AIR TECH SYSTEMS

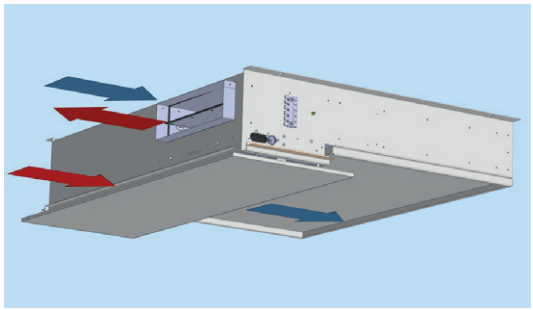
Technical Brochure

LTG Air-Water Systems

LTG Decentral

Decentralised ventilation unit FVP*pulse*-D

pulse ventilation



Installation in ceilings

www.LTG.net

Technical brochure • Decentralised ventilation unit FVP*pulse*-D, ceiling installation

LTG Comfort Air Technology

Air-Water Systems

Air Diffusers

Air Distribution

Content

Notes

Dimensions stated in this brochure are given in mm.

Dimensions stated in this brochure are subject to General Tolerances according to DIN ISO 2768-vL. For the outlet grille special tolerances stated in the drawing apply.

Straightness and twist tolerances for extruded aluminium profiles according to DIN EN 12020-2.

The surface finish is designed to meet the requirements for applications in buildings - room climate according to DIN 1946 part 2. Other requirements on request.

The actual tender documentations are available in word format from your responsible branch office or at www.LTG.net.

LTG Decentral

Dezentralised Ventilation Units

Flexible and energy-efficient!
Decentralised Ventilation Units with highly efficient heat recovery

Decentralised Ventilation Units offer unique flexibility in combination with high operational efficiency for architects and planners.

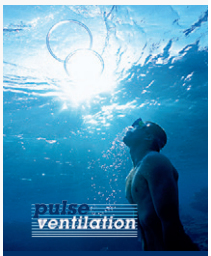
All ventilation is provided locally. Both supply and exhaust air flows are guided across the façade and conditioned to suit design conditions. An integrated, highly efficient heat recuperator minimises the heating/cooling losses to ensure low energy costs.

Without a central AHU, decentralised systems offer the only, highly efficient solution to renovate existing buildings in an energy-efficient manner. Local systems offer an innovative and energy-efficient means for individual, demand-controlled air conditioning for new construction projects as well

LTG Aktiengesellschaft offers units for local air conditioning for all installation situations in the ceiling, the façade and the false floor.

The product portfolio ranges from efficient supply air and supply/return air units to innovative concepts with non-stationary flow.

Benefits



Time to breathe

- No central air conditioning plant or duct system required
- Lower floor height possible for reduced construction costs and efficient use of space
- High user acceptance provided by individual control
- High energy efficiency provided by demand-controlled ventilation with heat recovery

LTG System PulseVentilation

The FVP*pulse* pulsed facade-mounted ventilation unit reproduces the natural movement of the air and allows buildings to „breathe“. Unlike conventional facade-mounted ventilation units, FVP*pulse* uses a shared air duct for both the supplied and waste air, a **single** facade opening and only **one** fan.Thanks to a system of dampers, it switches between the intake and outlet functions – without causing any airstream short-circuits !

This non-stationary ventilation results in the thorough mixing of the air in the room at low air velocities and high air volumes and consequently ensures an agreeable room climate. Important for architects and investors: FVP*pulse* units need fewer main components than conventional facade-mounted ventilation solutions and are more compact, while still offering the same level of performance.

LTG Connected Intelligence

Decentralised control intelligence

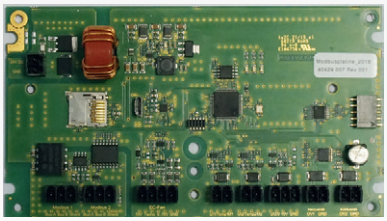
Intelligent bus-capable control.
Solution of automation and control tasks directly on the unit.

Demand-controlled ventilation even without building management systems.
Efficient, scalable, bus-compatible.

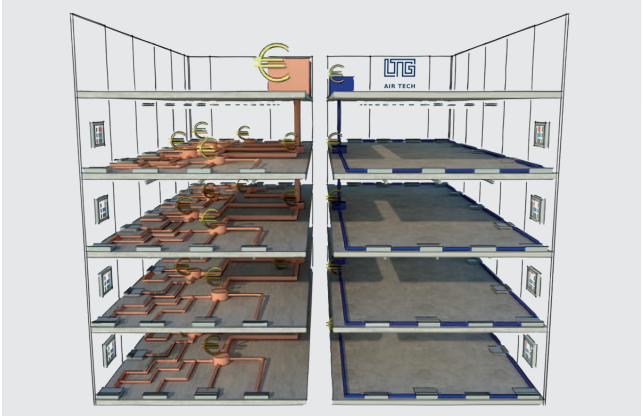
Advantages

- Cost-effective, simple, and flexible solution for your room automation tasks with LTG systems
- Innovative automation solution for at least 50% savings for investment/installation costs for the ICE
- Cost-effective or reduced installation/operating costs
- Open bus system, manufacturer-independent
- Flexible for retrofits, extensions, stand-alone solutions

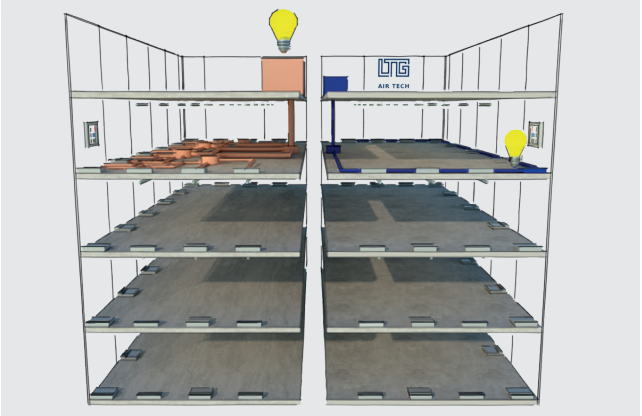
Specifications



- Unit plug-on board
- Modbus RTU interface
- 24 V DC supply
- Direct connection of thermal valves
- Connection of up to three sensors (room temperature, outdoor temperature, CO_2-concentration, condensate, window contact, presence, ...)
- Quick parametrization via SD card



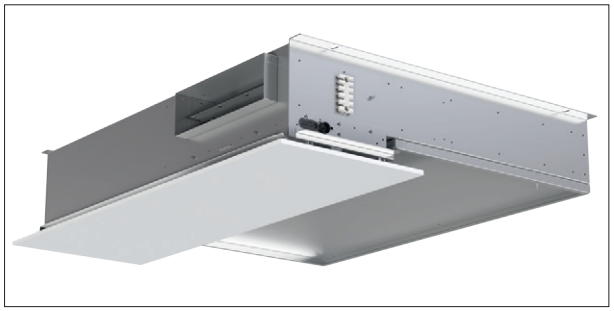
Cost reduction

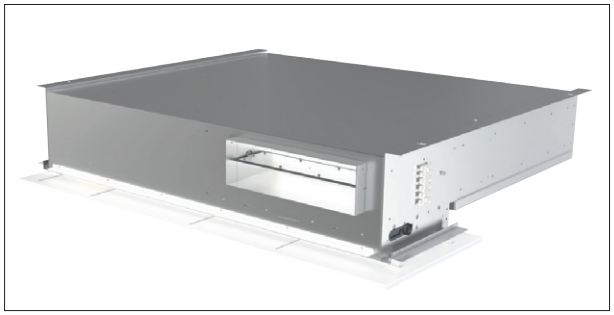


Decentralised control intelligence

Technical brochure • Decentralised ventilation unit FVP*pulse*-D, ceiling installation

Unit views





Application

Decentralised 2-pipe ventilation unit for installation in the ceiling, for decentralised ventilation and deaeration of rooms directly via the façade, as well as for heating and cooling the outside air, including highly efficient heat recovery. Also available for condensing operation on request. Excellently suited for areas with high demands on air quality and thermal comfort.

The supply air is introduced into the room via a baffle plate, which is mounted at a distance of 15 mm below the false ceiling.

Installation, positioning

The FVP-D is installed in the false ceiling. The total unit height is 265 mm, measured from the upper edge of he unit to the lower edge of the baffle plate. The unit body has an overall height of 235 mm (upper edge of mounting bracket to lower edge of false ceiling).

Since the unit body lies within the suspended ceiling, the FVP-D can also be used in rooms with fully glazed facades.

As the baffle plate is inserted into a frame supplied by LTG on the user side, the visual and functional requirements of the user can be implemented with a high degree of flexibility. For example, the baffle panel is available as a coloured plasterboard, wooden or stainless steel panel or as an acoustically effective acoustic sail.

Characteristics

- Air conditioning with high ventilation effectiveness and thermal comfort through impulse ventilation
- Economical solution thanks to the low capital investment and operating costs
- Only one façade opening, simplest structural integration without flow short-circuit
- High operational reliability through innovative design and control concepts

Specifications

All components comply with VDI 6022.

Unit casing

Made of galvanised sheet steel. With punched holes for water-side and electrical connection lines.

Heat exchanger

Made of corrosion-resistant aluminium alloy (EN AW 8006). Water-side connection G ½" female thread. Maximum permissible water-side operating pressure 12 bar, 2-pipe system, 4-pipe heat exchanger on request.

Heat recovery unit

High-efficiency regenerator of class H1 according to DIN EN 13053. The blades are made of a corrosion-resistant aluminium alloy (EN AW 8006). Due to the periodic fluctuation of the surface temperature of the regenerator around an average value, freezing is not possible in the cyclically operating mode. Heat recovery coefficient up to 90 % depending on the cycle time. Air filter for outside air and exhaust air.

The FVP unit is equipped with an outside air filter (filter class comparable to F7), with a sign indicating the filter type, inspection interval and time of the last filter replacement and with an exhaust air filter (comparable to G2).

Fan

Low-noise centrifugal fan with energy-saving high efficiency EC motor (SFP class 1, < 500 W/m^3 /s).

Facade-mounted damper / Internal unit tightness

Façade damper closes automatically in case of power failure (VDMA 24390) by means of an actuator with capacitors. Leakage air flow (related to the damper perimeter): Class 3.

Sound and heat insulation

The silencers are made of flame-retardant insulating materials (B1) with a closed-pored top layer, rot-proof and resistant to mould.

Condensate
The alternating air flow prevents condensation in the heat recovery unit.

Condensate may form in the heat exchanger due to water flow temperatures below the dew point. A condensate tray can be installed below the heat exchanger for this purpose. It can be removed for maintenance and must be connected to a local condensate network (using a condensate pump) in the case of condensing operation.

Thermal comfort

The pulsating mode of operation achieves a very good thermal comfort for the user even at very high sub-temperatures (category A according to DIN EN ISO 7730).

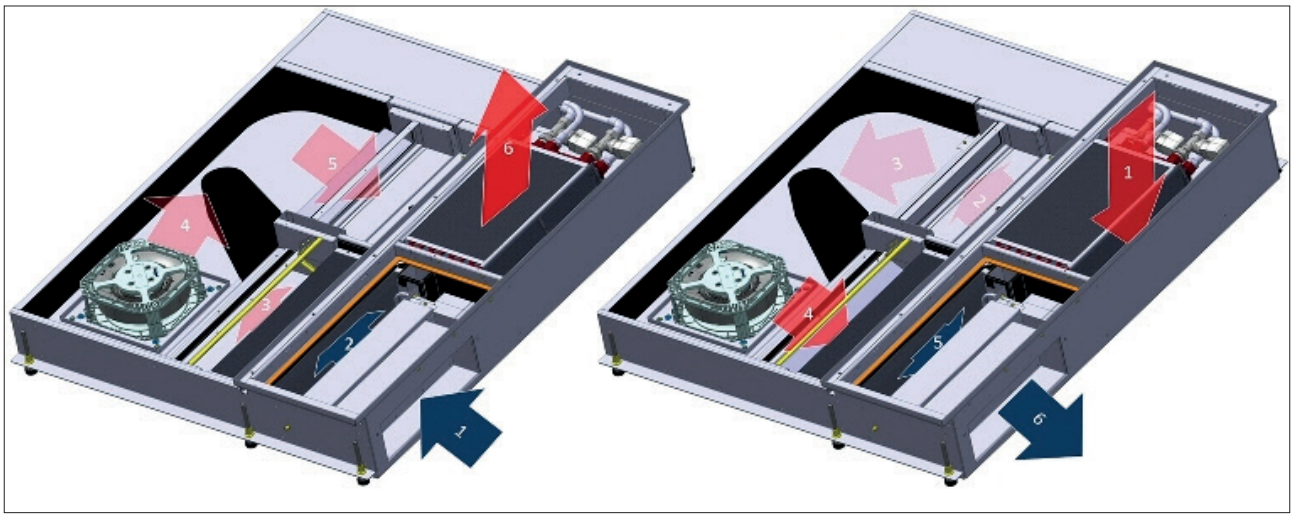
The ceiling jet reaching deep into the room effectively reduces the high discharge velocity and low discharge temperature of the supply air via the baffle plate.

An induction fan integrated into the support frame of the baffle plate divides the supply air introduced into the room (when breathing in) into individual jets, effectively supporting the reduction of under temperature and air velocity.

The induction fan can be individually adjusted and adapted to the existing room situation. For example, when installed next to an interior wall, the supply air can be directed into the room.

Due to the high impulse with which the supply air is introduced into the room, a large penetration depth is achieved as well as good mixing with the room air.

Design of the unit, mode of operation



Breathing IN (in winter)

Breathing OUT (in winter)

Breathing IN in winter (supply air operation)

Function: The heat recovery unit is still warm from the outlet cycle. The Breathing IN cycle now starts: the outside air is drawn in through the facade opening and supply air filter.

1. The outside air flows through the heat recovery unit and is heated (2).
2. The air passes through the fan's inlet chamber (lower level).
3. The EC fan transports the air from the inlet chamber (lower level) into the pressure chamber (upper level).
4. In the upper level, the supply air passes through the silencer.
5. Here, it passes through the damper and into the supply air duct.
6. After leaving the supply air duct, the air is cooled or heated by the heat exchanger and is discharged out through a supply air grille.

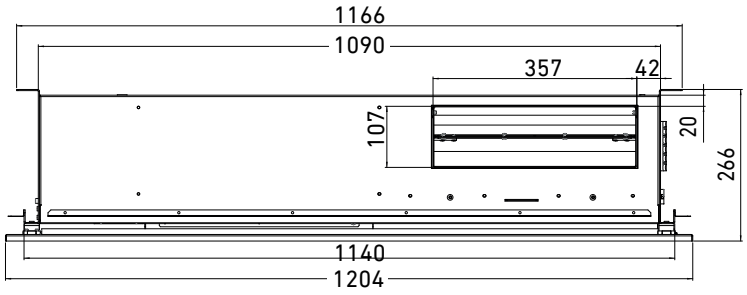
The flow is reversed by switching over the damper.

Breathing OUT in winter (exhaust air operation)

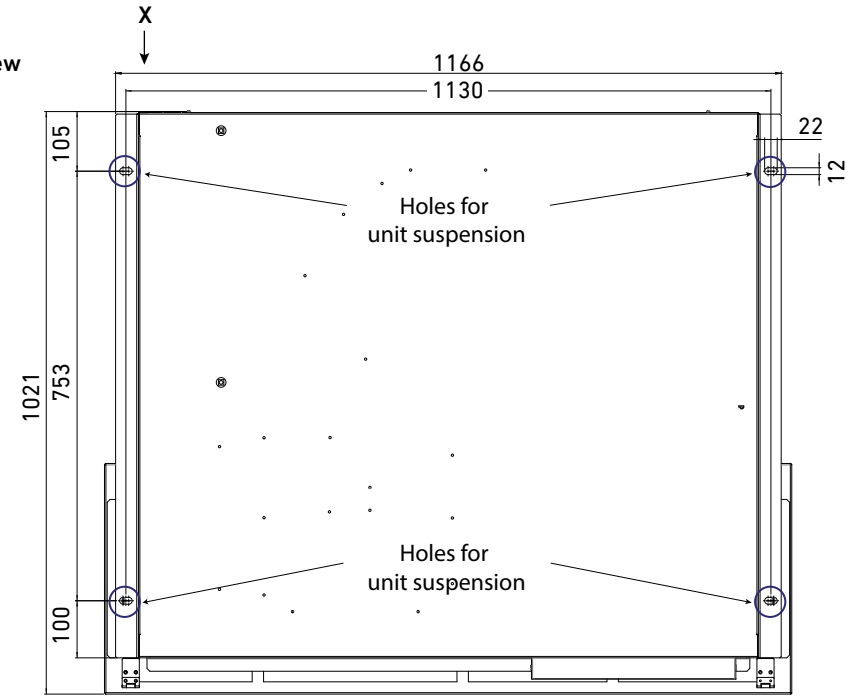
1. The exhaust air is drawn out of the room via the heat exchanger bypass and the "exhaust air filter".
2. The air passes through the damper and into the suction chamber (lower level).
3. In the suction chamber, the air flows to the EC fan (lower level).
4. The EC fan transports the air from the suction chamber (lower level) into the pressure chamber (upper level).
5. The warm air flows through the damper to the heat recovery unit where its energy is transferred to this unit.
6. The exhaust air is now evacuated to the outside via the facade opening.

Dimensions

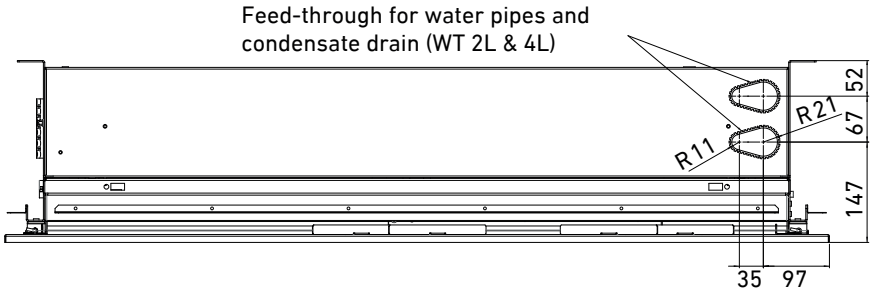
Front view



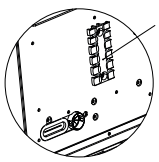
Top view



View X

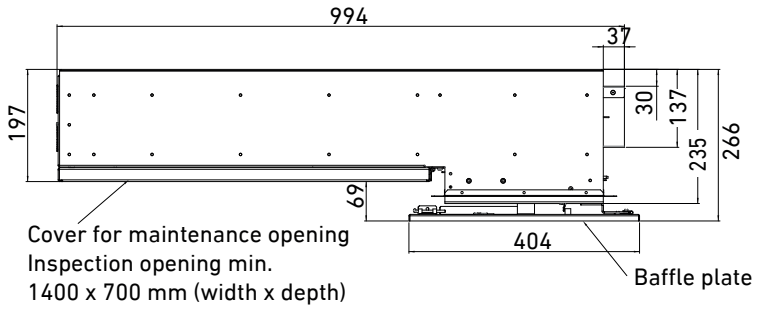


Detail A

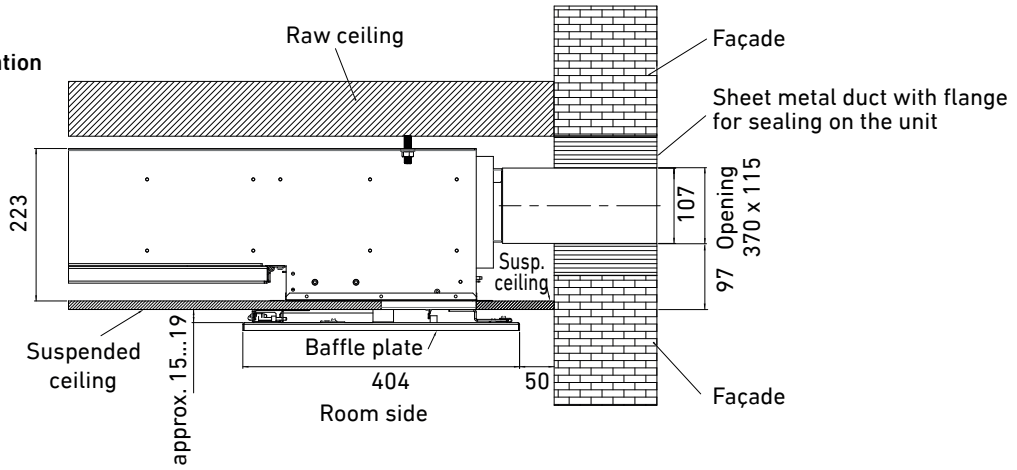


Dimensions

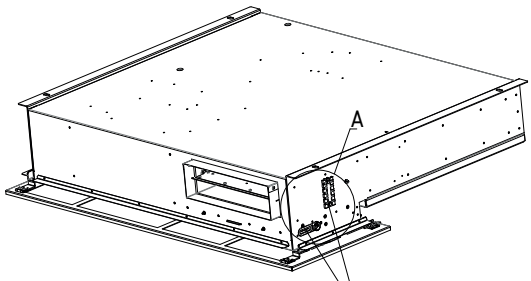
Side view, left



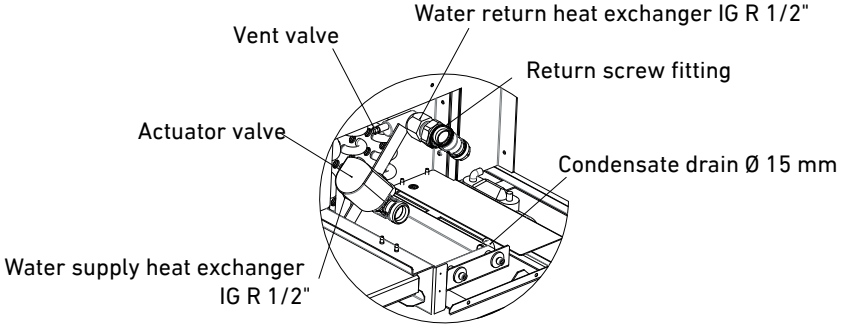
Side view, left
Installation situation



Isometric view



Electrical connection side (electrical transfer) with strain relief strip for cables



Technical data for 2-pipe system, cycle time 2 x 20 s

			Heating [1]				Cooling [2]					
P_{el} [4]	L_{WA}	V	$Q_{h,tot}$	$Q_{h,room}$	$T_{h,ZU}$	$T_{h,RL}$	$Q_{k,tot}$	$Q_{k,room}$	$T_{k,ZU}$	$T_{k,RL}$	W_{oh}	W_{ok}
[W]	[dB(A)]	[m³/h]	[W]		[°C]		[W]		[°C]		[kg/h]/[kPa]	
42	47	260 [3]	–	–	–	–	-906	-386	21	20	100 / 6	200 / 21
37	45	240 [3]	–	–	–	–	-851	-371	21	20		
25	39	200 [3]	–	–	–	–	-732	-332	21	19		
16	29	160 [3]	–	–	–	–	-601	-281	21	19		
40	45	120	2400	1040	48	48	-555	-315	18	18		
22	39	90	1834	814	49	51	-415	-235	18	17		
12	29	60	1229	549	50	54	-271	-151	19	17		
9	13	30	610	270	51	57	-129	-69	19	16		

1) At 60 °C water supply temperature,
-12 °C outside air temperature,
22 °C room temperature,
heat recovery level 76...82 % (depend. on flow rate),
cycle time 40 s,
free intake without external pressure loss

2) At 16 °C water supply temperature;
32 °C outside air temperature,
26 °C room temperature,
non-condensing operation,
heat recovery level 78...82 % (depend. on flow rate),
cycle time 40 s,
free intake without external pressure loss

3) Hybrid ventilation: In the summer, the waste air can be evacuated via a window left ajar. In this case, the unit operates continuously in air supply mode. This almost doubles the unit's cooling capacity and the outside air flow rate without causing any change to noise emissions. However, no heat recovery is possible.

4) The electrical power input, including for regulation, during ventilation operation.

P_{el} - Electrical power input

L_{wA} - Acoustic power level ± 3 dB(A)

V - Flow rate

$Q_{H,tot}$ - Heating capacity of unit, incl. heat recovery

$Q_{H,room}$ - Available room heating capacity

$T_{H,zu}$ - Supply air temperature in heating mode

$T_{H,RL}$ - Water return temperature in heating mode

$Q_{K,tot}$ - Cooling capacity of unit, incl. heat recovery

$Q_{K,room}$ - Available room cooling capacity

$T_{K,zu}$ - Supply air temperature in cooling mode

$T_{K,RL}$ - Water return temperature in cooling mode

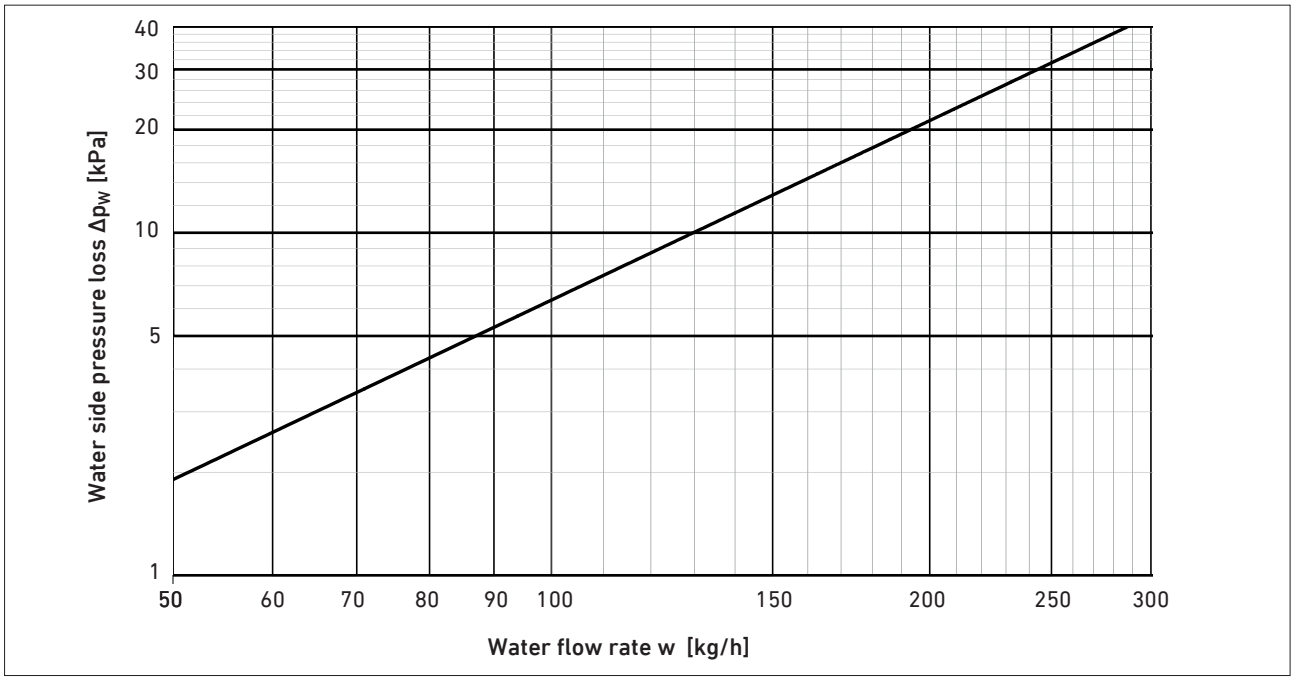
w_{oh} - Nominal water flow rate for heating

w_{ok} - Nominal water flow rate for cooling

Technical data 4-pipe-system on request

For detailed dimensionings, please use the dimensioning tool at www.LTG.de

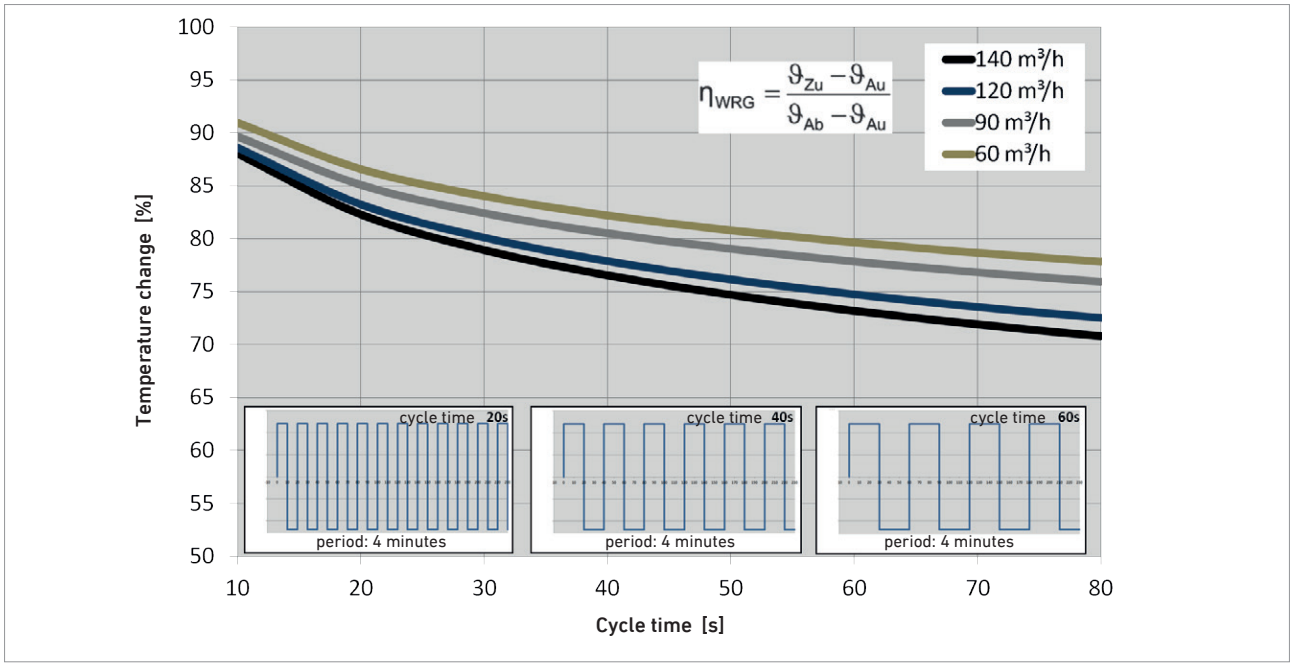
Water-side pressure loss of cooling/heating coil at different water flow rates



Heat recovery level as a function of cycle time

One cycle consists of:
- Supply air operation
- Switchover from supply air to exhaust air operation
- Exhaust air operation

Standard cycle time 40 s:
- 19 seconds supply air operation
- 2 seconds switchover
- 19 seconds exhaust air operation



Ventilation concept „Demand-controlled ventilation“

CO_2 sensors, presence or motion detectors register the ventilation requirement (control concepts see page 15 ff).

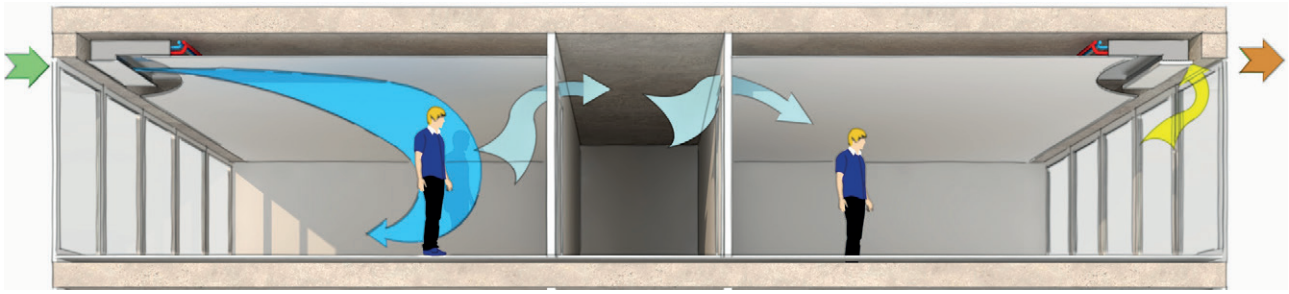
1st possibility: One unit per room

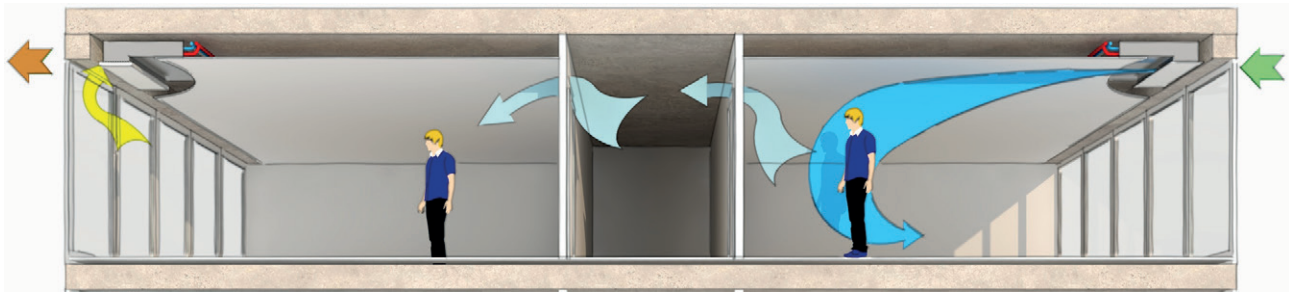
The transient ventilation system causes pressure fluctuations in the room. These pressure fluctuations can be balanced out using soundproofed transfer air devices (supplied by LTG, page 13). This also permits the decentralised ventilation of indoor areas.

In the first cycle), one unit breathes in, while the opposite unit is breathing out.

Following the switchover, the intake/outlet operation is inverted. Ideally, the two reciprocating units should communicate with one another during this process (master-slave communication).

In unused rooms, the FVP units can be switched off to save energy.



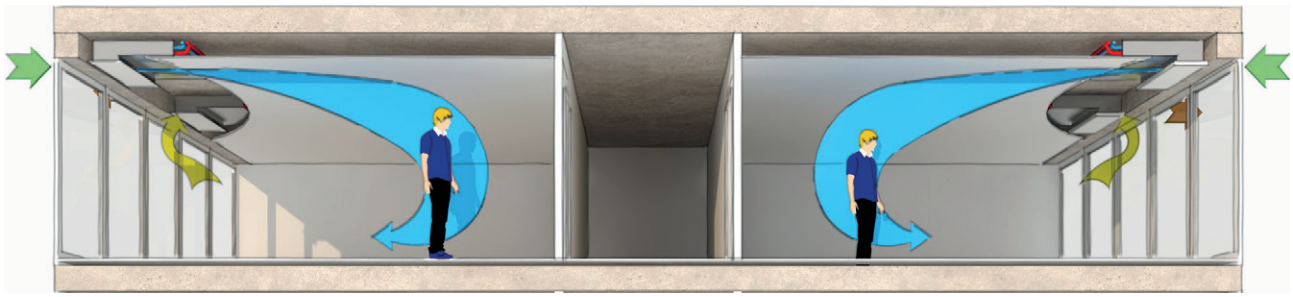


2nd possibility: Two units per room

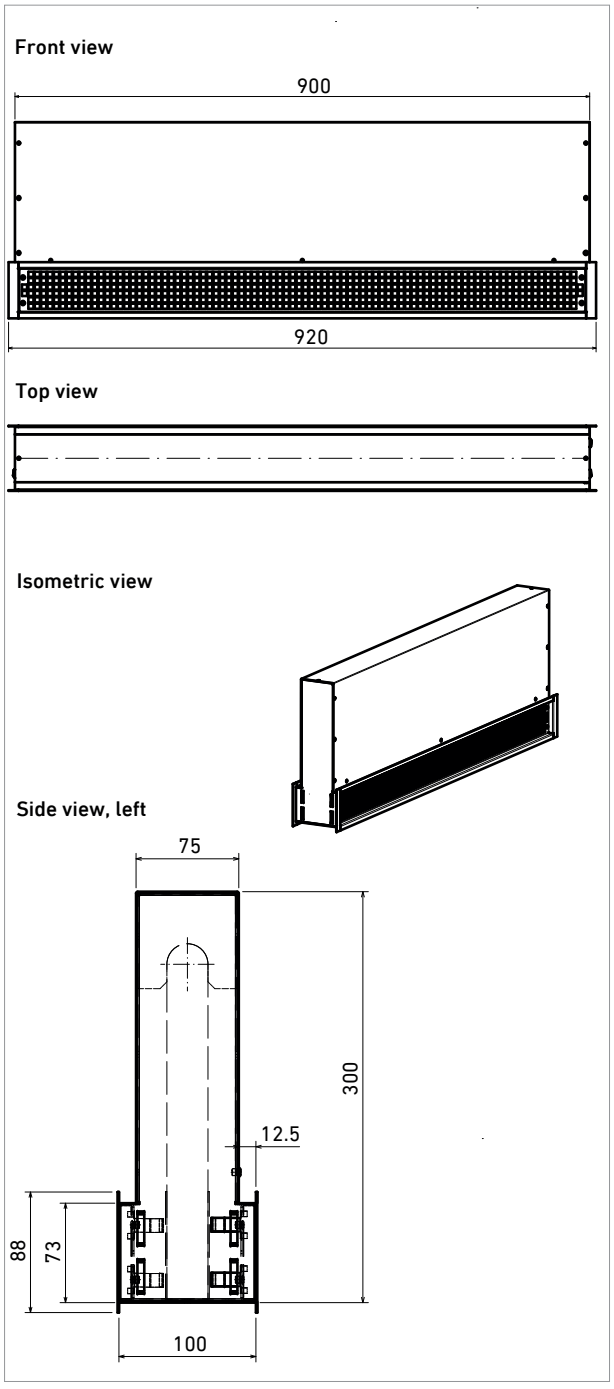
If two units are installed in each room then a transfer air device is no longer required.

The units can be connected together within a „master-slave configuration“ in such a way that one unit breathes in while the other unit breathes out. In this configuration, one master unit is connected to at most one slave unit.

Because the units operate cyclically in alternation, no over-pressure or under-pressure occurs in the room.



Dimensions of transfer air device LDO-T



Standard sound level difference
Transfer air device LDO-T, special version

Third octave mid-band frequency [Hz]	Standard sound level difference D(n,e)
63	34
80	32
100	34
125	34
160	38
200	30
250	31
315	39
400	39
500	38
630	38
800	37
1000	39
1250	42
1600	43
2000	45
2500	47
3150	50
4000	54

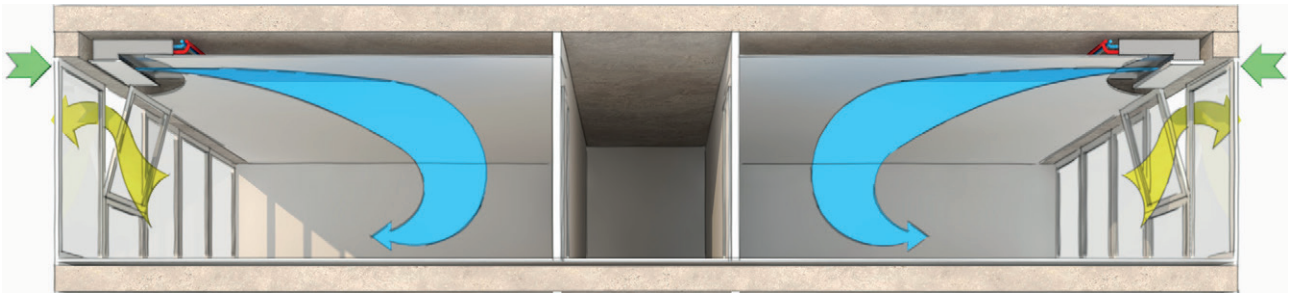
Pressure loss
Transfer air device LDO-T, special version

Flow rate [m^3/h]	Pressure loss [Pa]
0	0
20	1
40	1
60	2
80	4
100	6
120	8
140	10
160	13
180	16
200	19
220	23
240	27

Ventilation concept „Hybrid ventilation“

It is possible to pass up to 260 m^3/h of only supplied air through the unit. Hybrid ventilation is used to respond to the needs of peak cooling loads in the summer. When hybrid ventilation is used, the unit acts as a simple supply air unit. The exhaust air can be evacuated through a window left ajar, for example. This almost doubles the cooling capacity of the unit as well as the outside air flow rate without increasing noise emissions.

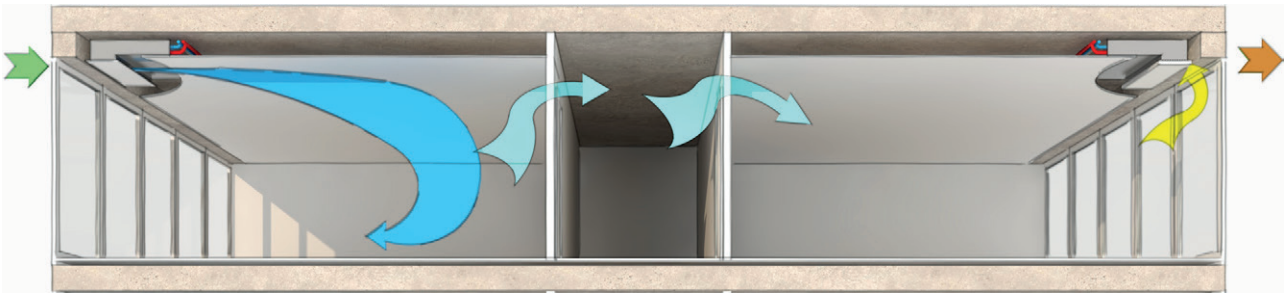
For the control mechanism, see page 25.



Ventilation concept “Night-time ventilation”

In night-time ventilation, the units are switched to a stationary operating mode. The units must be controlled in such a way that one unit takes air in while the unit opposite is evacuating air (in the case of master-slave communication, it is not necessary to control the slave unit separately). In this way, the building can be ventilated and cooled on cool summer nights without having to leave any windows open. The heat recovery function is therefore not active.

For the control mechanism, see page 25.



Operation with Connected Intelligence (CI)

Function

The CI board, which is optionally installed in each FVP unit, takes care of room temperature and air quality control. It only requires information about the desired operating mode (see "Ventilation concepts") and the setpoint and actual values in the control zone as an input variable. The CI board independently controls the fan, cycle time, heating and cooling valves at the decentralised unit level.

It communicates via Modbus RTU with other bus nodes or superordinate instances, depending on the concept implemented for the building management system (BMS).

The unit, CI board, and valves form a single unit and are completely wired together at the factory.

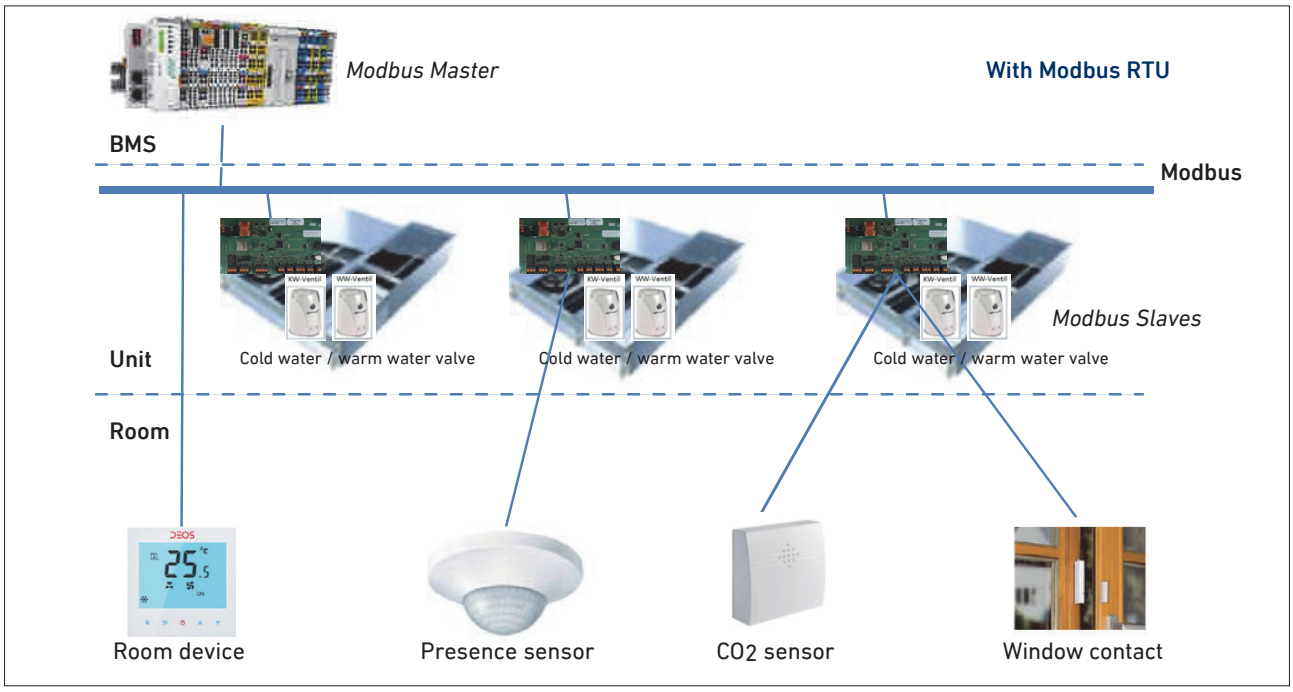
The following shows the different options for integration into a BMS concept for CI.
See the Connected Intelligence technical leaflet for more detailed information

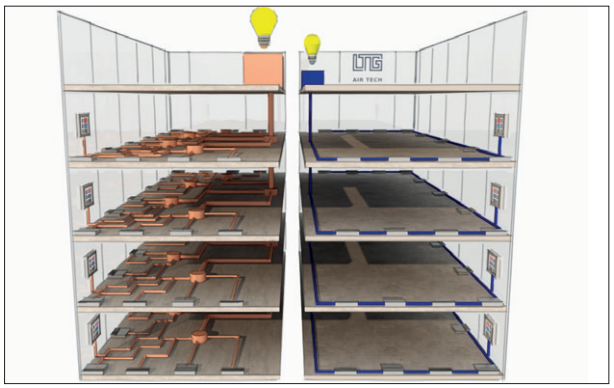
With superordinate BMS, with Modbus RTU

The FVP units generally communicate with a superordinate BMS. This assigns zones to units, reads room control units, and distributes the information to the slaves. They automatically regulate room temperature and, if necessary, air quality. Up to 120 LTG units (FVP*pulse* decentralised ventilation units, fan coil units, or induction units) can be networked in a Modbus network.

Beyond this, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensor (Ni1000) for recording room, outdoor, changeover, or supply air temperature,
- Normally closed or normally open contact for changeover, presence, condensate, window
- CO_2 or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on board; 230/24 V transformer optionally available for a surcharge)





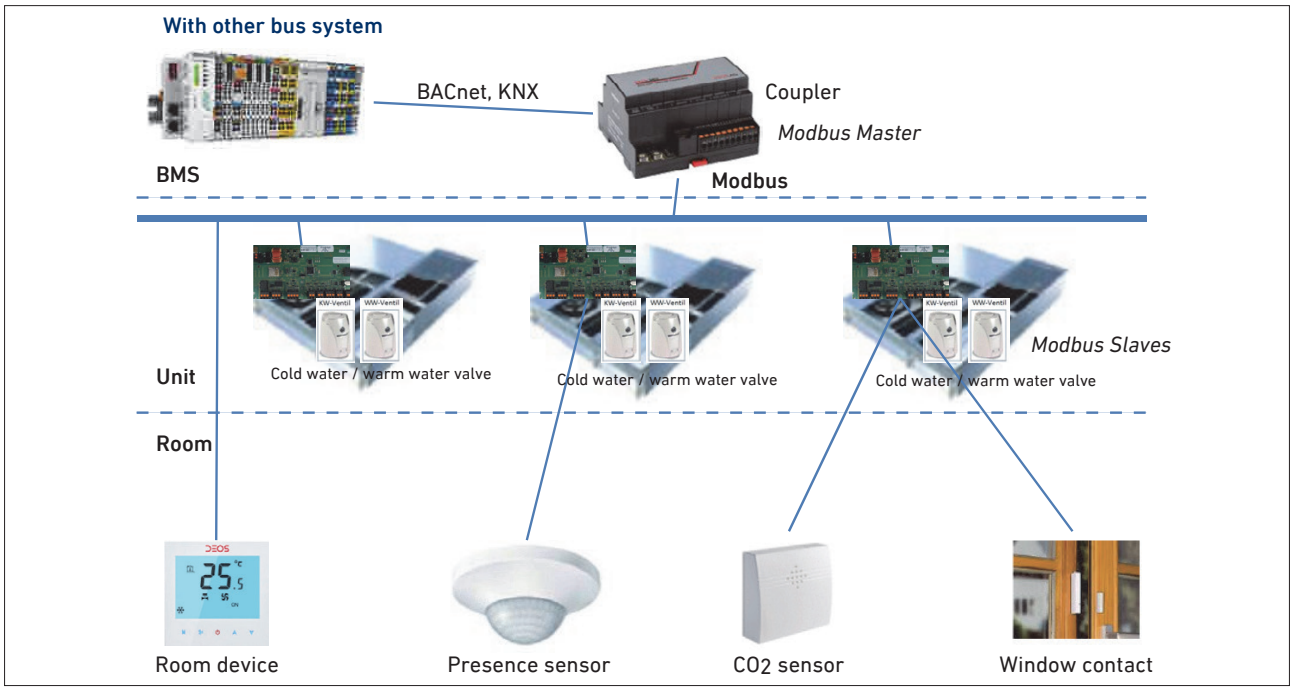
Operation with Connected Intelligence - With superordinate BMS, with other bus system

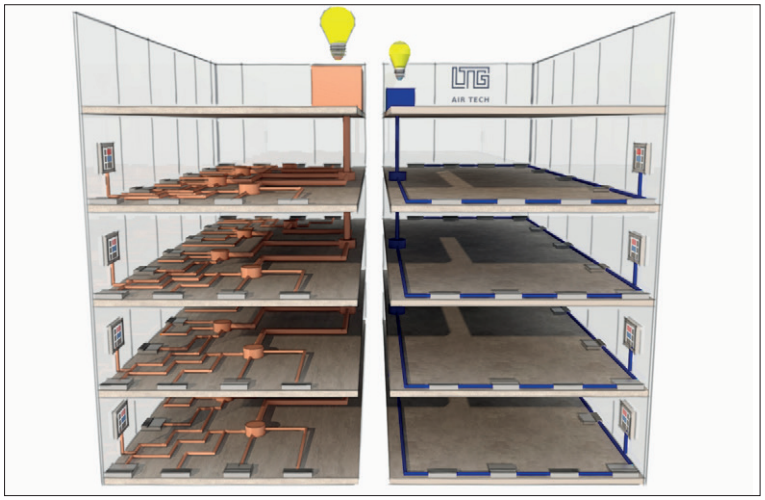
In the case of a superordinate BMS that does not communicate on a Modbus basis, a coupler/gateway is used, which is optionally available from LTG. This converts the information from Bacnet or KNX into Modbus RTU. We recommend the use of one coupler per floor, whereby the maximum number of 120 bus nodes (CI boards, room operating panels and possibly others) per coupler must not be exceeded.

The superordinate BMS again takes care of the zone assignment of the units, the readout of the room operating devices and the distribution of the information to the slaves. The room temperature and, if necessary, the air quality are controlled automatically by the CI board in the respective FVP unit.

Beyond this, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensor (Ni1000) for recording room, outdoor, changeover, or supply air temperature,
- Normally closed or normally open contact for changeover, presence, condensate, window
- CO_2 or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on board; 230/24 V transformer optionally available for a surcharge)





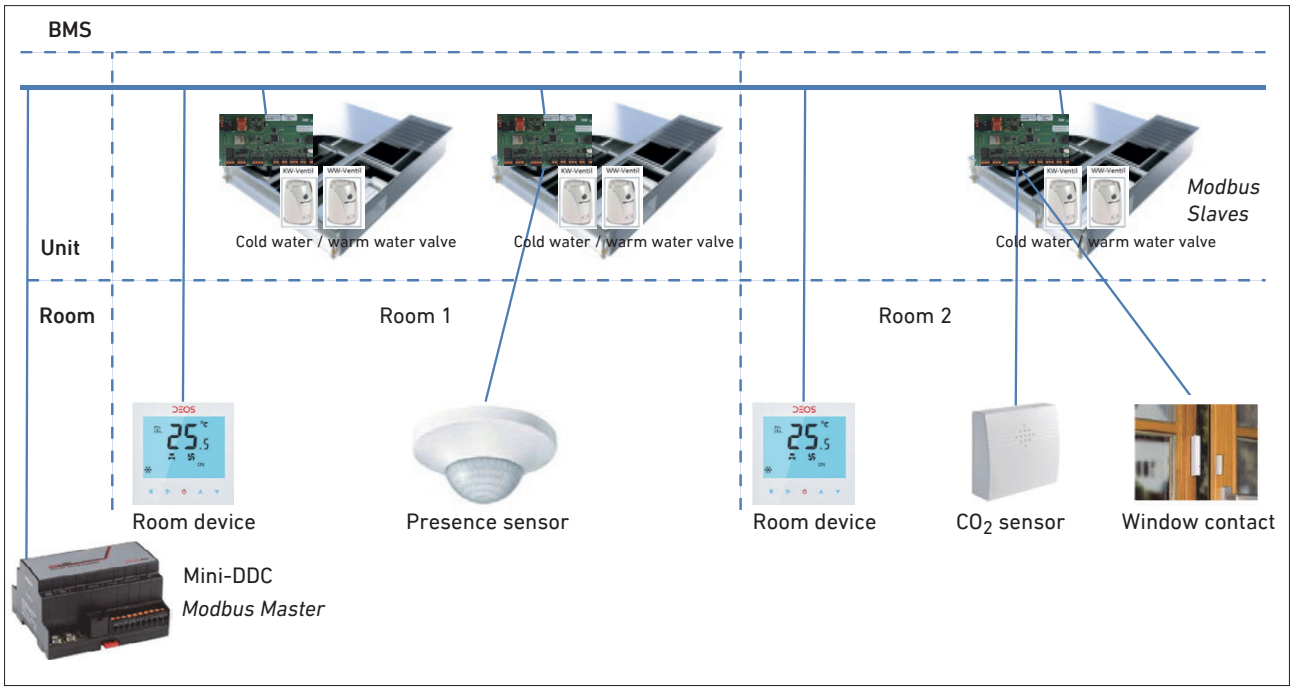
Operation with Connected Intelligence – Without superordinate BMS, as stand-alone solution with several rooms/control zones

If no superordinate BMS is available, but multiple control zones are desired, a mini DDC is used, which is optionally available from LTG. It performs zone assignment of the units and distribution of the information to the slaves, whereby the maximum number of 120 bus nodes (CI boards, room operating devices and possibly others) per coupler must not be exceeded.

The room temperature and, if necessary, the air quality are controlled automatically by the CI board in the respective FVP unit.

Beyond this, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensor (Ni1000) for recording room, outdoor, changeover, or supply air temperature,
- Normally closed or normally open contact for changeover, presence, condensate, window,
- CO_2 or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on board; 230/24 V transformer optionally available for a surcharge).

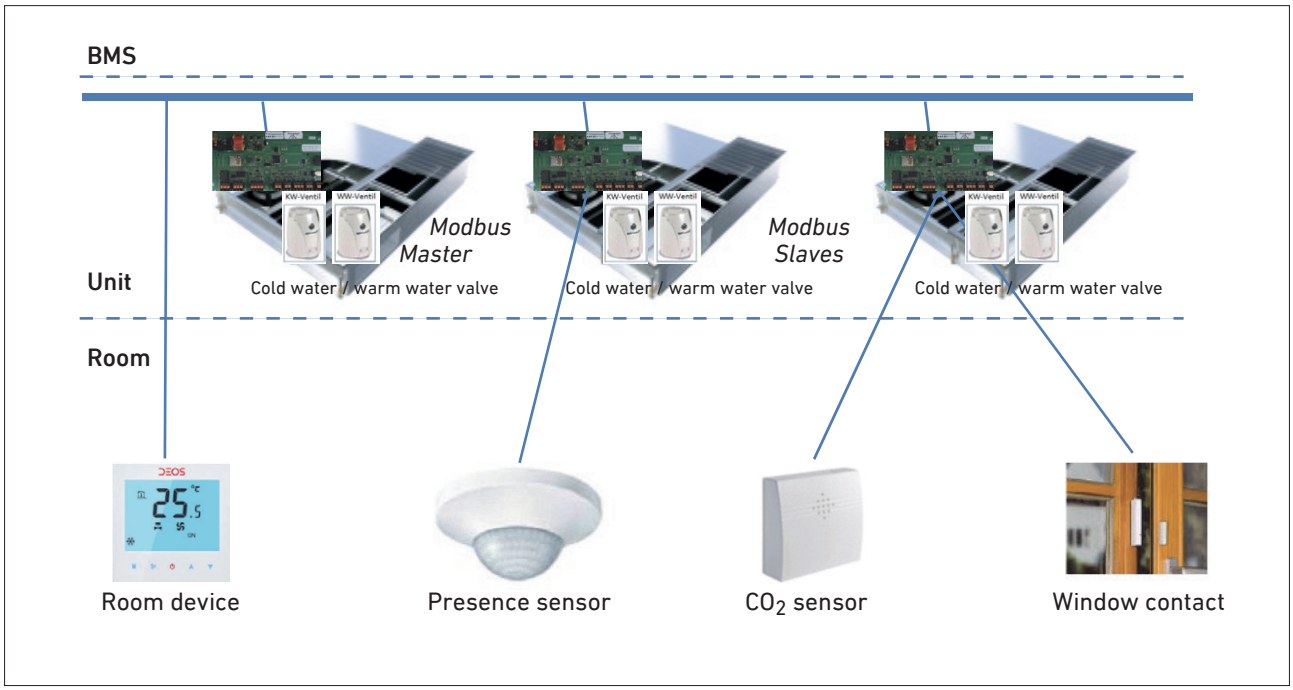


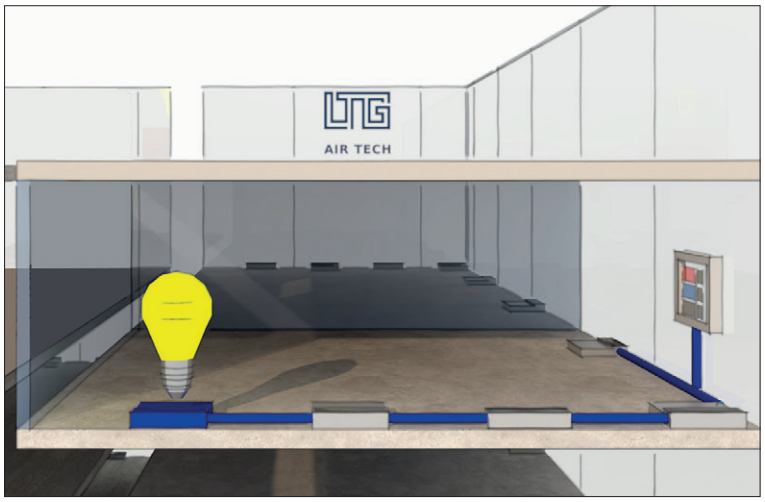
Operation with Connected Intelligence – Without superordinate BMS, as stand-alone solution with one room/one control zone

If there is no higher-level BMS and only one control zone (e.g. large meeting room with several FVP units), additional superordinate components can be omitted. In this case, the parameters of a CI board can be set from the Modbus network to assume the master function for the other CI boards in addition to the control functions for the unit in which it is installed. It then reads out the room operating devices and distributes the information to the slaves, whereby the maximum number of 6 bus nodes (CI boards, room operating devices and possibly others) per network must not be exceeded.

The room temperature and, if necessary, the air quality are controlled automatically by the CI board in the respective FVP unit.
Beyond this, a wide variety of sensors can be connected to the inputs of each CI board and made available for the control zone:

- Temperature sensor (Ni1000) for recording room, outdoor, changeover, or supply air temperature,
- Normally closed or normally open contact for changeover, presence, condensate, window
- CO_2 or VOC sensor (0...10 V DC signal; 24 V DC sensor supply available on board; 230/24 V transformer optionally available for a surcharge).





Operation without Connected Intelligence - ECO regulation/control

The ECO regulation/control possesses the following internal functions:

Cycle time

The cycle time (e.g. 20 s supply air transport / 20 s exhaust air transport, configurable via the USB port) is constant, the switchover between supply and exhaust mode is controlled automatically via the control board.

Error output

The error output can be read out via a floating contact. A more detailed error analysis is possible via the USB port.

Frost protection

Integrated frost protection prevents the heat exchanger from freezing and causing water damage. If the supplied air temperature falls below 10 °C, the fan switches off and the outside air damper is closed. This operating point can never occur if the unit is functioning in either heating or cooling mode. A fault message is also output via a floating contact.

Flow rate (level control)

Control is performed via a mechanical 3-level switch or room control (accessories). The flow rates for the different levels can be pre-configured via the USB port.

Continuous flow rate control

The flow rate can be adjusted continuously up to 130 m^3/h via an analogue control signal (0...10 V DC) both in the stationary operating mode (supply air only or extract air only, up to 260 m^3/h) and in the transient operating mode. If the control voltage is < 1 V or if no flow rate level is triggered, the unit automatically closes the outside air damper and the fan stops. If the unit has no setpoint voltage, the outside air damper closes.

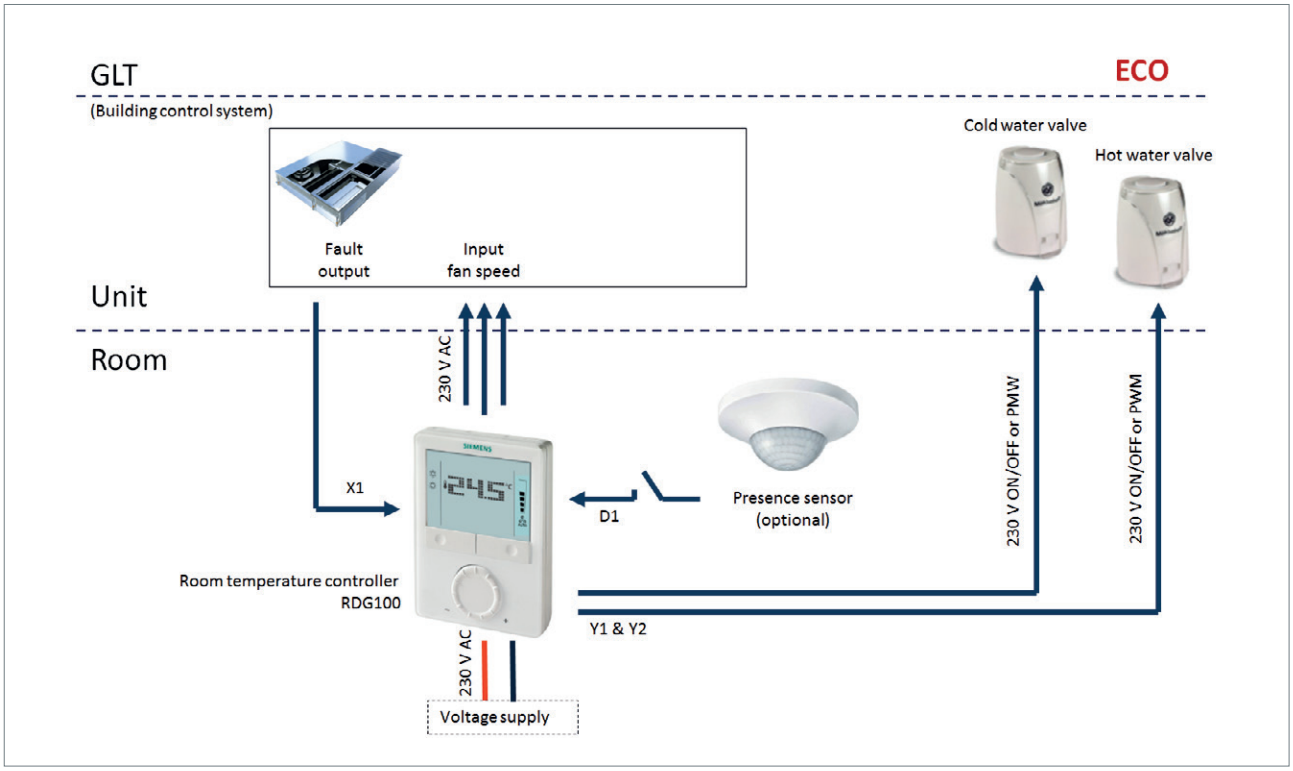
Valve control

The valve is not controlled via the board, but can, for example, be controlled via a room temperature control (available as an accessory).

Continuous adjustment of the cycle time

The cycle time for supply and exhaust air transport can be adjusted continuously from 10...80 s by means of an analogue signal (0...10 V DC). This results in the heat recovery levels indicated in the diagram on page 10.

+ Simple regulation using economical standard components
+ Simple, reliable control of the unit



Operation without Connected Intelligence - Example ECO regulation/control

Simple control diagram with room and building control system (GLT) options

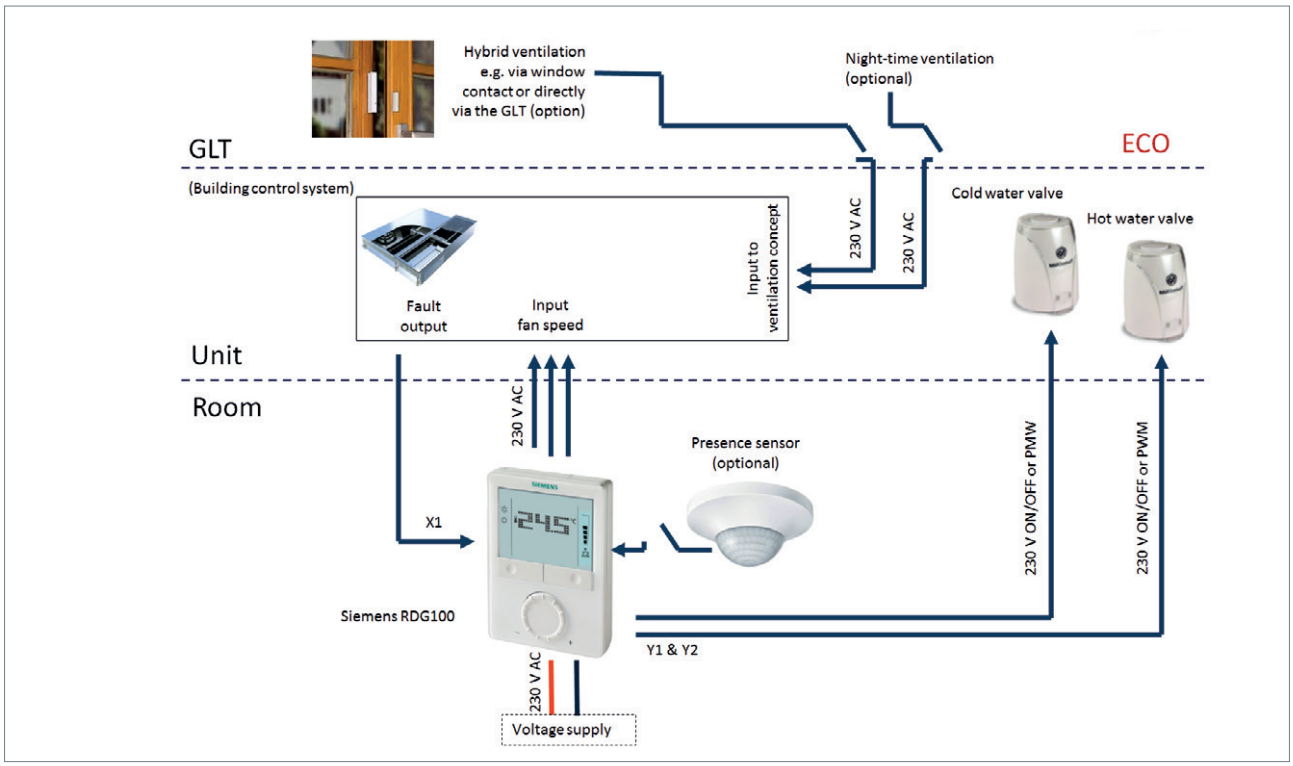
It is also possible, for example, to activate the ventilation concepts via the building control system. To this end, the unit possesses 230 V inputs for the activation of the ventilation concepts. The FVP unit does not possess a direct communications interface.

Controlling the hybrid ventilation

Hybrid ventilation should only be activated during the summer months. It is possible, for example, for a window contact to communicate with the building control system which then records the request and only permits the corresponding response during the summer months.

Controlling the night-time ventilation

Night-time ventilation is used for free cooling. It should be activated as appropriate by the building control system (GLT) when there is a significant difference between the room temperature and the outside air temperature on cool summer nights.

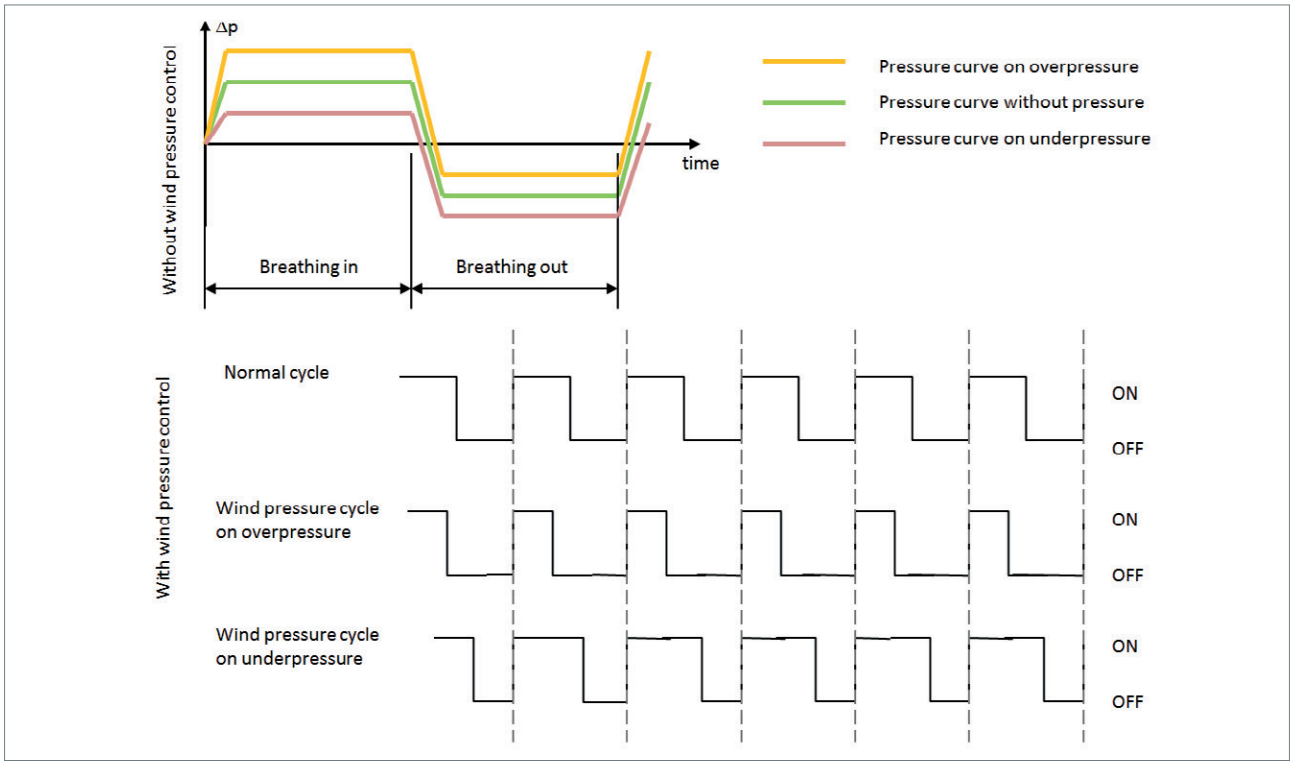


Operation without Connected Intelligence - Premium regulation/control

The Premium regulation/control offers the same capabilities as the ECO regulation/control, together with the following **additional** functions.

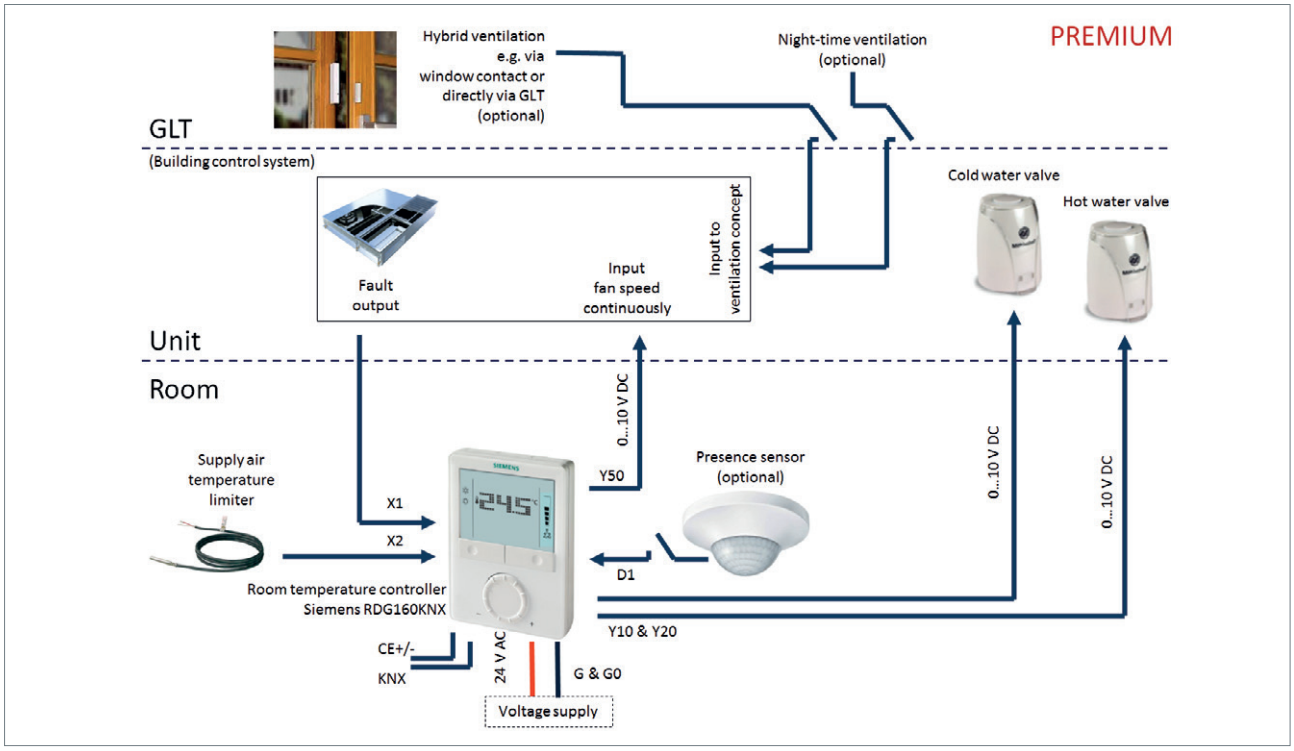
Wind pressure control

An intelligent control mechanism adapts the transported supply and exhaust air flows accordingly when there is an under-pressure or over-pressure at the facade. In the FVP unit, this is achieved through the asynchronous control of the supply and exhaust air flows.



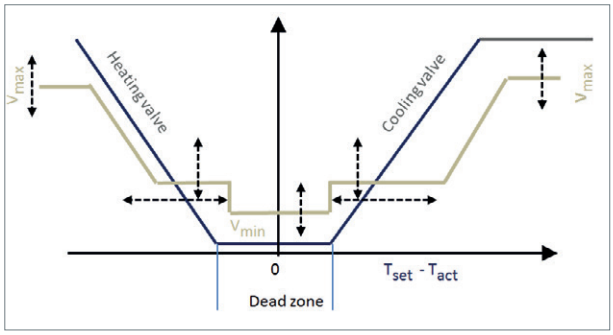
Operation without Connected Intelligence - Demand-controlled ventilation with the RDG 160 KNX room temperature controller

Simple control diagram with room and building control system (GLT) options:



The continuous control of the EC fan in the „Premium variant" means that there are even more possibilities when the unit is used in combination with the RDG 160 KNX room temperature controller. Because the fan and the valves are continuously controlled, particularly stable control over time is possible as indicated in the following diagram. Thanks to the optional presence sensor or „key-card" contact, it is also possible to implement an automatic „deactivation" mechanism.

The fan speed and the cold and hot water valves are automatically controlled in the light of the set temperature. If neither heating nor cooling are required, the fan continues to provide basic ventilation (configurable, e.g. 60 m^3/h).



Heating

The fan speed is increased and the valves are opened.

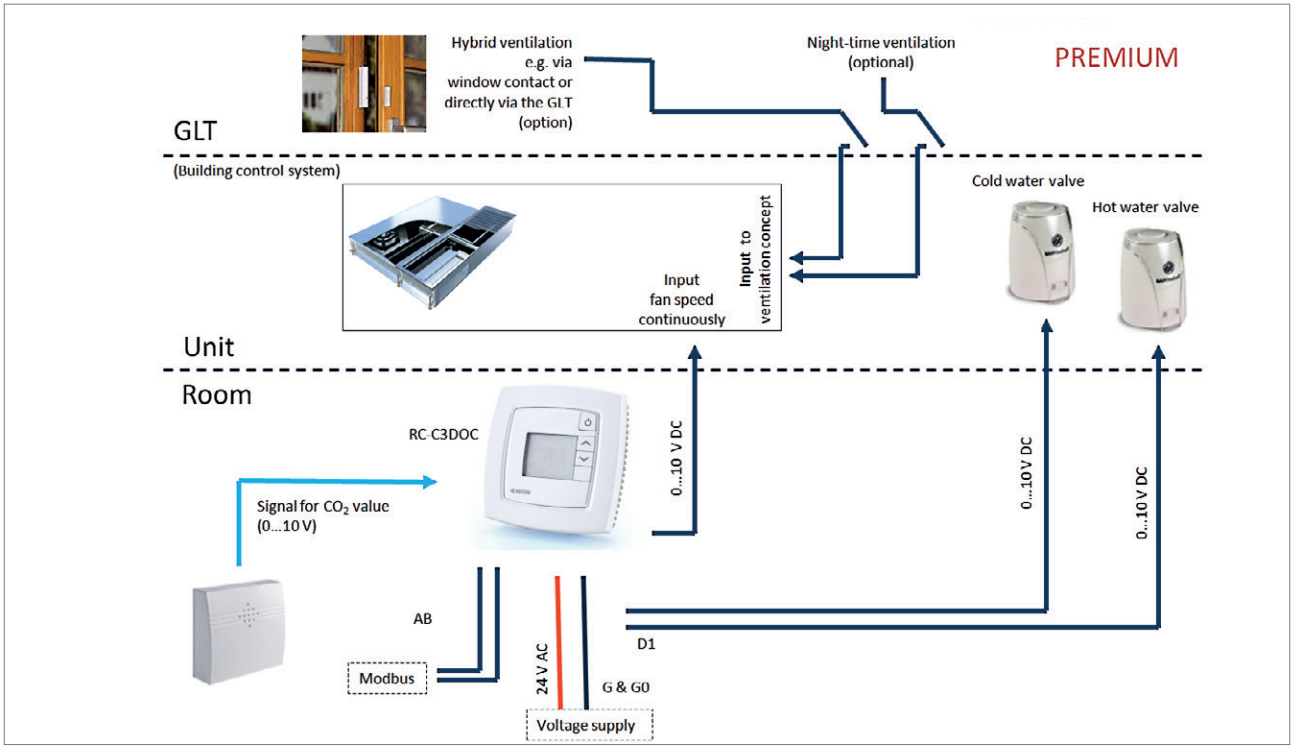
Cooling

- low cooling requirement (0...48 % of cooling capacity) cooling valves are opened, V remains set to V_{min}
- high cooling requirement (52...100 % of cooling capacity) cooling valves are fully opened, V rises to V_{max}

\+ reduced energy consumption
\+ improved thermal / acoustic comfort (supply air temperature limitation)
\+ reduced flow rate

Operation without Connected Intelligence - CO_2 demand-controlled ventilation

Simple control diagram with room and building control system (GLT) options



The use of an RC-C3DOC control makes other possibilities available for CO_2-dependent demand-controlled ventilation. The outside air flow rate is regulated depending on the air quality and the cooling/heating requirement. **Two control circuits** are needed for this:

CO_2 control circuit

A CO_2 sensor measures the current CO_2 value and sends this to the RC-C3DOC room temperature control as a signal of 0...10 V. This compares the current actual value with the set value and regulates the necessary outside air volume on this basis. The result is high air quality due to the regulation of the CO_2 value.

Temperature control circuit

If the cooling requirement is low then a cooling process is initiated using cold water. In this case, the volume flowing through the system is continuously adapted to the cooling requirement. If the temperature rises further then the cooling capacity is increased by increasing the air volume flow. This type of control is particularly suitable when there are high requirements in terms of acoustics, thermal comfort, energy consumption and air quality. This control is also Modbus-compatible.

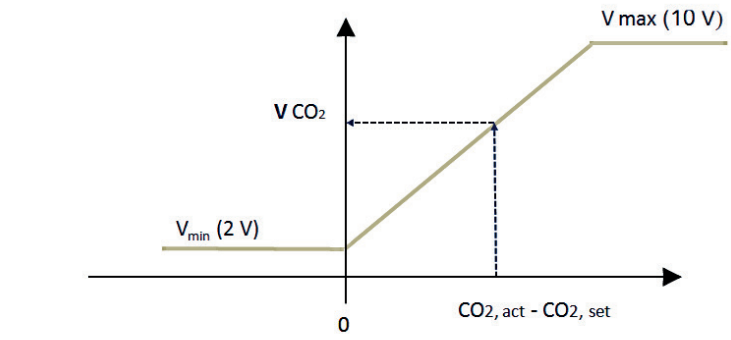
As a result, many of the parameters can be set via the building control system, e.g.
- Set room temperature
- Energy saving mode
- etc.

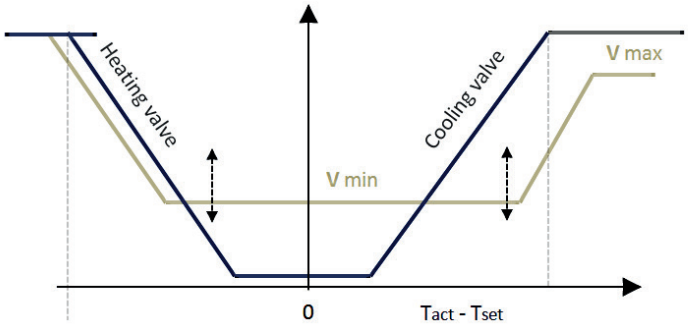
It is possible to read, for example:
- Actual room temperature
- CO_2 content
- etc.

Further advantages

+ Reduced energy consumption
+ The best possible thermal and acoustic comfort at all times
+ Reduced flow rates
+ Optimum air quality

CO_2 -demand-controlled ventilation





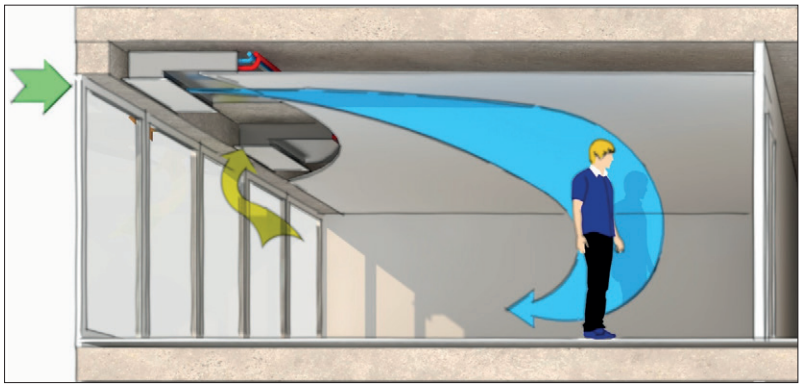
1.) CO_2 control circuit
The output signal for the flow rate control unit is set as a function of the CO_2 value

Flow rate output signal
This is determined by the higher of the values of the 2 control circuits

2.) Temperature control circuit

- Low cooling requirement
  (0...48 % of the cooling capacity) cooling valves are opened, V_{prim} remains set to V_{min}
- Higher cooling requirement
  (52...100 % of the cooling capacity) cooling valves are fully opened, V rises to V_{max}

Master-slave combinations



Each master unit is connected to a maximum of one slave unit.

If, for example, two units are installed in each room and there is no transfer air device, then the „master unit" must communicate with the „slave unit". This communication takes place over a commercially available Ethernet cable. In this type of application, it is only necessary to control one unit (the master unit) as the slave unit then works in the opposite mode to the master. In this case, control inputs at the slave are not processed.

This configuration ensures that no over-pressure or under-pressure occurs in the room. The configuration (definition of the master and slave unit) is specified via the USB port.

Activation of the ventilation concepts

Operating mode	Control without BMS	Building management system (BMS)	Input at board	Signal
Standard (cyclical operation)	Set value at master; slave in opposite mode	Set value at master; slave in opposite mode	ST 1, 2, 3 Constant flow rate	L (230 V AC 50 Hz) 1...10 V DC
Hybrid ventilation	Window contact at supply air input ("BZ") at master; slave in same mode (supply air) *	Window contact at BMS; BMA at supply air input at master ("BZ"); slave in same mode (supply air) **	Supply air mode "BZ"	L (230 V AC 50 Hz)
Night-time ventilation * **	Not recommended	Depending on installation location, signal from BMS to supply air mode ("BZ") or exhaust air mode ("BA") ***	Supply air mode ("BZ") or exhaust air mode ("BA")	L (230 V AC 50 Hz)

* In the winter, there is a risk that the heat recovery unit may freeze if the window is open.

** The building control system (GLT) should only permit hybrid ventilation in the summer because there is a risk that the heat recovery unit may freeze if the window is open in the winter.

*** If, for example, the master unit is switched to supply air mode ("BZ"), then the slave unit operates in exhaust air mode without receiving a control signal.

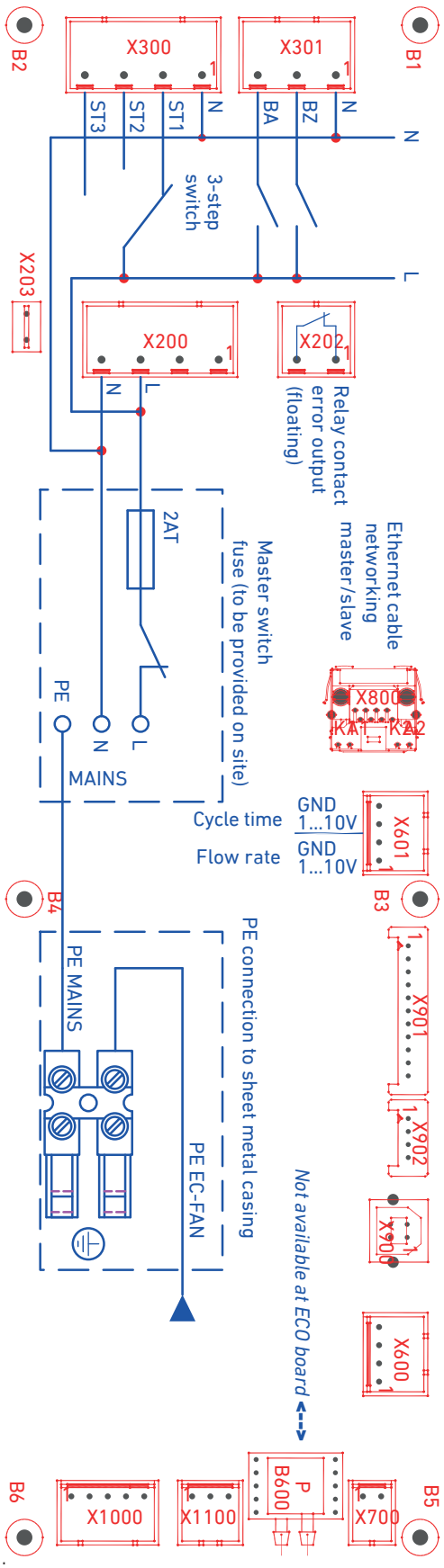
Note

Master-slave communication in combination with the control inputs (BZ) for supply or exhaust air (BA) can only be configured in such a way that the „slave unit" (in both operating modes) operates only in the opposite mode to the master unit (standard) or in the same mode as it. This means, for example, that hybrid ventilation and night-time ventilation using two units per room without transfer air device is not possible.

Circuit diagram

The circuit board is located in the unit, on the right hand side under the baffle plate to be removed, as seen from the room.

The circuit diagram for control with Connected Intelligence can be found in the technical brochure "Decentralised control intelligence LTG Connected Intelligence".



Electrical specifications of the plug-in connections

Designation	Spring-loaded terminal blocks	Connector number	Module dimension, orientation	Voltage / specification
Error output	Pico Max Wago	X202	MD 7.5 mm Orientation 180 °	230 V AC 50...60 Hz
3-level switch	Pico Max Wago	X300		230 V AC 50...60 Hz
Mains supply	Pico Max Wago	X200		230 V AC 50...60 Hz
Operating mode (BZ, BA)	Pico Max Wago	X301		230 V AC 50...60 Hz
Flow rate / cycle time *	Pico Max Wago	X601	MD 3.5 mm Orientation 180 °	0...10 V DC R_{In} approx. 30 K-Ohm
USB service port	USB type B socket	X900	Orientation 180 °	
Networking **	Ethernet cable	X800	Orientation 90 °	

* The 0...10 V signals must be transmitted via a screened cable

** The cable leading out of the unit from the RJ45 socket and used for master-slave communication (RJ45 connection) must be rated for a mains voltage of 300 V / 500 V at 20 °C.
For example, the Ölfex Heat 205 MC cable from "Lapp Group" can be used here.

Technical data

Voltage supply for control	230 V AC (+ 10...15 %) 50...60 Hz
Power consumption of control	max. 35 W
Switch outputs	230 V AC
Switching capacity of error relay	max. 2000 VA/10 A
Switching capacity of fan relay	max. 2000 VA/10 A
Temperature ranges	
Storage temperature	-20...+70 °C
Operating temperature	0...+50 °C

Wiring

- The installation of electrical equipment must be performed in accordance with the specifications of VDE0100-100:2009-06.
- Electrical installations must be installed professionally by suitable qualified personnel and using suitable materials in accordance with the current state of the art.
- The specifications of the respective manufacturer must be observed and implemented for accessory components (e.g. room control units, valve actuators, etc.) that are connected and operated with LTG units.
- Local regulations relating to wiring, fuses and earth bonding must be adhered to.
- The cables to the unit carry a mains voltage of 230 V AC and must be dimensioned accordingly.
- The lines for the control voltages (0...10 V DC, for example for flow rate / damper rest time) must be equipped with adequate cable screening.

Error output

The (floating) error output closes if

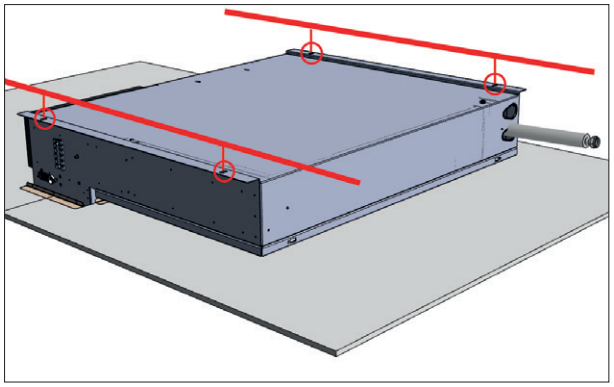
- the frost protection function is triggered (temperature at the heat exchanger < 10 °C)
- an internal cable breakage occurs
- internal components malfunction
- an impermissible command is received (e.g. supply air and exhaust air operation selected simultaneously)
- there is no voltage supply to the unit
- the fan does not rotate despite load
- the set flow rate is not achieved within 120 seconds

A more detailed analysis of the fault can then be performed via the USB port.

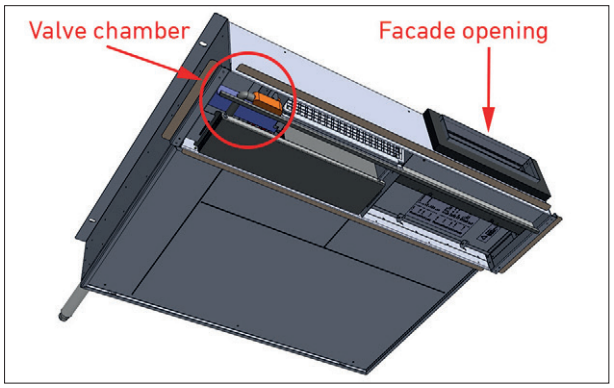
Optional: Error output closes when the unit is switched off or the control voltage is < 1 V (for monitoring the control line, adjustable via parameter).

Assembly

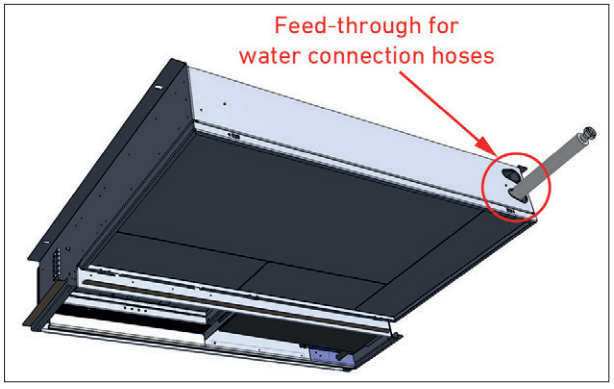
The unit is mounted either directly flush with the raw ceiling or suspended from the ceiling with the aid of threaded rods. Alternatively, optional mounting slides can be supplied from which the unit is suspended. The precise alignment of the unit is done with the help of the threaded rods and nuts on the outside of the unit. For this purpose, mounting brackets with slotted holes are attached to both sides.



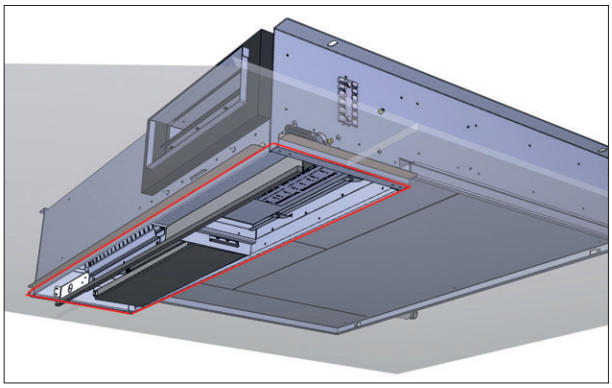
The valve chamber for connecting the control valves and the condensate drain (socket with Ø 15 mm) are located on the façade side on the opposite side of the façade opening.



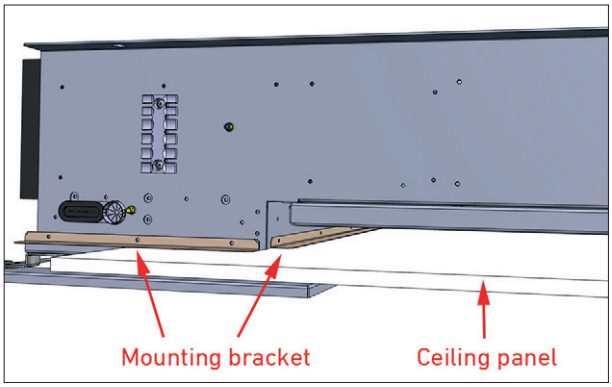
Feed-throughs for water connection hoses are located on the room side (on the right-hand side as seen from the room).



For the installation of the unit body in the suspended ceiling, a cut-out with the dimensions 1140 x 278 mm must be provided. The long side runs parallel to the façade.



The ceiling panels are screwed to the mounting brackets from below with screws. Depending on the ceiling panelling, these are mounted on the outside of the unit neck. Single and double ceiling panelling is possible, which must be specified in advance.



Due to the restricted space available in the valve chamber, connection is only possible using a special valve unit (available as an accessory).

This consists of a through-valve (KVS 0.86) with electro-thermal drive for water-side open/closed control or 0...10 V control, incl. elbow with union nut and flexible hose that is impermeable to oxygen (length: 1100 mm). The return flow screw fittings can also be supplied on request.

A version with fixed pipework inside the unit is also possible, in which a transfer point for the on-site connection is provided instead of the hose feed-through. For the selection of the appropriate connection type, please contact your local LTG branch.

Example façade connection

This figure presents an example of a typical façade installation. Thanks to the adaptable adjustable threaded rods, the construction tolerances can be optimally compensated for.

With the unit, LTG also supplies a “soft-pad” that performs the following tasks:

- Absorption of relative movements
- Structure-borne sound isolation
- Sealing of the facade against the housing
- Prevention of thermal bridges between the unit and the facade

We also recommend using an on-site sheet metal duct that should meet the following specifications:

- clear cross-section 370 x 115 mm
- Ideally with a flange for sealing at the unit
- With insulation to prevent thermal bridges in the ventilation duct
- The spocket should be inserted in the wall opening and be able to move.
- The sheet metal duct must be at least 115 mm long to ensure a minimum distance of 50 mm between the baffle plate and the inside of the façade (see drawing).

The figure does not take account of an on-site rain shield. This can, for example, take the form of a weatherproof grille and must provide for a slight incline (2...5 %) in the sheet metal duct.

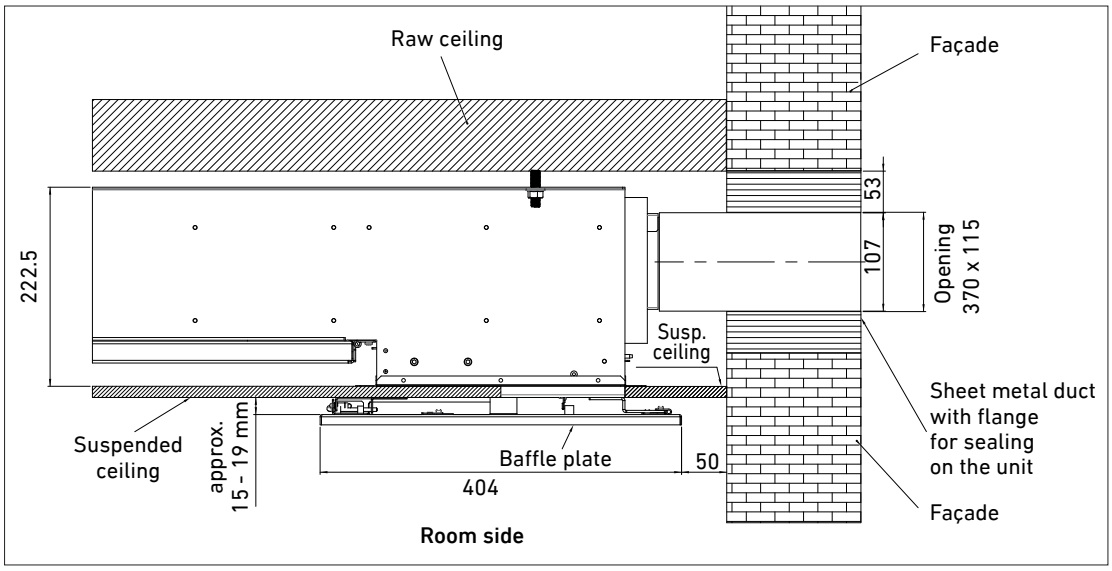
Maintenance and servicing

The components

- Outside air and exhaust air filters
- Board
- Heat exchanger
- Valves and actuators
- Condensate tray and pump

can be maintained and replaced as required via the baffle plate or the opening in the ceiling plate. For this purpose, the baffle plate can be folded towards the façade on two hinges so that the ceiling opening and the components to be serviced are accessible.

An inspection opening must be provided in the false ceiling below the room-side unit cover so that the fan or the damper assembly can be replaced in the event of a defect. This inspection opening must be at least 1350 x 700 mm (width x depth).



Nomenclature, ordering code

FVP-D / 2 / 1090 / P / MS / E

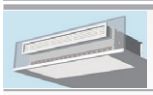
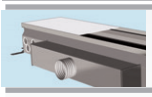
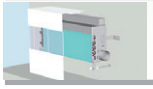
(1) (2) (3) (4) (5) (6) (7)

(1)	**Series**	**FVP**	= Dezentralised ventilation unit FVP*pulse*
(2)	**Type**	**D**	= Ceiling installation
(3)	**Heat exchager**	**2**	= 2-pipe system
		4	= 4-pipe system (on request)
(4)	**Unit length**	**1090**	= 1090
(5)	**Control**	**E**	= Eco
		P	= Premium
		CI	= Connected Intelligence
(6)	**Assembly**	**D**	= Directly
		MS	= Mounting slides
(7)	**Ceiling panelling**	**E**	= Single ceiling panelling
		D	= Double ceiling panelling

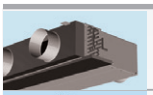
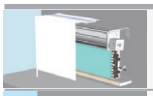
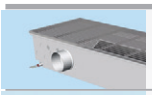
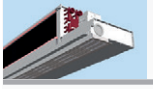
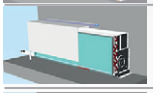
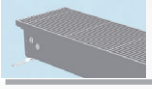
AIR TECH SYSTEMS

Product overview • **LTG Air-Water Systems**

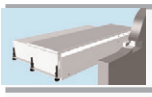
LTG Induction – Induction Units

Ceiling Installation	Sill Installation	Floor Installation
 HFF*suite* SilentSuite	 HFV*sf* System SmartFlow	 HFB / HFB*sf* System SmartFlow
HFG-0/D	 HFG	

LTG FanPower – Fan Coil Units

Ceiling Installation	Sill Installation	Floor Installation
 VKE	 VFC	 VKB
 VKL	 VFC-N	 SKB
	 QVC	
	 VKL-W	

LTG Decentral – Decentralised Ventilation Units

Ceiling/Wall Installation	Sill/Façade Installation	Floor Installation
 FVS*Eco$_2$School*	 FVP*pulse*-V *System PulseVentilation*	 FVP*pulse*-B System PulseVentilation
 FVP*pulse*-D System PulseVentilation	 FVP*pulse*-S System PulseVentilation	

Engineering Services

LTG Engineering Services Comfort Air Technology

AIR TECH SYSTEMS

Comfort Air Technology

Air-Water Systems
Air Diffusers
Air Distribution

Process Air Technology

Fans
Filtration Technology
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Engineering Services

Laboratory Test & Experiment
Field Measurement & Optimisation
Simulation & Expertise
R&D & Start-up

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