Pressure independent control valve
(PICV) FLOWMATIC®

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 EN 12165 CW602N
Headwork dezincification-resistant alloy EN 12164 CW602N
Control stem and piston: stainless steel EN 10088-3 (AISI 303)
Obturator seat:
- (H20): dezincification resistant alloy EN 12164 CW602N
- (H40, H60 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: 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 145014 and series 6565: M30 p.1.5
- pressure test ports: 1/4" F (ISO 228-1) with cap
- unions: - 3/8", 1/2", 3/4", 1" and 1 1/4" M (EN 10226-1)

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: 5 bar
Working temperature range: -20–120 °C
Nominal Ap control range: 25-400 KPa
Flow rate regulation range:
- (H20): 0,02–0,2 m³/h
- (H40): 0,08–0,4 m³/h
- (H60): 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 setpoint
Leakage: class V in accordance with EN 60534-4
Type: diaphragm
### Actuators / thermo-electric actuators compatible with series 145 valves

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* Actuator code 656524 ** Only for codes 145..7

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* Actuator code 145013 ** Only for codes 145..7

### Dimensions

** Only for codes 145..7

** Actuator code 656524 ** Only for codes 145..7

** Actuator code 145013 ** Only for codes 145..7

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Actuators / thermo-electric actuators compatible with series 145 valves

145013 | 656524 | 656502 | 656504

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

* auto stroke detection
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 \( \Delta p \)

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.

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.

Flow rate accuracy

\[ G \ (\text{m}^3/\text{h}) \]

\[ \Delta p \ (\text{kPa}) \]

\[ * \ For \ more \ details \ look \ at \ "Flow \ rate \ adjustment \ table" \]
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 Δp 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 Δp 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 $G_{\text{max}}$ value.

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**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.: $G_{\text{max}}$) 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 $G_{\text{max}}$ to completely closed (zero flow rate).

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**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.

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*For more details look at "Flow rate adjustment table"*
### Flow rate adjustment table

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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 Δp_min value shown in the table (Δp_{pump} = Δp_{circuit} + Δp_{min}).

### 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: 0–60 °C.
- Protection class: IP 54.
- Connection: M 30 p.1,5.
- Supply cable length: 2 m.

**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.

**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: 1 m.
Pressure independent control valve applications

Electronic flow rate and differential pressure measuring station. Supplied with shut-off valves and connection fittings. May be used for Δp measurements and setting of balancing valves. Bluetooth® transmission between Δp 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

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

130

Pressure independent control valve applications

100000
techn. 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

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

Measurements range: 0–1000 kPa.
static Pmax: 1000 kPa.

For use in line with various types of heat emitter: radiators, convectors, unit heaters, thermal strips, etc.

To ensure that the required amount of medium flows through each terminal.

To adjust flow rate in applications with chilled beams.

To balance circuits that serve air conditioning units.
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 Δp control range 25–400 kPa. Accuracy ± 5 % of the setpoint. Flow rate regulation range 0,02–0,2 m$^3$/h (0,02–0,2 m$^3$/h, 0,08–0,4 m$^3$/h, 0,08–0,8 m$^3$/h, 0,12–1,2 m$^3$/h, 0,18–1,8 m$^3$/h, 0,3–3 m$^3$/h and 0,37–3,7 m$^3$/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 Δp control range 25–400 kPa. Accuracy ± 5 % of the setpoint. Flow rate regulation range 0,02–0,2 m$^3$/h (0,02–0,2 m$^3$/h, 0,08–0,4 m$^3$/h, 0,08–0,8 m$^3$/h, 0,12–1,2 m$^3$/h, 0,18–1,8 m$^3$/h, 0,3–3 m$^3$/h and 0,37–3,7 m$^3$/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. 355 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.