Pressure independent control valve (PICV) FLOWMATIC®

145 series

ISO 9001 FM 21654

01262/17 GB
replaces 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 (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.

Gamma prodotti

145 series	Pressure independent control valve	sizes DN 15 (3/8" and 1/2"), DN 20 (3/4" and 1"), DN 25 (3/4", 1" and 1 1/4")
Code 145014	Proportional linear actuator for 145 series control valve	electric supply 24 V (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:	
-0,08÷0,4/0,08÷0,8/0,12÷1,2 m³/h:	PTFE
-0,18÷1,8/0,30÷3,00 m³/h:	stainless steel EN 10088-3 (AISI 303)
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:	50%
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 m³/h 0,08÷0,8 m³/h 0,12÷1,2 m³/h 0,18÷1,8 m³/h 0,30÷3,0 m³/h
Accuracy:	±15%
Max. flow rate with 656 series thermo-electric actuator installed, reduced by:	
-0,08÷0,4/0,08÷0,8/0,12÷1,2 m³/h:	20%
-0,18÷1,8/0,30÷3,00 m³/h:	25%

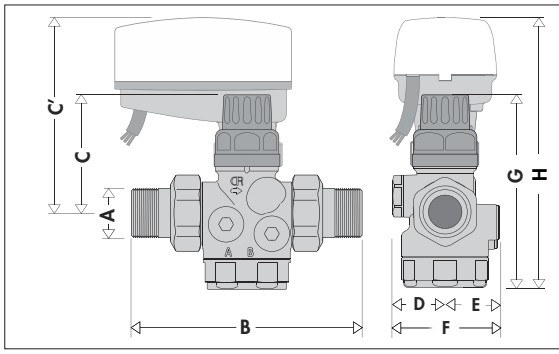
Connections

- main:	3/8", 1/2", 3/4", 1", 1 1/4" 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:	M30 p.1,5

Dimensions



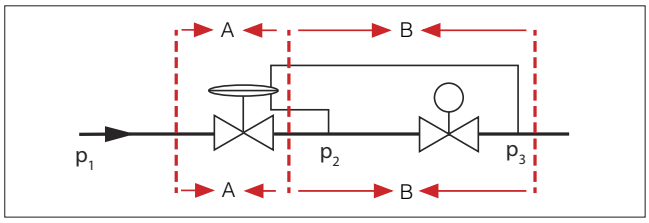
Code	DN	A	B	C	C'	D	E	F	G	H	Mass (kg)
145430 ...	**15**	3/8"	108	55	96	25	26	51	95	132	0,53
145440 ...	**15**	1/2"	110	55	96	25	26	51	95	132	0,57
145550 ...	**20**	3/4"	123	55	96	25	26	51	95	132	0,70
1455501H8	**25**	3/4"	159	63,1	100	30	36	66	113,7	150,6	0,77
145560 ...	**20**	1"	132	55	96	25	26	51	95	132	0,77
145660 ...	**25**	1"	169	63,1	100	30	36	66	113,7	150,6	1,50
145770 ...	**25**	1 1/4"	167	63,1	100	30	36	66	113,7	150,6	1,60
145552 ...	**20**	3/4"*	68	55	96	25	26	51	95	132	0,47

Euroconus

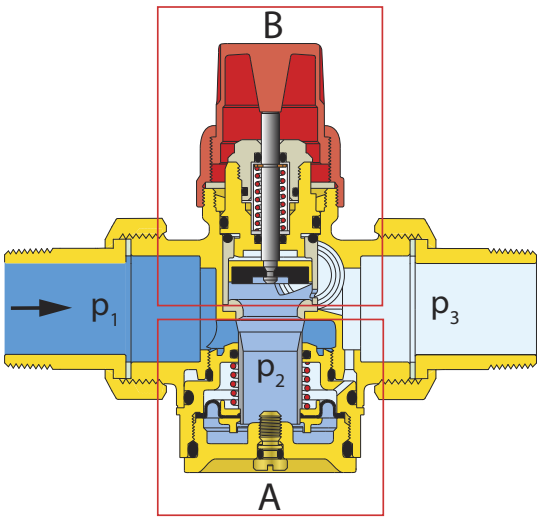
Operating principle

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.

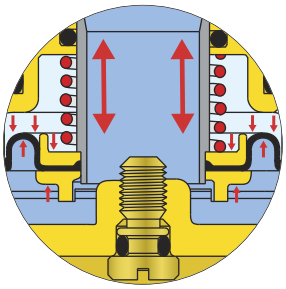
The device layout is shown in the diagram below:



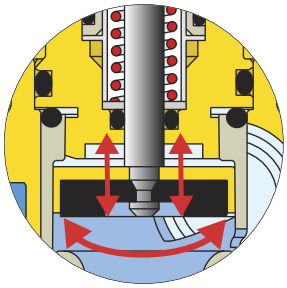
Where:
p_1 = upstream pressure
p_2 = intermediate pressure
p_3 = downstream pressure
(p_1 - p_3) = total valve **Δp**



a) Device **(A)** regulates Δp_i (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) = constant; in these conditions the flow rate will remain constant.



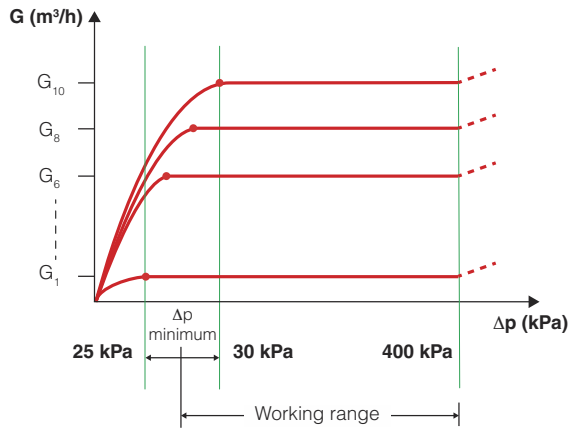
b) Device **(B)** regulates flow rate G by changing its bore cross section. The change in bore cross section determines hydraulic coefficient value (Kv) of the regulator device **(B)**, which remains constantly at:
- a manually pre-set value
- the value determined by the actuator's regulating action.



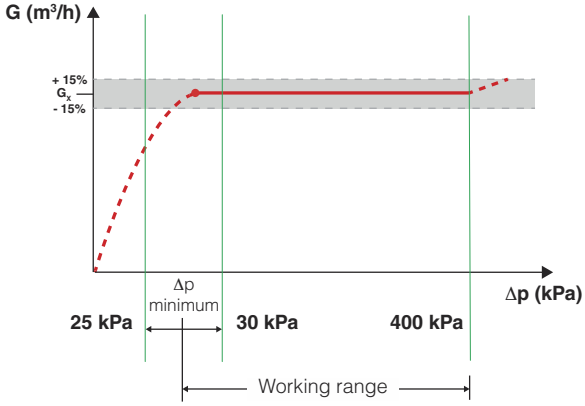
Concisely:
Since G = Kv x $\sqrt{\Delta p}$
- by manually or automatically adjusting device B, Kv value and consequently G value can be set;
- once G value has been set, it remains constant thanks to the action of **(A)** in response to circuit pressure changes.

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

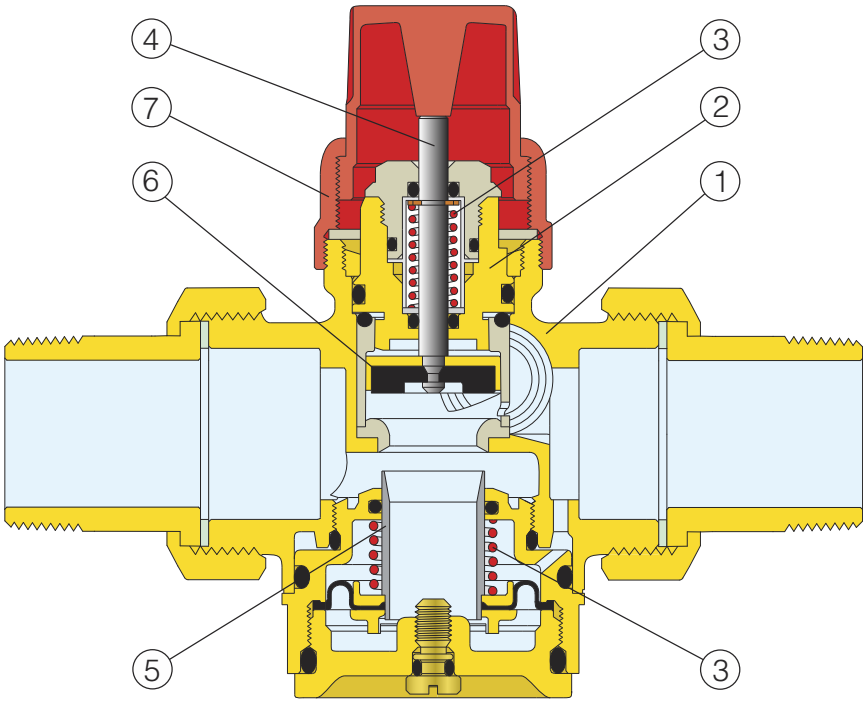


Construction details

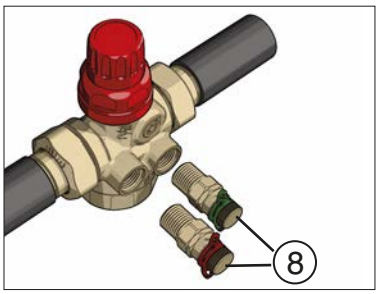
Materials in dezincification resistant alloy and stainless steel
Valve body (1) and headwork (2) are made of dezincification resistant alloy while springs (3), control stem (4) and piston (5) are in stainless steel.
These materials prevent phenomena of corrosion, guarantee accuracy, reliable performance 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.

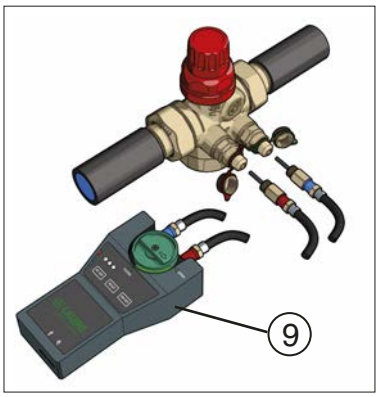
Compact and practical device
The easy-to-install valve features reduced dimensions and compact lines.
Protective knob (7) can be removed by hand easily for flow rate regulation purposes and actuator fitting.



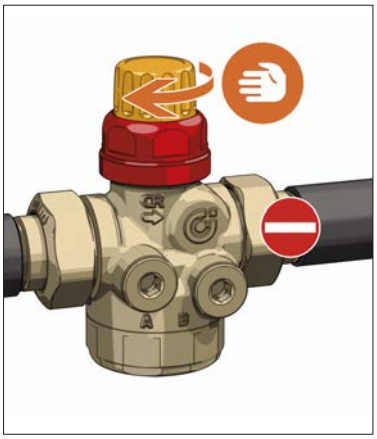
Pressure test ports
The valve is supplied with upstream and downstream connections for fast-plug pressure test ports (Caleffi code 100000) (8), to be fitted in the connections with the system cold and not in pressure.



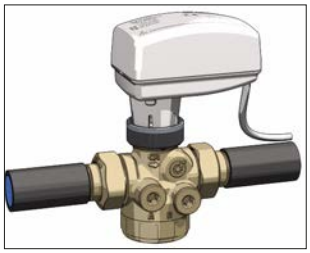
During operation the valve Δp generated by the fluid flow can be measured (with the Caleffi differential pressure measuring station code 130005/6) (9).
By comparing this value with the working Δp range, correspondence of the valve effective flow rate and the selected flow rate can be checked.



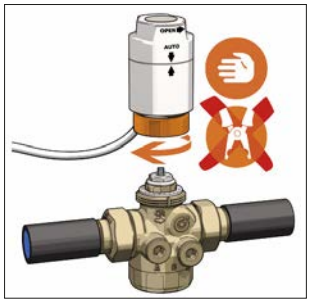
Shut-off
The knob can be used to shut-off the circuit zone controlled by the valve.



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.

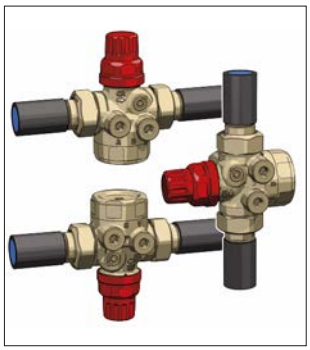


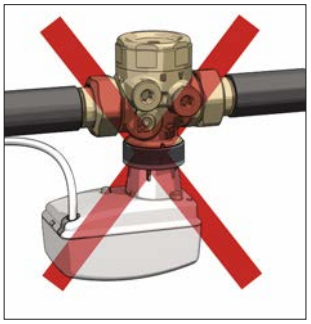
As an alternative to a proportional linear actuator, the valve can also be controlled with an ON/OFF type thermoelectric actuator for simpler temperature control logic.



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.

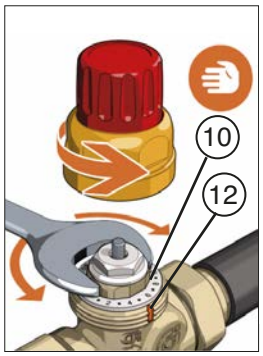




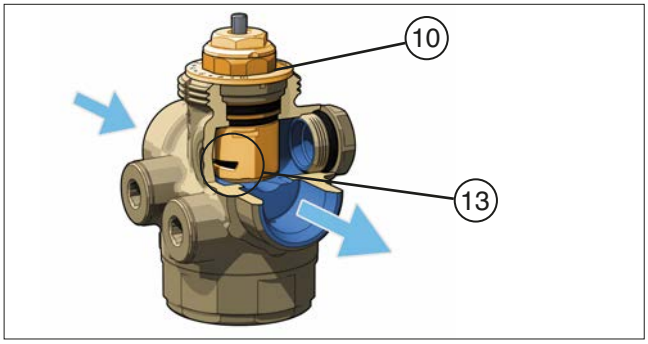
Adjustment procedure

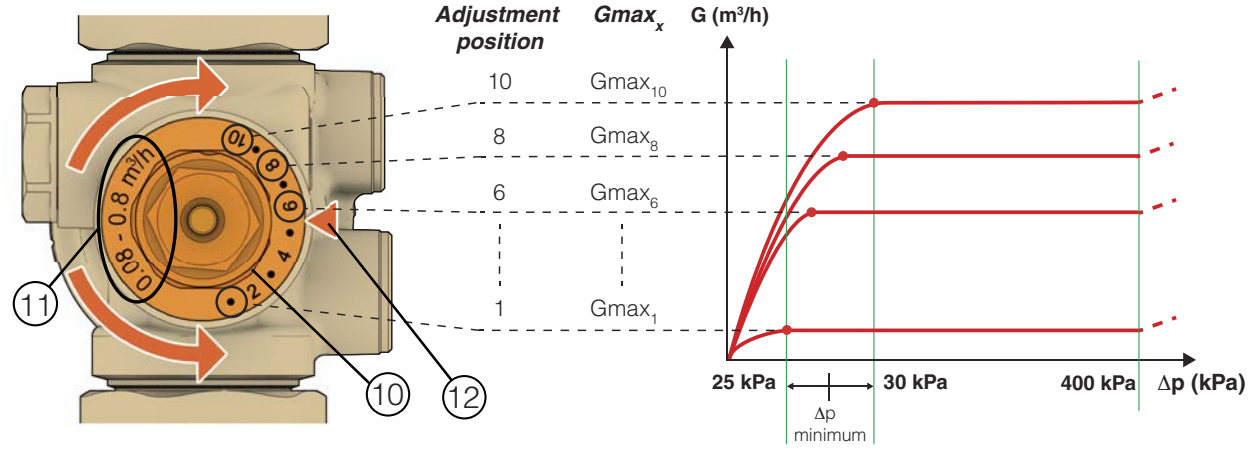
Maximum flow rate adjustment

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.



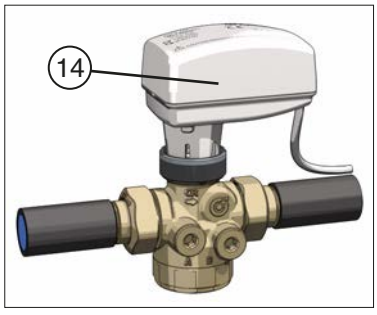
Turning adjustment nut (10), which determines the number associated with the "***Adjustment position***", results in opening/closing of the bore cross section in the external obturator (13). Hence, each bore cross section set on the adjustment nut corresponds to a specific ***Gmax$_x$*** value.

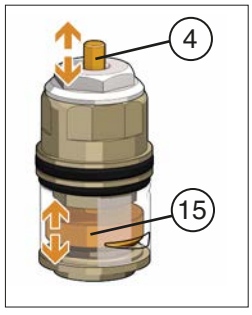


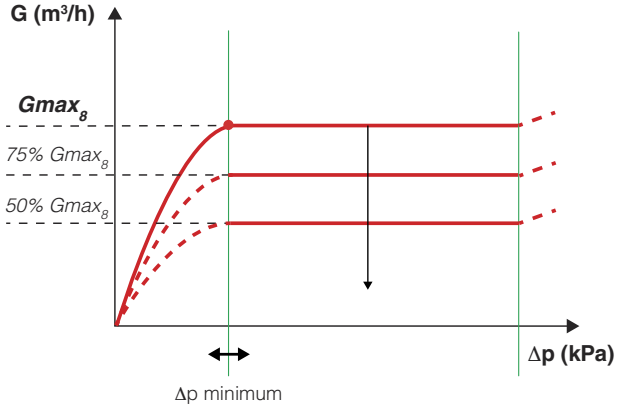


Automatic flow rate adjustment with actuator and external regulator

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.:* ***Gmax$_8$***) 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* ***Gmax$_8$*** *to completely closed (zero flow rate).*



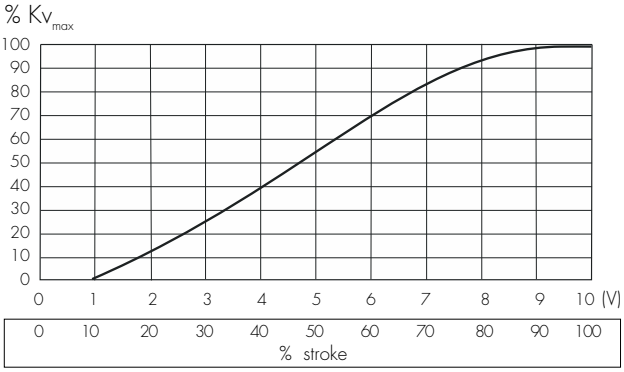




Flow rate adjustment curve

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 Kv.

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
● 145550 1H8 0,18÷1,80 m³/h	25	3/4”	Flow rates (m³/h)	0,18	0,36	0,54	0,72	0,9	1,08	1,26	1,44	1,62	1,8
			Δp min (kPa)	35	35	35	35	35	28	25	25	25	25
● 145660 1H8 0,18÷1,80 m³/h	25	1”	Flow rates (m³/h)	0,18	0,36	0,54	0,72	0,9	1,08	1,26	1,44	1,62	1,8
			Δp min (kPa)	35	35	35	35	35	28	25	25	25	25
● 145660 3H0 0,30÷3,00 m³/h	25	1”	Flow rates (m³/h)	0,3	0,6	0,9	1,2	1,5	1,8	2,1	2,4	2,7	3
			Δp min (kPa)	35	35	35	35	35	35	35	35	35	35
● 145770 1H8 0,18÷1,80 m³/h	25	1 1/4”	Flow rates (m³/h)	0,18	0,36	0,54	0,72	0,9	1,08	1,26	1,44	1,62	1,8
			Δp min (kPa)	35	35	35	35	35	28	25	25	25	25
● 145770 3H0 0,30÷3,00 m³/h	25	1 1/4”	Flow rates (m³/h)	0,3	0,6	0,9	1,5	1,5	1,8	2,1	2,4	2,7	3
			Δp min (kPa)	35	35	35	35	35	35	35	35	35	35

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

130

tech. broch. 01251

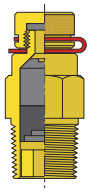
Electronic flow rate and differential pressure measuring station.
Supplied complete with shut-off and connection fittings.
Can be used for measuring the flow rate of balancing valves 130 series and of the flow metering device 683 series.
Suitable for Δp measurement of automatic flow rate regulators.
Electric supply from battery.
Bluetooth® transmission between Δp measuring station and remote control unit.
Versions complete with remote control unit with Android® application for Smartphone and Tablet.
Measurement range: 0–1000 kPa.
Static Pmax: 1000 kPa.

Smart Balancing Caleffi
Available app for smartphone.
Download for your Android® mobile phone.

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

100

tech. broch. 01041



Pair of fast-plug pressure/temperature test ports.
Their special construction allows rapid and accurate measurements while ensuring leaktightness.
Can be used for:
- checking the working range of AUTOFLOW®;
- checking the clog degree of strainers;
- checking the heat output of the terminals.

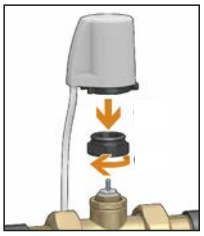
Cap cover facing available in:
- Red for upstream pressure test port.
- Green for downstream pressure test port.

Brass body.
EPDM seals.
Max. working pressure: 30 bar.
Temperature range: -5–130°C.

Code	
100000	1/4"

6562

tech. broch. 01198

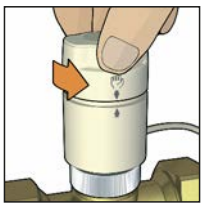


Thermo-electric actuator.
With opening position indicator.
Quick-coupling installation, with a clip adapter.
For valves 338, 339, 401, 402, 425, 426, 421, 422, 455, 456, 220, 221, 222, 223, 224, 225, 226 and 227 series. Normally closed.
With auxiliary microswitch.
Supply: 230 V (ac) or 24 V (ac)/(dc).
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.
Cable length: 80 cm.

Code	Supply voltage V	
656212	230	
656214	24	
656202	230	without auxiliary microswitch
656204	24	without auxiliary microswitch

6563

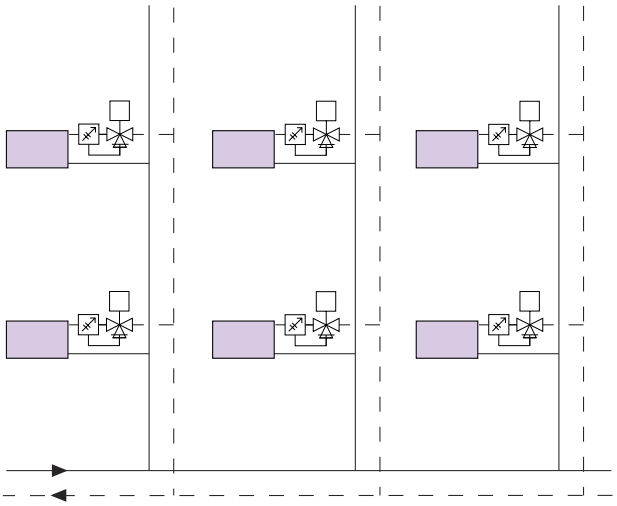
tech. broch. 01142



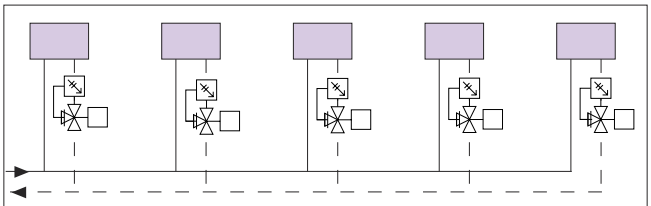
Thermo-electric actuator.
With manual opening and position indicator.
For valves 338, 339, 401, 402, 425, 426, 421, 422, 455, 456, 220, 221, 222, 223, 224, 225, 226 and 227 series.
Normally closed.
With auxiliary microswitch.
Supply: 230 V (ac) or 24 V (ac)/(dc).
Power consumption: 3 W.
Starting current: ≤ 1 A.
Starting current (656344/54): ≤ 250 mA.
Auxiliary microswitch contact rating: 0,8 A (230 V).
Ambient temperature range: 0–50°C.
Protection class: IP 40.
Cable length: 80 cm.

Code	Supply voltage V	
656312	230	
656314	24	
656302	230	without auxiliary microswitch
656304	24	without auxiliary microswitch

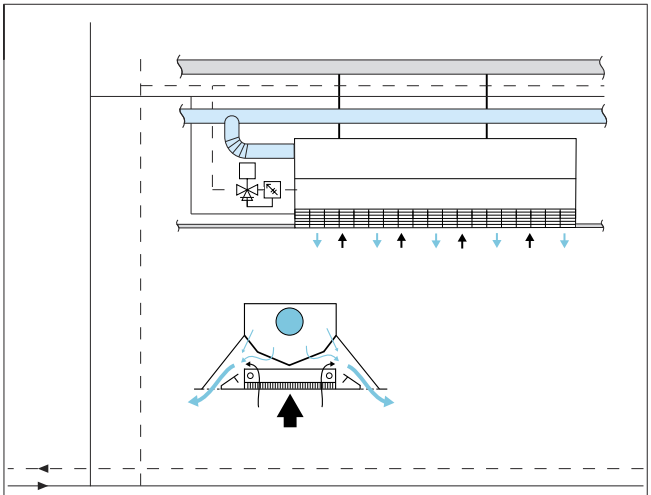
Pressure independent control valve applications ( )



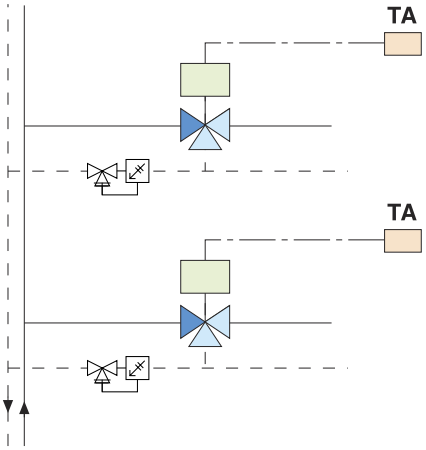
To ensure that the required amount of medium flows through each terminal.



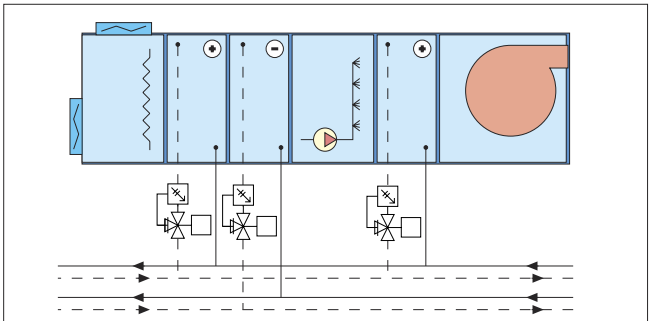
For use in line with various types of heat emitter: radiators, convectors, fan convectors, thermal strips, etc.



To adjust flow rate in applications with chilled beams.



To guarantee the design flow rates (with open or closed valve) to the various zones of a system.



To balance circuits that serve air conditioning units.

SPECIFICATION SUMMARY

145 series FLOWMATIC®

Pressure independent control valve (PICV). Size DN 15 (DN 20 and DN 25). Main connections 3/8" (from 3/8" to 1 1/4") 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 50%. 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 ±15%. Maximum flow rate, with 656. series thermo-electric actuator fitted, reduced by 20% for flow rates 0,08–0,4/0,08–0,8/0,12–1,2 m^3/h (25% for flow rates 0,18–1,8/0,30–3,0 m^3/h) Flow rate adjustment range 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, 0,30–3,0 m^3/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.

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