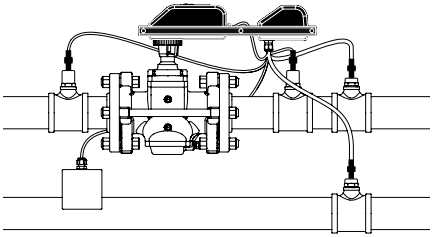
FlowCon international
A Griswold Controls LLC./FlowCon International Company

Installation and Operation Instruction

The **FlowCon Energy FIT System** is available in 2 different double union end connected models covering 5 different sizes and 4 different flanged models covering 8 different sizes:

- FlowCon FIT.1 DN15-25 (1/2”-1”)
- FlowCon FIT.2 DN25-40 (1”-1 1/2”)
- FlowCon FIT.3 DN50-80 (2”-3”)
- FlowCon FIT.4 DN80-100 (3”-4”)
- FlowCon FIT.5 DN125-150 (5”-6”)
- FlowCon FIT.6 DN200-250 (8”-10”)



O-rings are supplied with the valve body and are used to seal the connections. It is recommended to grease the O-rings with silicone grease.
Please make sure these are properly placed in the O-ring grooves on valve inlet and outlet, before installing the housing. Please note that FlowCon SM.6 (DN200-250 / 8”-10”) contains 2 O-ring grooves. Use the inner groove for DN200 / 8” flanges and outer groove for DN250 / 10” flanges.

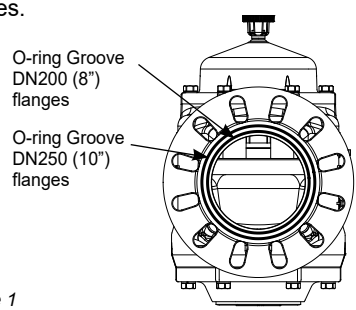


Figure 1

Flange Match

Model no.	Flange size (inch)	ASME B16.5 weld neck		Flange size (mm)	EN1092-1 weld neck			
		Class 150	Class 300		PN10	PN16	PN25	PN40
FIT.3.X	2			50	✓	✓	✓	✓
	2 1/2	✓	✓	65	✓	✓	✓	✓
	3	✓	✓	80	✓	✓	✓	✓
FIT.4.X	3	✓	✓	80	✓	✓	✓	✓
	4	✓	✓	100	✓	✓	✓	✓
FIT.5.X	5	✓	✓	125	✓	✓	✓	✓
	6	✓		150	✓	✓	✓	✓
FIT.6.2	8		✓	200			✓	✓
	10	✓		250	✓	✓	✓	✓

Fitting and Re-fitting the Actuator

The suitable **actuator types** FlowCon SM.0.0.0.3, SM.0.0.0.4 (failsafe) and SM.0.0.0.6 (failsafe and BACnet) are electrical programmable actuators.

It is recommended to grease the O-ring on the spindle adaptor with silicone grease before placing the spindle adaptor on the valve spindle.
❶ Then place the actuator on the spindle adaptor and place the three actuator “legs” into the three holes in the mounting bracket (figure 2 and 3). Make sure that the snap ring is clicked onto the mounting bracket, so that the snap ring is locked at the top of the mounting bracket, but still able to rotate. ❷ Then finger-turn the snap ring counter clockwise (upside view) approximately 1/6 of a turn until its stop points touch the actuator “legs” and the mounting is locked with a (small) click. Do not use additional tools.

It is essential that the actuator runs linear flow control mode, 2-10V DC.

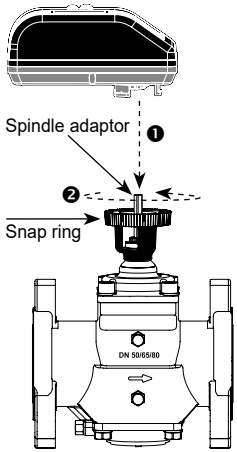


Figure 2

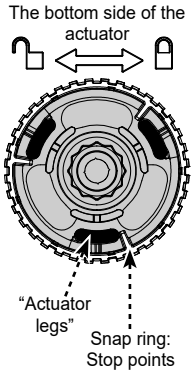


Figure 3

In case the actuator will have to be removed, it is recommended to electrically open the valve for easier removal. Hereafter reverse the procedure and ❸ turn the snap ring clockwise until the actuator is loosened and ❹ lift the actuator up. Again, no need for additional tools.

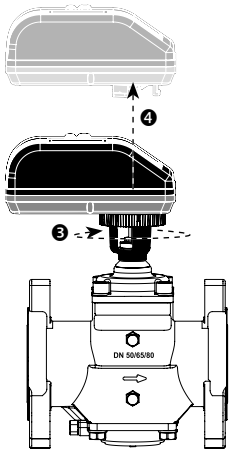


Figure 4

Do not remove cover from actuator. Opening cover will void warranty.

Remember to remove the protection film from the actuator display to avoid condensation.

Orientation

Upside-down installation is allowed along with the standard horizontal and vertical installation (figure 5).

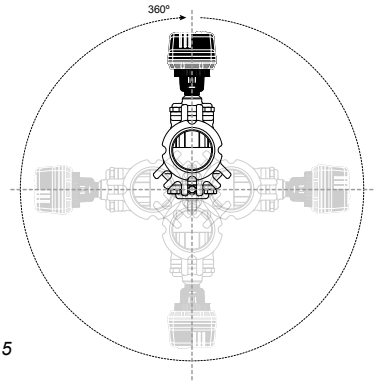


Figure 5

Intelligent Interface Connection

The FlowCon Energy FIT System includes the state-of-the-art FlowCon Intelligent Interface which is the controller of the FIT System. The Intelligent Interface is compatible with 24V AC/DC and calculates the BTU and displays the data via Bluetooth® on any Android or iPhone mobile device and includes fully integrated BACnet communication to and from the BMS and if FlowCon BACnet actuator is selected also to and from the PICV actuator.

The FIT System will automatically detect if it is installed in a heating or in a cooling system as it will add T1 and T2 readings and cross-check the result. If T1+T2<135°F the system is seen as a cooling system and if T1+T2≥135°F it will be considered a heating system.

Do not remove cover from Intelligent Interface. Opening cover will void warranty.

Sensor Kit Connection

The FlowCon Energy FIT System includes two temperature sensors that should be installed as close to the coil as possible, within 0.3-3 meter (1-10 ft). T1 should be installed on the inlet of the coil and T2 on the outlet of the coil. Sensors are to be installed in 1/4” ISO ports. The temperature sensors connect via quick-connectors to the grey cables from the Intelligent Interface. Cable length is different for T1 and T2. T1 connects to the longer cable (3 meter / 9 ft) and T2 to the shorter (1 meter / 3 ft).

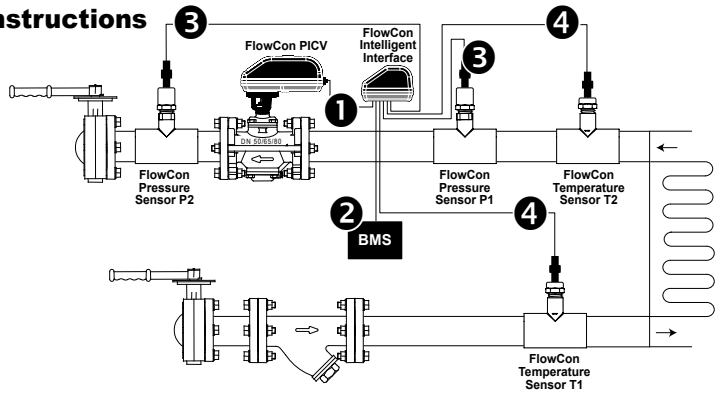
In addition, the FIT System includes two pressure sensors that must be installed on or close to the PICV valve. P1 should be installed on the inlet of the PICV and P2 on the outlet. The pressure sensors connect via quick-connectors to the black cables from the Intelligent Interface. P1 and P2 have identical cable length (1 meter / 3 ft), but P1 cable will be marked with a white sticker.

Be aware to connect according to wiring diagrams page 4 and 5 to avoid loosing warranty.

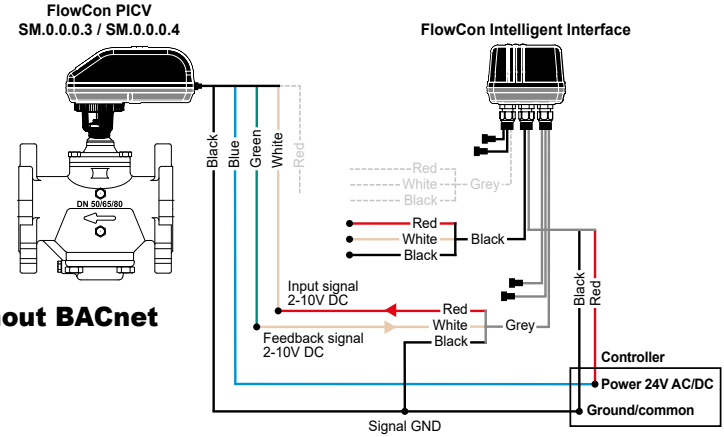
FlowCon App

Download the FlowCon App from AppStore or GooglePlay and take full advantage of the FIT system. Information on ΔT, ΔP, flow and BTU is transferred.

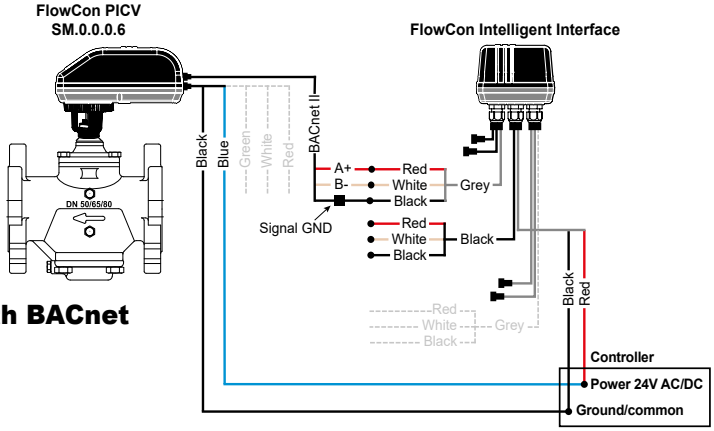
Wiring Instructions



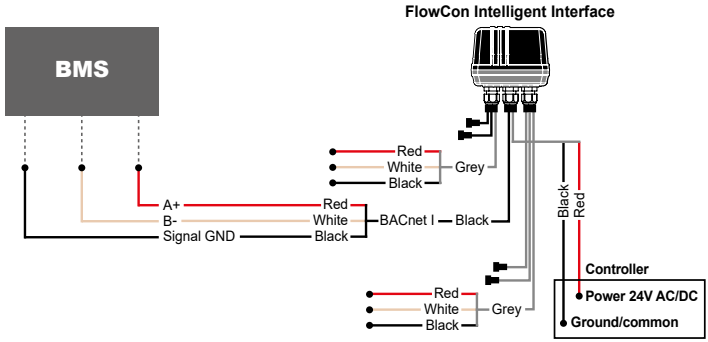
❶ PICV without BACnet



❶ PICV with BACnet

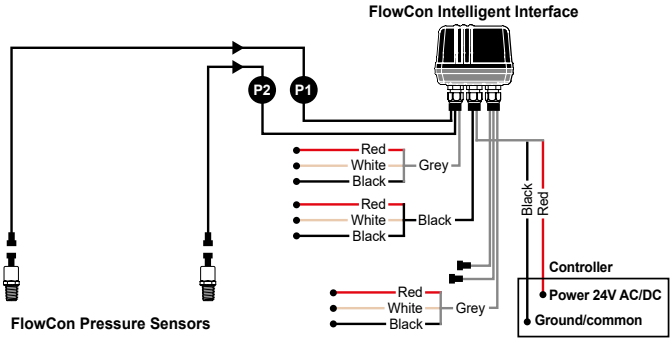


❷

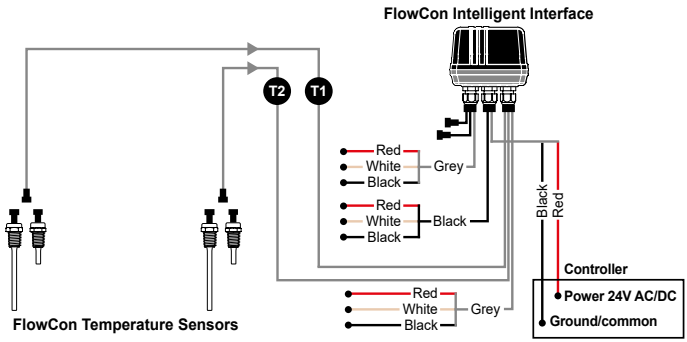


Please find the **Quick Start-Up guide** for proper set-up of Baud rate and MAC-address and FIT configuration **BEFORE connecting FlowCon FIT to BMS BACnet**

❸



❹



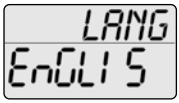
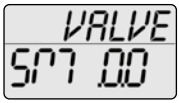
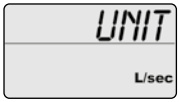
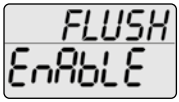
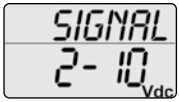
Manual programming of the actuator (SM.0.0.0.3/4/6)

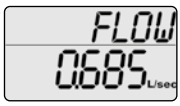
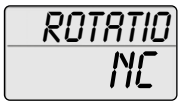
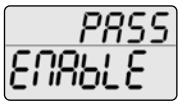
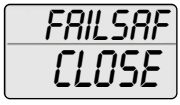
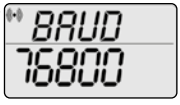
The programming menu is always accessible. To enter the programming menu, **simultaneously press ⇦ and ⇨ for 6 seconds,** until bottom line in display blinks.

To change a value, press △ or ▽. For quick scroll through values hold down △ or ▽. Press ⇨ to accept a value and go to next step and press ⇦ to go to previous step.

For fast menu exit press ⇦ and ⇨ simultaneously for 6 seconds. The actuator will automatically return to normal operation mode if no action is detected on arrow keys for 1 minute.

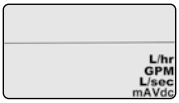
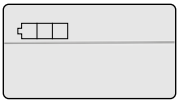
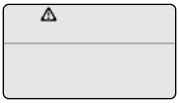
All values selected in the programming menu are stored in non-volatile memory.

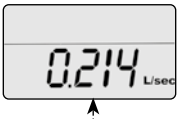
Step	Display	Description	Values
0	* 	Enter password. **scrolling top:* ENTER PASSWORD	**Disabled by default** Password: 3569266. *Only if Enabled (in step 11).* Change one digit at a time, press ⇨ and ⇦ to move between digits. At last digit, press ⇨ to go to next step.
1	* 	Select language. **scrolling top:* SELECT LANGUAG	Default: English. Possibility to choose other languages later on (not currently an option).
2	* 	Select valve model onto which the actuator is installed. **scrolling top:* SELECT VALVE MODEL	Default: SM.0.0. Select from the 11 available valve models, starting from SM.1.1. Options: SM.1.1, SM.2.1, SM....
3	* 	Choose unit scale for flow rate. **scrolling top:* SELECT UNIT SCALE	Default: l/sec. Options: l/sec or l/hr or GPM.
4	* 	Activate Flush mode at start-up. **scrolling top:* SELECT FLUSH MODE	Default: Enable. Options: Enable or Disable. *When no control signal (analog) is detected at start-up, flush mode is started (5/6 of fully opened). It will be dismissed when control signal is detected.*
5	* 	Select type of control signal. **scrolling top:* SELECT CONTROL SIGNAL	Default: 2-10VDC. Leave at default: 2-10V DC for SM.0.0.0.3/4 Set to: BACnet for SM.0.0.0.6

Step	Display	Description	Values
6	* 	Select minimum control value. **scrolling top:* SET MINIMUM LIMIT	Volt default: 2. Leave at default: 2.
7	* 	Select maximum control value. **scrolling top:* SET MAXIMUM LIMIT	Volt default: 10. Leave at default: 10.
8	* 	Select feedback signal. **scrolling top:* SELECT FEEDBAC SIGNAL	Default: AU; Automatic match of control signal. Leave at default: AU
9	* 	Set the designed maximum flow. Accuracy: Greatest of either ±5% of controlled flow or ±2% of max. valve flow. **scrolling top:* SELECT MAXIMUM FLOW	Default: Maximum setting. Values depend on valve model and unit scale chosen in step 2 and 3. Stepping increments as per tech note.
10	* 	Select direction of rotation. **scrolling top:* SELECT ROTAT DIRECT	Default: Normally Closed (NC). Leave at default: Normally Closed (NC).
11	* 	Select actuator mode. **scrolling top:* ACTUATOR MODE	Default: Linear flow. Leave at default: Linear flow
12	* 	Activate password. **scrolling top:* ACTIVAT PASSWORD	Default: Disable. Options: Enable or Disable. If Enabled password is required to access alarm and programming menu.
13	* 	Select direction of rotation when Failsafe. **scrolling top:* SELECT FAIL SAFE DIRECT	Default: Close. Options: Open or Close. *Only valid for SM.0.0.0.4/6 (failsafe models). Failsafe direction open means opening to max. flow chosen in step 9.*
14	* 	Select communication speed for PICV actuator. **scrolling top:* SELECT BAUD RATE	Default: 9600. Leave at default: 9600 *Only valid for SM.0.0.0.6 (BACnet model).*
15	* 	Select MAC address for PICV actuator. **scrolling top:* SELECT MAC ADDRESS	Default: 000. Leave at default: 000 *Only valid for SM.0.0.0.6 (BACnet model).*

Step	Display	Description	Values
16	* 	Change of device instance for PICV actuator. **scrolling top:* CHANGE DEVICE INSTANC	Default: NO. Leave at default: NO *Only valid for SM.0.0.0.6 (BACnet model).*
17	* 	Select device instance for PICV actuator. **scrolling top:* SELECT DEVICE INSTANC	Default: 0497000. Leave at default: 0497000 *Only valid for SM.0.0.0.6 (BACnet model).*
18	* 	Select out-of-service time-out for PICV actuator. **scrolling top:* OUT OF SERVICE IN MIN	Default: 15. Leave at default: 15 *Only valid for SM.0.0.0.6 (BACnet model).*

In Operation

Display	Description	Values
	Unit scale indicator.	l/sec or l/min or GPM. mA or VDC.
	Battery level indicator.	Basic version with no battery (SM.0.0.0.3) Failsafe version with battery (SM.0.0.0.4/6) Low battery level, charging needed. Medium battery level. High battery level, fully charged.
	Alarm indicator.	*Blinking if actuator is still functional (warning).* *Fully on if actuator is not working (critical).*



Information

Current flow rate[1].

CONTROL SIGNAL 6.0 VDC
FEEDBAC SIGNAL 6.0 VDC
VALVE SM. 3.1
PRESSUR RANGE 30-800 KPAD
MAXIMUM FLOW RATE 6.580 L/SEC
OPERAT DIRECT NC
ACTUAT.MODE LIN FLO
FAIL SAFE DIRECT CLOSE
ERROR CODE 01

SM.0.0.0.3/4

MAC ADDRESS 000
DEVICE INSTANC 0497000
T150C
T230C
DT 20.0
DP100KP

SM.0.0.0.6

Use ⇨ to go to next information line and
⇦ to go to the previous.

Note 1: The flow rate shown on the actuator display is a calculated value. Flow rates below 1.0 valve rotation is shown as indications, illustrated with an apostrophe in front of the flow rate. If display shows “NA” the valve model has not been chosen in programming menu step 2.

Alarm Menu

To enter the alarm menu, **simultaneously press △ and ▽ for 6 seconds**. The alarm menu is only accessible if an alarm is present (i.e. when the icon ⚠ is displayed). Press ⇨ to go to the next alarm display and press ⇦ to go to previous.

For fast menu exit press △ and ▽ simultaneously for 6 seconds. The actuator will automatically return to normal operation mode if no action is detected on arrow keys for 1 minute.

If the actuator is still **functioning** (= warning code 02, 04, 05 with failsafe and 07 with failsafe), the ⚠ icon will blink. If the actuator is **NOT functioning** (=error code 01, 03, 05 without failsafe, 06 and 08 with BACnet), the ⚠ icon is fully on. Error codes will be shown in the information part of the actuator display.

Display	Description	Action
	Alarm.	
	Enter password.	If enabled in programming menu step 11 Disabled by default. Password: 3569266.

Code	Icon	Description	Details
01	⚠ **FULL ON**	Valve/actuator is overtorqued.	Operation is stopped. Actuator will retry operation every 4 minutes. If over torque condition disappear, error will convert to error code 02.
02	⚠ **BLINKING**	Actuator has reached its torque limit in the past.	Actuator is functioning. To reset the alarm simultaneously press △ and ⇦ for 6 seconds.
03	⚠ **FULL ON**	Critical - over temperature.	Critical: Temperature in actuator is at least 70ºC, motor operation is stopped. If temperature is decreasing, operation will resume.
04	⚠ **BLINKING**	High temperature.	Actuator is still functioning. Temperature in actuator is at least 50ºC as limited according to tech note. If temperature is decreasing, operation will resume.
05	⚠ **FULL ON**	No Failsafe: Power supply not in range.	Operation is stopped. Alarm will automatically reset when voltage is back in range.
	⚠ **BLINKING**	With Failsafe: Power supply not detected / not in range.	Failsafe is activated. Alarm will automatically reset when voltage is back in range.
06	⚠ **FULL ON**	Control signal not detected.	Operation is stopped. Alarm will automatically reset when control signal is back in range.
07	⚠ **BLINKING**	Battery error.	Battery is not properly connected. Alarm will reset when battery is properly connected. *Only valid for SM.0.0.0.4/6 (failsafe models).*
08	⚠ **FULL ON**	BACnet fallback mode	BACnet control value has not been updated and BACnet fallback timeout has been reached. Alarm will reset when BACnet control signal is refreshed. *Only valid for SM.0.0.0.6 (BACnet model).*

Start-up Sequence

During start-up of any FlowCon SM actuator, the actuator will automatically calibrate to determine closing point of the valve. Calibration can take up to 10 minutes depending on the valve's position at start-up. During calibration, actuator display will show “CAL”. Hereafter it will proceed to normal operation mode (according to control signal provided by the FIT system). If no control signal is detected, flush is started if enabled in the programming menu (enabled by default), opening the valve to 5/6 of fully open. Actuator display will show “FLUSH” until control signal is detected.

All actuator settings must at this first start-up be set for the PICV actuator to work correctly. For SM.0.0.0.6 (NOTE: actuator baud rate and MAC address should be kept as default) setting should this is done via the black BACnet I cable from the BMS system and for SM.0.0.0.3/4 setting is done directly on the actuator buttons.

Auto-Stroke Sequence

In case the valve does not operate as expected, start the auto-stroke sequence to re-calibrate the closing point making sure that the actuator is able to open the valve fully. For SM.0.0.0.3/4 press ⇨ and △ simultaneously for 6 sec to start the sequence. For SM.0.0.0.6 set BV.63=1 to start auto-stoke sequence and actuator state will be MSV.45=4.
An auto-stroke sequence cannot be cancelled and during the sequence, actuator display will show “AUTO STROKE CYCLES”. After auto-cycle, the valve will proceed to normal operation mode (according to control signal from FIT) and for SM.0.0.0.6 returns BV.63=0 and MSV.45=1.

Manual Override

Manual override is used to temporarily set the valve position regardless the settings and control signal for the actuator. Before performing manual override, please turn off the power supply to the actuator and disconnect actuator from valve.

Manual override is performed by a wrench. Turn the valve spindle clockwise to close the valve and counter-clockwise to open. Re-mount the actuator and connect power. Be aware to protect the actuator from water while not on the valve.

When manually operating the valve do not use more than 10Nm torque. Use of higher torque will void warranty.

Failsafe Mode (FlowCon SM.0.0.0.4 / SM.0.0.0.6)

When power is lost, the actuator will go into failsafe mode with approximately 80 sec. delay. For SM.0.0.0.4 failsafe position in chosen in programming menu step 13 and during failsafe mode warning code 05 will show in the actuator display until the actuator shuts off. For SM.0.0.0.6 failsafe mode includes 3 steps. ❶ BV.59=1 and MSV.45=5 to indicate a warning (approx. 60 sec.). ❷ BV.59=1 and MSV.45=6 to indicate failsafe mode and move the actuator to failsafe position set in BV.18. ❸ After approx. 60 sec., the actuator shuts off.

Upon power before actuator shut-off, the actuator returns to normal operation mode and ⚠ will be reset. If power returns after actuator shut-off, the actuator re-calibrates, returns to normal operation and resets ⚠.

BACnet Fallback Function (FlowCon SM.0.0.0.6)

BACnet fallback function is always activated when using BACnet SM actuator together with FlowCon FIT. When AV.141 is written to, a time counter starts. If the counter reaches the value of AV.143, the action from MSV.43 starts and BV.62=1. When AV.141 is written to the next time, the counter resets and restarts; BV.62=0. If no BACnet fallback action is wanted, set MSV.43=2. BACnet fallback alarms are not indicated in MSV.45.

BACnet programming of FlowCon Intelligent Interface

In this instruction:

AV = Analog Value
BV = Binary Value
MSV = Multi-State Value.

Default values are underlined.
Please also see FlowCon FIT BACnet PICS.

❶ After completing **Quick Start-up Sequence** setting Baud Rate (MSV.1), MAC Address (MSV.2) and FIT Configuration (MSV.6) and reconnecting power at specific location start by **selecting** your **PICV valve** in MSV.38:

1 = SM.0.0 7 = SM.4.1
2 = SM.1.1 8 = SM.4.2
3 = SM.2.1 9 = SM.4.3
4 = SM.3.0 10 = SM.5.1
5 = SM.3.1 11 = SM.5.2
6 = SM.3.2 12 = SM.6.2

❷ Hereafter **trim the pressure sensors**. To trim the pressure sensors, please check via BACnet AV.18 (Pressure1) and AV.19 (Pressure2) which show simple read-out from the two pressure sensors. Before installation in the system or withdrawn from the system, the pressure sensors should both read zero (= related to atmospheric pressure). Any deviation from zero shall be deducted in AV.21 (Press1Correct) and AV.22 (Press2Correct) respectively. If AV.18 reads 10 and should be zero, then value in AV.21 is entered to -10. It is also possible to calibrate based on another known pressure entity than ATM.

❸ **Select flow unit** in MSV.39:
1 = l/sec 2 = GPM 3 = l/hr

❹ **Select pressure unit** in MSV.7:
1 = kPa 2 = psi

❺ **Select temperature unit** in MSV.3:
1 = °C 2 = °F

❻ **Select energy unit** in MSV.4:
1 = BTU and BTU/hr 2 = kW/h and kW

❼ Finally **select FIT control mode** in MSV.5:
1 = ΔT Control
2 = Comfort Control
3 = Smart Control
4 = ΔT Control 90% close
5 = Smart Control 90% close

When set to direct ΔT Control, FlowCon FIT will work as an energy valve and regulate based on ΔT target alone. When set to direct Comfort Control, FlowCon FIT will work as a PICV for room comfort control. When set to Smart Control, FlowCon FIT will prioritize room temperature setting and within designated range, optimize the ΔT.
When set to any 90% close-mode, FlowCon FIT will as minimum be opened 10% to avoid dead end leg.

❽ Provide **analog control signal** in AV.141 (0% to 100%).

Additional BACnet programming the SM.0.0.0.6 actuator

Please note that change of settings through BACnet is not available while one of the menus is entered on the actuator itself.

❶ **Set control mode** in MSV.40 to
4 = BACnet. Only BACnet is valid.

❷ **Set feedback mode** in MSV.41 to
4 = Auto. Only Auto is valid.

❸ **Set BACnet fallback action** in MSV.43:
1 = Close 2 = Stop 3 = Open 4 = Midway

❹ **Set BACnet fallback timeout** in AV.143:
from 1 to 60 minutes. Default is 10 minutes.
If MSV.5 is set to 1= ΔT control, AV.143 will automatically be set to 60 minutes.

❺ **Set control mode** in MSV.46 to
1 = Linear flow. Only Linear flow is valid.

The FlowCon FIT writes back T1, T2, ΔT and ΔP to the actuator display in AV.165, AV.166, AV.167 and AV.168. Water temperature is always shown in display as °C and pressure is always shown in display as kPaD.

❻ **Set actuator rotation direction** in BV.17:
0 = NO 1 = NC

❼ **Set failsafe direction** in BV.18:
0 = Open or
1 = Close.

❽ **Set flush mode** in BV.53:
0 = Disabled 1 = Enabled

❾ **Auto-Stroke** is activated in BV.63.
0 = Disabled 1 = Enabled

❿ **Activate password** in BV.54:
0 = Disabled 1 = Enabled

Condition of the FIT System through BACnet

Besides checking object values already described, the following information is available through BACnet for all three actuator types. Please also see FlowCon FIT BACnet PICS:

❶ **Check the current flow rate** (not measured) in AV.68. To know whether the valve is fully closed, please check the motor position in AV.98 (0%=fully closed). Set max.flow can be changed or confirmed in AV.62

❷ **Check P1, P2 and ΔP** in AV.18, AV.19 and AV.20. ΔP alarm can be seen in BV.1.

❸ **Check Water Temperatures T1, T2** and **ΔT** in AV.1, AV.2 and AV.3. **ΔT Target** is changed or confirmed in AV.4. **ΔT Target Deadband** is changed in AV.5

❹ **Check Room Temperature** in AV.6 and **Room Temperature Target** in AV.7. **Room Temperature Deadband** is changed in AV.8. Control interval for all water- and room temperatures is set in AV.9

❺ **Check current energy consumption** in AV.10. and two different **accumulated energy consumptions** in AV.11 and AV.13. Number of days for AV.11 and AV.13 are set in AV.12 and AV.14 respectively.

❻ **Check feedback signal** in AV.164 (valid only for SM.0.0.0.3 / SM.0.0.0.4).

Additional condition of the FIT System through BACnet SM.0.0.0.6:

See ΔP-range for selected SM valve in MSV.44.

Check battery capacity in AV.140
All alarms are available for identification through BACnet:

- Current overtorque alarm (BV.55)
- Previous overtorque alarm (BV.56)
- Critical temperature alarm (BV.57)
- High temperature alarm (BV.58)
- Power failure alarm (BV.59)
- No control signal alarm (BV.60)
- Battery error alarm (BV.61)
- BACnet fallback alarm (BV.62).

See actuator operation state in MSV.45:

1 = Normal	2 = Calibration
3 = Flush	4 = Auto-stroke
5 = Alarm	6 = Failsafe mode.

Problem Solving (FlowCon SM.0.0.0.6)

In case of problems with the actuator and/or valve, please follow this procedure:

- Verify that none of the actuator’s objects are out-of-service (values = FALSE).
- Check actuator state in MSV.45. If MSV.45=5 check which alarm(s) has been activated and try to resolve the alarm issue(s).
- Check all wiring to ensure that no loose connections are interrupting the signal.
- Restart the actuator (momentarily disconnect power). Make sure that the fail-safe action is completed, and the actuator is shut off before restoring power.