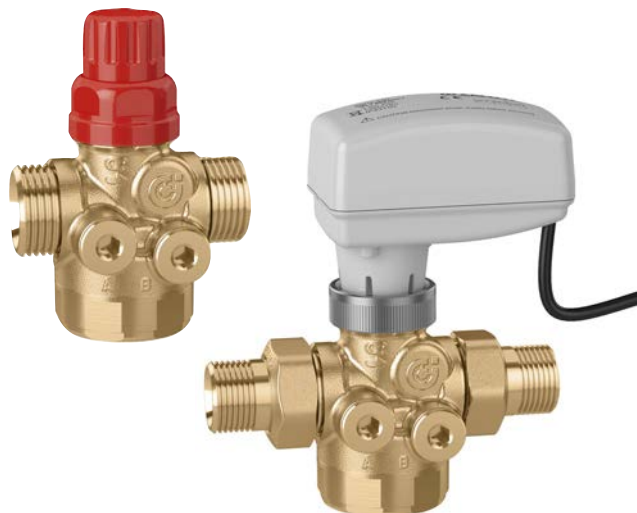


Pressure independent control valve (PICV)

145 series



01262/14 GB



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 (PIVC) 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

145 series Pressure independent control valve _____ sizes DN 15 (3/8" and 1/2"), DN 20 (3/4" and 1")
Code 145014 Proportional linear actuator for 145 series control valve _____ 24 V electric supply (ac/dc)

Technical specifications

Materials

Body:	dezincification resistant alloy CR EN 12165 CW602N
Headwork:	dezincification resistant alloy CR EN 12164 CW602N
Control stem and piston:	stainless steel EN 10088-3 (AISI 303)
Obturator seat:	PTFE
Obturator:	EPDM
Pressure regulator membrane:	EPDM
Springs:	stainless steel EN 10270-3 (AISI 302)
Seals:	EPDM
Gasket:	non-asbestos fibre
Pre-adjustment indicator:	PA6G30
Knob:	PA6

Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	30%
Maximum working pressure:	16 bar
Max. differential pressure with code 145014 actuator and 656 series thermo-electric actuators:	5 bar
Working temperature range:	-20–120°C.
Nominal Δp control range:	25–400 kPa
Flow rate regulation range:	0,08–0,4 m ³ /h 0,08–0,8 m ³ /h 0,12–1,2 m ³ /h
Accuracy:	± 15%
Max. flow rate with 656 series thermo-electric actuator installed, reduced by:	20%

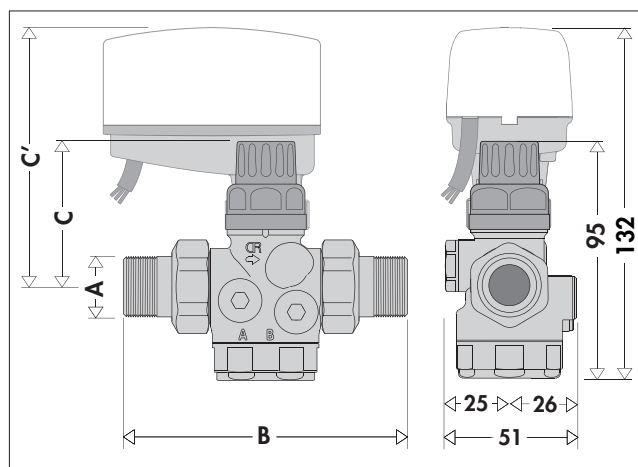
Connections

- main: 3/8", 1/2", 3/4", 1" M
EN 10226-1 (ISO 7/1) with union;
3/4" M (ISO 228-1) Euroconus
- for code 145014 and thermo-electric 656 series actuators: M 30 p.1,5
- pressure test ports: 1/4" F (ISO 228-1) with plug

Technical specifications for actuator code 145014

Proportional linear actuator	
Electric supply:	24 V (ac/dc)
Power consumption:	2,5 VA (ac) 1,5 W (dc)
Control signal:	0–10 V
Protection class:	IP 43
Ambient temperature range:	0–50°C
Supply cable length:	1,5 m
Connection:	M 30 p.1,5

Dimensions



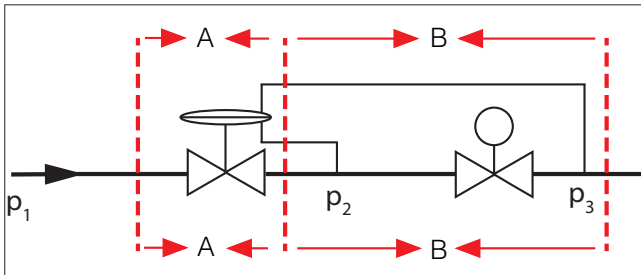
Code	DN	A	B	C	C'	Mass (kg)
145430 ...	15	3/8"	108	55	96	0,53
145440 ...	15	1/2"	110	55	96	0,57
145550 ...	20	3/4"	123	55	96	0,70
145560 ...	20	1"	132	55	96	0,77
145552 ...	20	3/4" Euroconus	68	55	96	0,47

Operating principle

The pressure independent control valve (PICV) is designed to regulate a flow 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:



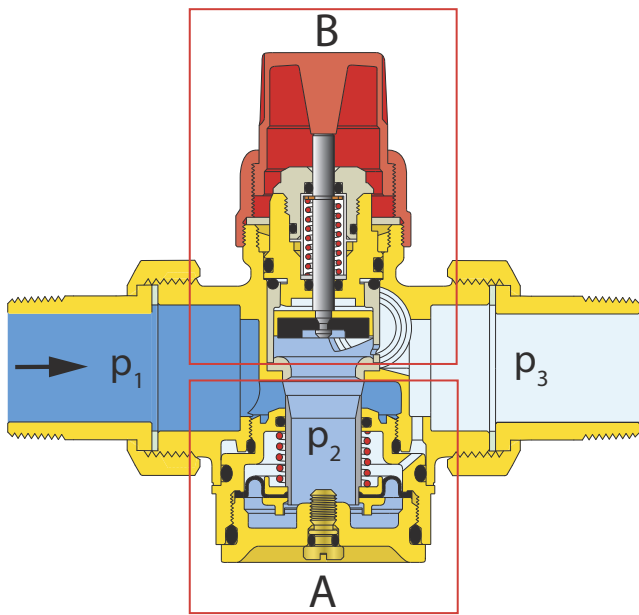
Where:

p_1 = upstream pressure

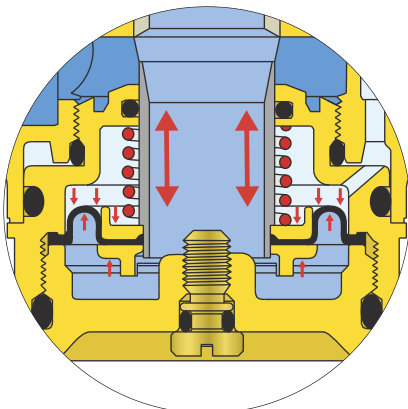
p_2 = intermediate pressure

p_3 = downstream pressure

$(p_1 - p_3)$ = total valve Δp

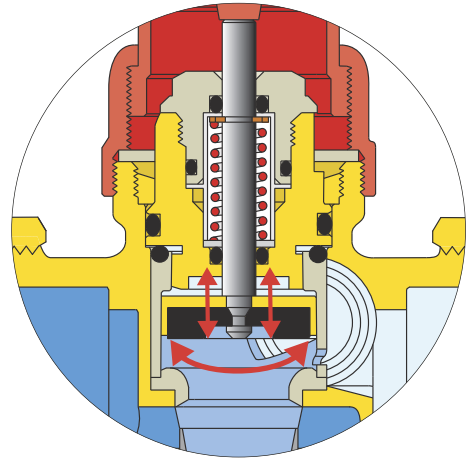


a) Device **(A)** regulates Δp ; ($p_2 - p_3$) and keeps it constant across the device **(B)** by means of an automatic action (balancing between the force generated by the differential pressure and the internal opposing spring). If $(p_1 - p_3)$ increases, the internal Δp regulator reacts to close the bore 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 the regulator device **(B)**, which remains constantly at:

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



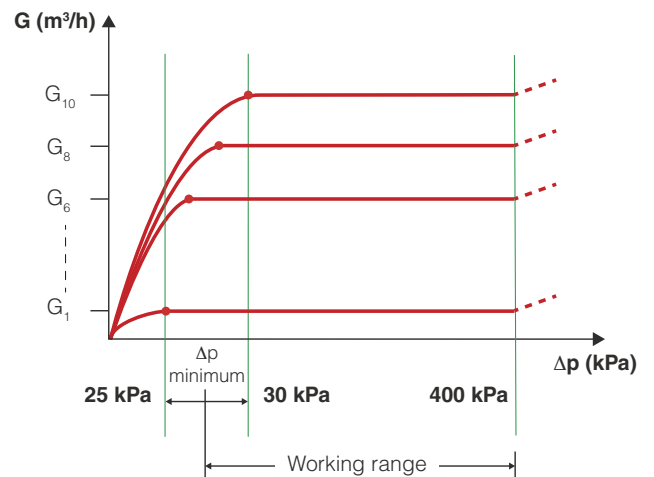
Concisely:

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

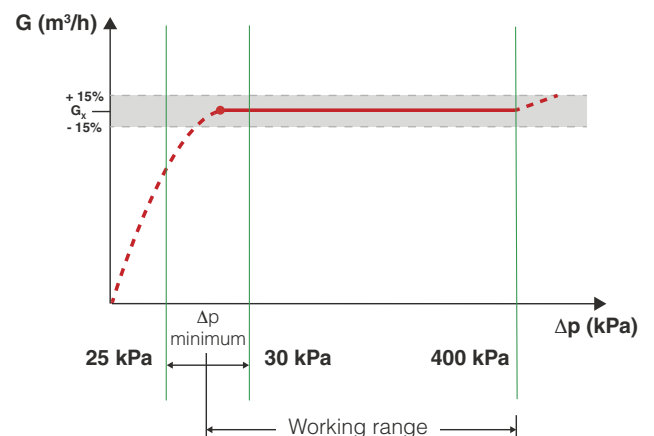
- by manually or automatically adjusting device B, K_v value and consequently G value can be set;
- once G value has been set, it remains constant thanks to the action of **(A)** in response to circuit pressure changes.

Working range

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



Flow rate accuracy



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.

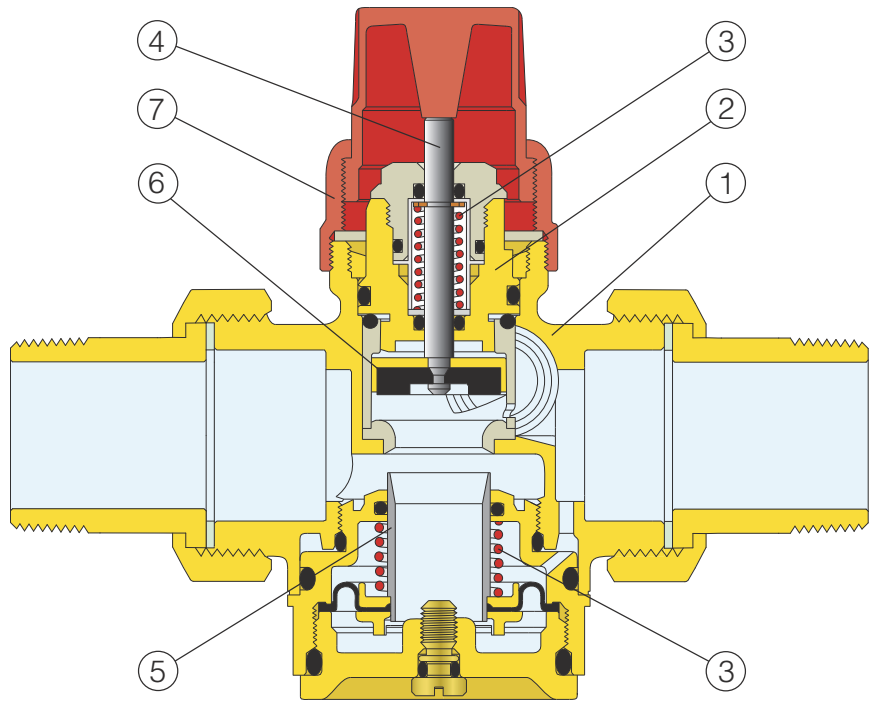
EPDM obturator

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

Compact and practical device

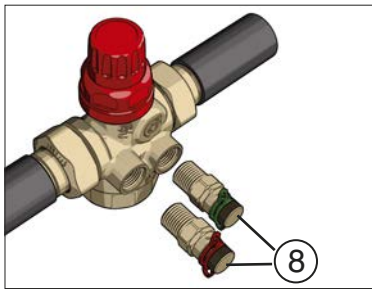
The easy-to-install valve features reduced dimensions and compact lines.

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



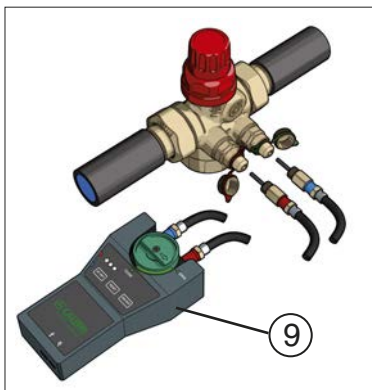
Pressure test ports

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



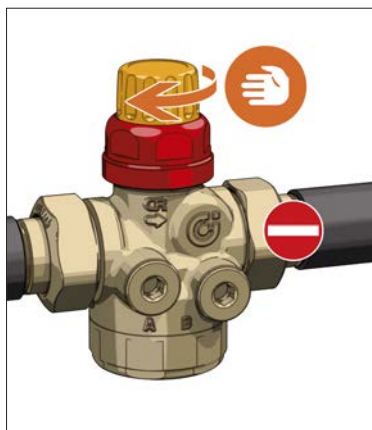
During operation the valve Δp generated by the fluid flow can be measured (with the Caleffi differential pressure measuring station code 130005/6) (9).

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



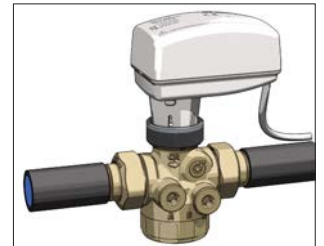
Shut-off

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

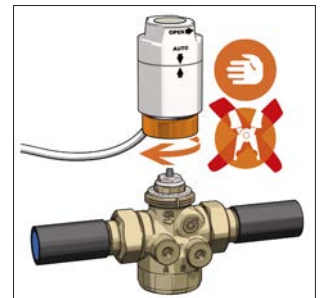


Use with actuators

The device is fitted to function with a proportional linear actuator (code 145014). When controlled by a regulator, the valve can modulate the flow rate in accordance with the system thermal load.

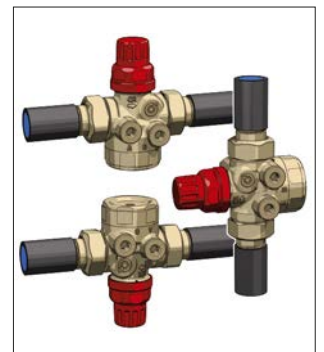


As an alternative to a proportional linear actuator, the valve can also be controlled with an ON/OFF type thermo-electric actuator for simpler temperature control logic.

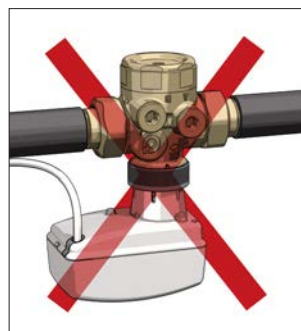


Installation versatility

The valve without actuator can be installed in any position.



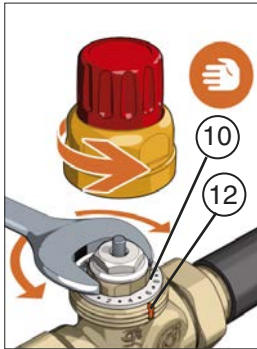
With an actuator fitted the valve can be installed in any position except upside down.



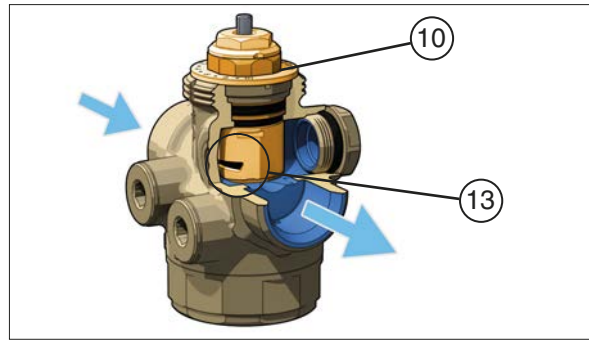
Adjustment procedure

Maximum flow rate adjustment

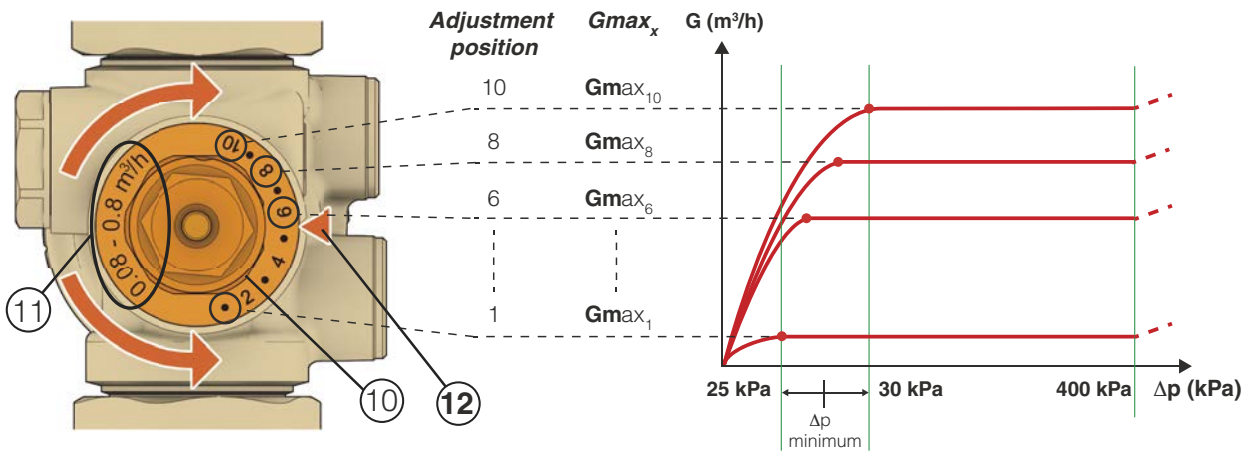
Unscrew the protective plug by hand to gain access to the maximum flow rate adjustment nut (10), which can be turned with a hexagonal wrench. The adjustment nut is fixed to a 10-position graduated scale, divided into steps corresponding to 1/10 of the maximum available flow rate, which is also shown on the scale (11). Turn the adjustment 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.



Turning adjustment nut (10), which determines the number associated with the "Adjustment position", results in opening/closing of the bore cross section in the external

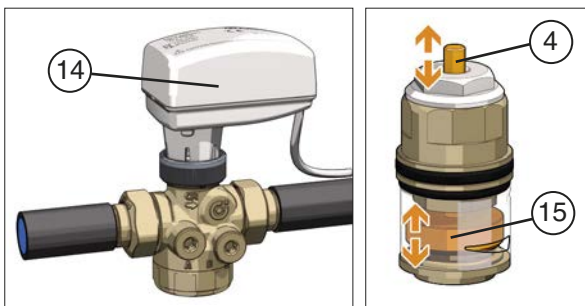


obturator (13). Hence, each bore cross section set on the adjustment nut corresponds to a specific G_{max_x} value.



Automatic flow rate adjustment with actuator and external regulator

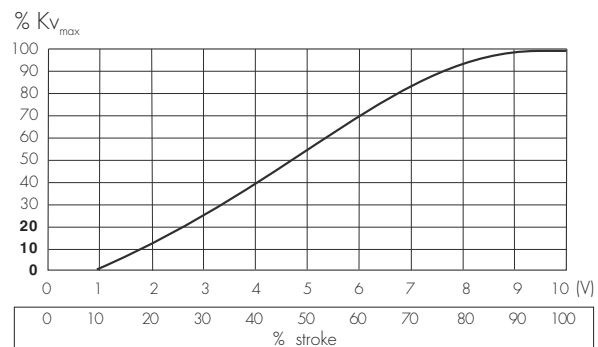
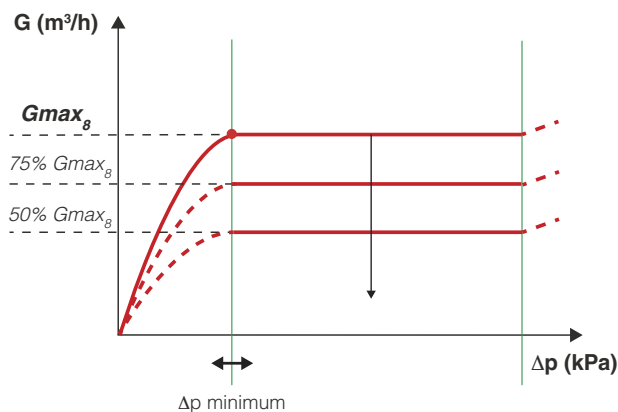
After adjusting the maximum flow rate, fit the actuator (0–10 V) code 145014 (14) to the valve. Under the control of an external regulator the actuator can automatically adjust the flow rate from the maximum set value (E.g.: G_{max_8}) to the minimum value in accordance with the thermal load to be controlled. 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_8} 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 .

This characteristic produces the following benefits: the flow rate can be fine-tuned to intermediate/partial values that can be fully controlled in terms of modulation for optimal tracking of changes in thermal load; automatic and servo-assisted control is achieved with 0–10 V actuators, which are widely used for applications of this type.



Flow rate adjustment table

Code nut colour/range G	DN	Size		Adjustment position									
				1	2	3	4	5	6	7	8	9	10
○ 145430 H40 0,08–0,40 m³/h	15	3/8"	Flow rates (m³/h)	-	0,08	0,12	0,16	0,2	0,24	0,28	0,32	0,36	0,40
			Δp min (kPa)	-	25	25,5	26	26	26,5	26,5	27	27	27
● 145430 H80 0,08–0,80 m³/h	15	3/8"	Flow rates (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,8
			Δp min (kPa)	25	25	25,5	26	26	27	27,5	28	28,5	29
○ 145440 H40 0,08–0,40 m³/h	15	1/2"	Flow rates (m³/h)	-	0,08	0,12	0,16	0,2	0,24	0,28	0,32	0,36	0,40
			Δp min (kPa)	-	25	25,5	26	26	26,5	26,5	27	27	27
● 145440 H80 0,08–0,80 m³/h	15	1/2"	Flow rates (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,8
			Δp min (kPa)	25	25	25,5	26	26	27	27,5	28	28,5	29
○ 145550 H40 0,08–0,40 m³/h	20	3/4"	Flow rates (m³/h)	-	0,08	0,12	0,16	0,2	0,24	0,28	0,32	0,36	0,40
			Δp min (kPa)	-	25	25,5	26	26	26,5	26,5	27	27	27
● 145550 H80 0,08–0,80 m³/h	20	3/4"	Flow rates (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,8
			Δp min (kPa)	25	25	25,5	26	26	26	26,5	26,5	27	27
● 145550 1H2 0,12–1,20 m³/h	20	3/4"	Flow rates (m³/h)	0,12	0,24	0,36	0,48	0,6	0,72	0,84	0,96	1,08	1,2
			Δp min (kPa)	25	25	25,5	26	26	26,5	26,5	27	27,5	28
○ 145560 H40 0,08–0,40 m³/h	20	1"	Flow rates (m³/h)	-	0,08	0,12	0,16	0,2	0,24	0,28	0,32	0,36	0,40
			Δp min (kPa)	-	25	25,5	26	26	26,5	26,5	27	27	27
● 145560 H80 0,08–0,80 m³/h	20	1"	Flow rates (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,8
			Δp min (kPa)	25	25	25,5	26	26	26	26,5	26,5	27	27
● 145560 1H2 0,12–1,20 m³/h	20	1"	Flow rates (m³/h)	0,12	0,24	0,36	0,48	0,6	0,72	0,84	0,96	1,08	1,2
			Δp min (kPa)	25	25	25,5	26	26	26,5	26,5	27	27,5	28
○ 145552 H40 0,08–0,40 m³/h	20	3/4" Euroconus	Flow rates (m³/h)	-	0,08	0,12	0,16	0,2	0,24	0,28	0,32	0,36	0,40
			Δp min (kPa)	-	25	25,5	26	26	26,5	26,5	27	27	27
● 145552 H80 0,08–0,80 m³/h	20	3/4" Euroconus	Flow rates (m³/h)	0,08	0,16	0,24	0,32	0,40	0,48	0,56	0,64	0,72	0,8
			Δp min (kPa)	25	25	25,5	26	26	26	26,5	26,5	27	27
● 145552 1H2 0,12–1,20 m³/h	20	3/4" Euroconus	Flow rates (m³/h)	0,12	0,24	0,36	0,48	0,6	0,72	0,84	0,96	1,08	1,2
			Δp min (kPa)	25	25	25,5	26	26	26,5	26,5	27	27,5	28

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 ($H_{\text{pump}} = \Delta p_{\text{circuit}} + \Delta p_{\min}$).

Accessories

130

Electronic flow rate and differential pressure measuring station.

Supplied complete 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 complete with remote control unit with Windows Mobile® or with Android® application for Smartphones and Tablets.

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



Code

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



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.



6562

tech. broch. 01198

Thermo-electric actuator. Normally closed. With opening position indicator.

Quick-coupling installation with clip adapter.

Electric supply: 230 V (ac) or 24 V (ac)/(dc)
Auxiliary microswitch contact rating 0,8 A (230 V).
Power consumption: 3 W.
Starting current: ≤ 1 A.
Ambient temperature range: 0–50°C.
Protection class: IP 54.
Electric supply cable: 80 cm.

Code	Voltage V	
656202	230	
656204	24	
656212	230	With auxiliary microswitch
656214	24	With auxiliary microswitch



6563

tech. broch. 01142

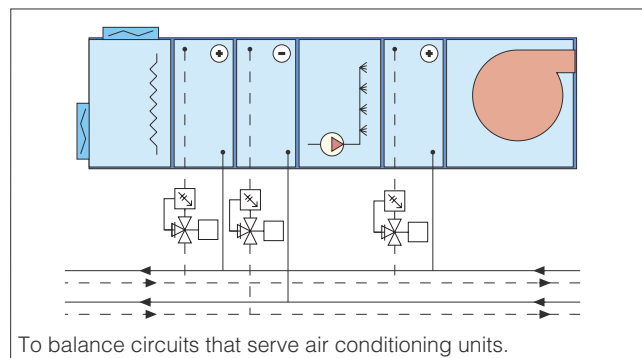
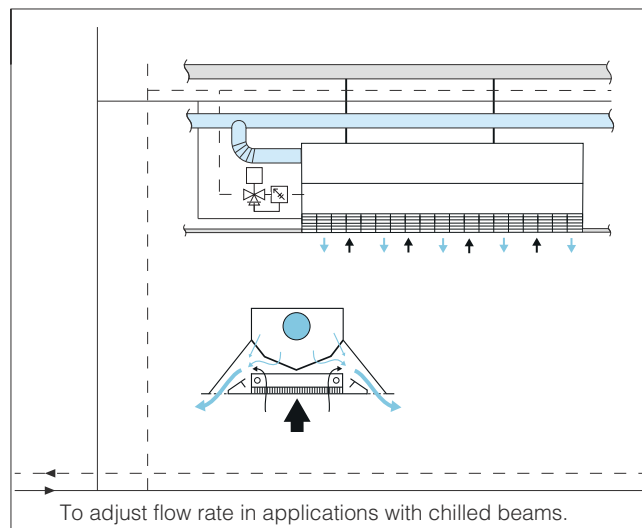
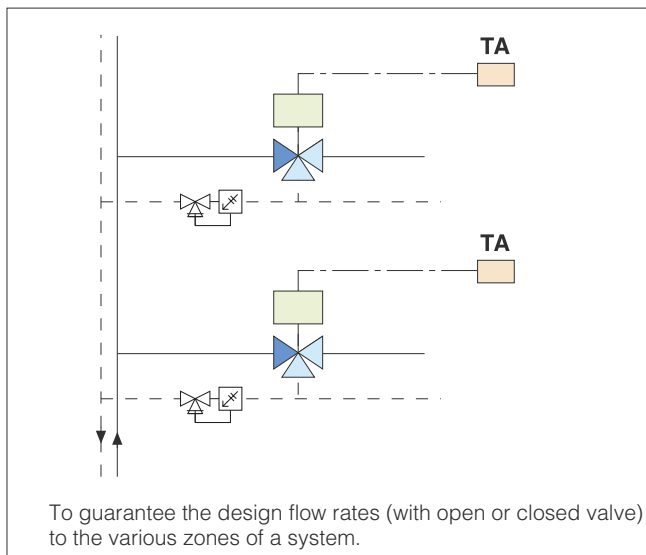
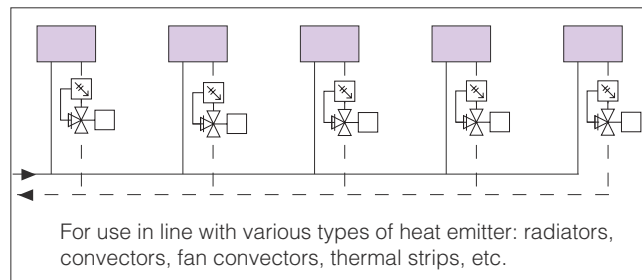
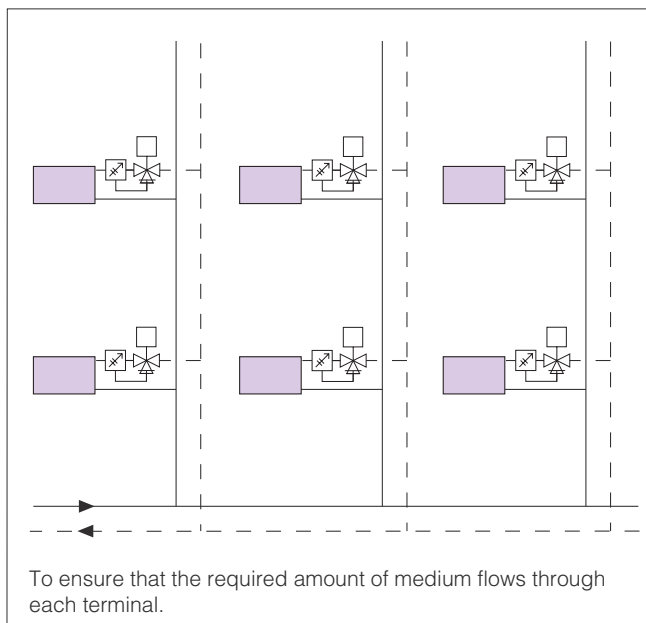
Thermo-electric actuator. Normally closed. With manual opening knob and position indicator.

Electric supply: 230 V (ac) or 24 V (ac)/(dc)
Auxiliary microswitch contact rating 0,8 A (230 V).
Running power consumption: 3 W.
Starting current: ≤ 1 A.
Ambient temperature range: 0–50°C.
Protection class: IP 40.
Electric supply cable: 80 cm.

Code	Voltage V	
656302	230	
656304	24	
656312	230	With auxiliary microswitch
656314	24	With auxiliary microswitch

Alternatively, a 6561 series thermo-electric actuator can be used

Pressure independent control valve applications ()



SPECIFICATION SUMMARY

145 series

Pressure independent control valve (PICV). Size DN 15 (and DN 20). Main connections 3/8" (from 3/8" to 1") M (ISO 7/1) with union; 3/4" M (ISO 228-1). Pressure test port connections 1/4" F (ISO 228-1) with plug. Connection for code 145014 and 656. series thermo-electric actuators M 30 p.1,5. Dezincification resistant alloy body and headwork. Control stem, piston and springs in stainless steel. Pressure regulator membrane, obturator and seals in EPDM. Gasket in Asbestos-free fibre. Pre-adjustment indicator in PA6G30. Knob in PA6. Medium water and glycol solutions; maximum percentage of glycol 30%. Maximum working pressure 16 bar. Maximum differential pressure with actuator code 145014 (and 656. series) installed 5 bar. Working temperature range -20–120°C. Nominal Δp control range 25–400 kPa. Accuracy $\pm 15\%$. Maximum flow rate, with 656. series thermo-electric actuator fitted, reduced by 20%. Flow rate adjustment range 0,08–0,4 m³/h (0,08–0,8 m³/h and 0,12–1,2 m³/h).

Code 145014

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 0–10 V. Protection class IP 43. Ambient temperature range 0–50°C. Connection M 30 p.1,5. Electric supply cable length 1,5 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.