

RetroFIT+ Assessment Report

Project goals

Example Report – Hotel Renovation: 73 rooms, heating, cooling, ventilationImprovement of energy efficiency, optimization of HVAC operation, creation of transparency, reduction of CO emissions

Building

Hotel 3,000m²

Musterstrasse 13

Musterlingen, Switzerland

Report author

Daniel Senn

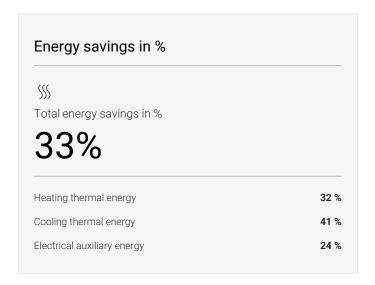
daniel.senn@belimo.ch

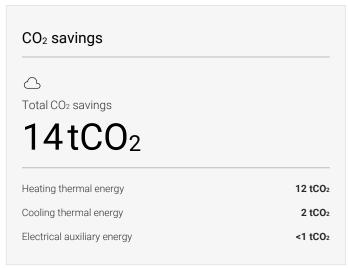
Report date 19.05.2025

BELIMO CH



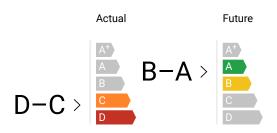
Potential savings per year







Overall efficiency



Efficiency per HVAC Functions



About RetroFIT+ methodology

The RetroFIT+ portal provides a BACS performance assessment and estimates savings for cooling and heating installations.

The savings displayed in this tool are indicative amounts calculated using the factor-based calculation method (BAC factor method) outlined in Norm EN ISO 52120-1 Section 7 and the scoring method weighting factors. The factors utilized are based on sources from eu.bac (System

Certification).

Occupant behavior, varying building usage (occupancy rate, etc.), technical equipment, building shape, and insulation may impact energy consumption. Estimations may vary depending on these parameters.

Disclaimer:

Any liability for the accuracy of the energy-saving values determined by this tool and the resulting potential savings is excluded.

Initial investment and CO₂ price

Investment

CHF 100,000

CO₂ price

<CHF 1,000

Brief description of proposed modifications

Introduction of individual room control with BMS communication, tight valves (PIQCV, Energy Valves), dynamic hydraulic balancing.

Demand-based control of temperature, pumps, and storage, coordinated HVAC control, free cooling, pressure reset.

Potential cost savings per year

Cost savings excl. CO2 pricing



Overall savings in CHF

CHF 45,000

Heating CHF 33,000
Cooling CHF 12,000
Ventilation <CHF 1,000

Cost savings incl. CO2 pricing



Overall savings in CHF

CHF 46,000

Heating CHF 34,000
Cooling CHF 12,000
Ventilation <CHF 1,000

Investment per saved ton of CO₂

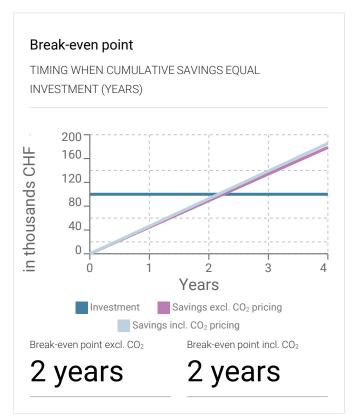
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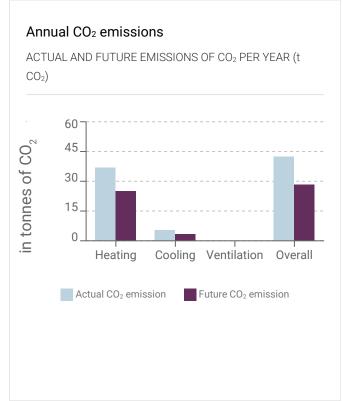
CHF invested per ton of CO2 saved

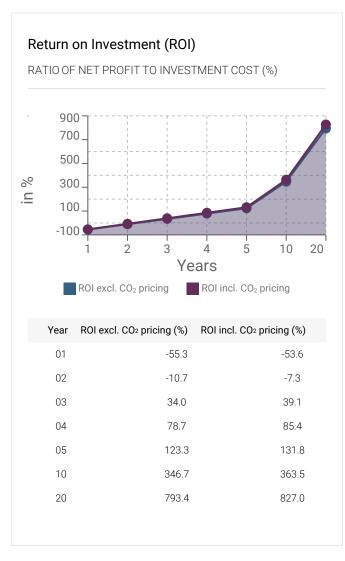
357 CHF/tCO₂

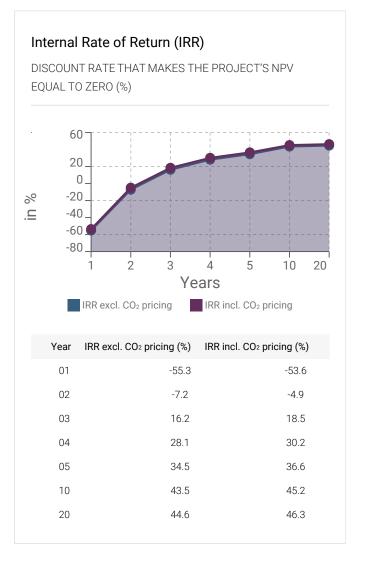
Description

Amount of money spent per ton of CO_2 emissions saved over an assumed lifetime of 20 years.









SS Heating

Thermal energy source: district heating	Electrical auxiliary		
Energy consumption		Energy consumption	
555	MWh/year	10	MWh/yea
CO ₂ emission		CO ₂ emission	
37	tCO ₂ /year	<1	tCO ₂ /yea
Total cost		Total cost	
99,900	CHF/year	2,000	CHF/yea

☆ Cooling

Thermal energy source: electricity		Electrical auxiliary		
	Energy consumption			
MWh/year	33	MWh/year		
	CO ₂ emission			
tCO ₂ /year	1	tCO ₂ /year		
	Total cost			
CHF/year	6,600	CHF/year		
	tCO ₂ /year	Energy consumption 33 CO ₂ emission tCO ₂ /year 1 Total cost		

∀ Ventilation

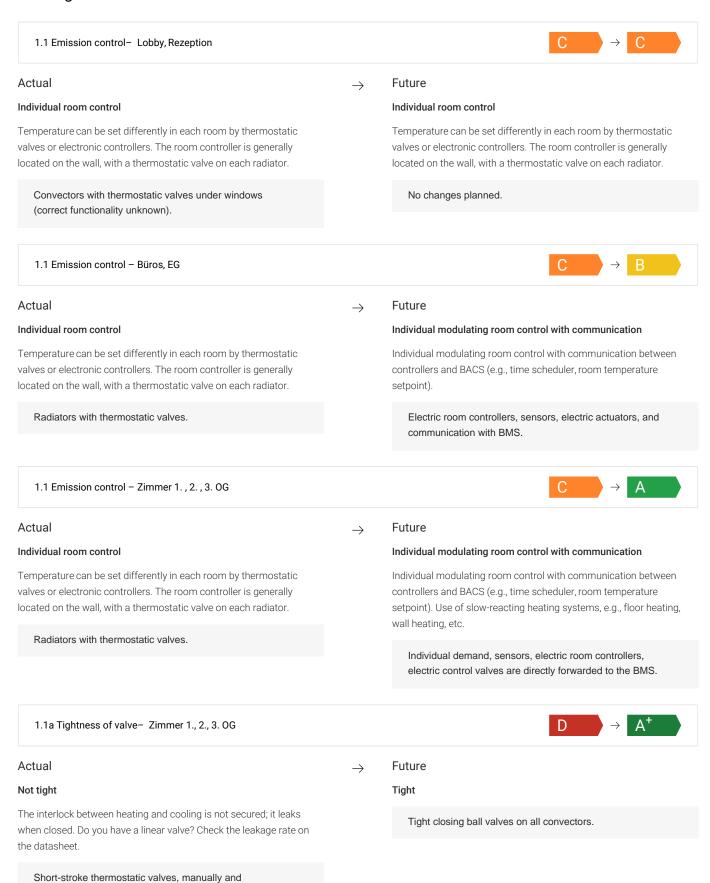
Energy consumption		CO ₂ emission		Total cost	
0	MWh/year	<1	tCO ₂ /year	3	CHF/year

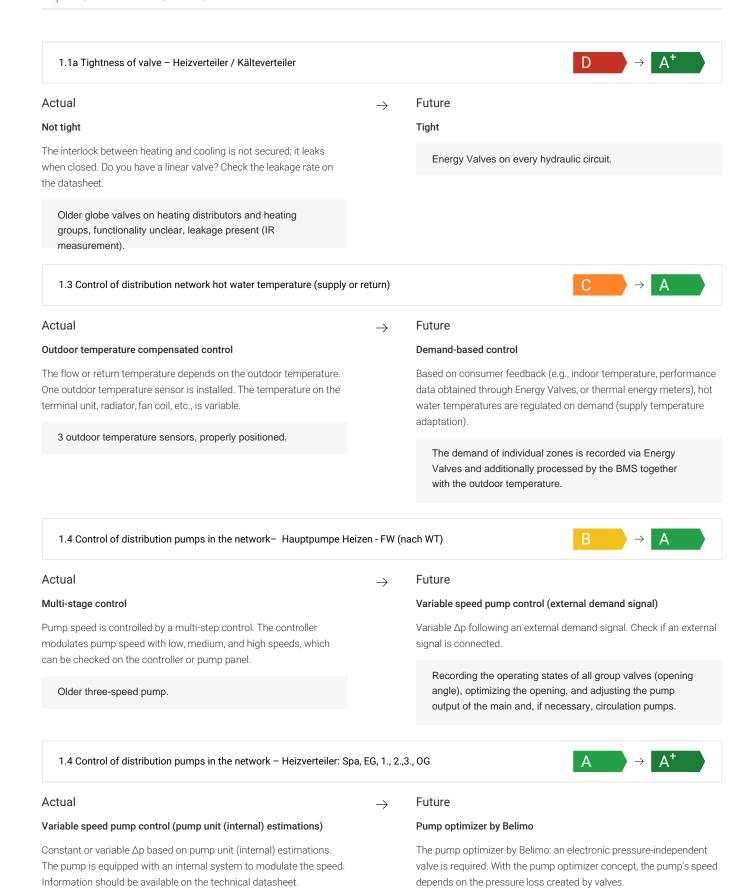
Comment

Assumed Energy Consumption:Thermal approx. 600 MWh, Electrical approx. 150 MWh, Supplied Areas: 73 guest rooms, each approx. 30 m², 5 offices each approx. 20 m², Restaurant approx. 150 m², Small spa area approx. 150 m²

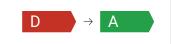
thermally motorized convectors.

Heating





1.4a Hydronic balancing heating distribution (including contribution to the balancing on the emission side)— Heizverteiler "Spa-Bereich"



Actual

Balanced statically per emitter and a static group balance

Static balancing valve per emitter and static group balance, only working at 100% nominal pressure and flow. Each emitter is equipped with a static balancing valve or a valve with a setting kvs, and a flow limitation valve is added on the branches or riser.



Future

Balanced dynamically per emitter

Balanced dynamically per emitter with an electronic or mechanical pressure-independent tight valve. Each emitter is equipped with a pressure-independent valve.

1.4a Hydronic balancing heating distribution (including contribution to the balancing on the emission side) - Zone





Actual

Balanced statically per emitter, without group balance

Balanced statically per emitter (static balancing valve), without group balance system, only working at 100% nominal pressure and flow. Each emitter is equipped with a static balancing valve or a valve with a setting kvs.



Future

Future

Future

Balanced statically per emitter and a dynamic group balance

A high balancing level is achieved with an electronic differential pressure valve for group balance and a tight valve per emitter. Each emitter is equipped with a static balancing valve or a valve with a setting kvs. The differential pressure is controlled on the branches or riser.

1.4a Hydronic balancing heating distribution (including contribution to the balancing on the emission side) – Büros

EG



Actual

Balanced statically per emitter and a static group balance

Static balancing valve per emitter and static group balance, only working at 100% nominal pressure and flow. Each emitter is equipped with a static balancing valve or a valve with a setting kvs, and a flow limitation valve is added on the branches or riser.



Balanced statically per emitter and a dynamic group balance

A high balancing level is achieved with an electronic differential pressure valve for group balance and a tight valve per emitter. Each emitter is equipped with a static balancing valve or a valve with a setting kvs. The differential pressure is controlled on the branches or riser.

1.4a Hydronic balancing heating distribution (including contribution to the balancing on the emission side) –

Zimmer 1., 2., 3. OG



Actual

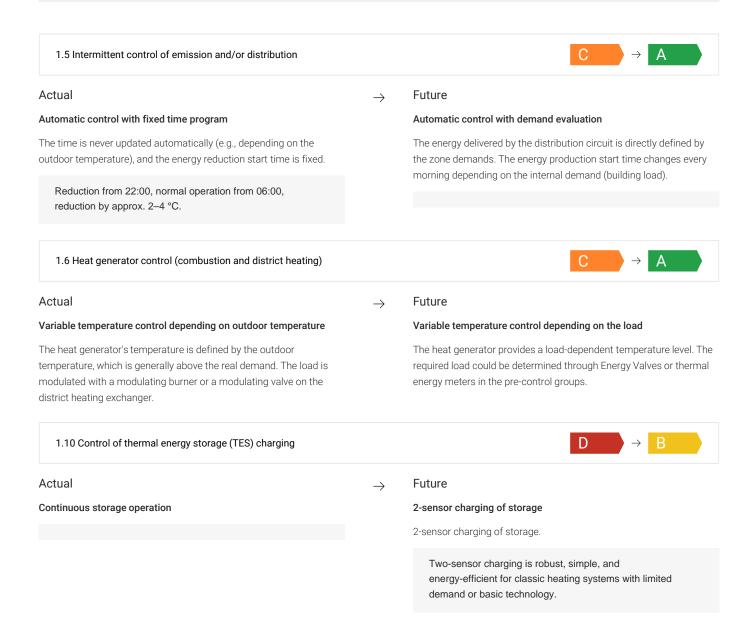
Balanced statically per emitter and a static group balance

Static balancing valve per emitter and static group balance, only working at 100% nominal pressure and flow. Each emitter is equipped with a static balancing valve or a valve with a setting kvs, and a flow limitation valve is added on the branches or riser.

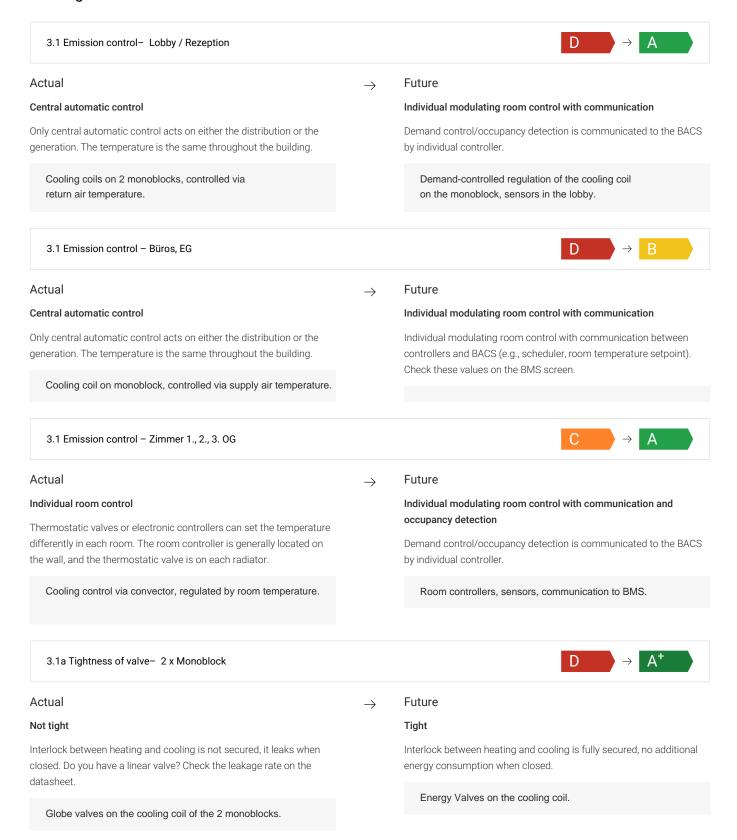


Balanced dynamically per emitter

Balanced dynamically per emitter with an electronic or mechanical pressure-independent tight valve. Each emitter is equipped with a pressure-independent valve.



Cooling







Actual

Not tight

Interlock between heating and cooling is not secured, it leaks when closed. Do you have a linear valve? Check the leakage rate on the datasheet.

Short-stroke valves with thermal actuators.

Future

 \rightarrow

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Tight

Interlock between heating and cooling is fully secured, no additional energy consumption when closed.

PIQCVs with electric-mechanical actuators.

3.3 Control of distribution network chilled water temperature (supply or return)



Actual

Outdoor temperature compensated control

The flow or return temperature depends on the outdoor temperature. One outdoor temperature sensor is installed. The temperature on the terminal unit, radiator, fan coil, etc., is variable.

Control of the chilled water temperature only via outdoor temperature sensor.

Future

Demand-based control

Based on consumer feedback (e.g., indoor temperature or performance data obtained through Energy Valves or thermal energy meters), cold water temperatures are regulated on demand (supply temperature adaptation).

Energy valves record loads (Delta-T) and communicate with the building automation system (BMS).

3.4 Control of distribution pumps in the network





Actual

Variable speed pump control (pump unit (internal) estimations)

The constant or variable Δp is based on the pump unit (internal) estimations. The pump is equipped with an internal system to modulate the speed pump, and information should be available on the technical datasheet.

Modern variable-speed pumps

\rightarrow Future

Pump optimizer by Belimo

An electronic pressure-independent valve is required using a pump optimizer from Belimo. With the pump optimizer concept, the speed of the pump depends on the pressure loss created by valves.

3.4a Hydronic balancing cooling distribution (including contribution to the balancing to the emission side)-

Zimmer 1., 2., 3. OG



Actual

Balanced statically per emitter and a static group balance

A static balancing valve per emitter and a static group balance work only at 100% nominal pressure and flow. Each emitter is equipped with a static balancing valve or a valve with a setting kvs, and a flow limitation valve is added onto the branches or the riser.

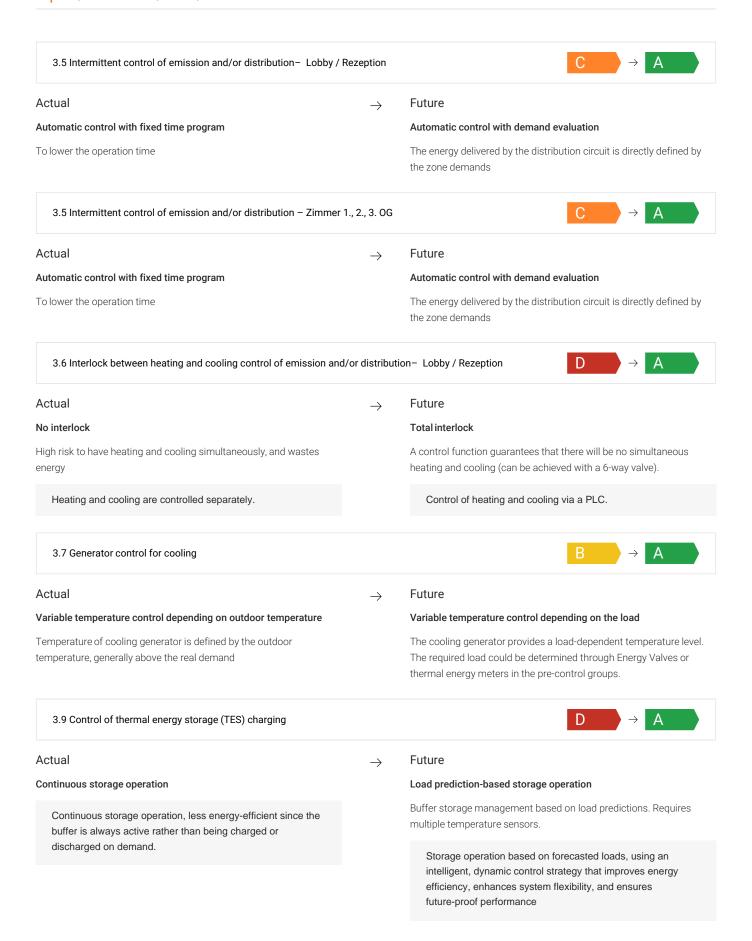
Convectors with balancing valve and short-stroke valve

\rightarrow Future

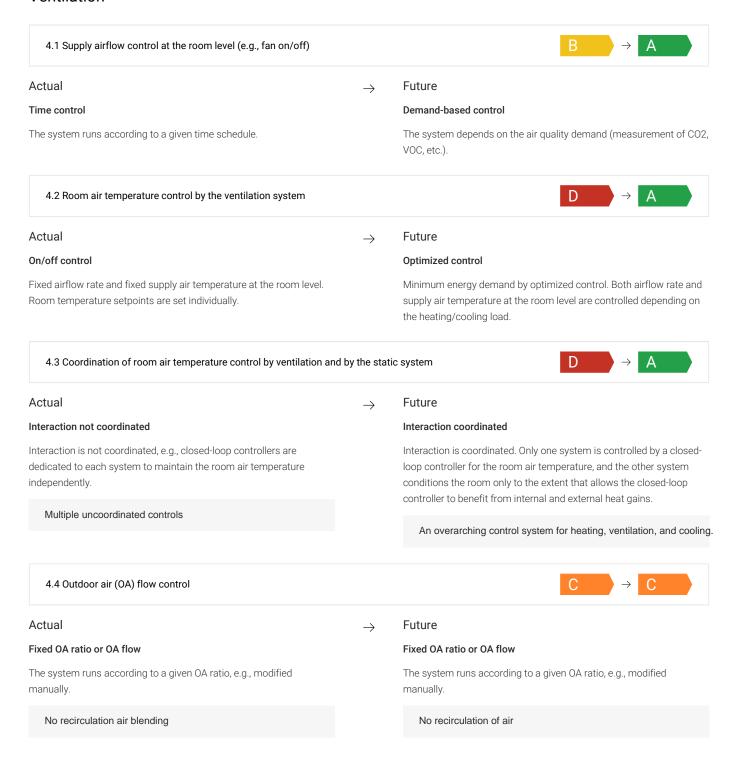
Balanced dynamically per emitter

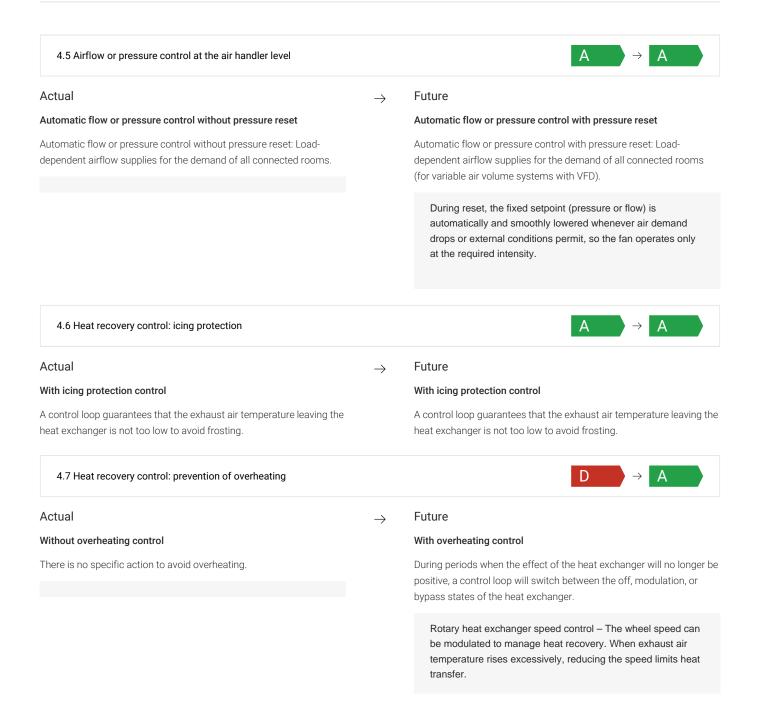
Balanced dynamically per emitter with an electronic or mechanical pressure-independent tight valve. Each emitter is equipped with a pressure-independent valve.

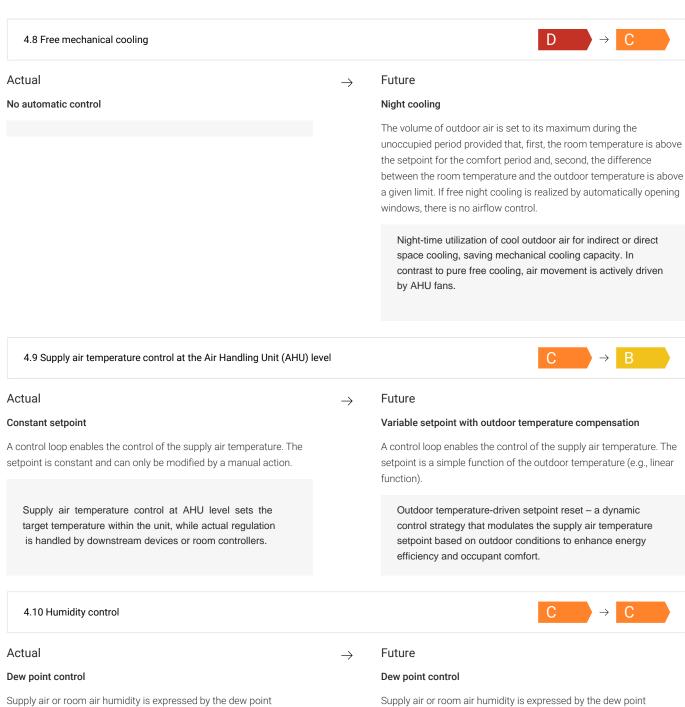
Each convector is equipped with a PIQCV.



Ventilation







Supply air or room air humidity is expressed by the dew point temperature and reheated supply air, which brings the relative humidity to the setpoint.

Supply and exhaust air humidity and temperature sensors monitor the exhaust air dew point. If the heat exchanger surface temperature approaches or falls below this threshold, preventive actions are implemented.

Supply air or room air humidity is expressed by the dew point temperature and reheated supply air, which brings the relative humidity to the setpoint.