VB601R with MB10-24T-PLUG, -ENGY, -FLEX

Dedicated change over actuators for the VB601R 6-port valves with SP90 Actuator

Product Description

The VB601R is a 6-port motorized ball valve that performs a diverting function between two water circuits in 4-pipe change over system. The VB601R valve switches between heating and cooling and is driven by the **SpaceLogic** MB10 actuators, 3 models of the MB10 actuators are designed to work with the SP90 communicating actuator and are described in this document.

Flow regulation is provided from an additional **SpaceLogic** PIBCV valve and the SP90 actuator. Combining the control valve with a change over valve provides balanced hydronics for the most energy efficient proportional control.

The control signal from the SP90 into the MB10 Change over actuator determines the direction of flow through the valve or if all ports are to be isolated.

During the 6-port valve motorization, the valve rotates through a mid point with all ports isolated and with no possibility to cross connect and mix the heating and cooling circuits.

Features:

- No cross-flow between supply circuits.
- Simple wiring, power and control plugged via the SP90 multifunction port.
- Visual indication of actual valve position.
- Silent and reliable operation.
- Maintenance free.
- Teflon seal and polished chrome valve ball to prevent valve sticking.
- Manual override.

Specifications

Valve

DN	15	20
Diff Pressure	3.6 kPa at Q_{Nom} of 450 l/h DN15-STD Flow **SpaceLogic** PIBCV	4.4 kPa Q_{Nom} of 900 l/h DN20-STD Flow **SpaceLogic** PIBCV
Kvs	2.4 m^3/h	4.0 m^3/h
Pressure Class, PN	16	16
Medium Temp.	0 ... 90 °C	
Shut off		800 kPa
Valve neck		Quick fix connection
Connection		Internal thread Rp 1/2 ISO 7/1
Certifications		PED 2014/68/EU Article 4 (3)
Weight		1140 g
Materials: Body and connection Ball Stem Seals O-ring		CW 602 N (DZR Brass) CW 614 N Chrome plated CW 614 N Nickel plated P.T.F.E. (TEFLON) 70 EPDM 281

Actuator

Power supply	24 Vac/dc +/- 20%
Operating power consumption	3.5 VA (only when running)
Frequency	50/60 Hz
Running speed	80 sec/90°
Control input	2-point
Operating torque	10 Nm
Rotation angle	90 °
Ambient temperature	0 … 55 °C
Storage and transport temperature	−10… 80 °C
Protection Class	II according to EN 60730-1
Enclosure Rating	IP42 according to EN 60529
Weight	405 g
Connection cable length WIre size	1.5 m 0.5 mm^2
Standards/Directives LVD / EMC RoHS	 EN 60730 2011/65/EU

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Ordering

VB601R 6-Way Valve Bodies

DN	kVS (m³/h)	Connection	Part No.
15	2.4	Rp ½	VB601R-15B
20	4.0	Rp 3/4	VB601R-20B

MB10 Change over Actuator

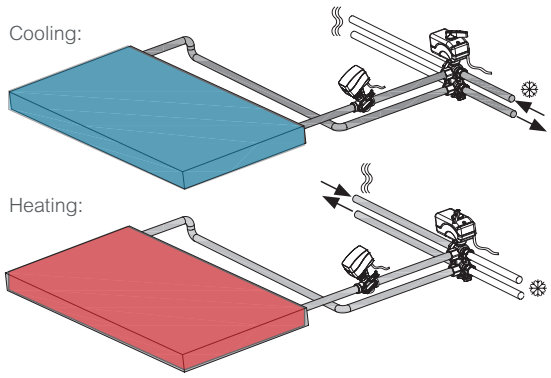
Supply voltage (V)	Speed (s / 90°)	Part No.	Description
24 AC	80	MB10-24T-PLUG	Direct connection to SP90 multi-function port
		MB10-24T-ENGY	Plug connection to SP90 mutli-function port + strap on temp sensors
		MB10-24T-FLEX	Free wire connection for conection of other devices

Note: Actuators MB10-24T and MB10-24T-10M are designed for use only with the MP130 actuators on top of the PIBCV, they are not suitable for use with the SP90 actuator.

Application Principles

Typical Applications

- Radiant ceiling panel, supplied by 4 pipes (Heating supply and return and cooling supply and return);
- Fan coil unit, with single coil supplied by 4 pipes (Heating supply and return and cooling supply and return).



Pump head calculation

To calculate required pump head:

- determine the critical circuit;

- calculate pump head without VB601R solution (VB601R + **SpaceLogic** PIBCV);

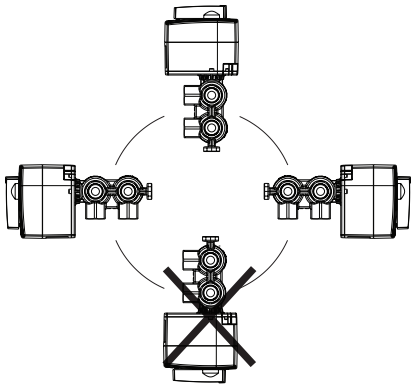
- starting pressure for VB601R solution is ~20kPa (VB601R 3.6kPa + **SpaceLogic** PIBCV 16kPa);

- add the starting pressure to the pump head.

Anti-Sticking Requirements

To reduce the risk of the ball valve sticking due to water quality, the valve must be partially rotated at least every 7 days and operation at least once per week to reduce the risk of higher toque loading on the actuator. Reversing the control signal for a maximum of 40 seconds will rotate the valve through 45 degrees to the zero flow position without changing between heating and cooling.

Installation and Mounting



Design flow setting for heating and cooling

The design flow needed for heating is generally less than for cooling. The SP90 regulates the PIBCV to the exact design flow limits for both heating and cooling as defined during set up. No flow pre-setting should be made on the PIBCV.

Example:

- Cooling Design Flow - 400 l/h
- Heating Design Flow - 200 l/h.

Recommended PIBCV valve selection, VP228E-15BQS (NT)

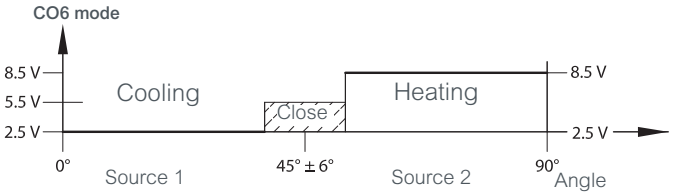
Set up in SP90 actuator:

- Heating design flow, AV:30 / 32796: 400 (l/h)
- Cooling design flow, AV:31 / 32798: 200 (l/h)
- SP90 Control Mode, MSV:9 / 32810: MB10 Change over

Signals from SP90 to MB10 Actuator

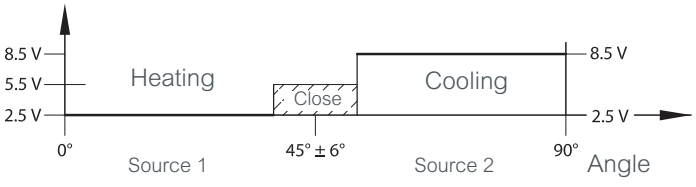
Normally cooling is connected to port 1 and 4 and heating to port 5 and 6. If that is not possible, then this may be switched and 4: Inverted CO6 Mode must be selected.

SP90 and the ChangeOver actuator communicate with 0…10V control and feedback signal. Whole functionality is available by using simple bus commands. For easier technical understanding, please see below detailed explanation of the communication between SP90 and the MB10 (6-Way Change Over) Actuator.



Cooling connected to port 1 and 4 Heating connected to port 5 and 6

Inverted CO6 mode



Heating connected to port 1 and 4 Cooling connected to port 5 and 6

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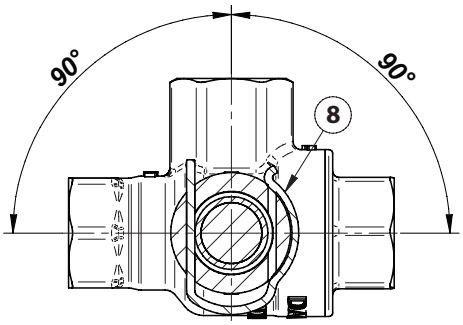
Feedback from MB10 to SP90

Signal from SP90 to MB10 ChangeOver Actuator

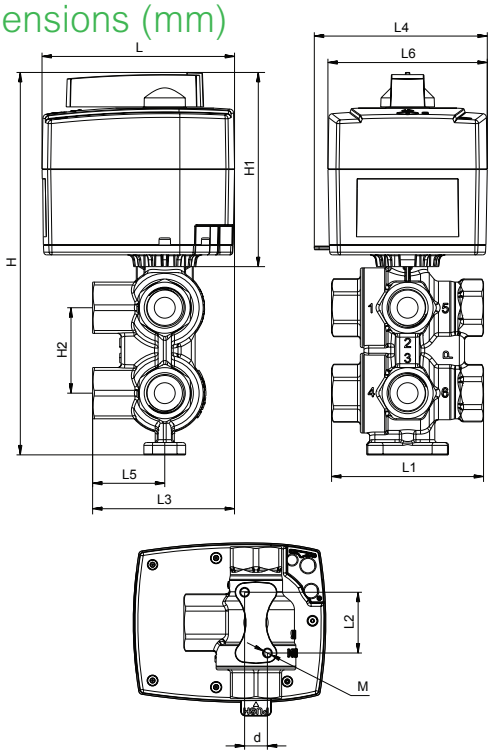
	Stop the motor	Cooling	Shut-off	Heating
CO6 mode	1.0 V	2.5 V	5.5 V	8.5 V
Inverted CO6 mode	1.0 V	8.5 V	5.5 V	2.5 V

Feedback signal from the MB10 ChangeOver Actuator to SP90

Un-able to move	Cooling	Moving direction: Cooling to Heating	Shut-off	Moving direction: Heating to Cooling	Heating
1.0 V	2.5 V	4.0	5.5 V	7.0 V	8.5 V



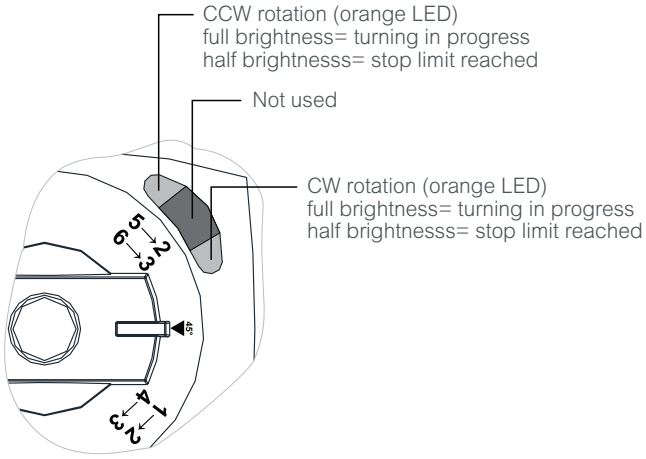
Dimensions (mm)



DN	L1	L2	L3	L4	L5	L6	H	H1	H2	d	M
	mm										
15	81	32	75	92	38	84	202	103	45	12	M5
20	92		82		45		224		60		

Indication and Setup

Actuator operation is indicated with LED lights.

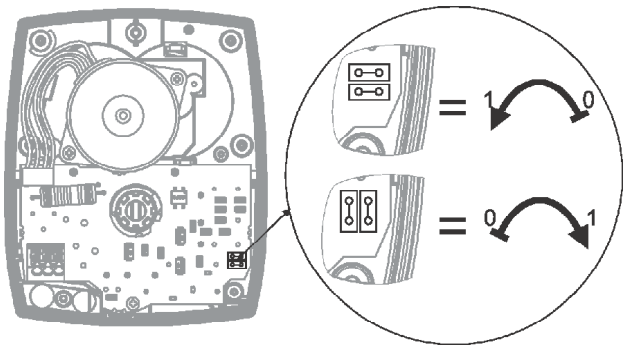


Actuator default setup is to have start position in CW limit position. Once controlled with the 24 V control phase, it wil turn to the end positon which is CCW limit position.

Default start and end position can be reversed by means of 2 jumpers on the actuator PCB.

To access them unscrew the screw (1), remove the handle (2), unscrew the screws of actuator cover (3) and remove the actuator cover (4).

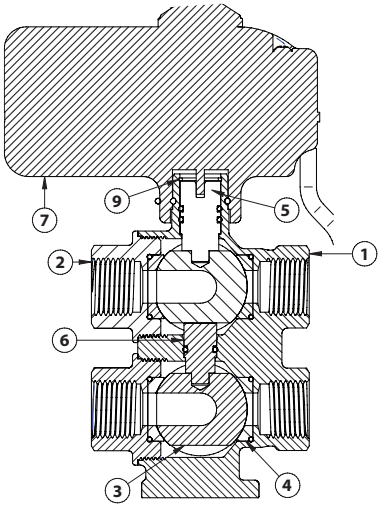
Adjust the jumpers to correspond the requested start and end position.



After adjusting the jumpers, put back the cover (1) and screw (2) it down, put back the handle (3) and screw it down with screw (4).

Design

1. Valve body
2. Pipe Connection
3. Ball with L-bore
4. Ball sealing with O-ring
5. Spindle with double O-ring
6. Connection spindle with O-ring
7. MB10 Actuator
8. Actuator connection pin
9. Snap ring



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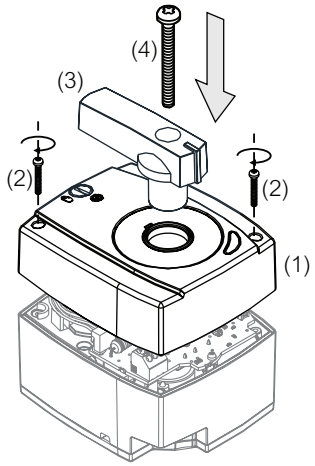
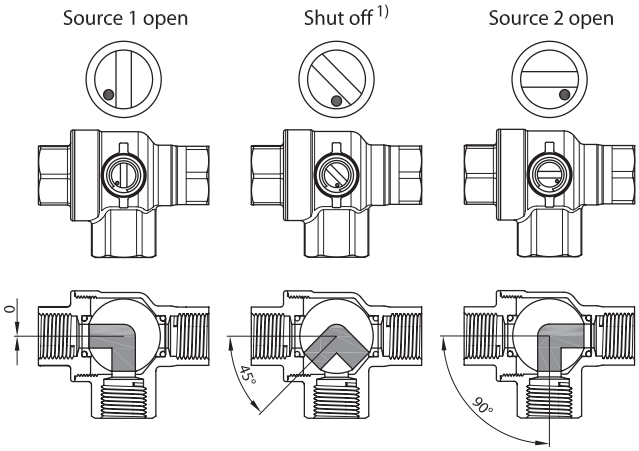
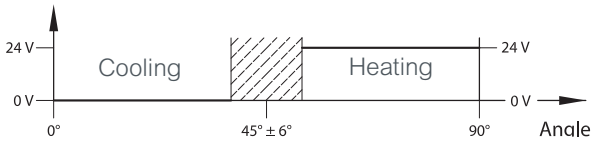


Isolation

Due to the valve design and construction there is no mixing possible between the heating and cooling circuit.

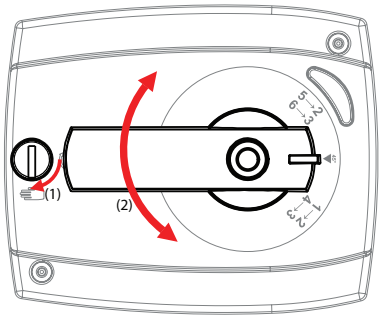




1 - manual override (for service purposes only)

Manual Override

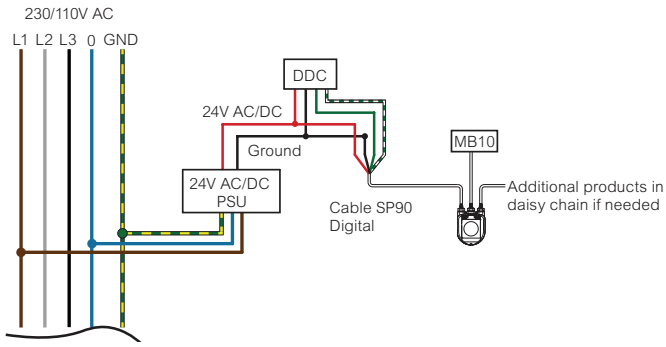
Do not manually operate the drive if power is connected. If manual override has been used when power is connected actuator will always return to its end position. To operate the manual overide lever, first depress and hold the motor clutch button.



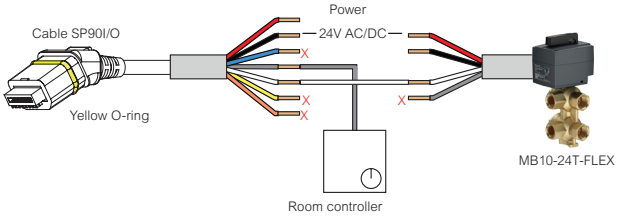
a. Turn the clutch knob (1) to manual mode.
b. Turn the knob (2) to rotate the valve to requested position.
c. Turn the clutch knob (1) back to automatic position, once the manual mode should be finished.

Wiring and Connections

MB10-24T-PLUG, MB10-24T-ENGY



MB10-24T-FLEX



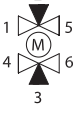
Example:

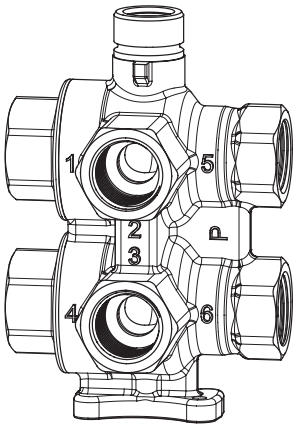
0…10 Vdc input from a room controller/sensor.

- Position feedback (gray wire) from MB10 shall be disabled to enable 0…10V controller input.
- Alternative, connection of RTD room sensor into the Yellow T1 input.

Marking

The 6 ports of the VB601R valve allow the following flow directions.

	Control signal - 0 VAC (brown wire):
	Port 1 to port 2 and port 3 to port 4
	Control signal - 24 VAC (brown wire):
	Port 5 to port 2 and port 3 to port 6
	Heating or cooling distribution pipes
	Ports 1, 4, 5 and 6
	Terminal unit pipes
	Ports 2 and 3



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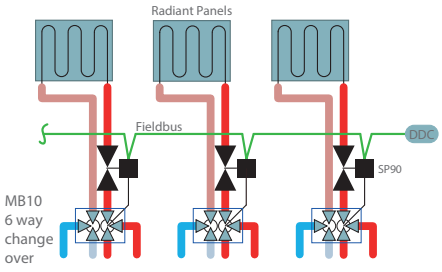
Key Application Principles and Set Up Objects/Registers

See SP90 product manual F-27972 for full details of all parameter settings.

Typical base application

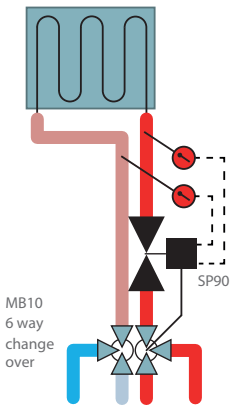
Defining maximum design flow settings for heating and cooling



Setup

Object / Register	Write/ read value	Description
MSV:9 / 32810	3: Application Mode	States 3 to 6 for differing 6 way application modes (i.e. direct / reverse / with and without alarms)
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over
AV:30 / 32796	250	Design flow setting of Heating e.g. 250 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h

Typical application with additional energy and ΔT functionality

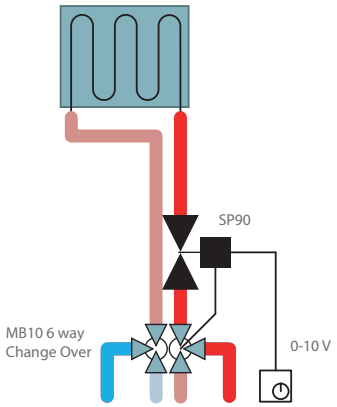


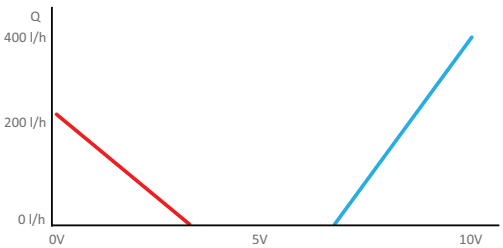
Setup

Object /Register	Write/read value	Description
MSV:9 / 32810	3: Application mode	States 3 to 6 for differing 6 way application modes (i.e. direct / reverse / with and without alarms)
AV:32 / 33288	Power emission	Calculates energy based on values from flow feedback (AV:2) and temperature (AI:1 and AI:2)
AV:33 / 33290	Heating Energy Counter	Accumulate Energy counter for heating
AV:34 / 33292	Cooling Energy Counter	Accumulate Energy counter for cooling
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over
AI:1 / 33218	Temperature	Select between temperature units or ohms
AI:2 / 33220	Temperature	Select between temperature units or ohms
AV:30 / 32796	250	Design flow setting of Heating e.g. 250 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h

0-10 V analog control application

With the Object MSV:9 / register 32810 state 7 or 8 both SP90 and the 6 way MB10 change over can be controlled by a single voltage output from a room controller. Flow, energy and ΔT information for feed back and control can be utilized with connection of the SP90 into the field bus network. SP90 can be customized to match the voltage values outputted by any room controller to both changeover and control the flow. This is done by configuring the objects AV:50-53 / register 32848-32854.

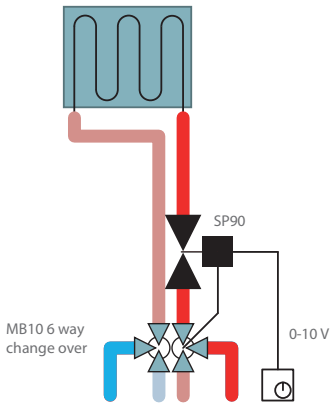


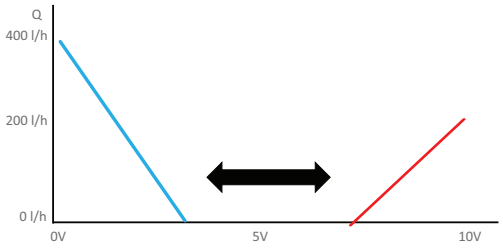


Setup

Object /Register	Write/read value	Description
MSV:9 / 32810	7: Application Mode	The flow and changeover signal is controlled by a single 0-10 V analog input.
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over
AV:30 / 32796	200	Design flow setting of Heating e.g. 200 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h
BV:2 / 32786	Direct	Used to switch the heating and cooling control signal from the Room controller. Must be set before AV:50-53 / register 32484-32554.
AV:50 / 32848	0	The control signal (V) for heating 100% open when MSV:9 / register 32810 = State 7 or 8.
AV:51 / 32850	3.3	The control signal (V) for heating 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:52 / 32852	6.7	The control signal (V) for cooling 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:53 / 32854	10	The control signal (V) for cooling 100% open when MSV:9 / register 32810= State 7 or 8.

Inverted analog control signal application

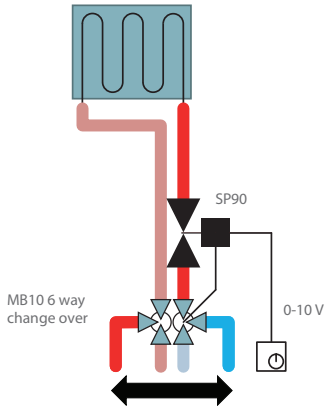


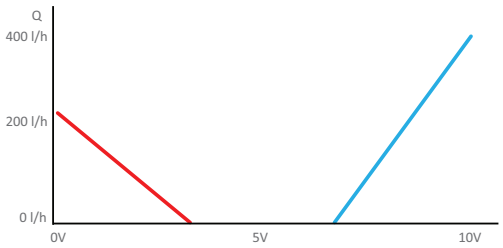


Setup

Object /Register	Write/read value	Description
MSV:9 / 32810	7: Application Mode	6 way analog change over mode where the flow and changeover signal is controlled by a single 0-10 V analog input.
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over.
AV:30 / 32796	200	Design flow setting of Heating e.g. 200 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h
BV:2 / 32786	Inverse	Used to switch the heating and cooling control signal from the Room controller. Must be set before AV:50-53 / register 32484-32554.
AV:50 / 32848	10	The control signal (V) for heating 100% open when MSV:9 / register 32810 = State 7 or 8.
AV:51 / 32850	6.7	The control signal (V) for heating 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:52 / 32852	3.3	The control signal (V) for cooling 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:53 / 32854	0	The control signal (V) for cooling 100% open when MSV:9 / register 32810= State 7 or 8.

Application configuration for an inverted pipe connection





Setup

Object /Register	Write/read value	Description
MSV:9 / 32810	8: Application Mode	Inverted 6 way change over mode with flow and changeover controlled by a single 0-10 V analog input.
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over.
AV:30 / 32796	200	Design flow setting of Heating e.g. 200 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h
BV:2 / 32786	Direct	Used to switch the heating and cooling control signal from the Room controller. Must be set before AV:50-53 / register 32484-32554.
AV:50 / 32848	0	The control signal (V) for heating 100% open when MSV:9 / register 32810 = State 7 or 8.
AV:51 / 32850	3.3	The control signal (V) for heating 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:52 / 32852	6.7	The control signal (V) for cooling 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:53 / 32854	10	The control signal (V) for cooling 100% open when MSV:9 / register 32810= State 7 or 8.

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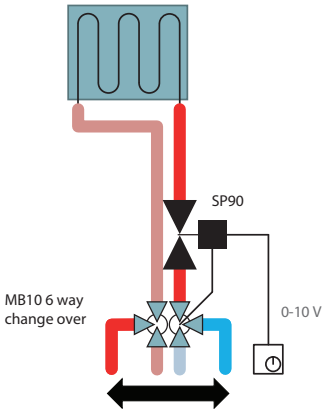
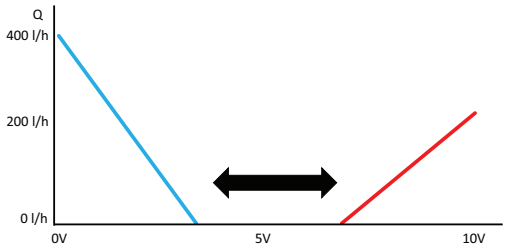
Application configuration for an inverted pipe and inverted signal





Setup

Object /Register	Write/read value	Description
MSV:9 / 32810	8: Application Mode	Inverted 6 way change over mode with flow and changeover controlled by a single 0-10 V analog input.
MSV:3 / 32802	Selected valve type	The Selected PIBCV Valve working in combination with the change over.
AV:30 / 32796	200	Design flow setting of Heating e.g. 200 l/h
AV:31 / 32798	400	Design flow setting of Cooling e.g. 400 l/h
BV:2 / 32786	Inverse	Used to switch the heating and cooling control signal from the Room controller. Must be set before AV:50-53 / register 32484-32554.
AV:50 / 32848	10	The control signal (V) for heating 100% open when MSV:9 / register 32810 = State 7 or 8.
AV:51 / 32850	6.7	The control signal (V) for heating 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:52 / 32852	3.3	The control signal (V) for cooling 0% open when MSV:9 / register 32810 = State 7 or 8.
AV:53 / 32854	0	The control signal (V) for cooling 100% open when MSV:9 / register 32810= State 7 or 8.