COMBIFLOW Multi Rotary Actuator

BACnet Integration Guide

Application

The COMBIFLOW Multi Rotary is a combined analogue and digital actuator designed to be used with the COMBIFLOW 6-way Pressure Independent Control Valve in 4-pipe applications.

The sizing flows can be programmed using BACnet or Modbus or by limiting the voltage or current signal to the actuator. The actuator can then be used for:

- Switching between cooling and heating.
- Flow modulation.
- Flow shut off.
- Error and status reporting.

When used as an analogue actuator, it communicates with the Building Management system (BMS) using a 0(2)-10 V or 0(4)-20 mA signal. When used as a digital actuator, it integrates with BACnet or Modbus systems, allowing simple configuration, feedback, flow and status indication.

This document describes how to integrate the actuators using BACnet MS/TP.

For actuator installation on the COMBIFLOW valve and electrical wiring, please refer to the COMBIFLOW Multi Rotary actuator Technote.

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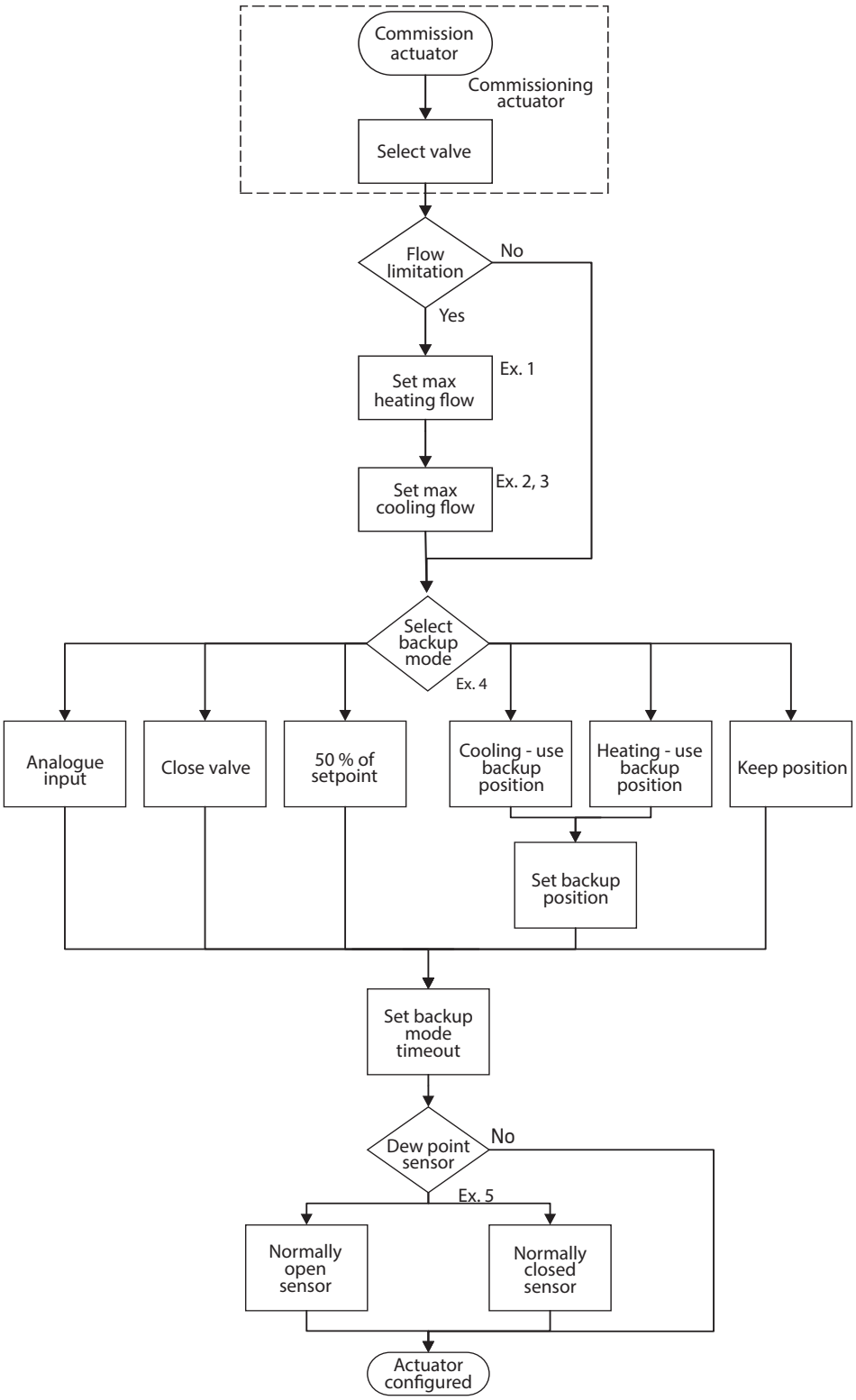
Overview

The flowchart below describes the complete actuator commissioning process. The guide starts by explaining the basic communication settings and valve selection process. Then, an application example is provided for each step of the flowchart and lastly, a complete object list is provided. Beside each step there is a reference such as Ex. 2.
This refers to an application example, so the example given is Application example 2 on page 5.
A basic commissioning can be done very quickly by jumping over the optional steps.



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Commissioning actuator

This basic setup prepares the valve and actuator to control the flow using algorithms.

Given that the BACnet-address has already been setup using the DIP-switches shown in the COMBIFLOW Multi Rotary Technote, these objects are needed to setup the BACnet communication. In objects where "**W**" is shown in the R/W column, values must be written into the object. By default, the BACnet communication rate is auto-baud 9600-76800.

To configure the communication settings, these objects must be setup (using 9600-76800 baud):

Name	Object	R/W	Values	Unit
MAC address*	IV-1	R/W	1..247	--
RS-485 baud rate	MSV-1	W	1: Autobaud 9600-76800	--
			2: 9600	
			3: 19200	
			4: 38400	
			5: 57600	
			6: 76800	
			7: 115200	
ValveSelect	MSV-3	W	4: DN15LF	--
Reset**	IV-0	W	3: Change baudrate and format	--

*** This register contains the current address of the actuator set by the HEX-switches. Changing this register overrides the HEX-switches.**

** Power cycling the device can also enable the new baudrate / data format.

The valve used in this example is a COMBIFLOW DN15 LF. The complete range of COMBIFLOW valves are selectable (see MSV-3/ValveSelect object in the object list).

When the commissioning has been done, the examples on the following pages can be performed.

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Application Example 1 · Flow setting and heating control

Example: Flow setting for cooling and heating, and controlling the valve in heating region.

Object AV-3: Preset value for the cooling side.
Object AV-7: Preset value for the heating side.
Object AV-6: Heating flow setpoint 0-100.

Name	Object	R/W	Values	Unit
MaxCooling	AV-3	W	2.5 (Preset value 2.5)	--
MaxHeating	AV-7	W	1.0 (Preset value 1.0)	--
HeatingSet*	AV-6	W	0..100	--

* Writing to HeatingSet, sets CoolingSet to 0, and vice versa.

Application Example 2 · Flow setting and cooling control

Example: Flow setting for cooling and heating, and control the valve in cooling region.

Object AV-3: Preset value for the cooling side.
Object AV-7: Preset value for the heating side.
Object AV-2: Cooling flow setpoint 0-100.

Name	Object	R/W	Values	Unit
MaxCooling	AV-3	W	2.5 (Preset value 2.5)	--
MaxHeating	AV-7	W	1.0 (Preset value 1.0)	--
CoolingSet*	AV-2	W	0..100 (0: No flow .. 100: Max preset)	--

* NB! Writing to HeatingSet, sets CoolingSet to 0, and vice versa.

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Application Example 3 · Flow setting, cooling control and read of flow estimation

Example: Flow setting for cooling and heating, controlling the valve in cooling region and reading the estimated flow.

Object AV-3: Preset value for the cooling side.
Object AV-7: Preset value for the heating side.
Object AV-2: Flow setpoint 0-100.
Object AV-1: Estimated flow in the cooling region.

Name	Object	R/W	Values	Unit
MaxCooling	AV-3	W	2.5 (Preset value 2.5)	--
MaxHeating	AV-7	W	1.0 (Preset value 1.0)	--
CoolingSet*	AV-2	W	50 (0: No flow .. 100: Max preset)	--
CoolingFlow	AV-1	R	Example: 70 = 70 l/h**	136: l/h

* Writing to CoolingSet, sets HeatingSet to 0
** Estimated actual flow in the valve. In this example valve DN15 LF is selected. The actual flow can deviate from the estimated flow due to mechanical tolerances in actuator and valve.

Application Example 4 · Backup function

Example: Setting up backup function in case of communication loss.
In this example the valve will go to cooling position 50 (range 0-100, approximately the middle of the cooling region) if the bus communication is down for more than 1 hour (3600 s).

Object AV-10: BackupPosition.
Object AV-11: BackupTimeout in seconds.
Object MSV-0: Cooling with position set in Object AV-10.

Name	Object	R/W	Values	Unit
BackupPosition	AV-10	W	50 (0: No flow .. 100: Max preset)	--
BackupTimeout	AV-11	W	3600 (3600 sec / 1 hour)	73: Seconds
BackupMode	MSV-0	W	4: Cooling with BackupPosition	--

Application Example 5 · Dew point sensor

Example: Setting up the dew point sensor.
When the dew point sensor is active, the actuator will close the valve.

Normally Open (N0) = Dew point active when Ain (Y1) is > 2V
Normally Closed (N1) = Dew point active when Ain (Y1) is < 2V
Object MSV-4: Select functionality of the dew point sensor. When the dew point sensor is active, the actuator will close the valve.

Name	Object	R/W	Values	Unit
DewPointSelect	MSV-4	W	Example: 2: Dew-point N0 (Normally open)	--

* In the example above the relay is connected between terminal 2 and 3.. When the relay is active (short circuit between pin 2 and 3 via the relay) the valve will be closed and there will be no flow as long as the relay is active.

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Application Example 6 · Analogue input

Example: Reading analogue input.

Object AI-0: Read the analogue input voltage present on Y1(when not used for dewpoint sensor).

Name	Object	R/W	Values	Unit
Ain (Y1)	AI-0	R	Example: 8.3 = 8.3V*	5: Volts

* In the example above a 8.3 V signal is present at pin 3.

Application Example 7 · Status

Example: Reading the status bits.

Object BSV-0: Current status of the actuator.

Name	Object	R/W	Values	Unit
Status	BSV-0	R	Example: 00001000* = Dew-point sensor active*	--

* In this example, the dew-point sensor is active, and the actuator has moved to the closed position

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Object List

Name	Description	Object	R/W	Values	Unit
Ain	Analogue (Y1) 0-10 V or dewpoint sensor input	AI-0	R	0 - 10	5: Volts
Aout	Analog Output (U) 0-10 V	AO-0	R	0 - 10	5: Volts
Cooling	Current cooling position	AV-0	R	0 - 100	--
CoolingFlow	Current cooling flow estimation (l/h)	AV-1	R	0 - Max flow of selected valve	136: l/h
CoolingSet	Cooling setpoint	AV-2	R/W	0 - 100	--
MaxCooling	Cooling preset 0-4.0	AV-3	R/W	0 - 4	--
Heating	Current heating position	AV-4	R	0 - 100	--
HeatingFlow	Current heating flow estimation (l/h)	AV-5	R	0 - Max flow of selected valve	136: l/h
HeatingSet	Heating setpoint	AV-6	R/W	0 - 100	--
MaxHeating	Heating preset 0-4.0	AV-7	R/W	0 - 4	--
BackupPosition	Backup position for either cooling or heating	AV-10	R/W	0 - 100	--
BackupTimeout	Backup timeout in seconds	AV-11	R/W	1 - 65535	73: Seconds
Firmware ver.	Current firmware version	AV-24	R	Current FW version	--
BackupMode	Analog input value	MSV-0	R/W	1	--
	Closed position			2	
	50 % of setpoint			3	
	Cooling with BackupPosition			4	
	Heating with BackupPosition			5	
	Keep position			6	

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Object List

Name	Description	Object	R/W	Values	Unit
BaudRate	Autobaud: 9600-76800 bps	MSV-1	R/W	1	--
	9600			2	
	19200			3	
	38400			4	
	57600			5	
	76800			6	
	115200			7	
DataFormat	8E1	MSV-2	R/W	1	--
	8N1			2	
	8N2			3	
	8O1			4	
ValveSelect	Generic	MSV-3	R/W	1	--
	DN20			2	
	Dn15			3	
	DN15LF			4	
DewPointSelect	No sensor	MSV-4	R/W	1	--
	Dew point sensor NO (N0) (Normally Open)			2	
	Dew point sensor NC (N1) (Normally Closed)			3	
Reset	No change	IV-0	R/W	0	--
	Reset to default values			1	
	Softreset			2	

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Object List

Name	Description	Object	R/W	Values	Unit
MAC address	RS-485 address of the actuator	IV-1	R/W	1..247	--
Status	Obstruction (Jammed)	BSV-0	R	Bit 0	--
	Cooling			Bit 1	
	Heating			Bit 2	
	Dew point sensor active			Bit 3	
	Reserved			Bit 4-7	

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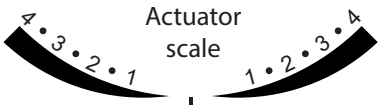
Setting and Flow



DN15 Low - 925 l/h

	Flow cooling [l/h]	Flow heating [l/h]	BACnet setting
❄	830	0	4.0
	780	0	3.8
	730	0	3.6
	660	0	3.4
	560	0	3.2
	460	0	3.0
	380	0	2.8
	310	0	2.6
	240	0	2.4
	190	0	2.2
	140	0	2.0
	120	0	1.8
	100	0	1.6
	85	0	1.4
	75	0	1.2
	65	0	1.0
	50	0	0.8
	35	0	0.6
	30	0	0.5
Switch over zone			
	0	30	0.5
	0	35	0.6
	0	50	0.8
	0	65	1.0
	0	75	1.2
	0	85	1.4
	0	100	1.6
	0	120	1.8
	0	140	2.0
🔥	0	190	2.2
	0	240	2.4
	0	310	2.6
	0	380	2.8
	0	460	3.0
	0	560	3.2
	0	660	3.4
	0	730	3.6
	0	780	3.8
	0	830	4.0

DN15 - 1200 l/h

	Flow cooling [l/h]	Flow heating [l/h]	BACnet setting
❄	1200	0	4.0
	1170	0	3.8
	1150	0	3.6
	1090	0	3.4
	1000	0	3.2
	910	0	3.0
	810	0	2.8
	700	0	2.6
	610	0	2.4
	550	0	2.2
	490	0	2.0
	430	0	1.8
	380	0	1.6
	320	0	1.4
	260	0	1.2
	210	0	1.0
Switch over zone			
	0	210	1.0
	0	260	1.2
	0	320	1.4
	0	380	1.6
	0	430	1.8
	0	490	2.0
	0	550	2.2
🔥	0	610	2.4
	0	700	2.6
	0	810	2.8
	0	910	3.0
	0	1000	3.2
	0	1090	3.4
	0	1150	3.6
	0	1170	3.8
	0	1200	4.0

DN20 - 4250 l/h

	Flow cooling [l/h]	Flow heating [l/h]	BACnet setting
❄	4250	0	4.0
	3990	0	3.8
	3730	0	3.6
	3400	0	3.4
	3000	0	3.2
	2600	0	3.0
	2310	0	2.8
	2020	0	2.6
	1760	0	2.4
	1540	0	2.2
	1310	0	2.0
	1110	0	1.8
	910	0	1.6
	740	0	1.4
	600	0	1.2
	460	0	1.0
Switch over zone			
	0	460	1.0
	0	600	1.2
	0	740	1.4
	0	910	1.6
	0	1110	1.8
	0	1310	2.0
	0	1540	2.2
🔥	0	1760	2.4
	0	2020	2.6
	0	2310	2.8
	0	2600	3.0
	0	3000	3.2
	0	3400	3.4
	0	3730	3.6
	0	3990	3.8
	0	4250	4.0

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