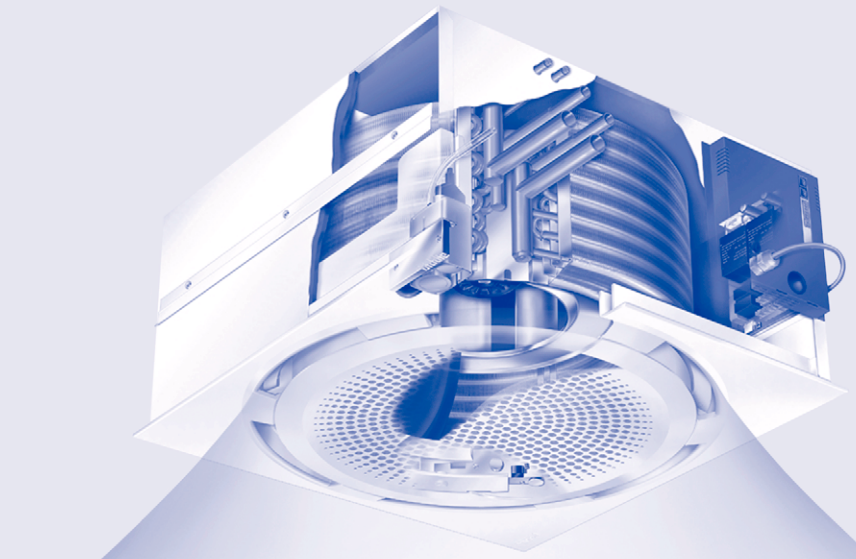
biddle
CLIMATE SOLUTIONS



Cassette units
Model Comfort Circle

- heating
- cooling
- ventilation

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Cassette unit: Comfort Circle

A comfortable room and climate are pleasant to work in and may also entice visitors to lengthen their stay. Whoever is looking for an attractive and space-saving solution for heating and/or cooling from the ceiling will find a friend in Biddle's Comfort Circle. The Comfort Circle provides for comfortable heat during cold winter months and offers comfortable cooling during hot summer days. Its stylish appearance and low noise level make this cassette unit highly suitable for use in rooms such as shops, showrooms, offices, reception areas and computer rooms.

Biddle's compact cassette unit has been especially designed to be built into suspended ceilings. The very small overall height of only 30 cm allows the unit to be mounted above the ceiling, with only the plastic grille remaining visible.

Circular discharge technology

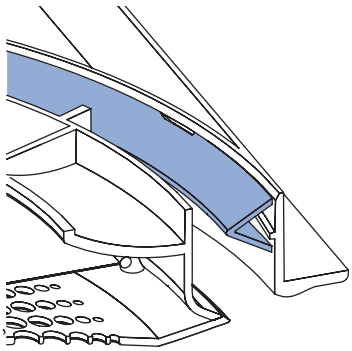


Fig. 1 Heating: Ring in high position

The Comfort Circle has been designed using circular discharge technology. Both the discharge and extraction of air takes place through the same grille. Return air is via the round holes in the middle of the grille. Having been heated or cooled, the air is evenly discharged into the room through the discharge openings in the grille's sides. Compared with a square discharge grille, the round discharge pattern provides for better air distribution, ensuring good downward penetration and air circulation at low air velocity.

When used for both heating and cooling Comfort Circle has an automatically adjustable and patented 'ring' as part of the discharge grille. The ring itself selects the correct discharge angle when heating or cooling, thus ensuring proper downward penetration and dispersion of air in either mode. The discharge pattern of the Comfort Circle can be geared to the room by applying blanking plates.

Units that can only heat or cool do not feature the adjustable and patented 'ring', having a fixed discharge angle.

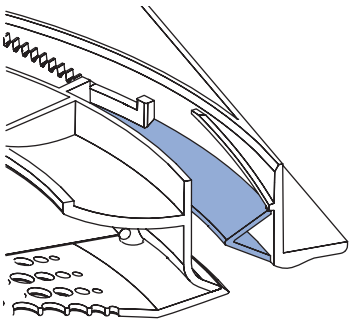
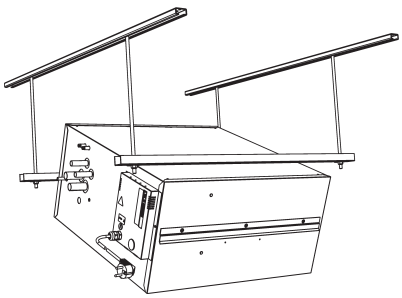


Fig. 2 Cooling: Ring in low position

• Heating
Hot air is discharged into the room at an angle of 45°, thus ensuring good downward penetration. The ring is then in a high position (see Fig. 1).

• Cooling
To create an optimum climate without draught, cold air is blown out horizontally along the ceiling. The ring is then in a low position (see Fig. 2) to make maximum use of the Coanda effect. This results in proper dispersion of the cooled air across the room.

Type codes
CC 60-H1C2-M1
Type
60 = 60 x 60 cm recirculation
90 = 90 x 90 cm recirculation
60 V = 60 x 60 cm ventilation
90 V = 90 x 90 cm ventilation
Coil type
H2 = heating 2-row
H3 = heating 3-row
C2 = cooling 2-row
C3 = cooling 3-row
H1/C2 = heating 1-row/cooling 2-row
R2 = cooling (direct expansion) 2-row
R3 = cooling (direct expansion) 3-row
H1/R2 = heating 1-row/cooling (direct expansion) 2-row
Regulation
S0 = standard air-side control
S1 = standard air-side control with automatic angle adjustment
M0 = modulating air- and water-side control
M1 = modulating air- and water-side control with automatic angle adjustment



Variants

The Comfort Circle comes with a hot-water and/or cooling coil. There are two different models: the CC 60 (60 x 60 cm) with a max. air flow rate of 830 m^3/h, and the CC 90 (90 x 90 cm) with a max. air flow rate of 1,730 m^3/h. The unit is designed to be integrated into suspended ceilings in rooms with a max. height of 3.5 m.
The following models are available:

- heating
- cooling
- heating and cooling
- ventilation

The casing of the Comfort Circle has a prepunched hole (except ventilation model), to which an air duct can be mounted for discharging air to an additional air grille in another place.

Ventilation model

Unlike the recirculation model, the ventilation model does not take air from the room through the inlet grille. Fresh outside air is taken through ducts, heated, and blown into the room. The installation of this model requires special accessories (see page 4). The ventilation unit is available only with modulating control (see page 5).

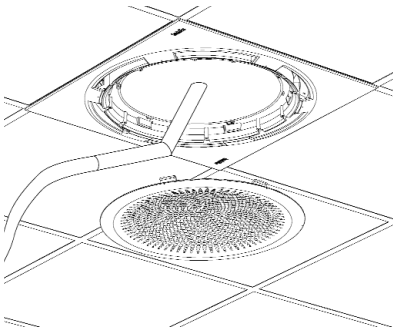
Connections

It is easy to connect the cassette unit to an existing CH system. The CH connections are located in the side of the unit and are easy to access (see page 20). The units are delivered ready for operation and come with a 2.5 m-long, plugged power cable.

Clever suspension system

The cassette unit can be mounted either before or after installing the suspended ceiling. The flexible suspension system allows you to adjust the unit in different directions, so that the unit is easy to integrate into the ceiling.

Cassette unit at Lidl supermarket: CC 90



Simple inspection and little maintenance

The inside of the unit is easy to access through the grille. A dirty filter may lead to inadequate performance as well as an increase in noise level. Therefore, the filter must be cleaned regularly. The air filter (Class G1) is located behind the inlet and is easy to clean using a vacuum cleaner.

Standard delivery and accessories

The Comfort Circle comes standard with:
- 2 suspension profiles
- 2 blanking plates to adjust the discharge pattern
- integrated condensate discharge pump (only with cooling)
- external condensate drain tray (only with cooling)
- 1 or 2 water sided valves, with drives (only with modulating control)

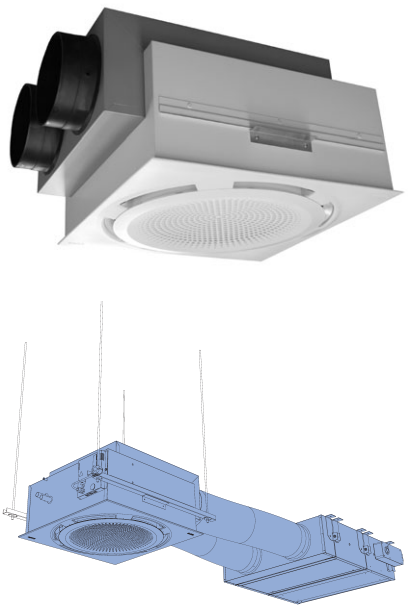
Features

- *Fits perfectly into suspended ceilings*
- *Ready for operation*
- *Little maintenance*
- *Heating, cooling and / or ventilation*

Additional accessories

Always required:
- control panel
- low-voltage cable (of various lengths)

Optional:
- suspension kit: 2 Flamco rails and 4 rods (M8)
- change-over sensor
- plenum for additional discharge connection



Composition of ventilation unit CC 60 V with ventilation box.

Ventilation accessories

To install a ventilation unit, Biddle offers the following required components:
- ventilation box, including air filter (page. 21)
- outside air inlet: wall and roof (page 22 and 23)
- servomotors
- ventilation module for coupling to exhaust fan (230V)

The ventilation box is connected to the Comfort Circle using insulated ducts. The required ductwork is not delivered by Biddle. Using the ventilation box (see page 21) the ventilation air is extracted and then heated by the Comfort Circle and blown into the room. The ventilation box houses an air valve and a flat-bed filter (Class G1) or a bag-type filter (Class G4). The included control comes with integrated servomotor control, frost protection and a (0-10V) extractor fan coupling.

Control options

The Comfort Circle is available with two control types: a standard (air-side) control and a modulating (air- and water-side) control. The control panel allows the user to easily set the indoor climate to a comfortable level.

1. Standard air-side control (S)
This control regulates the fan speed (in 3 speed) to reach the desired room temperature.

2. Modulating air- and water-side control (M)
This control regulates both the fan speed and the discharge air temperature to reach the desired room temperature. The ventilation unit is available only with this modulating control.

The control panel includes a room thermostat and a weekly timer

Control panel with LCD display

The control panel has various soft-touch keys and a clear LCD display. The desired room temperature can be set using the control panel, after which you can choose to have the control unit regulate the climate automatically or in one of the three fan modes. Next to this functionality, the control panel also features an integrated weekly timer, which can be used to switch the unit automatically on and off each day of the week. The control panel has an additional input for connecting, for instance, an external release.

The keys of the control panel can be blocked using a key lock to prevent unwanted use. 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 100 metres. The control panel has user, installation, timer and service menus.

- ***User menu***

The user can switch the Comfort Circle on and off, regulate the room temperature and change the fan speed. The LCD display shows these values in a clear manner. The display also shows the following information: room temperature, fan speed, filter contamination, any faults, and any peripheral equipment connected to the unit.

- ***Installation menu***

The installer can set functions to gear the functioning of the unit to the prevailing conditions. Examples include: setting the in- and outputs, the dead band, and the minimal inlet temperature.

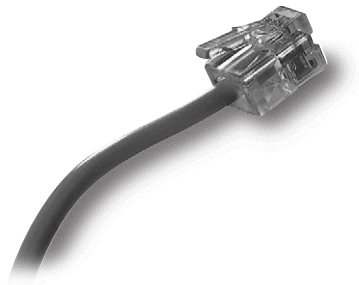
- ***Timer menu***

The Comfort Circle comes standard with a weekly timer, which allows the user to switch the unit on and off per day of the week.

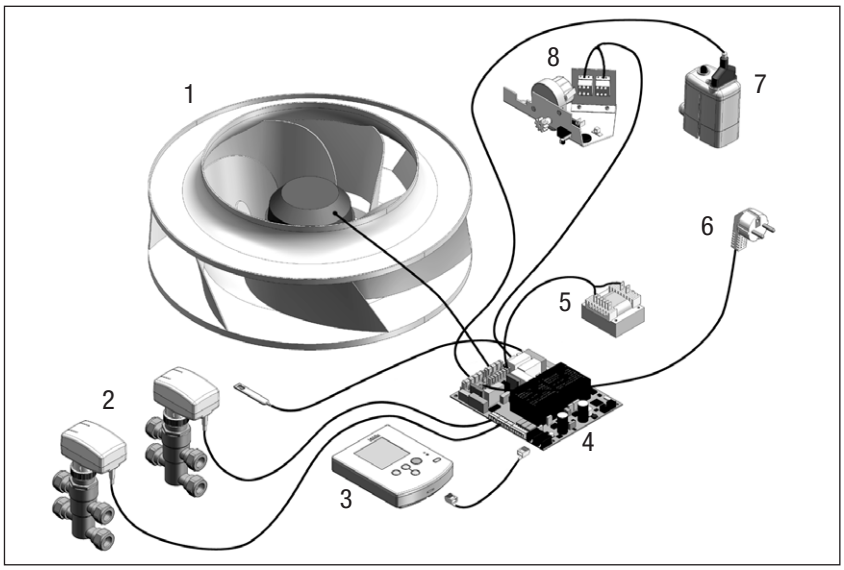
- ***Service menu***

The installer can read values that provide information on the operation of the unit.

Electronic control system



The control panel and the PCB in the unit constitute the electronic control system. The two components are connected to one another using a low-voltage cable that has RJ11 plugs. The side of the cassette unit houses a connector plate, where all connections are made. Here, the controller and other units, if any, are plugged in. Also, any water-side controls and in- and outputs can be connected here. The outputs (max. 24V) can be used for, for instance, controlling the CH boiler or cooling units. Faults can be reported, too. To the input, a low-limit thermostat, a summer or winter switch or a release from the Building Management System (BMS) can be connected.



1 = Fan
2 = Valves
3 = Control panel
4 = PCB
5 = Transformator
6 = Plug
7 = Condensate pump
8 = Drive of air outlet ring

The PCB carries out the communication between the different components.

Change-over-system

It is possible to use a cassette unit that is fit for cooling for heating as well using the so-called “change-over system”. The unit must then come with the automatically adjustable discharge ring. To properly gear the control unit to the heat and cold sources, a change-over sensor is to be used.

Deviating tapping voltages

The cassette unit has three settings that can be activated via the control panel. The CC 60 has standard settings of 130 - 160 - 230 Volt, and the CC 90 130 - 170 -230 Volt. Different RPM settings may be introduced by selecting different tapping voltages.

Technical data
CC 60 recirculation

General data

supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	0.6					
max. power input	W	125					
		1	2	3	4	5	6
tapping voltage	V	110	130	145	160	175	230
sound pressure	dB(A)	32	38	43	48	52	54

Heating		**H2**			**LPHW 80/60°C**			**H3**			**LPHW 60/40°C**		
air inlet conditions[1]	°C	20°C						20°C					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	300	390	510	620	710	830	300	390	510	620	710	830
heating capacity	kW	4.8	6.0	7.3	8.5	9.4	10.6	3.2	4.0	5.0	5.8	6.4	7.2
discharge temperature[2]	°C	68	66	63	61	59	58	52	51	49	48	47	46
water flow rate	l/h	210	265	320	375	415	465	140	175	215	250	280	315
water-side pressure loss[3]	kPa	1.3	1.9	2.7	3.6	4.3	5.3	0.4	0.6	0.8	1.1	1.3	1.6
weight	kg	30						32					

Cooling		**C2**			**LPCW 6/12°C**			**C3**			**LPCW 6/12°C**		
air inlet conditions[1]	°C/%	27°C / 48%						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	300	390	510	620	710	830	300	390	510	620	710	830
cooling capacity - total	kW	2.2	2.7	3.2	3.7	4.0	4.4	2.5	3.1	3.8	4.3	4.8	5.3
cooling capacitiy - sensible	kW	1.5	1.9	2.3	2.7	3.0	3.3	1.7	2.1	2.6	3.1	3.4	3.9
discharge temperature[2]	°C	12	12	13	14	14	15	10	11	11	12	12	13
water flow rate	l/h	315	380	460	525	575	635	360	440	540	620	680	760
water-side pressure loss[3]	kPa	3.3	4.7	6.6	8.4	10	11.9	2.5	3.6	5.2	6.7	8.0	9.6
weight	kg	31						33					

Heating/Cooling		**H1C2**			**LPHW 80/60°C**			**H1C2**			**LPCW 6/12°C**		
air inlet conditions[1]	°C/%	20°C						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	300	390	510	620	710	830	300	390	510	620	710	830
heating capacity	kW	2.4	2.9	3.5	3.9	4.3	4.8						
cooling capacity - total	kW							2.2	2.7	3.2	3.7	4.0	4.4
cooling capacity - sensible	kW							1.5	1.9	2.3	2.7	3.0	3.3
discharge temperature[2]	°C	44	42	40	39	38	37	12	12	13	14	14	15
water flow rate	l/h	110	130	155	175	190	210	315	380	460	525	575	635
water-side pressure loss[3]	kPa	0.5	0.6	0.9	1.1	1.2	1.5	3.3	4.7	6.6	8.4	10	11.9
weight	kg	33											

[1] The air inlet conditions are according to the Eurovent standards.

[2] The discharge air temperature for units with modulating control is limited to 50°C.

[3] Water-side pressure loss is exclusive of three-way valve. For Kvs values of three-way valve, see page 20.

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Technical data
CC 60 recirculation DX

General data

supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	0.6					
max. power input	W	125					
refrigerant		R410a[2]					
condensation temp.	°C	40					
evaporation temp.	°C	5					
		1	2	3	4	5	6
tapping voltage	V	110	130	145	160	175	230
sound pressure	dB(A)	32	38	43	48	52	54

Cooling (DX)		**R2**						**R3**					
air inlet conditions[1]	°C/%	27°C / 48%						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	300	390	510	620	710	830	300	390	510	620	710	830
cooling capacity - total	kW	2.7	3.2	4.0	4.5	5.0	5.5	3.0	3.7	4.5	5.3	5.8	6.5
cooling capacaty - sensible	kW	1.7	2.1	2.6	3.1	3.4	3.8	1.9	2.4	3.0	3.5	3.9	4.4
discharge air temperature	°C	9	10	11	12	13	13	8	8	9	10	10	11
weight	kg	31						33					

Heating/Cooling (DX)		**H1R2**				**LPHW 80/60°C**		**H1R2**					**R410a**
air inlet conditions[1]	°C/%	20°C						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	300	390	510	620	710	830	300	390	510	620	710	830
heating capacity	kW	2.4	2.9	3.5	3.9	4.3	4.8						
cooling capacity - total	kW							2.7	3.2	4.0	4.5	5.0	5.5
cooling capacity - sensible	kW							1.7	2.1	2.6	3.1	3.4	3.8
discharge air temperature	°C	44	42	40	39	38	37	9	10	11	12	13	13
water flow rate	l/h	110	130	155	175	190	210						
water-side pressure loss	kPa	0.5	0.6	0.9	1.1	1.2	1.5						
weight	kg	33											

[1] The air inlet conditions are according to the Eurovent standards.
[2] Specifications of other refrigerants are available on request.

Technical data
CC 60 ventilation

General data

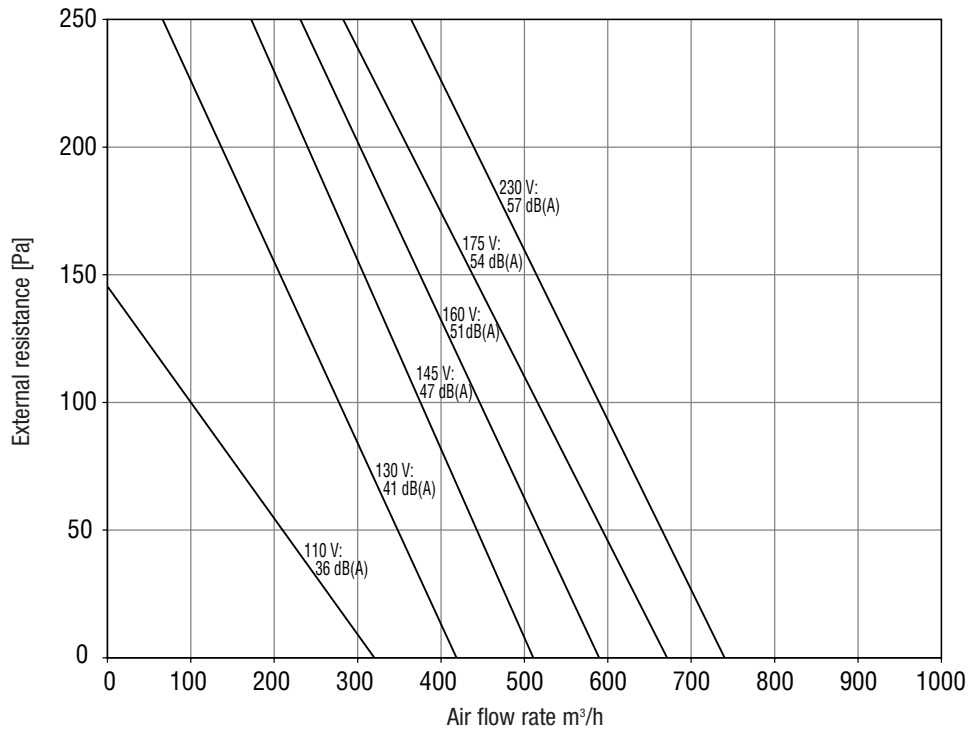
supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	0.6					
max. power input	W	125					
weight	kg	H2=31 kg / H3=33 kg					
		1	2	3	4	5	6
tapping voltage	V	110	130	145	160	175	230
sound pressure	dB(A)	36	41	47	51	54	57

Heating capacity CC 60 V

	H2 LPHW 80/60°C																				
	100 m³/h			200 m³/h			300 m³/h			400 m³/h			500 m³/h			600 m³/h			700 m³/h		
t_{Li} °C	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa
-10	2.3	50	0.1	4.5	50	0.2	6.8	50	0.5	9.0	50	1.0	11.2	50	2.2	13.5	50	4.5	15.8	50	9.3
-5	2.0	50	0.1	4.1	50	0.2	6.0	50	0.4	8.1	50	0.8	10.1	50	1.6	12.1	50	2.9	14.2	50	5.6
0	1.8	50	0.1	3.6	50	0.1	5.4	50	0.3	7.3	50	0.7	9.0	50	1.2	10.8	50	2.1	12.7	50	3.8
15	1.2	50	0.1	2.4	50	0.1	3.6	50	0.2	4.8	50	0.3	6.0	50	0.5	7.3	50	0.8	8.5	50	1.2
20	1.0	50	0.1	2.0	50	0.1	3.1	50	0.1	4.1	50	0.2	5.0	50	0.4	6.1	50	0.6	7.1	50	0.8
	H3 LPHW 60/40°C																				
-10	2.3	50	0.1	4.5	50	0.3	6.7	50	1.0	8.8	49	2.3	10.6	47	3.3	12.3	45	4.3	13.9	43	5.4
-5	2.0	50	0.1	4.1	50	0.3	6.1	50	0.9	8.0	49	1.9	9.6	47	2.7	11.1	45	3.6	12.6	44	4.5
0	1.8	50	0.1	3.6	50	0.3	5.4	50	0.6	7.2	50	1.6	8.6	48	2.3	10.0	46	3.0	11.3	45	3.7
15	1.2	50	0.1	2.4	50	0.1	3.6	50	0.4	4.8	50	0.7	5.8	49	1.1	6.7	48	1.4	7.6	47	1.8
20	1.0	50	0.1	2.0	50	0.1	3.0	50	0.3	4.1	50	0.5	4.9	49	0.8	5.7	48	1.1	6.4	47	1.3

t_{Li} = Inlet air temperature t_{Lu} = Outlet air temperature Q = Heating capacity Δp_W = Water-side pressure loss
Water-side pressure loss is exclusive of three-way valve. For values of three-way valve, see page 20.

Characteristics CC 60 V with ventilation box



For explanation see page 13.
Note: all data are inclusive of resistance in ventilation box.

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Technical data
CC 90 recirculation

General data

supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	1.3					
max. power input	W	270					
		1	2	3	4	5	6
tapping voltage	V	100	130	155	170	190	230
sound pressure	dB(A)	32	40	47	50	54	58

Heating		**H2**					**LPHW 80/60°C**	**H3**					**LPHW 60/40°C**
air inlet conditions[1]	°C	20°C						20°C					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	570	830	1080	1220	1420	1730	570	830	1080	1220	1420	1730
heating capacity	kW	9.2	12.4	15.2	16.7	18.7	21.6	6.3	8.6	10.6	11.7	13.2	15.3
discharge air temperature[2]	°C	68	64	62	61	59	57	53	51	49	49	48	46
water flow rate	l/h	401	541	665	730	818	945	273	373	462	509	573	666
water-side pressure loss[3]	kPa	1.2	2.1	3.1	3.7	4.5	5.9	0.3	0.5	0.8	0.9	1.2	1.5
weight	kg	47						50					

Cooling		**C2**					**LPCW 6/12°C**	**C3**					**LPCW 6/12°C**
air inlet conditions[1]	°C/%	27°C / 48%						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	570	830	1080	1220	1420	1730	570	830	1080	1220	1420	1730
cooling capacity - total	kW	4.2	5.5	6.6	7.2	8.0	9.0	4.9	6.6	8.1	8.9	10.0	11.5
cooling capacity - sensible	kW	2.9	3.9	4.8	5.3	5.9	6.8	3.3	4.6	5.7	6.3	7.1	8.3
discharge air temperature[2]	°C	12	13	14	14	14	15	9	10	11	11	12	12
water flow rate	l/h	598	790	950	1032	1142	1295	701	950	1165	1277	1427	1642
water-side pressure loss[3]	kPa	3.2	5.3	7.4	8.6	10.4	13.1	2.0	3.5	5.0	5.9	7.3	9.4
weight	kg	48						51					

Heating/Cooling		**H1C2**					**LPHW 80/60°C**	**H1C2**					**LPCW 6/12°C**
air inlet conditions[1]	°C/%	20°C						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	570	830	1080	1220	1420	1730	570	830	1080	1220	1420	1730
heating capacity	kW	5.0	6.6	7.9	8.6	9.5	10.8						
cooling capacity - total	kW							4.2	5.5	6.6	7.2	8.0	9.0
cooling capacity - sensible	kW							2.9	3.9	4.8	5.3	5.9	6.8
discharge air temperature[2]	°C	46	44	42	41	40	39	12	13	14	14	14	15
water flow rate	l/h	222	289	346	376	416	473	598	790	950	1032	1142	1295
water-side pressure loss[3]	kPa	1.4	2.3	3.2	3.7	4.5	5.7	3.2	5.3	7.4	8.6	10.4	13.1
weight	kg	51											

[1] The air inlet conditions are according to the Eurovent standards.

[2] The discharge air temperature for units with modulating control is limited to 50°C.

[3] Water-side pressure loss is exclusive of three-way valve. For Kvs values of three-way valve, see page 20.

Technical data
CC 90 recirculation DX

General data

supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	1.3					
max. power input	W	270					
refrigerant		R410a[2]					
condensation temp.	°C	40					
evaporation temp.	°C	5					
		1	2	3	4	5	6
tapping voltage	V	100	130	155	170	190	230
sound pressure	dB(A)	32	40	47	50	54	58

Cooling (DX)		**R2**						**R3**					
air inlet conditions[1]	°C/%	27°C / 48%						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	570	830	1080	1220	1420	1730	570	830	1080	1220	1420	1730
cooling capacity - total	kW	4.9	6.5	7.8	8.4	9.3	10.6	5.6	7.6	9.4	10.3	11.5	13.2
cooling capacity - sensible	kW	3.2	4.3	5.3	5.8	6.5	7.4	3.6	5.0	6.2	6.9	7.8	9.0
discharge air temperature	°C	10	11	12	13	13	14	8	9	10	10	10	11
weight	kg	48						51					

Heating/Cooling (DX)		**H1R2**				**LPHW 80/60°C**		**H1R2**					**R410a**
air inlet conditions[1]	°C/%	20°C						27°C / 48%					
tapping voltage		1	2	3	4	5	6	1	2	3	4	5	6
air flow rate	m³/h	570	830	1080	1220	1420	1730	570	830	1080	1220	1420	1730
heating capacity	kW	5.1	6.6	7.9	8.6	9.5	10.8						
cooling capacity - total	kW							4.9	6.5	7.8	8.4	9.3	10.6
cooling capacity - sensible	kW							3.2	4.3	5.3	5.8	6.5	7.4
discharge air temperature	°C	46	44	42	41	40	39	10	11	12	13	13	14
water flow rate	l/h	222	289	346	376	416	473						
water-side pressure loss	kPa	1.4	2.3	3.2	3.7	4.5	5.7						
weight	kg	33											

[1] *The air inlet conditions are according to the Eurovent standards.*

[2] *Specifications of other refrigerants are available on request.*

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CLIMATE SOLUTIONS

Technical data
CC 90 ventilation

General data

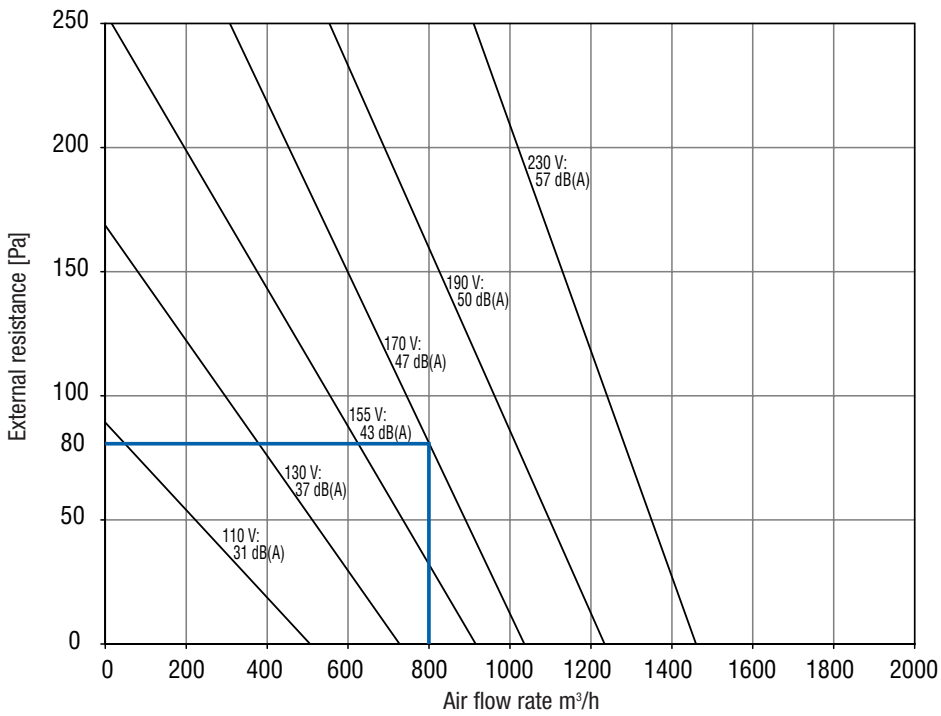
supply voltage	V;ph;Hz	230;1;50					
max. current cons.	A	1.4					
max. power input	W	270					
weight	kg	H2=53 kg / H3=56 kg					
		1	2	3	4	5	6
tapping voltage	V	100	130	155	170	190	230
sound pressure	dB(A)	31	37	43	47	50	57

Heating capacity CC 90

	H2 LPHW 80/60°C																				
	200 m³/h			400 m³/h			600 m³/h			800 m³/h			1000 m³/h			1200 m³/h			1400 m³/h		
t_{Li} °C	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa	Q kW	t_{Lu} °C	Δp_W kPa
-10	4.5	50	0.1	9.0	50	0.2	13.5	50	0.5	17.9	50	1.2	22.5	50	2.6	27.0	50	5.2	31.4.	50	9.9
-5	4.0	50	0.1	8.2	50	0.2	12.1	50	0.4	16.2	50	1.0	20.2	50	1.8	24.3	50	3.6	28.4	50	6.5
0	3.6	50	0.1	7.3	50	0.2	10.9	50	0.3	14.4	50	0.7	18.0	50	1.3	21.7	50	2.4	25.2	50	4.0
15	2.4	50	0.1	4.9	50	0.1	7.2	50	0.2	9.5	50	0.3	11.9	50	0.5	14.4	50	0.9	16.8	50	1.3
20	2.0	50	0.1	4.0	50	0.1	6.1	50	0.2	7.9	50	0.2	10.0	50	0.4	12.1	50	0.6	14.4	50	1.0
	H3 LPHW 60/40°C																				
-10	4.5	50	0.1	9.0	50	0.3	13.5	50	0.8	17.8	49	2.0	21.5	47	2.8	25.0	46	3.7	28.4	44	4.7
-5	4.1	50	0.1	8.0	50	0.2	12.1	50	0.6	16.1	50	1.7	19.5	48	2.4	22.7	46	3.1	25.7	45	3.9
0	3.6	50	0.1	7.2	50	0.2	10.8	50	0.5	14.5	50	1.4	17.5	49	1.9	20.3	47	2.6	23.0	46	3.2
15	2.4	50	0.1	4.8	50	0.1	7.2	50	0.3	9.6	50	0.6	11.8	50	0.9	13.7	48	1.2	15.5	47	1.6
20	2.0	50	0.1	4.0	50	0.1	6.0	50	0.2	8.1	50	0.4	10.0	50	0.7	11.6	49	0.9	13.1	48	1.1

t_{Li} = Inlet air temperature t_{Lu} = Outlet air temperature Q = Heating capacity Δp_W = Water-side pressure loss
Water-side pressure loss is exclusive of three-way valve. For values of three-way valve, see page 20.

Characteristics CC 90 V with ventilation box



For explanation see page 13.
Note: all data are inclusive of resistance in ventilation box.

Explanation of Technical Data

How to select your ventilation unit

The air displacement of the ventilation model in ventilation mode depends on the fan speed and on the air-side pressure loss in the air intake ducts. From the graphs and tables on pages 9 and 12, you can read the air displacement and heating capacity. You are to determine the air-side pressure loss yourself.

1. Determine the desired air flow rate: e.g., 800 m³/h (see example for CC 90 V on page 12).
2. Determine the external resistance in the applied ducts yourself.: e.g., 80 Pa.

The internal resistance in the unit, the ventilation box and the ventilation connection has already been included in the tables, so all you have to take into account is the external resistance from the applied ducts.

In the graph, draw a vertical line from 800 m³/h on the horizontal axis and a horizontal line from 80 Pa on the vertical axis. The fan speed of the unit is where these two lines cross. Look for other information at the table on page 12.

Result

Fan setting: 170 Volt — Air displacement: 800 m³/h
Sound pressure: 47 dB(A) — Discharge temperature: 50°C
Water-side pressure loss: 1.2 kPa — Heating capacity at -10°C: 17.9 kW
Water flow rate: 767 l/h (for calculation see formula on page 14)

Heating capacity correction coefficients

The heating capacities for the battery types H1 and H2 in the tables are based on a water range of 80/60°C. The heating capacity for battery type H3 is based on a water range of 60/40°C. These coefficients apply to the heating capacity mentioned in the tables, at an air inlet temperature of +20°C for recirculation and -10°C for ventilation. When other water temperatures and/or air inlet conditions are used, the heating capacity is to be multiplied by the appropriate correction coefficient given below.

Heating capacity correction coefficients – recirculation

Water-temperature	Air inlet temperature							
	+10 °C		+15 °C		+18 °C		+20 °C	
	H1/H2	H3	H1/H2	H3	H1/H2	H3	H1/H2	H3
90/70°C	1.44	2.54	1.32	2.32	1.25	2.21	1.21	2.12
80/60°C	1.23	2.16	1.11	1.96	1.04	1.82	1	1.76
70/50°C	1.01	1.77	0.90	1.58	0.94	1.66	0.78	1.38
60/40°C	0.79	1.39	0.68	1.20	0.61	1.08	0.57	1
50/40°C	0.70	1.24	0.59	1.04	0.53	0.93	0.49	0.86

Heating capacity correction coefficients – ventilation

Water-temperature	Air inlet temperature											
	-10 °C		0 °C		+10 °C		+15 °C		+18 °C		+20 °C	
	H1/H2	H3	H1/H2	H3	H1/H2	H3	H1/H2	H3	H1/H2	H3	H1/H2	H3
90/70°C	1.13	1.54	0.98	1.34	0.84	1.14	0.77	1.04	0.73	0.99	0.70	0.96
80/60°C	1	1.36	0.85	1.16	0.71	0.97	0.65	0.88	0.60	0.82	0.58	0.79
70/50°C	0.87	1.18	0.73	0.99	0.59	0.80	0.52	0.71	0.55	0.75	0.46	0.62
60/40°C	0.74	1	0.59	0.81	0.46	0.63	0.40	0.54	0.36	0.49	0.33	0.45
50/40°C	0.68	0.92	0.54	0.73	0.41	0.56	0.35	0.47	0.31	0.42	0.28	0.39

Cooling capacity correction coefficients

The cooling capacities for the battery types C2 and C3 in the tables, respectively, are based on a water range of 6/12°C and on air inlet conditions of 27°C / 48% RH. When other water temperatures and/or inlet conditions are used, the cooling capacity is to be multiplied by the appropriate coefficient from the below table. Data relating to deviating refrigerants are available on request.

Cooling capacity correction coefficients – battery types C2 and C3 (recirculation)

Water-temperature	Air inlet conditions	40% RH		48% RH		60% RH	
		Q_t	Q_v	Q_t	Q_v	Q_t	Q_v
6/12 °C	22°C	0.57	0.75	0.57	0.75	0.70	0.70
	24°C	0.66	0.87	0.68	0.83	0.93	0.81
	27°C	0.81	1.02	1	1	1.29	0.98
8/14 °C	22°C	0.47	0.62	0.47	0.62	0.47	0.58
	24°C	0.57	0.75	0.57	0.75	0.71	0.69
	27°C	0.71	0.94	0.78	0.89	1.07	0.86
10/16°C	22°C	0.38	0.50	0.38	0.50	0.38	0.50
	24°C	0.47	0.63	0.47	0.63	0.47	0.57
	27°C	0.61	0.81	0.61	0.81	0.84	0.75

Q_t = total cooling capacity Q_v = sensible cooling capacity

Water flow rate

When water and room temperatures other than the values mentioned in the tables are used, the water flow rate can be roughly calculated using the below formula. But first, to do so, the heating or cooling capacity must be recalculated, based on the tables on page 13 and 14.

m_W = water flow rate [l/h]
Q = capacity [kW]
ρ_W = density of water (=1) [kg/l]
C_{pW} = specific heat of water (=4.18) [kJ/kg°C]
ΔT_W = temperature difference, water [°C]

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

Water-side pressure loss

When water temperatures other than the values mentioned in the tables are used, the water-side pressure loss can be roughly calculated using the below formula. To do so, the water flow rate must first be calculated.

Δp_{W_2} = water-side pressure loss [kPa]
Δp_{W_1} = water-side pressure loss according to table values [kPa]
m_{W_1} = water flow rate table values [l/h]
m_{W_2} = water flow rate calculated using formula [l/h]

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

Sound

The tables on pages 7 to 12 provide the sound pressure levels in the reverberation field for all six speed settings. These sound pressure level values are based on the application of one Comfort Circle in a reference room. The sound pressure in the room depends on the installation and the fan speed. The sound data apply for each unit and are measured at a distance of 4 m from the unit.

Sound data, in dB(A)

Unit	Volume m^3	Reverberation time s	1	2	3	4	5	6
CC 60	300	0.5	32	38	43	48	52	54
CC 90	600	0.6	32	40	47	50	54	58
CC 60 V	300	0.5	36	41	47	51	54	57
CC 90 V	600	0.6	31	37	43	47	50	57

Deviating room or multiple units

T = reverberation value, deviating room [s]
T_0 = reverberation value ref. room [s] (see table)
V = volume, deviating room [m^3]
V_0 = volume, reference room [m^3] (see table)
n = number of units

If a unit is used in a deviating room, or if multiple units are used in a single room, the sound pressure level must be recalculated. This can be done using the below formula, whereby the relevant table value can be found in the tables on pages 7 to 12 (general selection data).

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

Sample calculation

Needed: the sound pressure level in the reverberation field if two CC 60 units are used at speed 2, in a room with a reverberation time of 0.7 s and a volume of 600 m^3.

$$48 + \left(10 \cdot \log\left(\frac{0{,}7}{0{,}5}\right) - 10 \cdot \log\left(\frac{600}{300}\right) + 10 \cdot \log(2)\right)$$

48 + 1.5 - 3 + 3 = 49.5 dB(A)

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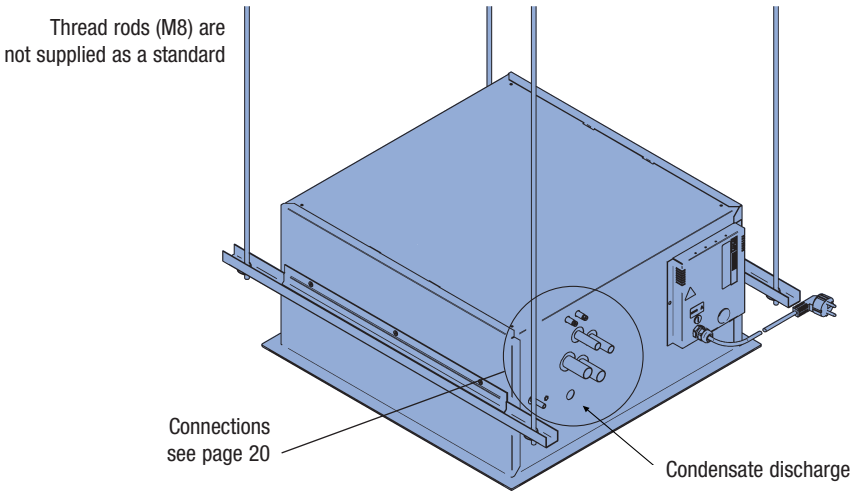
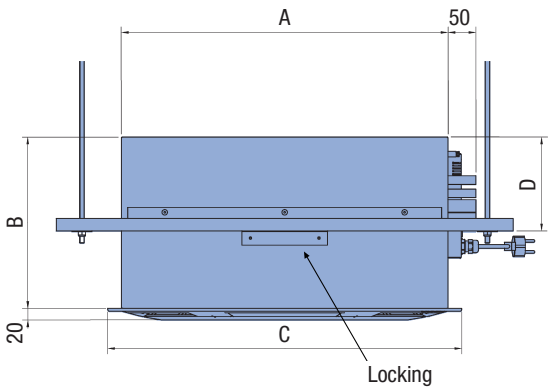
Overview of sound data

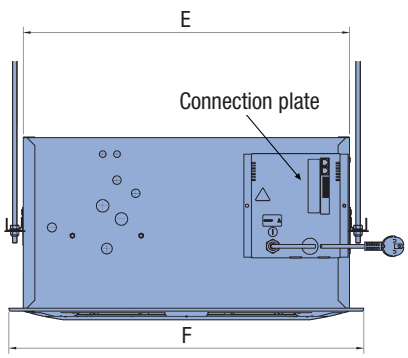
Sound power level in dB

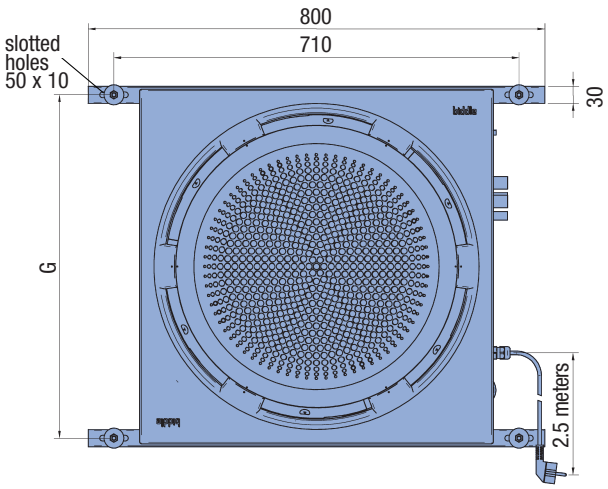
Unit	Speed	Per octave band in the medium frequency, in dB								Lw
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000Hz	dB(A)
CC 60	1	51.5	52.7	47.4	41.8	41.4	36.7	15.4	0	45.4
	2	53.6	57.1	52.5	47.3	45.8	45.0	29.3	0	51.6
	3	54.4	61.5	56.6	52.2	51.5	50.5	40.2	22.9	56.8
	4	56.8	66.6	61.5	56.7	56.4	55.0	48.7	32.6	61.7
	5	58.3	69.6	65.3	60.6	60.4	58.3	53.9	39.3	65.5
	6	59.9	72.2	67.9	62.9	62.7	60.2	56.7	43.6	67.8
CC 90	1	43.7	52.6	48.3	44.0	42.4	32.1	22.2	20.2	46.6
	2	52.9	60.1	55.6	51.9	51.2	46.2	35.0	24.5	55.3
	3	58.4	64.7	61.5	58.1	57.9	53.6	46.1	36.1	61.9
	4	59.5	66.9	65.3	61.3	61.1	56.9	51.0	42.1	65.2
	5	60.8	68.8	69.6	64.9	64.8	60.5	55.6	48.2	69.0
	6	64.4	71.3	74.3	69.5	69.3	64.7	60.4	55.1	73.5
CC 60 V	1	56.4	59.8	53.1	45.9	38.0	34.4	14.9	0	49.1
	2	56.9	61.7	58.6	51.9	43.9	43.1	28.9	0	54.2
	3	61.2	64.6	64.2	58.1	51.6	51.4	44.9	25.9	60.5
	4	61.7	69.3	68.3	62.2	55.8	54.2	50.8	33.6	64.5
	5	62.6	71.3	71.3	65.0	58.8	56.5	53.5	38.3	67.3
	6	63.9	73.4	74.9	68.5	61.7	59.0	55.6	42.6	70.5
CC 90 V	1	50.6	57.1	50.5	40.1	35.6	25.3	15.0	0	45.7
	2	54.1	58.9	57.5	47.7	44.6	39.7	27.7	0	52.2
	3	58.1	65.9	62.3	54.4	52.1	47.0	38.3	16.0	58.5
	4	58.0	69.6	65.4	56.8	55.4	51.9	41.3	25.6	61.8
	5	62.7	72.2	68.2	60.9	59.4	57.2	47.6	31.3	65.5
	6	64.0	79.0	74.5	66.3	64.9	64.4	57.6	42.0	71.9

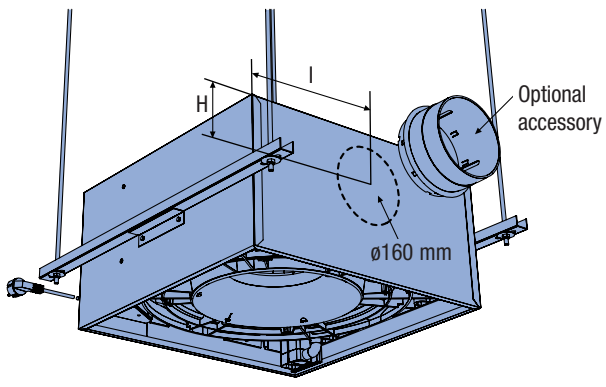
Dimensional Sketches CC 60 / CC 90 Recirculation







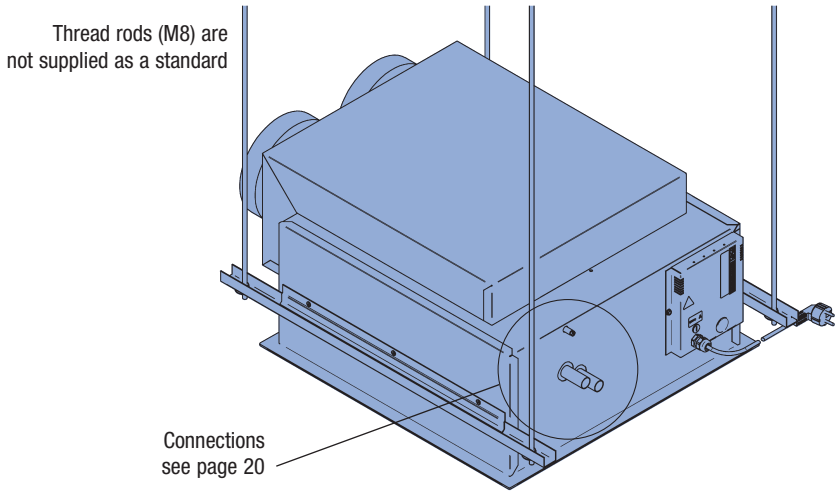


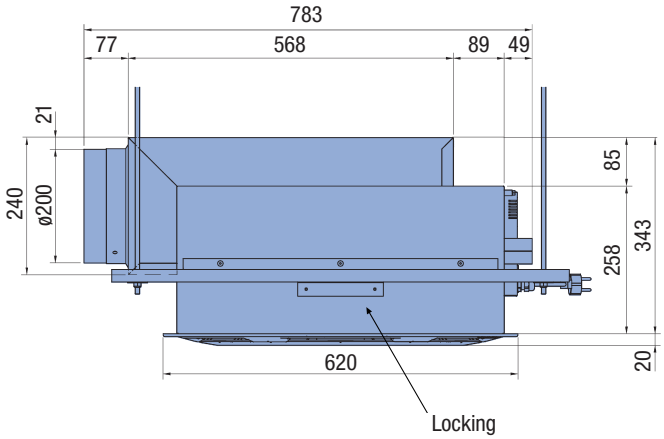


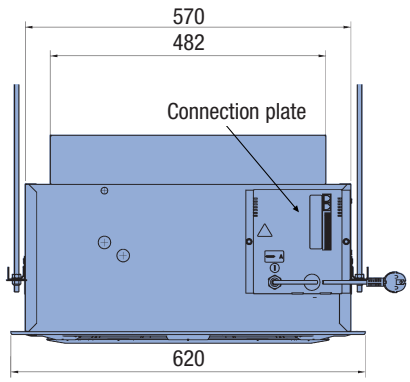
Prepunched hole for extra air duct

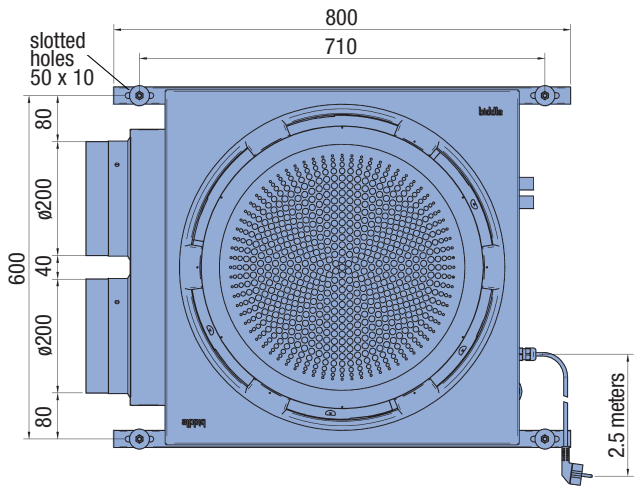
Unit	A	B	C	D	E	F	G	H	I
CC 60	572	300	620	164	570	620	600	110	285
CC 90	872	324	920	189	870	920	900	122	435

Dimensional Sketches CC 60 Ventilation

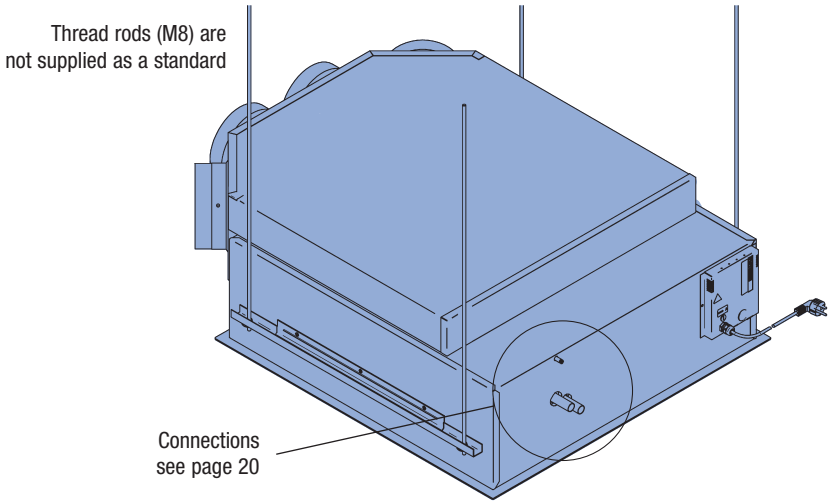


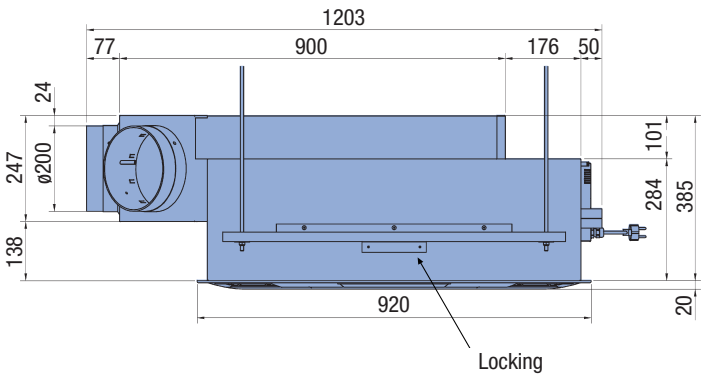


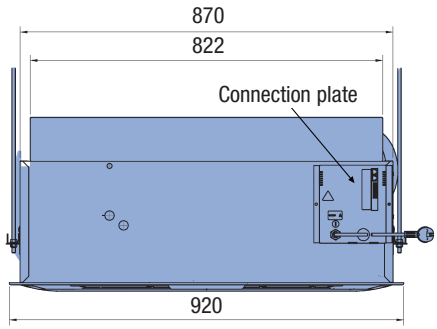


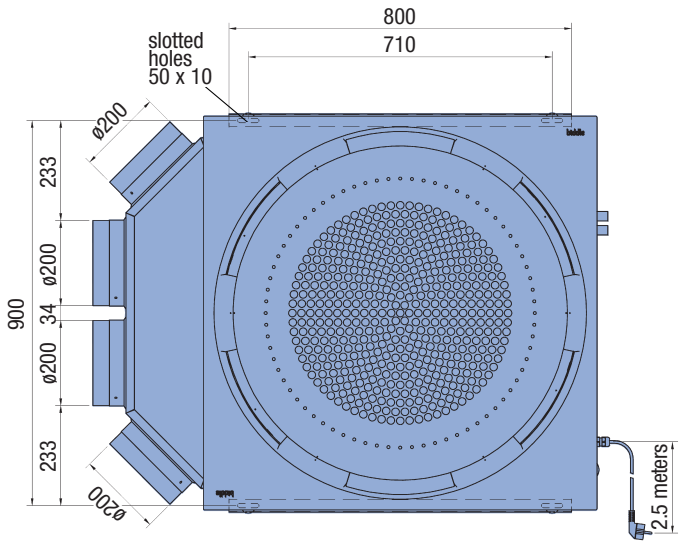


Dimensional Sketches CC 90 Ventilation





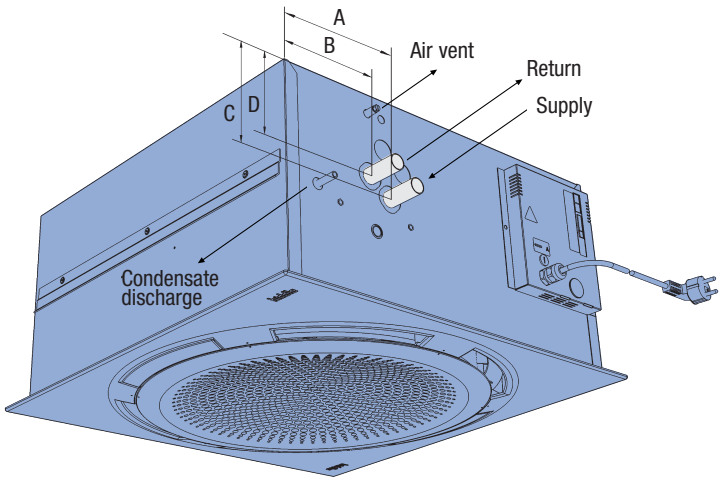




Dimensional Sketches Connections

Heating or cooling 2-pipe system

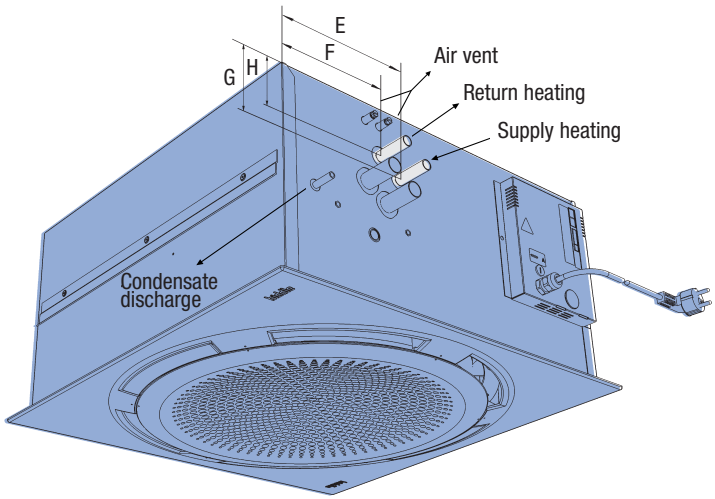
Unit	A	B	C	D
CC 60	171	139	125	102
CC 90	241	209	150	127
CC 60 V	171	139	143	120
CC 90 V	241	209	168	145



Heating and cooling 4-pipe system

Connections cooling are equal to 2-pipe system (see sketch above)

Unit	E	F	G	H
CC 60	196	164	98	75
CC 90	251	219	113	90



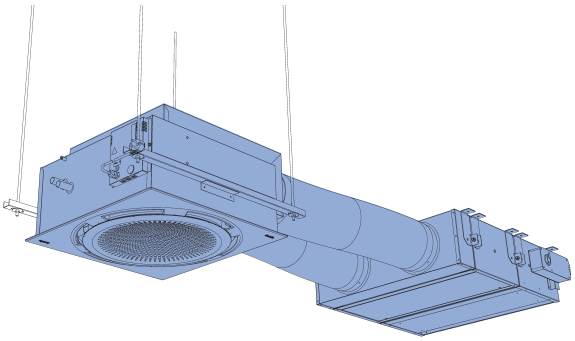
Connections

Unit	Coil type							
	H1		H2 & H3		C2 & C3		R2 & R3	
	Kvs[1]	DN	Kvs[1]	DN	Kvs[1]	DN	In[2]	Uit[2]
CC 60	1.6	15	2.5	20	2.5	20	3/8"	5/8"
CC 90	3.0	15	3.0	20	3.0	20	3/8"	3/4"

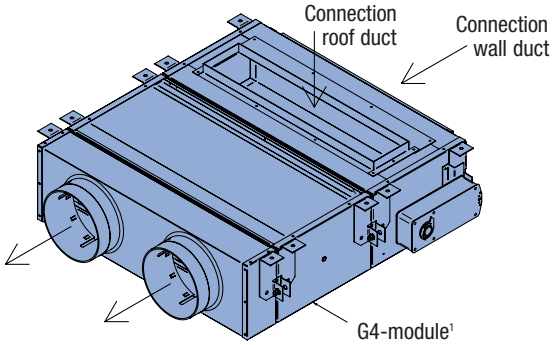
Compression fitting pipe diameter
DN 15 = 15 mm
DN 20 = 22 mm

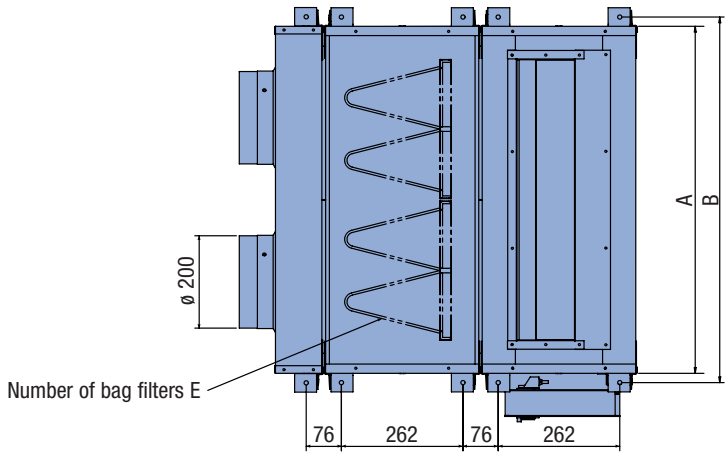
[1] *Kvs data 3-way valve*
[2] *R -model is fitted with flare coupling*

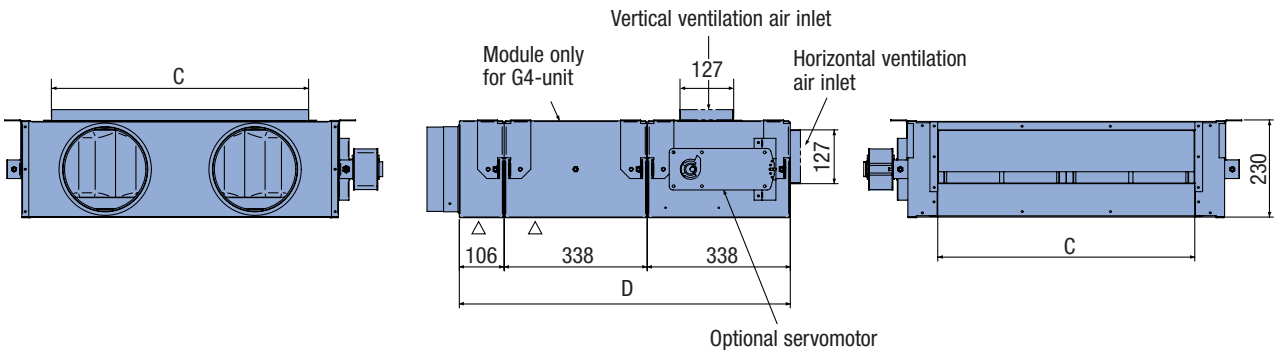
Dimensional sketches
Ventilation box

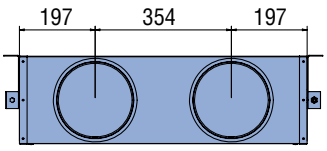


Composition of CC 60-V ventilation unit with ventilation box.

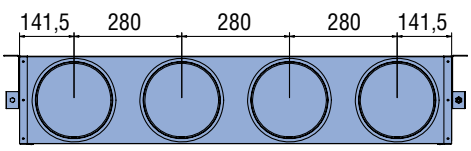








Duct connection CC 60



Duct connection CC 90

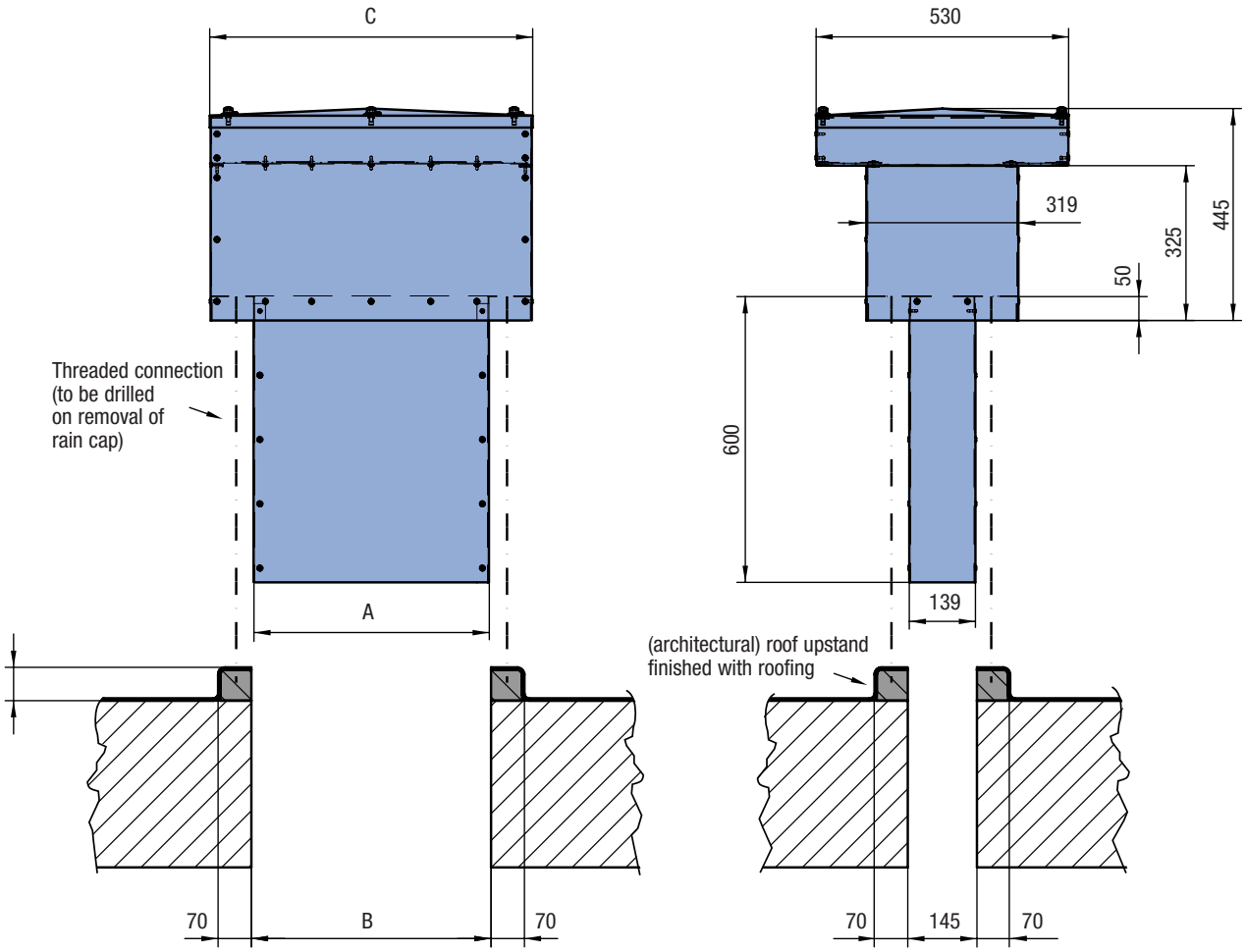
Unit	A	B	C	D	E
CC 60-HS / VS	748	788	607	444	-
CC 60-HG4 / VG4				782	2
CC 90-HS / VS	1123	1163	982	444	-
CC 90-HG4 / VG4				782	3

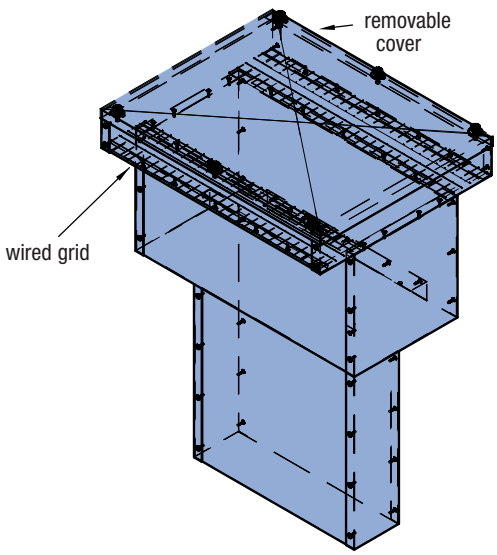
1) When a standard filter is used, the G4-module will be left out.

△ = filter remove

Dimensional Sketches Roof Duct

Roof cap and roof duct
Material: 1.5 mm aluminium sheet

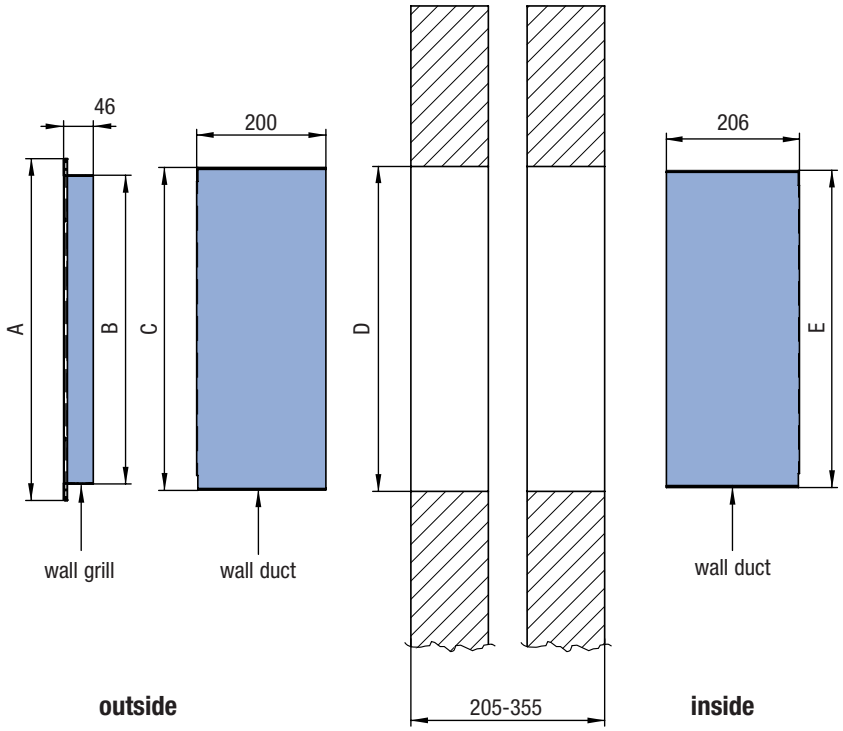


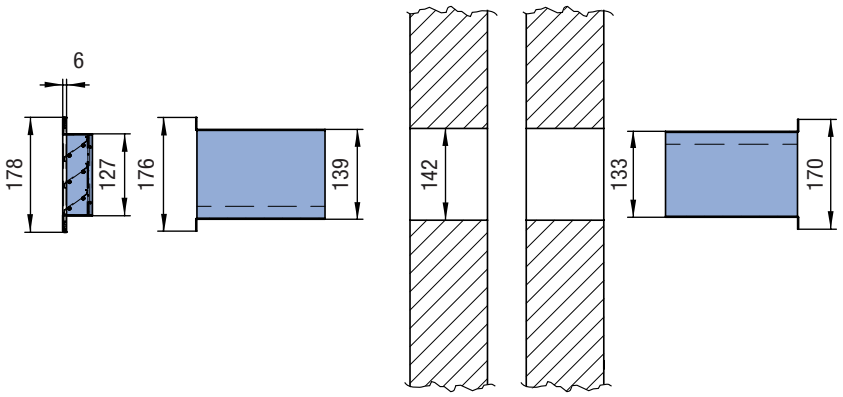


Unit	A	B	C
CC 60	619	628	803
CC 90	994	1003	1178

Dimensional Sketches Wall Duct

Wall duct and wall grill
Material wall duct: sendzimir plate steel
Material wall grill: extruded aluminium





Unit	A	B	C	D	E
CC 60	654	603	625	628	616
CC 90	1029	978	1000	1003	991

Specifications

Connections

The units come with a 2.5 m-long power cable with a moulded-on, earthed plug. The CH connections and the connector plate are located in the side of the unit.

Control and operation

The control panel is connected to the cassette unit using a low-voltage cable that has RJ11 plugs. This type of cable is also used to interconnect multiple units. The control unit in the device regulates the room temperature and the fan speed.

Casing

The casing is made of zinc-plated sheet steel, extra strengthened to minimise deformation and vibration, and it has an adjustable plastic air inlet grille in the bottom. The casing is fitted with soundproofing heat-insulation material. Units that are capable of both heating and cooling have an automatic angle adjustment. The casing and the inlet grille come standard in the colour white (RAL 9010) but other RAL colours are available at an extra charge.

Motor / fan assembly

The centrifugal fan has backward bent blades and has been mounted in the casing such that it causes no vibrations. The fan is driven by a rotor motor on ball bearings. The fan casing and the impeller are made of zinc coated sheet steel. The EBM motor is manufactured according to DIN 40050, Protection Class IP44 and Insulation Class F, and comes standard with thermal contacts. These thermal contacts will break the circuit of the motor when the maximum permissible motor temperature is exceeded (auto-reset).

Heating- (LPHW) / Cooling Coil (LPCW or DX)

The coils are made up of 3/8" copper tubes and aluminium fins. The coils are available with 2 or 4 rows of tubes. The maximum operating pressure is 8 bar at maximum 90°C. With the direct expansion coil (exclusive of expansion valve) the refrigerant R410a is used as standard, but other refrigerants may also be used. The maximum operating pressure is 41 bar.

Frost protection thermostat

Ventilation units have a frost protection thermostat, which is integrated into the control unit, and reduces the risk of the coil freezing (preset at 5°C).

ISO 9001: 2000

EUROPEAN PATENT

CE

Subject to change.

Biddle bv
P.O. Box 15
NL-9288 ZG Kootstertille
The Netherlands
tel. +31 512 33 55 55
fax +31 512 33 55 54
e-mail export@biddle.nl
internet www.biddle.info

biddle
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