



Comfort all around



**Cassette unit
Model Comfort Circle**

- heating
- cooling
- ventilation

Cassette units

Satisfied customers and staff

The Comfort Circle is a space efficient cassette unit from Biddle. With the ability to heat, cool and ventilate, the Comfort Circle offers customers a complete, year round climate control solution for offices and retail premises. The Comfort Circle creates a pleasant environment for customers and staff. Studies have proven that comfortable retail environments encourage customers to spend longer in store.

Attractive, striking design

The Comfort Circle has been designed to be easily integrated in a suspended ceiling system. The unit fits a standard ceiling tile leaving only the attractively finished outlet grille visible.



Comfort Circle

The benefits of the Comfort Circle model

- Optimum climate management
- Unobtrusive installation in (suspended) ceilings
- Heating, cooling and/or ventilation in a single unit
- Distributes air evenly within the indoor space
- Suitable models available for low water temperatures
- User-friendly automatic controller
- Swift delivery from stock
- Easy to maintain
- Ready to install - straight from the box

Optimum climate management

The combination of heating, cooling and ventilation in a single unit offer cost savings in equipment costs and installation time. The Biddle Comfort Circle is the only unit you need to create a comfortable indoor environment all year round.

Wide range of applications

The attractive appearance and low sound levels make the Comfort Circle cassette unit suitable for a wide range of applications such as shops, public buildings, offices, showrooms and reception areas.

Comfort Circle provides the optimum indoor climate for shops



Even air distribution

The Comfort Circle is fitted with a circular outlet grille. The air is drawn in through the circular openings in the centre of the grille and outlet air is expelled evenly throughout 360 degrees via the outlet openings on the side of the grille. The circular outlet pattern ensures even distribution of the conditioned air. This design results in a good throw and air circulation at low fan speeds, thus saving energy.

Automatically adjustable ring

The outlet grille of cassette units is fitted with a patented adjustable outlet ring. The ring can be set to provide the appropriate outlet angle. As a result the throw and distribution of the conditioned air is guaranteed.

Fixed outlet angle setting

Cassette units which are designed only for heating or cooling have a fixed outlet angle. Warm air is blown toward the floor at an oblique angle of 45° to achieve a good throw (fig.1). To obtain the optimum climate without creating moisture, cold air is blown along the ceiling horizontally (fig. 2), making use of the Coanda-effect. This creates a better distribution of the cold air in the space.



Biddle cassette units (CC 90) are in use in the computer rooms of this university.

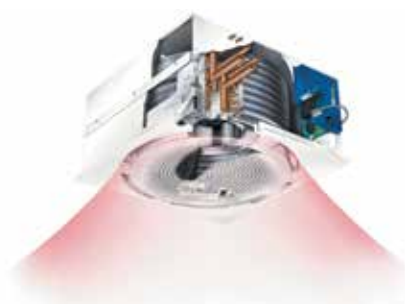


Fig. 1: Heating



Fig. 2: Cooling

Various control options

By selecting any one of the four controllers available for Comfort Circle the unit can be optimised to meet your control strategy. Choose from: no controller (basic version), fan speed control or one of the two Biddle plug& play controllers: air outlet thermostatic control or the modulating control of the water valve (see page 6).

Space-saving solution

The cassette unit is built into the ceiling and therefore does not use valuable wall or floor space thus optimising the retail space available.

A wealth of options

The Comfort Circle is suitable for the recirculation and/or ventilation (information upon request) and is available in two specifications:

- CC 60 (60 x 60 x 30.0 cm) with a max. air capacity of 740 m³/h.
- CC 90 (90 x 90 x 32.4 cm) with a max. air capacity of 1630 m³/h.

Selection

A CC 60 can heat a maximum area of 100 m² and a CC 90 a maximum area of 200 m². Specific requirements apply to cooling. A cooling load calculation is required for this. The cassette unit is suitable for a maximum fitting height of four metres.

Ventilation model

In the ventilation model fresh outside air is taken in via a ventilation box, heated or cooled and blown into the room. This model is only supplied with the modulating controller (see page 6) and detailed information is available on request.

Sustainable installations

Emphasis is increasingly being placed on energy-efficient and sustainable installations, as a result of which lower water temperature flows are used. This can be achieved by utilising the residual heat of a cooling installation or a heat pump. The Comfort Circle is also suitable for connection to such a system. The unit must then be fitted with an H3 or C3-coil.

Change-over-system

It is possible to use a cooling unit for heating, which is referred to as a “change-over-system”. To enable this, the unit must be fitted with the automatically adjustable outlet ring. To achieve the correct alignment between the cassette unit and the heat and cold sources it is necessary to install a change-over-sensor.

Easy inspection and maintenance

It is not necessary to move the ceiling tiles for inspection and maintenance as the components can be easily reached via the removable grille panel on the underside of the unit. The air filter can be conveniently cleaned using a vacuum cleaner. The outlet grill can be removed from the unit for cleaning.

Type code

CC 60-H1C2-M1

Specification

60 = 60 x 60 cm recirculation
 90 = 90 x 90 cm recirculation
 60V = 60 x 60 cm ventilation*
 90V = 90 x 90 cm ventilation*

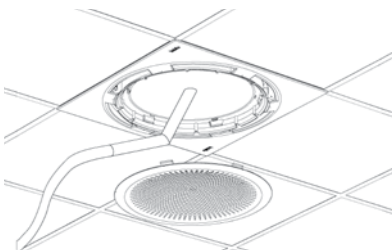
Coil type

H2 = 2 row heating
 H3 = 3 row heating
 C2 = 2 row cooling
 C3 = 3 row cooling
 H1C2 = 1 row heating, 2 row cooling

Controller

B0 = basic version
 (without controller)
 T0 = fan speed controller
 S0 = thermostatic (air side)
 controller
 S1 = thermostatic (air side)
 controller with auto angle
 adjustment
 M0 = modulating air and water
 side controller
 M1 = modulating air and water
 side controller with auto
 angle adjustment

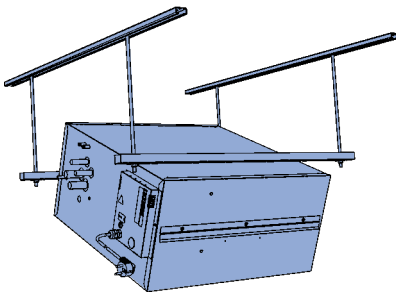
* Information about the ventilation model is available on request. Ventilation in combination with recirculation is also possible.



Easy to maintain



Cassette units (CC 60) installed above the tills at a supermarket.



Flexible suspension system

Using an adaptor plate the CC 90 is tailored to the existing ceiling system.

Standard accessories

The Comfort Circle is supplied with the following accessories as standard:

- two suspension sections
- two blanking strips to adjust the outlet pattern
- external condensation draining pump (only for cooling)
- external condensation tray (only for cooling)
- one or two water-side valves, fitted with actuators (only with modulating controller)

Additional accessories

Required when a Biddle controller is fitted:

- control panel
- low-voltage cables (various lengths available)

Optional:

- suspension set
- change-over-sensor (heating and cooling)
- adaptor plate for the CC 90
- installation thermostat

Colours

The casing and the inlet grille of the Comfort Circle are supplied in the colour white (RAL 9016) as standard. Other RAL colours are of course available at extra cost.

Well-conceived suspension system

Biddle cassette units can be installed either before or after a suspended ceiling has been installed. Due to the adjustable suspension system the unit is adjustable in all directions and the final mounting position can be determined very accurately. As a result, the unit can be easily integrated in the ceiling.

Change-over-system

It is possible to use a cooling unit for heating, which is referred to as a “change-over-system”. To enable this, the unit must be fitted with the automatically adjustable outlet ring. To achieve the correct alignment between the cassette unit and the heat and cold sources it is necessary to install a change-over-sensor.



Various control options



The control panel includes a room thermostat and weekly timer.

Four control options are available for the Comfort Circle. The Comfort Circle is available without controller (basic version), with a fan speed controller or with the choice of one of the Biddle plug & play controllers: either a thermostatic (air side) or modulating (air and water side) controller and the accompanying user-friendly control panel. The indoor climate is easily set to a comfortable level using the control panel.

1. Basic version (without controller)

The cassette unit is equipped with a tapped transformer set to a single fixed setting as standard.

2. Speed controller

This controller is compatible with external controllers, for example a building management system. The fan speed is then controlled externally (0-10 Volt, non-live).

3. Thermostatic (air-side) controller

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

4. Modulating (air-side and water-side) controller

This plug & play controller regulates both the fan speed and the discharge temperature in order to achieve the desired room temperature accurately. The desired room temperature is set via the control panel.

Control panel with LCD screen

The control panel has a variety of touch keys and a user-friendly LCD screen. The room temperature can be set using the control panel, allowing the system to automatically select one of three fan speeds. In addition to these functionalities, the control panel is also equipped with an integrated weekly timer. This can automatically switch the unit on or off on particular days of the week. The buttons on the control panel can be locked to prevent unwanted operation using 'key lock'.

A single control panel allows the user to interconnect and operate up to 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 cassette 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.

• Ready for use

Units with integrated Biddle controllers are delivered ready for use. For connection to the mains voltage the units are fitted with power cables (approx. 2 m 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.



Plug & play

Technical data CC 60 / 90

Recirculation model

Basic data

tapping ¹		1	2	3	4	5	6	7	8	9	10	11	
tapping voltage	V	60	70	80	90	100	115	130	155	170	190	230	
air volume	CC 60	m ³ /h	120	150	190	230	270	350	430	550	620	680	740
sound level		dB(A)	13	15	19	23	26	32	38	45	47	50	52
air volume	CC 90	m ³ /h	240	300	360	430	510	630	750	1040	1260	1490	1630
sound level		dB(A)	24	23	25	28	29	34	38	45	50	54	57

		CC 60						CC 90					
electrical supply	V/ph/Hz	230/1/50						230/1/50					
max. input current	A	0.7						1.2					
max. input power	W	137						270					
weight	kg	H2=28	C2=29	H3, C3, H1C2=31			H2,C2 = 49	H3 = 52	C3 = 53		H1C2 = 54		

Heating		H2 LDWW 82/71 °C			H3 LDWW 60/40 °C			H2 LDWW 82/71 °C			H3 LDWW 60/40 °C		
inlet conditions		20°C						20°C					
	Speed ¹	1	2	3	1	2	3	1	2	3	1	2	3
air volume	m ³ /h	430	620	740	430	620	740	750	1260	1630	750	1260	1630
heating capacity	kW	7.2	9.6	11.1	4.3	5.8	6.7	12.8	19.3	23.5	8	12	14.7
discharge air temperature ²	°C	70	66	64	50	48	47	71	66	63	51	48	47
water flow rate	l/h	0.16	0.21	0.25	0.05	0.07	0.08	0.29	0.43	0.52	0.10	0.15	0.18
water pressure drop ³	kPa	7.7	12.9	16.8	0.6	1.1	1.4	6.8	14.5	20.8	0.5	1	1.4

Cooling		C2 LDKW 6/12 °C			C3 LDKW 6/12 °C			C2 LDKW 6/12 °C			C3 LDKW 6/12 °C		
inlet conditions		23°C / 50%			23°C / 50%			23°C / 50%			23°C / 50%		
	Speed ¹	1	2	3	1	2	3	1	2	3	1	2	3
air volume	m ³ /h	430	620	740	430	620	740	750	1260	1630	750	1260	1630
total cooling capacity	kW	1.9	2.4	2.8	2.2	2.9	3.3	3.4	4.9	5.8	4.1	6.1	7.4
sensible cooling capacity	kW	1.6	2.1	2.4	1.8	2.4	2.8	2.8	4.2	5.1	3.3	5	6.2
discharge air temperature ²	°C	12	13	13	10	11	12	12	13	14	10	11	12
water flow rate	l/h	0.08	0.10	0.11	0.09	0.12	0.13	0.14	0.19	0.23	0.17	0.24	0.29
water pressure drop ³	kPa	2.5	4	5	2	3.3	4.1	2.2	4.3	5.9	1.5	3	4.2

Heating/cooling		H1C2 LDWW 82/71 °C			H1C2 LDKW 6/12 °C			H1C2 LDWW 82/71 °C			H1C2 LDKW 6/12 °C		
inlet conditions		20°C			23°C / 50%			20°C			23°C / 50%		
	Speed ¹	1	2	3	1	2	3	1	2	3	1	2	3
air volume	m ³ /h	430	620	740	430	620	740	750	1260	1630	750	1260	1630
heating capacity	kW	3.7	4.8	5.4				7.3	10.4	12.3			
total cooling capacity	kW				1.9	2.4	2.8				3.5	4.9	4.9
sensible cooling capacity	kW				1.6	2.1	2.4				2.9	4.3	4.3
discharge air temperature ²	°C	46	43	42	12	13	13	49	45	42	12	13	13
water flow rate	l/h	0.08	0.11	0.12	0.08	0.10	0.11	0.16	0.23	0.27	0.14	0.2	0.24
water pressure drop ³	kPa	2.9	4.5	5.6	2.5	4	5	8.2	15.7	21.6	2.3	4.5	6.2

¹ The unit is wired as standard on circuits 7, 9 and 11. This is speed 1, 2 and 3.

² The discharge temperature of units with modulating control is limited to 50 °C.

³ Water pressure loss excludes the three-way valve. For the Kvs values of the three-way valve, see page 11.

Explanation of technical data

Correction coefficients - heating capacity

The heating capacities for the coil types H1 and H2 listed in the tables on pages 7 are based on a water temperature range of 82/71 °C. The heating capacities for the coil type H3 are based on a water temperature range of 60/40 °C. If water temperatures differ, the heating capacity is to be multiplied by the coefficients from the below tables. These coefficients are applicable to the heating capacities from the table on page 7 at an air inlet temperature of 20 °C.

Correction coefficients for heating capacities of the coil type H2 and H3 (recirculation)

Water range	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	1.27	2.45	1.16	2.25	1.1	2.13	1.06	2.06
82/71 °C	1.2	2.3	1.1	2.1	1.04	1.99	1	1.91
80/60 °C	1.08	2.1	0.98	1.9	0.92	1.79	0.88	1.71
70/50 °C	0.89	1.74	0.79	1.55	0.73	1.43	0.69	1.36
60/40 °C	0.7	1.38	0.6	1.19	0.54	1.08	0.5	1
50/40 °C	0.62	1.2	0.52	1.02	0.47	0.91	0.43	0.84
50/30 °C	0.5	1.01	0.4	0.82	0.34	0.7	0.3	0.62

Correction coefficients - cooling capacity

The cooling capacities for the coil types C2 and C3 listed in the tables on pages 7 are based on a water temperature range of 6/12 °C and on an air inlet temperature of 23 °C at 50% R.H. If water temperatures and inlet conditions differ, the cooling capacity is to be multiplied by coefficients from the below table. Data relating to deviating refrigerants are available on request.

Correction coefficients for cooling capacities of the coil type C2 and C3 (recirculation)

Water range	Inlet temperature	relative humidity					
		40% R.V.		50% R.V.		60% R.V.	
		Q _t	Q _s	Q _t	Q _s	Q _t	Q _s
6/12 °C	22 °C	0.84	0.95	0.89	0.93	1.05	0.89
	23 °C	0.91	1.03	1	1	1.22	0.96
	24 °C	0.99	1.11	1.13	1.07	1.39	1.03
	27 °C	1.29	1.32	1.57	1.27	1.94	1.25
	28 °C	1.41	1.38	1.75	1.34	2.13	1.31
8/14 °C	22 °C	0.7	0.8	0.7	0.79	0.79	0.76
	23 °C	0.77	0.88	0.79	0.87	0.92	0.82
	24 °C	0.84	0.95	0.89	0.93	1.08	0.89
	27 °C	1.08	1.18	1.27	1.13	1.61	1.1
	28 °C	1.18	1.25	1.44	1.2	1.81	1.17
10/16 °C	22 °C	0.56	0.63	0.56	0.63	0.57	0.62
	23 °C	0.63	0.72	0.63	0.72	0.68	0.69
	24 °C	0.7	0.8	0.71	0.8	0.79	0.76
	27 °C	0.92	1.03	1.01	1	1.27	0.95
	28 °C	0.99	1.11	1.14	1.06	1.46	1.03
12/18 °C	22 °C	0.41	0.47	0.41	0.47	0.41	0.47
	23 °C	0.49	0.55	0.49	0.55	0.49	0.55
	24 °C	0.56	0.64	0.56	0.64	0.58	0.63
	27 °C	0.78	0.88	0.79	0.87	0.94	0.82
	28 °C	0.85	0.96	0.9	0.94	1.11	0.89

Q_t = total cooling capacity Q_s = sensible cooling capacity

m_W = water flow rate [l/h]
 Q = capacity [kW] (page 14)
 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]

Water flow rate

If water flow rates differ from those listed in the table, the water flow rate may be roughly calculated using the below formula. Before doing so, the heating or total capacity must first be recalculated (see page 7 and 8).

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

Water pressure loss

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

When water temperatures differ from those listed in the table, and then the water pressure loss may be roughly calculated using the formula below. To do so, the water flow rate must first be calculated (see above).

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

Unit	Volume (m ³)	Reverb. time (s)
CC 60	300	0.5
CC 90	600	0.6

Sound

In the table on page 7 a sound level in the reverberation field is listed for all speeds. These sound level values are based on the use 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.

L_p = sound pressure [dB(A)]
 T = reverberation value in deviating room [s]
 T_0 = reverberation value [s]
 (see table)
 V = volume of deviating room [m³]
 V_0 = volume reference room [m³]
 (see table)
 n = number of units

Deviating room and multiple units

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

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

Sound level in dB

Sample calculation: What is the sound level in the reverberation field if two Comfort Circle 60 are used at speed 2 in a room featuring a reverberation time of 0.7 s and a volume of 600 m³?

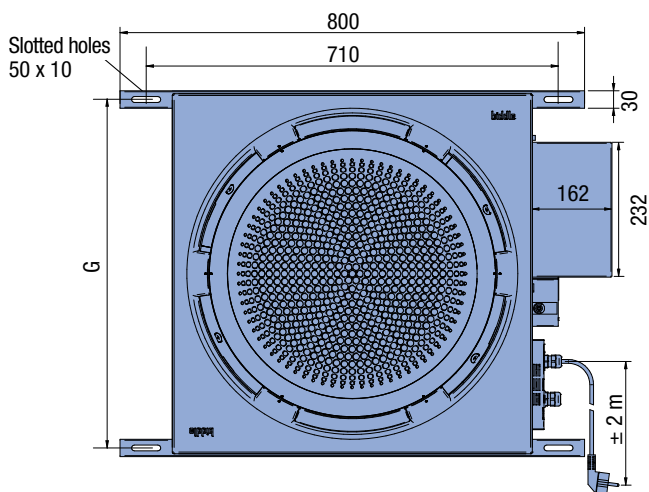
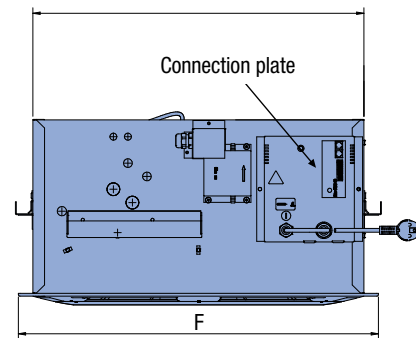
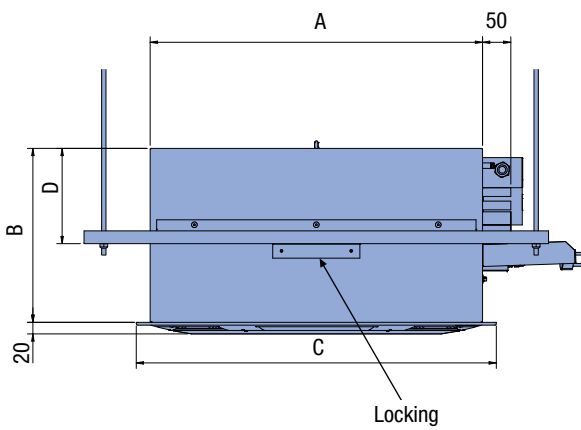
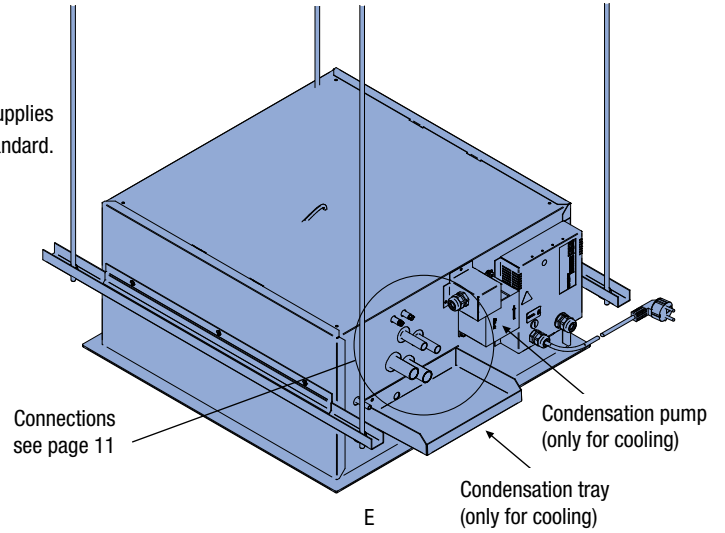
$$48 + \left(10 \cdot \log \left(\frac{0,7}{0,5} \right) - 10 \cdot \log \left(\frac{600}{300} \right) + 10 \cdot \log (2) \right)$$

$$48 + 1.5 - 3 + 3 = 49.5 \text{ dB(A)}$$

Unit	Speed	Per octave band in the medium frequency, in dB								Lw dB(A)
		63	125	250	500	1000	2000	4000	8000	
CC 60	1	44.6	54.4	50.5	45.7	44.8	44.5	29.2	16.3	50.5
	2	47.6	62.1	59.4	55.3	55	53.7	46.8	34	60
	3	50.9	65.7	64.2	60	60.3	57.4	53.4	41.3	65
CC 90	1	62.5	58.6	55.1	50.6	46.9	39.6	29.8	17.1	52.5
	2	56.5	68	65.3	61.1	60.5	55.7	48.5	38.3	64.5
	3	60.8	72	71.1	67.8	67.1	64.3	57.1	48.5	71.5

Dimensional sketches recirculation CC 60 / 90

Thread rods (M8) are not supplied as a standard.

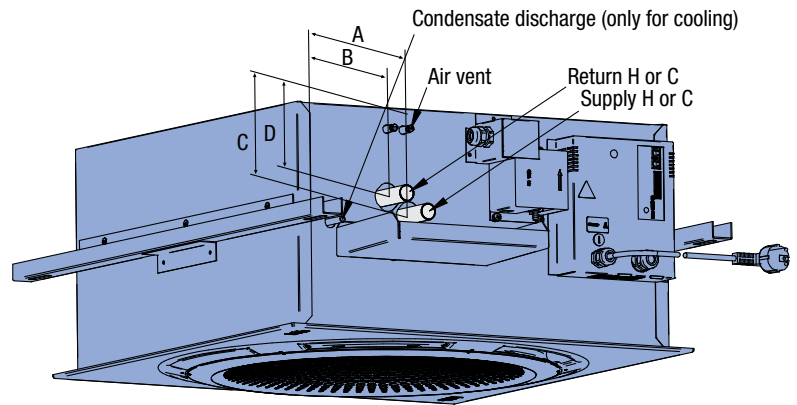


	A	B	C	D	E	F	G
CC 60	572	300	620	164	570	620	600
CC 90	872	324	920	189	870	920	900

Notes:

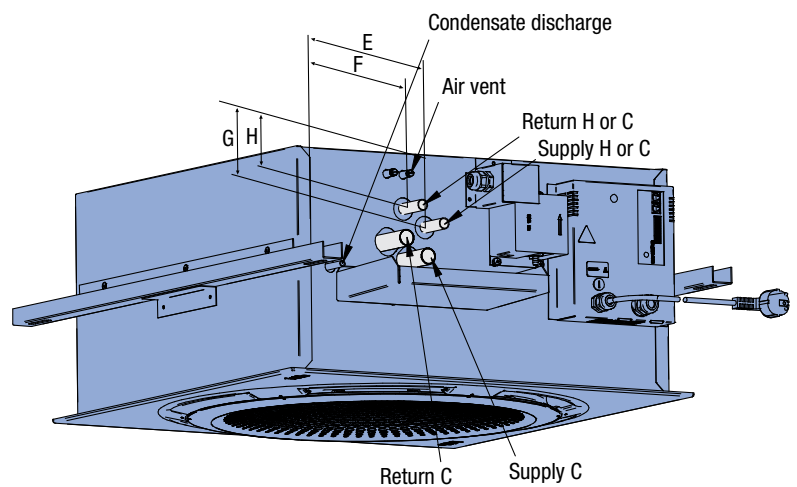
- All dimensions in mm.

Dimensional sketches connections Heating (H) or cooling (C) 2-pipe system



	A	B	C	D
CC 60	171	139	143	120
CC 90	241	209	168	145

Heating (H) and cooling (C) 4-pipe system



Connection of cooling similar to 2-pipe system
(see dimensional sketch above).

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

Connections

	H1		H2 & H3		C2 & C3	
	Kvs ¹	DN	Kvs ¹	DN	Kvs ¹	DN
CC 60	1.6	15	2.5	20	2.5	20
CC 90	4.0	15	4.0	20	4.0	20

¹ Kvs for 3-way valves.

Notes:

- All dimensions in mm.

Pipe diameter of compression fittings:
DN 15 = 15 mm
DN 20 = 22 mm

Specifications

Casing



Comfort Circle is also suitable for offices

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. The casing and the inlet grille come standard in the colour white (RAL 9016). 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 motor is manufactured according to DIN 40050, Protection Class IP44 and Insulation Class B (CC 60) and F (CC 90) 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 3 rows of tubes. The maximum operating pressure is 8 bar at maximum 90°C.



In this supermarket the CC 90 is applied.



• ISO 9001
• ISO 14001



Subject to change

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