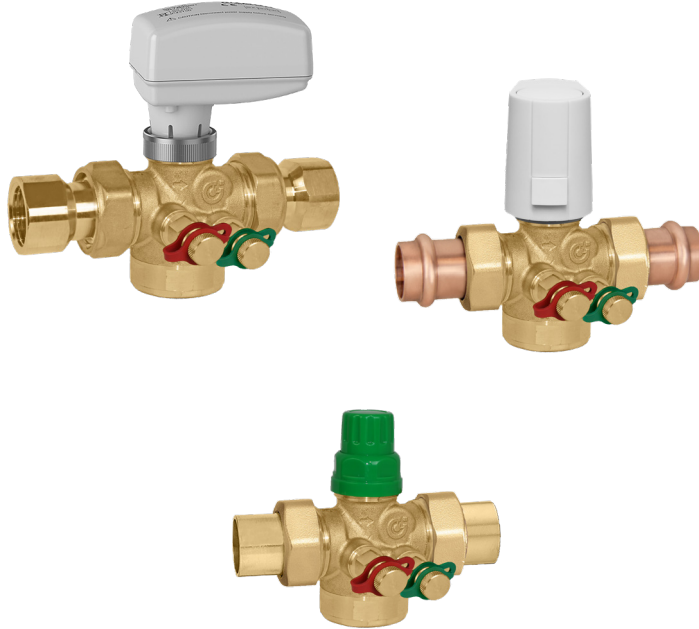


# Pressure independent control valve (PICV) FLOWMATIC®



01262/23 NA

## 145 series



### Function

The FLOWMATIC® pressure independent control valve (PICV) combines an automatic differential pressure regulator and a control valve with optional actuator. The PICV automatically adjusts flow rate and keeps it constant under changing circuit differential pressure conditions where it is installed.

Flow rate is adjusted either:

- manually on the automatic differential pressure regulator, to restrict the maximum value, or
- automatically by the control valve in utilizing a separately purchased and field installed proportional (0–10 V) or ON/OFF actuator.

The (PICV) is supplied complete with upstream and downstream pressure test ports for measuring operating conditions.

The FLOWMATIC PICV is designed for use in hydronic heating and cooling systems and has tight shutoff to minimize energy loss.

### Product range

145 series	Pressure independent control valve, includes PT ports.....	sizes 1/2", 3/4", 1" NPT female, sweat, press, union connections
Code 145013	0 to 10 volt proportional actuator for 145 series control valve.....	24 V AC/DC supply, fail-in-place
Code 145018	0 to 10 volt proportional actuator for 145 series control valve.....	24 V AC/DC supply, NC/NO
Code 656504	On/Off thermo-electric actuator for 145 series control valve.....	24 V AC/DC supply, NC
Code 656524	0 to 10 volt proportional thermo-electric actuator for 145 series control valve.....	24 V AC/DC supply, NC

### Technical specifications

#### Materials

Body:	DZR corrosion-resistant brass CW602N
Bonnet:	DZR corrosion-resistant brass CW602N
Control stem and piston:	stainless steel EN 10088-3 (AISI 303)
Valve plug seat:	
- (G90):	DZR corrosion-resistant brass CW602N
- (1G8, 3G5 and 5G3):	PTFE
- (7G9, 13G and 16G) :	stainless steel EN 10088-3 (AISI 303)
Valve plug:	peroxide-cured EPDM
Differential pressure regulator diaphragm:	peroxide-cured EPDM
Springs:	stainless steel EN 10270-3 (AISI 302)
Seals:	peroxide-cured EPDM
Pre-adjustment indicator:	Glass Fiber Reinforced PA6G30
Protective knob:	Polyamide Nylon PA6

#### Connections




- main inlet/outlet: 1/2", 3/4", 1" NPT female, sweat, press union
- for actuators: M30 x 1.5
- pressure test ports: 1/4" F (ISO 228-1)

#### Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Max. working pressure:	360 psi (25 bar)
Max. differential pressure:	58 psi (4 bar)
Working temperature range:	-4 to 248 °F (-20 to 120 °C)
Nominal differential pressure control range:	3.6 to 58 psid (0.25 to 4 bar)
Flow rate regulation range:	
(G90):	0.09-0.90 gpm (0.34–3.4 l/min)
(1G8):	0.35-1.75 gpm (1.3–6.6 l/min)
(3G5):	0.35-3.5 gpm (1.3–13.2 l/min)
(5G3):	0.53-5.3 gpm (2.0–20 l/min)
(7G9):	0.79-7.9 gpm (3.0–30.3 l/min)
(13G):	1.3-13 gpm (5.0–50 l/min)
(16G):	1.6-16 gpm (6.25–62.5 l/min)

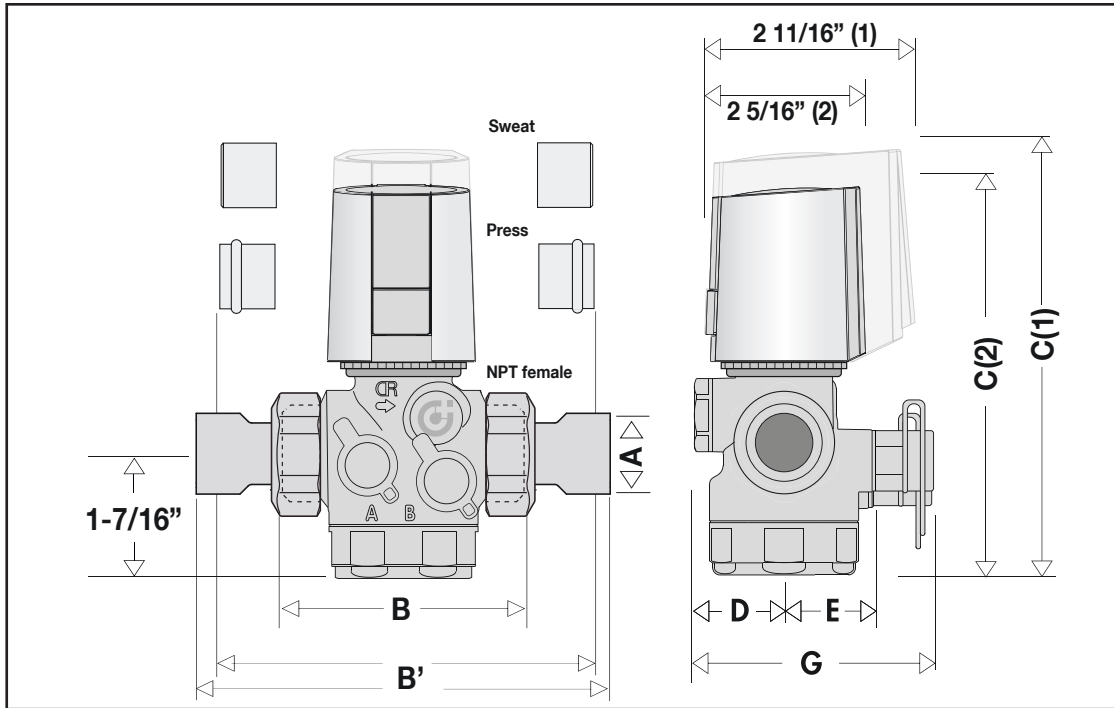
Accuracy:	± 5% of the set-point
Leakage:	0.01%: class V in accordance with EN 60534-4, equivalent to ISA/FCI Class VI

Actuators / thermo-electric actuators compatible with series 145 pressure independent control valves

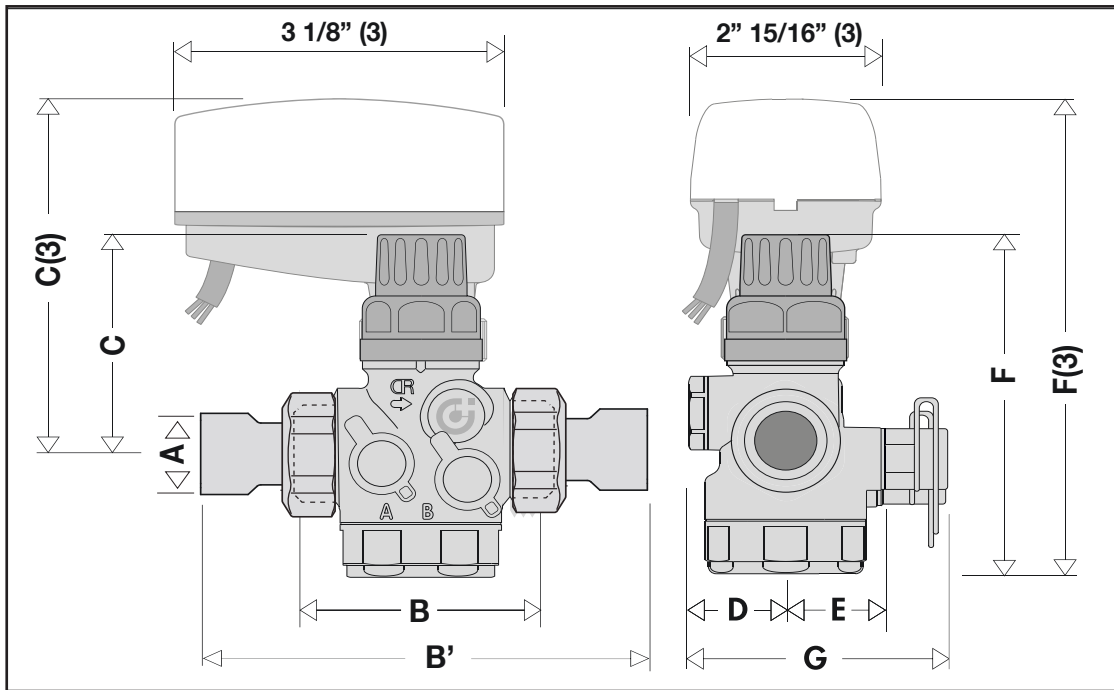
				
<b>Code</b>	<b>145013</b>	<b>145018</b>	<b>656504</b>	<b>656524</b>
<b>Type</b>	Proportional		Thermo-Electric	
<b>Fail position</b>	Fail-in-place	Fail safe closed or open	Normally Closed	
<b>Electric supply</b>	24 V AC/DC			
<b>Power consumption</b>	2.5 VA; 1.5 W DC		1 W	1.2 W
<b>Control signal</b>	0 (2)-10 VDC 0 (4)-20 mA	0-10 VDC	ON/OFF	0-10 VDC
<b>Opening &amp; closing time</b>	~ 35 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)		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)			
<b>Starting current</b>	1.54 A		300mA	320 mA

\* auto stroke detection

Dimensions



(1) Actuator code 656524; (2) Actuator code 656504



(3) Actuator codes 145013 and 145018

**Dimensions**

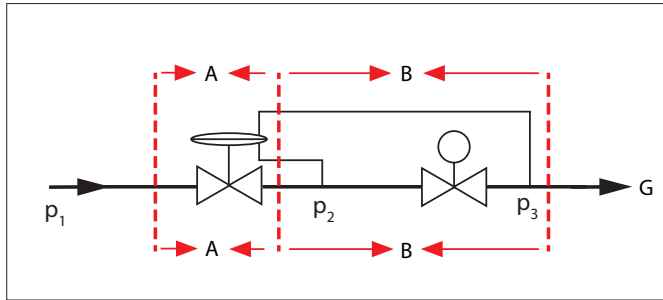
Code	A	B	B'	C	C(1)	C(2)	C(3)	D	E	F	F(1)	F(2)	F(3)	G	Wt (lb/kg)																						
145443A G90	1/2" FNPT	2 3/4"	5- 1/4"	2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"	1.0/ 0.45																						
145443A 1G8																																					
145443A 3G5																																					
145553A G90																																					
145553A 1G8																																					
145553A 3G5																																					
145553A 5G3																																					
145663A 7G9	1" FNPT	2- 3/16"	6"												2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"	1.1/ 0.50											
145663A 13G																																					
145663A 16G																																					
145449A G90	1/2" Sweat	2 3/4"	5- 3/8"																							2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"	1.0/ 0.45
145449A 1G8																																					
145449A 3G5																																					
145559A G90																																					
145559A 1G8																																					
145559A 3G5																																					
145559A 5G3																																					
145669A 7G9	1" Sweat	2- 3/16"	6"	2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"																							1.1/ 0.50
145669A 13G																																					
145669A 16G																																					
145446A G90	1/2" press*	2 3/4"	5- 1/4"												2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"												1.0/ 0.45
145446A 1G8																																					
145446A 3G5																																					
145556A G90																																					
145556A 1G8																																					
145556A 3G5																																					
145556A 5G3																																					
145666A 7G9	1" press*	2 3/16"	6- 13/16"																							2- 5/16"	5- 1/16"	4- 5/8"	3- 3/4"	3	1"	3- 3/4"	5"	4- 5/8"	5- 3/16"	3"	1.1/ 0/50
145666A 13G																																					
145666A 16G																																					

**(1) Actuator code 656524; (2) Actuator code 656504; (3) Actuator codes 145013 and 145018**

\*Press connection lay lengths:  
 size 1/2 inch: 3 1/2"  
 size 3/4 inch: 3 1/4"  
 size 1 inch: 4 13/16"

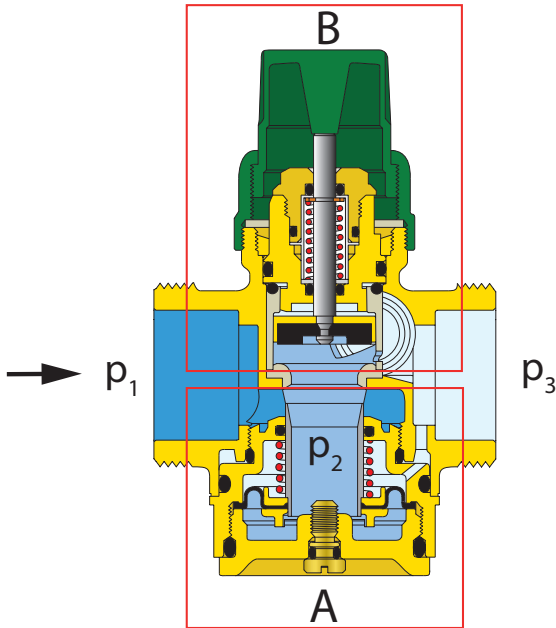
**Operating principle**

Pressure independent control valves (PICV) are designed to regulate the flow rate of hot or chilled water and 50% glycol solutions in response to the demand of a controller in HVAC system circuit. The Caleffi 145 series PICV can be manually adjusted, or automatically controlled with field-installed actuator, to meet the flow requirements of that circuit despite any variation in differential pressure conditions in the circuit. The principle of operation is shown in the diagram below:

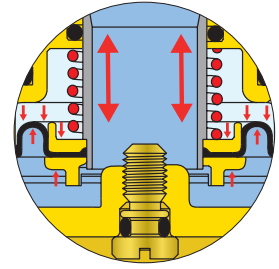


Where:

- $p_1$  = upstream pressure
- $p_2$  = intermediate pressure
- $p_3$  = downstream pressure
- $(p_1 - p_3)$  = total valve  $\Delta p$

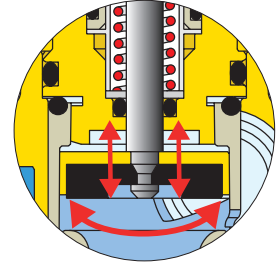


a) Subassembly (A) regulates  $\Delta p$  ( $p_2 - p_3$ ) and keeps it constant across the subassembly (B) automatically (balancing between the force generated by the differential pressure and the internal opposing spring). If  $(p_1 - p_3)$  increases the internal  $\Delta p$  regulator reacts to close the core and maintains  $(p_2 - p_3)$  to be constant; conditions where the flow rate will remain constant.



b) Subassembly (B) regulates flow rate G by changing its bore cross section. The change in bore cross section determines hydraulic coefficient value (Cv) of the regulator subassembly (B), which remains constantly at:

- a manually pre-set value.
- the value determined by the actuator's regulating action.

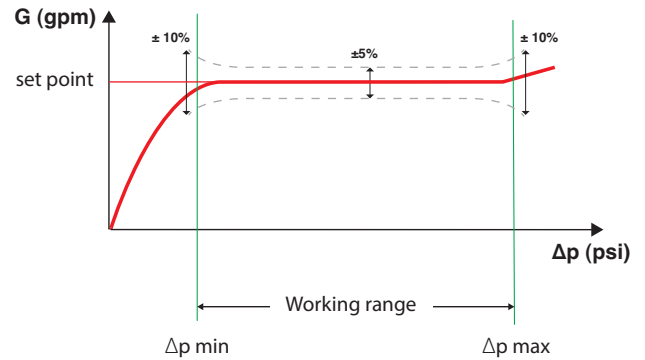


**Specifically:**

Since  $G = C_v \times \text{square root of } \Delta p$

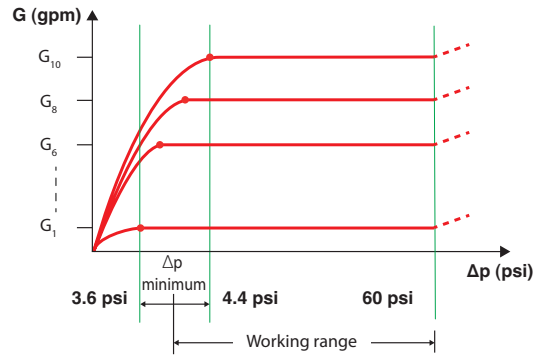
- by manually or automatically adjusting the subassembly (B),  $C_v$  value and subsequently the flow rate (G) value can be set;
- once the flow rate (G) value has been set, it remains constant due to the action of subassembly (A) in response to circuit pressure changes.

**Flow rate accuracy:**



### Working range

To keep the flow rate constant independently from the circuit's differential pressure conditions, total valve  $\Delta p$  ( $p_1 - p_2$ ) must be in the range from the minimum  $\Delta p$  value (see "Flow rate adjustment tables") and the maximum value of 58 psid.



### Construction details

#### Materials in dezincification resistant alloy and stainless steel

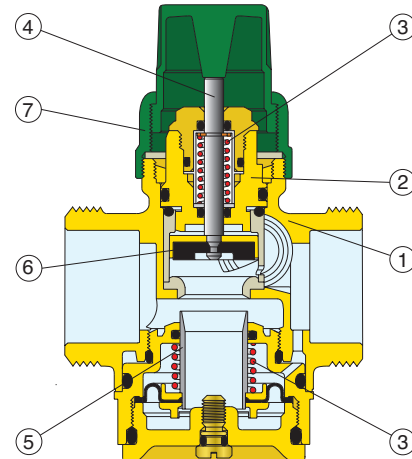
Valve body (1) and bonnet (2) are made of dezincification resistant brass and springs (3), control stem (4) and piston (5) are stainless steel. These materials prevent corrosion, guarantee accuracy and reliable performance over time, and are compatible with the glycols and additives often used in air conditioning systems.

#### EPDM valve plug seat

The EPDM valve plug seat (6) provides a positive shut-off.

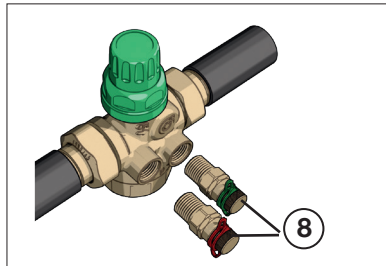
#### Easy installation

The easy-to-install valve features reduced dimensions and union connections. Protective knob (7) is easy to remove by hand easily to manually adjust the flow rate or install an actuator.



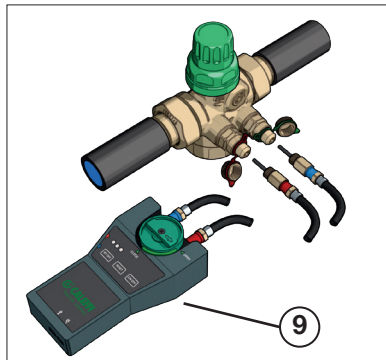
#### Pressure test ports

The valve comes complete with upstream and downstream quick-fit pressure test ports (8).



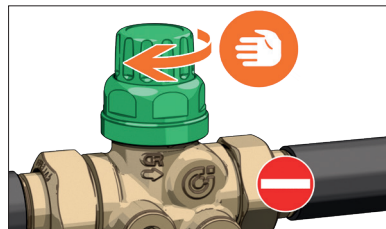
During operation the valve  $\Delta p$  generated by the fluid flow can be measured with a manometer (9).

Comparing this value with the working  $\Delta p$  range, validates the selected flow rate.



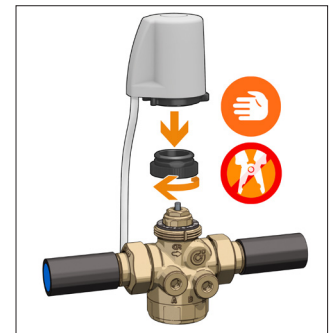
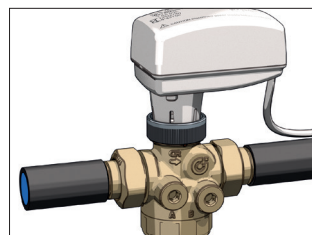
#### Shut-off

The protective knob can be used to shut-off the circuit zone controlled by the valve.



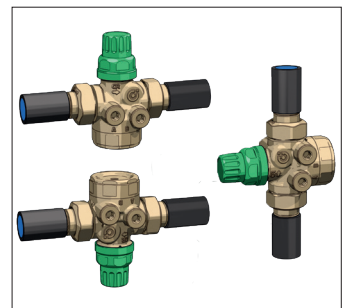
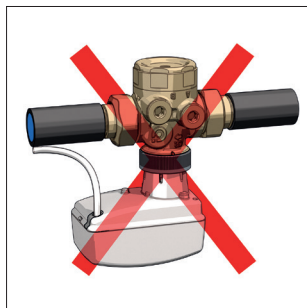
#### Use with actuators

The 145 series PICV can be equipped to function with a field-installed proportional linear actuator (code 145013, 145018 and 656524). When controlled by an actuator, the valve can modulate the flow rate in response to the system thermal load. As alternative to a proportional linear actuator, the valve can also be controlled with an ON/OFF type thermo-electric actuator . code 656504.



#### Installation versatility

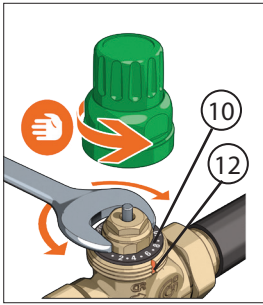
The valve without actuator can be installed in any position. With an actuator the valve can be installed in any position except upside down.



**Adjustment procedure**

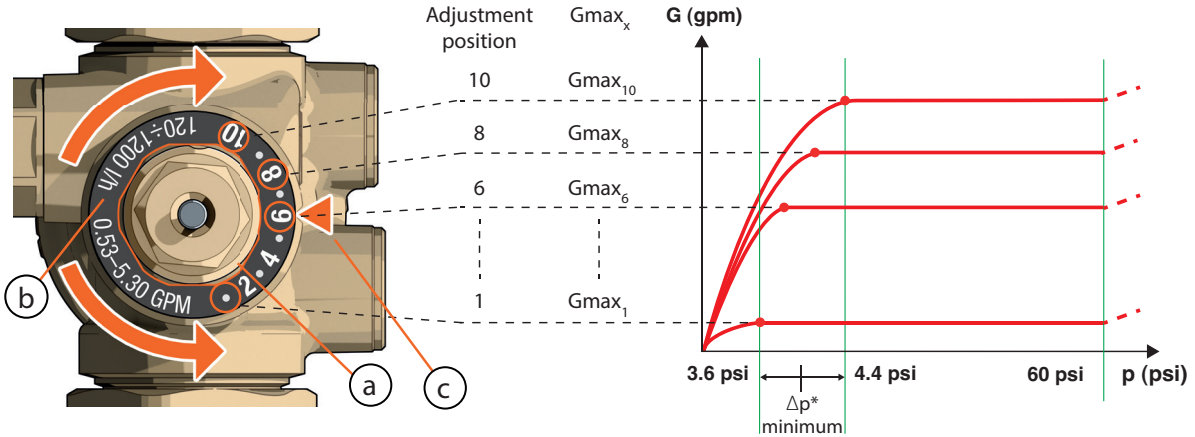
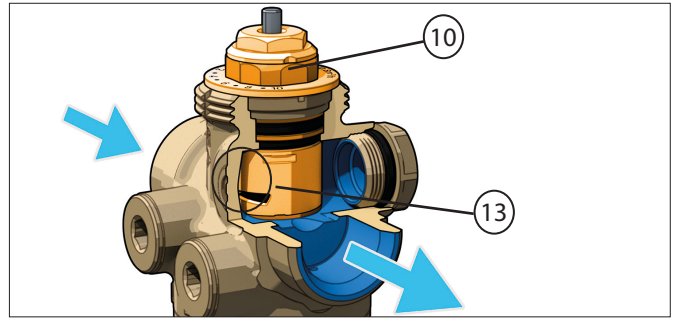
**Maximum flow rate adjustment**

Unscrew the protective cap by hand to gain access to the maximum flow rate locking nut (10), which can be turned with a 19 mm wrench. The locking nut



is attached 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 (11). 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 notch (12) on the valve body is the physical positioning reference. This adjustment does not reduce valve plug total stroke (full stroke modulation).

Turning the locking nut (10), which determines the number associated with the "Adjustment position", results in opening/closing of the bore cross section in the external valve plug (13). Hence, each bore cross section set on the locking nut corresponds to a specific  $G_{max_x}$  value.

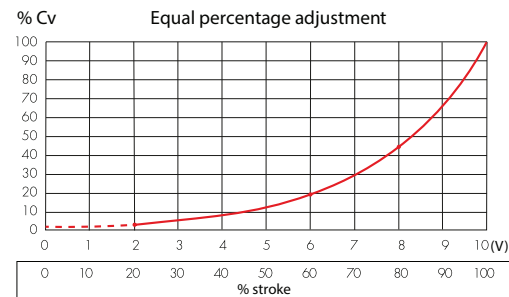
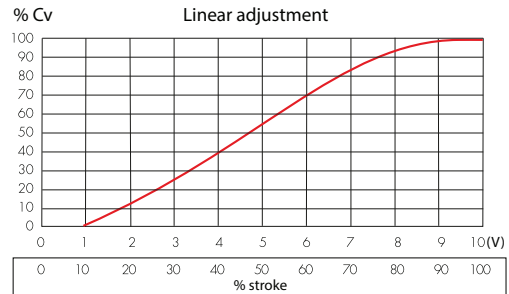
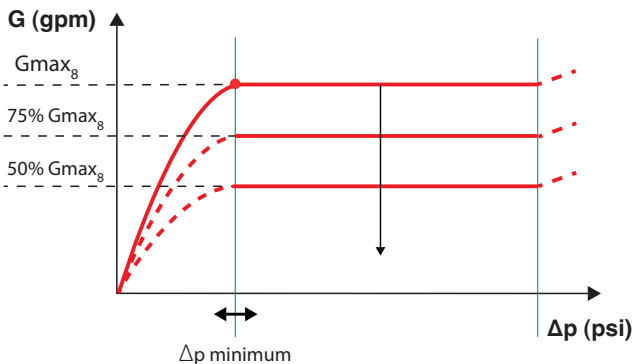
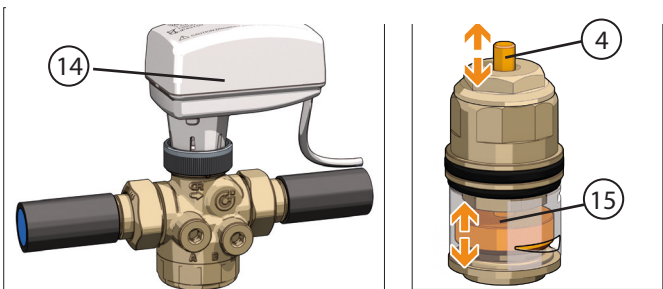


**Automatic flow rate adjustment with actuator and external regulator**








After adjusting the maximum flow rate, install the actuator (0-10 V code 145013 or 145018 (14) to the valve. The actuator, operated by an external controller, can automatically adjust the flow rate from the maximum set value (E.g.:  $G_{max_8}$ ) to the minimum value in response to the thermal load. The actuator moves the control stem (4), resulting in opening or closing (up or down), on the maximum bore cross section, by the internal valve plug (15). For example, if the maximum flow rate has been set to position 8, the flow rate can be adjusted automatically by the actuator from  $G_{max_8}$  to completely closed (zero flow rate).

**Flow rate adjustment curve**

The valve adjustment curve is linear. An increase or decrease in the valve opening cross section corresponds to a directly proportional increase or decrease of the valve's hydraulic coefficient  $C_v$ . The motor is factory configured with linear adjustment. It is possible to obtain an equal-percentage adjustment (see diagram below) setting the actuator (code 145013, 145018) for this operation by means of the dedicated switch inside it (see specific instruction sheet). In this way the control signal is set to obtain an equal percentage adjustment.



**Flow rate adjustment table**

Code locking nut color	flow range G $\Delta p$ min	Adjustment position ( $G_{max}$ )									
		1	2	3	4	5	6	7	8	9	10
145... G90 	0.34-3.40 (l/min)	0.34	0.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.40
	0.09-0.90 (GPM)	0.09	0.18	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.90
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	25 3.6	25 3.6	25 3.6	25 3.6	25 3.6	25 3.6	25,5 3.7	25,5 3.7	26 3.8	26 3.8
145... 1G8 	1.30-6.60 (l/min)	–	1.30	2.00	2.67	3.33	4.00	4.67	5.33	6.00	6.60
	0.35-1.75 (GPM)	–	0.35	0.53	0.70	0.88	1.05	1.23	1.40	1.58	1.75
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	– –	25 3.6	25,5 3.7	26 3.8	26 3.8	26,5 3,8	26,5 3,8	27 3,9	27 3,9	27 3,9
145... 3G5 	1.30-13.2 (l/min)	1.30	2.67	4.00	5.33	6.67	8.00	9.33	10.67	12.00	13.20
	0.35-3.50 (GPM)	0.35	0.70	1.05	1.40	1.75	2.10	2.45	2.80	3.15	3.50
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	25 3.6	25 3.6	25,5 3.7	26 3.8	26 3.8	27 3.9	27,5 4.0	28 4.1	28,5 4.1	29 4.2
145... 5G3 	2.0-20.0 (l/min)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00
	0.53-5.30 (GPM)	0.53	1.06	1.59	2.12	2.65	3.18	3.71	4.24	4.77	5.30
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	25 3.6	25 3.6	25,5 3.7	26 3.8	26 3.8	26,5 3.8	26,5 3.8	27 3.9	27,5 4.0	28 4.1
145... 7G9 	3.0-30.30 (l/min)	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.30
	0.79- 7.9 (GPM)	0.80	1.60	2.40	3.20	4.00	4.80	5.60	6.40	7.20	8.00
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	28 4.1	25 3.6	25 3.6	25 3.6
145... 13G 	5.0-50.0 (l/min)	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
	1.30-13 (GPM)	1.30	2.60	3.90	5.20	6.50	7.80	9.10	10.40	11.70	13.00
	$\frac{\text{(kPa)}}{\text{(psi)}}$	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1	35 5.1
145... 16G 	6.25-62.50 (l/min)	6.25	12.33	18.5	24.67	30.83	37.00	43.17	49.33	55.50	62.50
	1.6-16 (GPM)	1.65	3.30	4.95	6.60	8.25	9.90	11.55	13.20	14.85	16.50
	$\Delta p$ min $\frac{\text{(kPa)}}{\text{(psi)}}$	48 6.96	48 6.96	48 6.96	48 6.96	45 6.53	45 6.53	43 6.24	43 6.24	43 6.24	43 6.24

**Minimum differential pressure required**

For pump sizing, add the min press difference required by the served emitter to the fixed head losses of the most flow starved circuit. Use this value to find the  $\Delta p$  min shown in the above table to select the 145 series code ( $H_{pump} = \Delta p_{circuit} + \Delta p_{min}$ ).



## Accessories

### 145

Proportional linear actuator for 145 series pressure independent control valve.

Electric supply: 24 V AC/DC.

Running power consumption:

1.5 W DC, 2.5 VA AC.

Ambient temperature range: 32-120 °F  
(0-50 °C)

Protection class: IP 54.

Connection: M 30 x 1.5.

Supply cable length: 78 inches (2 m).



Code	Voltage V	Control signal	Feedback signal	
<b>145013</b>	24	0-10 V	0-10 V	fail in place
<b>145018</b>	24	0-10 V	0-10 V	NC/NO

### 6565

Proportional thermo-electric actuator for 145 series pressure independent control valve.

Quick-coupling installation with clip adaptor.

Normally closed.

Electric supply: 24 V AC/DC.

Running power consumption: 1.2 W.

Ambient temperature range: 32-140 °F  
(0-60 °C).

Protection class: IP 54.

Connection: M 30 p.1,5.

Supply cable length: 39 inches (1 m).



Code	Voltage V	Control signal	Feedback signal	
<b>656504</b>	24	on/off	--	NC
<b>656524</b>	24	0-10 V	0-10 V	NC

## Isolation ball valves

### NA108

Isolation ball valve easily installs in the inlet and outlet sides of the valve body using a close nipple. The NA108 series have an extended stem which allows operation if the valve body gets insulated. The valve features a blowout proof stem, PTFE seats, double o-ring stem seals, lead free brass ball and stem, and polyamide thermal plastic T handle.

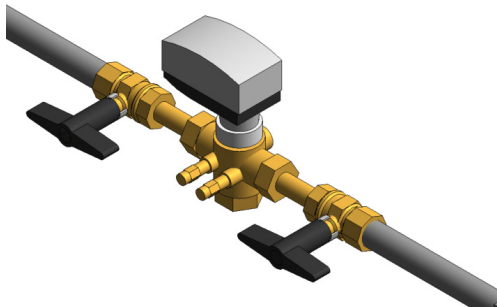
The following codes can be ordered separately for field installation with separately sourced close nipples, on size 1/2" and 1" FLOWMATIC series valves with female NPT connections.

Code **NA10824**.....1/2" FNPT ball valve

Code **NA10826**.....1" FNPT ball valve

Code **NA10834**.....1/2" NPT nipple

Code **NA10836**.....1" NPT nipple



### 290

Isolation ball valve.

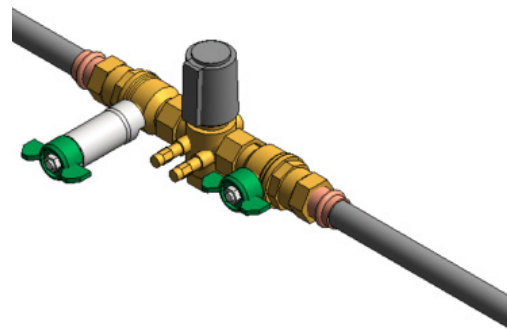
Low lead Male x Female union fits 1" valves between body and tailpiece.

This valve option applies only to size 3/4" 145 FLOWMATIC series valves.

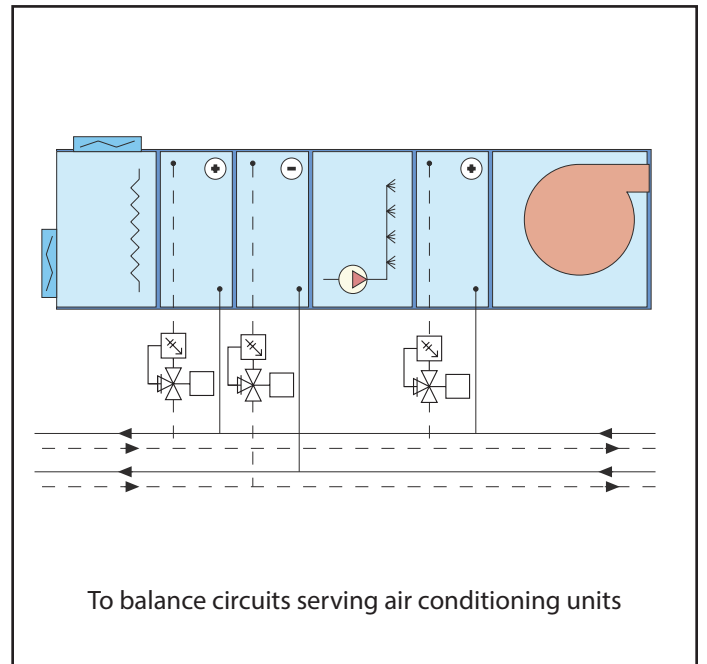
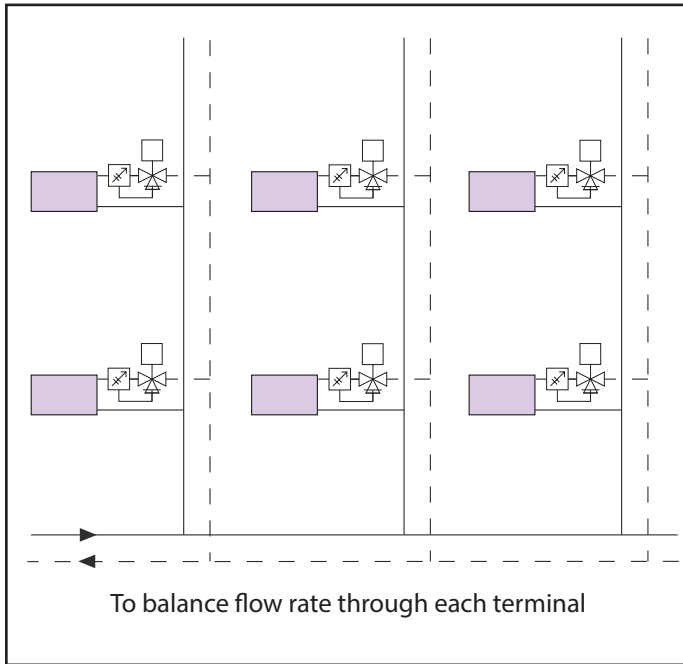


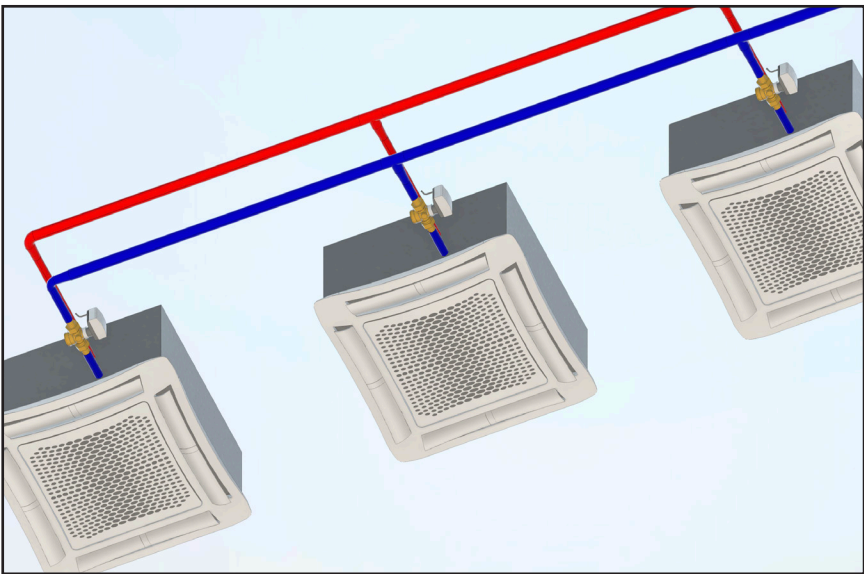
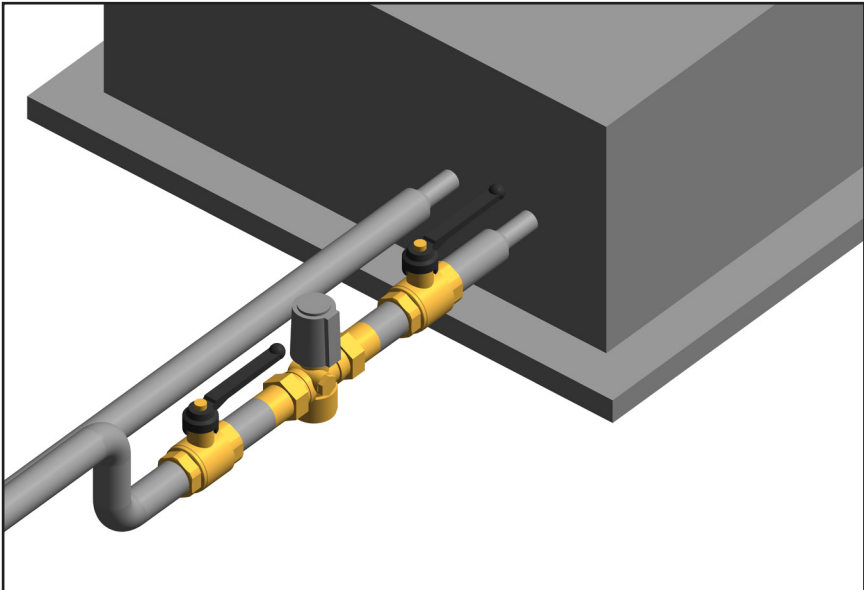
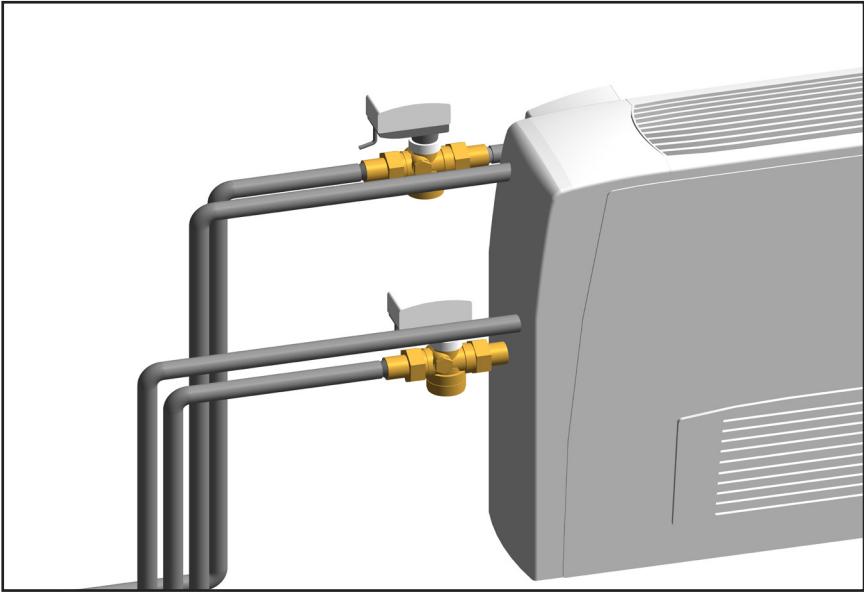
**290030**.....isolation ball valve 1" M x 1" F union

**NA10815**.....stem extension for 290030



## Pressure independent control valve applications ( )







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## SPECIFICATION SUMMARY

### FLOWMATIC 145 series

Pressure independent control valve (PICV) complete with pressure/temperature ports. Connections ½", ¾", 1" NPT male, sweat, press. Connection for actuators code 145013, 145018 and series 6565: M30 x 1.5. DZR corrosion-resistant brass body and bonnet, EN 12164 CW602N. Stainless steel EN 10088-3 (AISI 303) control stem and piston. Stainless steel EN 10270-3 (AISI 302) springs. Peroxide-cured EPDM differential pressure regulator diaphragm, valve plug and differential pressure regulator seals. Glass fiber reinforced PA6G30 pre-adjustment indicator, polyamide nylon PA6 knob. Water and up to 50% maximum glycol solutions. Maximum working pressure 360 psi (25 bar). Maximum differential pressure with actuator code 145013, 145018 and 6565 series) installed 58 psi (4 bar). Working temperature range -4 to 250°F (-20–120°C). Nominal differential control range 3.6 to 58 psid (.25–4 bar). Accuracy ± 5% of the set point. Flow rate regulation range: 0.09-0.90 gpm (0.34–3.4 l/min); 0.35-1.75 gpm (1.3–6.6 l/min); 0.35-3.50 gpm (1.3–13.2 l/min); 0.53-5.30 gpm (2.0–20 l/min); 0.79-7.9 gpm (3.0–30.3 l/min); 1.3-13 gpm (5.0–50 l/min); 1.6-16 gpm (6.25–62.5 l/min). The adjustment position does not affect the valve plug stroke. Full stroke modulation. Flow rate pre-adjustment 10 reference positions and continuous adjustment. Leakage 0%: class V in accordance with EN 60534-4, equivalent to ISA/FCI Class VI. Provide with optional 24 V AC/DC supply actuators: 0 to 10 volt proportional fail-in-place, code 145013; 0 to 10 volt proportional, normally closed, normally open, code 145018; on/off thermo-electric normally closed, code 656504; 0 to 10 volt proportional thermo-electric, normally closed, code 656524, separately sourced. Provide with optional inlet and outlet full-port ball valves, NPT female x NPT female, for isolating size 1/2 or 1 inch 145 series valves, separately-sourced, code NA108 series, with separately-sourced close nipples, field installed. Provide with optional inlet and outlet isolation ball valves for size 3/4 inch 145 series valves, separately sourced, code 290030, and stem extension, separately sourced, code NA10815, field installed.

#### Code 145013

Proportional linear actuator for 145 series pressure independent control valve. Electric supply 24 V AC/DC. Power consumption 2.5 VA AC/DC, 1.5 W AC/DC. Control signal 0 (2) - 10 V DC, 0 (4) - 20 mA. Feedback signal: 0–10 V DC. Starting current 1.54 A. Force 36 lbf (160 N). Fail position: Fail-in-Place. Protection class NEMA 3 (IP 54). Ambient temperature range 32 to 120 °F ( 0 to 50 °C). Connection M30 x 1.5. Electric supply cable length 78 inches (2 m). Operating time (open-close) approx. 35 seconds.

#### Code 145018

Proportional linear actuator for 145 series control valve. Electric supply 24 V AC/DC. Power consumption 2.5 VA AC/DC, 1.5 W AC/DC. Control signal 0 (2) - 10 V DC, 0 (4) - 20 mA. Feedback signal: 0–10 V DC. Starting current 1.54 A. Force 36 lbf (160 N). Fail position: Fail safe closed or open. Protection class NEMA 3 (IP 54). 32 to 120 °F ( 0 to 50 °C). Connection M30 x 1.5. Electric supply cable length 78 inches (2 m). Operating time (open-close) approx. 35 seconds.

#### Code 656504

Thermo-electric actuator. Normally closed. Electric supply 24 V AC/DC. Running power consumption 1 W. Control signal ON/OFF. Starting current 300 mA. Force 23 lbf (100 N). Protection class NEMA 3 (IP 54). Ambient temperature range 32 to 140 °F ( 0 to 60 °C). Connection M30 x 1.5, quick-coupling. Electric supply cable length 39 inches (1 m). Operating time (open-close) approx. 240 seconds.

#### Code 656524

Thermo-electric actuator for 145 series control valve. Electric supply 24 V AC/DC. Power consumption 1.2 W. Control signal 0–10 V DC. Feedback signal: 0–10 V. Starting current 320 mA. Force 28 lbf (125 N). Protection class NEMA 3 (IP 54). Ambient temperature range 32 to 140 °F ( 0 to 60 °C). Connection M30 x 1.5, quick-coupling. Electric supply cable length 39 inches (1 m). Valve stroke automatic detection. Operating time (open-close) approx. 200 seconds.

*We reserve the right to change our products and their relevant technical data, contained in this publication, at any time and without prior notice.*



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