

Belimo – Applications Chillers and cooling towers

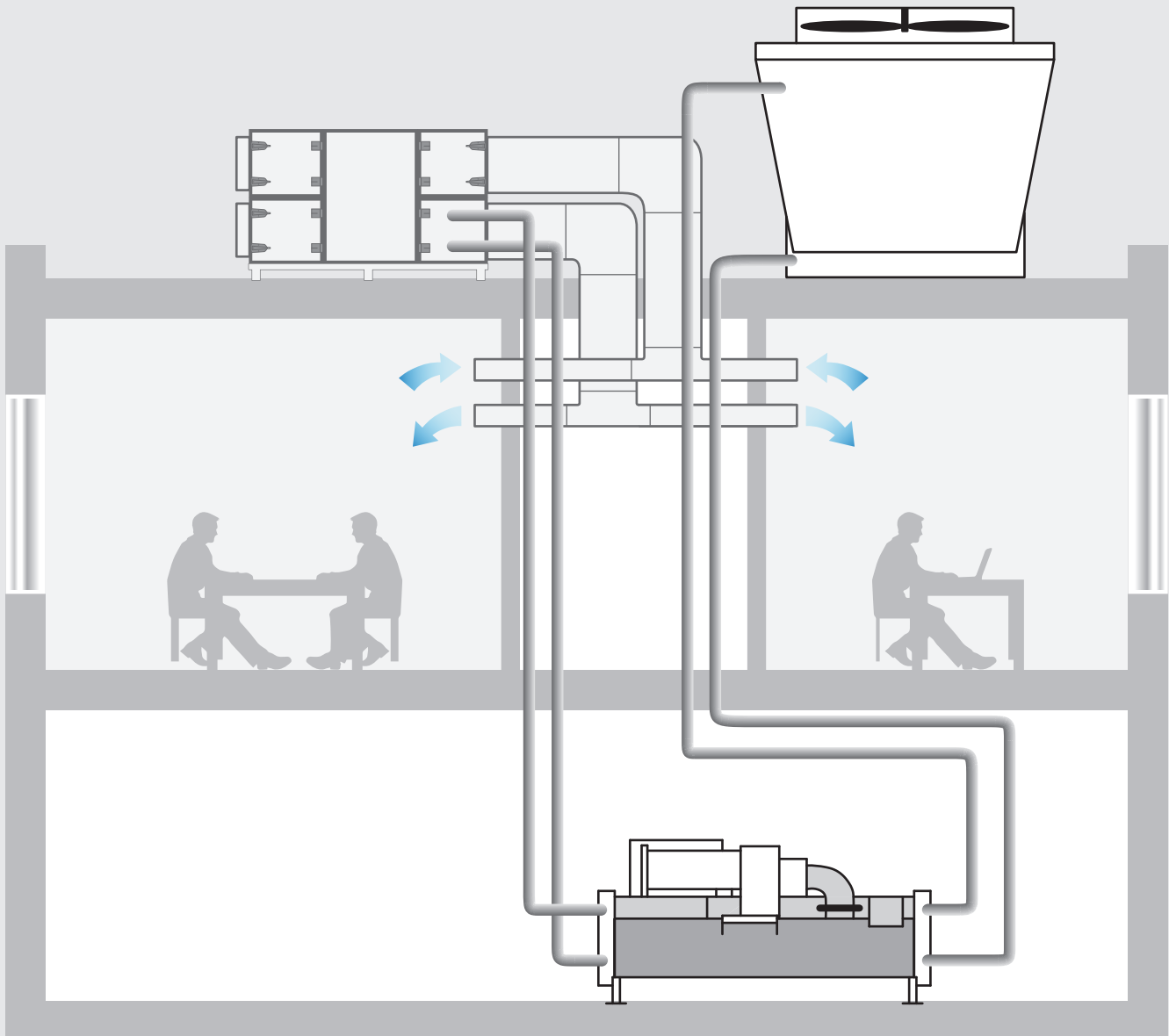
Preface

Preface

In chillers and cooling tower applications, it is possible to select from various products. For this reason, we show you different possibilities of how you can equip your cooling applications. The following isolation, change-over and control applications are taken into account:

- Isolation of chillers and bypass in closed cooling tower
- Isolation of chillers and isolation of open cooling tower with fail-safe function
- Hybrid cooling
- Emergency cooling with fail-safe function
- Bypass chillers with 2-way control valve
- Bypass open cooling tower with 2-way control valve
- Chiller start-up circuit
- Cooling with ice storage

The diagram shows an example of the interaction between a chiller and a cooling tower with a cooling register in an air handling unit ventilation system (consumer).



The Belimo butterfly valves and actuators offer maximum flexibility.



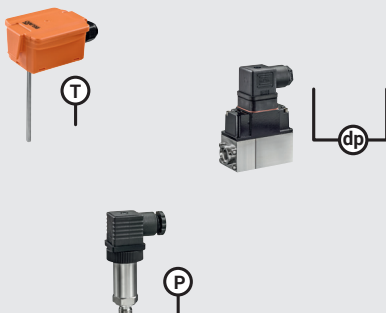
Belimo actuators and butterfly valves have been specially developed for HVAC technology and are perfectly coordinated. This means that they are maintenance free over their entire lifecycle. All butterfly valve-actuator combinations with PR actuators are equipped with Near Field Communication (NFC) and enable rapid commissioning and parametrisation via your smartphone. The SuperCap technology also offers an intelligent and energy-efficient alternative to the mechanical spring-return.

Simple and durable globe valve actuator.












Globe valves are the proven and trusted solution for chiller and cooling tower applications. The globe valve actuators from Belimo with their universal actuator concept ensure optimum and robust motorisation. They are the ideal complement to our characterised control valves, even when it comes to high temperatures, pressure classes, flow rates and linear control characteristics. Simple and safe to install, reliable and maintenance-free during operation. Also available in stainless steel for special applications.

Belimo sensors – the perfect complement to actuators and valves.



The sensors from Belimo meet the highest quality and reliability requirements. Using innovative technology, simple installation and seamless compatibility with all essential building automation systems is guaranteed. Installation and commissioning only take a few steps thanks to the well thought out design. The specially designed snap-on cover allows for tool-free assembly. Spring loaded terminal blocks are used in the housing, which ensure that wiring is easy to carry out.










Belimo butterfly valve product range and globe valve product comparison

	2-way		
			
	2-way open/close butterfly valve	2-way control butterfly valve	2-way globe valve
 Applications	<ul style="list-style-type: none"> • DN 25...700 • With fail-safe function DN 25...300 	<ul style="list-style-type: none"> • Equal-percentage characteristic curve DN 25...700 • Linear characteristic curve DN 150...300³⁾ • With fail-safe function DN 25...300 	<ul style="list-style-type: none"> • Equal-percentage characteristic curve DN 15...150 • Linear characteristic curve DN 200...250 • With fail-safe function DN 15...100
	<ul style="list-style-type: none"> • For open and closed water circuits 		<ul style="list-style-type: none"> • For open water circuits DN 15...50 • For closed water circuits DN 15...250
 Flexibility	<ul style="list-style-type: none"> • Universal power supplies 24...230 V¹⁾ • Running time 30...120 s adjustable¹⁾ • Degree of protection IP66/67 	<ul style="list-style-type: none"> • Control 0.5...10 V, 2...10 V, 4...20 mA, communicative¹⁾ • Universal power supplies 24...230 V¹⁾ • Running time 30...120 s adjustable • Degree of protection IP66/67 	<ul style="list-style-type: none"> • Control 0.5...10 V, 2...10 V, 4...20 mA, communicative²⁾ • Running time 35...150 s adjustable • Adjustable characteristic curve²⁾
 Installation	<ul style="list-style-type: none"> • Any direction of flow and any installation in the pipeline 		<ul style="list-style-type: none"> • Take note of the direction of flow when installing in the pipeline
 Commissioning	<ul style="list-style-type: none"> • Clearly visible position indication • Fast and simple commissioning with the Belimo Assistant App¹⁾ 		<ul style="list-style-type: none"> • With position indicator
 Communication	<ul style="list-style-type: none"> • BACnet MS/TP DN 25...300 • Modbus RTU DN 25...300 • Belimo MP-Bus DN 25...300 		<ul style="list-style-type: none"> • Belimo MP-Bus DN 15...150 • BACnet MS/TP DN 15...100 • Modbus RTU DN 15...100 • LON DN 15...100
 Energy efficiency	<ul style="list-style-type: none"> • Leakage: leakage rate A, tight (EN 12266-1) 		<ul style="list-style-type: none"> • Leakage: 0.05% of k_{VS}

¹⁾ Motorisation with PR actuators DN 150...300

²⁾ Motorisation with actuators with MP-Bus DN 15...150

³⁾ Planned market launch 2020

	3-way		
	 3-way change-over butterfly valve	 3-way control butterfly valve	 3-way globe valve
 Applications	<ul style="list-style-type: none"> • DN 150...300 	<ul style="list-style-type: none"> • Equal-percentage characteristic curve DN 150...300 • Linear characteristic curve DN 150...300³⁾ 	<ul style="list-style-type: none"> • Equal-percentage characteristic curve DN 15...150 • Linear characteristic curve DN 200...250
 Flexibility	<ul style="list-style-type: none"> • Control 0.5...10 V, 2...10 V, 4...20 mA, communicative • Universal power supply 24...230 V • Running time 30...120 s adjustable • Degree of protection IP66/67 	<ul style="list-style-type: none"> • For open and closed water circuits DN 150...300 	<ul style="list-style-type: none"> • For open water circuits DN 15...50 • For closed water circuits DN 15...250
 Installation	<ul style="list-style-type: none"> • Any direction of flow and any installation in the pipeline or on the optionally available T-piece • Installation permissible at the mixing and diverting point 	<ul style="list-style-type: none"> • Control 0.5...10 V, 2...10 V, 4...20 mA, communicative²⁾ • Running time 35...150 s adjustable • Adjustable characteristic curve²⁾ 	<ul style="list-style-type: none"> • Take note of the direction of flow when installing in the pipeline • Installation usually only permissible at the mixing point
 Commissioning	<ul style="list-style-type: none"> • Clearly visible position indication 	<ul style="list-style-type: none"> • Fast and simple commissioning with the Belimo Assistant App 	<ul style="list-style-type: none"> • With position indicator
 Communication	<ul style="list-style-type: none"> • BACnet MS/TP DN 150-300 • Modbus RTU DN 150-300 • Belimo MP-Bus DN 150-300 		<ul style="list-style-type: none"> • Belimo MP-Bus DN 15-150 • BACnet MS/TP DN 15-100 • Modbus RTU DN 15-100 • LON DN 15-100
 Energy efficiency	<ul style="list-style-type: none"> • Leakage in control and bypass path: leakage rate A, tight (EN 12266-1) 		<ul style="list-style-type: none"> • Leakage in control path: 0.05% of k_{VS} • Leakage in bypass: 1% of k_{VS}

²⁾ Motorisation with actuators with MP-Bus DN 15-150

³⁾ Planned market launch 2020

Introduction

Thank you for your interest in our products. In this brochure you will find information for planning applications with chillers and cooling towers. We also describe innovative Belimo products that you can use in your cooling applications. Of course, our recommendations and useful advice do not replace the individual system planning and design of hydraulic components. As a rule, planning an application should always be done in coordination with the manufacturers of chillers, cooling towers and pumps.




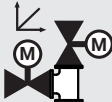

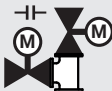



All sections are split up in the same way:

1. Hydraulic diagram
2. Application description
3. Bill of material
4. Belimo – features and advantages

You can find summarised tender texts starting from **page 43**.

Please contact us for more information.

Legend – Water products

	2-way open/close butterfly valve		3-way change-over butterfly valve
	2-way control butterfly valve or globe valve		3-way control butterfly valve ¹⁾
	2-way open/close butterfly valve with fail-safe function		3-way change-over butterfly valve with fail-safe function
	Manual 2-way open/close butterfly valve		2-way open/close ball valve
	3-way globe valve		

¹⁾ Note: The hydraulic diagrams are drawn with 3-way control butterfly valves. A 3-way globe valve can also be used in these applications.

Legend – Sensors



Temperature sensor

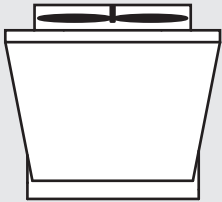


Differential pressure sensor

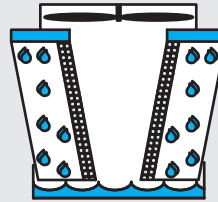


Pressure sensor

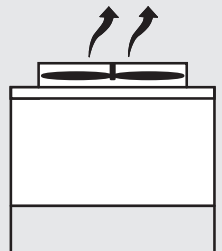
Legend for additional components



Closed cooling tower



Open cooling tower



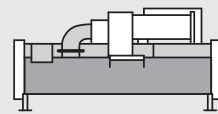
Dry-cooler



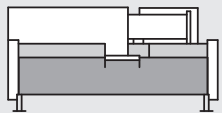
Ice storage tank



Hydraulic separator ¹⁾



Compression chiller



Screw chiller

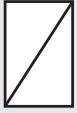


Pump

¹⁾ Note: The hydraulic diagrams are drawn with a hydraulic switch. A buffer tank can also be used in these applications.

Legend

Legend for additional components



Transfer station / heat exchanger



Strainer



Room with cooling requirement (consumer)



Data centre (consumer)

Disclaimer

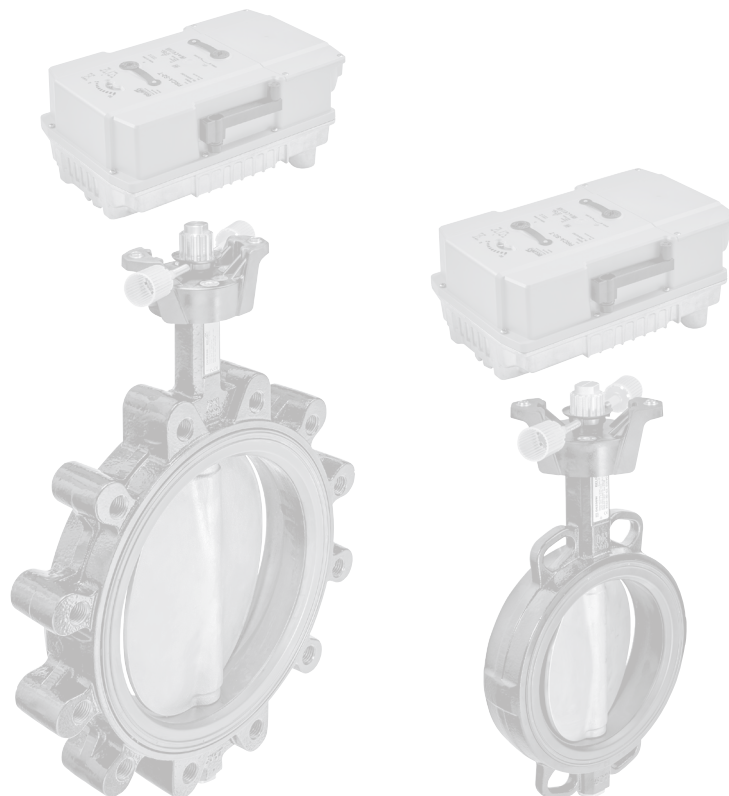
Please note that the pictures are examples only and may therefore vary, depending on the chiller or cooling tower application. Subject to modifications and amendments. Please get in touch with your local Belimo contact person to check the specifications.

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Isolation of chillers and bypass in closed cooling tower

Shows a typical isolation application with several chillers

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Hydraulic diagram

1

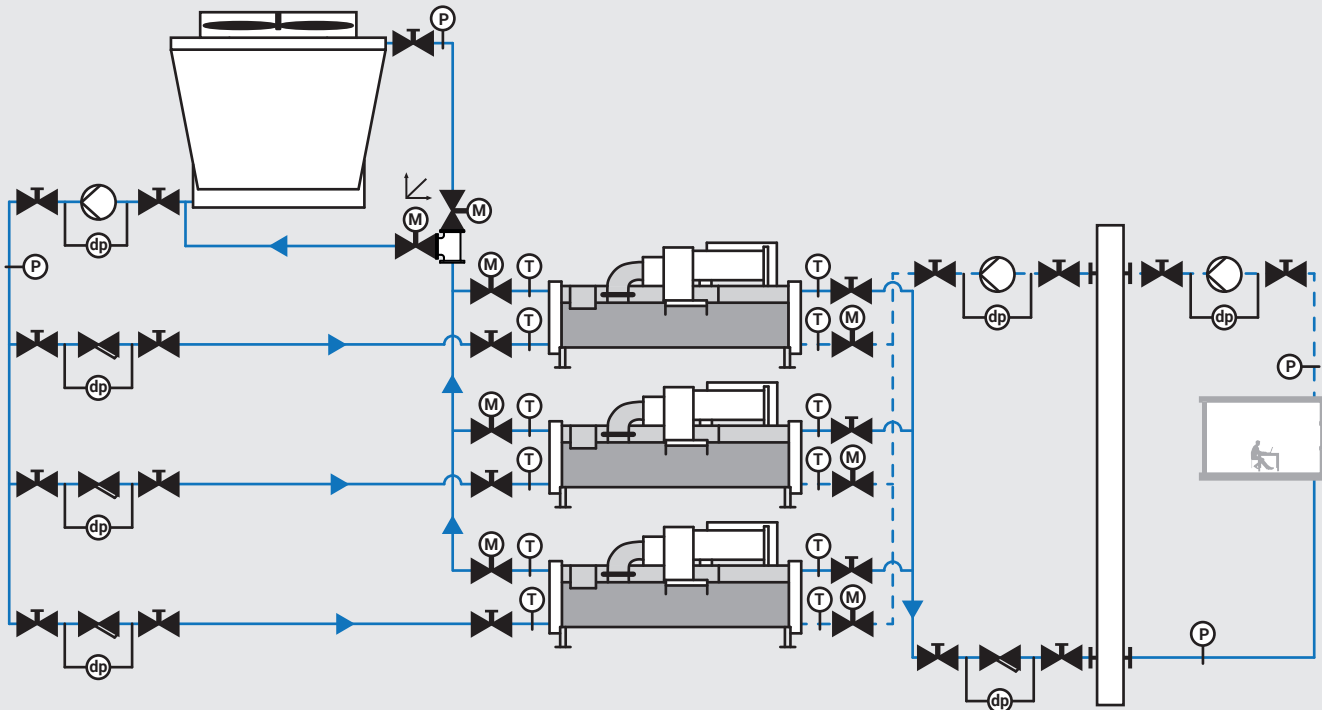


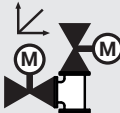





Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

- Motorised open/close butterfly valves are responsible for the isolation of the various chillers
- Depending on cooling requirements, one, two or three chillers are in operation
- Manual open/close butterfly valves with worm gears isolate the pumps, the chillers, the cooling tower and the strainers during commissioning or maintenance.
- The 3-way control butterfly valve (diverting valve) performs temperature control on the cooling tower so that the downstream entry temperature on the chillers is not too low
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation

Bill of material

	Belimo type	Description	Quantity	Costs
	D6..W(L) D6..N(L)	Open/close butterfly valve, wafer or lug type, DN	6	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	21	
	D7../BAC	3-way control butterfly valve with lug type, DN	1	
	ZD7..	T-piece for 3-way control butterfly valve. DN	1	
	01DT-.. or 22DT-..	Immersion temperature sensor	12	
	22WDP-..	Differential pressure sensor	7	
	22WP-..	Static pressure sensor	4	

Belimo – features and advantages

1

Valves & actuators

Features	Advantages
Tight-closing valve with leakage rate A, tight (EN 12266-1)	No wastage of energy
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Fast running time of 35 s (configurable between 30 and 120 s)	Fast cooling supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Sensors

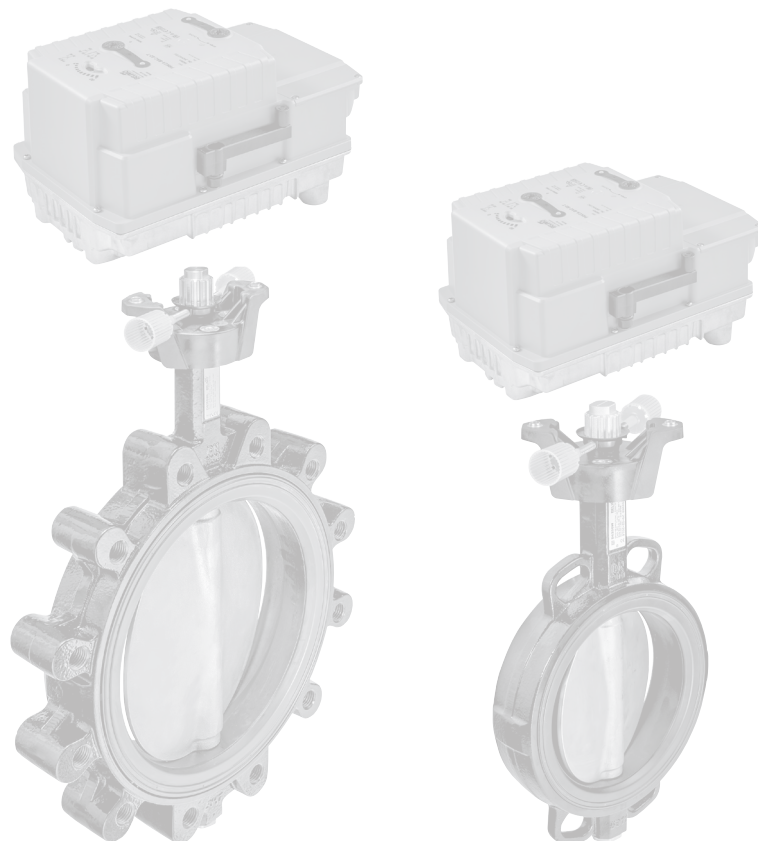
Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

2

Isolation of chillers and isolation of open cooling tower with fail-safe function

Shows a typical isolation application with actuators with fail-safe function

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Hydraulic diagram

2

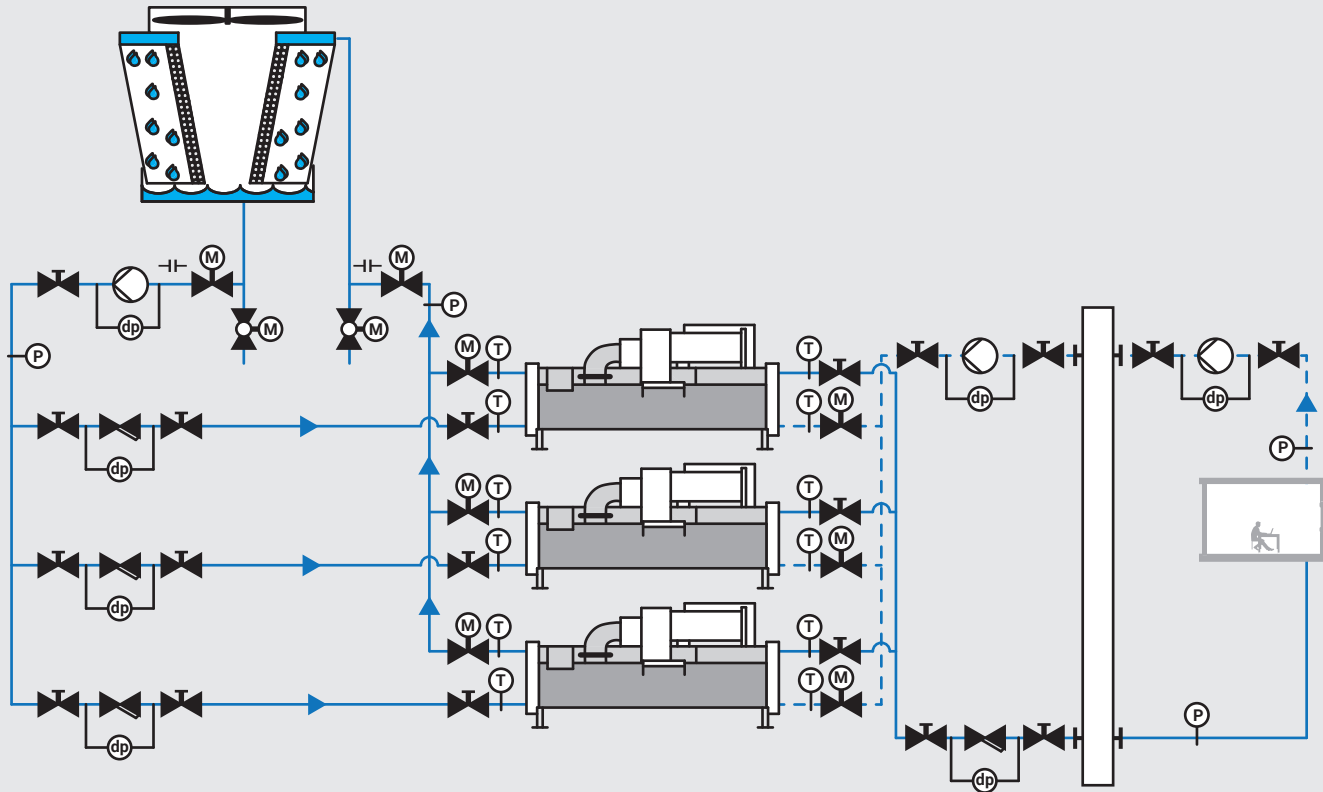










Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

- Isolation of open cooling tower with fail-safe function
- The open/close butterfly valves with fail-safe function prevent the open cooling tower from running dry in case of voltage interruption
- Manual open/close butterfly valves with worm gears isolate the pumps, the chillers, the cooling tower and the strainers during commissioning or maintenance.
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation
- Open/close ball valves, for example with nominal diameter DN 20, ensure that the pipes in open cooling towers are emptied prior to winter operation
- The open/close ball valves can optionally be motorised with a fail-safe function actuator
- All valves underneath the open cooling tower are in a frost-free area

Bill of material

	Belimo type	Description	Quantity	Costs
	D6..W(L) D6..N(L)	Open/close butterfly valve, wafer or lug type, DN	8	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	PRKCA-BAC-S2-T..	Multifunctional rotary fail-safe function actuator, 160 Nm, AC 24...240 V / DC 24...125 V	2	
	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	19	
	01DT-.. or 22DT-..	Immersion temperature sensor	12	
	22WDP-..	Differential pressure sensor	7	
	22WP-..	Static pressure sensor	4	
	R20..-S.. + LR..A	Open/close ball valve DN with rotary actuator 5 Nm Optional: rotary fail-safe function actuator LRF..	2	

Belimo – features and advantages

Valves & actuators

Features	Advantages
Tight-closing valve with leakage rate A, tight (EN 12266-1)	No wastage of energy
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Fast running time of 35 s (configurable between 30 and 120 s)	Fast cooling supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Sensors

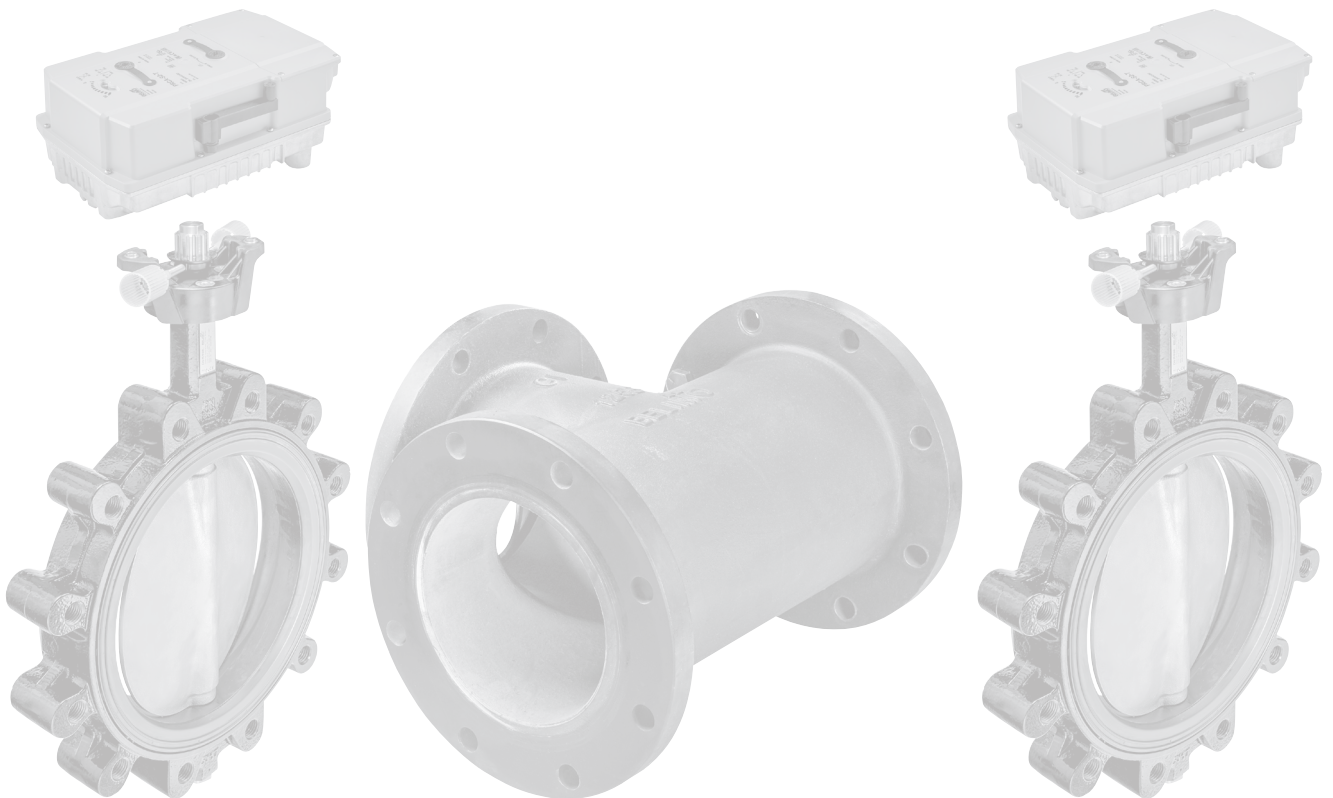
Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

3

Hybrid cooling

Shows a typical change-over application between free cooling and cooling with a chiller

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Hydraulic diagram

3

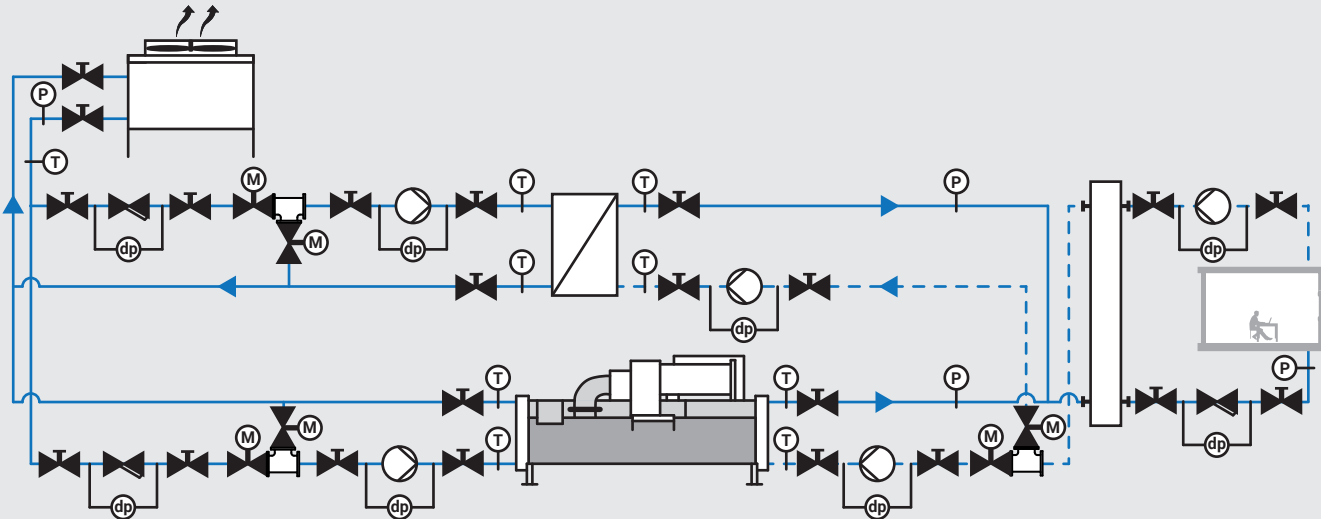








Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

- Hybrid cooling is a change-over application, in which either free cooling is used in cold weather conditions or cooling with a chiller is used in warm weather conditions
- The 3-way change-over butterfly valve handles the change-over between free cooling and cooling with the chiller
- The two 3-way control butterfly valves (mixing valves) control the temperatures at the heat exchanger and/or the chiller (the required linear characteristic curves for constant flow can be parameterised with the Belimo Assistant App)
- Alternatively to the 3-way control butterfly valves, 3-way globe valves can be used
- Manual open/close butterfly valves with worm gears isolate the pumps, chillers, dry cooler and strainers during commissioning and maintenance
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation

Bill of material

Belimo type	Description	Quantity	Costs
 D7../BAC	3-way change-over valve or control butterfly valve with Belimo lug types, DN	3	
 ZD7..	T-piece for 3-way control butterfly valve. DN	3	
 D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	22	
 01DT-.. or 22DT-..	Immersion temperature sensor	9	
 22WDP-..	Differential pressure sensor	8	
 22WP-..	Static pressure sensor	4	

3

Belimo – features and advantages

Valves & actuators

Features	Advantages
Tight-closing valve with leakage rate A, tight (EN 12266-1)	No wastage of energy
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Equal percentage and linear characteristic curve (configurable using the Belimo Assistant App)	Cost-effective and reliable control valve Perfect characteristic curve for mixing and diverting
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Fast running time of 35 seconds (configurable between 30 and 120 seconds)	Fast chiller start-up for fast cooling supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Sensors

Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

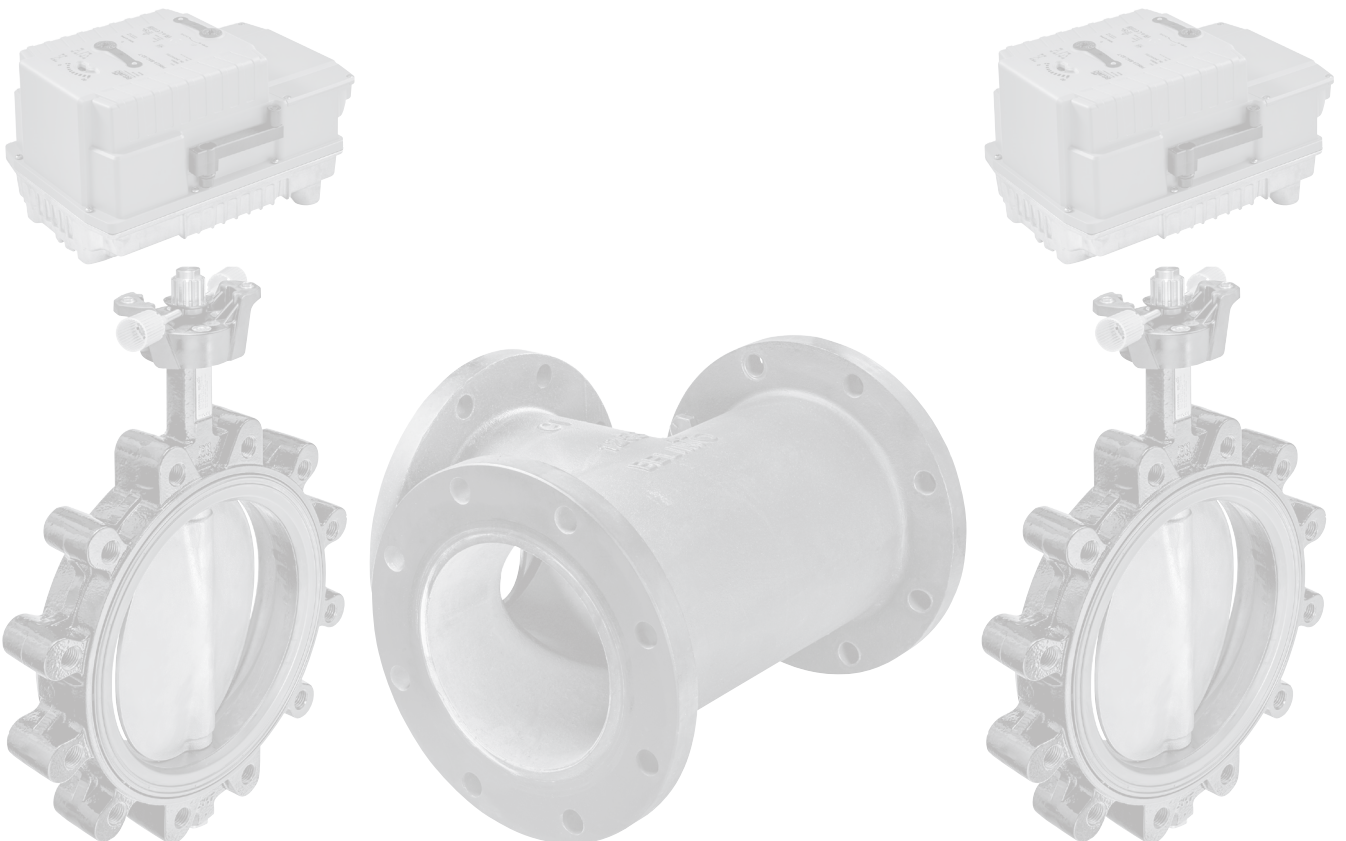
4

Emergency cooling with fail-safe function

Shows a typical change-over application with actuators with fail-safe function (changing between normal cooling and emergency cooling)

4

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Hydraulic diagram

4

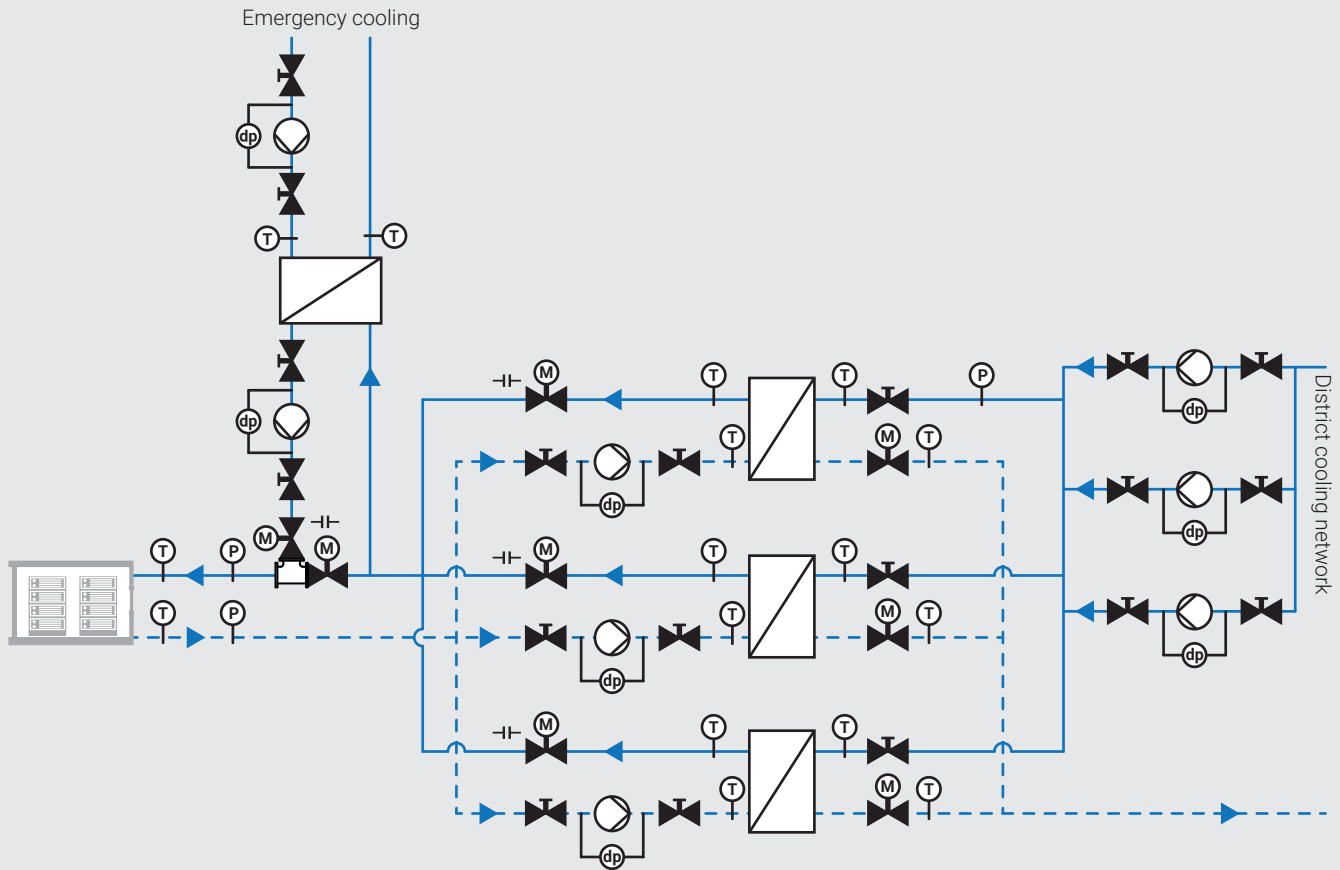










Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

- The 3-way change-over butterfly valve with fail-safe function switches between normal cooling (district cooling in this example) and emergency cooling in case of a voltage interruption
- Manual open/close butterfly valves with worm gears shut off the pumps and transfer stations during commissioning or maintenance
- Differential pressure sensors monitor the differential pressure of the pump to ensure the pump is functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Static pressure sensors detect leakages in the system
- To guarantee emergency cooling, the pumps must be supplied with emergency power for emergency cooling

Bill of material

	Belimo type	Description	Quantity	Costs
	D6..W(L) D6..N(L)	Open/close butterfly valve, wafer or lug type, DN	8	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	3	
	PRKCA-BAC-S2-T..	Multifunctional rotary fail-safe function actuator, 160 Nm, AC 24...240 V / DC 24...125 V	5	
	ZD7..	T-piece for 3-way change-over butterfly valve, DN	1	
	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	19	
	01DT-..	Immersion temperature sensor	16	
	22WDP-..	Differential pressure sensor	8	
	22WP-..	Static pressure sensor	3	

Emergency cooling with fail-safe function

Belimo – features and advantages

Valves & actuators

Features	Advantages
Tight-closing valve with leakage rate A, tight (EN 12266-1)	No wastage of energy
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Flexible installation at T-piece	Flexible planning
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Electrical fail-safe function (adjustable 0...100%)	High operating safety
Fast running time of 30...120 s (configurable)	Fast change-over between normal cooling and emergency cooling
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Sensors

Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

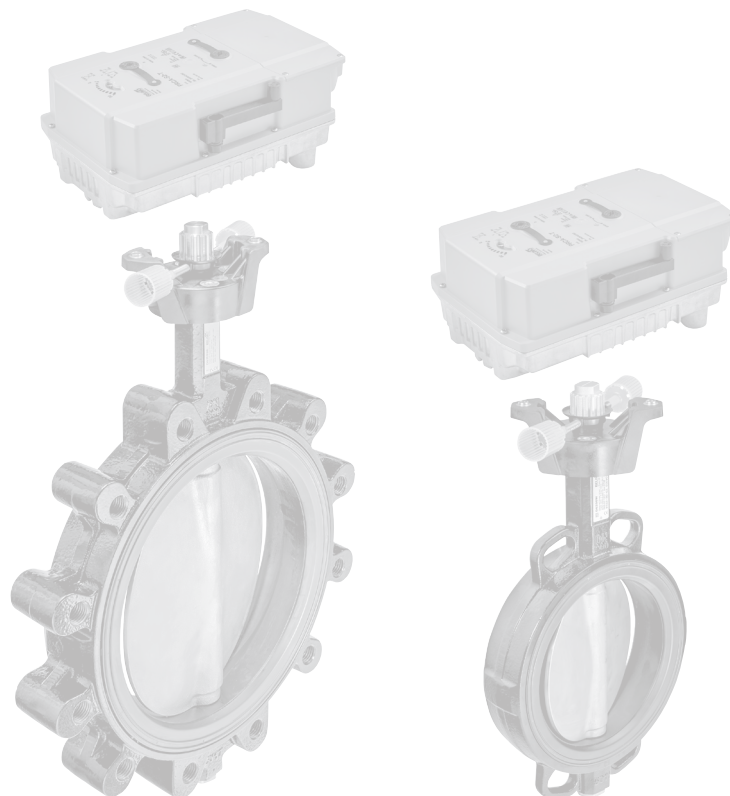
5

Bypass chillers with 2-way control valve

Shows a typical control application when bypassing a chiller

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5



Hydraulic diagram

5

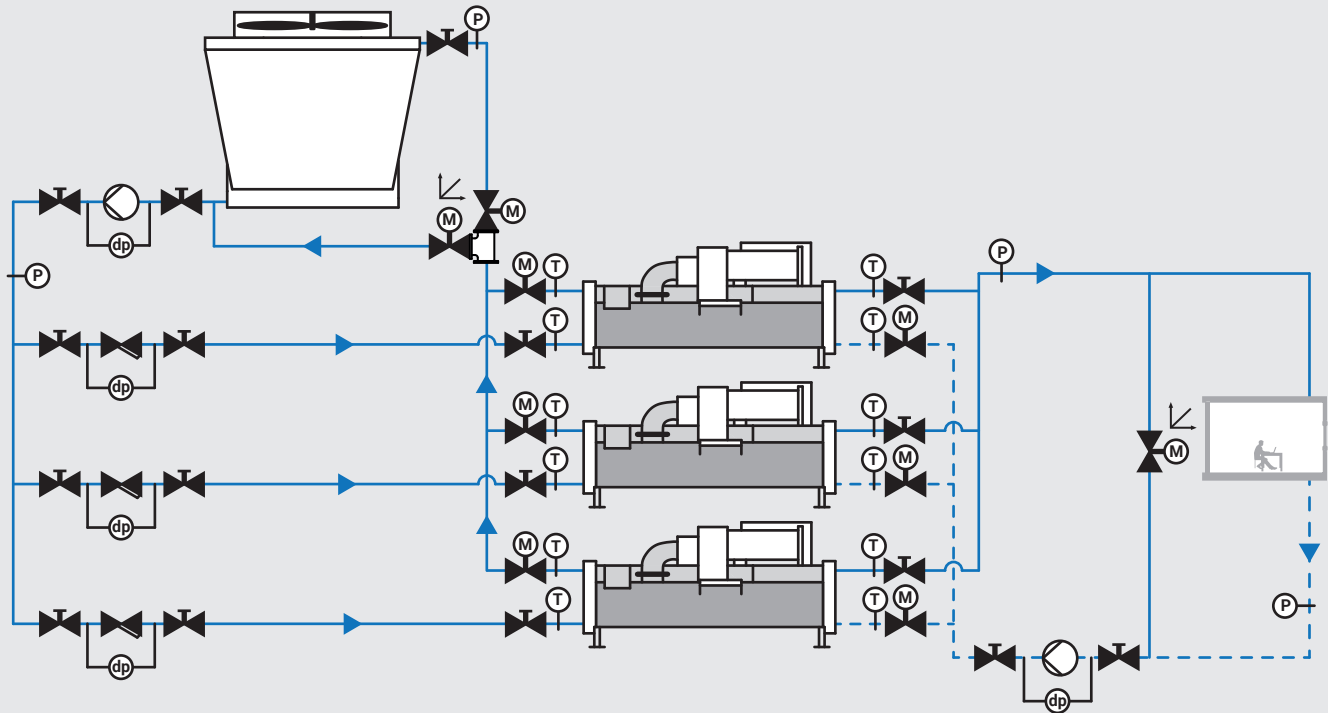


Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

- In the case of partial-load operation on the cooling consumer, the remaining amount of water is guided through the control valve (2-way control butterfly valve or 2-way globe valve) as a bypass
- In the case of full-load operation on the cooling consumer, the bypass valve is closed
- The 3-way control butterfly valve (diverting valve) performs temperature control on the cooling tower so that the downstream entry temperature on the chillers is not too low
- Manual open/close butterfly valves with worm gears isolate the pumps, the chillers, the cooling tower and the strainers during commissioning or maintenance.
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system

Bill of material

Alternative 1

	Belimo type	Description	Quantity	Costs
 	D6..W(L)	Open/close butterfly valve & control butterfly valve, wafer or lug type, DN	7	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	PRCA-BAC-S2-T..	Multifunctional rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	1	

Alternative 2

	D6..W(L)	Open/close butterfly valve, wafer or lug type, DN	6	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	H6..W..-S7	2-way globe valve for control applications, DN	1	
	GV12-.-T	Long stroke actuator DC 0...10 V with 12 kN actuating force AC/DC 24 V or AC 230 V	1	

Equal for alternative 1 and 2

	D7../BAC	3-way control butterfly valve with lug type, DN	1	
	ZD7..	T-piece for 3-way control butterfly valve. DN	1	
	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	17	
	01DT-..	Immersion temperature sensor	12	
	22WDP-..	Differential pressure sensor	5	
	22WP-..	Static pressure sensor	4	

Bypass chillers with 2-way control valve

Belimo – features and advantages

Valves & actuators – alternative 1

Features	Advantages
High closing and differential pressures	Full flexibility during the planning phase
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Actuator with Near Field Communication	Fast and simple commissioning, parametrisation directly via smartphone
Equal-percentage characteristic curve or linear characteristic curve (configurable with the Belimo Assistant App)	Cost-effective and reliable control valve Perfect characteristic curve for mixing and diverting
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Fast running time of 30...120 s (configurable)	Fast refrigeration supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

5

Valves & actuators – alternative 2

Features	Advantages
Linear characteristic over the entire stroke range of the valve	Perfect characteristic curve for mixing

Sensors

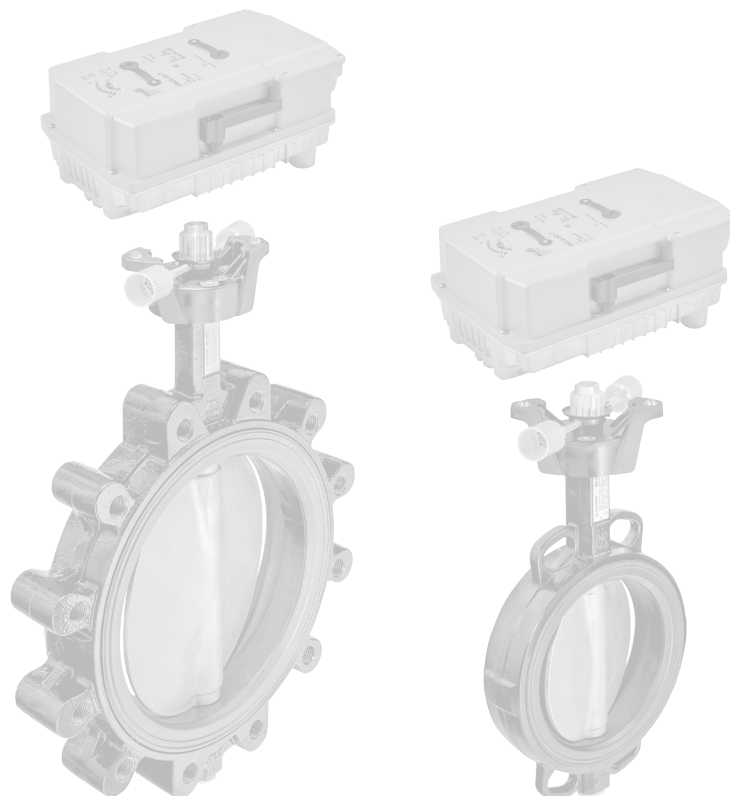
Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

6

Bypass open cooling tower with 2-way control valve

Shows typical temperature control to avoid volumetric flows with excessively low temperatures when entering the chillers

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Application description	33
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Belimo – features and advantages	34



Hydraulic diagram

6

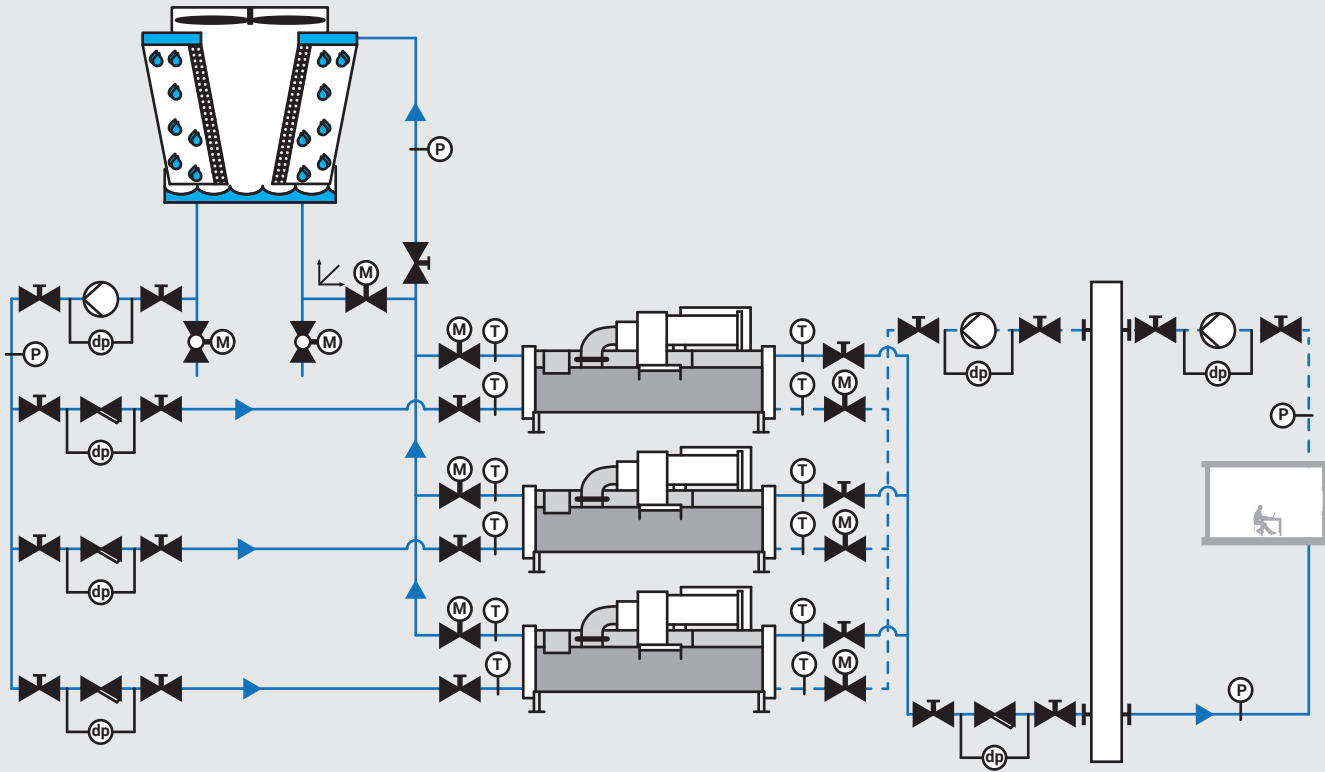




Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description



- Using a bypass on an open cooling tower, is a usual functionality used in areas with colder climates to avoid large, cold volumetric flows at the entrance of the chillers
- The 2-way control valve (2-way control butterfly valve or 2-way globe valve) controls the load of the cooling tower depending on cooling requirements
- This leads to cost savings as the load on the pump after the cooling tower is reduced
- Manual open/close butterfly valves with worm gears isolate the pumps, the chillers, the cooling tower and the strainers during commissioning or maintenance.
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation
- Open/close ball valves, for example with nominal diameter DN 20, ensure that the lines in open cooling towers are emptied prior to winter operation
- The open/close ball valves can optionally be motorised with an fail-safe actuator
- All valves underneath the open cooling tower are in a frost-free area

Bill of material






Alternative 1

	Belimo type	Description	Quantity	Costs
 	D6..W(L)	Open/close butterfly valve & control butterfly valve, wafer or lug type, DN	7	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	PRCA-BAC-S2-T..	Multifunctional rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	1	

Alternative 2

	D6..W(L)	Open/close butterfly valve & control butterfly valve, wafer or lug type, DN	6	
	PRCA-S2-T..	Open/close rotary actuator, 160 Nm, AC 24...240 V / DC 24...125 V	6	
	H6..W..-S7	2-way globe valve for control applications, DN	1	
	GV12-..-T	Long stroke actuator DC 0...10 V with 12 kN actuating force AC/DC 24 V or AC 230 V	1	

Equal for alternative 1 and 2

	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	21	
	01DT-..	Immersion temperature sensor	12	
	22WDP-..	Differential pressure sensor	7	
	22WP-..	Static pressure sensor	4	
	R20-..-S.. + LR..A	Open/close ball valve DN with rotary actuator 5 Nm Optional: rotary fail-safe actuator LRF..	2	

Bypass open cooling tower with 2-way control valve

Belimo – features and advantages

Valves & actuators – alternative 1

Features	Advantages
High closing and differential pressures	Full flexibility during the planning phase
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Actuator with Near Field Communication	Fast and simple commissioning, parametrisation directly via smartphone
Equal-percentage characteristic curve or linear characteristic curve (configurable with the Belimo Assistant App)	Cost-effective and reliable control valve Perfect characteristic curve for mixing and diverting
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Fast running time of 30...120 s (configurable)	Fast refrigeration supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Valves & actuators – alternative 2

Features	Advantages
Linear characteristic over the entire stroke range of the valve	Perfect characteristic curve for mixing

6

Sensors

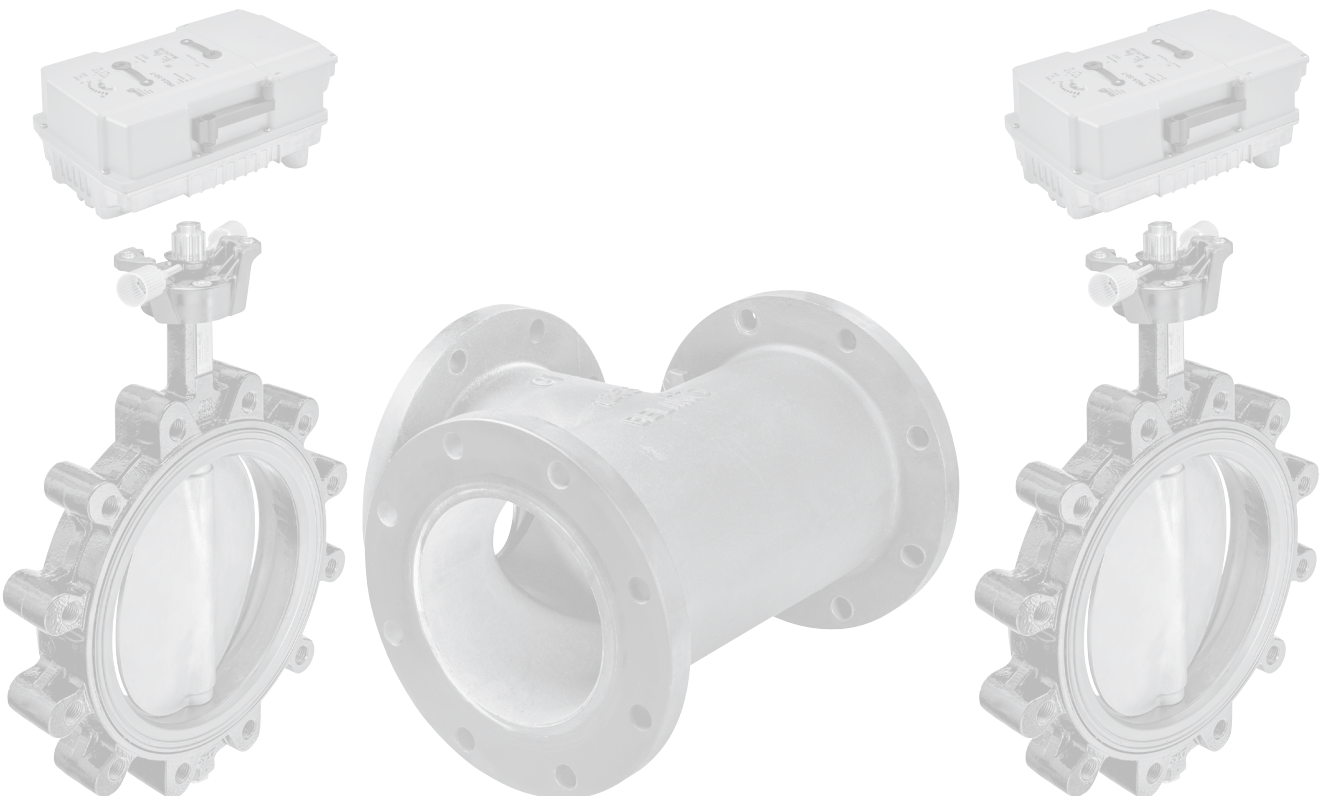
Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

7

Chiller start-up circuit

Shows typical temperature control (mixing application) with 3-way control butterfly valve or 3-way globe valve

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Chiller start-up circuit

Hydraulic diagram

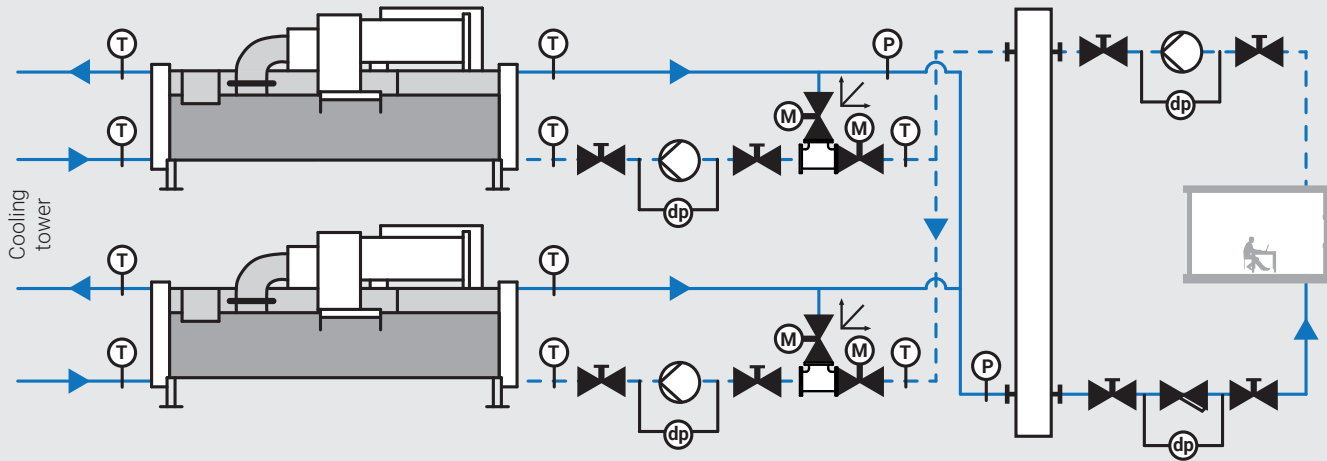


Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

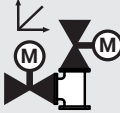
Application description

7


- Mixing application with a 3-way control butterfly valve (the required linear characteristic curves to achieve a constant amount of water can be parameterised using the Belimo Assistant App)
- A 3-way globe valve can be used in the application as an alternative to the 3-way control butterfly valve shown
- The inlet temperature of the chiller is controlled. If the temperature increases at the entrance to the chiller, then cold water is mixed in via the bypass
- Manual open/close butterfly valves with worm gears isolate the pumps during commissioning or maintenance
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation

Bill of material





Alternative 1

	Belimo type	Description	Quantity	Costs
	D7../BAC	3-way control butterfly valve with lug type, DN	2	
	ZD7..	T-piece for 3-way control butterfly valve	2	

Alternative 2

	H7..W..-S7	3-way globe valve for control applications, DN	2	
	GV12-.-T	Long stroke actuator DC 0...10 V with 12 kN actuating force AC/DC 24 V or AC 230 V	2	

Equal for alternative 1 and 2

	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	8	
	01DT-..	Immersion temperature sensor	10	
	22WDP-..	Differential pressure sensor	4	
	22WP-..	Static pressure sensor	2	

Chiller start-up circuit

Belimo – features and advantages

Valves & actuators – alternative 1

Features	Advantages
High closing and differential pressures	Full flexibility during the planning phase
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Actuator with Near Field Communication	Fast and simple commissioning, parametrisation directly via smartphone
Equal-percentage characteristic curve or linear characteristic curve (configurable using Belimo Assistant App)	Cost-effective and reliable control valve Perfect characteristic curve for mixing and diverting
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Fast running time of 30...120 s (configurable)	Fast refrigeration supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Valves & actuators – alternative 2

Features	Advantages
Linear characteristic over the entire stroke range of the valve	Perfect characteristic curve for mixing

Sensors

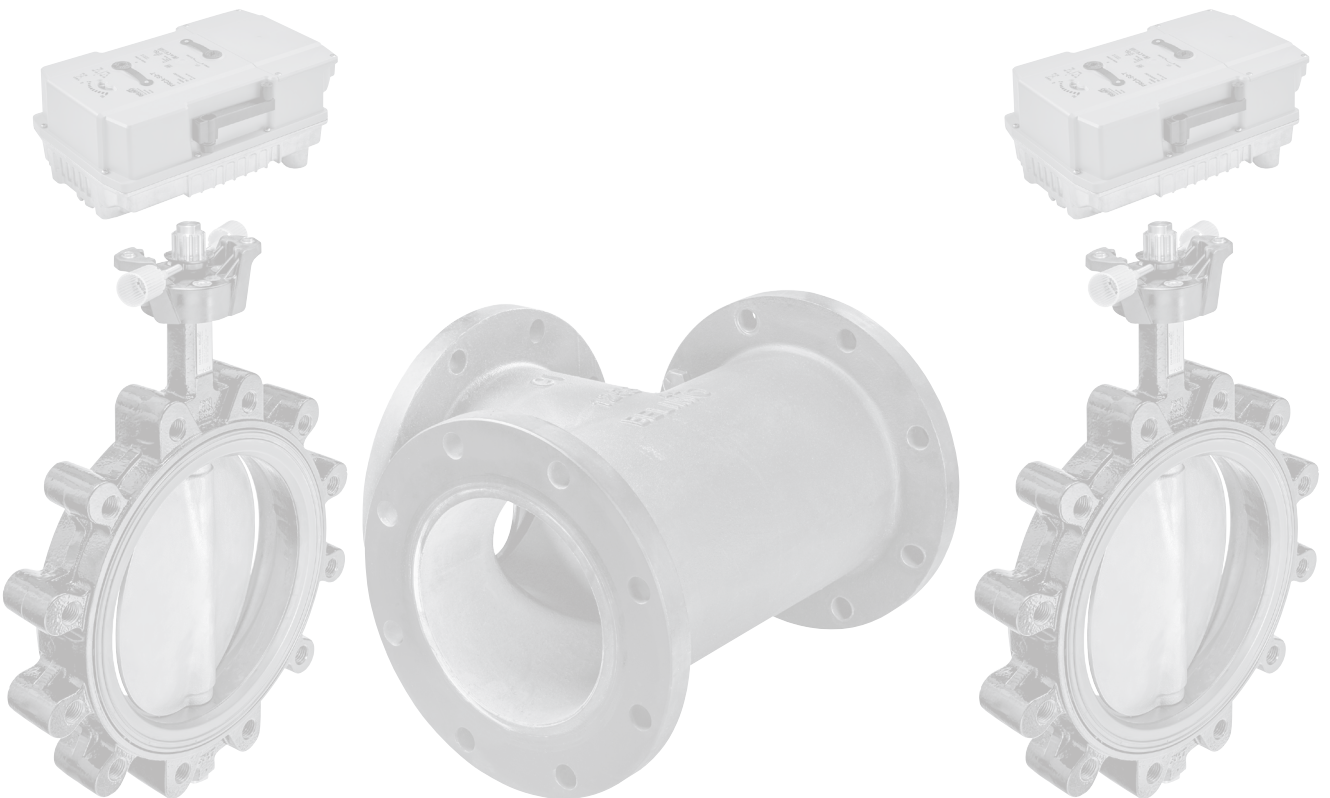
Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

8

Cooling with ice storage

Shows a typical combined 3-way mixing and diverting application

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Hydraulic diagram

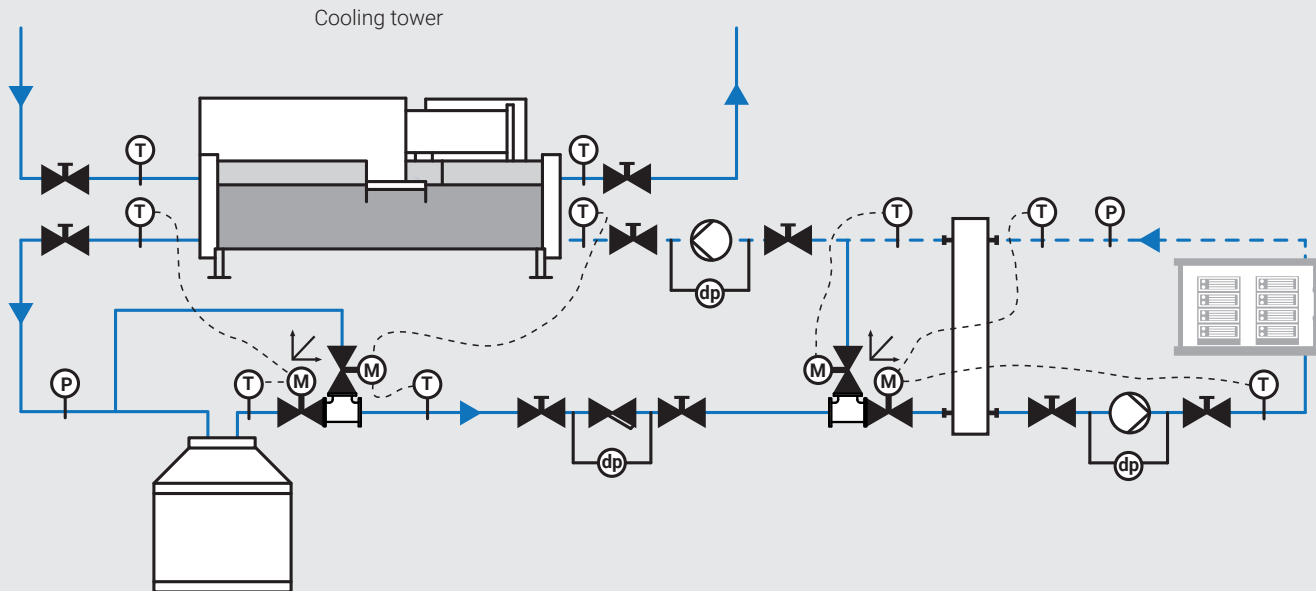


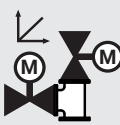




Illustration example
Further possibly required components, such as expansion vessels, safety valves etc., are not shown

Application description

8

- This application consists of three operating modes: a charging mode, a discharging mode and a bypass mode
- Charging mode: electrical energy is cheaper at night, so ice is made and stored at night
- Discharging mode: there is a cooling requirement at the consumer during the day. Here, the 3-way valve mixes chilled water from the chiller with cold water from the ice storage
- Bypass mode: on days with moderate temperatures, the mixing valve bypass (3-way control butterfly valve or alternatively 3-way globe valve) is fully open and only chilled water from the chiller is used for cooling
- The diverting valve (3-way control butterfly valve) in the bypass is either fully open during the charging mode or fully open in the control path during the discharging or bypass mode
- If the BACnet MS/TP or Modbus RTU communication protocol is used, then analogue temperature sensors can be processed via the PR actuator (only possible when using a 3-way control butterfly valve)
- Manual open/close butterfly valves with worm gears isolate the pumps, chiller and strainers during commissioning or maintenance
- Differential pressure sensors monitor the differential pressure of the pumps to ensure the pumps are functioning and to avoid irregular operating states (cavitation, air in the system etc.)
- Differential pressure sensors monitor the strainers to detect contamination in the pipe system at an early stage
- Static pressure sensors detect leakages in the system
- In most cases, the volumetric flows of the generator (chiller) and consumer (usually partial load) will vary, meaning that a hydraulic separator or a buffer tank is used for the required load equalisation

Bill of material

	Belimo type	Description	Quantity	Costs
	D7../BAC	3-way control butterfly valve with lug type, DN	2	
	ZD7..	T-piece for 3-way control butterfly valve	2	
	D6..W(L) + ZD6N-S.. D6..N(L) + ZD6N-S..	Manual open/close butterfly valve, wafer or lug type with worm gear, DN	9	
	01DT-..	Immersion temperature sensor	9	
	22WDP-..	Differential pressure sensor	3	
	22WP-..	Static pressure sensor	2	

Cooling with ice storage

Belimo – features and advantages

Valves & actuators

Features	Advantages
High closing and differential pressures	Full flexibility during the planning phase
Reduced height and weight of the actuator	Quick and easy installation
Universal power supply, high degree of protection (IP66 + IP67), high closing pressure	Simple and flexible design, full flexibility for isolation of chillers in indoor and outdoor applications
Actuator with Near Field Communication	Fast and simple commissioning, parametrisation directly via smartphone
Equal percentage or linear characteristic curve (configurable using Belimo Assistant App)	Cost-effective and reliable control valve Perfect characteristic curve for mixing and diverting
BACnet MS/TP, Modbus RTU, MP-Bus or conventional control	Flexible and transparent communication
Fast running time of 30...120 s (configurable)	Fast refrigeration supply
Maintenance-free and 5-year guarantee	Reliable product with full Belimo support

Sensors

Features	Advantages
Robust housing with IP65 degree of protection	Easy selection and full flexibility for indoor and outdoor applications
Snap-on cover	Quick and tool-free assembly
Spring loaded terminal blocks	Quick installation & commissioning thanks to tool-free wiring and simple data point test
Mounting plate can be used as drilling template	Quick and easy installation

D6..W(L)
D6..N(L)

2-way butterfly valve with wafer type or lug type for open/close or control applications.
For open and closed cold and warm water systems.

Medium:	Water with glycol to max. 50% vol.
Nominal diameter:	DN 25...700
Pipe connection:	PN 6, 10, 16
K_{Vmax} :	50...42800 m ³ /h (for open/close applications)
K_{Vs} :	24...11760 m ³ /h (for control applications)
Medium temperature:	-20...120°C
Permissible pressure p_S :	1600 kPa
Differential pressure dp_{max} :	300 kPa
Flow characteristic:	Equal percentage or linear characteristic curve (configurable on PR actuator using Belimo Assistant app)
Leakage rate:	A, tight (EN 12266-1)
Angle of rotation:	90°
Valve:	EN-JS1030 (GGG 40), epoxy-powder coating
Closing element:	DIN/EN 1.4301 (stainless steel)
Seat:	EPDM
Stem:	DIN/EN 1.4005 (stainless steel)
Stem seal:	EPDM O-ring
Spindle bearing:	RPTFE
Make:	Belimo
Type:	D6..W(L); D6..N(L)

ZD6N-S..

Worm gear for mounting on Belimo butterfly valves D6...
Self-locking, maintenance-free. Steplessly adjustable.

Position indication:	0° / 22.5° / 45° / 77.5° / 90°
Rangeability:	24:1
For nominal diameter:	DN 25...700
Make:	Belimo
Type:	ZD6N-S..

Tender texts

D7../BAC

3-way butterfly valve lug type for mixing and diverting applications and water-side change-over and control applications.
 Control (inc. PR actuators) open/close, modulating, communicative.
 Communication via BACnet MS/TP, Modbus RTU, MP-Bus or conventional control.
 For open and closed cold and warm water systems.

Medium:	Water with glycol to max. 50% vol.
Nominal diameter:	DN 150...300
Pipe connection:	PN 16
K_{Vmax} :	1100...4700 m ³ /h (for change-over applications)
K_{VS} :	400...1700 m ³ /h (for control applications)
Medium temperature:	-20...120°C
Permissible pressure p_s :	1600 kPa
Differential pressure dp_{max} :	300 kPa
Flow characteristic	equal percentage or linear characteristic curve (configurable on PR actuator using Belimo Assistant App)
Leakage rate:	A, tight (EN 12266-1)
Max. torque:	160 Nm @ nominal voltage
Nominal voltage:	AC 24...240 V, DC 24...125 V
Communicative control:	MP-Bus, BACnet MS/TP, Modbus RTU
Control signal Y:	DC 0...10 V
Control signal Y note:	input resistance 100 kΩ
Operating range Y:	DC2...10 V
Operating range Y variable:	DC 0.5...10 V, 4...20 mA
Position feedback U:	DC 2...10 V
Position feedback U note:	max. 0.5 mA
Position feedback U variable:	DC 0.5...10 V
Power consumption:	
- Operation:	20 W @ nominal torque
- In rest position:	6 W
- Rating:	at 24 V 20 VA at 230 V 52 VA
Connection supply:	terminals 2.5 mm ²
Connection control:	terminals 1.5 mm ²
Connection auxiliary switch:	terminals 2.5 mm ²
Auxiliary switch:	2 x SPDT, 1 x 10° fix / 1 x 85° (0...90° adjustable)
Manual override:	with hand crank, can be fixed in any position
Running time:	35 s (adjustable 30...120 s)
Protection class:	II reinforced insulation
Degree of protection:	IP66 / IP67
EMC:	CE according to 2014/30/EU
Suitable T-piece:	ZD7..
Make:	Belimo
Type:	D7../BAC

ZD7..

T-piece for 3-way butterfly valve.

Medium:	Water with glycol to max. 50% vol.
Nominal diameter:	DN 150...300
Pipe connection:	PN 16
Material:	EN-GJS400-15 (GGG 40), matte black
Make:	Belimo
Type:	ZD7..

PRCA-S2-T..

Rotary actuator 160 Nm.

Overload protected, current reduction in rest position and smart heating.

Near Field Communication (NFC) allows easy commissioning, parameterisation and maintenance directly from a smartphone.

Max. torque:	160 Nm @ nominal voltage
Nominal voltage:	AC 24...240 V, DC 24...125 V
Control:	open/close or 3-Point
Power consumption:	
- Operation:	20 W @ nominal torque
- In rest position:	6 W
- Rating:	at 24 V 20 VA at 230 V 52 VA
Connection:	terminals 2.5 mm ²
Auxiliary switch:	2 x SPDT, 1 x 10° fix / 1 x 85° (0...90° adjustable)
Manual override:	with hand crank, can be fixed in any position
Running time:	35 s (adjustable 30...120 s)
Degree of protection:	IP66 / IP67
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	PRCA-S2-T..

Tender texts

PRCA-BAC-S2-T.

Communicative rotary actuator 160 Nm.

Overload protected, current reduction in rest position and smart heating.

Communication via BACnet MS/TP, Modbus RTU, MP-Bus or conventional control.

Conversion of sensor signals.

Near Field Communication (NFC) allows easy commissioning, parameterisation and maintenance directly from a smartphone.

Max. torque:	160 Nm @ nominal voltage
Nominal voltage:	AC 24...240 V, DC 24...125 V
Communicative control:	MP-Bus, BACnet MS/TP, Modbus RTU
Control signal Y:	DC 0...10 V
Control signal Y note:	input resistance 100 kΩ
Operating range Y:	DC 2...10 V
Operating range Y changeable:	DC 0.5...10 V, 4...20 mA
Position feedback U:	DC 2...10 V
Position feedback U note:	max. 0.5 mA
Position feedback U variable:	DC 0.5...10 V
Power consumption:	
- Operation:	20 W @ nominal torque
- In rest position:	6 W
- Rating:	at 24 V 20 VA at 230 V 52 VA
Connection supply:	terminals 2.5 mm ²
Connection control:	terminals 1.5 mm ²
Connection auxiliary switch:	terminals 2.5 mm ²
Auxiliary switch:	2 x SPDT, 1 x 10° fix / 1 x 85° (0...90° adjustable)
Manual override:	with hand crank, can be fixed in any position
Running time:	35 s (adjustable 30...120 s)
Degree of protection:	IP66 / IP67
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	PRCA-BAC-S2-T.

PRKCA-BAC-S2-T..

Communicative rotary actuator with electrical fail-safe function.
 Overload protected, current reduction in rest position and smart heating.
 Life time SuperCaps 15 years.
 Communication via BACnet MS/TP, Modbus RTU, MP-Bus or conventional control.
 Conversion of sensor signals.
 Near Field Communication (NFC) allows easy commissioning, parametrisation and maintenance directly from a smartphone.

Max. torque:	160 Nm @ nominal voltage
Nominal voltage:	AC 24...240 V, DC 24...125 V
Communicative control:	MP-Bus, BACnet MS/TP, Modbus RTU
Control signal Y:	DC 0...10 V
Control signal Y note:	input resistance 100 kΩ
Operating range Y:	DC 2...10 V
Operating range Y variable:	DC 0.5...10 V, 4...20 mA
Position feedback U:	DC 2...10 V
Position feedback U note:	max. 0.5 mA
Position feedback U variable:	DC 0.5...10 V
Power consumption:	
- Operation:	52 W @ nominal torque
- In rest position:	7 W
- Rating:	at 24 V 54 VA at 230 V 68 VA
Connection supply:	terminals 2.5 mm ²
Connection control:	terminals 1.5 mm ²
Connection auxiliary switch:	terminals 2.5 mm ²
Auxiliary switch:	2 x SPDT, 1 x 10° fix / 1 x 85° (0...90° adjustable)
Manual override:	with hand crank, can be fixed in any position
Running time:	35 s (adjustable 30...120 s)
Running time fail-safe function:	30 s
Setting of the fail-safe position:	0...100%, adjustable (ex-works: 0%)
Bridging time (PF):	1...10 s (ex-works 2 s)
Degree of protection:	IP66 / IP67
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	PRKCA-BAC-S2-T..

H6..W..-S7

Large globe valves, 2-way, with flange PN 16, for closed cold and warm water systems, for modulating water-side control of cooling and heat-generating systems.

Connection:	Flange according to ISO 7005-2 (PN 16)
Nominal diameter:	DN 200...250
K _{VS} value:	630...1000 m ³ /h
Medium temperature:	5...120°C
Permissible pressure p _S :	1600 kPa
Leakage rate:	Control path A-AB: Leakage Class III (DIN EN 1349 and DIN EN 60534-4)
Characteristic curve:	Control path A-AB: equal percentage (VDI/VDE 2173)
Stroke:	65 mm
Valve:	GG25
Closing element:	stainless steel
Valve seat:	stainless steel
Valve stem:	stainless steel
Stem seal:	EPDM ring
Make:	Belimo
Type:	H6..W..-S7

Tender texts

H7..W..-S7

Large globe valves, 3-way, with flange PN16, for closed cold and warm water systems, for modulating water-side control of cooling and heat-generating systems.

Connection:	Flange according to ISO 7005-2 (PN16)
Nominal diameter:	DN 200...250
K_{VS} value:	630...1000 m ³ /h
Medium temperature:	5...120°C (-10°C with spindle heating)
Permissible pressure p_S :	1600 kPa
Leakage rate:	Control path A-AB: Leakage Class III (DIN EN 1349 and DIN EN 60534-4)
Bypass B-AB:	max. 1% of k_{VS} value
Characteristic curve:	Control path A-AB: linear (VDI/VDE 2173),
Bypass B-AB:	linear (VDI/VDE 2173)
Stroke:	65 mm
Valve:	GG25
Closing element:	stainless steel
Valve seat:	stainless steel
Valve stem:	stainless steel
Stem seal:	EPDM ring
Make:	Belimo
Type:	H7..W..-S7

GV12-..-T

Long stroke actuator for 2-way and 3-way large globe valves DN 200 / DN 250.

Closing force:	12000 N
Nominal voltage:	AC/DC 24 V or AC 230 V
Control:	DC 0...10 V
Operating range:	DC 2...10V
Position feedback:	DC 2...10 V
Power consumption:	65 VA
Connection:	terminals 1.5 mm ²
Nominal stroke:	65 mm
Running time:	150 s
Actuating time:	0.79 mm/s
Position indication:	mechanical
Manual override temporary:	handwheel, temporary
Degree of protection:	IP65
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	GV12-..-T

01DT-..

Passive immersion temperature sensor

Sensor types:	Pt100, Pt1000, NTC10k
Probe length:	50...450 mm
Probe diameter:	6 mm
Degree of protection:	IP65 / NEMA 4X
Removable spring loaded terminal blocks max. 2.5 mm ² inc. mounting clip	
Thermowell pocket A-22P-A.. (optional)	
Make:	Belimo
Type:	01DT-..

22WDP-..

Differential pressure sensor liquid media 0...6 bar.

Nominal voltage:	AC/DC 24 V
Output:	DC 0...10 V
Degree of protection:	IP65 / NEMA 4X
Connection:	G 1/4" (internal thread)

Make:	Belimo
Type:	22WDP-..

22WP-..

Pressure sensor liquids 0...16 bar.

Nominal voltage:	AC/DC 24 V
Output:	DC 0...10 V
Degree of protection:	IP65 / NEMA 4X
Connection:	G 1/4" (external thread)

Make:	Belimo
Type:	22WP-..

R20..-S..

2-way open/close ball valve.

Medium:	Water with glycol with max. 50% vol.
Connection:	internal thread Rp 3/4"
K _{VS} value:	4 m ³ /h...32 m ³ /h
Medium temperature:	-10...120°C
Closing pressure	1400 kPa
Leakage rate:	A, air bubble-tight (EN 12266-1)
Valve:	Nickel-plated brass
Closing element:	stainless steel
Sealing:	PTFE
Stem:	stainless steel
Stem seal:	EPDM
Characterising disk:	TEFZEL

Make:	Belimo
Type:	R20..-S..

Tender texts

LR..A

Rotary actuator for adjustment of open/close and change-over ball valves (2- / 3-way) DN 15...25.
Direct mounting on the ball valve with only one central screw.
The assembly tool is integrated in the add-on position indication.
The mounting location in relation to the ball valve can be selected in 90° steps.
Overload protected and without end switch, current reduction in rest position.

Torque:	min. 5 Nm @ nominal voltage
Nominal voltage:	AC/DC 24 V, AC 230 V
Control:	open/close or 3-Point
Power consumption:	
- Operation:	1 W @ nominal torque
- In rest position:	0.2 W
Connection:	cable 1 m, 3 x 0.75 mm ²
Manual override:	with push button
Running time:	90 s
Degree of protection:	IP54
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	LR...A

LRF..

Open/close rotary fail-safe actuator to adjust 2- and 3-way ball valves DN 15...25. Direct mounting on ball valve with a screw, mounting location selectable related to the ball valve in 90-degree steps. The actuator is overload protected and automatically stops when the end stop is reached.

Torque:	
- Actuator:	min. 4 Nm @ nominal voltage
- Spring return:	min. 4 Nm
Nominal voltage:	AC/DC 24 V or AC 230 V
Control:	open/close
Power consumption:	
- Spring winding:	5 W
- Holding position:	3 W
Connection:	cable 1 m, 2 x 0.75 mm ²
Fail-safe function:	NC (deenergised NC, (A-AB = 0%))
Angle of rotation:	Max. 95°
Running time:	actuator: 40...75 s
Spring-return:	approx. 20 s
Service life:	min. 60,000 emergency positions
Safety class:	II protective insulated
Degree of protection:	IP54
EMC:	CE according to 2014/30/EU
Make:	Belimo
Type:	LRF..

All inclusive.

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

Always focusing on customer added 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 warranty



On site around the globe



Complete product range



Tested quality



Short delivery times



Comprehensive support



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