

## Project information IBC

Decentralised sill ventilation units in modular design  
PI/FSL/3/EN/2



### The building

The new Investment Banking Center (IBC) in Theodor-Heuss-Allee in Frankfurt am Main is a complex comprising three buildings. Along with two office buildings, one of the largest trade centres in the Rhine-Main area with approx. 1,000 jobs forms part of the building complex. The object encompasses a rented area of a total of 79,500 m<sup>2</sup>.

One of the special features is the variable space saving room concept with decentralised ventilation units and flexible control by using ventilation units, cooling ceilings, lighting and blinds. Due to the use of this concept, it was possible to plan the building without knowledge of the subsequent room layout. In the case of changes of use, the plant equipment in the building is adapted to new layouts and needs by simply changing parameters in the building management system – physical changes to the installation and wiring are not necessary.



Supply and return air functional box

### The ventilation concept

The internal areas are ventilated using a central plant ventilation system. The perimeter rooms are ventilated using decentralised FSL sill ventilation units in modular design (supply and return air type), as described below.

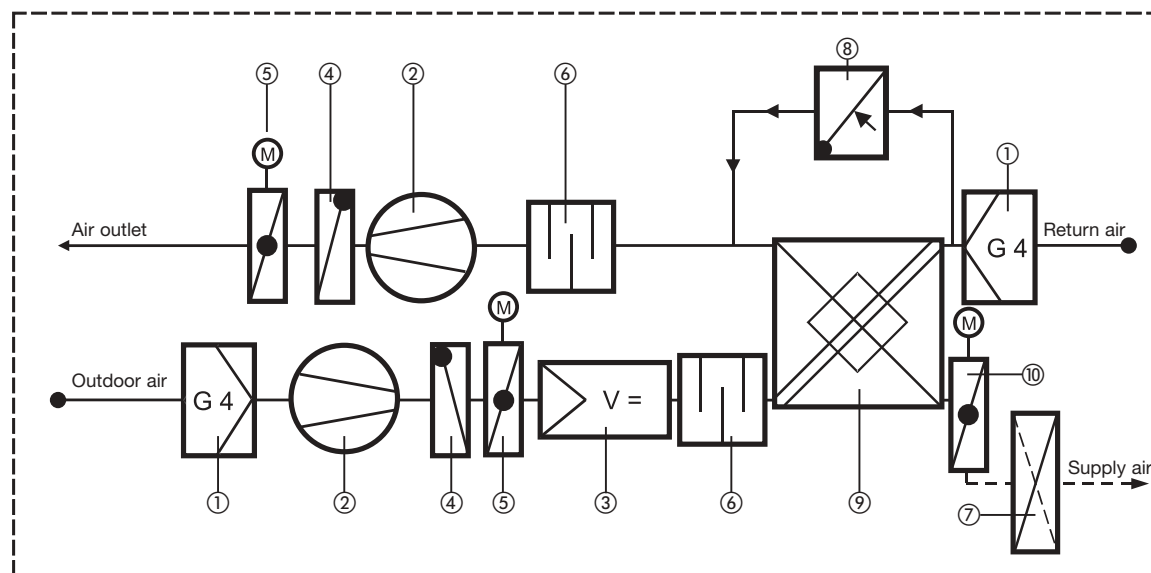
In the early stages of construction, empty housings (modules) with supply and return air openings were installed in the sill area of the outer facade. Once usage had been defined, these housings were equipped with thermal and acoustic insulating boxes without a ventilation function, or with functional boxes, depending on the usage required. In the case of the functional boxes, a differentiation is made between combined supply air and return air units, and recirculation units. With the ventilation function, it is also possible to heat and cool the perimeter rooms using this system. Chilled ceilings were additionally provided for controlling the temperature in the rooms.

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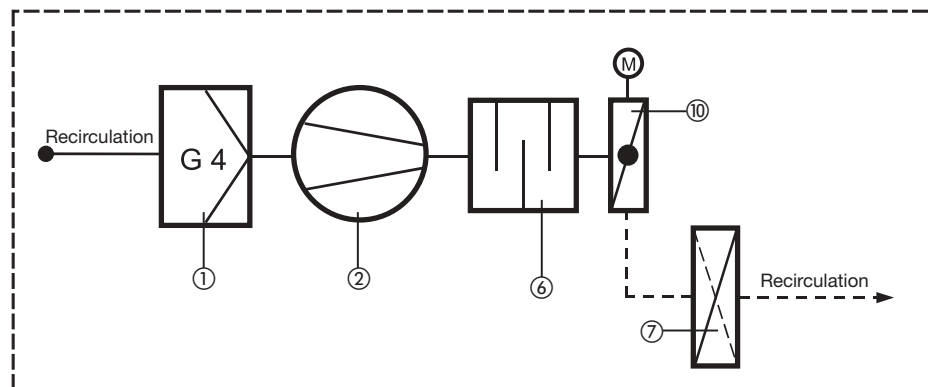
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### Ventilation schematic diagram for sill ventilation units, supply and return air type (1)



### Ventilation schematic diagram for sill ventilation units, recirculation type (2)



- ① Coarse dust filter
- ② Fan
- ③ Constant flow rate controller
- ④ Backdraught damper
- ⑤ Motorised shut-off damper
- ⑥ Acoustic attenuator
- ⑦ Air heater or cooler
- ⑧ Bypass damper
- ⑨ Plate heat recovery unit air / air (WRG)
- ⑩ Thermal switch

## The decentralised sill ventilation units in modular design

### Layout

The sill ventilation units comprise a module, function box, thermal switch and coils unit (see drawing on page 3). With the exception of the electronic components and the seals, only non-flammable materials have been used. The modules are installed between the sill and the window. The modules are manufactured from coated aluminium. For thermal isolation, a Promat plate clad with an aluminium sheet is installed on the outside. The top of the module is designed such that the window sill can be installed there. Depending on the operation required, a functional box of recirculation type, or supply and return air type, is slid into the module. The thermal switch is on the room side. This comprises a housing with an acoustically attenuating outer cladding and a damper with actuator. The thermal unit with

four-pipe coils and condensate tray are underneath the thermal switch (see drawing on page 3). The window sill and the trim on the room side were not supplied by the FSL in this project.

The main components of the supply and return air functional box are two radial fans, shut-off and backdraught dampers, a flow volume controller, the heat recovery unit, two filters, as well as the housing manufactured from galvanised steel sheet with acoustically and thermally insulating cladding. The recirculation functional box comprises, along with the housing with glass fibre fabric faced mineral wool cladding, and a fan with a filter. The filters in the functional boxes are arranged and designed such that they can be replaced quickly without tools.

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### Principle of operation of the supply and return air unit

The outdoor air is drawn through the façade using the supply air fan and cleaned using the class G 4 air filter positioned at the inlet to the unit (see schematic diagram 1). A backdraught damper prevents room air being drawn out of the building through the supply air duct in the event of suction at the façade. The shut-off damper equipped with spring return actuator is closed when the ventilation unit is switched off such that there is no flow through the ventilation unit, independent of whether there is pressure or suction at the facade. An automatic constant flow volume controller of type ENS limits the supply air volume flow to the maximum value set. The supply air is fed through a heat recovery unit, where part of the energy contained in the return air is transferred to the supply air. During operation of the ventilation unit, the supply air damper is opened, and the air is fed through the four pipe coils. By this means the air is further heated or cooled, before it is introduced to the room approx. 10 cm above the floor. Condensation produced in the heat recovery unit and the air-water coils is collected in a condensate tray and drawn off.

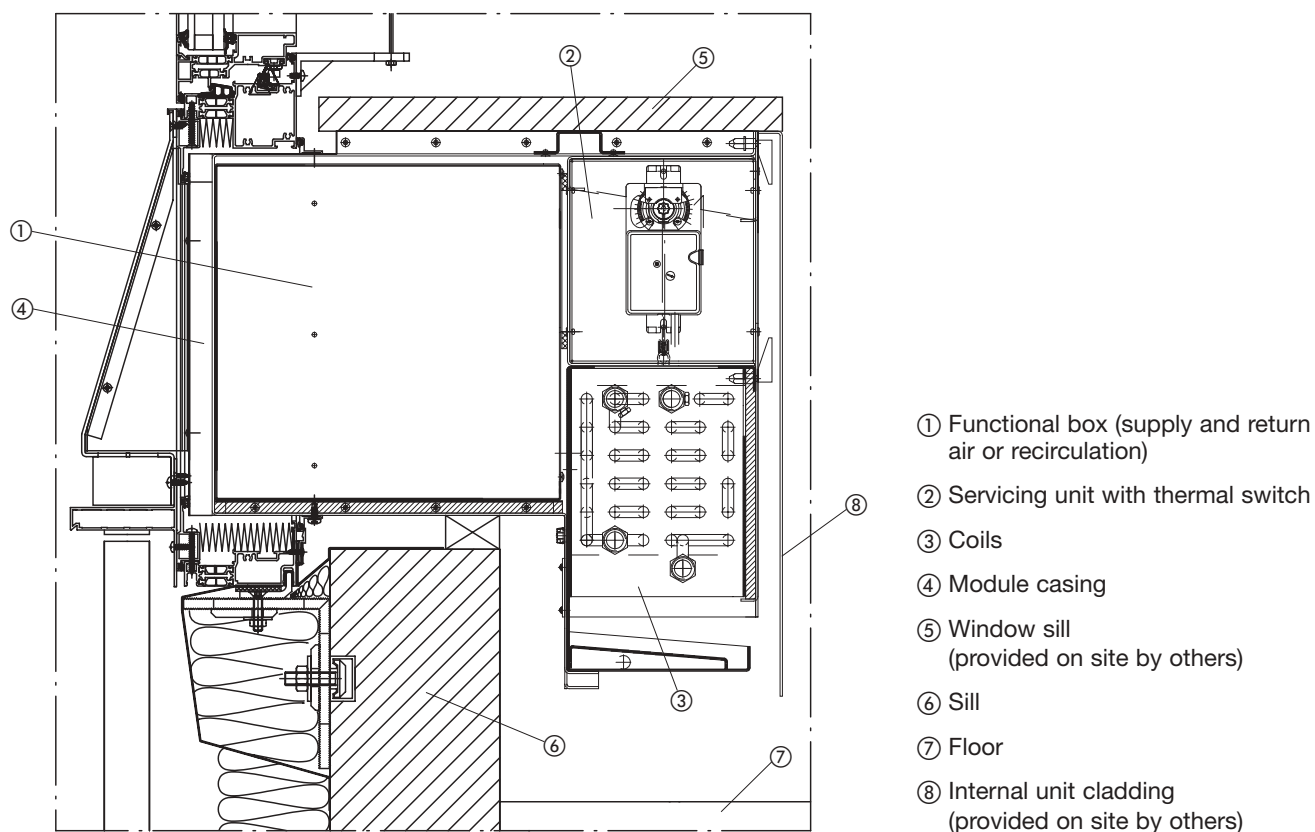
The return air is extracted under the window sill and also fed through a class G 4 filter to protect the subsequent heat recovery unit and fan from soiling. Should, in the case of extreme outdoor temperatures, the heat recovery unit freeze, an automatic damper is opened and the room return air is fed past the heat recovery unit via a bypass. In this way ventilation is assured even during these conditions. A backdraught damper and shut-off damper with the same functionality as in the supply air duct are also integrated into the return air duct.

If the ventilation unit is not active, the damper for the thermal switch is placed in the "static heating" position and the four-pipe coils can be used for heating.

### Principle of operation of the recirculation unit

Similar to the supply and return air units, the return air is drawn out under the window sill and also fed through a class G 4 filter to protect the subsequent heat recovery unit and ventilator from soiling (see schematic diagram 2). The air then passes directly through the recuperative unit to the coils and is heated or cooled there. Also as for the supply and return air unit, heating by means of natural convection is also possible with the unit switched off.

### Sill ventilation unit as modular design – façade section



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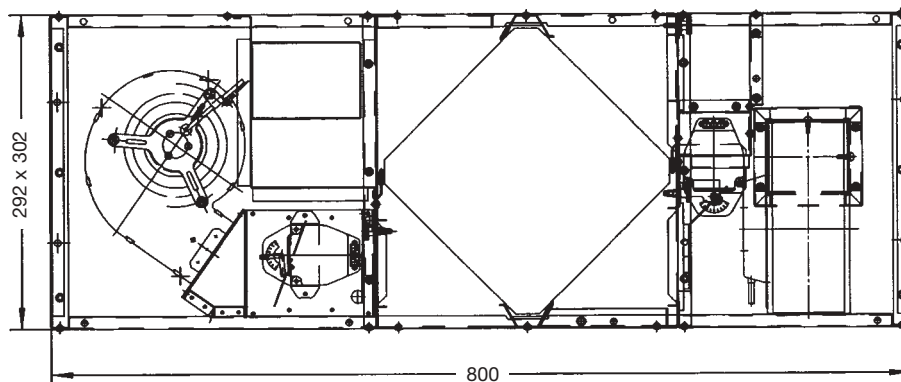
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### Dimensions

The layout and dimensions of the modular housing and the units were defined by the project-specific façade. The depth of the complete sill ventilation unit (see drawing on page 3) is 510 mm and the height is 480 mm.

The unit width was adapted to suit the spacing on the façade. The dimensions of the functional boxes can be taken from the drawing.

### Function box, supply and return air type



### Technical data

The acoustic, flow-related, and thermal optimisation of the sill units is based on project-specific requirements. The coils were selected based on the performance figures

required for the volumetric flows stipulated. The performance data of the units is summarised in the following table.

Volumetric flow		m³/h	Supply and return air		Recirculation	
			120	90	200	150
Cooling	Cooling load	W	690	560	480	350
	Air inlet temperature	°C	32	32	23	23
	Air outlet temperature	°C	18,7	18,3	16	16
	Chilled water volumetric flow	l/h	100	100	90	54
	Water flow temperature	°C	12	12	12	12
	Water return temperature	°C	18	17	16,5	17,6
	Pressure drop, water side	Pa	9400	9400	5600	2100
Heating	Heating load	W	1010	800	960	720
	Air inlet temperature	°C	4	4	20	20
	Air outlet temperature	°C	29	30,3	34	34
	Hot water volumetric flowrate	l/h	54	36	66	36
	Water flow temperature	°C	70	70	70	70
	Water return temperature	°C	53,9	50,5	57,2	52,3
	Pressure drop, water side	Pa	600	300	900	300
Sound pressure level incl. 8 dB room attenuation		dB(A)	37,5	33	34,5	27,5
Fan voltage		V	120	94	130	103
Current consumption		A	0,343	0,307	0,213	0,177