

## COMBIFLOW 6-way

### Description

The COMBIFLOW is a 6-way Pressure Independent Control Valve (PICV) for 4-pipe cooling and heating water distribution systems, enabling switching between cooling and heating whilst preventing cross-flow between the two water circuits.

### Operation

The COMBIFLOW 6-way PICV enables flowrate modulation uninfluenced by pressure variations in the water distribution system.

Flowrate is precisely controlled by an actuator with either a 0–10 V or 4–20 mA analogue signal or by BACnet or Modbus fieldbus for individual programming of the cooling and heating flow.



### Application

The COMBIFLOW is used in 4-pipe systems, such as:

- Heating and cooling via radiant panels
- Decentralised ventilation units
- Fan coil systems
- Convection heating & cooling units

### Features

- Patented “6-way PICV” technology eliminates overflows, regardless of fluctuating system pressure
- Differential pressure (DP) controller integrated within the 6-way valve
- Single valve and actuator for flowrate modulation and switching between cooling and heating circuits
- Separate flowrate pre-sets for cooling and heating via BACnet or Modbus
- Constant differential pressure guarantees 100% authority
- Ultra-high KVS value with minimal pressure loss
- Achieves high flows with minimal required differential pressure due to advanced design of the PICV
- Integrated pressure relief in closed position to allow for contraction or expansion when not heating or cooling
- Removable differential pressure cartridge.

### Benefits

- Precise flow modulation without need for a second valve and second actuator and without separate flowrate feedback, reduces bill of materials and assembly and commissioning work with less risk of leakage through connectors
- Compact solution with small space requirements
- Complete solution. No balancing valves or additional PICVs required
- Large bores ensure lowest pressure loss of any 6-way solution, lowering required pump head and energy used and potentially pump size, leading to substantial savings
- Removable DP-cartridge makes flushing at full flow efficient and draining simple, without the need to disconnect and reseal pipe connections
- Only one data point required to connect to the BMS
- Remote flow setting via BACnet or Modbus
- Longer lifetime of the actuator and lower power consumption since all pressure fluctuations are compensated by the integrated DP controller and not by continuous adjustment of actuator position
- Simple and fast sizing, just select design flow

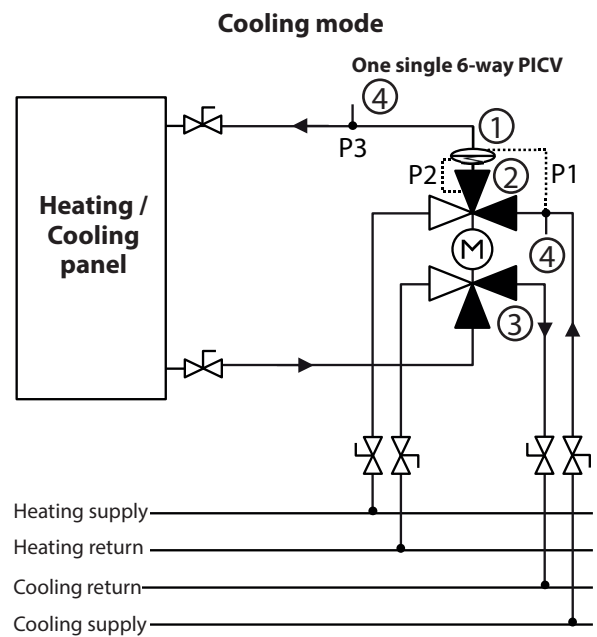
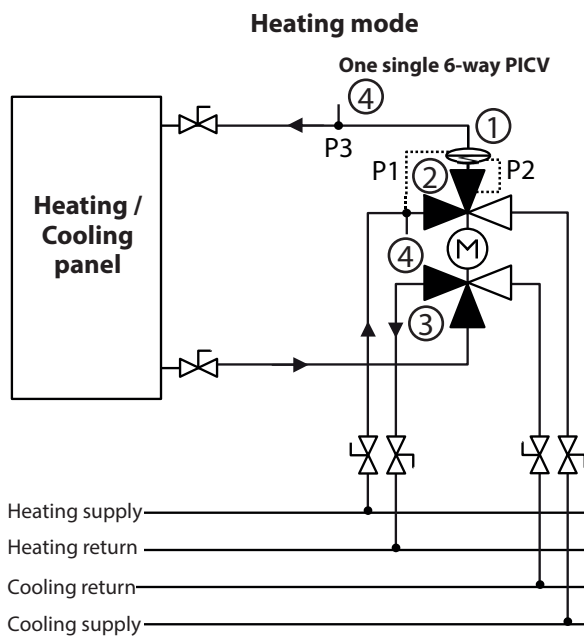
## COMBIFLOW 6-way

### Design

The design of COMBIFLOW 6-way PICV combines high performance with small size and compact construction.

The main components of the valve are:

- ① Differential pressure (DP) controller
- ② Characterized ball valve designed for modulating control and switching between heating or cooling (inlet)
- ③ Ball valve for switching between heating or cooling (outlet)
- ④ P/T Plugs (P3 Optional)



The innovative patented design makes it possible for the integrated differential pressure controller to maintain the differential pressure over the characterized ball valve on the inlet side, and thereby ensure desired flowrates without overflow for both the heating and the cooling demands.

When the valve is changing from heating to cooling or vice versa, the inlet pressure P1 is transferred to the upper side of the differential pressure controller by an internal capillary. The capillary connection is changing from the heating to the cooling side through a hole in the spindle that is rotating from the heating to the cooling side. In this way the differential pressure can be controlled both on the heating or the cooling side by only one differential pressure controller, thus providing full pressure independent flow control.

### Pressure independency

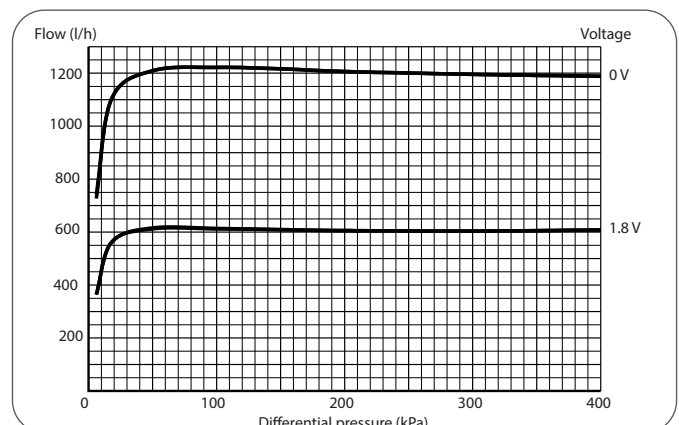
Regardless of pressure fluctuations in the system, the maximum flow is kept constant up to a maximum differential pressure of 400 kPa.

The graph indicates the performance of the valve at the different flow settings of 1200 l/h and 610 l/h, demonstrating its pressure independency once minimum differential pressure is reached. The same performance is achieved over the whole flow range.

#### Example DN15 - Pre-set flow cooling with analogue actuator:

1200 l/h (0.0 V)

610 l/h (1.8 V)



## COMBIFLOW 6-way

### Function

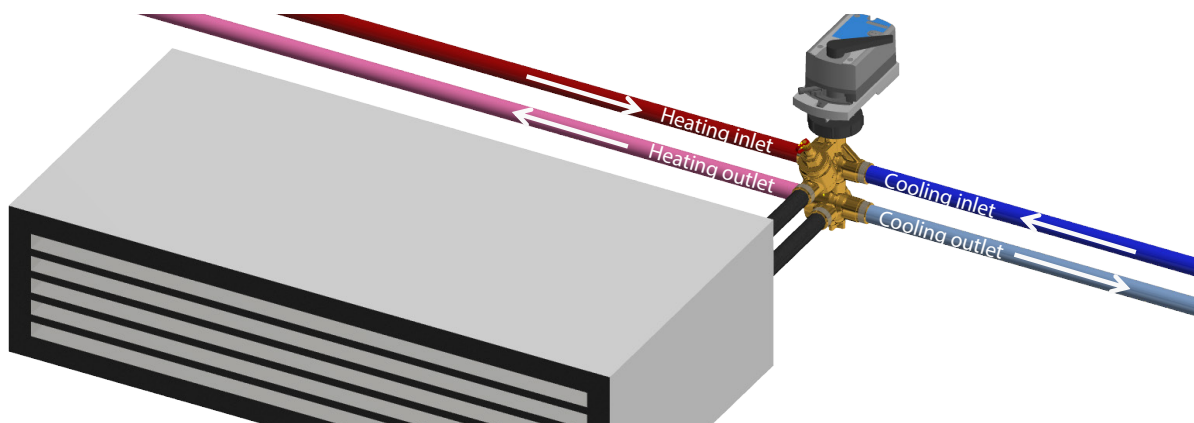
The COMBIFLOW 6-way PICV controls both heating and cooling flows with only one single data point from the BMS system, through a 0-10 V or 4-20mA or BACnet or Modbus fieldbus.

**Digital control:** The design flow rates are set using BACnet or Modbus actuator. Use the Setting and Flow tables and refer to the mounting instruction.

**Analogue control:** The design flow rates are set using 0-10 V or 4-20 mA input signal and [for 48-5397] mechanical limiting screws. Using a voltage signal to set the sizing flow for cooling, limit the voltage between 0 V - 4 V. To set the sizing flow for heating, limit the voltage between 6 V - 10 V.

The actuator offers manual override function. This function can be used to temporarily set the flow when the power supply is not connected to the actuator.

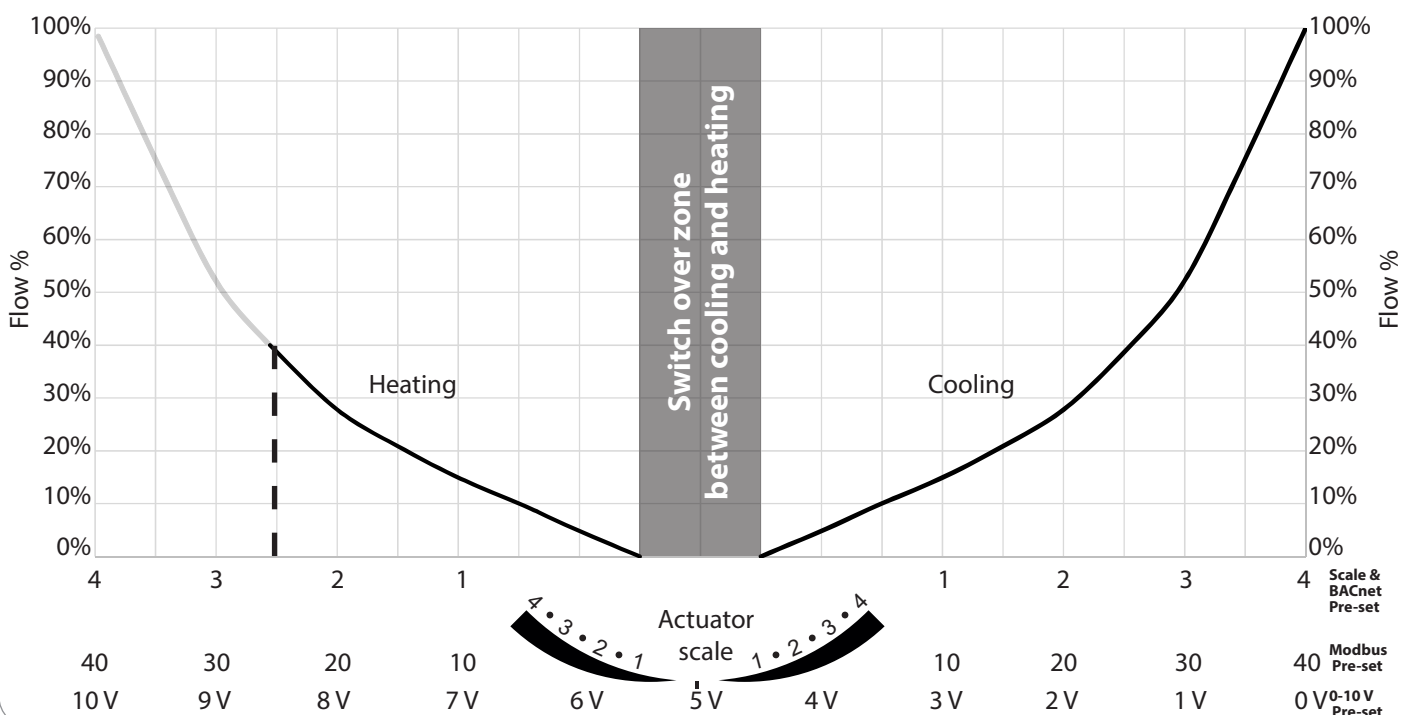
The actuator modulates the flow based on the current load conditions in reference to the control signal from the controller.



### Example with Cooling at 100% and Heating at 40% of maximum flow

Heating side limited to pre-set **2.5** on scale (BACnet pre-set **2.5**, Modbus pre-set **25** or Voltage pre-set **8.5 V**)

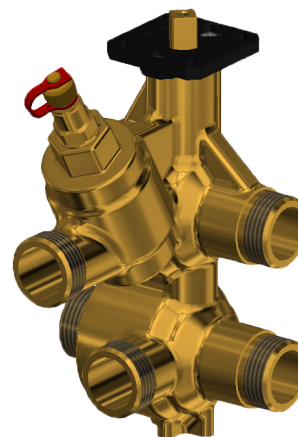
**Please note:** The graph is just an illustration of the function and mA-values are not shown. The exact values are in the Setting and Flow tables



## COMBIFLOW 6-way

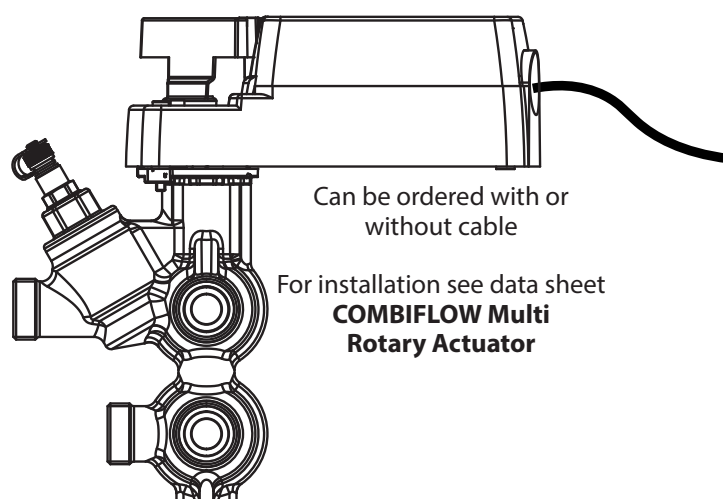
### Technical Data - COMBIFLOW 6-Way

<b>Valve housing:</b>	DZR Brass, CW602N
<b>Balls</b>	DZR Brass, nickel plated
<b>Gasket</b>	PTFE, Glass and carbon fiber reinforced
<b>DP controller:</b>	PPS 40% glass
<b>Spring:</b>	Stainless steel
<b>Diaphragm:</b>	HNBR
<b>O-rings:</b>	EPDM
<b>Mounting plate for actuator</b>	PPS GF40
<b>Rotator for DP-pressure</b>	PPO
<b>Pressure class:</b>	PN25
<b>Max. differential pressure:</b>	400 kPa
<b>Medium temperature range:</b>	0°C to 90°C

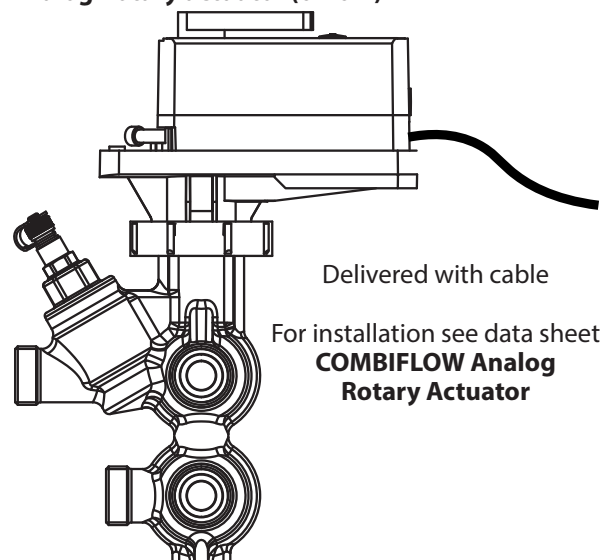


### Actuator Installation & Electrical wiring

#### Multi Rotary actuator

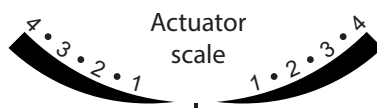


#### Analog Rotary actuator (0-10 V)





## COMBIFLOW 6-way

### Setting and Flow DN15 Low

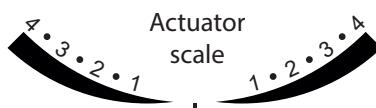


DN15 Low - 830 l/h



	Flow cooling [l/h]	Flow heating [l/h]	Pre-set scale & BACnet setting	Modbus setting	Voltage 0-10 V [V]	Current 4-20 mA [mA]	Min DP [kPa] for flow verification	Total required DP [kPa] for pump calculation
	830	0	4.0	40	0.0	4.0	19	26
	780	0	3.8	38	0.2	4.3	18	25
	730	0	3.6	36	0.5	4.8	17	23
	660	0	3.4	34	0.7	5.1	16	21
	560	0	3.2	32	0.9	5.4	15	19
	460	0	3.0	30	1.1	5.8	15	18
	380	0	2.8	28	1.3	6.1	14	16
	310	0	2.6	26	1.6	6.6	14	15
	240	0	2.4	24	1.8	6.9	14	15
	190	0	2.2	22	2.0	7.2	14	15
	140	0	2.0	20	2.2	7.5	13	14
	120	0	1.8	18	2.4	7.8	12	13
	100	0	1.6	16	2.7	8.3	11	12
	85	0	1.4	14	2.9	8.6	11	12
	75	0	1.2	12	3.1	9.0	10	11
	65	0	1.0	10	3.3	9.3	8	10
	50	0	0.8	8	3.5	9.6	5	10
	35	0	0.6	6	3.8	10.1	4	10
	30	0	0.5	5	3.9	10.2	4	10
Switch over zone								
	0	30	0.5	5	6.1	13.8	4	10
	0	35	0.6	6	6.2	13.9	4	10
	0	50	0.8	8	6.5	14.4	5	10
	0	65	1.0	10	6.7	14.7	8	10
	0	75	1.2	12	6.9	15.0	10	11
	0	85	1.4	14	7.1	15.4	11	12
	0	100	1.6	16	7.3	15.7	11	12
	0	120	1.8	18	7.6	16.2	12	13
	0	140	2.0	20	7.8	16.5	13	14
	0	190	2.2	22	8.0	16.8	14	15
	0	240	2.4	24	8.2	17.1	14	15
	0	310	2.6	26	8.4	17.4	14	15
	0	380	2.8	28	8.7	17.9	14	16
	0	460	3.0	30	8.9	18.2	15	18
	0	560	3.2	32	9.1	18.6	15	19
	0	660	3.4	34	9.3	18.9	16	21
	0	730	3.6	36	9.5	19.2	17	23
	0	780	3.8	38	9.8	19.7	18	25
	0	830	4.0	40	10.0	20.0	19	26

## COMBIFLOW 6-way

### Setting and Flow DN15

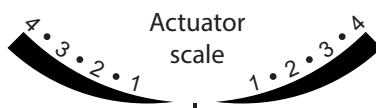


DN15 - 1200 l/h



	Flow cooling [l/h]	Flow heating [l/h]	Pre-set scale & BACnet setting	Modbus setting	Voltage 0-10V [V]	Current 4-20 mA [mA]	Min DP [kPa] for flow verification	Total required DP [kPa] for pump calculation
	1200	0	4.0	40	0.0	4.0	23	36
	1170	0	3.8	38	0.2	4.3	22	34
	1150	0	3.6	36	0.5	4.8	21	32
	1090	0	3.4	34	0.7	5.1	21	31
	1000	0	3.2	32	0.9	5.4	20	29
	910	0	3.0	30	1.1	5.8	19	27
	810	0	2.8	28	1.3	6.1	18	25
	700	0	2.6	26	1.6	6.6	17	23
	610	0	2.4	24	1.8	6.9	17	21
	550	0	2.2	22	2.0	7.2	16	19
	490	0	2.0	20	2.2	7.5	15	17
	430	0	1.8	18	2.4	7.8	15	17
	380	0	1.6	16	2.7	8.3	15	16
	320	0	1.4	14	2.9	8.6	15	16
	260	0	1.2	12	3.1	9.0	15	15
	210	0	1.0	10	3.3	9.3	15	15
Switch over zone								
	0	210	1.0	10	6.7	14.7	15	15
	0	260	1.2	12	6.9	15.0	15	15
	0	320	1.4	14	7.1	15.4	15	16
	0	380	1.6	16	7.3	15.7	15	16
	0	430	1.8	18	7.6	16.2	15	17
	0	490	2.0	20	7.8	16.5	15	17
	0	550	2.2	22	8.0	16.8	16	19
	0	610	2.4	24	8.2	17.1	17	21
	0	700	2.6	26	8.4	17.4	17	23
	0	810	2.8	28	8.7	17.9	18	25
	0	910	3.0	30	8.9	18.2	19	27
	0	1000	3.2	32	9.1	18.6	20	29
	0	1090	3.4	34	9.3	18.9	21	31
	0	1150	3.6	36	9.5	19.2	21	32
	0	1170	3.8	38	9.8	19.7	22	34
	0	1200	4.0	40	10.0	20.0	23	36

## COMBIFLOW 6-way

### Setting and Flow DN20

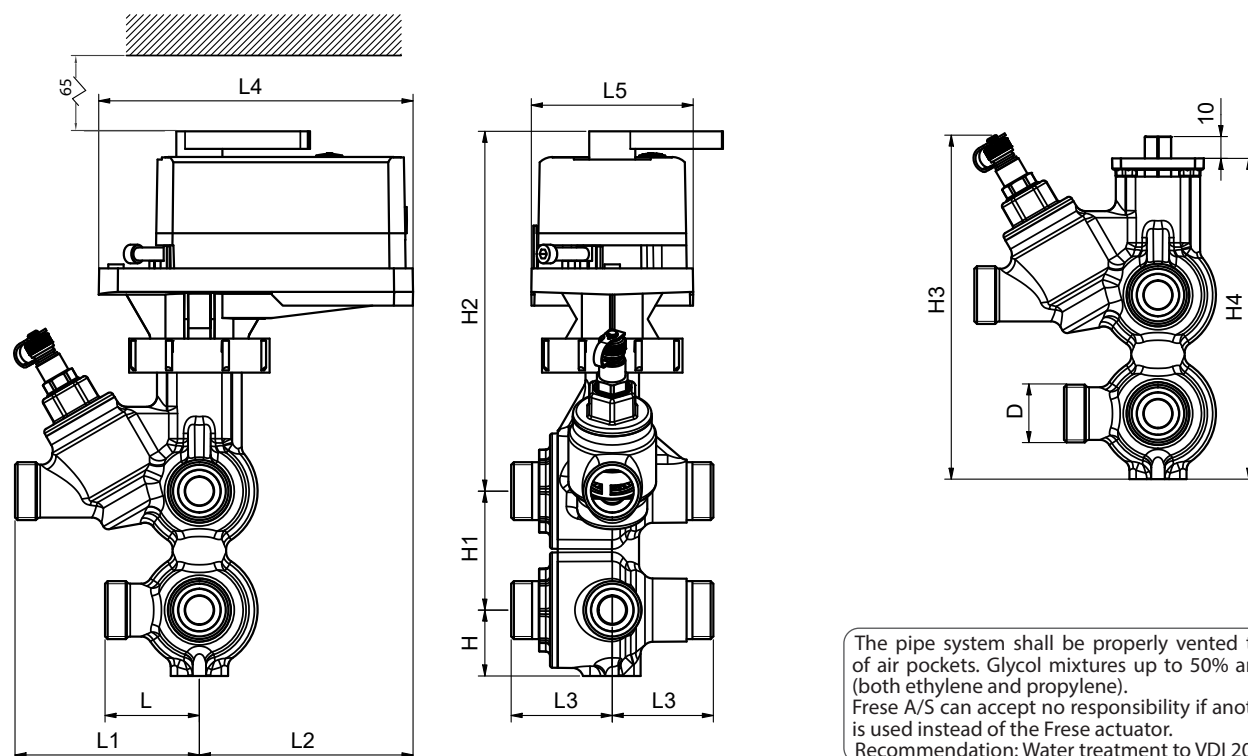


DN20 - 4250 l/h

	Flow cooling [l/h]	Flow heating [l/h]	Pre-set scale & BACnet setting	Modbus setting	Voltage 0-10V [V]	Current 4-20 mA [mA]	Min DP [kPa] for flow verification	Total required DP [kPa] for pump calculation
	4250	0	4.0	40	0.0	4.0	38	56
	3990	0	3.8	38	0.2	4.3	35	51
	3730	0	3.6	36	0.5	4.8	32	46
	3400	0	3.4	34	0.7	5.1	29	40
	3000	0	3.2	32	0.9	5.4	26	35
	2600	0	3.0	30	1.1	5.8	23	30
	2310	0	2.8	28	1.3	6.1	22	28
	2020	0	2.6	26	1.6	6.6	21	26
	1760	0	2.4	24	1.8	6.9	20	24
	1540	0	2.2	22	2.0	7.2	19	22
	1310	0	2.0	20	2.2	7.5	18	20
	1110	0	1.8	18	2.4	7.8	18	19
	910	0	1.6	16	2.7	8.3	18	19
	740	0	1.4	14	2.9	8.6	17	18
	600	0	1.2	12	3.1	9.0	17	18
	460	0	1.0	10	3.3	9.3	17	17
Switch over zone								
	0	460	1.0	10	6.7	14.7	17	17
	0	600	1.2	12	6.9	15.0	17	18
	0	740	1.4	14	7.1	15.4	17	18
	0	910	1.6	16	7.3	15.7	18	19
	0	1110	1.8	18	7.6	16.2	18	19
	0	1310	2.0	20	7.8	16.5	18	20
	0	1540	2.2	22	8.0	16.8	19	22
	0	1760	2.4	24	8.2	17.1	20	24
	0	2020	2.6	26	8.4	17.4	21	26
	0	2310	2.8	28	8.7	17.9	22	28
	0	2600	3.0	30	8.9	18.2	23	30
	0	3000	3.2	32	9.1	18.6	26	35
	0	3400	3.4	34	9.3	18.9	29	40
	0	3730	3.6	36	9.5	19.2	32	46
	0	3990	3.8	38	9.8	19.7	35	51
	0	4250	4.0	40	10.0	20.0	38	56

## COMBIFLOW 6-way

### Dimensions Valve and Rotary Actuators



The pipe system shall be properly vented to avoid risk of air pockets. Glycol mixtures up to 50% are applicable (both ethylene and propylene). Frese A/S can accept no responsibility if another actuator is used instead of the Frese actuator. Recommendation: Water treatment to VDI 2035.

### Dimensions

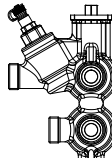
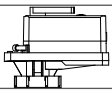
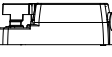
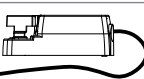
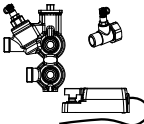
Size		DN15		DN20	
		Rotary Actuator 0-10V <b>48-5397</b>	Multi Rotary Actuator <b>48-5394/95</b>	Rotary Actuator 0-10V <b>48-5397</b>	Multi Rotary Actuator <b>48-5394/95</b>
Length [mm]	L	43		50	
	L1	84		120	
	L2	97	145	97	145
	L3	46		55	
	L4	143	180	143	180
	L5	74	100	74	100
Height [mm]	H	30		38	
	H1	54		69	
	H2	164	127	171	134
	H3	157		193	
	H4	147		177	
Thread	D	M/M G 3/4		M/M G 1	
Weight* [kg]		1.9		3.4	

\* Weight without actuator



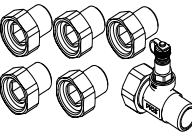
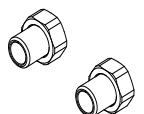
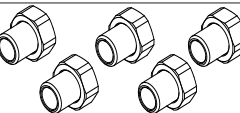

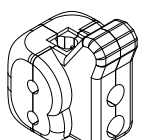
## COMBIFLOW 6-way

### Product programme

	Size	Type	Flow [l/h]	Control signal	Frese no.
	DN15 Low	COMBIFLOW 6-way	30-830	-	53-1839
	DN15	COMBIFLOW 6-way	210-1200	-	53-1844
	DN20	COMBIFLOW 6-way	460-4250	-	53-1845
	-	COMBIFLOW Analog Rotary Actuator	-	0-10V	48-5397
	-	COMBIFLOW Multi Rotary Actuator	-	Modbus, BACnet 0-10 V, 4-20 mA (2-10 V, 0-20 mA)	48-5395
		COMBIFLOW Multi Rotary Actuator with cable			48-5394
	DN15 Low	COMBIFLOW KIT: COMBIFLOW (53-18396) PT Coupling (48-0038) Multi Rotary Actuator with cable (48-5394)	30-830	Modbus, BACnet 0-10 V, 4-20 mA (2-10 V, 0-20 mA)	53-1838

**Please note:** For further actuator details please refer to the specific actuator Technote

### Accessories

	Type	For COMBIFLOW valve size	Coupling connection to pipe system	Frese no.
	Complete coupling set 5 couplings & 1 PT coupling incl. gaskets	DN15	DN15 Male	48-0081
			DN20 Male	48-0082
		DN20	DN20 Male	48-0083
			DN25 Male	48-0084
	Couplings DZR brass CW602N (2 pieces incl. gaskets)	DN15	DN15 Male	43-2330
			DN20 Male	48-0042
		DN20	DN20 Male	43-3330
			DN25 Male	43-3331
	Couplings DZR brass CW602N (5 pieces incl. gaskets)	DN15	DN15 Male	48-0085
	PT Coupling	DN15	DN15 Male	48-0038
			DN20 Male	48-0041
		DN20	DN20 Male	48-0039
			DN25 Male	48-0040
	Insulation cover	DN15	-	38-0879
		DN20	-	38-0880

## COMBIFLOW 6-way

### Technical Specification Text

- The total required differential pressure for pump calculation shall not exceed 12 kPa at 100 l/h. (DN15 Low)
- The total required differential pressure for pump calculation shall not exceed 36 kPa at 1200 l/h. (DN15)
- The total required differential pressure for pump calculation shall not exceed 51 kPa at 4000 l/h. (DN20)
- The valve pressure class shall be PN25
- The solution must be one valve providing both change-over between heating and cooling, and pressure independent modulating flow control with one common DP-controller for both heating and cooling side.
- When the valve is in closed position without heating or cooling demands it shall provide pressure relief of the coil.
- The 6-way pressure independent control valve, with only one data point from the external BMS system, must ensure modulating control for both heating and cooling.
- Remote digital flow setting of the valve shall be possible via BACnet or Modbus connection to the BMS
- Remote analogue flow setting of the valve shall be possible via a 0-10V or 4-20mA input signal from BMS
- The valve must contain a removable DP-controller to allow for full flushing without flow limitation through the valve.
- The actuator shall be capable of providing a feedback signal.
- Protection class for the actuators shall be IP 54 according to EN 60529.
- The valve housings shall be made in dezincification resistant brass (DZR).
- The pressure independent control valve shall have a maximum operating differential pressure of 400 kPa (4 bar)
- The pressure independent control valve shall be capable of closing against a maximum differential pressure of 400 kPa (4 bar) complying with EN1349 Class IV [maximum leakage rate of 0.01% of the maximum rated volumetric flow.]