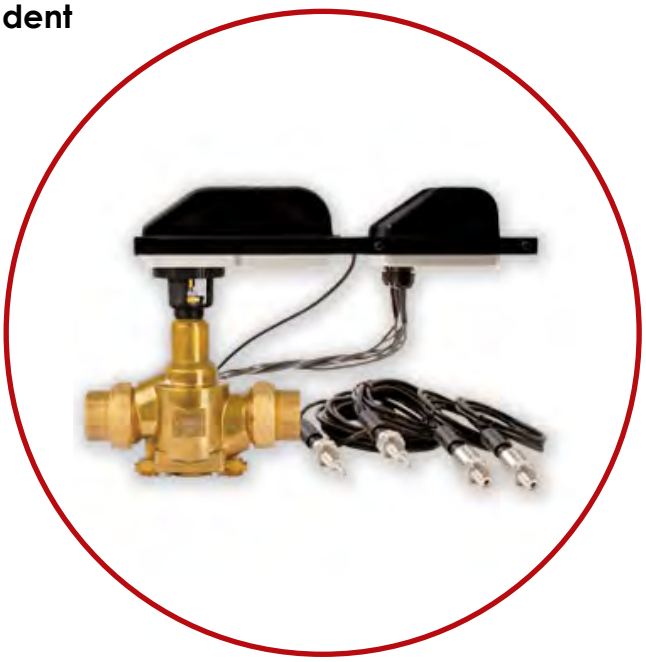
PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"



SPECIFICATIONS

Maplef PICV valve:

Static pressure:	2500 kPa / 360 psi
Ambient temperature:	-10°C to +50°C / +14°F to +122°F
Media temperature:	-20°C to +120°C / -4°F to +248°F
Material:	
- Housing and covers:	Forged brass ASTM CuZn40Pb2
- Stem seals:	EPDM
- Union end connections:	Brass alloy
- Metal components (internal):	Stainless steel
- Stem seal and O-rings:	EPDM
- Diaphragm:	Hydrogenated acrylonitrile-butadiene-rubber
Stroke:	2160°
Maximum close off pressure:	600 kPa / 87 psi
Maximum operational ΔP:	320 kPaD / 46 psid
Control characteristic:	Linear flow
Control range:	1:800 / IEC 60534
Rangeability:	>100:1
Turn down ratio:	228:1
Shut-off leakage:	ANSI / FCI 70-2 2006 / IEC 60534-4 - Class IV
Flow rate range:	0.176-2.34 l/sec / 2.78-37.1 GPM
End connection[1]:	Union end connections ISO or NPT
Body taps:	1/4" ISO

Note 1: NPT only available ex. US-factory

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SPECIFICATIONS (...continued)

Maplef PICV actuator:

Maplef MSM.0.0.0.3, MSM.0.0.0.4, MSM.0.0.0.5 (with BACnet) and MSM.0.0.0.6 (with BACnet) actuators[2]

Supply voltage:	22-26V AC, 50/60 Hz or 22-26V DC
Type:	Electrical, Bi-directional synchronous motor
Power consumption:	12VA. For failsafe versions: 25VA (peak)
Control signal:	2-10V DC
Resolution:	1:800 (2-10V)
Feedback:	2-10V DC
Control mode:	Linear flow
Failsafe function:	Yes (MSM.0.0.0.4 and MSM.0.0.0.6)
Manuel override:	Yes
Position indicator:	No
Operation time:	FIT.1-2: 190 sec (from closed to fully open valve)
Ambient temperature:	-10°C to +50°C / +14°F to +122°F
Humidity rating:	5..95% rH, no condensation
Housing material:	UL94 V0-rated plastic
Protection:	IP54 including upside-down mounting
CE conformity:	EN 60730, class II
Programming:	Programming of all settings on interface with buttons and display or via BACnet
Cable:	Fixed, 5 wires x 0.80 mm2, halogen free, 1 meter Fixed, 5 wires x AWG18, halogen free, 3 ft
Additional for BACnet versions:	Fixed, 3 wires x 0.80 mm2, halogen free, 1 meter Fixed, 3 wires x AWG18, halogen free, 3 ft
Calibration:	Automatic at startup
Valve-actuator coupling:	Easy snap coupling
BACnet device profile:	BACnet Application Specific Controller (B-ASC) type server
BACnet protocol:	BACnet Master Slave/Token passing (MS/TP)
BACnet baud rates supported:	9600, 19200, 38400 and 76800
BACnet services (BIBBS) supported:	DS-RP-B, DS-WP-B, DM-DDB-B, DM-DOB-B and DM-DCC-B

Maplef Intelligent Interface:

Supply voltage:	24V AC/DC
Power consumption:	4W
Cable:	3 groups: Group 1: fixed, 1 wire with quick-connector, 3 meter / 9 ft (T1) fixed, 1 wire with quick-connector, 1 meter / 3 ft (T2) fixed, 3 wires, 0.6 meter / 2 ft (analog actuator communication) Group 2: fixed, 2 wires 0.6 meter / 2 ft (power and ground) fixed, 3 wires 0.6 meter / 2 ft (BACnet BMS Communication) Group 3: fixed, 1 wire with quick-connector, 1 meter / 3 ft (P1) fixed, 1 wire with quick-connector, 1 meter / 3 ft (P2) fixed, 3 wires, 0.6 meter / 2 ft (BACnet actuator communication)
Communication standard:	RS485
Control signal:	2-10V DC
Output signal:	2-10V DC
Humidity rating:	5..95% rH, no condensation
Protection:	IP54 including upside-down mounting
Housing material:	UL94 V0-rated plastic
CE conformity:	Yes
BACnet device profile:	BACnet Application Specific Controller (B-ASC) type server
BACnet protocol:	BACnet Master Slave/Token passing (MS/TP)
BACnet baud rates supported:	9600, 19200, 38400, 57600, 76800 and 115200
BACnet services (BIBBS) supported:	DS-RP-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DS-RPM-B and DM-RD-B

Note 2: Maplef warranty is voided using other actuators than supplied or recommended by Maplef.

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"

SPECIFICATIONS (...continued)

Temperature sensors (T1 and T2):

Supply voltage:	NA
Cable:	No cable, but with quick-connector
Signal output:	Resistive
Media temperature:	-20°C to +120°C / -4° to +248°F
Working pressure:	40 bar / 580 psi
Housing material:	304 stainless steel
Protection:	IP65
Probe length:	12.7 mm / 0.5 in
Probe diameter:	6 mm / 0.236 in
CE conformity:	Yes
Connection:	1/4" ISO
Performance data:	
- Sensor type:	PT1000
- Accuracy:	0.5% FS (Full Scale)
- Linearity:	±0.5% FS (Full Scale)
- Long time stability:	0.1% FS (Full Scale)
- Response time:	at 50°C (122°F): 2.3 sec / at 90°C (194°F): 5.4 sec.

Pressure sensors (P1 and P2):

Supply voltage:	12V DC
Cable:	No cable, but with quick-connector
Output:	4-20mA
Media temperature:	-10°C to +85°C / 14°F to +185°F
Pressure range[3]:	0-25 bar / 0-360 psi
Housing material:	304 stainless steel
Protection:	IP65
CE conformity:	Yes
Connection:	1/4" ISO
Performance data:	
- Accuracy:	±1.5% FS (Full Scale) (tolerances can be software compensated in the Maplef Intelligent Interface)
- Stability:	0.5% FS (Full Scale) ±0.05%
- Thermal effect on zero:	±0.1% FS (Full Scale)
- Thermal effect on span:	±0.05% FS (Full Scale)
- Electronic proof:	Short circuit protection
- Response time:	<20 msec (20 sec mean value calculated in the Maplef Intelligent Interface)

Note 3: Calibrated at factory at 24V DC

PRESSURE INDEPENDENT CONTROL VALVE

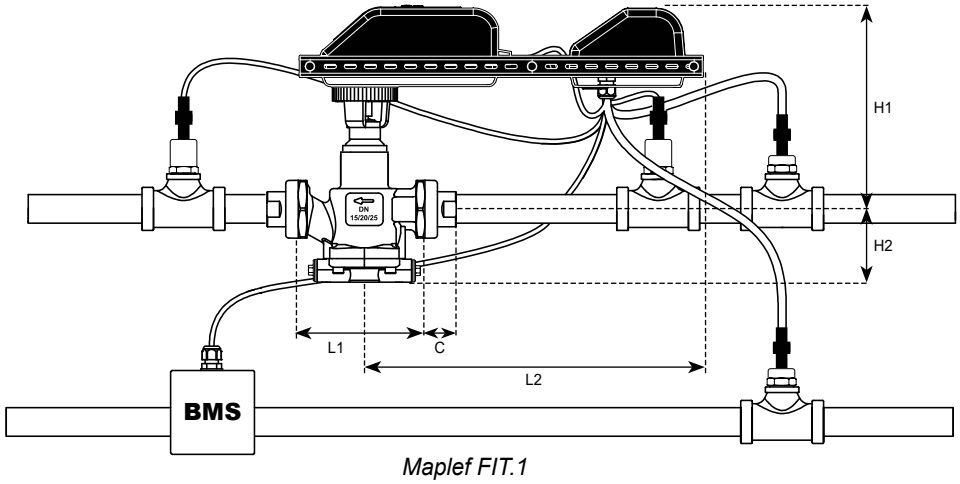
Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System

DN15-40 / 1/2"-1 1/2"

DIMENSIONS AND WEIGHTS (NOMINAL)

Model No	Valve Size mm (in)	PICV Valve				End connections C[4]			Weight[5] kg (lb)
		L1 mm (in)	L2 mm (in)	H1 mm (in)	H2 mm (in)	ISO Female mm (in)	ISO Male mm (in)	Sweat mm (in)	
FIT.1	15 (1/2)	108 (4.25)	338 (13.3)	185 (7.28)	59 (2.32)	22 (0.87)	24 (0.95)	20 (0.79)	3.58 (7.89)
	20 (3/4)					22 (0.87)	25 (0.99)	20 (0.79)	
	25 (1)					-	39 (1.54)	22 (0.87)	
FIT.2	25 (1)	149 (5.87)	338 (13.3)	235 (9.25)	63 (2.48)	35 (1.38)	40 (1.57)	34 (1.34)	5.28 (11.6)
	32 (1 1/4)					33 (1.30)	40 (1.57)	34 (1.34)	
	40 (1 1/2)					33 (1.30)	42 (1.65)	-	

Note 4: Add end connection length to body length.
Note 5: Weight includes PICV valve, PICV actuator (non failsafe), Intelligent Interface and sensor kit, but no end connections.



Maplef FIT.1

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"

MODEL NUMBER SELECTION

FIT . 1 2

Housing size:
1 = DN15-25 / 1/2"-1"
2 = DN25-40 / 1"-1 1/2"

Control range:
1 = 32-320 kPaD / 4.6-46 psid (FIT.1) or
40-320 kPaD / 5.8-46 psid (FIT.2)

P/t plug requirements:
P = taps plugged (standard)
B = p/t plugs

Type of actuator:
1 = display
2 = display and failsafe
3 = display and BACnet
4 = display, BACnet and failsafe

Union end connections (inlet x outlet):

Model and size	Female threaded	Male treaded	Sweat
FIT.1 DN15-25 / 1/2"-1"	**E** = 15 mm / 1/2" **F** = 20 mm / 3/4"	**H** = 15 mm / 1/2" **I** = 20 mm / 3/4" **J** = 25 mm / 1"	**K** = 15 mm **L** = 18 mm **M** = 22 mm **O** = 1/2" **R** = 3/4" **U** = 1"
FIT.2 DN25-40 / 1"-1 1/2"	**G** = 25 mm / 1" **P** = 32 mm / 1 1/4" **Q** = 40 mm / 1 1/2"	**J** = 25 mm / 1" **S** = 32 mm / 1 1/4" **T** = 40 mm / 1 1/2"	**N** = 28 mm **W** = 35 mm **V** = 1 1/4" **W** = 1 1/2"

Sensor kit:
2 = PICV valve, pressure/temperature sensor kit, Bluetooth® and ΔT control

1 actuator bracket included (standard)

Example:
FIT.2.1.B.1.Q.Q.2 = Maplef Energy FIT System DN25-40 (1"-1 1/2"), 40-320 kPaD (5.8-46 psid) with p/t plugs, display actuator and DN40 (1 1/2") ISO female threaded end connections as well as pressure/temperature sensor kit, Bluetooth® and ΔT control incl. actuator bracket.

For **NPT threaded solution**, please add "**N**" at the end of the model number.

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
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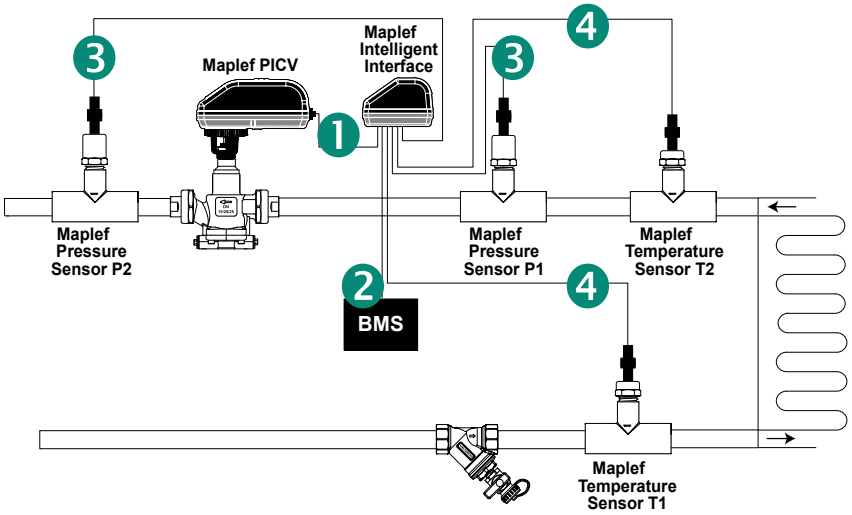
Temperature Control System

DN15-40 / 1/2"-1 1/2"

WIRING INSTRUCTION



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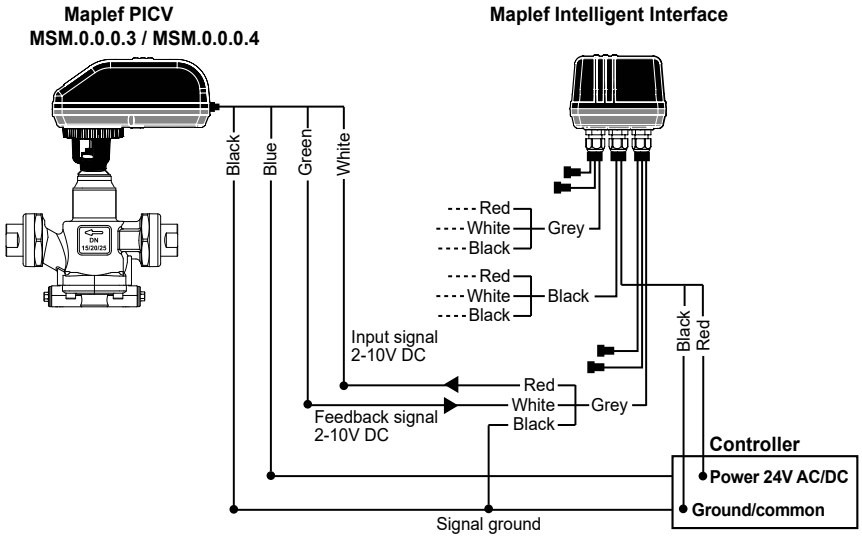
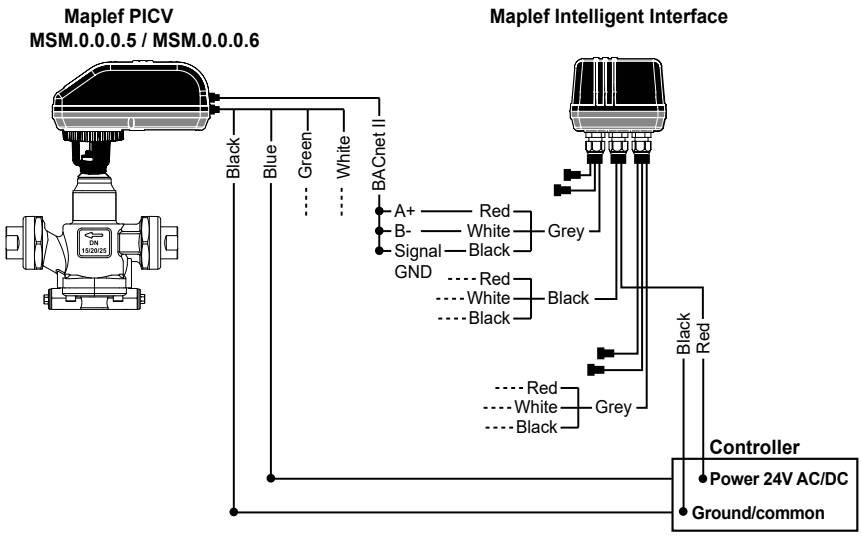


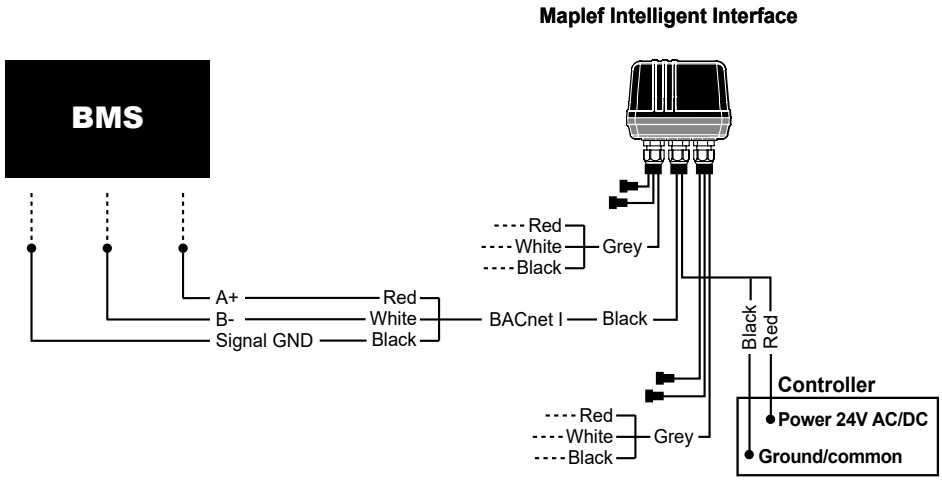


PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"

WIRING INSTRUCTION

2



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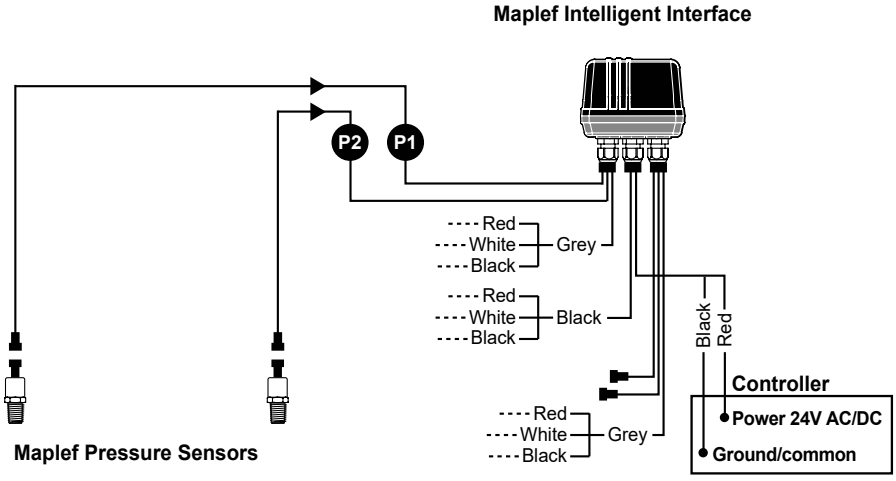

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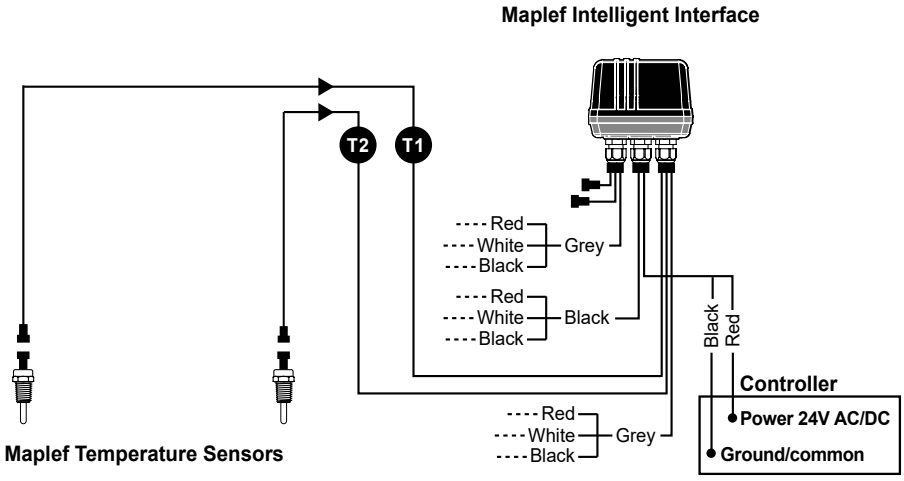


PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"

DESCRIPTION

The Maplef Energy FIT System measures energy usage while monitoring coil performance to adjust a PICV to optimize coil performance. The PICV maintains the correct flow despite pressure changes and guarantees the flow and actuator position only change when demand requirements change or ΔT is outside of specification.

The pressure sensors measure upstream and downstream pressure allowing the BMS to reduce system pressure to save pump energy when pressure drop is higher than the PICV's requirements.

The Maplef Intelligent Interface calculates the BTU and displays the data via Bluetooth® on an Android or iPhone mobile device and sends it back to the BMS via BACnet communication.

The Maplef Energy FIT System is fully customizable and allows selection of components that work best to optimize the application's unique energy goals.

FLOW RATE TABLE

Model no.	Valve size		Control range		Lowest settable max flow			Turn down ratio lowest max flow	Highest settable max flow			Turn down ratio highest max flow
	mm	inch	kPaD	psid	l/sec	l/hr	GPM		l/sec	l/hr	GPM	
FIT.1	15	1/2	32-320	4.6-46	0.176	633	2.78	38:1	0.685	2470	10.9	228:1
	20	3/4										
	25	1										
FIT.2	25	1	40-320	5.8-46	0.513	1850	8.13		2.34	8420	37.1	
	32	1 1/4										
	40	1 1/2										

Accuracy: Greatest of either ±5% of controlled flow rate or ±2% of maximum flow rate.

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent Temperature Control System

DN15-40 / 1/2"-1 1/2"

FLOW RATE SETTING[6]

Maximum Flow Rate					
DN15-DN25 · 1/2"-1"			DN25-DN40 · 1"-1 1/2"		
32-320 kPaD · 4.6-46 psid			40-320 kPaD · 5.8-46 psid		
FIT.1.1			FIT.2.1		
l/sec	l/hr	GPM	l/sec	l/hr	GPM
0.176	633	2.78	0.513	1850	8.13
0.195	702	3.09	0.573	2060	9.08
0.214	770	3.39	0.632	2280	10.0
0.233	838	3.69	0.690	2480	10.9
0.251	902	3.97	0.746	2690	11.8
0.268	964	4.24	0.802	2890	12.7
0.285	1030	4.51	0.856	3080	13.6
0.301	1080	4.77	0.909	3270	14.4
0.317	1140	5.02	0.961	3460	15.2
0.332	1200	5.26	1.01	3640	16.0
0.347	1250	5.50	1.06	3820	16.8
0.362	1300	5.73	1.11	4000	17.6
0.376	1350	5.96	1.16	4170	18.3
0.390	1400	6.18	1.20	4330	19.1
0.403	1450	6.38	1.25	4500	19.8
0.416	1500	6.59	1.29	4660	20.5
0.428	1540	6.78	1.34	4810	21.2
0.440	1580	6.97	1.38	4970	21.9
0.452	1630	7.16	1.42	5120	22.5
0.463	1670	7.33	1.46	5260	23.2
0.474	1710	7.51	1.50	5400	23.8
0.485	1750	7.68	1.54	5540	24.4
0.495	1780	7.84	1.58	5680	25.0
0.505	1820	8.00	1.61	5810	25.6
0.515	1850	8.16	1.65	5940	26.2
0.524	1890	8.30	1.69	6070	26.7
0.533	1920	8.44	1.72	6190	27.3
0.542	1950	8.59	1.75	6310	27.8
0.550	1980	8.71	1.79	6430	28.3
0.559	2010	8.86	1.82	6550	28.8
0.567	2040	8.98	1.85	6660	29.3
0.574	2070	9.09	1.88	6770	29.8
0.582	2100	9.22	1.91	6870	30.3
0.589	2120	9.33	1.94	6980	30.7
0.596	2150	9.44	1.97	7080	31.2
0.603	2170	9.55	1.99	7180	31.6
0.609	2190	9.66	2.02	7280	32.0
0.616	2220	9.76	2.05	7370	32.5
0.622	2240	9.85	2.07	7460	32.9
0.628	2260	9.95	2.10	7550	33.3
0.634	2280	10.1	2.12	7640	33.6
0.639	2300	10.1	2.15	7730	34.0
0.645	2320	10.2	2.17	7810	34.4
0.650	2340	10.3	2.19	7890	34.8
0.655	2360	10.4	2.22	7970	35.1
0.661	2380	10.5	2.24	8050	35.5
0.667	2400	10.6	2.26	8130	35.8
0.671	2420	10.6	2.28	8200	36.1
0.676	2430	10.7	2.30	8280	36.4
0.680	2450	10.8	2.32	8350	36.8
0.685	2470	10.9	2.34	8420	37.1

Accuracy: Greatest of either ±5% of controlled flow rate or ±2% of maximum flow rate.

Note 6: Above values are related to maximum flow rate setting of the valve and thereby defining the flow through the valve at maximum control signal, normally 10V. Values above do not relate to control signals below 10V. All above valves will have 800 positions between the pre-set flow value and 2V if control range is selected to 2-10V.

Maplef recommends that the Maplef Energy FIT System is selected to ensure that the set maximum flow rates are minimum 50% of the rated valve maximum capacity.

PRESSURE INDEPENDENT CONTROL VALVE

Maplef Energy FIT System
Energy-Saving Pressure Independent
Temperature Control System
DN15-40 / 1/2"-1 1/2"

BACNET FUNCTIONS

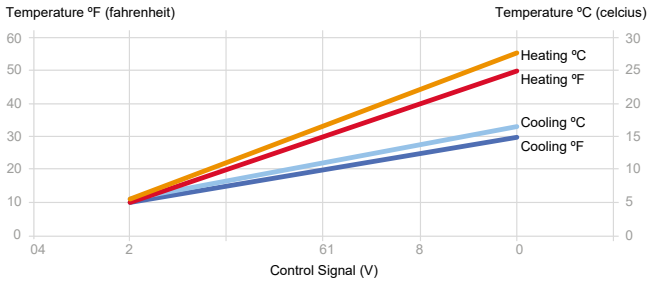
BACnet I - Interface to/from BMS

Description	Write	Read
Control priority (ΔT control, comfort control or smart control)	✓	✓
P1		✓
P2		✓
ΔP		✓
ΔP alarm (on/off)	✓	✓
T1		✓
T2		✓
ΔT		✓
ΔT target	✓	✓
Flow		✓
BTU (immediate)		✓
BTU accumulated (period)		✓
Room temperature	✓	✓
Room temperature target	✓	✓

BACnet II - Interface to/from actuator (MSM.0.0.0.5/6)

Description	Write	Read
Valve model	✓	✓
Maximum flow	✓	✓
Current flow rate		✓
Motor position		✓
Battery capacity		✓
Control signal (V)	✓	
Feedback signal (V)		✓
Flow unit (l/s, l/hr or GPM)	✓	✓
Rotation direction (NO or NC)	✓	✓
Flush mode	✓	✓
Auto-stroke	✓	✓
Pressure range		✓
Actuator operating state		✓
Various fault alarms		✓
T1		✓
T2		✓
ΔT		✓
ΔP		✓

CONTROL CURVE VS. ΔT



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DN15-40 / 1/2"-1 1/2"

GENERAL SPECIFICATIONS

1. PRESSURE INDEPENDENT TEMPERATURE CONTROL SYSTEM

1.1. Contractor shall install where indicated in drawings.
1.2. System shall include a Pressure independent dynamic control valve, a sensor kit and an electronic unit.
  1.2.1. The PICV valve shall accurately control flow independent of system pressure fluctuations.
  1.2.2. The sensor kit shall include 2 temperature sensors and 2 pressure sensors. Temperature sensors shall measure the ΔT across the coil and pressure sensors shall measure the ΔP across the PICV.
  1.2.3. The intelligence interface shall accurately change PICV flow to maintain target ΔT. In addition, the electronic unit shall calculate BTU heat transfer and supply continuous information on ΔT, ΔP and flow.

2. VALVE ACTUATOR

2.1. Valve-actuator coupling shall be snap coupling for fast mounting and de-mounting.
2.2. Actuator housing shall be rated to IP54 including upside-down mounting.
2.3. Actuator shall be driven by a 24V AC/DC motor and shall accept 2-10V DC electric input signal.
2.4. Actuator shall be capable of providing linear feedback signal to the control system. Feedback signal shall be equal to input signal, 2-10V DC.
2.5. Automatic calibration of valve position shall be standard.
2.6. Actuator shall include buttons for external programming of all settings.
2.7. Actuator display showing current valve flow, maximum valve flow, input signal, feedback signal and operational direction shall be standard.
2.8. Optional failsafe versions to power valve to either open (max. setting) or closed position from any position in case of power failure shall be available.
2.9. Optional BACnet versions shall be available. BACnet versions shall provide remote setting and control of actuator.

3. VALVE HOUSING

3.1. Housing shall consist of forged brass ASTM CuZn40Pb2 rated at no less than 2500 kPa (360 psi) static pressure and +120°C (+248°F).
3.2. Housing shall be permanently marked to show direction of flow.
3.3. Housing shall be double union end construction with a range of pipe connections available for appropriate pipe size.
3.4. Dual pressure/temperature test plugs for verifying accuracy of flow performance shall be standard on all valve sizes.

4. FLOW REGULATOR / AUTOMATIC BALANCING UNIT

4.1. Maximum flow setting shall be adjustable to 51 different settings within the range of the valve size.
4.2. Flow regulation unit shall be manufactured of stainless steel and hydrogenated acrylonitrile-butadienerub ber and shall be capable of controlling flow within ±5% of controlled flow rate or ±2% of maximum flow rate.
4.3. Flow regulation unit shall be accessible for change-out or maintenance.

5. INTELLIGENT INTERFACE / ELECTRONIC UNIT

5.1. Intelligent interface shall consist of UL94 V0-rated plastic.
5.2. Intelligent interface shall be rated to IP54 including upside-down mounting.
5.3. Intelligent interface shall be driven by 24V AC/DC.
5.4. Intelligent interface shall be Bluetooth® enabled.
5.5. Intelligent interface shall be capable of communicating via BACnet with the control system and wireless feedback signal to handheld devices. Shall communicate with both Android and iPhone devices and display via App.

6. TEMPERATURE SENSOR

6.1. Temperature sensors shall consist of 304 stainless steel.
6.2. Temperature sensors shall be IP65.
6.3. Temperature sensors shall provide a resistive output signal corresponding to water temperature.

7. PRESSURE SENSOR

7.1. Pressure sensors shall consist of 304 stainless steel.
7.2. Pressure sensors shall IP65.
7.3. Pressure sensors shall be driven by 12V DC.
7.4. Pressure sensors shall provide a 4-20mA output signal corresponding to water pressure.

PRESSURE INDEPENDENT CONTROL VALVE

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Temperature Control System

DN15-40 / 1/2"-1 1/2"

APPLICATION AND SCHEMATIC EXAMPLE