

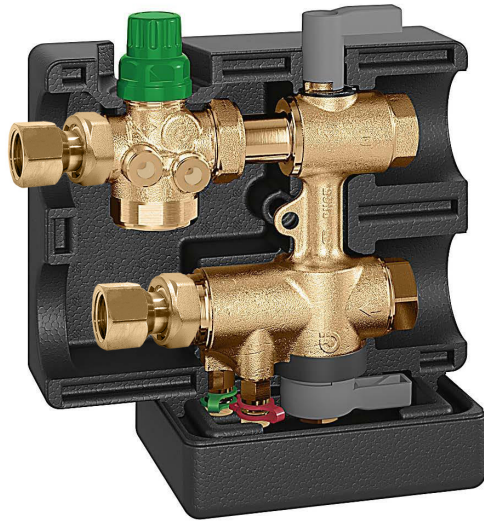
# FLOWMATIC® Express Connection and regulation kit for HVAC terminal units



**149 series**

01336/24.1 NA

Replaces 01336/24 NA



## Function

The compact pre-assembled kit connects variable air volume (VAV) reheat boxes, fan-coils, chilled beams or ceiling-mounted terminal units with the main hydronic distribution system. It provides flow control, balancing, bypass, filtering and isolation functions for maintenance of the terminal unit and flushing of the system. The integral venturi with PT ports allows the kit to be sized to match the terminal unit design flow rate. A preformed insulation jacket is included. This kit comes complete with a pressure independent control valve (PICV) with manual operating knob, three-way shutoff valves, integrated bypass, and filtering cartridge. It also includes a 3/8" all-thread adapter nut which allows the kit to be suspended from ceiling strut using field-supplied 3/8" all-thread rod. Optional on/off or proportional actuators add automatic control for connection to a BAS or thermostat.

## Product range

149 series connection and regulation kit for HVAC terminal units.....1/2", 3/4", 1" NPT female

## Technical specifications

### Materials

Body : DZR corrosion-resistant brass CW602N  
 Strainer mesh: stainless steel AISI 304  
 Shut-off valves knobs: PA6G30

### PICV

Body and bonnet: DZR corrosion-resistant brass CW602N  
 Control stem and piston: stainless steel AISI 303  
 Control shutter: PPSG40  
 Seat:  
     - (G90): DZR corrosion-resistant CW602N  
     - (1G8, 3G5, 5G3): PTFE  
     - (7G9, 13G, 16G): stainless steel AISI 303  
 Springs: stainless steel AISI 302  
 Seals: peroxide-cured EPDM  
 Pre-adjustment indicator: PA6G30  
 Knob: PA6

### Connections

System side: 1/2", 3/4", 1" integral NPT female  
 Terminal unit side: 1/2", 3/4", 1" NPT female union

### Performance

Medium: water, glycol solutions  
 Maximum percentage of glycol: 50%  
 Max. working pressure: 360 psi (25 bar)  
 Max. differential pressure with actuators: 58 psi (4 bar)  
 Working temperature range: 14 – 248 °F (-10 – 120 °C)  
 Ambient temperature range: 32 – 120 °F (0 – 50°C)  
 Nominal Δp operating range: 3.6 - 58 psi (0.2 - 4 bar)  
 Flow rate regulation range: 0.1 to 16 gpm (0.4 to 0.6 lpm)  
     (see hydraulic characteristics)  
 Accuracy: ± 5% of the set point  
 Leakage: 0.01% (class V)  
 Strainer mesh size: 800 μm

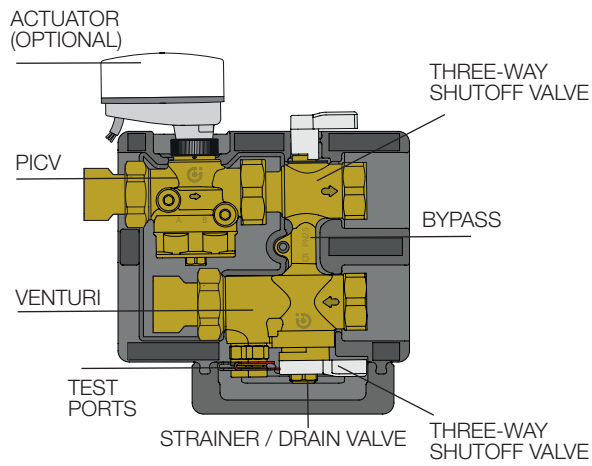
### Insulation

Material: EPP  
 Density: 30 kg/m³  
 Thermal conductivity:  
     at 50 °F (10°C): 0.257 BTU · in/hr · ft² · ° F (0.037 W/m · K)

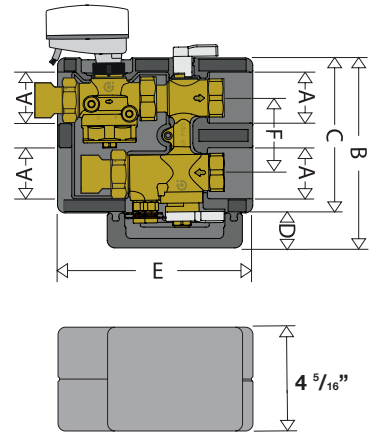
### Approvals:

Compliant with the requirements of standard UL 2043 for plenum installations without insulation jacket.

### Characteristic components

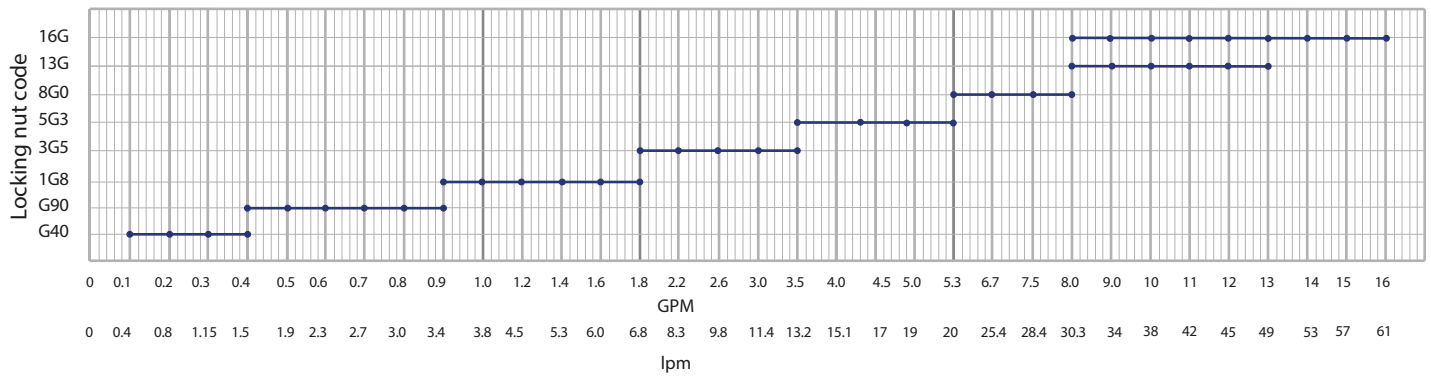


### Dimensions






Code	Connections	A	B	C	D	E	F	Wt (lb/kg)
149400A G40	1/2" NPTF	2 1/8"	7 15/16"	6 1/2"	1 1/2"	8 1/8"	3.15" (80 mm)	5.0/2.3
149400A G90								
149400A 1G8								
149400A 3G5								
149500A G90	3/4" NPTF	2 1/8"	7 15/16"	6 1/2"	1 1/2"	8 1/8"	3.15" (80 mm)	5.2/2.4
149500A 1G8								
149500A 3G5								
149500A 5G3								
149600A 7G9	1" NPTF	2 1/8"	7 15/16"	6 1/2"	1 1/2"	8 1/8"	3.15" (80 mm)	6.3/2.9
149600A 13G								
149600A 16G								

### Flow rate range shortcut charts



Compatible actuators / thermo-electric actuators compatible with series 145 valves

				
<b>Code</b>	<b>145013</b>	<b>145018</b>	<b>656504</b>	<b>656524</b>
<b>Type</b>	Proportional		Thermo-Electric	
<b>Fail position</b>	Fail-in-place	Fail safe closed or open	Normally Closed	
<b>Electric supply</b>	24 V AC/DC			
<b>Power consumption</b>	2.5 VA; 1.5 W DC		1 W	1.2 W
<b>Control signal</b>	0 (2)-10 VDC 0 (4)-20 mA	0-10 VDC	ON/OFF	0-10 VDC
<b>Opening &amp; closing time</b>	32 seconds (*)	88 seconds (*)	~ 240 seconds	~ 200 seconds
<b>Protection class</b>	NEMA 3 (IP 54)			
<b>Ambient temp range</b>	32 - 120 °F (0 - 50 °C)		32 - 140 °F (0 - 60 °C)	
<b>Feedback signal</b>	0 - 10 V		---	0 - 10 V
<b>Supply cable length</b>	78 inches (2 m)	59 inches (1.5 m)	39 inches (1 m)	
<b>Connection</b>	M30 p.1.5		M30 p.1.5 (quick coupling)	
<b>Force</b>	36 lbf (160 N)	27 lbf (120 N)	23 lbf (100 N)	28 lbf (125 N)
<b>Max. differential pressure</b>	58 psid (4 bar)			

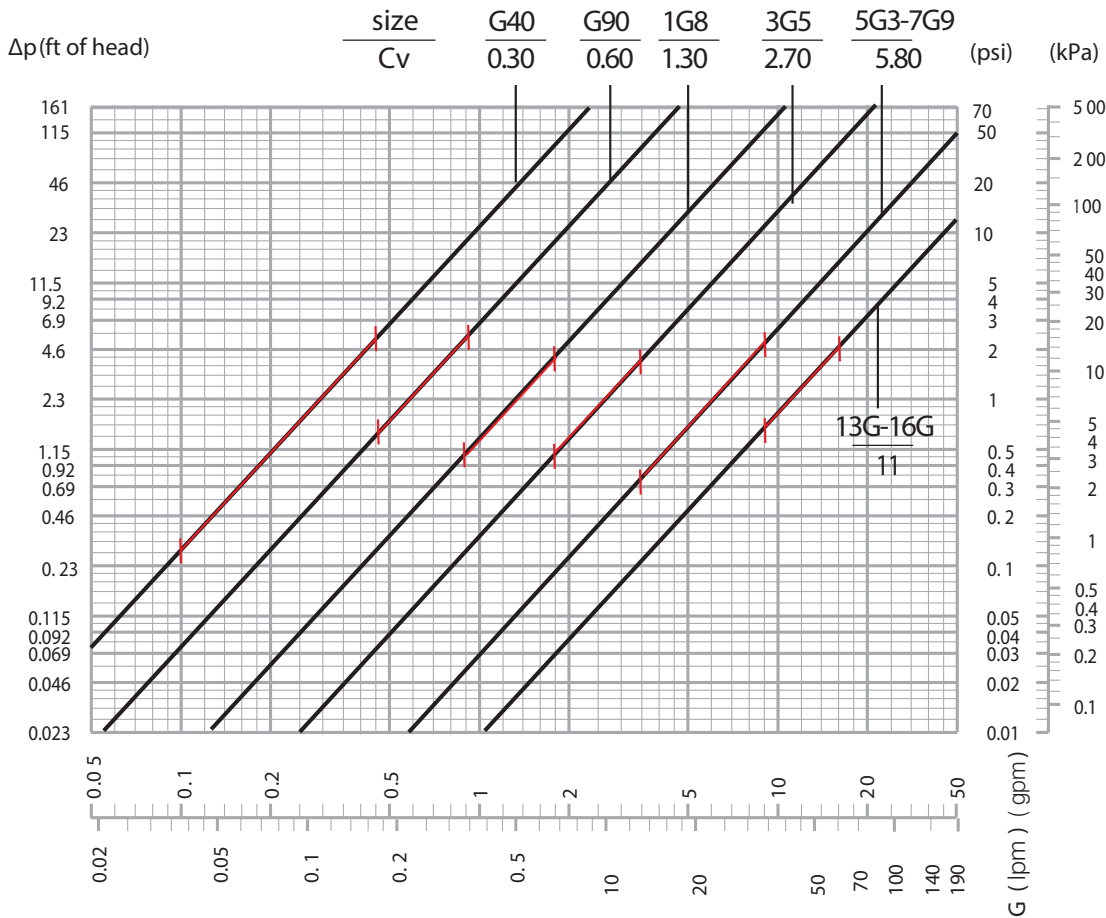
\* auto stroke detection

Hydraulic characteristics per PICV dial setting

Coil Kit code	PICV size	Cv Venturi	flow range $\Delta p$ min	Adjustment position (max flow rate)									
				1	2	3	4	5	6	7	8	9	10
149400A G40	1/2"	0.29	0.3 to 1.5 (lpm)	0.3	0.6	0.9	1.2	1.5	--	--	--	--	--
			0.1 to 0.4 (gpm)	0.1	.16	.24	.32	0.4	--	--	--	--	--
			$\Delta p$ min PICV (kPa)	25					--	--	--	--	--
			$\Delta p$ min PICV (psi)	3.62					--	--	--	--	--
			$\Delta p$ body (kPa)	.5	1.8	4.0	7.1	11.1	--	--	--	--	--
			$\Delta p$ body (psi)	.07	.26	.58	1.0	1.6	--	--	--	--	--
149400A G90	1/2"	0.58	1.5 to 3.4 (lpm)	--	--	--	--	1.5	2.0	2.4	2.7	3.0	3.4
			0.4 to 0.9 (gpm)	--	--	--	--	0.4	0.5	0.6	0.7	0.8	0.9
			$\Delta p$ min PICV (kPa)	--	--	--	--	25	25.5	26			
			$\Delta p$ min PICV (psi)	--	--	--	--	3.62	3.7	3.8			
			$\Delta p$ body (kPa)	--	--	--	--	2.8	4.0	5.4	7.1	9.0	11.1
			$\Delta p$ body (psi)	--	--	--	--	.41	.58	.78	1.0	1.3	1.6
149400A 1G8	1/2"	1.3	3.5 to 6.8 (lpm)	--	--	--	--	3.5	4.1	4.8	5.5	6.1	6.8
			0.9 to 1.8 (gpm)	--	--	--	--	0.9	1.1	1.3	1.5	1.6	1.8
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	26.5	27			
			$\Delta p$ min PICV (psi)	--	--	--	--	3.8	3.85	3.9			
			$\Delta p$ body (kPa)	--	--	--	--	2.4	3.4	4.6	6.1	7.7	9.5
			$\Delta p$ body (psi)	--	--	--	--	.35	.49	.67	.88	1.1	1.4
149400A 3G5	1/2"	2.7	6.6 to 13.2 (lpm)	--	--	--	--	6.6	7.9	9.3	10.6	12	13.2
			1.9 to 3.5 (gpm)	--	--	--	--	1.9	2.1	2.5	2.8	3.2	3.5
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	27	27.5	28	28.5	29
			$\Delta p$ min PICV (psi)	--	--	--	--	3.6	3.9	4.0	4.06	4.1	4.2
			$\Delta p$ body (kPa)	--	--	--	--	1.9	2.7	3.7	4.9	6.2	7.6
			$\Delta p$ body (psi)	--	--	--	--	.28	.39	.54	.71	.90	1.1
149500A G90	3/4"	0.58	1.5 to 3.4 (lpm)	--	--	--	--	1.5	2.0	2.4	2.7	3.0	3.4
			0.4 to 0.9 (gpm)	--	--	--	--	0.4	0.5	0.6	0.7	0.8	0.9
			$\Delta p$ min PICV (kPa)	--	--	--	--	25	25.5	26			
			$\Delta p$ min PICV (psi)	--	--	--	--	3.62	3.7	3.8			
			$\Delta p$ body (kPa)	--	--	--	--	2.8	4.0	5.4	7.1	9	11.1
			$\Delta p$ body (psi)	--	--	--	--	.40	.58	.78	1.0	1.3	1.6
149500A 1G8	3/4"	1.3	3.5 to 6.8 (lpm)	--	--	--	--	3.5	4.1	4.8	5.5	6.1	6.8
			0.9 to 1.8 (gpm)	--	--	--	--	0.9	1.1	1.3	1.5	1.6	1.8
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	26.5	27			
			$\Delta p$ min PICV (psi)	--	--	--	--	3.8	3.85	3.9			
			$\Delta p$ body (kPa)	--	--	--	--	2.4	3.4	4.6	6.1	7.7	9.5
			$\Delta p$ body (psi)	--	--	--	--	.35	.49	.67	.89	1.1	1.4
149500A 3G5	3/4"	2.7	6.6 to 13.2 (lpm)	--	--	--	--	6.6	7.9	9.3	10.6	12	13.2
			1.9 to 3.5 (gpm)	--	--	--	--	1.9	2.1	2.5	2.8	3.2	3.5
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	27	27.5	28	28.5	29
			$\Delta p$ min PICV (psi)	--	--	--	--	3.6	3.9	4.0	4.06	4.1	4.2
			$\Delta p$ body (kPa)	--	--	--	--	1.9	2.7	3.7	4.9	6.2	7.6
			$\Delta p$ body (psi)	--	--	--	--	.28	.40	.54	.71	.90	1.1
149500A 5G3	3/4"	5.8	13.2 to 20 (lpm)	--	--	--	--	--	--	13.2	16	18	20
			3.5 to 5.3 (gpm)	--	--	--	--	--	--	3.5	4.2	4.8	5.3
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	--	26.5	27	27.5	28
			$\Delta p$ min PICV (psi)	--	--	--	--	--	--	3.8	3.9	4.0	4.06
			$\Delta p$ body (kPa)	--	--	--	--	--	--	2.3	2.9	3.7	4.6
			$\Delta p$ body (psi)	--	--	--	--	--	--	.33	.42	.54	.67

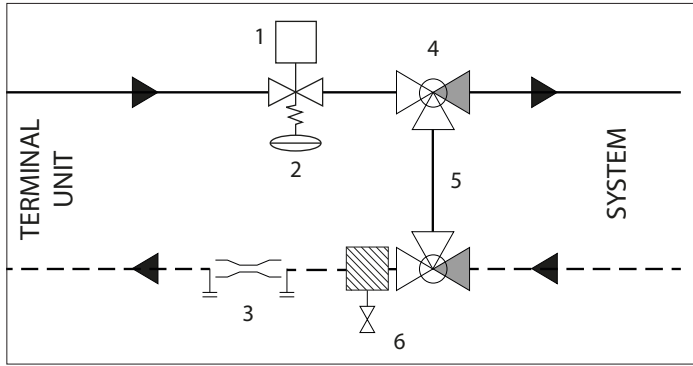
Coil Kit code	PICV size	Cv Venturi	flow range $\Delta p$ min	Adjustment position (max flow rate)									
				1	2	3	4	5	6	7	8	9	10
149600A 7G9	1"	5.8	21 to 30 (lpm)	--	--	--	--	--	--	21	24	27	30
			5.3 to 7.9 (gpm)	--	--	--	--	--	--	5.3	6.3	7.1	7.9
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	--	25			
			$\Delta p$ min PICV (psi)	--	--	--	--	--	--	3.62			
			$\Delta p$ body (kPa)							5.1	6.6	8.4	10.3
			$\Delta p$ body (psi)							.74	.96	1.2	1.5
149600A 13G	1"	11	30 to 49 (lpm)	--	--	--	--	--	30	34	39	44	49
			7.9 to 13 (gpm)	--	--	--	--	--	7.8	9.1	10.4	11.7	13
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	35				
			$\Delta p$ min PICV (psi)	--	--	--	--	--	5				
			$\Delta p$ body (kPa)	--	--	--	--	--	3.5	4.8	6.3	7.9	9.8
			$\Delta p$ body (psi)	--	--	--	--	--	.51	.70	.91	1.1	1.4
149600A 16G	1"	11	30 to 60 (lpm)	--	--	--	--	3.5	4.1	4.8	5.5	6.1	6.8
			8 to 16 (gpm)	--	--	--	--	0.9	1.1	1.3	1.5	1.6	1.8
			$\Delta p$ min PICV (kPa)	--	--	--	--	45		43			
			$\Delta p$ min PICV (psi)	--	--	--	--	6.5		6.2			
			$\Delta p$ body (kPa)	--	--	--	--	3.7	5.4	7.3	9.5	12.0	14.9
			$\Delta p$ body (psi)	--	--	--	--	.54	.78	1.1	1.4	1.7	2.2

### Venturi hydraulic characteristics



Locking nut code	G40	G90	1G8	3G5	5G3-7G9	13G-16G
Flow range (gpm)	0.1-0.4	0.4-0.9	0.9-1.8	1.8-3.5	3.5-7.9	7.9-16
Cv Venturi	0.3	0.6	1.3	2.7	5.8	11

## Operating principle



1. Actuator (optional).
2. Pressure independent control valve (PICV).
3. Venturi device for flow rate measurement with connections for pressure test ports.
4. Three-way shut-off valve.
5. By-pass.
6. Shut-off valve with built-in strainer and drain port.

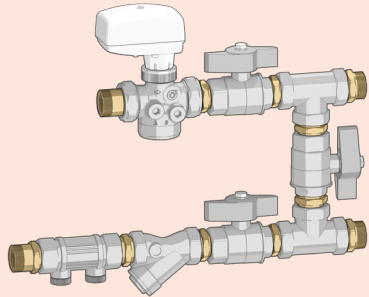
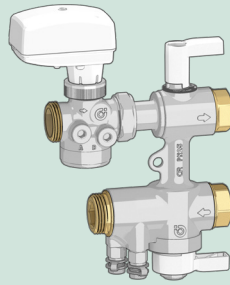
The FLOWMATIC Express coil kit:

- Regulates and maintains the constant flow rate of the terminal unit as the differential pressure conditions of the main system change by means of the pressure independent control valve PICV (2);
- Isolates the terminal unit through the three-way shut-off valves (4-6);
- Bypasses flow through the three-way shut-off valves (4-6) and the integrated by-pass (6);
- Filters the inlet water to the terminal unit through the strainer located inside the shut-off valve (6);
- Measures the flow rate passing through the terminal unit using the Venturi device with the pressure test ports (3);
- Cleans the circuit and drains the water through the drain port (6).

## Construction details

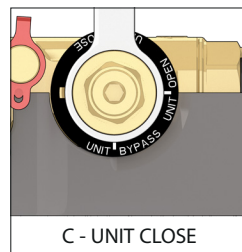
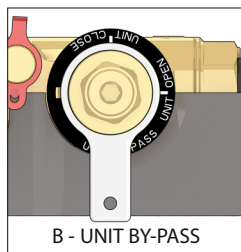
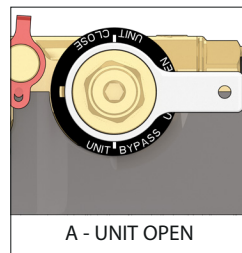
Compact body

The FLOWMATIC Express coil kit is designed specifically for small, compact and easy installation to connect the terminal unit to the main system.

Individual components assembled on site	Pre-assembled kit
 <p>20 hydraulic connections</p> <p>Laborious installation and with high risk of hydraulic leakage</p>	 <p>4 hydraulic connections</p> <p>Ease of installation and low risk of hydraulic leakage</p>

### Three-way ball valve

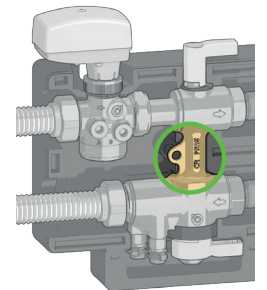
The shut-off valves have three positions. The internal ball is designed to open the straight path (A) (for normal operation), the bypass path (B) (for passage through the bypass) or to completely close the passage and isolate the circuit of the terminal unit (C).



### Integrated by-pass

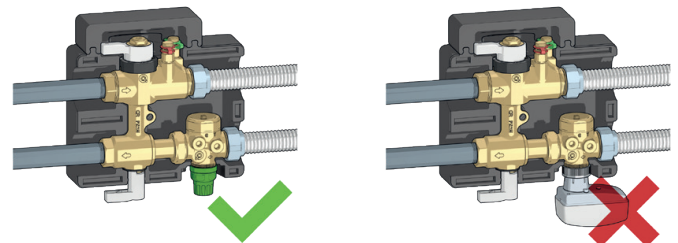
The kit is equipped with a bypass, which is used for:

- flushing the main circuit pipes without the fluid passing through the terminal unit;
- isolation for maintenance work on the terminal unit.
- to determine bypass flow and pressure drop, the bypass Cv (Kv) is 1.6 (1.4).



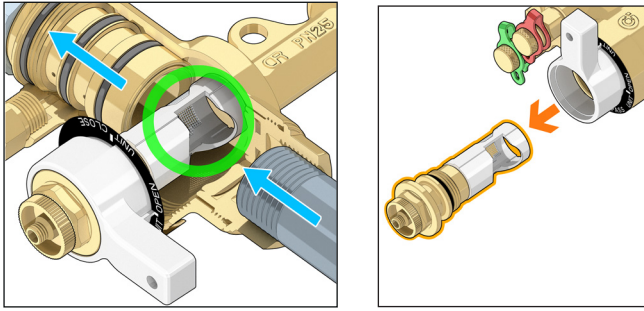
### Installation versatility

The kit, without actuator, can be installed in any position. With actuator, do not install the kit with the valve upside down.



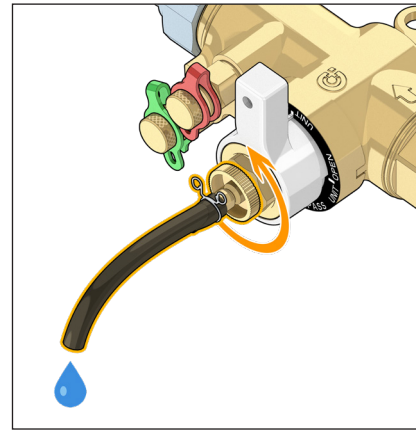
### Built-in removable strainer

Heating and air conditioning systems can degrade over time due to impurities contained in the system circulating fluid. If these impurities are not removed, they can impair operation of system components, such as boilers, heat exchangers, or terminal units in the circuits, especially during system commissioning. The cartridge strainer in the kit captures impurities in the fluid before they reach the terminal unit. See page 11 for strainer cleaning instructions.



### Drain valve with rubber hose

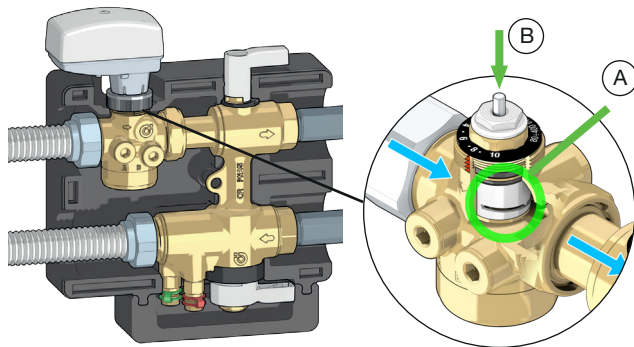
The kit is complete with drain valve and rubber hose for flushing and draining.



### Integrated PICV

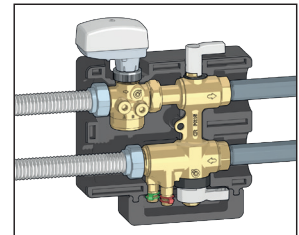
The kit includes a pressure independent control valve (PICV) capable of regulating the flow rate and keeping it constant even when the differential pressure conditions of the system change. The flow rate is adjusted:

- manually on the automatic flow rate regulator, to restrict the maximum value. The adjustment is made by turning the locking nut and positioning it on the relative adjustment number: this opens/closes the control shutter cross section (A).
- automatically by the flow rate control valve in combination with a proportional (0–10 V) or ON/OFF actuator, in accordance with the thermal load requirements of the cross section of the circuit to be controlled. The actuator adjusts the flow rate from the maximum value to the minimum value by acting on the vertical displacement of the control stem (B). See page 3 for separately sourced actuator options.

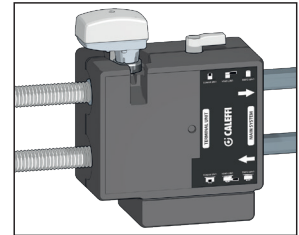


### Use with actuators

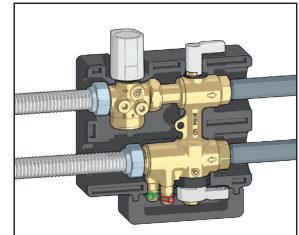
The FLOWMATIC Express coil kit is designed to operate with a proportional linear actuator (code 145013). When controlled by an actuator, the valve can modulate the flow rate in accordance with the system thermal load.



Also shown with insulation jacket closed.



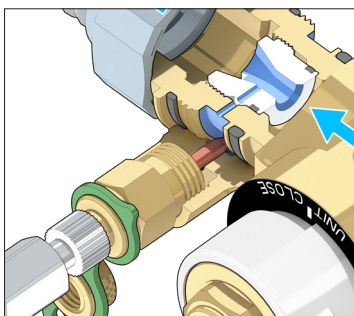
As an alternative to a proportional linear actuator, the valve can also be controlled with an ON/OFF type thermo-electric actuator 656 series, for simple temperature control logic.



### Flow rate venturi

The kit contains a venturi which allows system flow rate measurement and verification. Each differential pressure value (measured at the pressure test ports) has a corresponding accurate flow rate value, determined by the venturi Cv value. Refer to the Venturi hydraulic characteristics chart on page 5, or calculate using formula:

$$\text{Flow rate (gpm)} = C_v \text{ Venturi} \times \Delta p \text{ Venturi (psi)}.$$



## SIZING

### Design data

A system is set up to serve 80 fan coils divided into 8 secondary circuits, as shown in the image below.

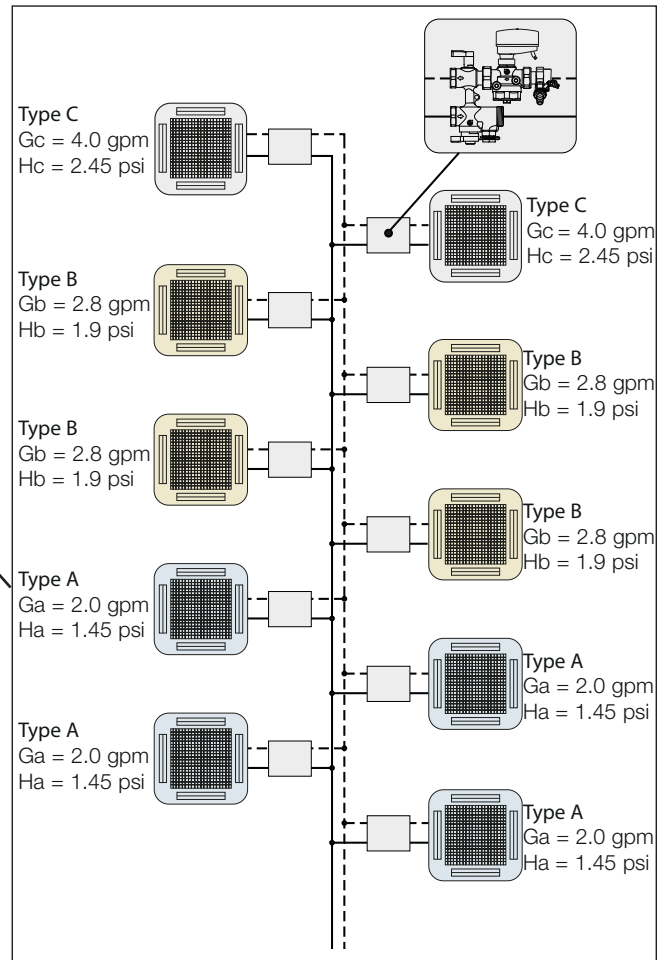
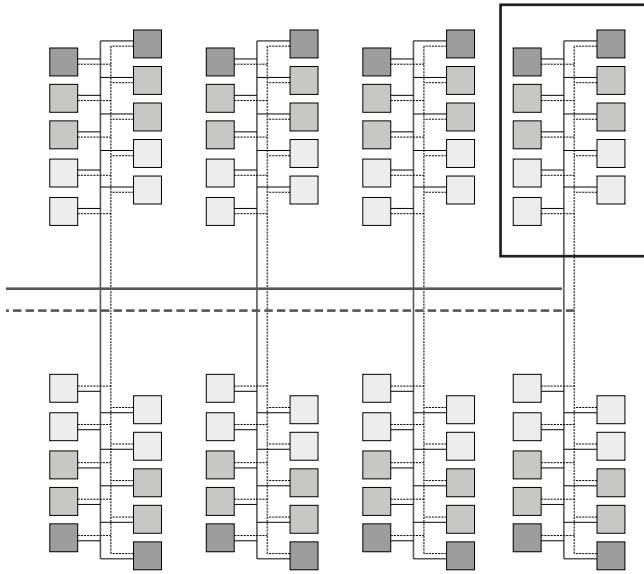
In each secondary branch (see box) the system must serve 3 types of fan coil.

The following design data is:

Type A	- Ga = 2.0 gpm	- Ha = 1.45 psi
Type B	- Gb = 2.8 gpm	- Hb = 1.9 psi
Type C	- Gc = 4.0 gpm	- Hc = 2.45 psi

where:

G = design flow rate  
H = fan coil design pressure drop

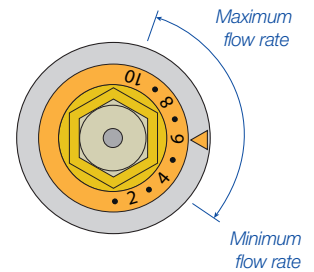


### Kit size selection

Each fan coil is served by a kit for which it is necessary to choose:

- 1- the body size
- 2- the flow rate range and the related flow rate preset.

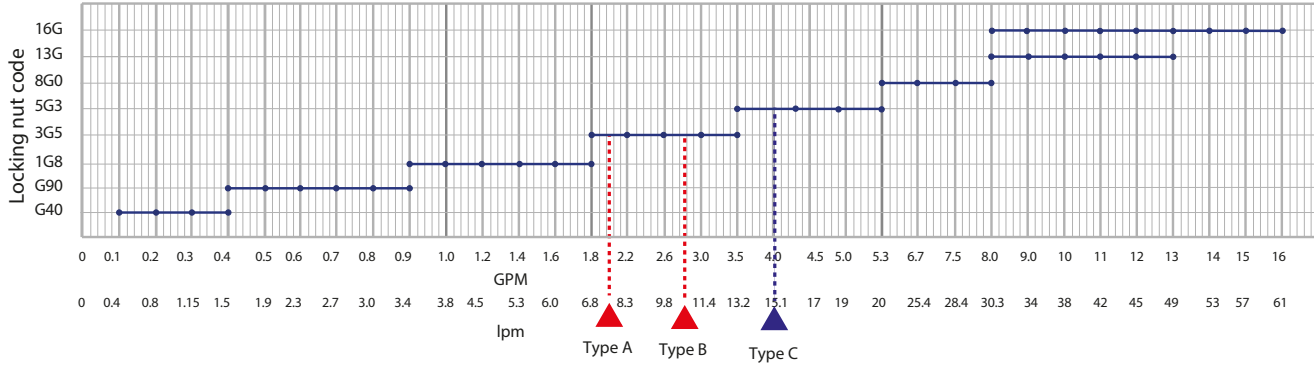
The PICV locking nut can be adjusted to align with the minimum and maximum design flow rate of the coil. In this example, for type A and B the flow rate range 3G5 is chosen, available in sizes 1/2 inch and 3/4 inch. For type C, the next size 5G3 is chosen, available exclusively in 3/4 inch.





The following sizes can be chosen:

- Type A and B flow rate range 3G50 - size 1/2" & 3/4"
- Type C flow rate range 5G3 - size 3/4"



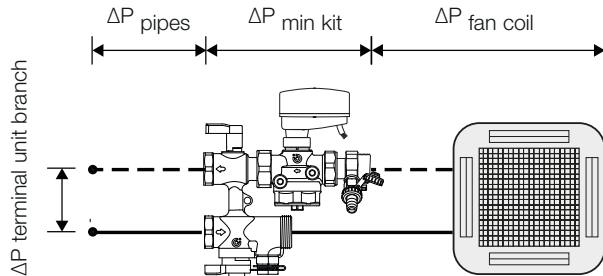
### Calculate the $\Delta P$ for the terminal unit branch connections

This value is determined with the formula:

$$\Delta P_{\text{terminal unit}} = \Delta P_{\text{pipes}} + \Delta P_{\text{min kit}} + \Delta P_{\text{fan coil}}$$

where:

- $\Delta P_{\text{pipes}}$  = pressure drops in the main line-fan coil connection sections (for the sake of simplicity we assume 0.3 psi)
- $\Delta P_{\text{min kit}}$  = minimum  $\Delta P$  of connection and regulation kit
- $\Delta P_{\text{fan coil}}$ 
  - Type A = 1.45 psi
  - Type B = 1.9 psi
  - Type C = 2.45 psi



The pressure drop of the 149 coil kit is obtained from the corresponding table listing the flow rate by size and maximum flow rate adjustment nut (ie: 3G5) of the 149 series groups chosen:

$$\Delta P_{\text{min kit}} = \Delta P_{\text{body}} + \Delta P_{\text{min PICV}}$$

#### Type A

- Ga = 2 gpm flow rate range 3G5 - size 3/4"
- $\Delta P_{\text{min PICV}} = 3.6$  psi
- $\Delta P_{\text{body}} = 0.28$  psi

#### Type B

- Gb = 2.8 gpm flow rate range 3G5 - size 3/4"
- $\Delta P_{\text{min PICV}} = 4$  psi
- $\Delta P_{\text{body}} = 0.7$  psi

#### Type C

- Gc = 4 gpm flow rate range 5G3 - size 3/4"
- $\Delta P_{\text{min PICV}} = 3.9$  psi
- $\Delta P_{\text{body}} = 0.4$  psi

Based on these values the  $\Delta P_{\text{min kit}}$  are:

- Type A  $\Delta P_{\text{min kit}} = 0.28 + 3.6 = 3.88$  psi
- Type B  $\Delta P_{\text{min kit}} = 0.7 + 4 = 4.7$  psi
- Type C  $\Delta P_{\text{min kit}} = 0.4 + 3.9 = 4.3$  psi

The pressure drops for terminal unit branches (tub) are:

- Type A  $\Delta P_{\text{tub}} = 0.3 + 3.88 + 1.45 = 5.63$  psi
- Type B  $\Delta P_{\text{tub}} = 0.3 + 4.7 + 1.9 = 6.9$  psi
- Type C  $\Delta P_{\text{tub}} = 0.3 + 4.3 + 2.45 = 7.05$  psi

### Calculate the system flow rate and head loss

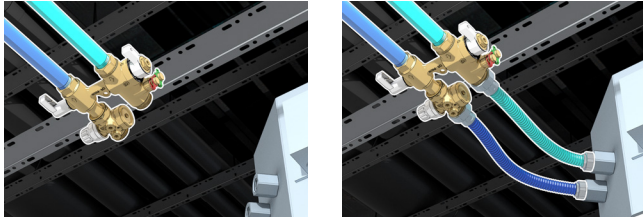
Considering that the kit stabilizes the flow rate on all the branches and makes it independent from the various actions, the flow rates that cross the network are exactly the design ones.

Once the flow rates in the various sections have been determined, the pressure drops of the pipes are calculated with the usual formulas.

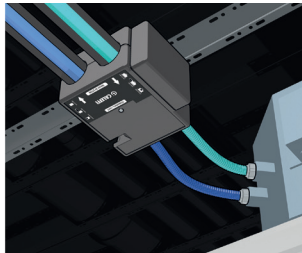
## INSTALLATION

### Mounting instructions

Connect the FLOWMATIC Express coil kit to the main pipe and then to the terminal unit using flexible pipes.

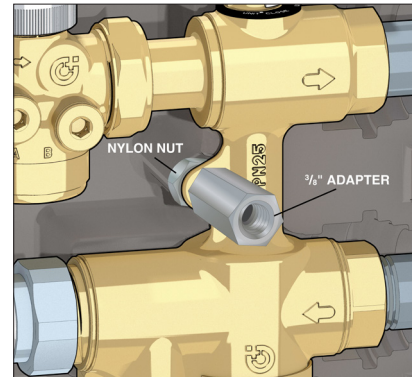


The insulation can be closed with the clamps housed in the appropriate spaces.



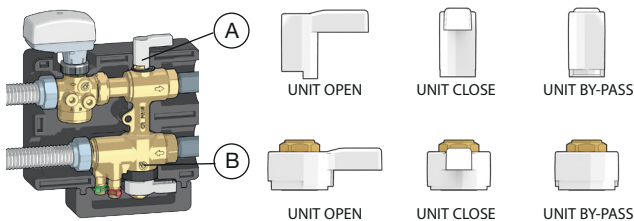
### Support using 3/8" all-thread rod

The casting has a tab with hole, next to the bypass, for mounting purposes. Included with the kit is a 5/16" x 3/8" NPT adapter which attaches to the hole and allows the kit to be suspended from strut using field-provided 3/8" all-thread rod.



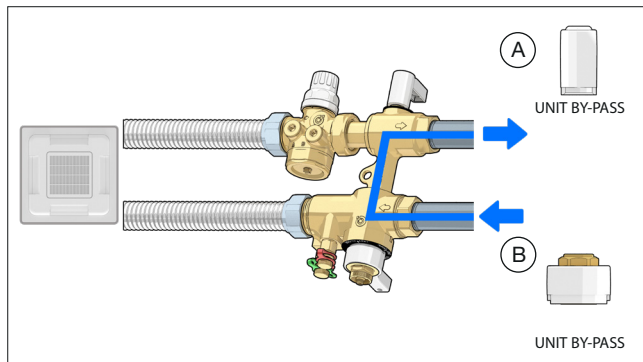
## COMMISSIONING

The three-way ball valves (A and B) can be positioned for a variety of flow path operations.



### 1) Bypass mode:

Flush the main circuit, isolating the terminal unit. Place both lever A and lever B on "UNIT BY-PASS".



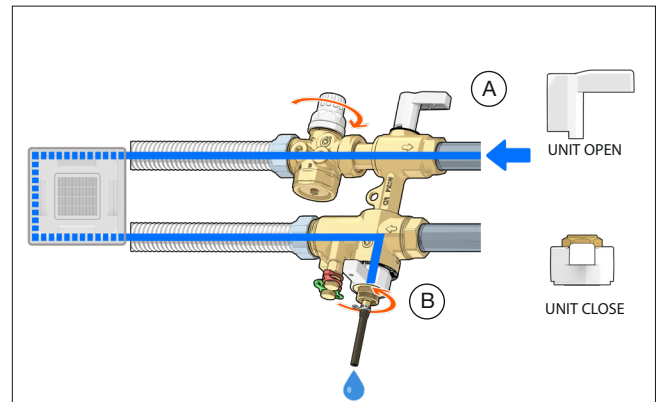
### 2) Terminal unit flushing:

Position lever A at "UNIT OPEN" and lever B at "UNIT CLOSE", screw on the rubber hose and unscrew the drain valve. The flow direction in this flushing diagram is opposite of normal operation. This flushing is accomplished due to system pressure.

With this configuration, opening the ball valve downstream the PICV (A) and closing the ball valve upstream (B), the system pressure (already pressurized) is used to flush the coil.

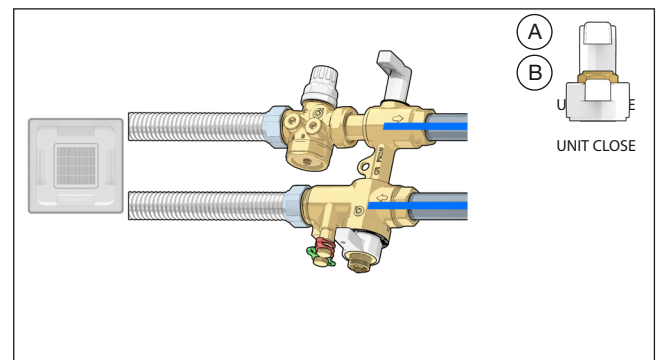
Therefore use the purge valve on the handle of the upstream 3-way valve (B) to flush the dirt.

If using an automatic fill valve, filling with fresh water in the system is more beneficial.

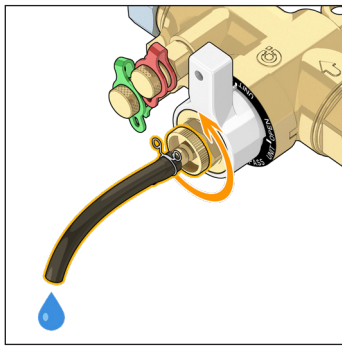


### 3) Strainer cleaning

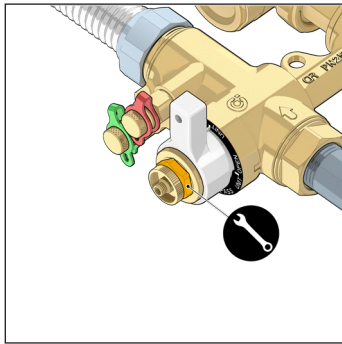
To clean the strainer position both levers on "UNIT CLOSE".



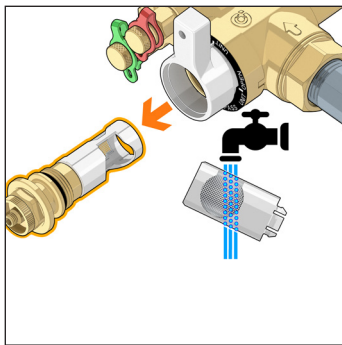
Loosen the locking nut (by about 2 turns) to drain the water from the terminal unit circuit.



Unscrew the strainer cartridge with a 20 mm wrench.



Remove the strainer holder cartridge and clean the strainer under running water.

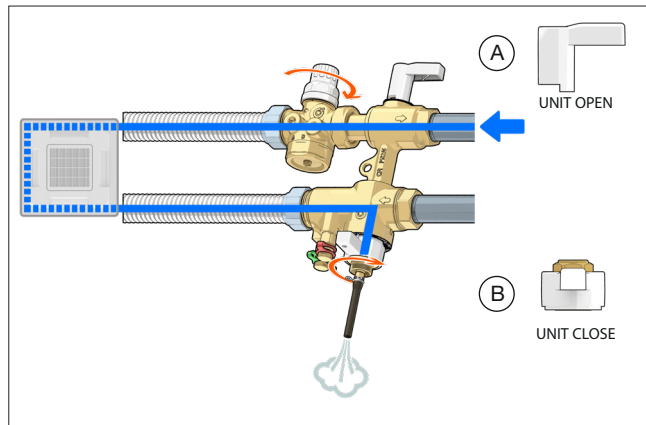


**Caution**

Tighten the locking nut fully and check that there are no leaks.

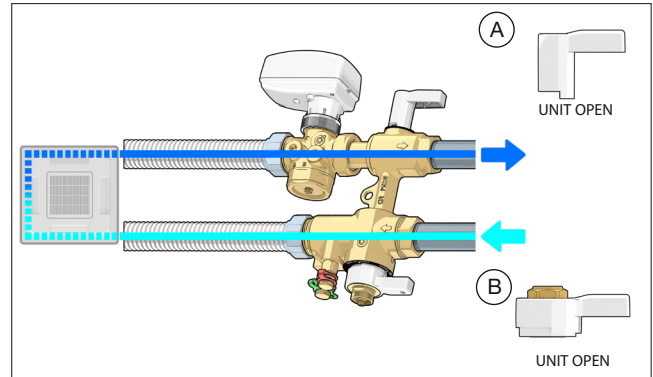
**4) Purging the terminal unit:**

Position lever A at "UNIT OPEN" and lever B at "UNIT CLOSE", and open the PICV with the corresponding knob. Close the drain valve as soon as the air is completely eliminated. Purging is accomplished due to system pressure; the flow is backward through the coil.



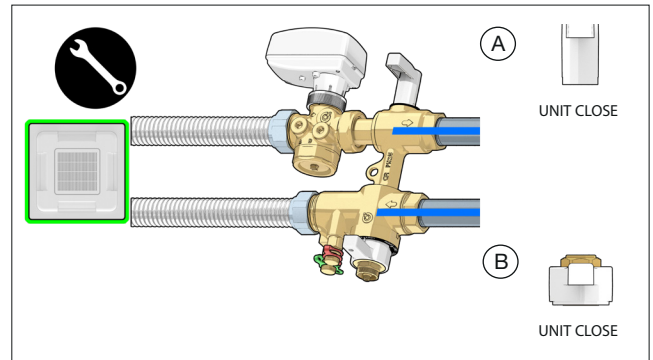
**5) Normal operation:**

Normal operation involves positioning both valves on "OPEN". Water passes through the strainer before entering in the terminal unit, protecting the unit against impurities in the main circuit water.



**6) Isolate the lines, service the terminal unit:**

The terminal unit can be cutoff and thus isolate the secondary circuit. This procedure is used to perform maintenance on the terminal unit.

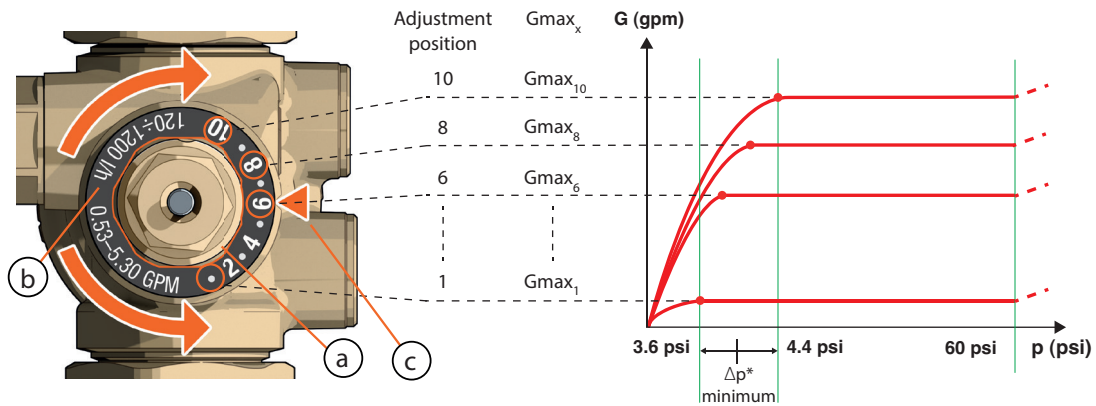
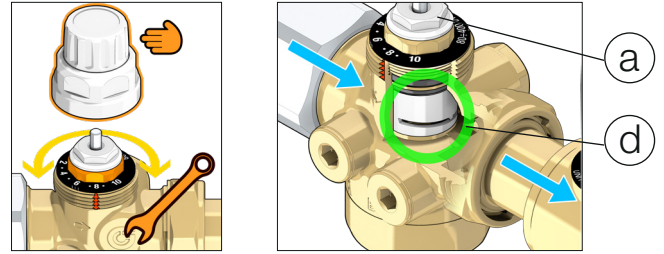


## FLOW RATE REGULATION

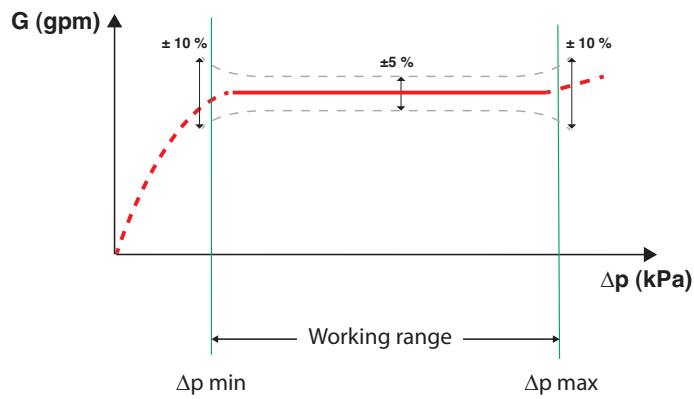
### Maximum flow rate regulation

Unscrew the protective cap by hand to gain access to the maximum flow rate adjustment nut (a). The locking nut is connected to a 10-position graduated scale, divided into steps corresponding to 1/10 of the maximum available flow rate, which is also shown on the scale (b). Turn the locking nut to the numerical position corresponding to the required flow rate (design flow rate), referring to the "Flow rate adjustment table". The slot (c) on the valve body is the physical positioning reference. Turning the locking nut (a), which determines the number associated with the "Adjustment position", opens/closes the cross section in the control shutter (d).

Each cross section set on the locking nut corresponds to a specific  $G_{max}$  value.



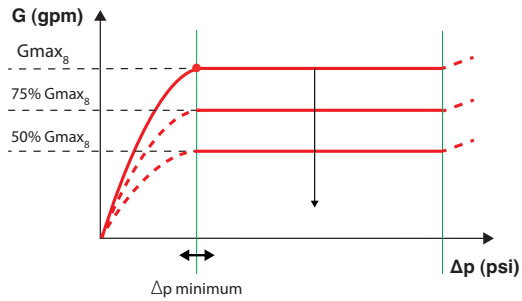
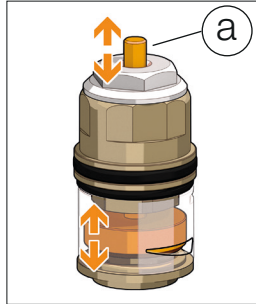
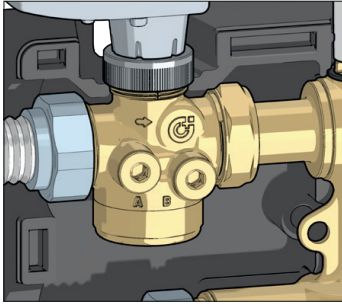
### Flow rate accuracy



## Automatic flow rate control with actuator and external controller

After setting the maximum flow rate, a 0 to 10 V proportional actuator (code 145013, 145018 or 656524) or an ON/OFF actuator (code 656504) can be installed, to control the PICV between the maximum flow rate and closed. For example, if the maximum flow rate has been set to position 8, the actuator can modulate the flow rate automatically from 8 to completely closed. The actuator pushes on the spring-return control stem (a).

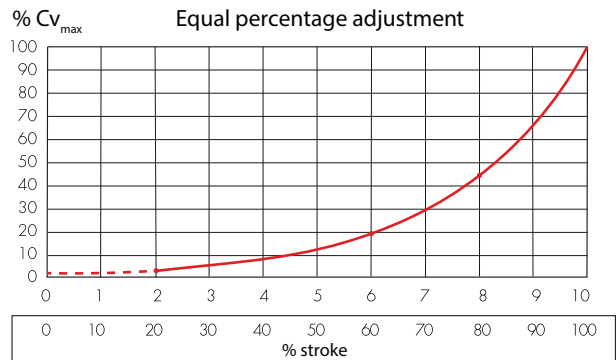
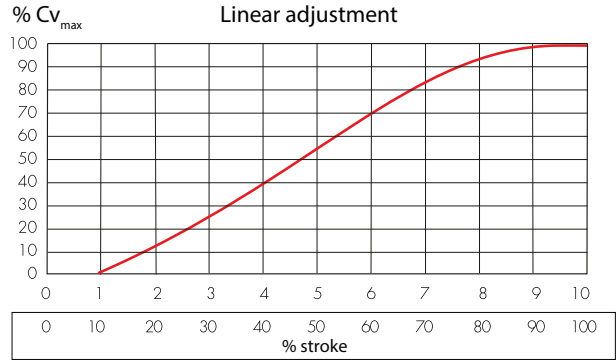
Under the control of an external controller the actuator can change the flow rate from the maximum value set (E.g.:  $G_{max_g}$ ) down to the minimum value, depending on the thermal load to be controlled while keeping the systems automatically balanced.



## Valve control characteristics

The PICV valve control characteristic is linear. An increase or decrease in the valve opening cross section corresponds to a directly proportional increase or decrease of the valve  $C_v$ .

The 145 series proportional actuator motor is factory set for a linear flow characteristic. Or, changing the switch setting inside the actuator can provide an equal-percentage flow characteristic, if desired.



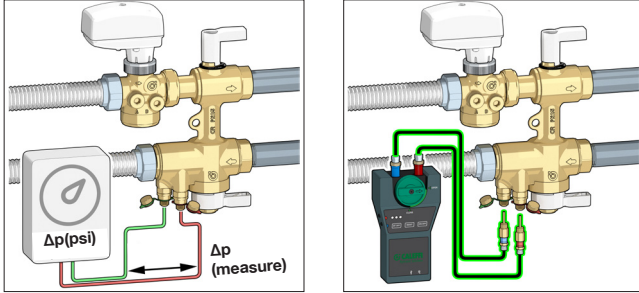
# FLOW RATE MEASUREMENT

## Flow rate measurement

Connect a differential pressure meter to the Venturi device pressure test ports on the FLOWMATIC Express coil kit. Reading the  $\Delta p$  on the meter, read the flow rate, G, from the hydraulic characteristic flow curve for the Venturi size being used. Or, analytically, you can calculate the flow rate with this equation:

$$G = C_{v \text{ Venturi}} \times \sqrt{\Delta p \text{ Venturi}} \quad (1.1)$$

Locking nut code	G40	G90	1G8	3G5	5G3-7G9	13G-16G
Cv Venturi	0.3	0.6	1.3	2.7	5.8	11

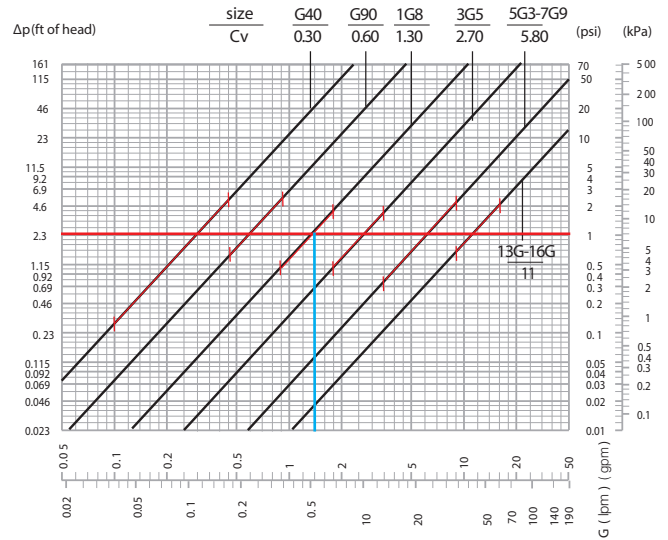
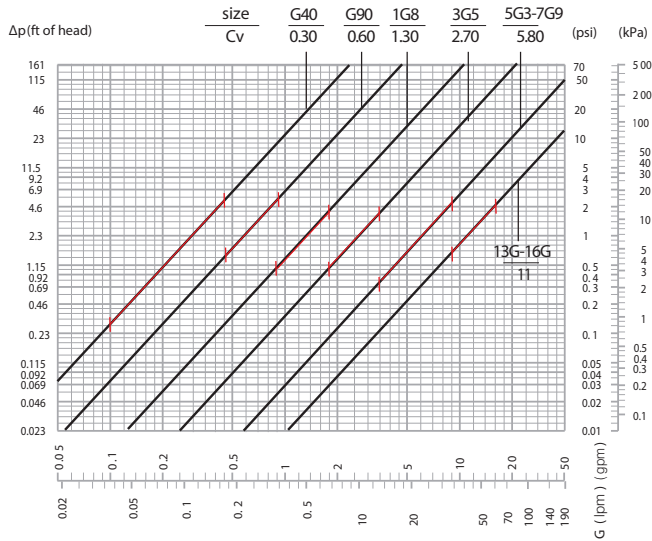


## Example of flow rate measurement

Reading a  $\Delta p_{\text{Venturi}}$  of 1 psi (red line) on an 1G8 valve and using the characteristic Venturi chart for the valve in question, the x-axis gives a flow rate of 2.25 gpm (blue line).

Instead, to proceed analytically using the ratio (1.1), a measurement of  $\Delta p_{\text{Venturi}}$  equal to 1 psi (bearing in mind that the  $C_{v \text{ Venturi}}$  of the 1G8 valve is equal to 1.3) leads to the calculation of a flow rate

$$G = 1.3 \times \sqrt{1.00} = 1.35 \text{ gpm} \quad (1.1)$$



## ACCESSORIES

### 145 FLOWMATIC®



Proportional linear actuator for FLOWMATIC Express 149 series coil kit.  
 Electric supply: 24 V AC/DC.  
 Control signal: 0 – 10 V.  
 Feedback signal: 0–10 V.  
 Power consumption 25 VA, 1.5 W DC.  
 Ambient temperature range:  
 32 - 120 °F (0 – 50 °C);  
 Opening and closing time is with autostroke detection.  
 Protection class: IP 54 (NEMA 3);  
 Connection: M 30 p.1,5.

Code	Description
<b>145013</b>	24V AC/DC, 0 (2) - 10 VDC, 0 (4) - 20 mA, proportional, fail-in-place, 35 sec. open/close time, 78 in. cable length.
<b>145018</b>	24V AC/DC, 0 - 10 V DC , proportional, fail safe closed or open, 88 sec. open/close time, 59 in. cable length.

### 6565



Proportional thermo-electric actuator for FLOWMATIC Express 149 series coil kit.  
 Quick-coupling installation with mounting clip adapter.  
 Normally closed.  
 Electric supply: 24 V AC/DC.  
 Running power consumption: 1.2 W.  
 Control signal: 0 – 0 VDC.  
 Feedback signal: 0–10 V.  
 Power consumption 1.2 W.  
 Ambient temperature range:  
 32 - 140 °F (0 – 60 °C).  
 Opening and closing time: 200 seconds.  
 Protection class: IP 54 (NEMA 3).  
 Connection: M 30 p.1,5 (quick coupling).  
 Electric supply cable: 39 inches (1 m).

Code	Description
<b>656524</b>	24V AC/DC, 0 - 10 VDC, thermo-electric, NC

### 6565



On/off thermo-electric actuator for FLOWMATIC Express 149 series coil kit.  
 Quick-coupling installation with mounting clip adapter.  
 Normally closed.  
 Electric supply: 24 V AC/DC.  
 Running power consumption: 1 W.  
 Ambient temperature range:  
 32 - 140 °F (0 – 60 °C).  
 Protection class: IP 54.  
 Connection: M 30 p.1,5 (quick coupling).  
 Electric supply cable: 39 inches (1 m).

Code	Description
<b>656504</b>	24V AC/DC, on/off, thermo-electric, NC

### Optional Insulation Jacket for chilled water applications



Material: EPP  
 Density: 30 kg/m<sup>3</sup>  
 Thermal conductivity:  
 at 50 °F (10°C): 0.257 BTU · in/hr · ft<sup>2</sup> · ° F  
 (0.037 W/m · K)

Code	Description
<b>F0001771</b>	Insulation jacket to cover entire 149A assembly for chilled water applications

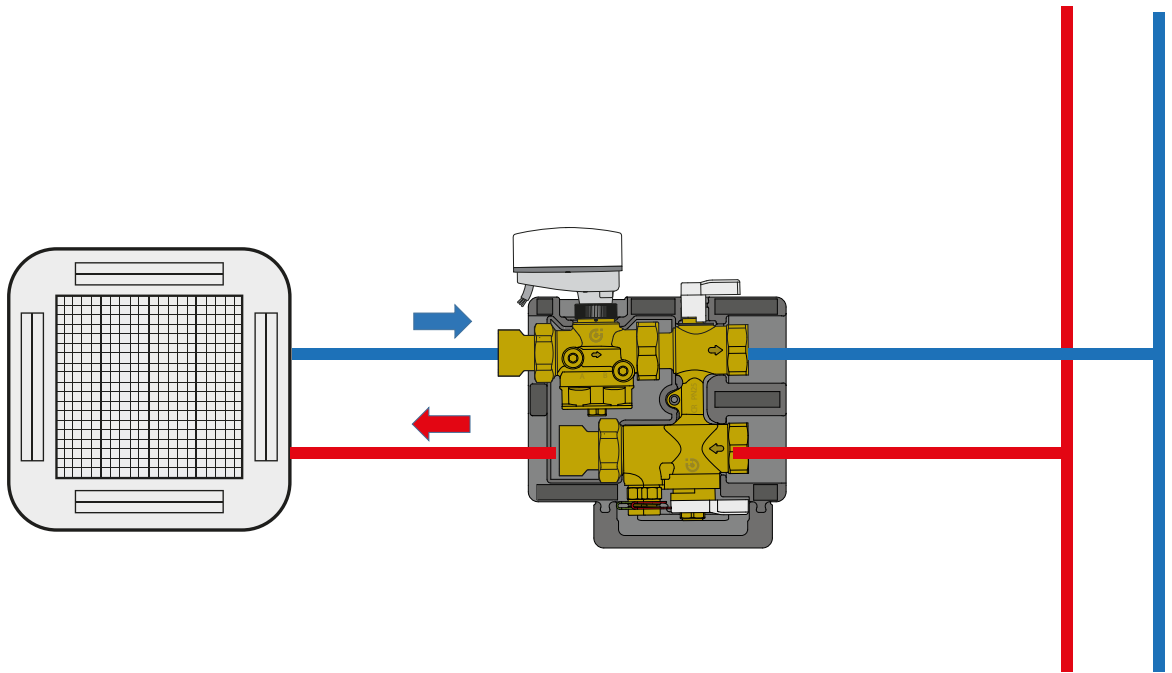
### Terminal unit connecting hoses



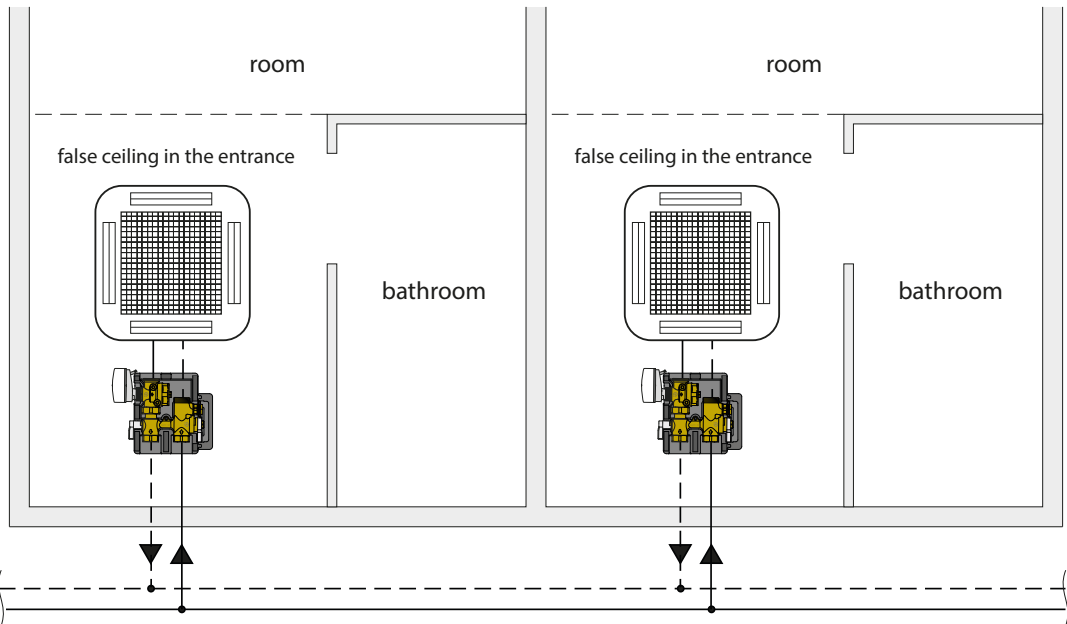
Material: Stainless steel braided  
 Fitting connection:  
 NPT male x NPT male, plated steel  
 Max. working pressure: 400 psi (28 bar)  
 Max. operating temperature:  
 212 °F (100 °C)

Code	Description
<b>NA10970</b>	1/2" NPT male X 12" length, pair
<b>NA10971</b>	1/2" NPT male X 18" length, pair
<b>NA10972</b>	1/2" NPT male X 24" length, pair
<b>NA10973</b>	3/4" NPT male X 12" length, pair
<b>NA10974</b>	3/4" NPT male X 18" length, pair
<b>NA10975</b>	3/4" NPT male X 24" length, pair
<b>NA10976</b>	1" NPT male X 12" length, pair
<b>NA10977</b>	1" NPT male X 18" length, pair
<b>NA10978</b>	1" NPT male X 24" length, pair

# APPLICATION DIAGRAMS



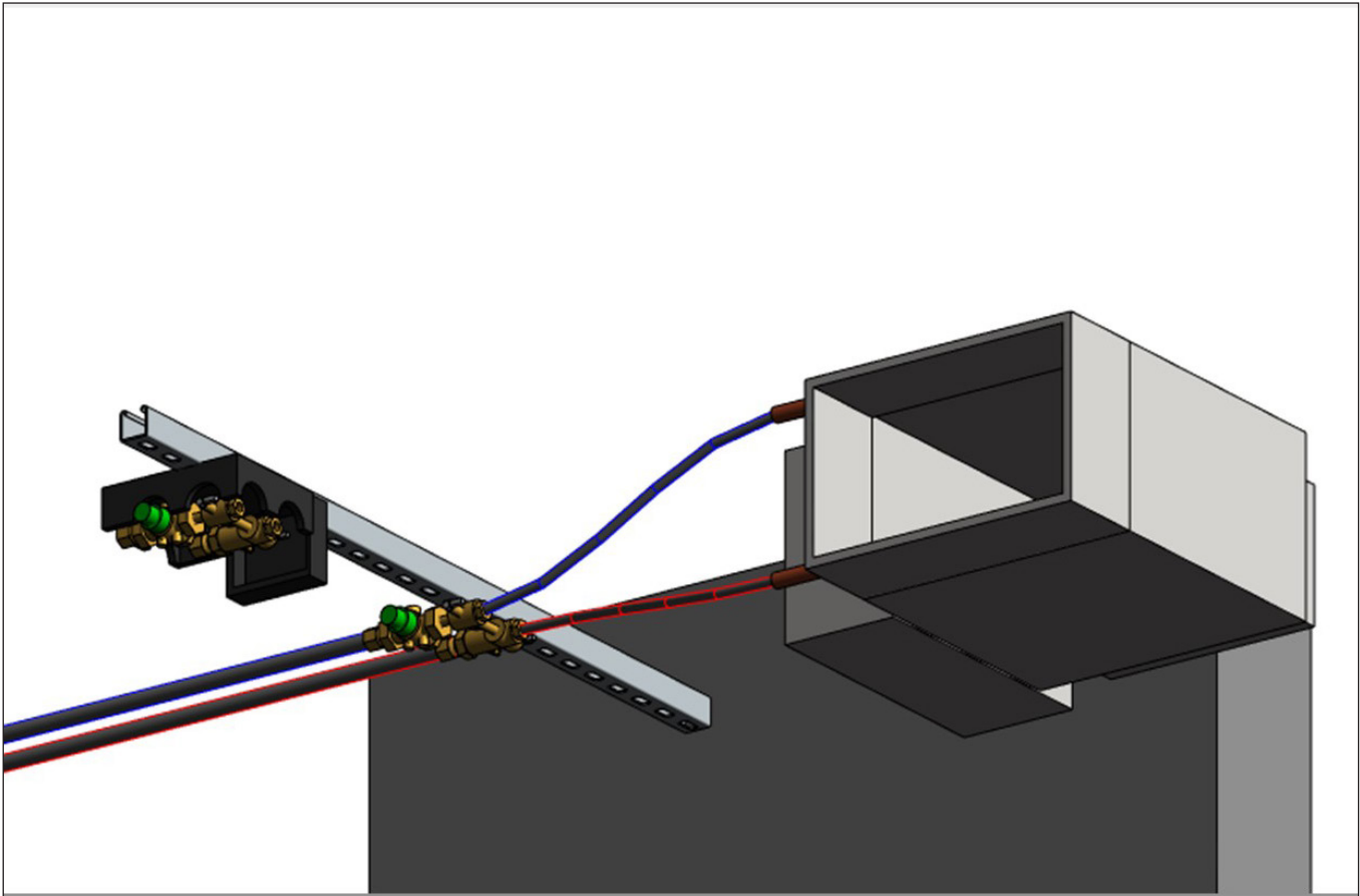
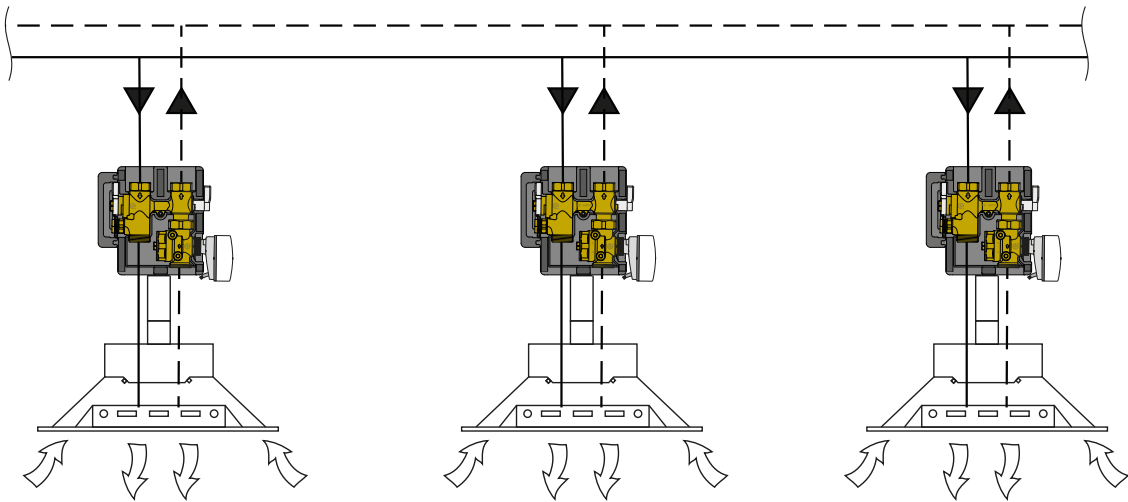
## Installation in false ceiling for fancoils





APPLICATION DIAGRAMS

Cold beam installation





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## SPECIFICATION SUMMARY

### 149 series

FLOWMATIC Express connection and regulation kit for HVAC terminal units in heating and cooling systems. Complete with: pressure independent control valve (PICV), three-way shut-off valves, integrated by-pass, venturi device with pressure test ports, strainer cartridge, rubber hose and pre-formed shell insulation in EPP. Connections on system side 1/2", 3/4" and 1" integral NPT female; terminal unit side 1/2", 3/4" and 1" NPT female union. Connections center distance: 3.15 inches (80 mm). Connection for actuators code 145013, 145018 and 6565 series thermo-electric actuators M30 p.1.5. Flow rate regulation range of the kit with Venturi device: 0.1 to 0.4 gpm (0.3 to 1.5 lpm) for code 149400A G40; 0.4 to 0.9 gpm (1.5 to 3.4 lpm) for code 149400A G90 and 149500A G90; 0.9 to 1.8 gpm (3.5 to 6.8 lpm) for code 149400A 1GB and 149500A 1GB; 1.9 to 3.5 gpm (6.6 to 13.2 lpm) for code 149400A 3G5 and 149500A 3G5; 3.5 to 5.3 gpm (13.2 to 20 lpm) for 149500A 5G3; 5.3 to 7.9 gpm (21 to 30 lpm) for code 149600A 769; 7.9 to 13 gpm (30 to 49 lpm) for code 149600 13G; 8 to 16 gpm (30 to 60 lpm) for code 149600A 16G. The adjustment position does not affect the valve stroke. Full-stroke modulation. Flow rate pre-adjustment device with at least 10 reference positions and continuous adjustment. Flow rate accuracy  $\pm 5\%$ . Linear or equal percentage flow rate adjustment characteristic, set up by actuator depending on the characteristics of the terminal unit. Maximum working pressure 360 psi (25 bar). Maximum differential pressure with actuator code 145013, 145018, and 6565 series installed 58 psid (4 bar). Nominal working  $\Delta p$  range 3.6 to 58 psid (0.2 to 4 bar). Working temperature range 14 degrees F to 248 degrees F (-10 degrees C to 120 degrees C). Ambient temperature range 32 degrees F to 120 degrees F (0 degrees C to 50 degrees C). Strainer mesh size 800  $\mu\text{m}$ . Medium: water and glycol solutions; maximum percentage of glycol 50%. Shutoff leakage 0.01% (class V). Bypass Cv 1.6 (Kv 1.4). Pressure independent control valve (PICV) DZR corrosion-resistant brass body and bonnet CW602N; stainless steel AISI 303 control stem and piston; stainless steel AISI 304 strainer mesh; PICV differential pressure diagram and PSSG40 control shutter, peroxide-cured EPDM valve plug and seals. Provide with full-coverage optional insulation jacket in EPP, code F0001771, for cooling applications, separately purchased and field replacing standard supplied jacket. Compliant with the requirements of standard UL 2043 for plenum installations without insulation jacket.

### Code 145013

FLOWMATIC proportional linear actuator for FLOWMATIC Express 149 series coil kit. Electric supply 24 V AC/DC. Power consumption 25 VA, 1.5 W DC. Control signal 0 (2) to 10 VDC, 0 (4) to 20 mA. Feedback signal: 0–10 V. Fail-in-place. Protection class NEMA 3 (IP 54). Ambient temperature range 32 degrees F to 120 degrees F (0 degrees C to 50 degrees C). Opening and closing time 32 seconds with autostroke detection. Connection M30 p. 1.5. Supply cable length 78 inches (2 meter).

### Code 145018

FLOWMATIC proportional linear actuator for FLOWMATIC Express 149 series coil kit. Electric supply 24 V AC/DC. Power consumption 25 VA, 1.5 W DC. Control signal 0 to 10 VDC. Feedback signal: 0–10 V Fail safe closed or open. Protection class NEMA 3 (IP 54). Ambient temperature range 32 degrees F to 120 degrees F (0 degrees C to 50 degrees C). Opening and closing time 88 seconds with autostroke detection. Connection M30 p. 1.5. Supply cable length 59 inches (1.5 meter).

### Code 656524

Proportional thermo-electric actuator for FLOWMATIC Express 149 series coil kit. Electric supply 24 V AC/DC. Power consumption 1.2 W. Control signal 0–10 V. Feedback signal: 0–10 V. Normally closed. Protection class IP 54. Ambient temperature range 32 degrees F to 140 degrees F (0 degrees C to 60 degrees C). Opening and closing time 200 seconds. Connection M30 p. 1.5. Supply cable length 39 inches (1 meter).

### Code 656504

On/off thermo-electric actuator for FLOWMATIC Express 149 series coil kit. Electric supply 24 V AC/DC. Power consumption 1 W. Control signal on/off. Normally closed. Protection class IP 54. Ambient temperature range 32 degrees F to 140 degrees F (0 degrees C to 60 degrees C). Opening and closing time 240 seconds. Connection M30 p. 1.5. Supply cable length 39 inches (1 meter).

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