HVAC efficiency – the goldmine in building renovation projects.

RetroFIT+ Guide

Edition 2024-05/B

BELIMO

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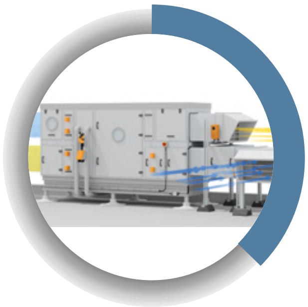
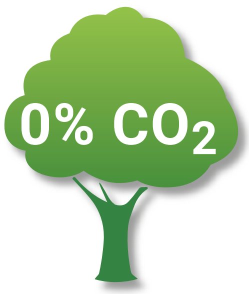
Current situation and goals

Buildings account for 40% of global energy consumption



40% of energy used in buildings is related to HVAC systems

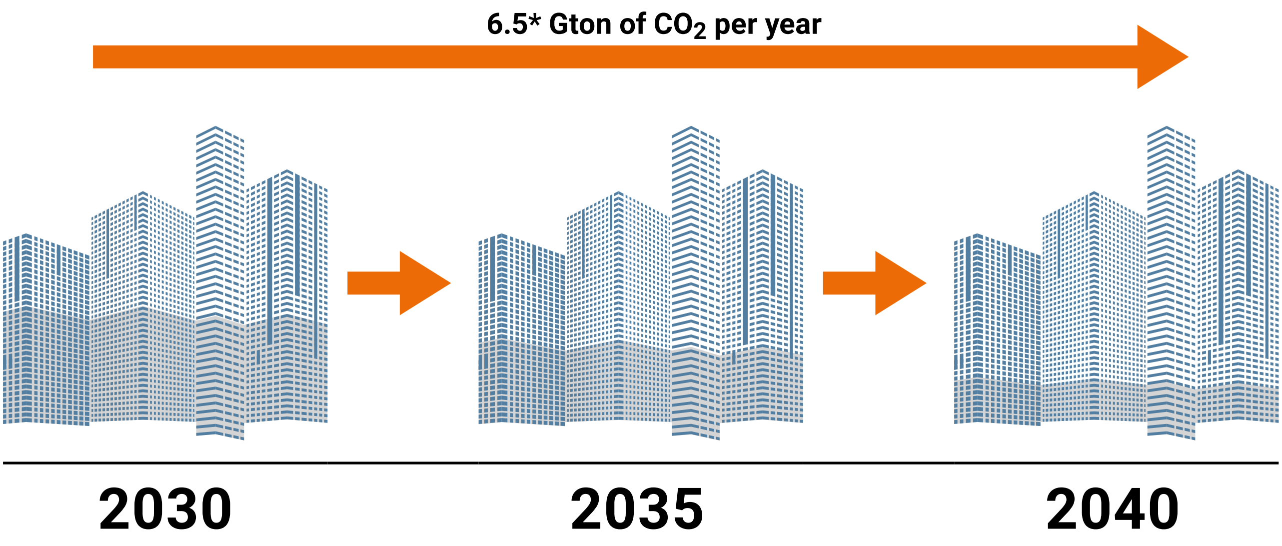
Carbon neutrality in 2050



All EU members have pledged to fight climate change, a commitment first made before the 20th Conference of the Parties to the United Nations Framework Convention on Climate Change and reaffirmed before the One Planet Summit in Paris. This commitment underscores their strong determination to become carbon-neutral by 2050 and to prioritise climate-relevant solutions in their collective actions. A significant aspect of reaching this neutrality involves reducing energy consumption, particularly through optimising HVAC systems in buildings. This emphasises the importance of energy-efficient HVAC technologies and sustainable building practices as pivotal elements in achieving carbon-neutral by 2050.

Local environmental requirements

As a consequence, businesses are obligated to implement environmental measures that substantially decrease the energy usage of their heating, ventilation-, and air-conditioning systems. This directive is an integral component of our industry-wide effort to implement more energy-efficient and sustainable practices.



* Source: International Energy Agency

Consumption and need

Usage

Energy conservation has the most effective and immediate impact on decarbonisation. As a result, it is critical to modify the energy consumption of a structure in accordance with its level of utilisation and intensity of operation.

30 to 50% vacant workstation

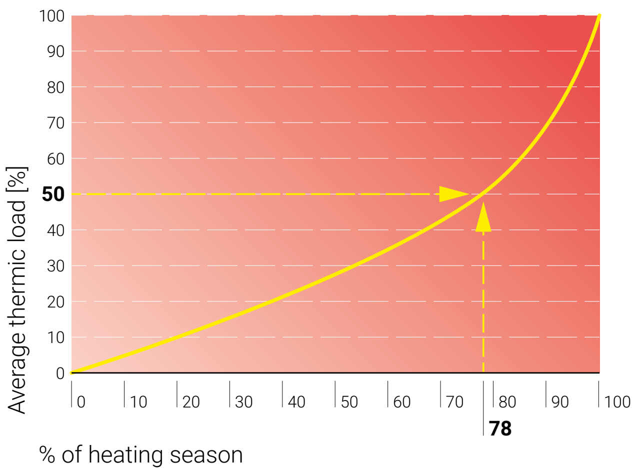
Intermittency management

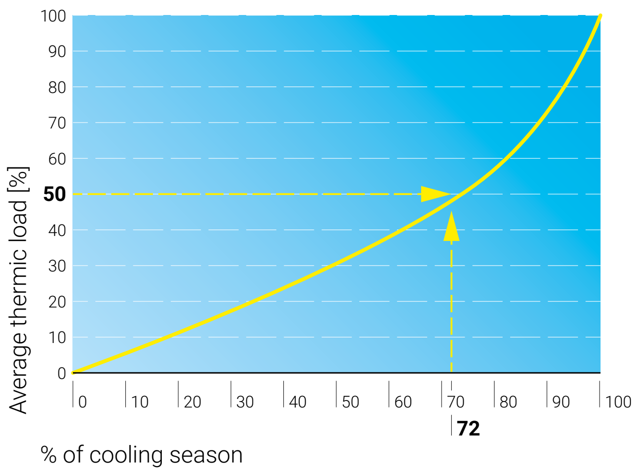
The periods of non-use in so-called functional structures, notably offices, are relatively lengthy. By reducing or completely stopping energy consumption during these times, it is possible to achieve up to 30% of energy savings, as outlined by ISO 52120-1.

15.65 hours of vacant office time

Partial load

On average, heating systems operate at less than 50% of their installed capacity for 78% of their operational time, and cooling systems do so for 72% of the time. It is crucial to ensure that these systems are optimised for efficient operation even when running at partial load.





What an efficient system really needs

An effective technical management system is needed

A technical management system is essential for minimising energy consumption in buildings. This system intelligently manages the balance between comfort and efficiency, ensuring that resources are spent wisely while maintaining optimal environmental conditions. The key objectives of such a system include:

- Targeted energy supply: providing energy only in occupied areas to avoid waste
- Comfort with efficiency: maintaining a pleasant environment while reducing energy use
- Demand-responsive energy generation: energy generation is regulated in direct reaction to actual demand

Reliable components

Actuators, valves and sensors are crucial to the operation of an HVAC system and play an important role in its reliability and efficiency. It is important to focus on the following key technical properties to ensure they are maintained over time:

- Valve tightness: ensuring total integrity throughout the life of the valve
- Accurate measurements: ensuring measurement stability without deviation or drift
- Durability: focusing on long-lasting components that guarantee system reliability

Energy-efficient elements

In any efficient system, optimising the energy performance of active elements such as pumps and fans is important. It must be assured that these components are operating as efficiently as possible and that their efficiency is not compromised by, for example, inappropriate control of other components such as actuators, valves and sensors. The following are important focal points:

- Efficient component integration: keeping poorly operated components such as actuators, valves and sensors from degrading pump and fan efficiency
- Optimised component interaction: ensuring that all components work together to improve the overall efficiency of the system
- Reduced consumption: aiming for lower energy consumption across all components in order to improve the system's overall energy efficiency

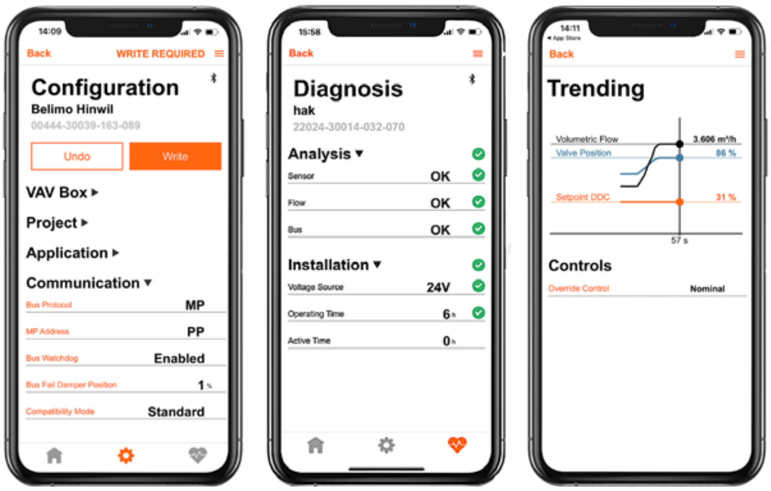
Efficiency principles

Settings are appropriate for all times of day and year

The performance of the HVAC system must be automatically maintained, both in full-load and part-load operation so that only the absolute minimum consumption occurs with no losses.

Adjusting the parameters to reflect real usage

Office buildings have a very high incidence of non-utilisation periods. This suggests that a lot of energy is being wasted. Intelligent automation can eliminate this waste and save up to 30% on energy use.



No decrease in performance over time

Drift in plant performance needs to be detected quickly and easily, and communicative actuators, valves and sensors generate the information required for preventive and predictive maintenance.

Improvement and optimisation in 4 steps

Measuring and monitoring

Effective control is rooted in precise measurement. Key to this are communicative actuators, valves and sensors which not only facilitate accurate control but also supply additional data essential for optimising system operation.

Benchmark

Benchmarking is critical for making educated judgements and categorising implemented measures. Effective processing of monitoring data enables:

- Verification of objective accomplishments and compliance with energy efficiency criteria
- Improved energy management by educated comparative assessments
- Benchmarking against a reference for transparent before-and-after evaluations and informed decision-making

Optimisation

In many systems, reducing delta T can greatly improve energy efficiency and reduce water flow in heating and air-conditioning systems. This modification can result in a flow rate decrease of up to 50%. Furthermore, by adapting the energy management to the specific needs of individual zones, pump and fan energy usage can be reduced by 20...30%.

Energy recovery

Internal loads and solar radiation frequently cause surplus heat in many buildings. This surplus heat has the potential to be reused in heat recovery systems, transforming a waste product into a valuable resource for energy efficiency.

Smart devices enable efficient building management

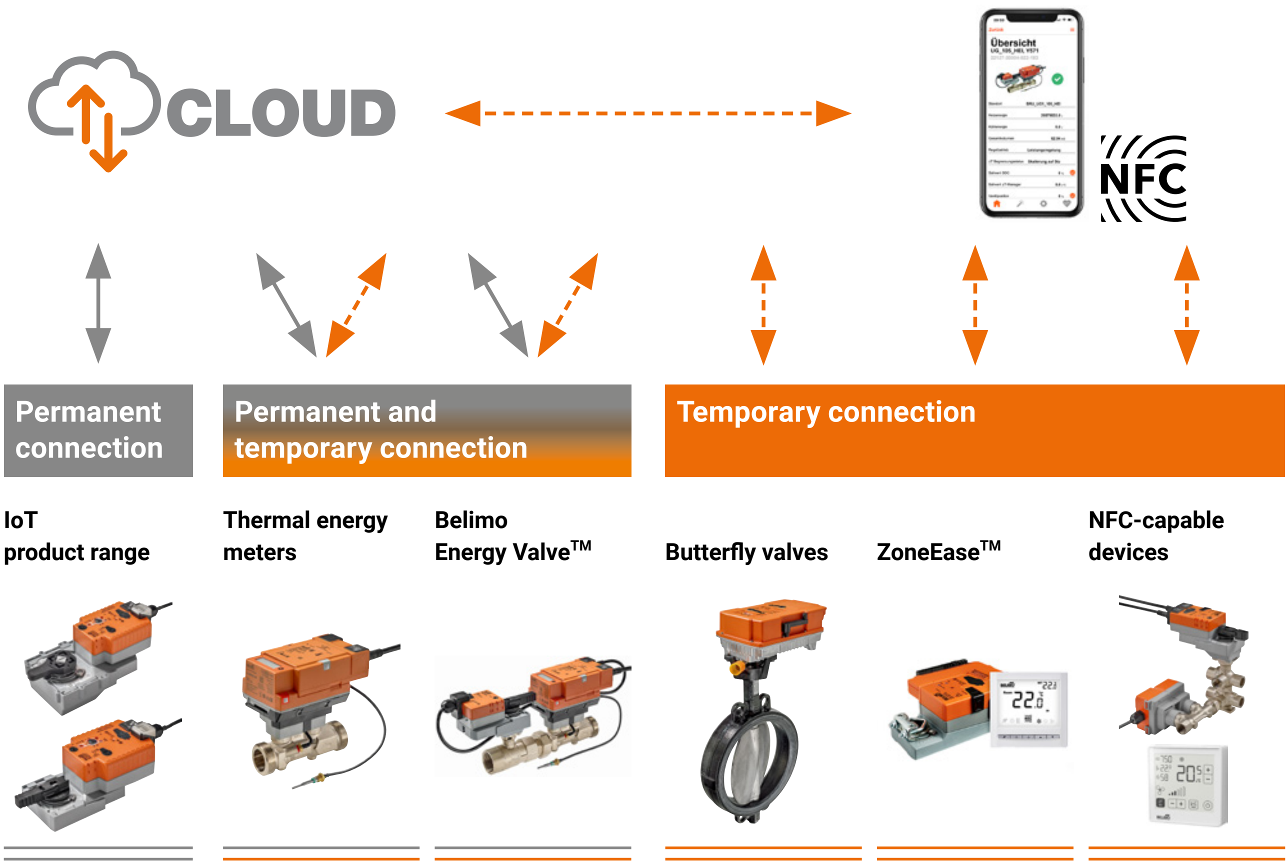
Integrating smart devices for advanced energy management in buildings

Smart devices play an important role in enhancing building management by delivering data back to the building management system (BMS). This flow of information equips the BMS with the insights needed for more efficient energy management, allowing for real-time adjustments and proactive maintenance strategies. By harnessing data from communicative actuators, valves and sensors, buildings can dynamically adapt to optimise energy consumption and improve overall efficiency. This integration of smart devices with the BMS paves the way for intelligent energy optimisation applications and establishes a foundation for smart building operations.

The three levels of building management

The three levels of building management must provide the necessary data for real-time control. Communicative actuators, valves and sensors open the door to energy optimisation applications.

Connection to the Belimo Cloud via building management system or mobile app.



Permanent connection

The cloud-enabled Belimo device is permanently connected to the cloud via Ethernet and Internet. Data is exchanged continuously.

Temporary connection

The cloud-enabled Belimo device does not connect directly to the cloud. A smartphone with the Belimo Assistant App installed exchanges data with the device via NFC and synchronises it with the cloud.

Energy-saving solutions

Improve: 1 minor benefits

The entire building is dynamic; setpoint, schedule, energy production need to be recommissioned regularly or an auto-adaptive solution must be used.

Solutions	On demand	Optimisation	Energy efficiency	Smart	Subsidy
Sensor and mechanical actuator setpoints		■			
Setting actuator, valve and sensor setpoints, editing reports		■			
Delta T manager setting		■			
RetroFIT+ App		■			
Setting Belimo Energy Valve™ control mode		■			

1 + upgrade with RetroFIT+: average benefits

Controlling energy production according to the needs of the zones allows savings of 20 to 30%, according to ISO 52120.

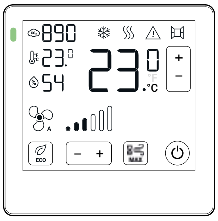
Solutions	On demand	Optimisation	Energy efficiency	Smart	Subsidy
Improving BACS class	■	■		■	■
Hydronic balancing		■	■	■	■
Hydronic and air antenna	■		■	■	
Air handling unit with delta T manager	■	■	■	■	
High-performance fan coil unit		■	■		■
Balancing branch	■	■	■	■	■
Variable-speed pump management	■	■		■	

1 + 2 HVAC architecture: major benefits

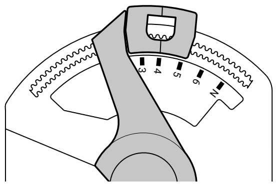
Adjusting the architecture by modulating the flow and recovering energy is an efficient way of reducing energy costs.

Solutions	On demand	Optimisation	Energy efficiency	Smart	Subsidy
Hot water sanitary production		■	■	■	
Switching the hydronic network to variable flow	■	■	■	■	
Lowering the return temperature of a network	■	■			■
Heat recovery system in a cooling unit	■	■		■	■
Heat recovery system in a cooling tower	■	■		■	■
Optimising pump and fan energy	■	■		■	■

Setpoint adjustments



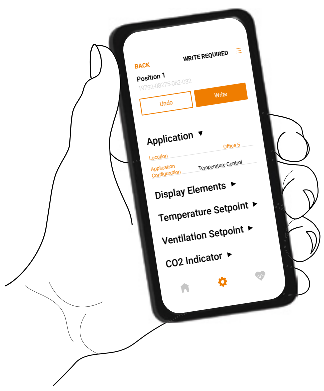
In a heating environment, if the room temperature is 1°C too high, the system will consume on average 7% more energy.
If the room temperature is 1°C too low, the energy consumed by the air-conditioning system will increase by 12 to 18%.

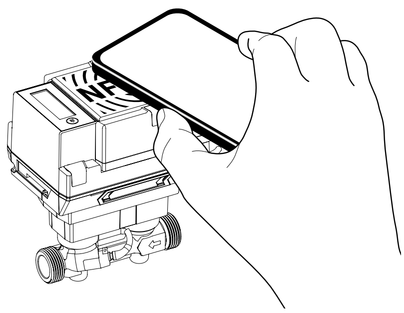


Circulating water that is 1°C warmer increases the heat loss of the pipework by 3%.
The electrical energy required to operate the pumps can be reduced by 40% through hydronic balancing of the circuits.

Digital settings

In existing buildings, field devices are often not adapted to changing environments due to a lack of connectivity.
To overcome this limitation, Belimo offers easy parametrisation via smartphone (Belimo Assistant App), bus, web server or cloud.
The current settings can be sent via email for support requests or to create a reference database.

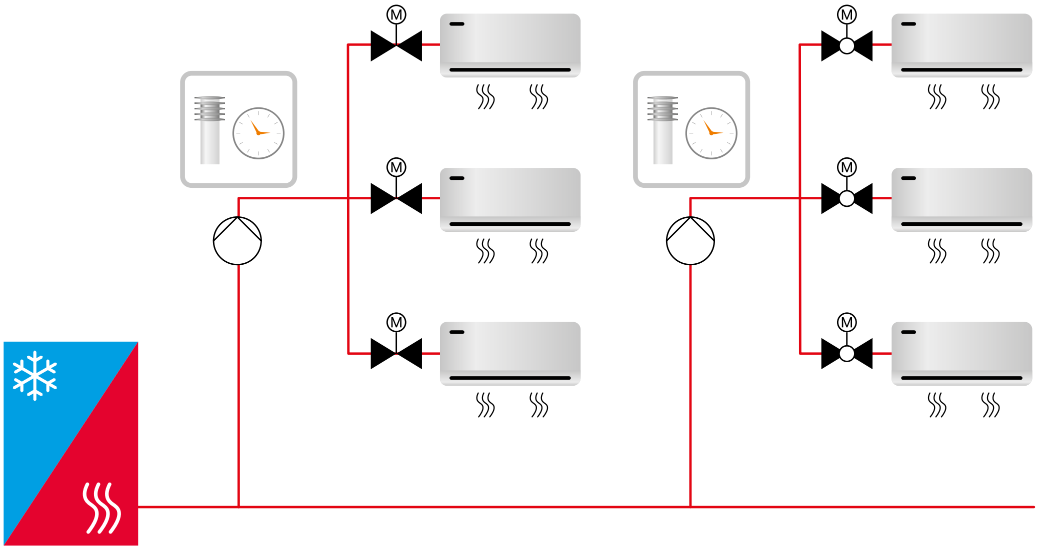




Building management systems

Current situation: BACS class C

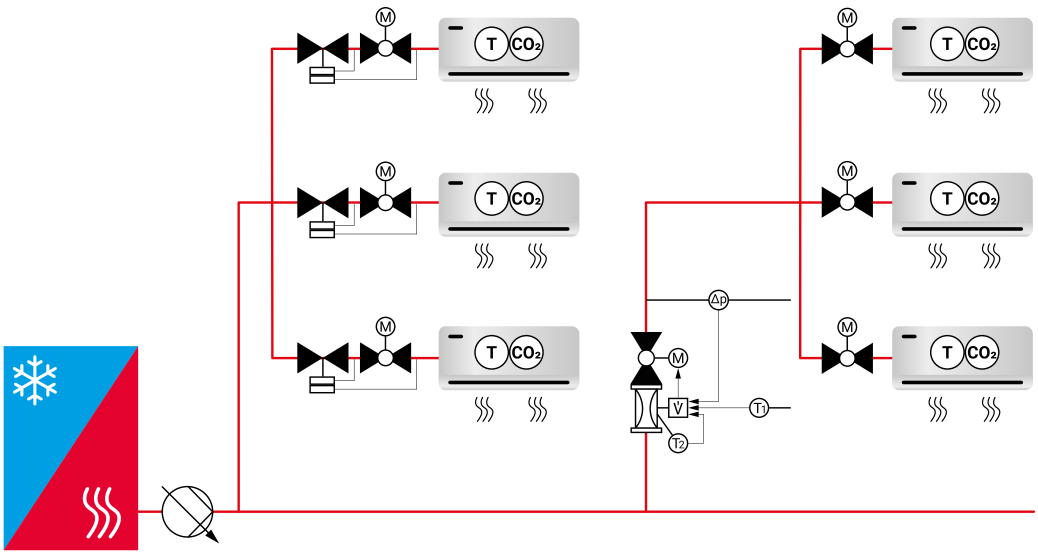
The production and distribution of energy are defined according to outside temperatures and a time schedule.



Operation
A temperature sensor measures the outside temperature, the building automation and control system (BACS) determines the power supplied to the installation, and a setpoint reduction can be made according to the predicted occupancy of the building.
Solution limitations
Energy is produced without regard to energy demand; unoccupied or partial loads are not taken into account.

Future situation: BACS class A

The production and distribution of energy is defined according to zone demand with hydronic balancing.



Features and benefits

Modifications
Communicative sensors, valves and actuators are installed to transmit information from each zone.
– Presence
– CO_2 level
– Position of valves
– Energy demand

Operation
The electronic pressure-independent valves communicate their positions to optimise pump speed. The Belimo Energy Valve™ transmits the power required by each circuit, and the sum of these powers enables control of the energy produced.

Features
Operation:
It is no longer necessary to modify or deviate from a programme to adapt to periods of occupancy and non-occupancy of zones. The partial load level of the building is transmitted to the energy distribution and production units.
Maintenance:
Communicative actuators, valves and sensors transmit faults and operating states to BACS.

Benefits
Office building: BACS class C to class A, savings potential 30%.

Possible subsidy

Depending on country

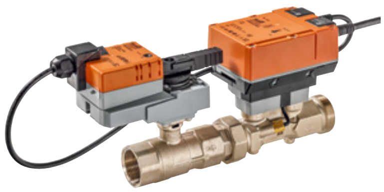
Product range options

Good
Traditional actuator with analogue feedback

All Belimo actuators

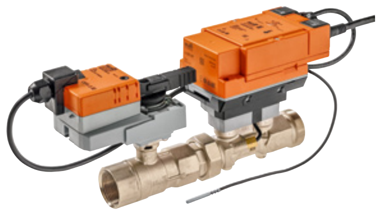
Better
Actuator with analogue or digital position feedback, electronic flow sensor

EPIV + QCV



Best
Load metering, occupancy control; on-demand energy valve

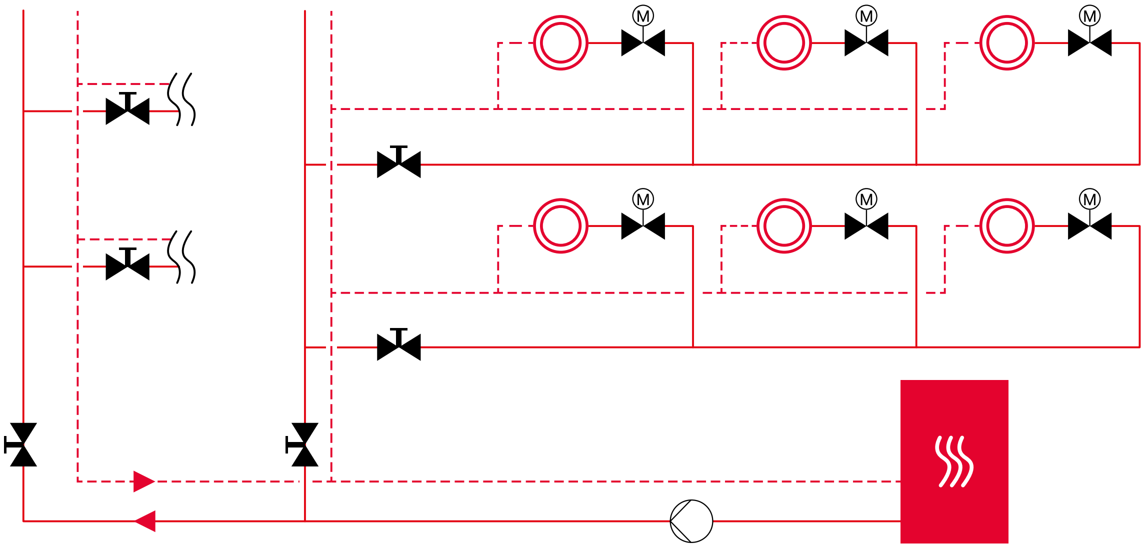
Belimo Energy Valve™



Hydronic balancing

Current situation: BACS class D or C

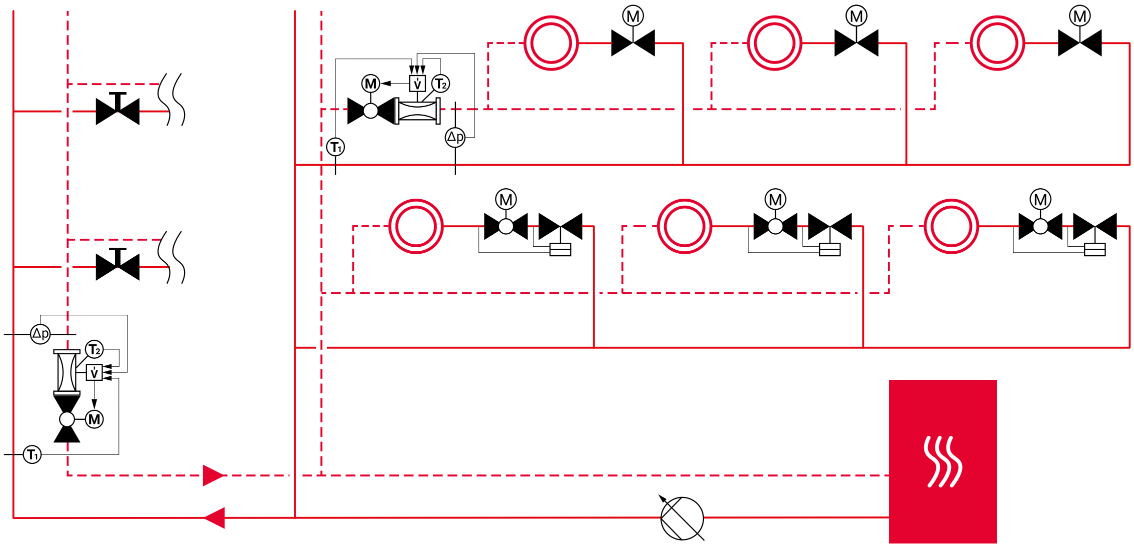
All installations of risers and branches are fitted with static balancing valves; this solution works only with a constant speed pump at nominal flow.



Operation
Branches and risers are set with a static balancing valve. Pump maintains constant speed.
Solution limitations
No flow control if one of the valves is not fully open. Pumps are mainly at constant speed; variable speed is possible with limited hydronic balancing effects.

Future situation: BACS class C or A

Risers and/or branches are equipped with dynamic balancing valves; control at partial load is possible.



Features and benefits

Modification

Replacement of static balancing valve with an electronic differential pressure valve on each antenna. Standard zone valves can be pressure-dependent or pressure-independent.
All consumers can be fitted with a PICV valve.

Operation

Hydronic:
If a zone valve closes, the electronic differential pressure valve maintains the setpoint by reducing the flow. All antennas are balanced.
Communication:
Flow, pressure, air and water actuator position data are transmitted to the management system to optimise energy production and pump speed.

Features

- Flexibility in the choice of terminals for each tenant area
- Rental-area flexibility, metering and billing of energy per rental area
- Data available to management systems via standardised buses and API
- Adaptation of energy production to occupancy rates
- Pump optimiser-ready
- Zone isolation controlled by BACS
- Information for maintenance: faults, setpoints and measured values, alarms

Benefits

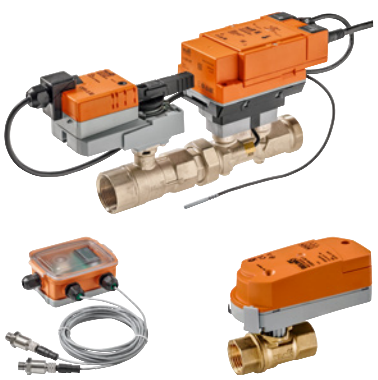
A three-degree temperature difference between the part closest to production and the part furthest away results in a 20% over-consumption.

Product range options

Good

Static balancing per consumer and dynamic group balancing

Electronic differential pressure valve + QCV



Better

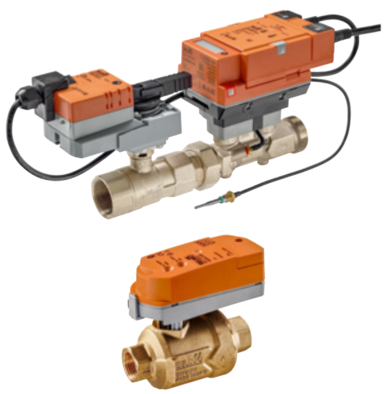
Static balancing per consumer

PIQCV

Best

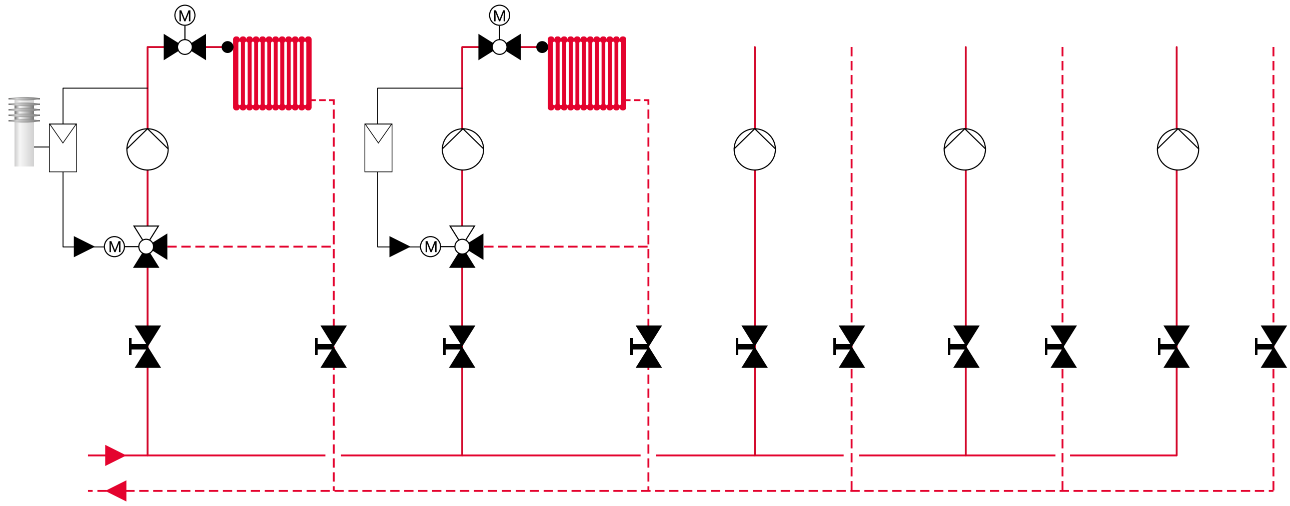
Dynamic balancing per consumer and dynamic group balancing: billing per group

Belimo Energy Valve^{TM} MID + PIQCV



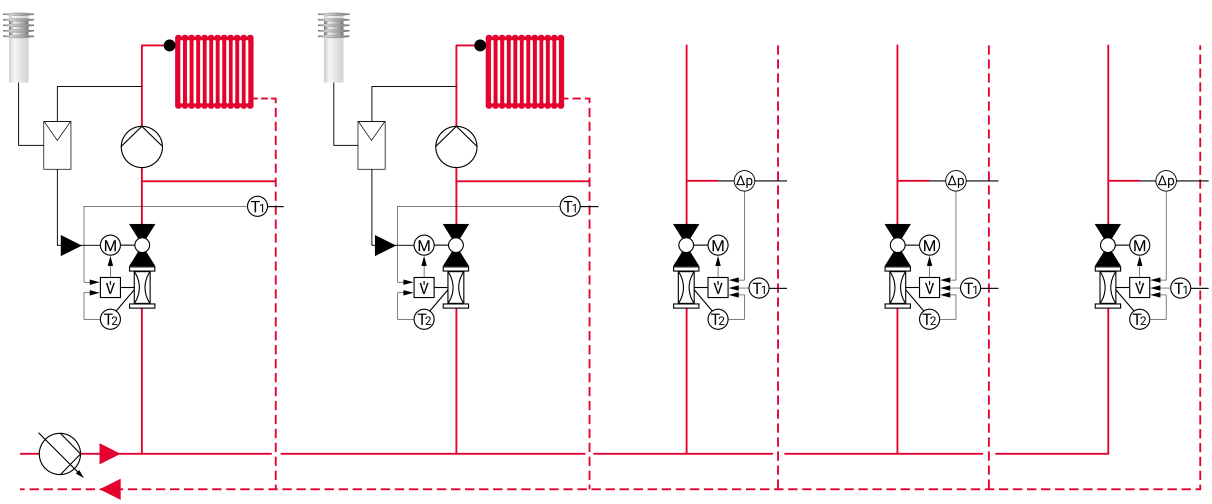
Control and balancing of distribution networks

Current situation:
BACS class D or C



Operation
Supply temperature can be modulated by a 3-way valve. Some circuits are fed directly by the pump at a constant temperature.
Solution limitations
High risk of interaction between individual circuits. Possibility of recirculation on the low loss header; temperature supply/return of the whole system is not optimised.

Future situation:
BACS class B or A



Features and benefits

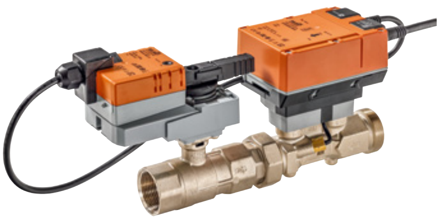
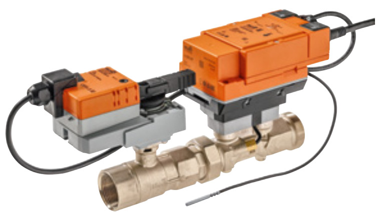
Modification
3-way valves controlling the supply temperature of mixing circuits are replaced by injection circuits with a 2-way pressure independent control valve and fixed bypass. Pumps for constant temperature circuits are replaced by electronic differential pressure valves. One high efficiency pump is installed for all circuits.

Operation
Hydronic:
All circuits are pressure-independent to prevent any hydronic interaction. The delta T is set by each circuit to optimise the flow. Minimum flow for the main pump is controlled by a 2-way pressure-independent valve at the end of a circuit.

Features
– Data available to management systems via standardised buses and API
– Pump optimiser-ready
– Information for maintenance: faults, alarms, setpoints and measured values

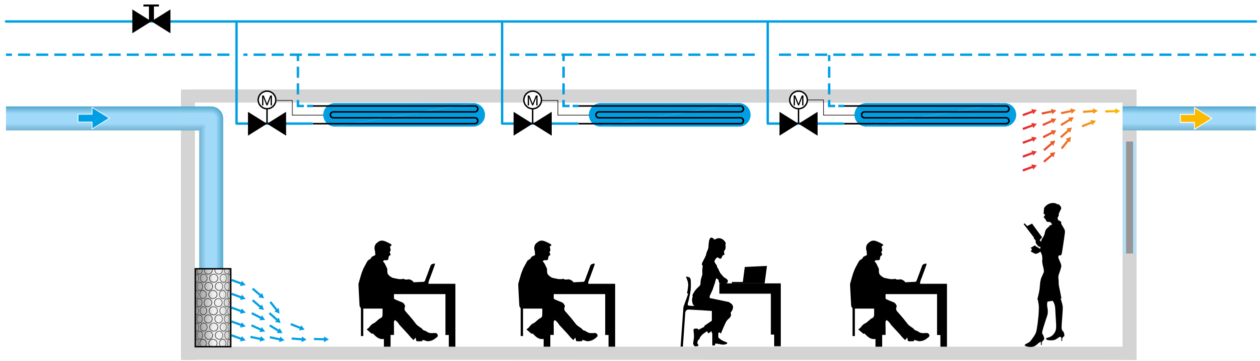
Benefits
By optimising the pump head, up to 50% of electrical power consumption can be saved.
A plant operates 70% of the year at less than 50% of the installed capacity. The modulation of flow rates is an important source of savings.

Product range options

Good	Better	Best
Electronic balancing valve with integrated flow sensor	Electronic balancing valve with integrated flow/energy meter	Electronic balancing valve with integrated flow/energy meter and differential pressure control, certified for billing
EPIV	Belimo Energy Valve™	Belimo Energy Valve™ MID with dp control
		

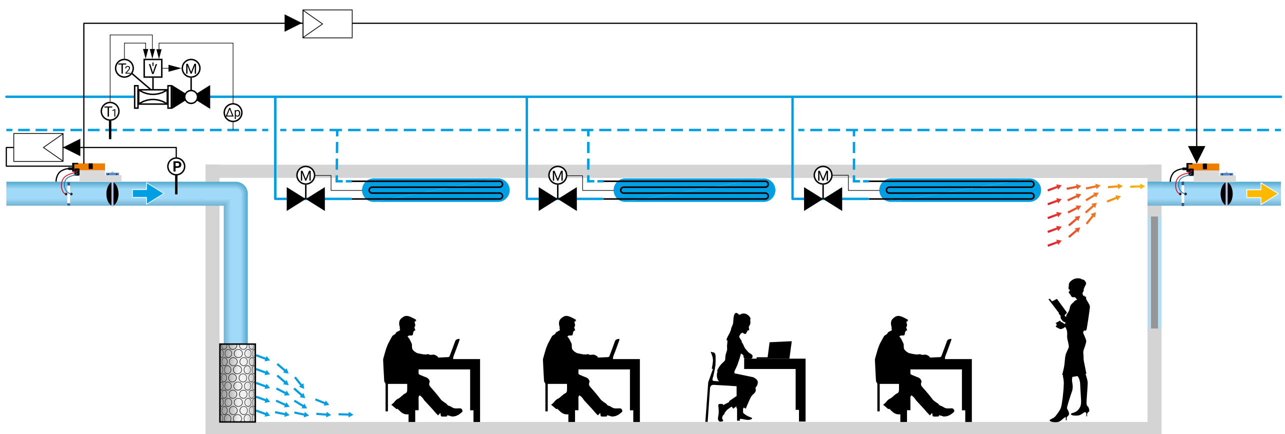
Group balancing for hydronic loops and aeraulic ducts

Current situation:
BACS class D



Operation
The constant flow box limits the air flow. The mechanical differential pressure regulator limits the water flow.
Solution limitations
The fan in the air handling unit has a constant speed. The mechanical differential pressure regulator limits the possibilities of fan optimisation.

Future situation:
BACS class C or A



Features and benefits

Modifications
Installation of a pressure regulator to control the zone inlet damper. Replacement of the mechanical differential pressure regulator with an electronic differential pressure valve. Connection of the VAV actuator and the electronic differential pressure valve to the BACS network.

Operation
Ventilation:
The VAV is controlled according to the air pressure in the duct.
Hydronic:
The differential pressure of the zone is regulated by modulating the water flow.
Communication:
Data on the flow rate, pressure and position of the air and water actuators are transmitted to the building management system for optimisation.

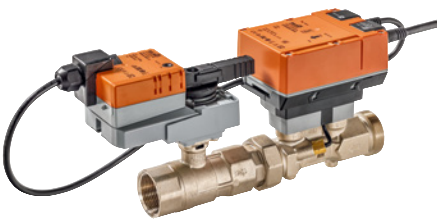
Features
- Flexibility in the choice of terminals for each tenant area
- Rental-area flexibility, metering and billing by rental area
- Data available to management systems via standardised buses and API
- Adaptation of energy production to occupancy rates
- Pump optimiser-ready
- Zone isolation controlled by the BACS
- Information for maintenance: fault, setpoints and measured values, alarms

Benefits
HVAC systems operate approx. 75% of the time at less than 50% of the installed capacity. By optimising the hydronic system, the production capacity can be lowered by up to 20%.

Product range options

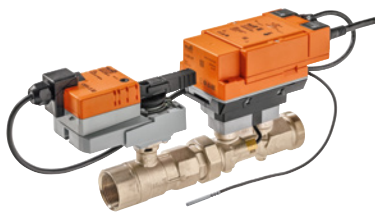
Good
Traditional actuator without feedback

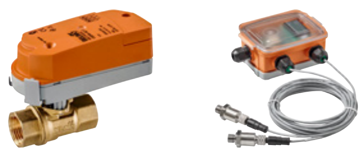
EPIV + external controller + QCV



Better
Balancing by zone, dp control

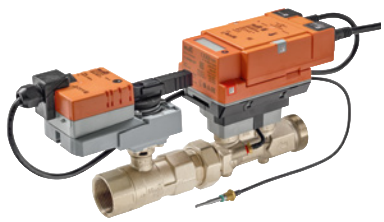
Belimo Energy Valve™ + QCV

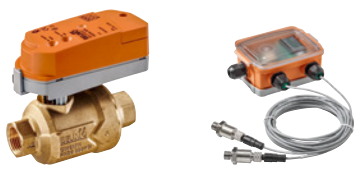




Best
Balancing by zone, dp control, balancing per consumer

Belimo Energy Valve™ MID + PIQCV

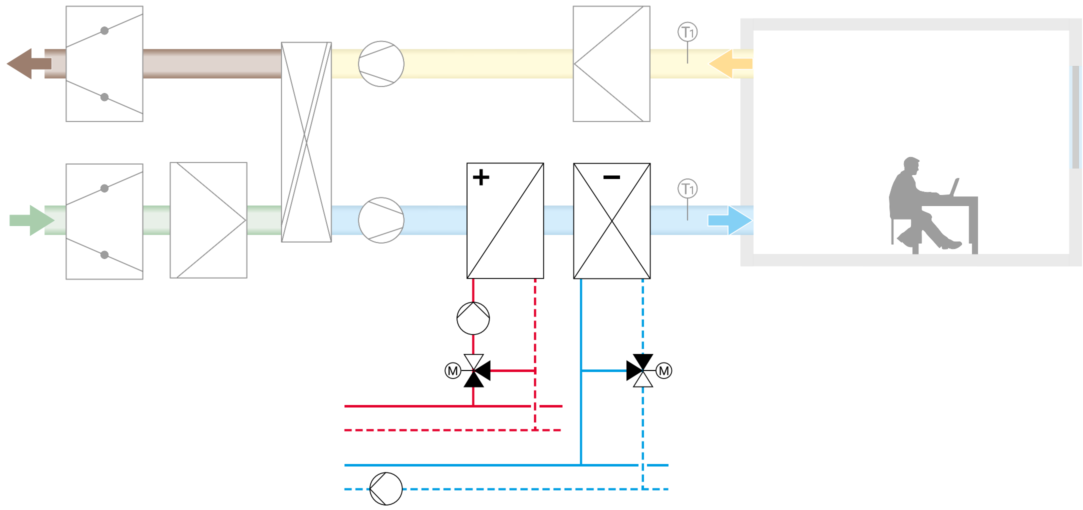




Air handling units

Current situation: constant air and hydronic flow

The air handling unit is connected to constant-flow hot and cold hydronic networks. The sensors are either analogue or with trigger thresholds.



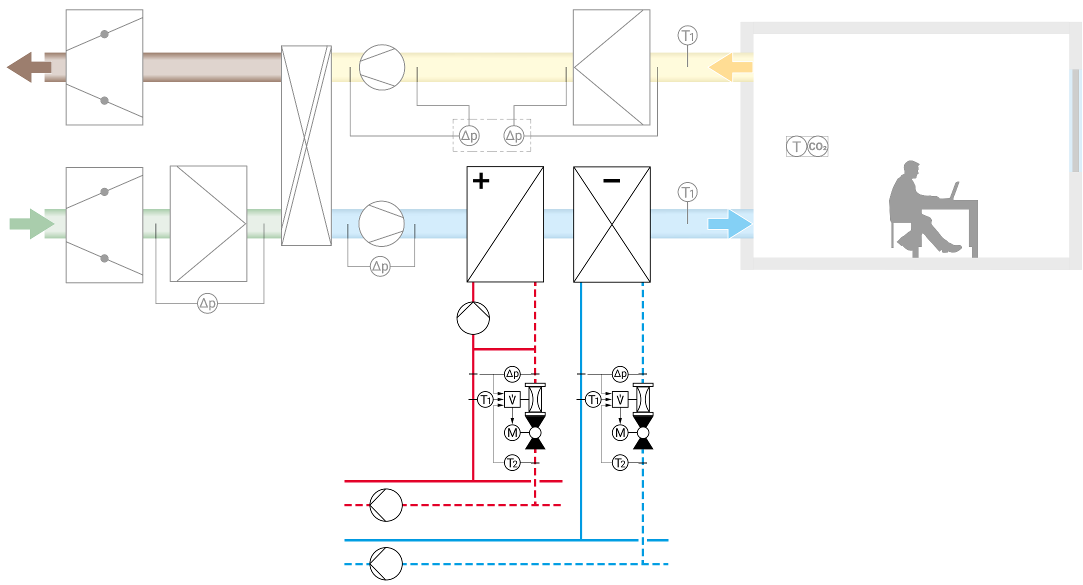
Operation

The primary network has a constant flow rate with static balancing. The flow variation in the heat exchangers is managed by two 3-way valves mounted in a diverting circuit. The fans and filters are monitored by differential pressure sensors or switches.

Solution limitations

It is not possible to vary the speed of the primary network pump.

Future situation: variable air and hydronic flow with pressure sensors



Features and benefits

Modifications

Combined temperature and CO_2 sensors with display and with traffic light function are installed, pressure switches are replaced by pressure sensors. Variable-speed pumps are installed on the heating and cooling networks. Electronic pressure-independent valves with energy measurement replace 3-way valves.

Operation

Belimo Energy Valves are controlled by the current temperature controller and modulate the water flow. The Belimo Energy Valve™ balances the distribution circuit for air handling units. The delta T manager guarantees delta T in line with expectations by optimised flow rate in the heat exchangers and maximum efficiency of the generators.

Features

Operation:

Energy valves facilitate demand-based allocation of energy per circuit, enabling the measurement, metering and billing of energy usage for each specific circuit. Additionally, the supply air flow rate can be adjusted based on the quality of the indoor air or extract air.

Maintenance:

Notifications are issued if the valve becomes disengaged or blocked. Further notifications are issued if the required power or flow rate is not achieved.

Setpoints and measured values:

Setpoints include supply and return temperatures, power and flow rate.

Benefits

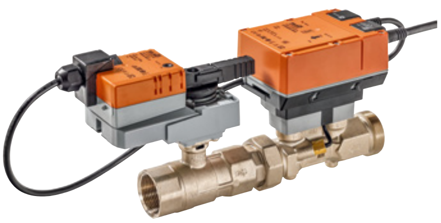
Up to 50% reduction in hot and cold coil flow with the delta T manager.

Product range options

Good

Balancing with variable flow

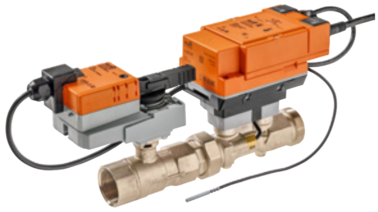
EPIV



Better

Delta T management for energy monitoring, on demand

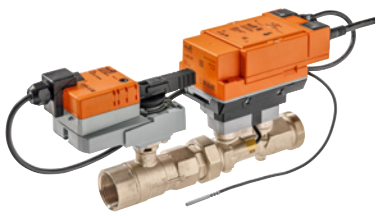
Belimo Energy Valve™



Best

Delta T management for energy monitoring, on demand, CO_2 sensor in each room

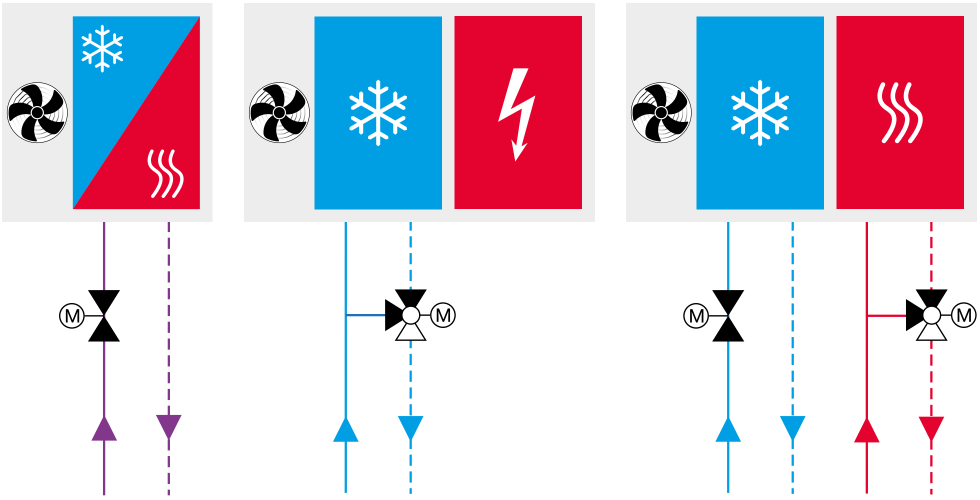
Belimo Energy Valve™ + CO_2 sensor



High-performance fan coils

Current situation: constant primary flow, low-performance fan

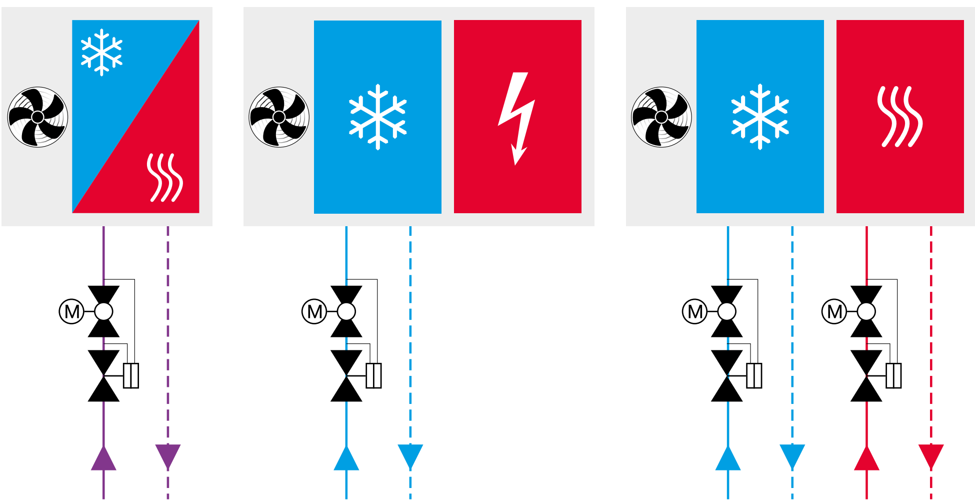
The fans have three speeds; 2- or 3-way valves are pressure controlled.



Operation
The hydronic network has a constant flow rate upstream of the 3-way valves with static balancing. The flow variation in the heat exchangers is managed by two 3-way valves mounted in bypass or by a 2-way valve. The fans have 3-step speed variation.

Solution limitations
The heating or cooling circuit pump has a fixed speed. A variation in the flow at the fan coil units will lead to hydronic balancing problems. DC motors generally have 3-step speed variation.

Future situation: variable primary flow, high-performance fan, balancing valve (0% leakage)



Features and benefits

Modifications
The fan coils are replaced with high-efficiency Eurovent class A fan coils. Tight and pressure-independent 2-way valves and variable-speed pumps are installed. The valves are controlled by low-power electromechanical actuators.

Operation
The modulation of the thermal output of the terminal units is ensured by the variation of the hydronic flow and the speed modulation of the fans.

Features
Operating:
Fan-speed modulation provides significant energy savings and acoustic comfort.
The pressure-independent valves allow the speed of the pumps to be modulated while automatically balancing the system.
Valve tightness ensures that unoccupied areas are completely sealed off, preventing heating and cooling the air simultaneously.
Maintenance:
It is possible to replace a faulty valve or increase the heat output of the fan coils without rebalancing.
High lifetime of electromechanical motors significantly reduces maintenance costs.

Benefits
Leakage of a small stroke valve leads to undetected energy consumption.

Possible subsidy

Depending on country

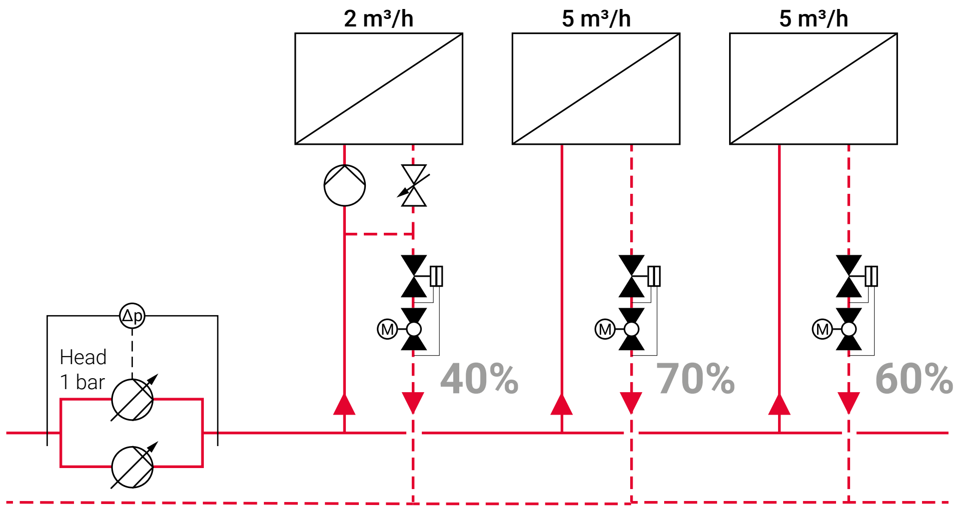
Product range options

Good	Better	Best
Tight valve, energy-efficient actuator	Balancing	On demand, flexibility
QCV + CQ actuator	PIQCV + CQ actuator	PIQCV + CQ actuator with BACnet protocol
		

Optimisation of the pressure head of variable-speed pumps

Current situation: variable-flow circuit, constant pressure head

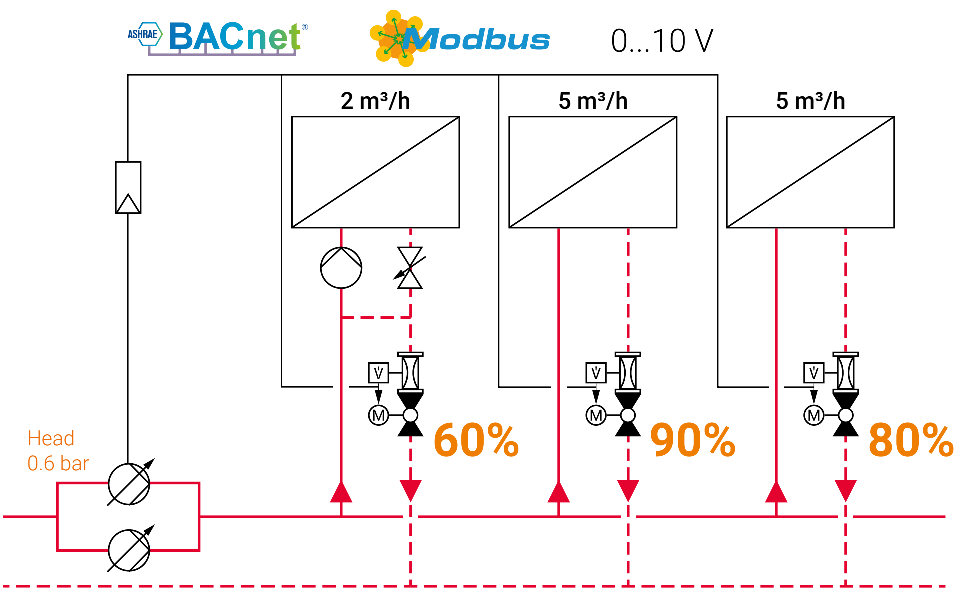
The pump head is kept constant by differential pressure control.



Operation
The flow is modulated by the 2-way valves on each circuit, and the pump speed is continuously adjusted to maintain a constant head.

Solution limitations
The pump generates an overpressure head which is partially absorbed by the 2-way valves.

Future situation: variable-flow circuit, with adjustable pressure head



Features and benefits

Modifications
Pressure-independent valves with electronic flow measurement and control are installed. The position of the valves is transmitted via a communication bus or an analogue 0...10 V signal to a programmable logic controller (PLC). The pump pressure head is optimised.

Operation
The electronic pressure-independent valves have an interesting feature. Their positions accurately reflect the inlet and outlet pressure differential. The position of the valves is compared to determine which valve is causing the greatest pressure drop. If all valves are less than 85% open, the pump speed is reduced by the PLC. As soon as one of the valves reaches this value, the pump speed is stabilised. If the opening of one of the valves exceeds 95%, the pump speed is increased.

Features
The pressure head is continuously adjusted to limit unnecessary pressure losses.
Maintenance:
Changing the power of one of the circuits does not require a change in setting the controller or the pump.

Benefits
Adjusting the pressure head can save up to 30% of electrical energy.

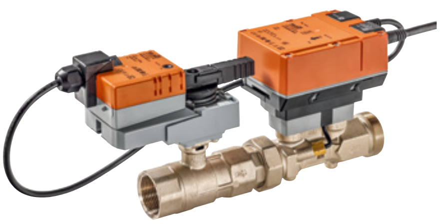
Possible subsidy

Depending on country

Product range options

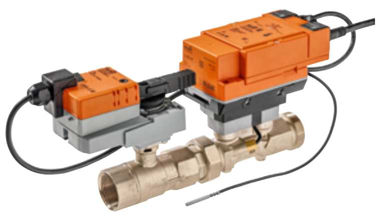
Good
Balancing

EPIV



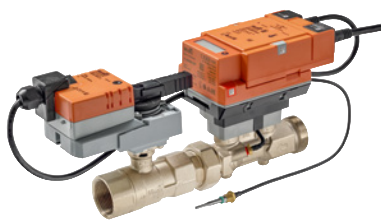
Better
Balancing, energy monitoring

Belimo Energy Valve™



Best
Balancing, energy monitoring, billing

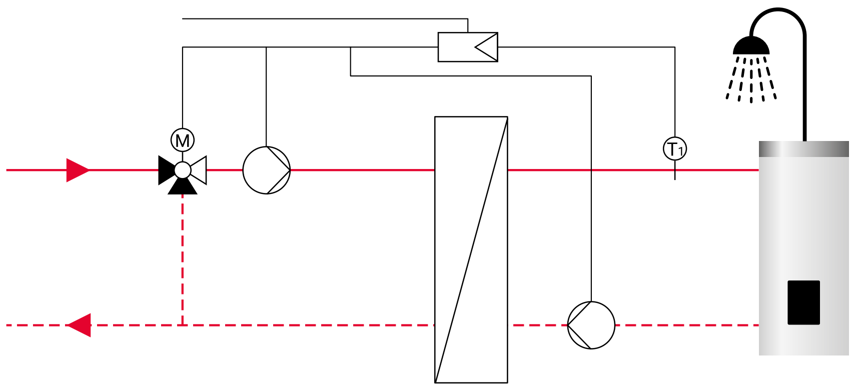
Belimo Energy Valve™ + MID



Domestic hot water production

Current situation: storage tank on the DHW loop

The domestic hot water (DHW) tank is charged via a heat exchanger and sized to store the hot water required for the duration and flow rate of the peak consumption. The DHW is drawn directly from the tank.



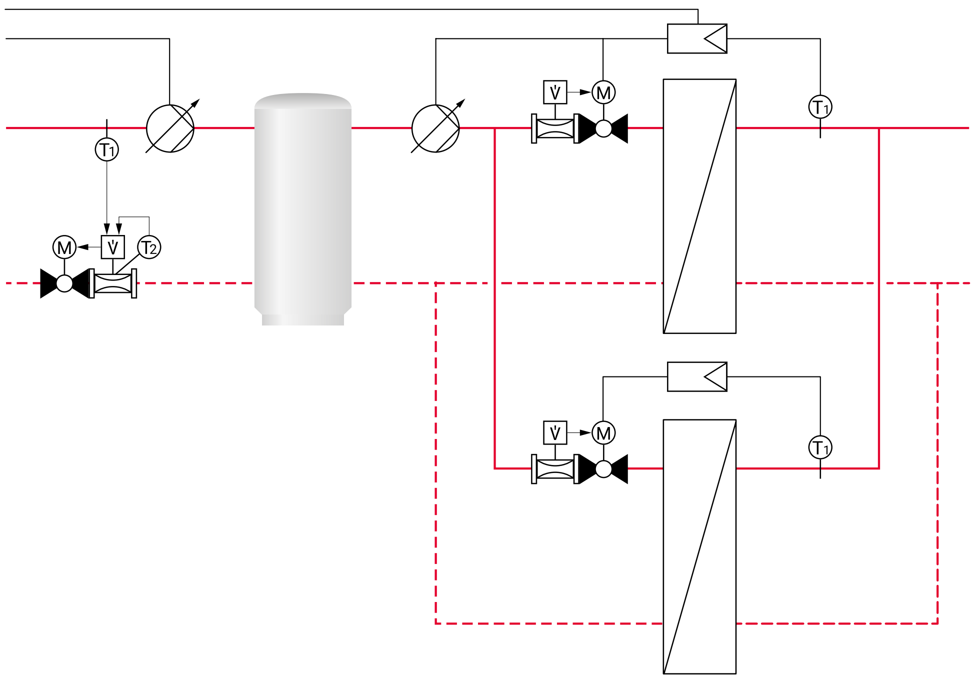
Operation

The temperature of the primary heat exchanger is regulated by a 3-way valve used as a mixing valve. To comply with current regulations, the temperature of the tank must be monitored and/or increased regularly.

Solution limitations

Regular sampling of the tank is essential to monitor bacterial growth. The primary network pump runs at a constant speed. The DHW loop flow rate is designed to ensure the required flow rate and temperature during peak consumption periods.

Future situation: static water storage tank



Features and benefits

Modifications
The storage tank is moved upstream of the heat exchanger. Variable-speed pumps are installed upstream and downstream of the storage tank, and self-balancing 2-way valves control the primary flows of each exchanger. An optional second heat exchanger can also be connected.

Operation
The Belimo Energy Valve™ upstream of the storage tank allows you to:
- Regulate the storage tank charge autonomously or via a controller in the DHW loop
- Hydronically balance and limit the maximum flow rate allocated to the DHW
- Measure the energy of the DHW station in accordance with the applicable thermal regulations
- Communicate consumption information to a BACS
- Optimise return temperatures to increase generator efficiency

The 2-way valve is equipped with a fast running actuator (35 seconds) and a safety function that stops energy production in cases of overheating of the secondary heat exchanger detected by the safety thermostat. This safety feature prevents any risk of burn injuries to users.

Features
Option of having two DHW flows and capacities; the two heat exchangers are used during peak consumption periods; a single heat exchanger provides reduced flow during off-peak periods.
The heat exchanger provides separation between the primary circuit, storage tank and DHW loop, eliminating the need for bacteriological monitoring.
The integration of renewable energy generation is simplified.

Benefits
Reduction in the consumption of pump energy.

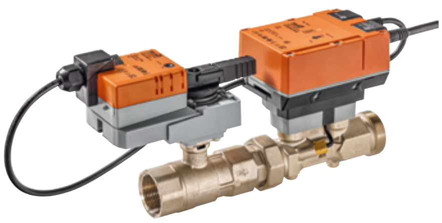
Product range options

Good
Supply temperature control

Characterised control valve

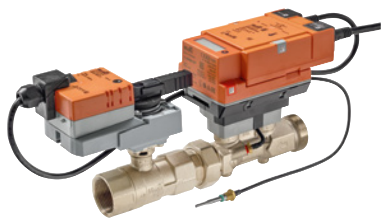
Better
Energy monitoring

Belimo Energy Valve™



Best
Balancing, energy monitoring, billing

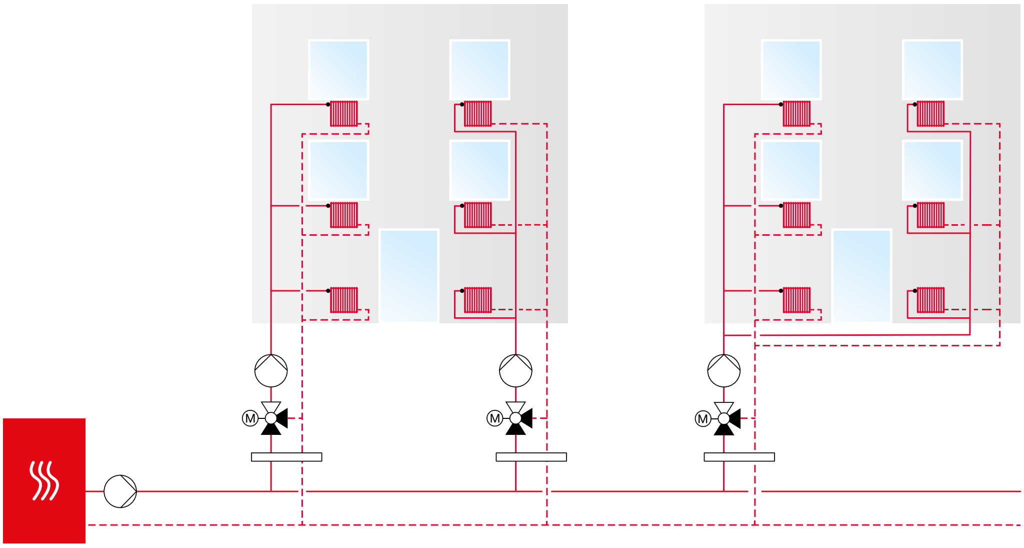
Belimo Energy Valve™ + MID



Lowering the return temperature of a condensing boiler

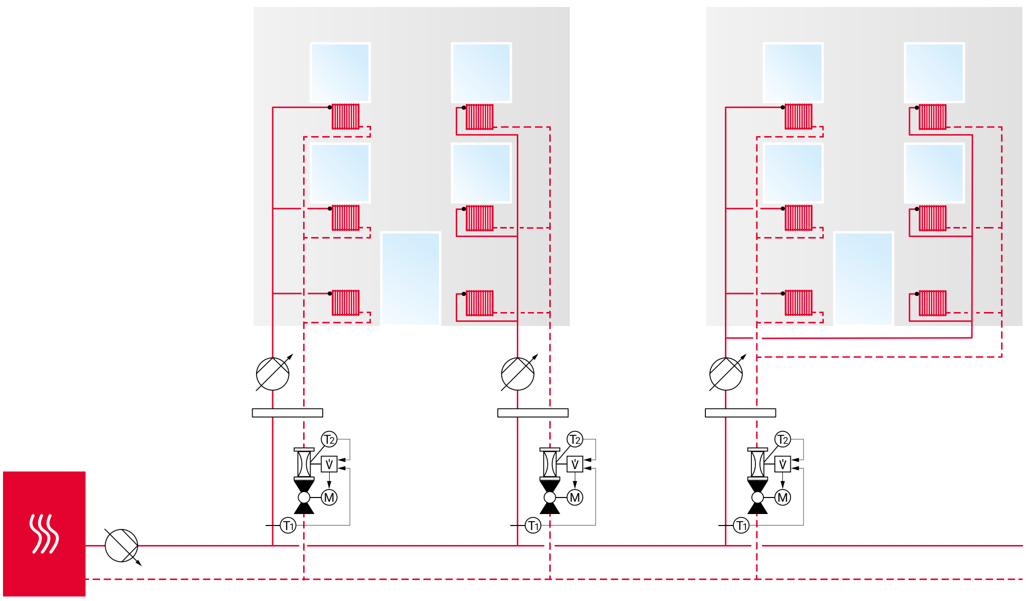
Current situation: constant primary flow

The boiler supplies energy to the primary network, and substations with low loss headers or heat exchangers are connected to the primary loop. The temperature of each circuit is regulated independently.



Operation
The primary network has a constant flow rate with static balancing. Each circuit has a recycling point either in a low loss header or via heat exchanger.
Solution limitations
It is not possible to vary the speed of the primary network pump. Return temperatures are not controlled.

Future situation: variable primary flow



Features and benefits

Modifications

The 3-way valves controlling the radiator supply temperature are replaced with Energy Valves mounted upstream of the low loss header or heat exchanger. The 3-way valve on the secondary side is no longer needed. The primary network pump is replaced by a variable-speed pump. The Belimo Energy Valve™ allows the effective setting of flow rates and temperatures to be validated.

Operation

The controller controls the Energy Valve to regulate the primary flow or thermal power in case of power control mode. The Belimo Energy Valve™ balances the primary network loop. The delta T manager ensures delta T in line with expectations, a low return temperature and thus maximum generator efficiency.

Features

Primary network:
Possibility of allocating or billing energy.
Pump optimiser-ready: adjustment of primary pump speed. The power demand of each network is transmitted to production.
Data made available: setpoints and measured values such as temperatures, flow, power and alarms.
Secondary network:
Easy adjustment of the supply rate and/or power in the event of an improvement in the energy performance of the buildings served.
Data for maintenance power or flow not achieved, supply and return temperatures, energy consumed.

Benefits

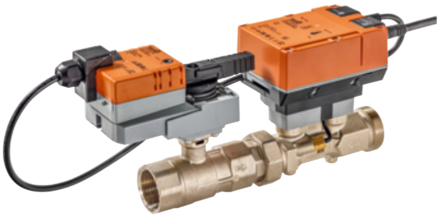
Improvement of primary and secondary flows to optimise delta T can save 8% of thermal energy.

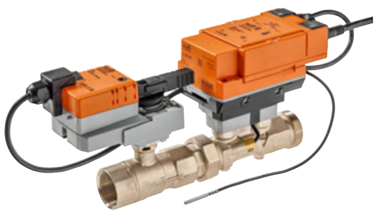
Possible subsidy

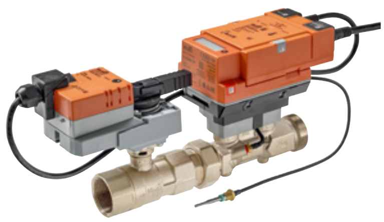
Depending on country

Product range options

Good	Better	Best
Balancing	Balancing, energy monitoring	Balancing, energy monitoring, billing
EPIV	Belimo Energy Valve™	Belimo Energy Valve™ + MID



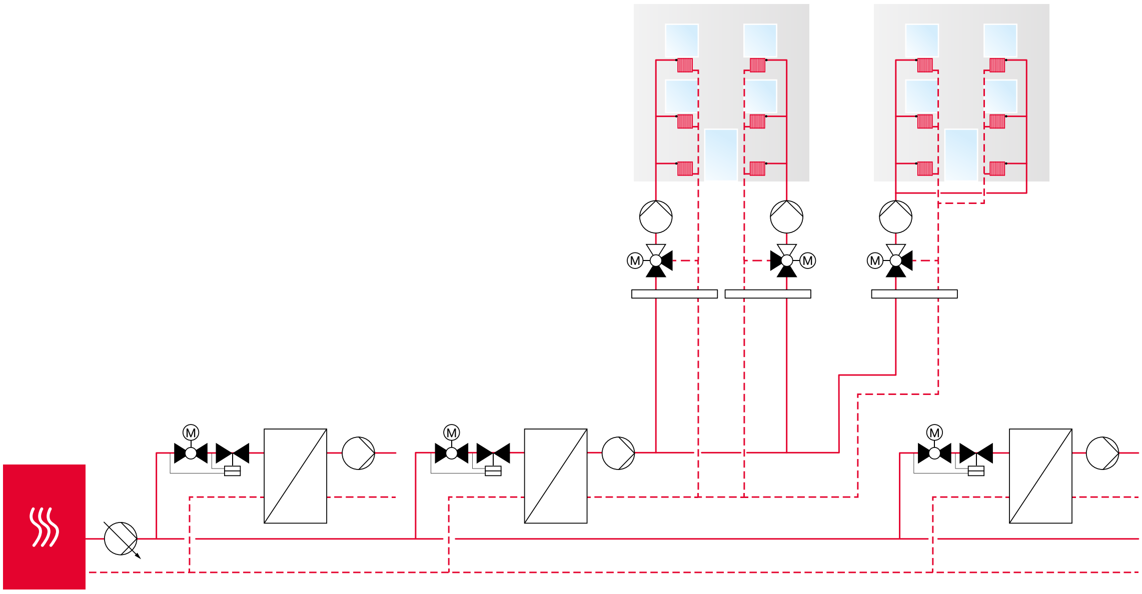




Lowering the return temperature to district heating networks

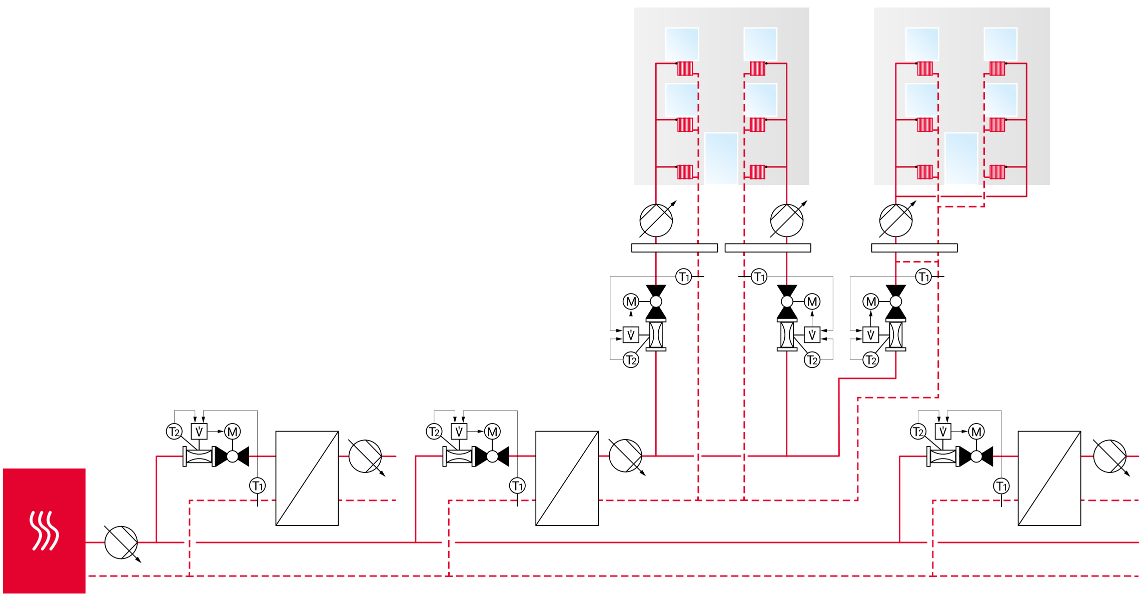
Current situation: constant-flow substations

The heating network supplies energy to each substation. The secondary networks downstream of the heat exchangers can serve one or more temperature-controlled circuits.



Operation
The primary network has a variable flow. The secondary networks have constant flow. Each circuit in the secondary networks has a low loss header.
Solution limitations
The possibility of varying the speed of the primary network pump is very low. Return temperatures are not controlled.

Future situation: variable-flow substations



Features and benefits

Modifications
The 3-way control valves are replaced by Belimo Energy Valves, which are installed upstream of a fixed bypass or low loss header. The secondary network pump is replaced by a variable-speed pump. The Belimo Energy Valve™ allows the effective setting of flow rates and temperatures to be validated.

Operation
The controller controls the Energy Valve to regulate the primary flow or thermal power in case of power control mode. The Belimo Energy Valves are controlled by the temperature controller of the current situation. The Energy Valve ensures balancing of each loop of the secondary network. The delta T manager ensures that the delta T is maintained and the return temperature of the secondary network is kept low.

Features
Primary network:
- Possibility of allocating or billing energy
- Pump optimiser-ready: adjustment of the speed of the pumps in the secondary networks
- The power demand of each network is transmitted to production
- Easy adjustment of the flow rate or power in the event of an improvement in the energy performance of the building
- Data made available: setpoints and measured values such as temperatures, flow, power and alarms

Secondary network:
- Easy adjustment of the flow rate or power in the event of an improvement in the energy performance of the building
- Data for maintenance: power or flow rate not achieved, delta T manager active

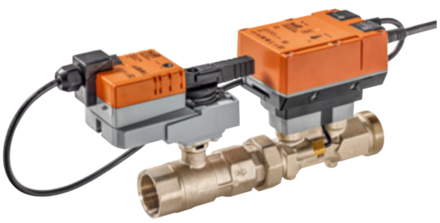
Benefits
Improvement of primary and secondary flow to optimise temperatures can save 11% of thermal energy.

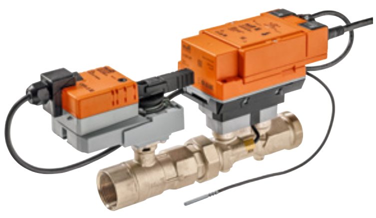
Possible subsidy

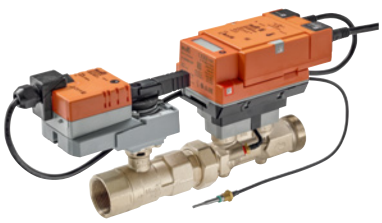
Depending on country

Product range options

Good	Better	Best
Balancing	Balancing, energy monitoring	Balancing, energy monitoring, billing
EPIV	Belimo Energy Valve™	Belimo Energy Valve™ + MID

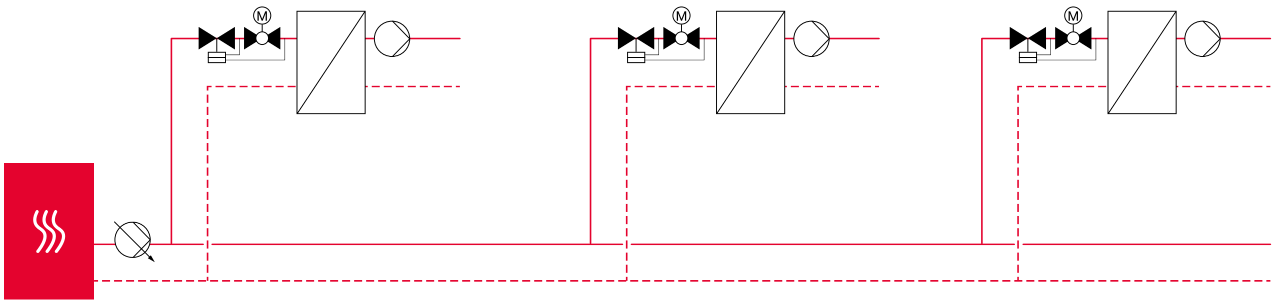






Recovery of waste heat for use in heating networks

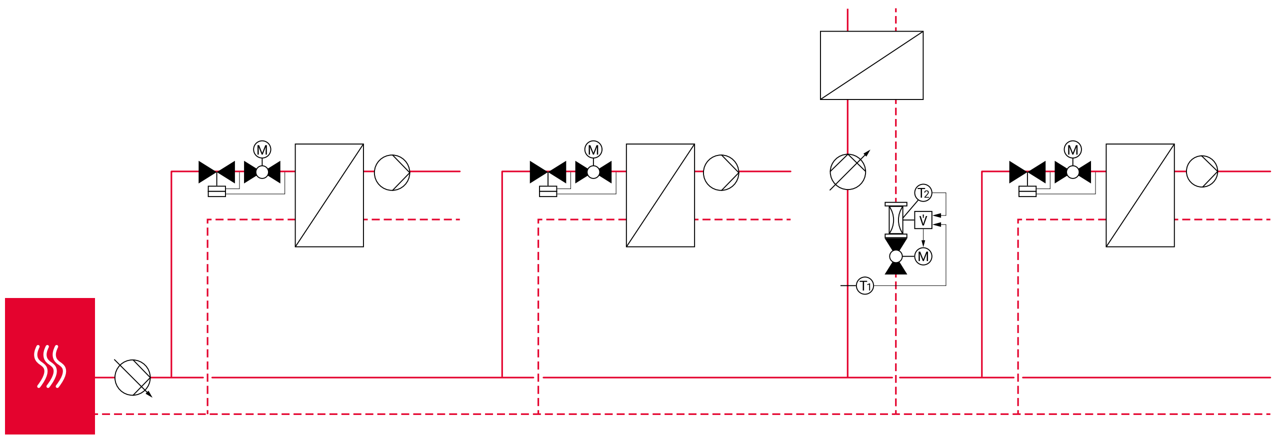
Current situation:
no heat recovery



Operation
Heating networks are supplied by one or more energy sources, which are then made available to other consumers.

Solution limitations
The heat produced by local industrial processes is not recovered.

Future situation:
heat recovery



Features and benefits

Modifications
Installation of a heat exchanger to recover waste heat from an industrial process. A Belimo Energy Valve™ is installed on the energy recovery circuit.

Operation
The flow of water heated by the recovery heat exchanger is regulated by the Belimo Energy Valve™. The delta T manager allows this flow rate to maintain the supply and return temperatures.

Features
Ideally, the heat recovery system is operated in supply temperature control mode. The recovered energy is measured directly by the Energy Valve. The delta T manager ensures that the design temperatures are adhered to. Energy data is made available to management systems via standardised buses and APIs.

Benefits
The Energy Valve prevents the circuit from overflowing and thus running at low efficiency. The heat recovery potential depends on the simultaneity of the waste heat available and the demand in the heating network.

Possible subsidy

Depending on country

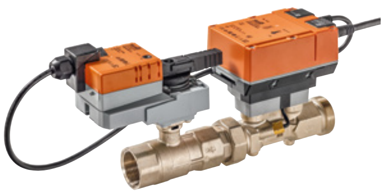
Product range options

Good
Supply temperature control

Characterised control valve

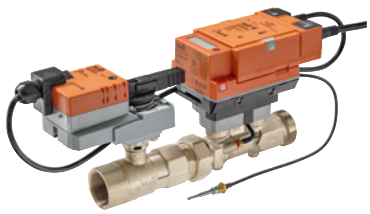
Better
Energy monitoring

Belimo Energy Valve™



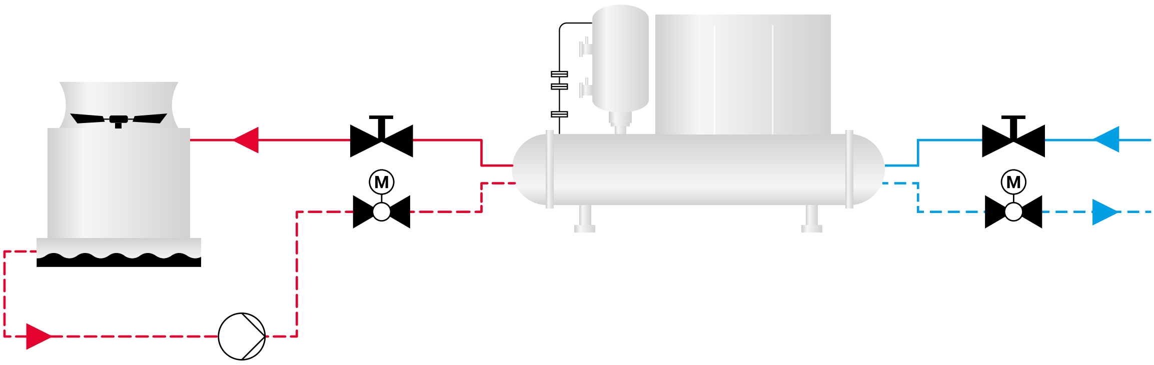
Best
Balancing, energy monitoring, billing

Belimo Energy Valve™ + MID



Heat recovery in a cooling system

Current situation: no heat recovery



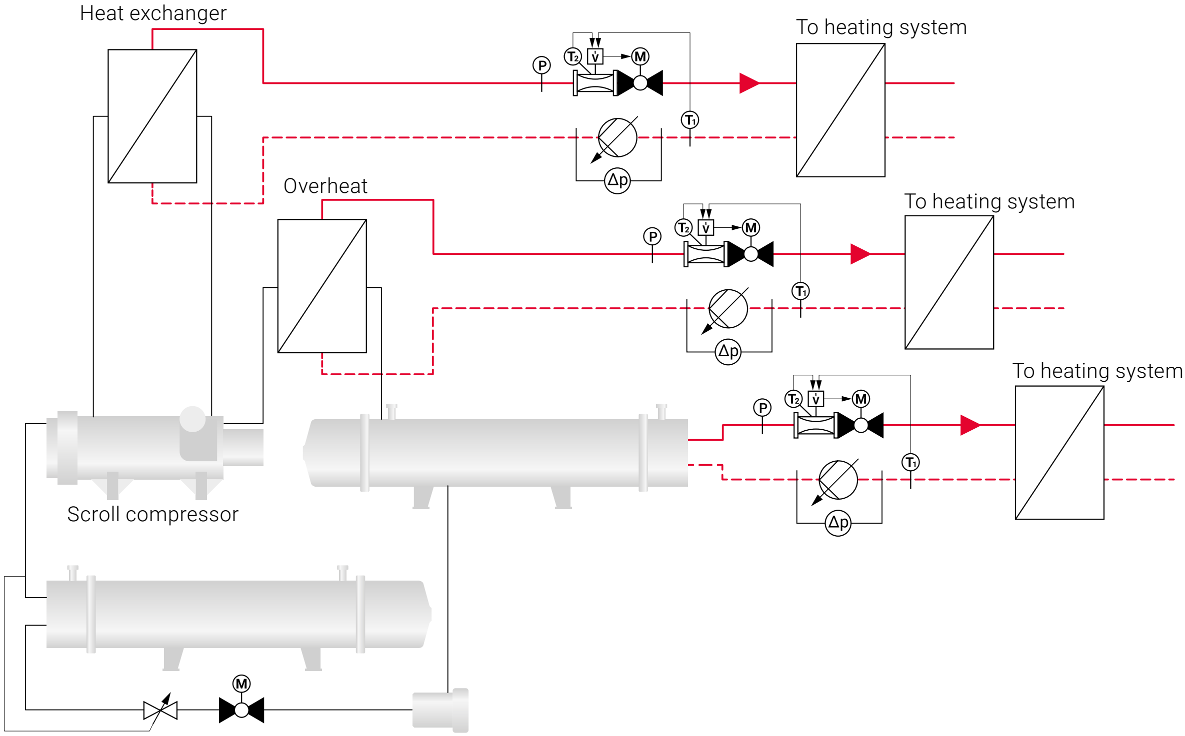
Operation

Heat from the cooling unit is released into the atmosphere. This energy is considered to be wasted and not recovered.

Solution limitations

A large proportion of the energy generated by chillers is found in cooling towers in the form of warm water (typically 20 to 70°C), which is constantly cooled by outside air.

Future situation: heat recovery



Features and benefits

Modifications
Installation of a heat exchanger to recover heat. A Belimo Energy Valve™ is installed in the heat recovery system.

Operation
The delta T manager of the Energy Valve monitors the supply and return temperature. In case the delta T falls below a certain value, the Energy Valve reduces the flow to maintain the delta T set by the user. The designed flow is maintained and the system operates at its best efficiency.

Features
The Belimo Energy Valve™ works autonomously; no temperature control is required.
Energy data is made available to management systems via standardised buses and API, Belimo Cloud.

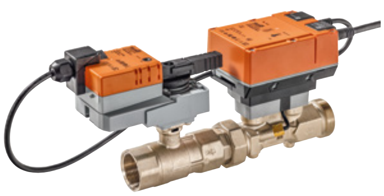
Benefits
The Energy Valve prevents the circuit from overflowing and thus running at low efficiency. The heat recovery potential depends on the simultaneity of the process to be cooled and the heat demand of the recovery system.

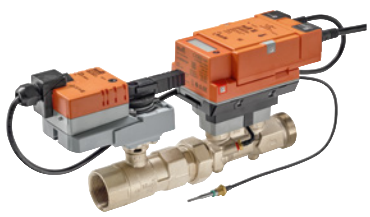
Possible subsidy

Depending on country

Product range options

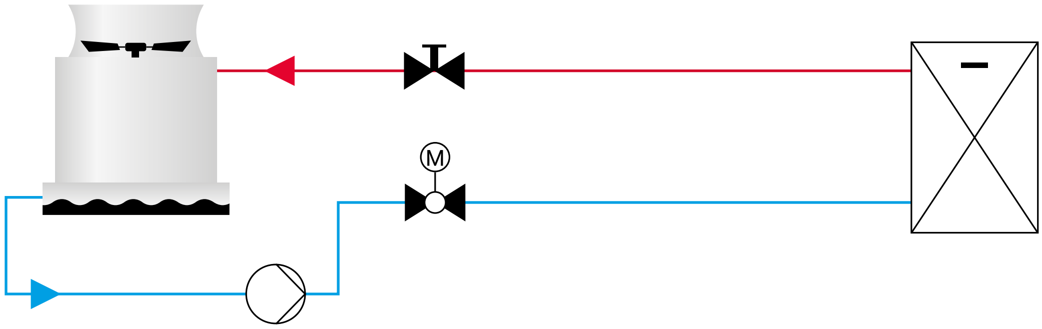
Good	Better	Best
Supply temperature control	Energy monitoring	Balancing, energy monitoring, billing
Characterised control valve	Belimo Energy Valve™	Belimo Energy Valve™ + MID





Heat recovery system in a cooling tower

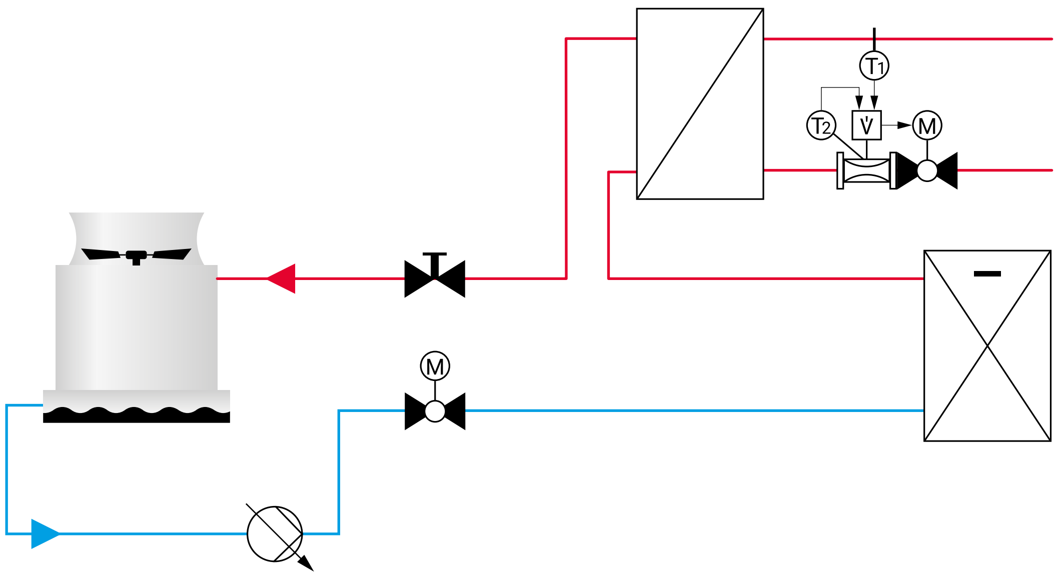
Current situation: no heat recovery



Operation
The heat extracted from the process is released into the atmosphere. This energy is considered to be wasted and not recovered.

Solution limitations
The return temperature in the condensers is not controlled; all energy extracted is lost to the atmosphere.

Future situation: heat recovery



Features and benefits

Modifications
Installation of a heat exchanger to recover heat before dissipation by the cooling tower. A Belimo Energy Valve™ is installed in the heat recovery system.

Operation
The delta T manager of the Energy Valve monitors the supply and return temperature. In case the delta T falls below a certain value, the Energy Valve reduces the flow to maintain the delta T set by the user. The designed flow is maintained and the system operates at its best efficiency.

Features
The Belimo Energy Valve™ works autonomously; no temperature control is required. Energy data is made available to management systems via standardised buses and API. If the hot network is protected with glycol, this is measured and automatically compensated for by the Energy Valve.

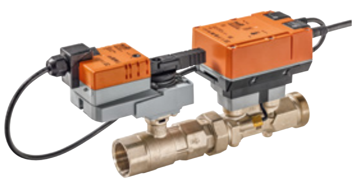
Benefits
The Energy Valve prevents the circuit from overflowing and thus running at low efficiency. The heat recovery potential depends on the simultaneity of the process to be cooled and the heat demand of the recovery system.

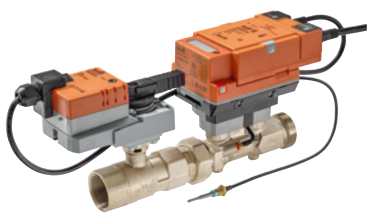
Possible subsidy

Depending on country

Product range options

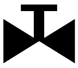
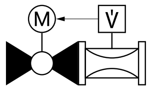
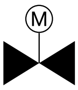
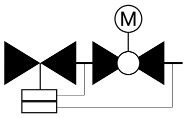
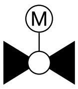
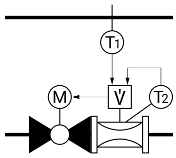
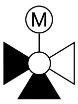
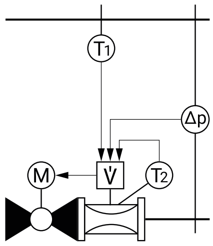
Good	Better	Best
Supply temperature control	Energy monitoring	Balancing, energy monitoring, billing
Characterised control valve	Belimo Energy Valve™	Belimo Energy Valve™ + MID



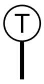
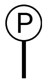
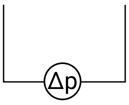


Legend

Products

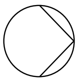
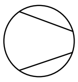
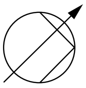
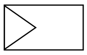
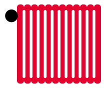
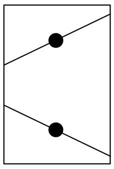
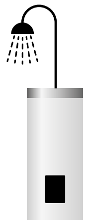
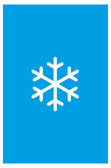
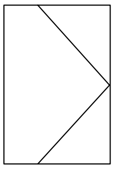
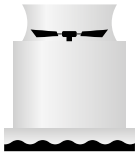
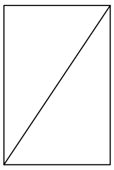
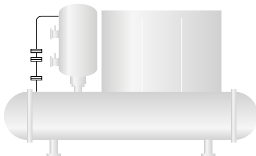
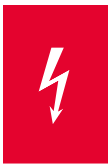
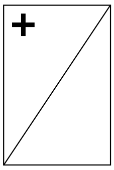
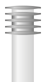
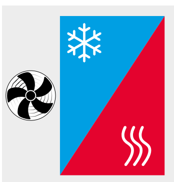
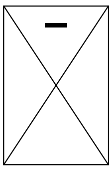
Symbol	Name	Symbol	Name
	Manual 2-way open/close valve		2-way EPIV
	2-way open/close valve		2-way PIQCV
	2-way ball valve with rotary actuator		Belimo Energy Valve™
	3-way characterised control valve		Belimo Energy Valve™ with dp control

Sensors

Symbol	Name	Symbol	Name
	Temperature sensor		Pressure sensor
	Differential pressure sensor		

Legend

Components

Symbol	Name	Symbol	Name	Symbol	Name
	Single-stage pump		Fan		Heat consumer
	Variable speed pump		Controller		Heater
	Heat generator		Air damper		Hot-water tank
	Chiller		Air filter		Cooling tower
	Chiller / Heat generator		Heat exchanger		Compressor
	Electric air heater		Air heater		Outdoor weather sensor
	Fan coil		Air cooler		Chilled beam
	Chilled ceiling				

All inclusive.

Belimo as a global market leader develops innovative solutions for the controlling of heating, ventilation and air-conditioning systems. Damper actuators, control valves, sensors and meters represent our core business.

Always focusing on customer value, we deliver more than only products. We offer you the complete product range for the regulation and control of HVAC systems from a single source. At the same time, we rely on tested Swiss quality with a five-year warranty. Our worldwide representatives in over 80 countries guarantee short delivery times and comprehensive support through the entire product life. Belimo does indeed include everything.

The "small" Belimo devices have a big impact on comfort, energy efficiency, safety, installation and maintenance.

In short: Small devices, big impact.

- 5-year guarantee
- On site around the globe
- Complete product range
- Tested quality
- Short delivery times
- Comprehensive support

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EN – 2024-05/B – Subject to technical modifications