

# Pressure independent control valve (PICV) FLOWMATIC®



01262/20 EN  
replaces dp 01262/19.01 GB

## 145 series



### Function

The pressure independent control valve is a device composed of an **automatic flow rate regulator** and a **control valve** with actuator. The device can adjust flow rate and keep it constant in the presence of changing differential pressure conditions of the circuit in which it is installed.

Flow rate is adjusted in two different ways:

- manually on the **automatic flow rate** regulator, to restrict the maximum value
- automatically by the **control valve in** combination with a proportional (0–10 V) or ON/OFF actuator, in accordance with the thermal load requirements of the section of the circuit to be controlled.

The pressure independent control valve (PICV) is supplied complete with connections for upstream and downstream pressure test ports for checking of operating conditions.

The device can be used in air-conditioning systems.

### Product range

Series 145..4	Pressure independent control valve _____ sizes DN 15 (1/2" and 3/4"), DN20 (1") and DN25 (1 1/4")
Series 145..7	Pressure independent control valve with pressure test ports _____ sizes DN 15 (1/2" and 3/4"), DN 20 (1") and DN25 (1 1/4")
Code 145013	Proportional linear actuator for 145 series control valve _____ 24 V electric supply (ac/dc)
Code 656524	Proportional thermo-electric actuator for 145 series control valve _____ 24 V electric supply (ac/dc)
6565 series	Thermo-electric actuator for 145 series control valve _____ electric supply 230 V (ac) or 24 V (ac/dc)

### Technical specifications

#### Materials

Body:	dezincification-resistant alloy <b>CR</b> EN 12165 CW602N
Headwork	dezincification-resistant alloy <b>CR</b> EN 12164 CW602N
Control stem and piston:	stainless steel EN 10088-3 (AISI 303)
Obturator seat:	
	- (H20): dezincification resistant alloy <b>CR</b> EN 12164 CW602N
	- (H40, H80 and 1H2): PTFE
	- (1H8, 3H0 and 3H7) : stainless steel EN 10088-3 (AISI 303)
Obturator:	EPDM
Pressure regulator diaphragm:	EPDM
Springs:	stainless steel EN 10270-3 (AISI 302)
Seals:	EPDM
Seals:	non-asbestos fibre
Pre-adjustment indicator:	PA6G30
Knob:	PA6




#### Connections

- main: 1/2", 3/4", 1" and 1 1/4" M (ISO 228-1)
- for actuators code 145013 and series 6565: M30 p.1,5
- pressure test ports: 1/4" F (ISO 228-1) with cap

#### Performance

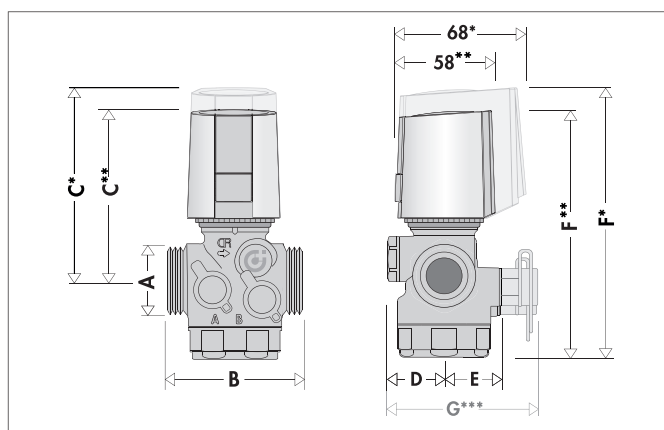
Medium:	water, glycol solutions
Max. percentage of glycol:	50 %
Max. working pressure:	25 bar
Max. differential pressure	
with actuator code 145013 and 6565 series:	4 bar
Working temperature range:	-20–120 °C
Nominal Δp control range:	25-400 kPa
Flow rate regulation range:	
	(H20): 0,02–0,2 m³/h
	(H40): 0,08–0,4 m³/h
	(H80): 0,08–0,8 m³/h
	(1H2): 0,12–1,2 m³/h
	(1H8): 0,18–1,8 m³/h
	(3H0): 0,30–3,0 m³/h
	(3H7): 0,37–3,7 m³/h
Accuracy:	± 5% of the set-point
Leakage:	class V in accordance with EN 60534-4
Type:	diaphragm

**Actuators / thermo-electric actuators compatible with series 145 valves**

			
	<b>145013</b>	<b>656524</b>	<b>656502</b>   <b>656504</b>
	-	Normally closed	Normally closed
<b>Type</b>	Actuator	Thermo-electric actuator	Thermo-electric actuator
<b>Electric supply</b>	24 V		230 V   24 V
<b>Power consumption</b>	2,5 VA (ac) • 1,5 W (dc)	1,2 W	1 W
<b>Control signal</b>	0 (2)-10 V 0 (4)-20 mA	0-10 V	ON / OFF
<b>Opening and closing time*</b>	approx. 35 s (*)	approx 200 s	approx 240 s
<b>Protection class</b>	IP 54	IP 54	IP 54
<b>Ambient temperature range</b>	0-50 °C	0-60 °C	0-60 °C
<b>Feedback signal</b>	0-10 V	0-10 V	-
<b>Supply cable length:</b>	2 m	1 m	1 m
<b>Connection</b>	M30 p.1,5	M30 p.1,5 (quick-coupling)	M30 p.1,5 (quick-coupling)
<b>Force</b>	160 N	125 N	100 N
<b>Max. differential pressure</b>	4 bar	4 bar	4 bar
<b>Starting current</b>	1,54 A	320 mA	550 mA   300 mA

\* auto stroke detection

**Dimensions**

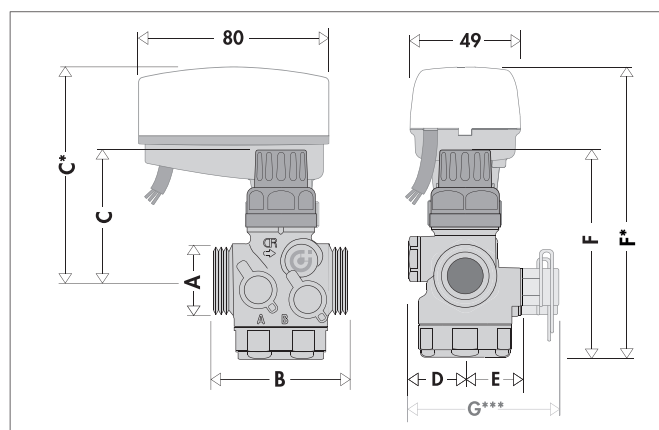


Code	DN	A	B	C**	C*	D	E	F**	F*	G***	Mass (kg)
14543. H20	15	1/2"	70	81	91	25	26	117	127	76	0,60
14544. H40	15	3/4"	70	81	91	25	26	117	127	76	0,60
14544. H80	15	3/4"	70	81	91	25	26	117	127	76	0,60
14555. H40	20	1"	72	81	91	25	26	117	127	76	0,62
14555. H80	20	1"	72	81	91	25	26	117	127	76	0,62
14555. 1H2	20	1"	72	81	91	25	26	117	127	76	0,62
14566. 1H8	25	1 1/4"	90	85	95	30	36	136	146	86	1,14
14566. 3H0	25	1 1/4"	90	85	95	30	36	136	146	86	1,14
14566. 3H7	25	1 1/4"	90	85	95	30	36	136	146	86	1,14

\* Actuator code 656524

\*\*\* Only for codes 145..7

\*\* Actuators codes 656502 - 656504



Code	DN	A	B	C	C*	D	E	F	F*	G***	Mass (kg)
14543. H20	15	1/2"	70	59	96	25	26	95	132	76	0,60
14544. H40	15	3/4"	70	59	96	25	26	95	132	76	0,60
14544. H80	15	3/4"	70	59	96	25	26	95	132	76	0,60
14555. H40	20	1"	72	59	96	25	26	95	132	76	0,62
14555. H80	20	1"	72	59	96	25	26	95	132	76	0,62
14555. 1H2	20	1"	72	59	96	25	26	95	132	76	0,62
14566. 1H8	25	1 1/4"	90	63	100	30	36	114	151	86	1,14
14566. 3H0	25	1 1/4"	90	63	100	30	36	114	151	86	1,14
14566. 3H7	25	1 1/4"	90	63	100	30	36	114	151	86	1,14

\* Actuator code 145013

\*\*\* Only for codes 145..7

## Product range

With pressure test ports.

Code	DN	Conn.	Flow rate range (m <sup>3</sup> /h)
145437 H20	15	1/2"	0,02÷0,20
145447 H40	15	3/4"	0,08÷0,40
145447 H80	15	3/4"	0,08÷0,80
145557 H40	20	1"	0,08÷0,40
145557 H80	20	1"	0,08÷0,80
145557 1H2	20	1"	0,12÷1,20
145667 1H8	25	1 1/4"	0,18÷1,80
145667 3H0	25	1 1/4"	0,30÷3,00
145667 3H7	25	1 1/4"	0,37÷3,70

Without pressure test ports.

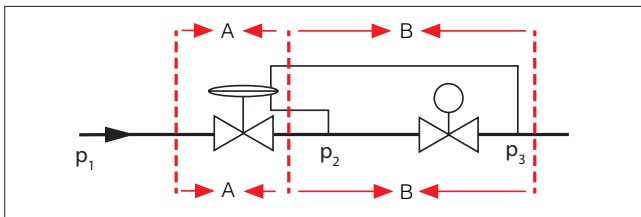
Code	DN	Conn.	Flow rate range (m <sup>3</sup> /h)
145434 H20	15	1/2"	0,02÷0,20
145444 H40	15	3/4"	0,08÷0,40
145444 H80	15	3/4"	0,08÷0,80
145554 H20	20	1"	0,02÷0,20
145554 H40	20	1"	0,08÷0,40
145554 H80	20 <td 1"	0,08÷0,80	
145554 1H2	20	1"	0,12÷1,20
145664 1H8	25	1 1/4"	0,18÷1,80
145664 3H0	25	1 1/4"	0,30÷3,00
145664 3H7	25	1 1/4"	0,37÷3,70

## Operating principle

The pressure independent control valve (PICV) is designed to regulate a flow rate of fluid that is:

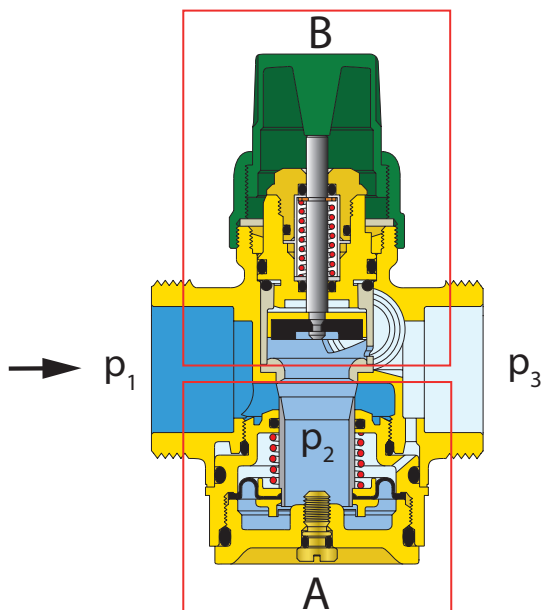
- adjustable in accordance with the requirements of the part of the circuit controlled by the device;
- constant despite any variation in differential pressure conditions in the circuit.

The device layout is shown in the diagram below:

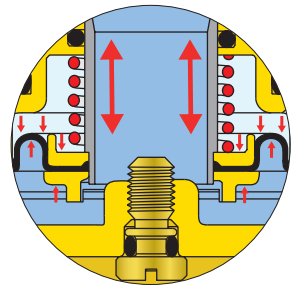


Where:

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

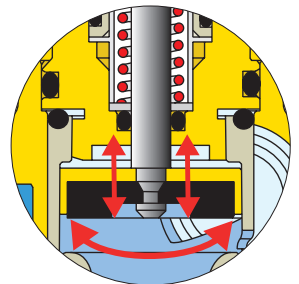


a) Device **(A)** regulates  $\Delta p_1$  ( $p_2 - p_3$ ) and keeps it constant across the device **(B)** by means of an automatic action (balancing between the force generated by the differential pressure and the internal opposing spring). If  $(p_1 - p_3)$  increases the internal  $\Delta p$  regulator reacts to close the core and maintains  $(p_2 - p_3) = \text{constant}$ ; in these conditions the flow rate will remain constant.



b) Device **(B)** regulates flow rate  $G$  by changing its bore cross section. The change in bore cross section determines hydraulic coefficient value ( $K_v$ ) of regulator device **(B)**, which remains constantly at:

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

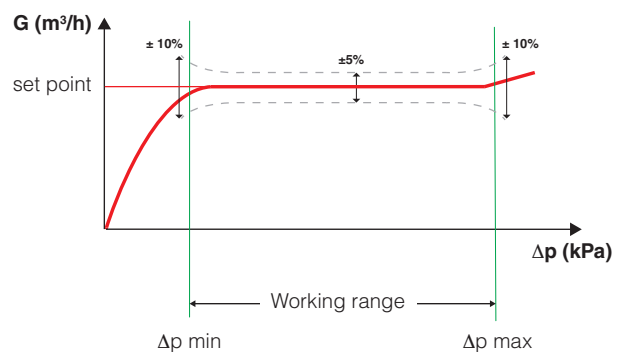


## Concisely:

Since  $G = K_v \times \sqrt{\Delta p}$

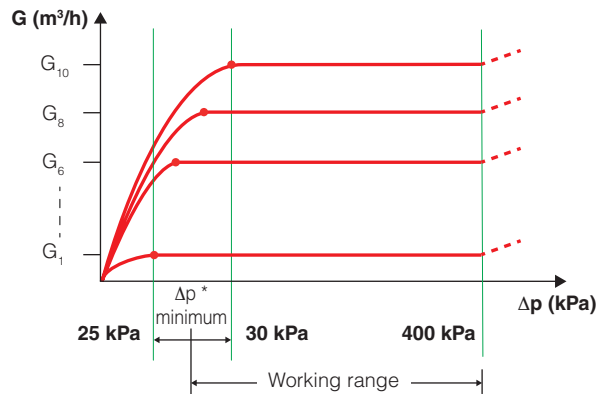
- by manually or automatically adjusting the device **(B)**,  $K_v$  value and consequently  $G$  value can be set;
- once  $G$  value has been set, it remains constant thanks to the action of **(A)** in response to circuit pressure changes.

## Flow rate accuracy



**Working range**

For the device to keep the flow rate constant independently from the circuit's differential pressure conditions, total valve  $\Delta p$  ( $p_1 - p_3$ ) must be in the range from the minimum  $\Delta p$  value (see "Flow rate adjustment tables") and the maximum value of 400 kPa.



**Construction details**

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

Valve body (1) and headwork (2) are made of dezincification resistant alloy while springs (3), control stem (4) and piston (5) are in stainless steel.

These materials prevent phenomena of corrosion, guarantee accuracy, reliable performance over time and a use compatible with glycols and additives, which are often used in the circuits of air conditioning systems.

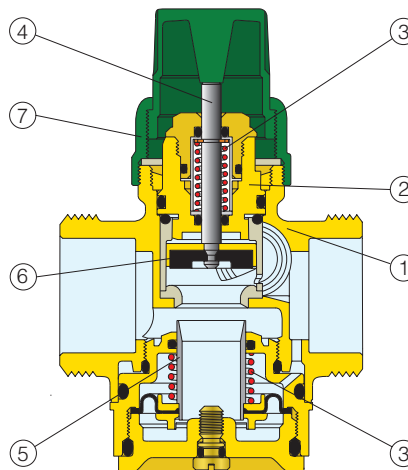
**EPDM obturator**

EPDM obturator (6) provides a perfect seal in the case of complete closing of the valve for circuit shut-off.

**Compact and practical device**

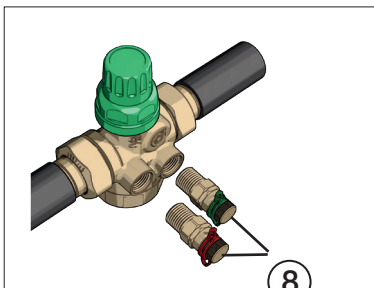
The easy-to-install valve features reduced dimensions and compact lines.

Protective knob (7) can be removed by hand easily for flow rate regulation purposes and actuator fitting.



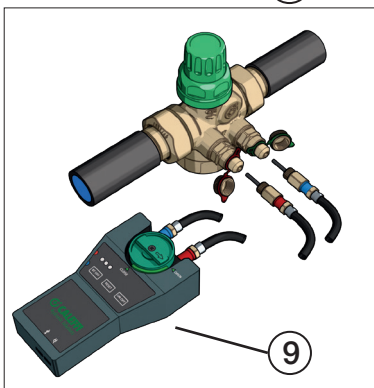
**Pressure test ports**

The valve is supplied, upstream and downstream, with connections for quick-fit pressure test ports (Caleffi code 100000) (8) to be fitted in the connections with the system cold and not in pressure.



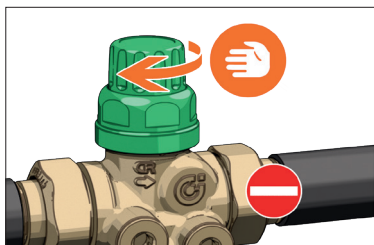
During operation the valve  $\Delta p$  generated by the fluid flow can be measured (with Caleffi differential pressure measuring station Caleffi code 130005/6) (9).

By comparing this value with the working  $\Delta p$  range, correspondence of the valve effective flow rate and the selected flow rate can be checked.



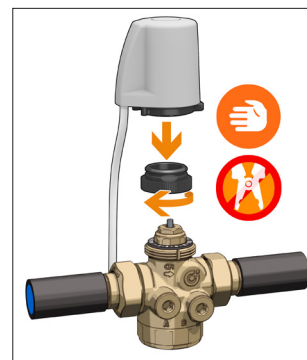
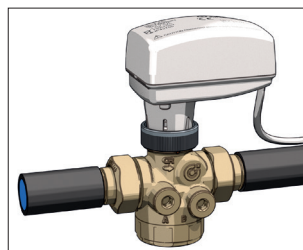
**Shut-off**

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



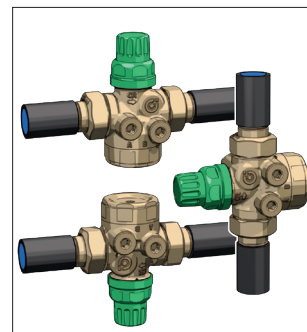
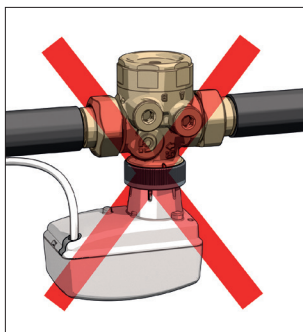
**Use with actuators**

The device is fitted to function with a proportional linear actuator (code 145013 and 656524). When controlled by a regulator, the valve can modulate the flow rate in accordance with 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 6565 series, for simpler temperature control logic.



**Installation versatility**

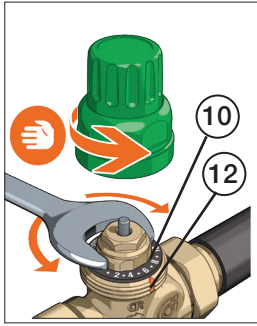
The valve without actuator can be installed in any position. With an actuator fitted the valve can be installed in any position except upside down.



## Adjustment procedure

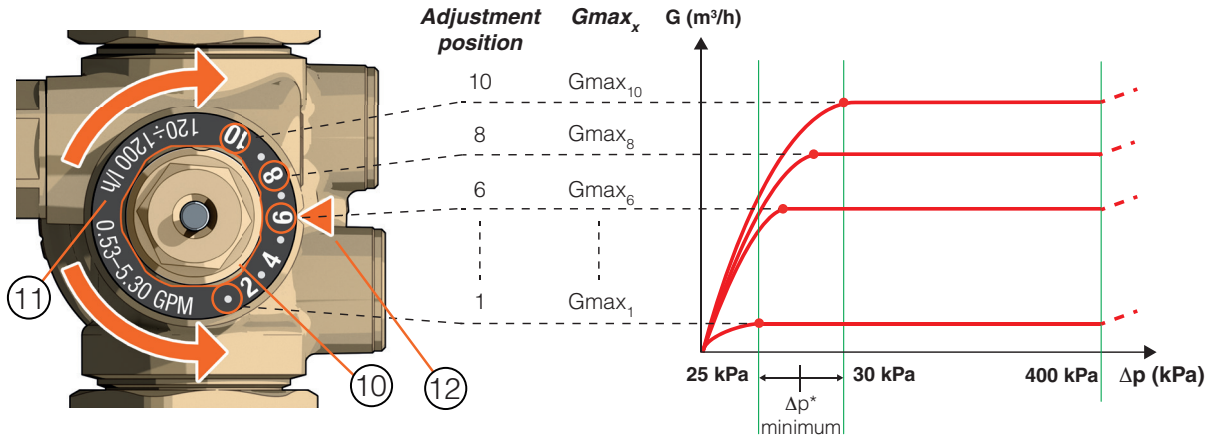
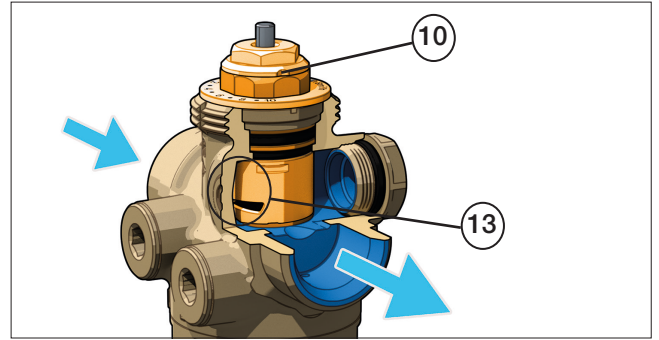
### Maximum flow rate adjustment

Unscrew the protective cap by hand to gain access to the maximum flow rate locking nut (10), which can be turned



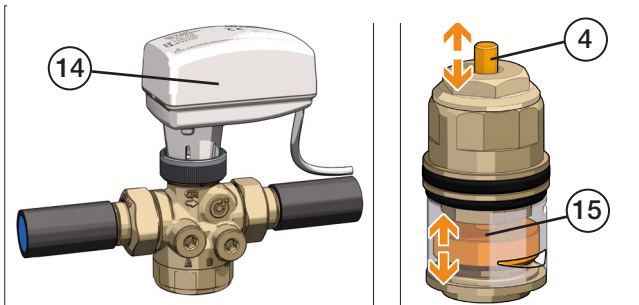
with a hexagonal key. The locking nut is fixed to a 10-position graduated scale, divided into steps corresponding to 1/10 of the maximum available flow rate, which is also shown on the scale (11). Turn the locking nut to the numerical position corresponding to the required flow rate (design flow rate), referring to the "Flow rate adjustment table". The notch (12) on the valve body is the physical positioning reference. Such operation does not reduce obturator 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 obturator (13). Hence, each bore cross section set on the locking nut corresponds to a specific  $G_{max_x}$  value.



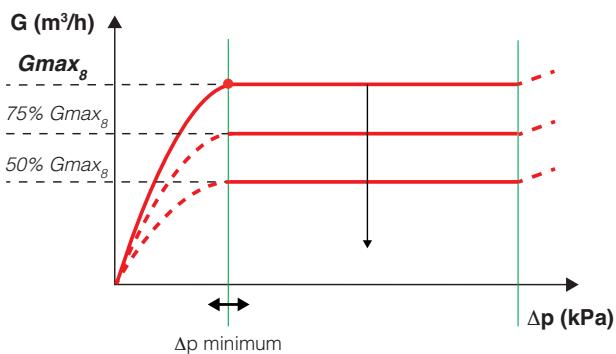
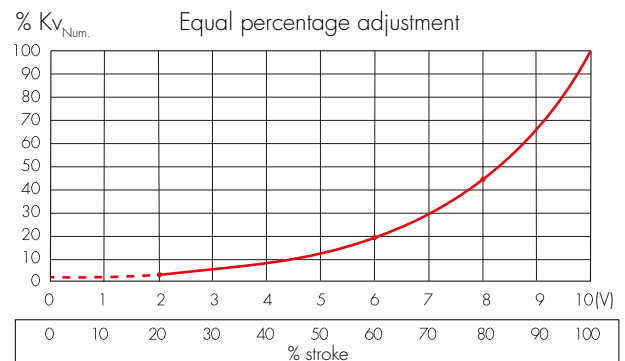
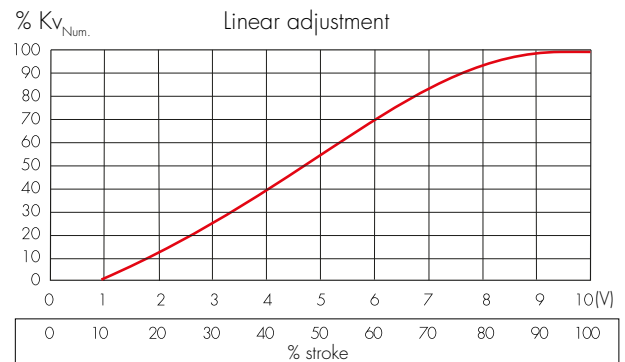
### Automatic flow rate adjustment with actuator and external regulator

After adjusting the maximum flow rate, fit the actuator (0–10 V) code 145013 (14) to the valve. Under the control of an external regulator the actuator can automatically adjust the flow rate from the maximum set value (E.g.:  $G_{max_g}$ ) to the minimum value in accordance with the thermal load to be controlled. The actuator acts on the vertical displacement of control stem (4). This results in additional opening/closing, on the maximum bore cross section, by the internal obturator (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  $G_{max_g}$  to completely closed (zero flow rate).










### Flow rate adjustment curve

The valve adjustment curve is of the linear type. An increase or decrease in the valve opening cross section corresponds to a directly proportional increase or decrease of the device's hydraulic coefficient  $K_v$ . 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) for this operation by means of the dedicated switch inside it (see specific instruction sheet). In this way the control signal is managed to obtain an equal percentage adjustment.





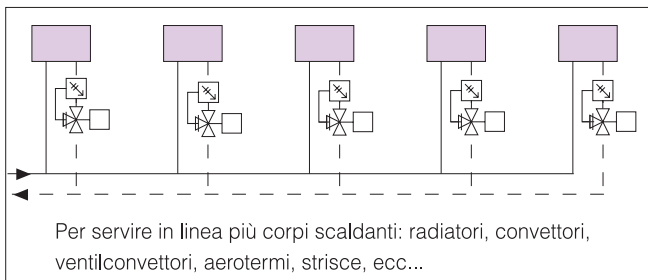
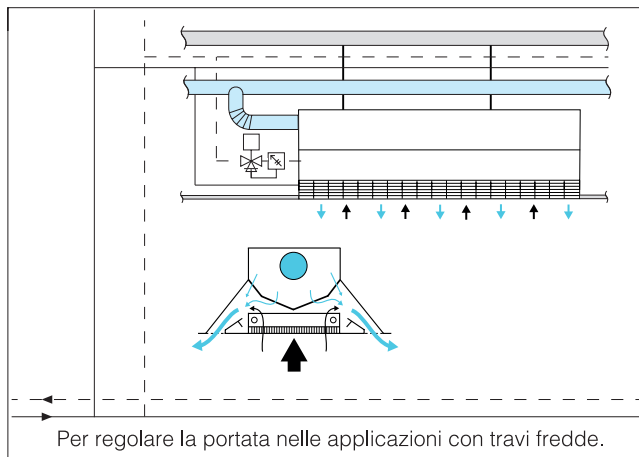
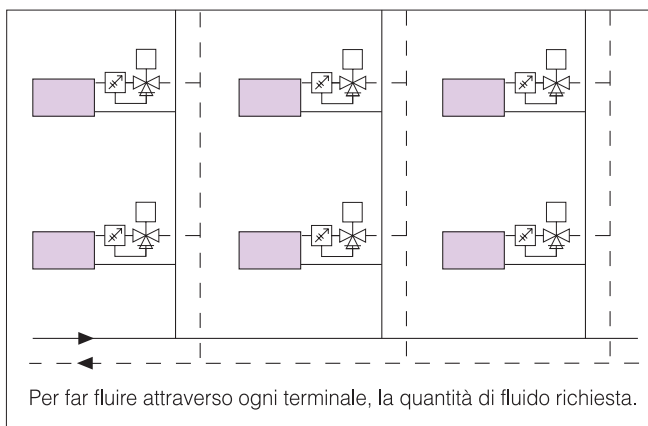
**Flow rate adjustment table**

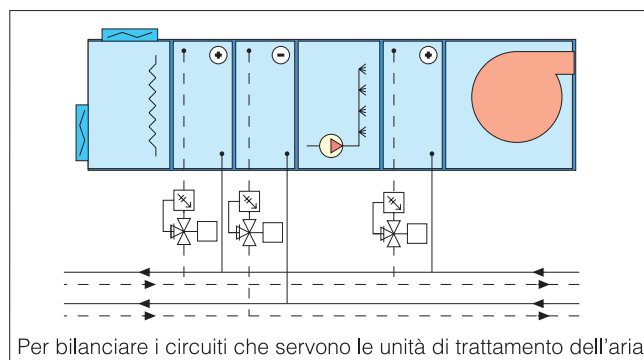
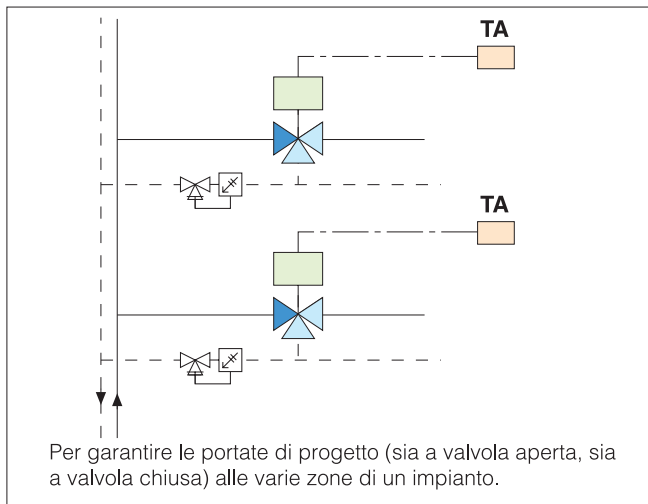
Code locking nut colour	range G $\Delta p$ min	Adjustment position									
		1	2	3	4	5	6	7	8	9	10
145... H20 	0,02-0,20 (m³/h)	0,02	0,04	0,06	0,08	0,10	0,12	0,14	0,16	0,18	0,20
	0,09-0,90 (GPM)	0,09	0,18	0,27	0,36	0,45	0,54	0,63	0,72	0,81	0,90
	$\Delta p$ min (kPa) (psi)	25 3,6	25 3,6	25 3,6	25 3,6	25 3,6	25 3,6	25,5 3,7	25,5 3,7	26 3,8	26 3,8
145... H40 	0,08-0,40 (m³/h)	-	0,08	0,12	0,16	0,20	0,24	0,28	0,32	0,36	0,40
	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 (kPa) (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... H80 	0,08-0,80 (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,80
	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 (kPa) (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... 1H2 	0,12-1,20 (m³/h)	0,12	0,24	0,36	0,48	0,60	0,72	0,84	0,96	1,08	1,20
	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 (kPa) (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... 1H8 	0,18-1,80 (m³/h)	0,18	0,36	0,54	0,72	0,90	1,08	1,26	1,44	1,62	1,80
	0,80-8,00 (GPM)	0,80	1,60	2,40	3,20	4,00	4,80	5,60	6,40	7,20	8,00
	$\Delta p$ min (kPa) (psi)	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	25 3,6
145... 3H0 	0,30-3,00 (m³/h)	0,30	0,60	0,90	1,20	1,50	1,80	2,10	2,40	2,70	3,00
	1,30-13,00 (GPM)	1,30	2,60	3,90	5,20	6,50	7,80	9,10	10,40	11,70	13,00
	$\Delta p$ min (kPa) (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... 3H7 	0,37-3,70 (m³/h)	0,37	0,74	1,11	1,48	1,85	2,22	2,59	2,96	3,33	3,70
	1,65-16,50 (GPM)	1,65	3,30	4,95	6,60	8,25	9,90	11,55	13,20	14,85	16,50
	$\Delta p$ min (kPa) (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**

To choose the pump you need to add the minimum pressure difference required by the device to the fixed head losses of the most disadvantaged circuit. This value corresponds to working range starting  $\Delta p_{min}$  value shown in the table ( $H_{pump} = \Delta p_{circuit} + \Delta p_{min}$ ).

**Applicazioni della valvola di regolazione indipendente dalla pressione (  )**





## Accessories

### 145 FLOWMATIC®



Proportional linear actuator for 145 series control valve.  
 Electric supply: 24 V (ac/dc).  
 Running power consumption: 1,5 W (dc), 2,5 VA (ac).  
 Control signal: 0–10 V.  
 Feedback signal: 0–10 V.  
 Ambient temperature range: 0–50 °C.  
 Protection class: IP 54.  
 Connection: M 30 p.1,5.  
 Supply cable length: 2 m.

Code	Voltage V	Control signal	Feedback signal
145013	24	0–10 V	0–10 V

### 656524



Proportional thermo-electric actuator for 145 series control valve.  
**Quick-coupling installation with clip adaptor.** Normally closed.  
 Electric supply: 24 V (ac/dc).  
 Running power consumption: 1,2 W.  
 Control signal: 0–10 V.  
 Feedback signal: 0–10 V.  
 Ambient temperature range: 0–60 °C.  
 Protection class: IP 54.  
 Connection: M 30 p.1,5.  
 Supply cable length: 1 m.

Code	Voltage V	Control signal	Feedback signal
656524	24	0–10 V	0–10 V

### 6565



Thermo-electric actuator.  
**Quick-coupling installation with clip adaptor.**  
 Normally closed.  
 Electric supply: 24 V (ac/dc).  
 Running power consumption: 1 W.  
 Ambient temperature range: 0–60 °C.  
 Protection class: IP 54.  
 Connection: M 30 p.1,5.  
 Supply cable length: 1m.

Code	Voltage V	Control signal
656502	230	ON/OFF
656504	24	ON/OFF

### 130

Electronic flow rate and differential pressure measuring station. Supplied with shut-off valves and connection fittings. May be used for  $\Delta p$  measurements and setting of balancing valves. Bluetooth® transmission between  $\Delta p$  measuring station and remote control unit.  
 Versions with remote control unit with Android® application for Smartphone and Tablet.



Measurement range: 0–1000 kPa.  
 static Pmax: 1000 kPa.  
 Electric supply from battery.



**Caleffi Smart Balancing**  
 Smartphone app available.  
 Download the version for your Android® mobile phone.

Code	Description
130006	complete with remote control unit, with Android® app
130005	without remote control unit, with Android® app



### 100000

tech. broch. 01041

Couple of quick-fit pressure/temperature ports.  
 Brass body.  
 EPDM seals.  
 Max. working pressure: 30 bar.  
 Working temperature range: -5–130 °C  
 Connections: 1/4" M.



### 145

Union with seal.  
 Thread EN 10226-1

Code	Thread
145001	1/2" F x 3/8" M
145003	3/4" F x 1/2" M
145005	1" F x 3/4" M
145006	1" F x 1" M
145007	1 1/4" F x 1" M
145008	1 1/4" F x 1 1/4" M

## SPECIFICATION SUMMARY

### 145..4 series FLOWMATIC®

Pressure independent control valve (PICV). Size DN 15 (from DN 15 to DN 25). Main connections 1/2" M (from 1/2" to 1 1/4") (ISO 228-1). Pressure test port connections 1/4" F (ISO 228-1) with cap. Connection for actuators code 145013 and actuators 6565 M30 p.1,5. Dezincification resistant alloy body and headwork. Control stem, piston and springs in stainless steel. Pressure regulator diaphragm, obturator and seals in EPDM. Asbestos-free fibre seals. Pre-adjustment indicator in PA6G30. Knob in PA6. Medium water and glycol solutions; maximum percentage of glycol 50 %. Maximum working pressure 25 bar. Maximum differential pressure with actuator code 145013 (and 6565 series) installed 5 bar. Working temperature range -20–120°C. Nominal  $\Delta p$  control range 25–400 kPa. Accuracy  $\pm 5$  % of the setpoint. Flow rate regulation range 0,02–0,2 m<sup>3</sup>/h (0,02–0,2 m<sup>3</sup>/h, 0,08–0,4 m<sup>3</sup>/h, 0,08–0,8 m<sup>3</sup>/h, 0,12–1,2 m<sup>3</sup>/h, 0,18–1,8 m<sup>3</sup>/h, 0,3–3 m<sup>3</sup>/h and 0,37–3,7 m<sup>3</sup>/h). The adjustment position does not affect the obturator stroke. Full stroke modulation. Flow rate pre-adjustment device with at least 10 reference positions and continuous adjustment. Leakage class V according to EN60534-4. Diaphragm pressure regulator.

### 145..7 series FLOWMATIC®

Pressure independent control valve (PICV) complete with quick-fit pressure/temperature ports. Size DN 15 (from DN 15 to DN 25). Main connections 1/2" M (from 1/2" to 1 1/4") (ISO 228-1). Connection for actuators code 145013 and actuators 6565. M30 p.1,5. Dezincification resistant alloy body and headwork. Control stem, piston and springs in stainless steel. Pressure regulator diaphragm, obturator and seals in EPDM. Asbestos-free fibre seals. Pre-adjustment indicator in PA6G30. Knob in PA6. Medium water and glycol solutions; maximum percentage of glycol 50 %. Maximum working pressure 25 bar. Maximum differential pressure with actuator code 145013 (and 6565 series) installed 5 bar. Working temperature range -20–120°C. Nominal  $\Delta p$  control range 25–400 kPa. Accuracy  $\pm 5$  % of the setpoint. Flow rate regulation range 0,02–0,2 m<sup>3</sup>/h (0,02–0,2 m<sup>3</sup>/h, 0,08–0,4 m<sup>3</sup>/h, 0,08–0,8 m<sup>3</sup>/h, 0,12–1,2 m<sup>3</sup>/h, 0,18–1,8 m<sup>3</sup>/h, 0,3–3 m<sup>3</sup>/h and 0,37–3,7 m<sup>3</sup>/h). The adjustment position does not affect the obturator stroke. Full stroke modulation. Flow rate pre-adjustment device with at least 10 reference positions and continuous adjustment. Leakage class V according to EN60534-4. Diaphragm pressure regulator.

### Code 145013

Proportional linear actuator for 145 series control valve. Proportional linear actuator. Electric supply 24 V (ac/dc). Power consumption 2,5 VA (ac), 1,5 W (dc). Control signal 0 (2) - 10 V, 0 (4) - 20 mA. Feedback signal: 0–10 V. Protection class IP 54. Ambient temperature range 0–50 °C. Connection M30 p. 1,5. Electric supply cable length 2 m. Operating time (open-close) approx. 35 seconds.

### Code 656524

Proportional thermo-electric actuator for 145 series control valve. Electric supply 24 V (ac/dc). Power consumption 1,2 W. Control signal 0–10 V. Feedback signal: 0–10 V. Protection class IP 54. Ambient temperature range 0–60 °C. Connection M30 p. 1,5. Electric supply cable length 1 m. Valve stroke automatic detection. Operating time (open-close) approx. 200 seconds

### 6565 series

Thermo-electric actuator. Normally closed. Electric supply 230 V (ac); 24 V (ac); 24 V (dc). Running power consumption 1 W. Protection class IP 54. Ambient temperature range 0–60 °C. Operating time (open-close) approx. 240 seconds. Electric supply cable length 1 m.

We reserve the right to make changes and improvements to the products and related data in this publication, at any time and without prior notice.