

## FLOWMATIC® Express Coil Kit

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**149 Series**

### 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 selected 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. For more extensive commercial applications, the coil kit offers the choice of customized product tags for easy identification and assignment to the relevant system terminal units. Reach out to Caleffi customer service to request the form.

### Product range

149 series connection and regulation kit for HVAC terminal units

1/2", 3/4", 1" NPT female

### Technical Characteristics

#### 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 brass CW602N  
 - (1G8, 3G5, 5G3): PTFE  
 - (7G9, 13G, 16G): stainless steel AISI 303  
 Springs: stainless steel AISI 302  
 Seals: peroxide-cured EPDM  
 Washers: EPDM fiber  
 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  
 Max. percentage of glycol: 50%  
 Max. working pressure: 360 psi (25 bar)  
 Max. differential pressure with actuators: 58 psi (4 bar)  
 Working temperature range: 14 - 250 °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 set point  
 Leakage: 0.01% (class V)  
 Strainer mesh size: 800 μm

#### Insulation:

Material: EPP  
 Density: 45 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.



## SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.**



**WARNING:** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warning.ca.gov](http://www.P65Warning.ca.gov).



**CAUTION:** All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of systems in accordance with all applicable codes ordinances.



**CAUTION:** Over-tightening and breakage can occur with the use of Teflon® pipe joint compounds. Teflon® provides lubricity so that care must be exercised not to over-tighten joints. Failure to follow these instructions could result in property damage and / or personal injury.



**CAUTION:** System fluids under pressure or temperature can be hazardous. Be sure the pressure has been reduced to zero and the system temperature is below 100 °F (38 °C). Failure to follow these instructions could result in property damage and/or personal injury.



**CAUTION:** Clean the pipes of any debris, rust, incrustations, welding slag and any other contaminants. For optimal operation, air in the system must be removed.



**WARNING:** The outer surface of the device, especially in polymer type components, must not come into contact with any chemical substance, either on purpose or accidentally. The system fluid and any chemical additives used within the water piping system – whether for washing or as protection – must be compatible with the materials used to make the device and with the function it performs.



**CAUTION:** Make sure that all the connecting pipework is water tight. Caleffi shall not be liable for damages resulting from stress corrosion, misapplication or misuse of its products.

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## CONSIGNE DE SÉCURITÉ

Ce symbole d'avertissement servira dans ce manuel à attirer l'attention sur la sécurité concernant instructions. Lorsqu'il est utilisé, ce symbole signifie. **ATTENTION! DEVEZ ALERTE ! VOTRE SÉCURITÉ EST EN JEU ! NE PAS SUIVRE CES INSTRUCTIONS PEUT PROVOQUER UN RISQUE DE SECURITE.**



**AVERTISSEMENT:** Ce produit peut vous exposer à des produits chimiques comme le plomb, qui est connu dans l'État de Californie pour causer le cancer, dommages à la naissance ou autre. Pour plus d'informations rendez-vous [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**AVERTISSEMENT:** Tous les travaux doivent être effectués par du personnel qualifié formé à la bonne application, installation et maintenance des systèmes conformément aux codes et règlements locaux.



**AVERTISSEMENT:** Un serrage excessif et une rupture peuvent survenir avec l'utilisation de Teflon® composés de joint de tuyau. Le Teflon® offre un pouvoir lubrifiant de sorte que les soins doivent être exercé pour ne pas trop serrer les joints. Non-respect de ces instructions pourrait entraîner des dommages matériels et / ou des blessures corporelles.



**AVERTISSEMENT:** Les liquides du système sont sous pression ou de la température peuvent être dangereux. Être sûr que la pression a été réduite à zéro et la température du système est inférieure à 100 °F (38 °C). Le non-respect de ces instructions peut entraîner des dommages matériels et/ou des blessures.



**AVERTISSEMENT:** Nettoyer les tuyaux de tout débris, roille, incrustations, scories de soudure et d'autres contaminants. Pour un fonctionnement optimal, de l'air dans le system doit être retiré.



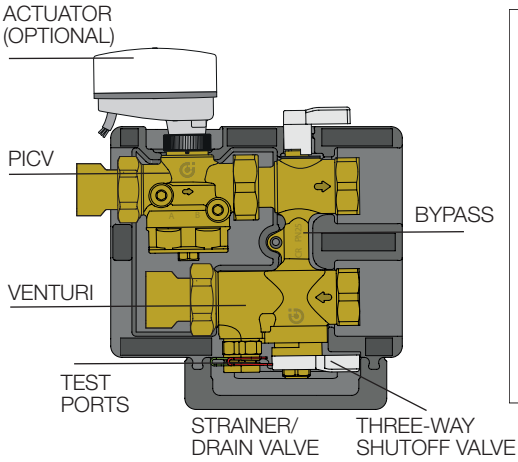
**AVERTISSEMENT:** La surface extérieure de l'appareil, en particulier les composants de type polymère, ne doit pas entrer en contact avec des substances chimiques, que ce soit volontairement ou accidentellement. Le produit et les additifs chimiques utilisés dans les canalisations d'eau - que ce soit pour le lavage ou la protection - doivent être compatibles avec les matériaux utilisés pour la fabrication de l'appareil et avec la fonction qu'il remplit.



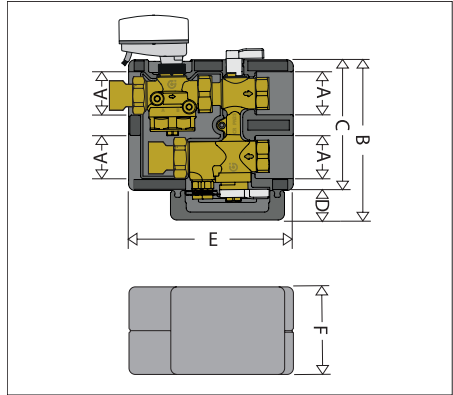
**AVERTISSEMENT:** S'assurer que tous les raccordements sont étanches. Caleffi ne pourra être tenue responsable des dommages résultant de la corrosion, d'une mauvaise utilisation ou une mauvaise utilisation des produits.

Caleffi ne pourra être tenue responsable des dommages résultant de la corrosion, d'une mauvaise utilisation ou une mauvaise utilisation des produits.

### Characteristic components

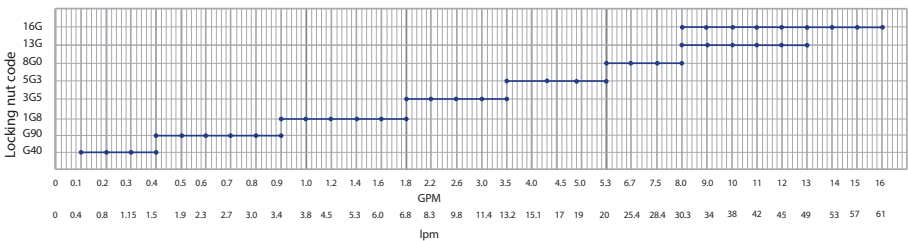


### Dimensions






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"	4 5/16"	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"	4 5/16"	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"	4 5/16"	6.3/2.9
149600A 13G								
149600A 16G								

### Flow rate range shortcut charts



**Actuators compatible with PICV valve in 149 coil kit**

				
<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>	~ 35 seconds (*)		~ 200 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)		39 inches (1 m)	
<b>Connection</b>	M30 p.1.5		M30 p.1.5 (quick coupling)	
<b>Force</b>	36 lbf (160 N)		23 lbf (100 N)	28 lbf (125 N)
<b>Max. differential pressure</b>	58 psid (4 bar)			

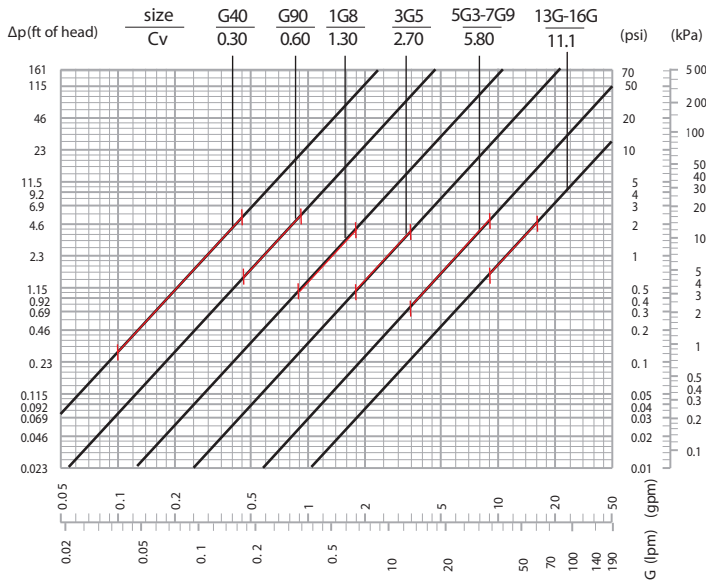
\* auto stroke detection

### 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"	0.3	0.1 to 0.4 (gpm)	0.1	.16	.24	.32	0.4	--	--	--	--	--
			0.3 to 1.5 (lpm)	0.1	.16	.24	.32	0.4	--	--	--	--	--
			$\Delta p$ min PICV (psi)	3.62					--	--	--	--	--
			$\Delta p$ min PICV (kPa)	25					--	--	--	--	--
149400A G90	1/2"	0.6	0.4 to 0.9 (gpm)	--	--	--	--	0.4	0.5	0.6	0.7	0.8	0.9
			1.5 to 3.4 (lpm)	--	--	--	--	1.5	2.0	2.4	2.7	3.0	3.4
			$\Delta p$ min PICV (psi)	--	--	--	--	3.62		3.7		3.8	
			$\Delta p$ min PICV (kPa)	--	--	--	--	25		25.5		26	
149400A 1G8	1/2"	1.3	0.9 to 1.8 (gpm)	--	--	--	--	0.9	1.1	1.3	1.5	1.6	1.8
			3.5 to 6.8 (lpm)	--	--	--	--	3.5	4.1	4.8	5.5	6.1	6.8
			$\Delta p$ min PICV (psi)	--	--	--	--	3.8	3.85		3.9		
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	26.5		27		
149400A 3G5	1/2"	2.7	1.9 to 3.5 (gpm)	--	--	--	--	1.9	2.1	2.5	2.8	3.2	3.5
			6.6 to 13.2 (lpm)	--	--	--	--	6.6	7.9	9.3	10.6	12	13.2
			$\Delta p$ min PICV (psi)	--	--	--	--	3.6	3.9	4.0	4.06	4.1	4.2
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	27	27.5	28	28.5	29
149500A G90	3/4"	0.6	0.4 to 0.9 (gpm)	--	--	--	--	0.4	0.5	0.6	0.7	0.8	0.9
			1.5 to 3.4 (lpm)	--	--	--	--	1.5	2.0	2.4	2.7	3.0	3.4
			$\Delta p$ min PICV (psi)	--	--	--	--	3.62		3.7		3.8	
			$\Delta p$ min PICV (kPa)	--	--	--	--	25		25.5		26	
149500A 1G8	3/4"	1.3	0.9 to 1.8 (gpm)	--	--	--	--	0.9	1.1	1.3	1.5	1.6	1.8
			3.5 to 6.8 (lpm)	--	--	--	--	3.5	4.1	4.8	5.5	6.1	6.8
			$\Delta p$ min PICV (psi)	--	--	--	--	3.8	3.85		3.9		
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	26.5		27		
149500A 3G5	3/4"	2.7	1.9 to 3.5 (gpm)	--	--	--	--	1.9	2.1	2.5	2.8	3.2	3.5
			6.6 to 13.2 (lpm)	--	--	--	--	6.6	7.9	9.3	10.6	12	13.2
			$\Delta p$ min PICV (psi)	--	--	--	--	3.6	3.9	4.0	4.06	4.1	4.2
			$\Delta p$ min PICV (kPa)	--	--	--	--	26	27	27.5	28	28.5	29
149500A 5G3	3/4"	5.8	3.5 to 5.3 (gpm)	--	--	--	--	--	--	3.5	4.2	4.8	5.3
			13.2 to 20 (lpm)	--	--	--	--	--	--	13.2	16	18	20
			$\Delta p$ min PICV (psi)	--	--	--	--	--	--	3.8	3.9	4.0	4.06
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	--	26.5	27	27.5	28

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	5.3 to 7.9 (gpm)	--	--	--	--	--	--	5.3	6.3	7.1	7.9	
			21 to 30 (lpm)	--	--	--	--	--	21	24	27	30		
			$\Delta p$ min PICV (psi)	--	--	--	--	--	3.62					
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	25					
149600A 13G	1"	11.1	7.9 to 13 (gpm)	--	--	--	--	--	7.8	9.1	10.4	11.7	13	
			30 to 49 (lpm)	--	--	--	--	--	30	34	39	44	49	
			$\Delta p$ min PICV (psi)	--	--	--	--	--	5					
			$\Delta p$ min PICV (kPa)	--	--	--	--	--	35					
149600A 16G	1"	11.1	8 to 16 (gpm)	--	--	--	--	8	9.6	11.2	12.8	14.4	16	
			30 to 60 (lpm)	--	--	--	--	30	36	42	48	55	60	
			$\Delta p$ min PICV (psi)	--	--	--	--	6.5	6.2					
			$\Delta p$ min PICV (kPa)	--	--	--	--	45	43					

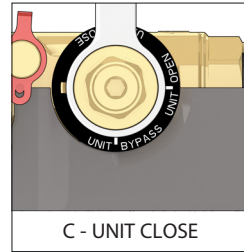
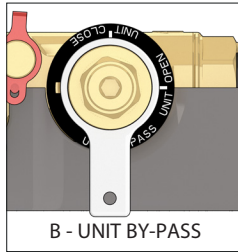
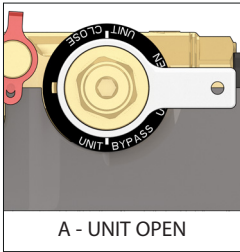
### Venturi hydraulic characteristics



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	11.1

### Three-way ball valve

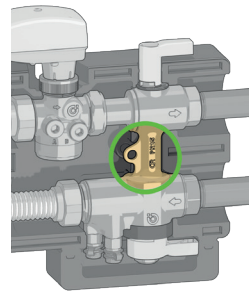
The shut-off valves have three positions. The internal ball is designed to open the straight path (A) (for normal operation), the bypass path (B) (for passage through the bypass) or to completely close the passage and isolate the circuit of the terminal unit (C).



### Integrated by-pass

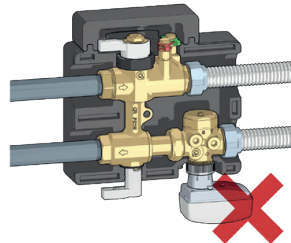
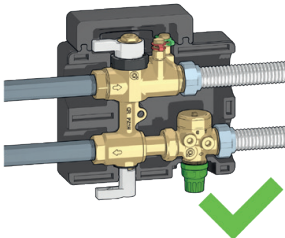
The kit is equipped with a bypass, which is used for:

- flushing the main circuit pipes without the fluid passing through the terminal unit;
- isolation for maintenance work on the terminal unit.



### Installation versatility

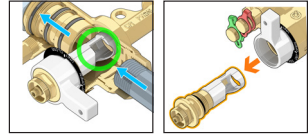
The kit, without actuator, can be installed in any position. With actuator, do not install the kit with the valve upside down.





### Built-in removable strainer

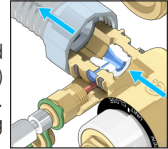
Heating and air conditioning systems can degrade over time due to impurities contained in the system circulating fluid. If these impurities are not removed, they can impair operation of system components, such as boilers, heat exchangers, or terminal units in the circuits, especially during system commissioning.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



### Flow rate venturi

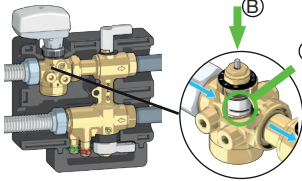
The kit contains a venturi which allows system flow rate measurement and verification. Each differential pressure value (measured at the pressure test ports) has a corresponding accurate flow rate value, determined by the venturi Cv value. Refer to the Venturi hydraulic characteristics chart on page 7, or calculate using formula:

$$\text{Flow rate G (gpm)} = C_v \text{ Venturi} \times \sqrt{\Delta P \text{ Venturi (psi)}}$$



### Integrated PICV

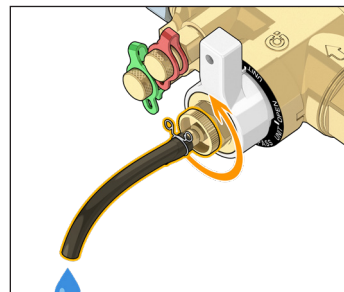
The kit is equipped with a pressure independent control valve (PICV) capable of regulating the flow rate and keeping it constant even when the differential pressure conditions of the system change. The flow rate is adjusted:



- **manually** on the automatic flow rate regulator, to restrict the maximum value. The adjustment is made turning the locking nut and positioning it on the relative adjustment number: this opens/closes the 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 circuit to be controlled. The actuator adjusts the flow rate from the maximum value to the minimum value by pushing down the control stem (B). See page 5 for separately sourced actuator options.

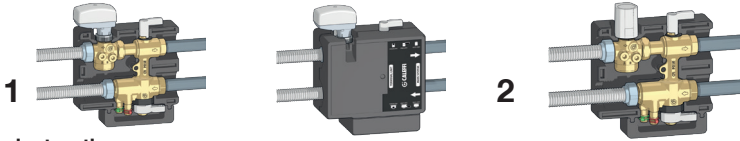
### Drain valve with rubber hose

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



## Use with actuators

(1) 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. (2) 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.



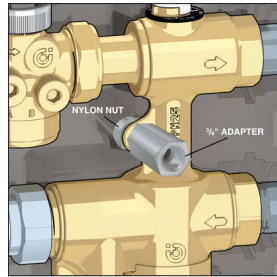
## Mounting instructions

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.



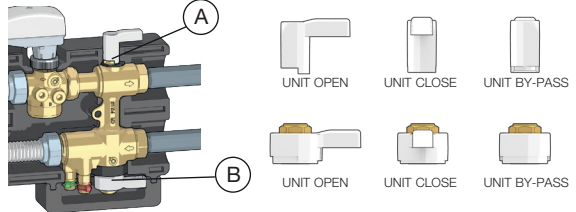
## Support using 3/8" all-thread rod

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.



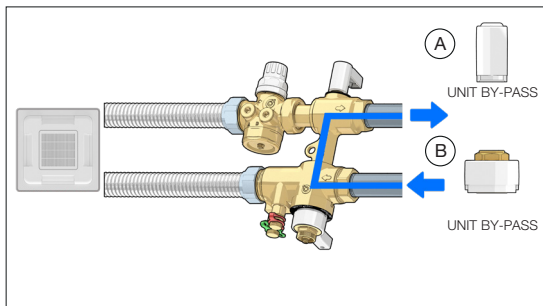
## Commissioning

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



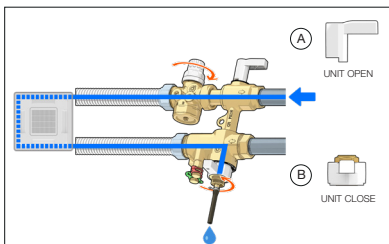
### 1) Bypass mode:

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



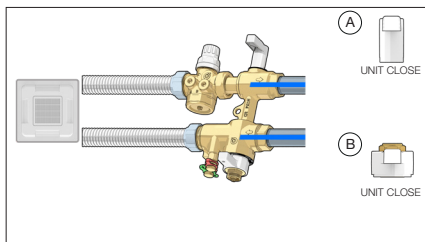
## 2) Terminal unit flushing:

Position lever A at "UNIT OPEN" and lever B at "UNIT CLOSE", screw on the rubber hose and unscrew the drain valve. The system pressure will cause reverse flow through the coil to purge.

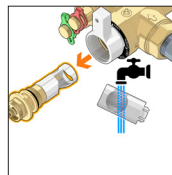
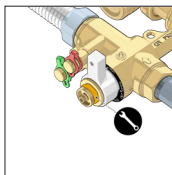
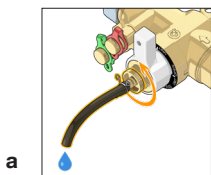


## 3) Strainer cleaning

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



(a) Loosen the locking nut (by about 2 turns) to drain the water from the terminal unit circuit. (b) Unscrew the strainer cartridge with a 20 mm wrench. (c) Remove the strainer holder cartridge and clean the strainer under running water.

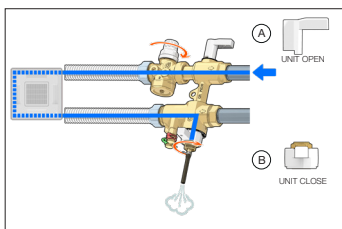


## Caution:

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

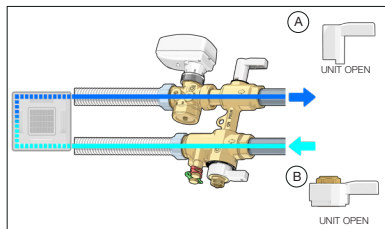
## 4) Purging the terminal unit:

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.



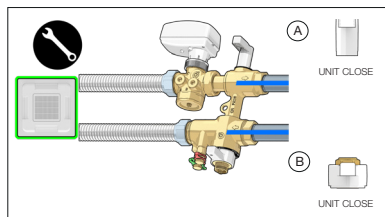
## 5) Normal operation:

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.



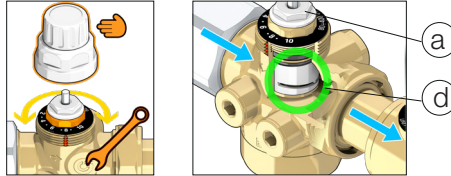
## 6) Isolate the lines, service the terminal unit:

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

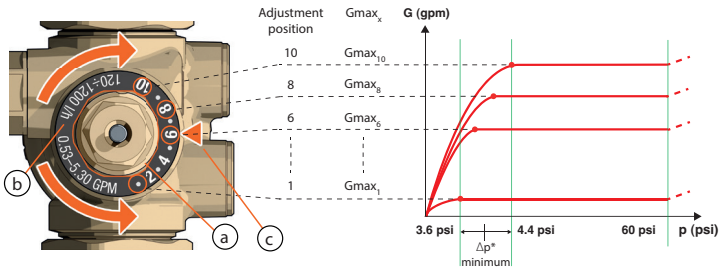


### Maximum flow rate regulation

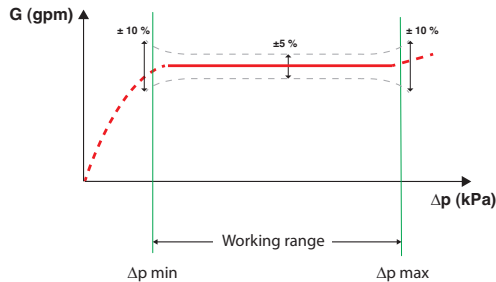
Unscrew the protective cap by hand to gain access to the maximum flow rate adjustment nut (a). The locking nut is connected to a 10-position graduated scale, divided into steps corresponding to 1/10 of the maximum available flow rate, which is also shown on the scale (b). Turn the locking nut to the 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.

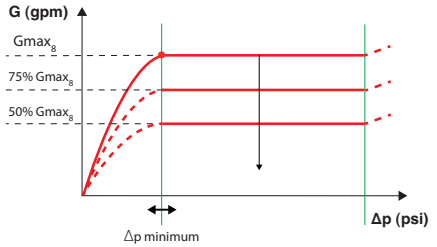
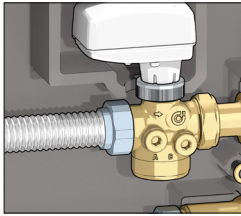


### Flow rate accuracy



### Automatic flow rate control with actuator and external controller

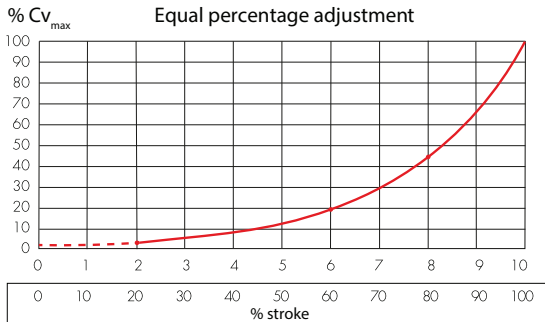
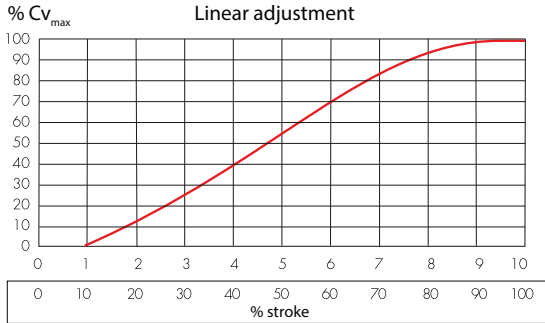
After setting the maximum flow rate, a 0 to 10 V proportional actuator (code 145013, 145018 or 656524) or an ON/OFF actuator (code 656504) can be installed, to control the PICV between the maximum flow rate and closed. For example, if the maximum flow rate has been set to position 8, the actuator can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



### 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 Cv.

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.

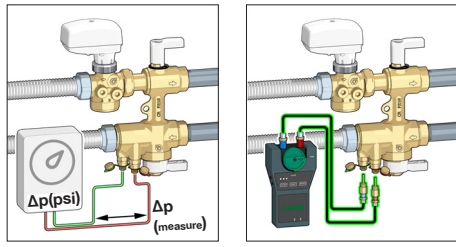
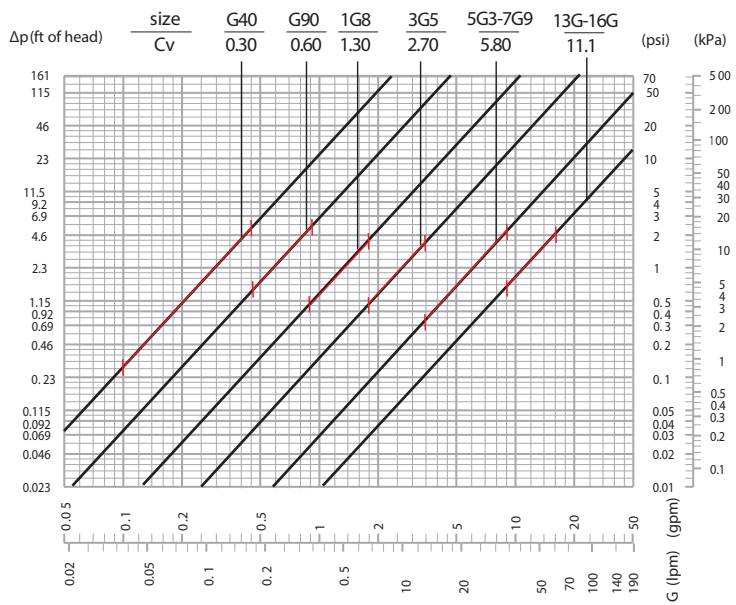


### Flow rate measurement

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:

$$G = C_v \text{ Venturi} \times \sqrt{\Delta p \text{ Venturi}}$$

Locking nut code	G40	G90	1G8	3G5	5G3-7G9	13G-16G
Cv Venturi	0.3	0.6	1.3	2.7	5.8	11.1



### Example of flow rate measurement

See Caleffi Technical Brochure 01336-NA for example.

### Optional Insulation Jacket for chilled water applications

This insulation jacket fully covers the assembly, if desired, and can be easily field installed, replacing the standard supplied smaller jacket.



Code: F0001771

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)

### 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

LEAVE THIS MANUAL WITH THE USER.

Laissez ce manuel à la disposition de l'utilisateur.



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01-2024

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