duct (e.g. ventilation). The air is discharged in the room itself via an (unsilenced) discharge duct and grille. The sound levels were measured at a distance of 1.5m from the discharge grille (free-field emission, Q = 1).



L_p(d) = discharge sound pressure
L_p(i) = air inlet sound pressure
L_p(tot) = total sound pressure

SPECIFIC SOUND DETAILS

- The sound power (Lw) of the discharge side is 14.5dB(A) higher than the values in the table.
- For all Biddle modular fan coil units, the sound levels (sound-pressure and sound-power levels) on the air inlet side are 4dB(A) lower than on the discharge side.
- The noise emitted by the unit is comparable to the table value minus 20dB(A). This must be taken into account in the event that this produces discharge sound levels of 25dB(A) or above. For example, this can cause problems if a system is installed in one room but discharges in another room, as the noise emitted by the unit will be audible in the room it is in.
- In the event you wish to revert from the dB(A) values in the table to (linear, i.e. unweighted) sound-pressure values in decibels per octave, then apply the below correction coefficients to the values displayed in the tables.

Frequency in Hz	63	125	250	500	1k	2k	4k	8k
PS 20/21	+4	+10	+1	-4	-5	-13	-19	-26
PS 40/41	-6	0	+3	-2	-5	-9	-15	-27
PS 60/61	-6	0	+3	-2	-5	-9	-15	-27

- If you want to perform step 4 but with sound-power values instead of sound-pressure values, increase the values for each octave by 14.5dB.
- The sound-reduction values per octave of the attenuator module are:

Frequency in Hz	63	125	250	500	1k	2k	4k	8k
Attenuator	0	6	14	16	18	19	17	14

Sound reduction [dB]

DIFFERENT ROOMS AND MULTIPLE UNITS

When one of the units is installed in a different room or multiple units are installed in a single room, the sound-pressure level must be determined again. This can be done by using the formula below (the relevant table values are displayed in the tables on pages 14-24).

$$L_p = \text{table value} + \left(10 \bullet \log\left(\frac{T}{T_0}\right) - 10 \bullet \log\left(\frac{V}{V_0}\right) + 10 \bullet \log(n)\right) \text{ [dB(A)]}$$

L_p = sound pressure in dB(A)
T = reverberation time of other room in seconds
T_0 = reverberation time is 0.5 seconds
V = volume of other room in m^3
V_0 = volume of control room is $350m^3$
n = number of units

ADDING UP SOUND LEVELS OF TWO UNITS WITH DIFFERENT VALUES

In order to calculate total sound in the room when two units with different sound levels are installed (e.g. direct air inlet and discharge in the room), the following formula can be used:

$$L_p(\text{tot}) = 10 \bullet \log\left(10^{\frac{L_{p1}}{10}} + 10^{\frac{L_{p2}}{10}}\right)$$

L_{p1} = sound source 1 [dB(A)]
L_{p2} = sound source 2 [dB(A)]
L_p(tot) = total sound [dB(A)]

EXAMPLE CALCULATION

Requested: The sound-pressure level in the reverberation field emitted by three PS 20 modular fan coil units with values of 400 m^3/h, Δp = 60 Pa and a tapped voltage of 220 V in a room with a reverberation time of 0.6 seconds and a volume of $600m^3$.

$$40 + \left(10 \bullet \log\left(\frac{0.6}{0.5}\right) - 10 \bullet \log\left(\frac{600}{350}\right) + 10 \bullet \log(3)\right)$$

= 40 + (0.8 - 2.3 + 4.8) = 43.3 dB(A)

ATTENUATOR MODULE

The attenuators can be fitted to both the inlet and discharge sides. The attenuator module has the following sound-reduction values:

PS 20/PS 21: 10dB(A)
PS 40/PS 41: 14dB(A)
PS 60/PS 61: 14dB(A)

If the sound reduction is not sufficient, then soundproofed ducts and/or ceiling soundproofing can be installed. Example: A ceiling tile of approx. $3kg/m^2$ with a layer of mineral-wool insulation on top has a sound-reduction value of 10dB(A). This does require minimisation of the number of openings in the ceiling.

NB:
If the inlet is connected to an external duct, then crosstalk and noise emissions from this duct can have an effect. If in doubt, consult Biddle.

EXAMPLE CALCULATION SOUND LEVEL

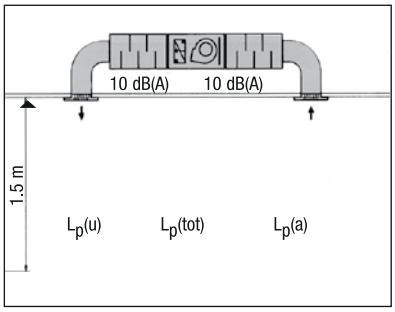
EXAMPLE 1 PS 20, 400m³/h, electrical supply 220V, Δp = 60 Pa.

- Direct inlet and direct discharge in one room
- Attenuator modules with sound-reduction values of 10dB(A) applied to both inlet and discharge side

Sound level L_P(d), without attenuator = 40 dB(A)
Sound level L_P(i), without attenuator (-4 dB(A)) = 36 dB(A)

L_P(u) with attenuator = 40 - 10 = 30 dB(A)
L_P(a) with attenuator = 36 - 10 = 26 dB(A)

L_P(tot) = 31.5 dB(A) (see formula on page 29)



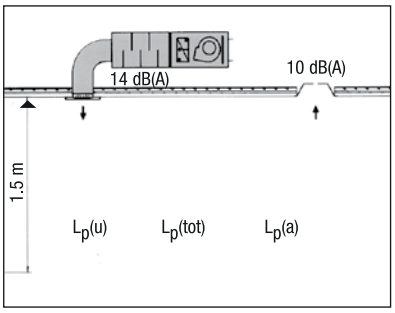
EXAMPLE 2 PS 41, 600m³/h, electrical supply 130V, Δp = 150 Pa.

- Inlet via plenum above soundproofed ceiling with sound-reduction value of 10dB(A)
- Direct discharge in room
- Attenuator module with sound-reduction value of 14dB(A) applied to the discharge side

Sound level L_P(d) without attenuator = 56 dB(A)
Sound level L_P(i) without attenuator (-4 dB(A)) = 52 dB(A)

L_P(d) with attenuator = 56 - 14 = 42 dB(A)
L_P(i) below roof = 52 - 10 = 42 dB(A)

L_P(tot) = 45 dB(A) (see formula on page 29)

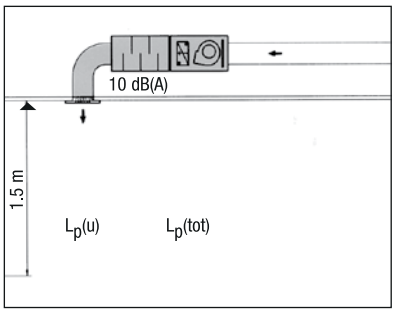


EXAMPLE 3 PS 20, 400m³/h, tapped voltage of 220V, Δp = 60 Pa.

- Inlet outside room via external duct.
- Direct discharge in room.
- Attenuator module with sound-reduction value of 10dB applied to the discharge side.

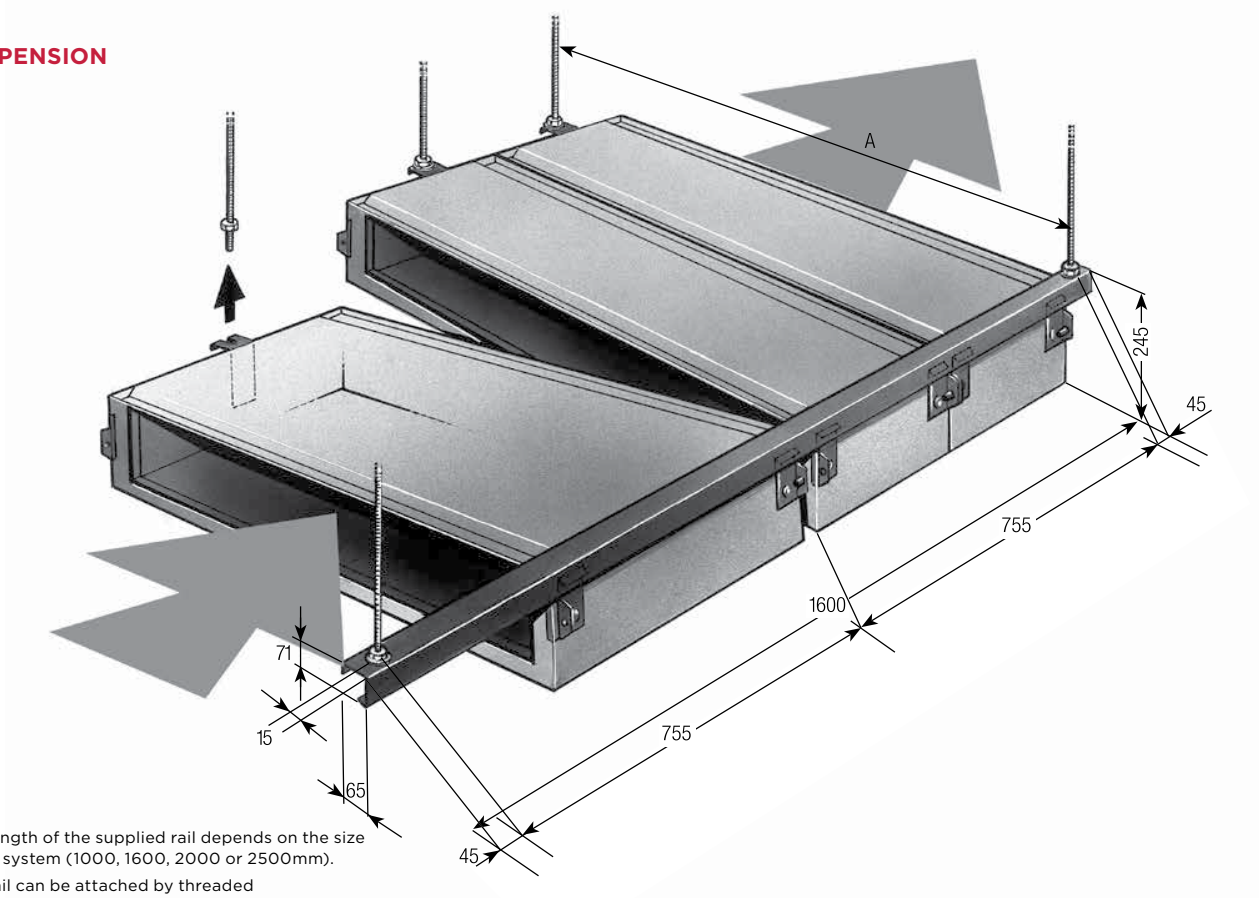
Sound level L_P(d), without attenuator = 40 dB(A)
L_P(d) with attenuator = 40 - 10 = 30 dB(A)

L_P(tot) = 30 dB(A)



SUSPENSION

SUSPENSION



NB:

The length of the supplied rail depends on the size of the system (1000, 1600, 2000 or 2500mm).

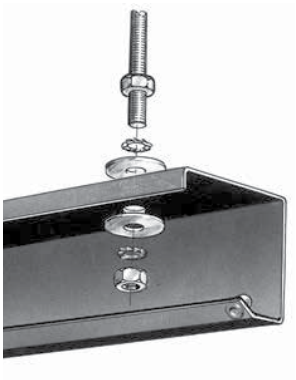
The rail can be attached by threaded rods or secured to the wall directly.

When the modules are installed using suspension rails, extra tilt space is required. The suspension rail is secured to the left, against the direction of the air flow. Maintain a distance of at least 190mm between the centre of the suspension rail and walls or other obstacles, such as pillars.

Model	A
PS 20/PS 21	782
PS 40/PS 41	1157
PS 60/PS 61	1657

SUSPENSION RAIL

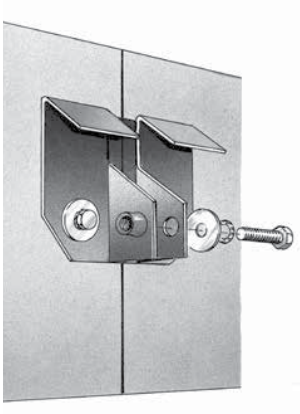
M8 threaded rod (to be provided by installation engineer)



SUSPENSION HOOK

M8 threaded rod (to be provided by installation engineer)

SUSPENSION/ CONNECTION BRACKET



SECURING BRACKET

NOTES

- The seal between the modules is approx. 3mm.
- All measurements in mm.

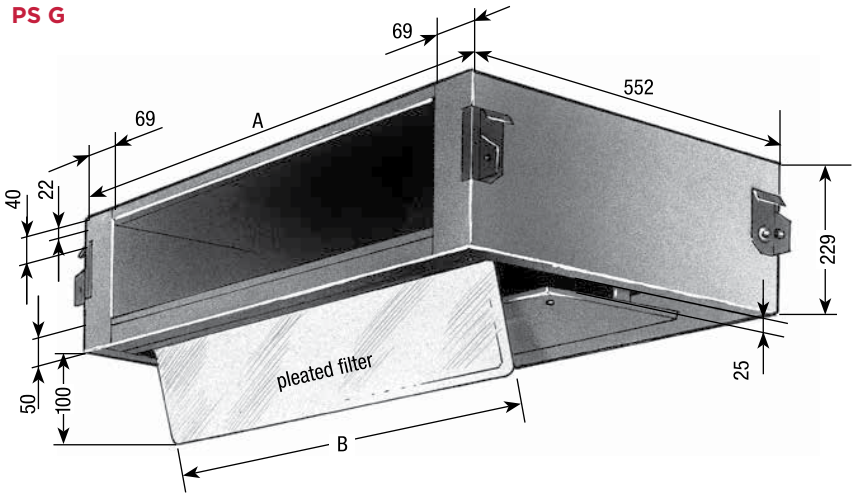
MODULES

RIGHT-HAND CONNECTION (AGAINST THE DIRECTION OF THE AIR-FLOW).

BASE MODULE (DIMENSIONS ALSO APPLY TO THE ATTENUATOR MODULE)

PS B

PS G



Total height for the condensation-collection tray with a water-side connection: 229 + 35mm.

Total widths of the PS B combined with the following modules:

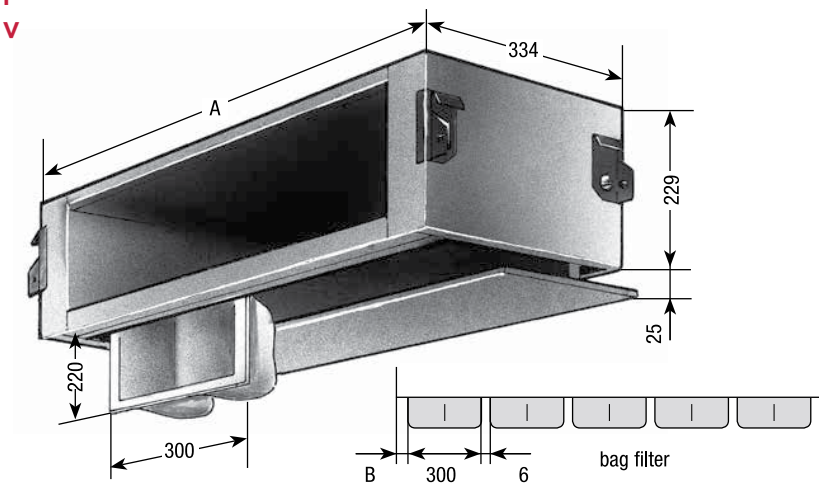
- Biddle controller: A + 320mm.
- External condensation-collection tray with water-side connection: A + 250mm.

Model	A	B
PS 20/PS 21	748	655
PS 40/PS 41	1123	1030
PS 60/PS 61	1623	1530

FILTER MODULE (DIMENSIONS ALSO APPLY TO THE HEATING MODULE)

PS F

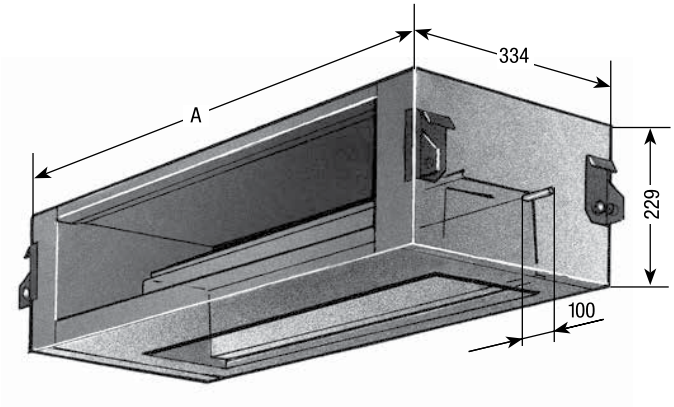
PS V



Model	A	B	Bag Filter
PS 20/PS 21	748	71	2
PS 40/PS 41	1123	105	3
PS 60/PS 61	1623	50	5

AIR MIXING MODULE

PS L

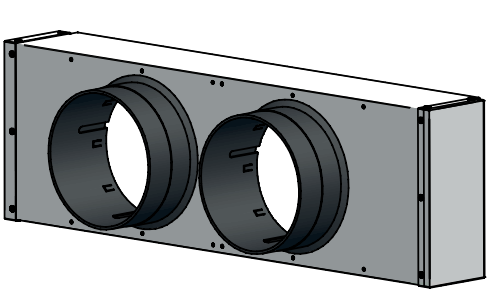


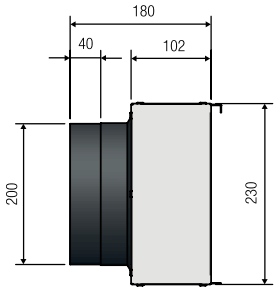
Model	A
PS 20/PS 21	748
PS 40/PS 41	1123
PS 60/PS 61	1623

NOTES

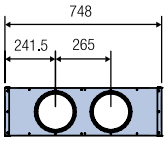
- All measurements in mm.

PLENUM MODULE
PS P

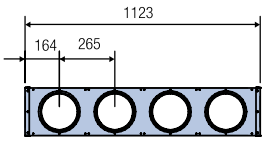




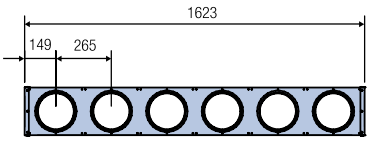
PS 20/PS 21



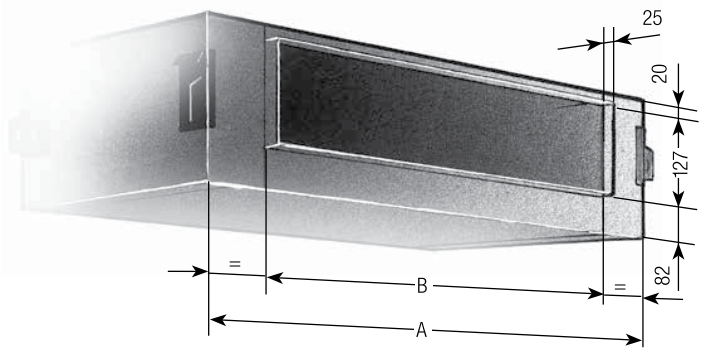
PS 40/PS 41



PS 60/PS 61

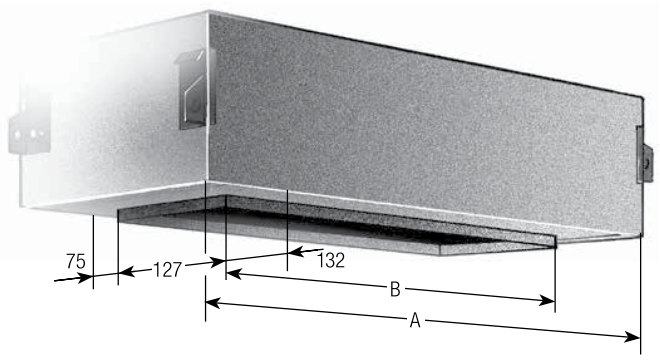


DUCT-CONNECTION FLANGE, RIGHT-ANGLED AND HORIZONTAL (FOR ALL MODULES)
PS TH



Model	A	B
PS 20/PS 21	748	607
PS 40/PS 41	1123	982
PS 60/PS 61	1623	1482

DUCT-CONNECTION FLANGE, RIGHT-ANGLED AND VERTICAL (AIR MIXING MODULE)
PS TV



*Connection is possible via both the underside and top side.

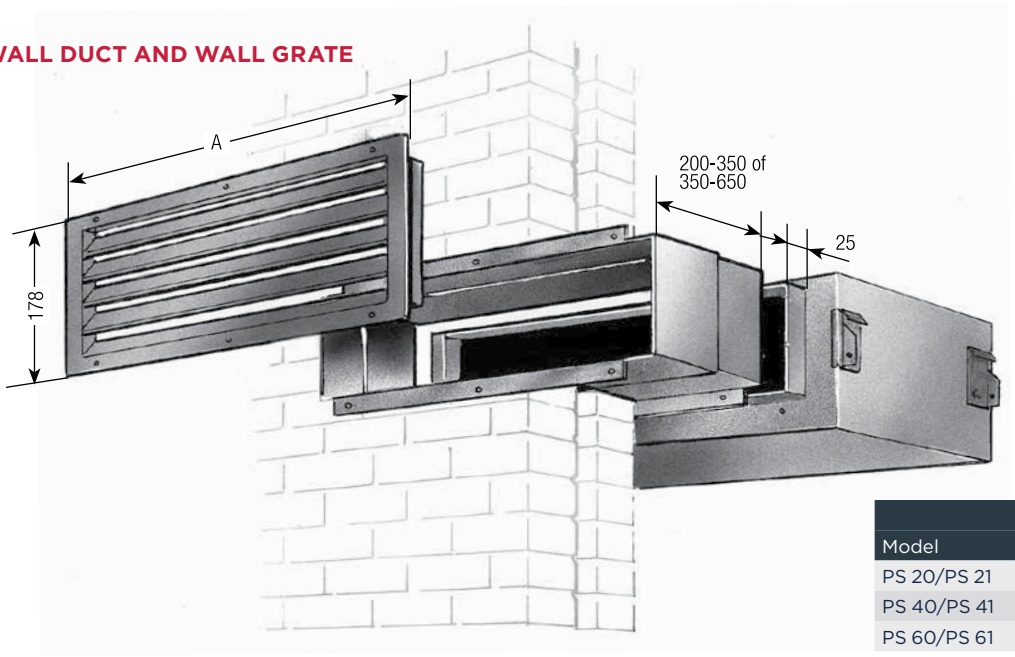
Model	A	B
PS 20/PS 21	748	607
PS 40/PS 41	1123	982
PS 60/PS 61	1623	1482

NOTES

- All measurements in mm.

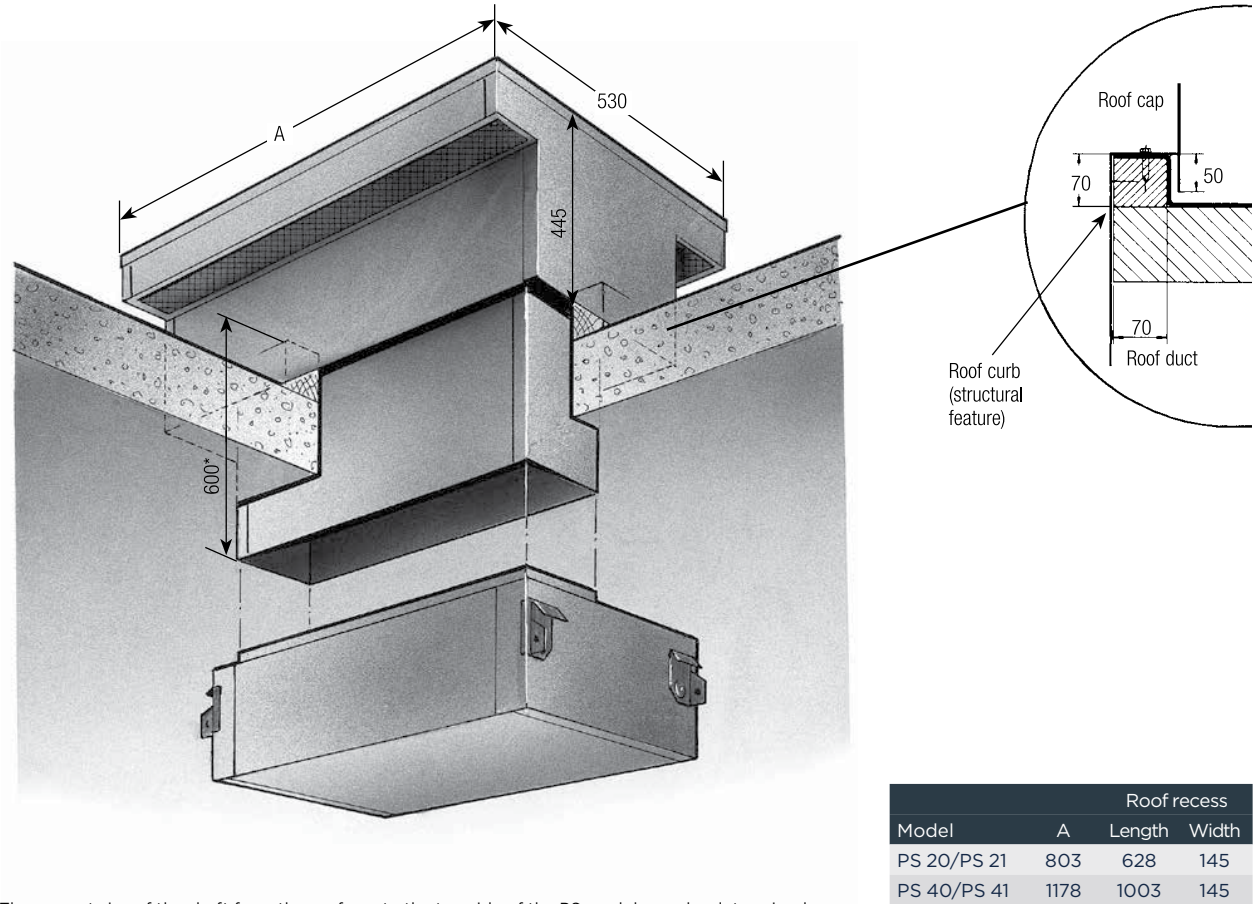
WALL AND ROOF DUCTS

WALL DUCT AND WALL GRATE



		Wall recess	
Model	A	Length	Height
PS 20/PS 21	654	628	142
PS 40/PS 41	1029	1003	142
PS 60/PS 61	1529	1503	142

ROOF CAP WITH ROOF DUCT



*The correct size of the shaft from the roof cap to the top side of the PS module can be determined during the assignment. Standard maximum: 600mm.

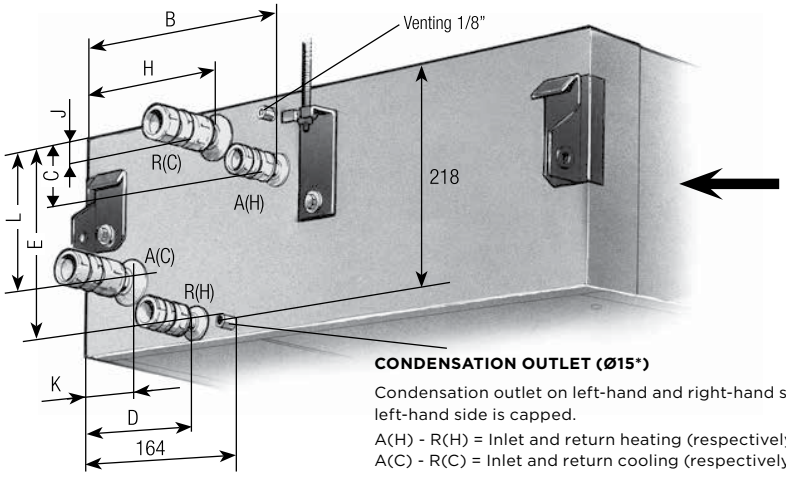
		Roof recess	
Model	A	Length	Width
PS 20/PS 21	803	628	145
PS 40/PS 41	1178	1003	145
PS 60/PS 61	1678	1503	145

NOTES

- All measurements in mm.

WATER-SIDE CONNECTIONS

BASE MODULE - HEATING/COOLING (4-PIPE MODEL)



CONDENSATION OUTLET (Ø15*)

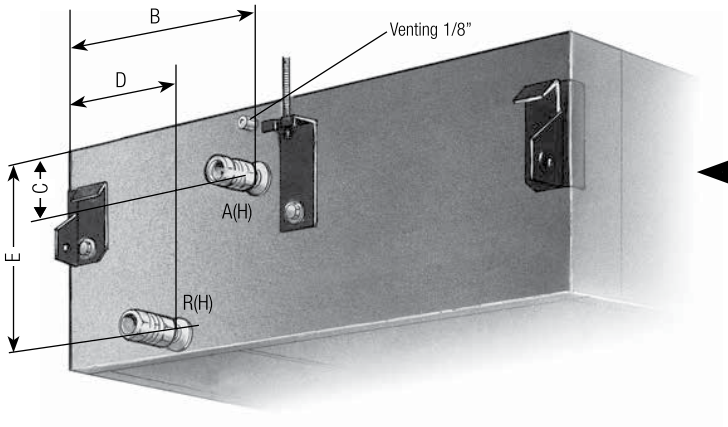
Condensation outlet on left-hand and right-hand side, left-hand side is capped.

A(H) - R(H) = Inlet and return heating (respectively)
A(C) - R(C) = Inlet and return cooling (respectively)

Coil type		H1C3	H2C2
A-R (H)	PS-20/PS-21	15	15
	PS-40/PS-41	15	22
	PS-60/PS-61	15	22
A-R (C)	PS-20/PS-21	22	15
	PS-40/PS-41	22	22
	PS-60/PS-61	22	22
B		217	214
C		73	71
D		93	90
E		197	194
H		181	179
J		38	35
K		57	55
L		161	159

**When the Biddle controller is installed, A(H) - R(H) refers to the inlet and return heating respectively.

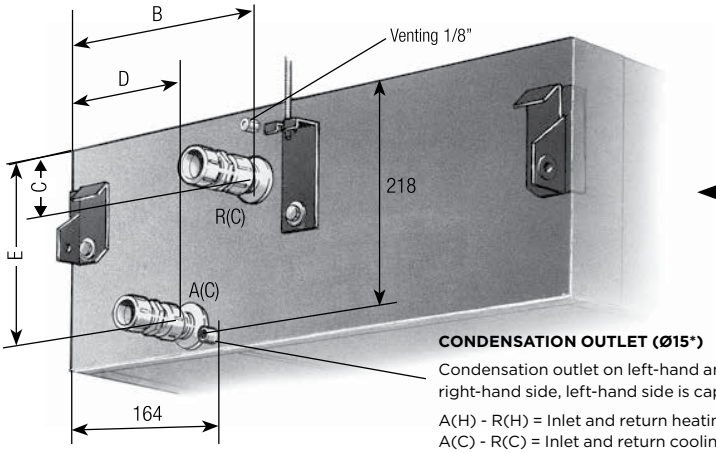
BASE AND ADDITIONAL HEATING MODULE (2-PIPE MODEL)



Coil type		H1	H2	H3	H4
A-R (H)	PS-20/PS-21	15	15	22	22
	PS-40/PS-41	15	22	22	22
	PS-60/PS-61	15	22	22	22
B		214	214	205	196
C		71	71	62	53
D		90	90	81	73
E		194	194	185	177

**When the Biddle controller is installed, A(H) - R(H) refers to the inlet and return heating respectively.

BASE MODULE - COOLING (2-PIPE MODEL)



CONDENSATION OUTLET (Ø15*)

Condensation outlet on left-hand and right-hand side, left-hand side is capped.

A(H) - R(H) = Inlet and return heating (respectively)
A(C) - R(C) = Inlet and return cooling (respectively)

*With a condensation-collection tray, the condensation outlet is 15mm in diameter.

Coil type	C3	C4
A-R (C)	22	22
B	205	196
C	62	53
D	81	73
E	185	177

NOTES

- All measurements in mm.

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