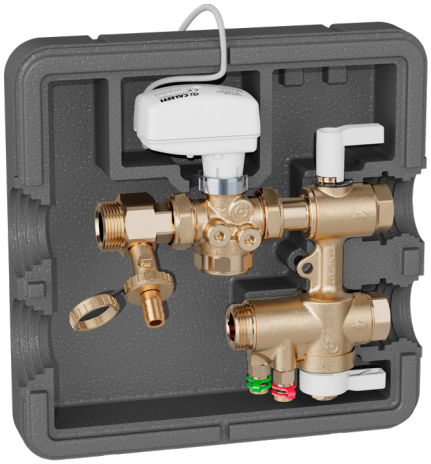
Connection and regulation kit for HVAC terminal units

149 series

01336/20 EN
replaces 01336/18 GB



Function

The pre-assembled kit for terminal units is compact and able to shut-off, adjust and filter the secondary circuit of the terminal unit. It also allows to perform maintenance and setting operations of the system.
It allows the connection of fan-coils, cold beams or ceiling-mounted air-conditioning systems with the main distribution system.
Complete with insulation suitable for both heating and cooling.
Available with Venturi device for flow rate measurement.

Product range

149 series connection and regulation kit for HVAC terminal units ____ size DN 15 (1/2" F x 3/4" M)
____ DN 20 (3/4" F x 1" M), DN 25 (1" F x 1 1/4" M)

Reference documentation

- Tech. broch. 01262 Proportional thermo-electric actuator for flow rate control valve. 6565 series.
- Tech. broch. 01262 Pressure independent control valve (PICV) FLOWMATIC®. 145 series.

Technical specifications

Materials

Body:	dezincification resistant alloy CR EN 12165 CW602N
Strainer mesh:	AISI 304
Shut-off valves knobs:	PA6G30

PICV

Headwork:	dezincification resistant alloy CR EN 12164 CW602N
Control stem and piston:	stainless steel EN 10088-3 (AISI 303)
Obturator seat:	-0,02–0,4/0,08–0,8/0,12–1,2 m³/h: PTFE -0,18–1,8/0,37–3,70 m³/h: 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
Preset indicator:	PA6G30
Knob:	PA6

Connections

System side: 1/2" F (DN 15) - 3/4" F (DN 20) - 1" F (DN 25)
Terminal unit side: 3/4" M (DN 15) - 1" M (DN 20) - 1 1/4" M (DN 25)

Performance

Medium: water, glycol solutions

Maximum percentage of glycol:	50 %
Max. working pressure:	25 bar
Max. differential pressure with actuator code 145013 and 6565 series thermo-electric actuators:	4 bar
Working temperature range:	-10–120 °C
Ambient temperature range:	0–50 °C
Nominal Δp operating range:	25-400 kPa
Flow rate regulation range:	0,02–3,70 (see hydraulic characteristics)

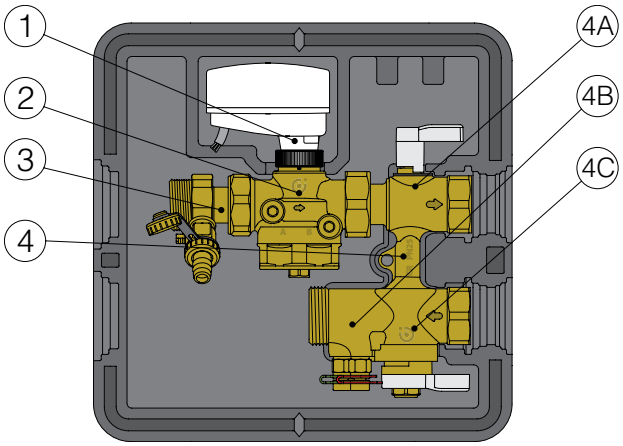
Accuracy: ± 5 % of the set point
Leakage: class V in accordance with EN 60534-4

Type:	diaphragm
Strainer mesh size:	800 µm

Insulation

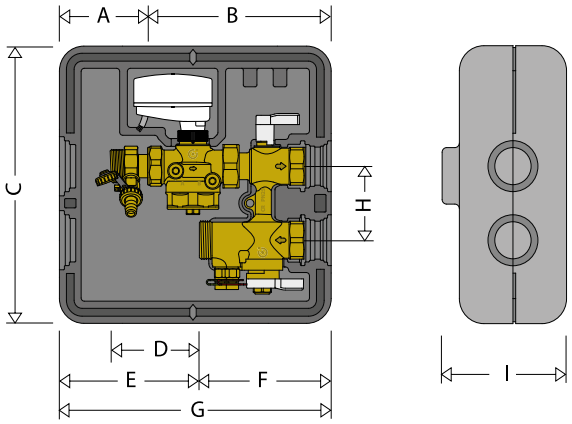
Material:	PPE
Density:	30 kg/m³
Thermal conductivity:	0,037 W/(m·K) at 10 °C
Reaction to fire (UL94):	HBF class

Characteristic components



1. Actuator (optional)
2. Pressure independent control valve (PICV)
3. Fill/drain cock (optional)
4. By-pass kit composed of:
   - 4A. Three-way shut-off valve
   - 4B. Venturi device for flow rate measurement with connections for pressure test ports (in 149.00 codes only)
   - 4C. Three-way shut-off valve with built-in strainer

Dimensions

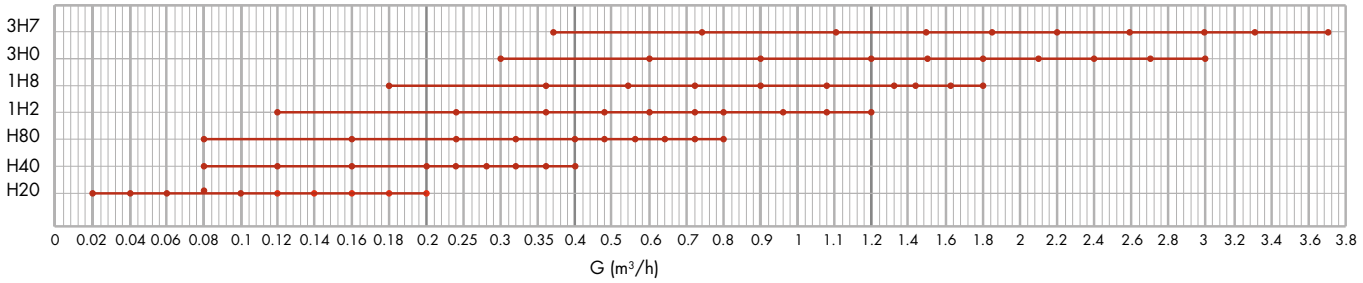


	A	B	C	D	E	F	G	H	I
DN 15	109	191	300	83	150	150	300	80	137
DN 20	109	191	300	94	154	146	300	80	137
DN 25	100	200	300	109	154	146	300	80	137

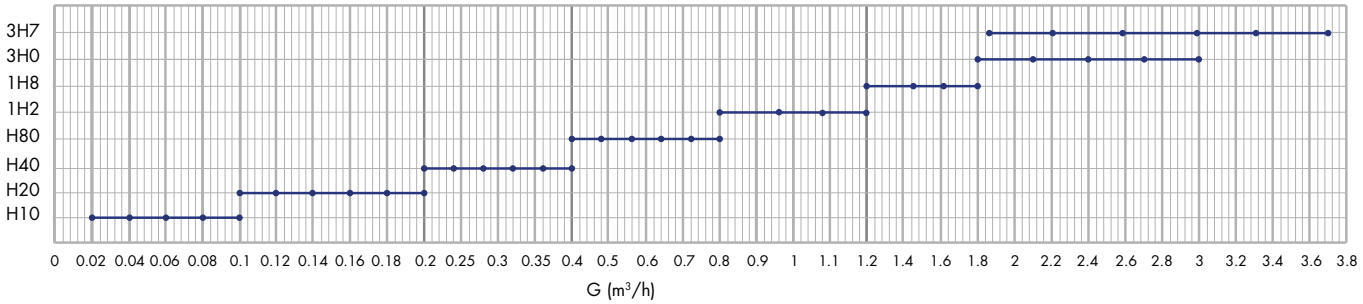
	Mass (kg)
DN 15	2.4
DN 20	2.5
DN 25	3.0

Flow rate range shortcut charts

Kit without Venturi device



Kit with Venturi device



Actuators / thermo-electric actuators compatible with series 145 valves

				
	145013	**656524**	**656502**	**656504**
	–	Normally closed	Normally closed	
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	0–50 °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

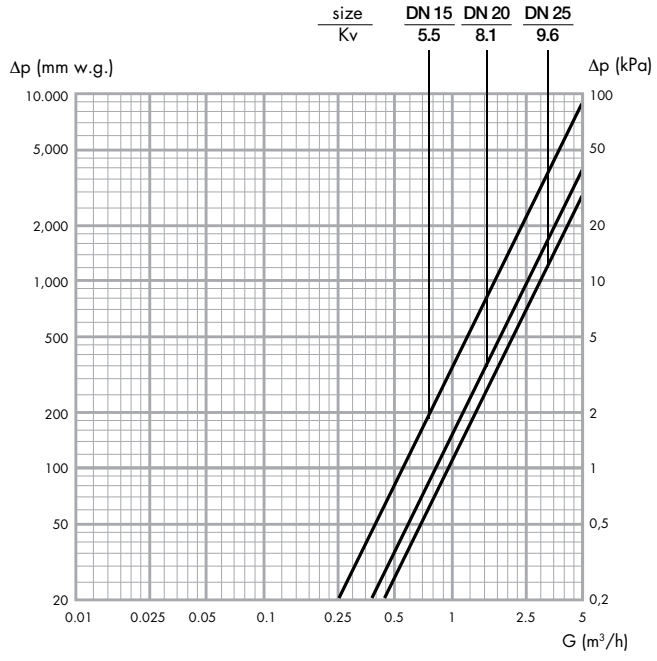
* with factory stroke 4,3 mm

Hydraulic characteristics of the kit without Venturi device

	DN		1	2	3	4	5	6	7	8	9	10
149410 H20 0.02-0.20 m³/h	15	0,02-0,2 (m³/h)	0.02	0.04	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.2
		Δp min PICV (kPa)	25	25	25	25	25	25	25.5	25.5	26	26
		Δp by-pass kit (kPa)	*	*	*	*	*	*	*	*	*	*
149410 H40 0.08-0.40 m³/h	15	0,08-0,4 (m³/h)	-	0.08	0.12	0.16	0.2	0.24	0.28	0.32	0.36	0.40
		Δp min PICV (kPa)	-	25	25.5	26	26	26.5	26.5	27	27	27
		Δp by-pass kit (kPa)	-	*	*	*	*	*	*	*	*	0.5
149410 H80 0.08-0.80 m³/h	15	0,08-0,8 (m³/h)	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.8
		Δp min PICV (kPa)	25	25	25.5	26	26	27	27.5	28	28.5	29
		Δp by-pass kit (kPa)	*	*	*	*	0.5	0.8	1	1.4	1.7	2.1
149510 H20 0.02-0.20 m³/h	20	0,02-0,2 (m³/h)	0.02	0.04	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.2
		Δp min PICV (kPa)	25	25	25	25	25	25	25.5	25.5	26	26
		Δp by-pass kit (kPa)	*	*	*	*	*	*	*	*	*	*
149510 H40 0.08-0.40 m³/h	20	0,08-0,4 (m³/h)	-	0.08	0.12	0.16	0.2	*0.24*	0.28	0.32	0.36	0.40
		Δp min PICV (kPa)	-	25	25.5	26	26	26.5	26.5	27	27	27
		Δp by-pass kit (kPa)	-	*	*	*	*	*	*	*	*	*
149510 H80 0.08-0.80 m³/h	20	0,08-0,16 (m³/h)	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.8
		Δp min PICV (kPa)	25	25	25.5	26	26	27	27.5	28	28.5	29
		Δp by-pass kit (kPa)	*	*	*	*	*	*	0.5	0.6	0.8	1
149510 1H2 0.12-1.20 m³/h	20	0,12-1,2 (m³/h)	0.12	0.24	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2
		Δp min PICV (kPa)	25	25	25.5	26	26	26.5	26.5	27	27.5	28
		Δp by-pass kit (kPa)	*	*	*	*	0.5	0.8	1.1	1.4	1.8	2.2
149610 1H8 0.18-1.80 m³/h	25	0,18-1,8 (m³/h)	0.18	0.36	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8
		Δp min PICV (kPa)	35	35	35	35	35	28	25	25	25	25
		Δp by-pass kit (kPa)	*	*	*	0.6	0.9	1.3	1.7	2.3	2.8	3.5
149610 3H0 0.3-3.00 m³/h	25	0,3-3 (m³/h)	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
		Δp min PICV (kPa)	35	35	35	35	35	35	35	35	35	35
		Δp by-pass kit (kPa)	*	*	*	1.6	2.4	3.5	4.8	6.3	7.9	9.8
149610 3H7 0.37-3.70 m³/h	25	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
		Δp min PICV (kPa)	48	48	48	48	45	45	43	43	43	43
		Δp by-pass kit (kPa)	0.2	0.6	1.4	2.4	3.7	5.4	7.3	9.5	12.0	14.9

(*) Values not indicated as ΔP negligible (ΔP by-pass kit < 0,5 kPa)

By-pass kit (without Venturi)



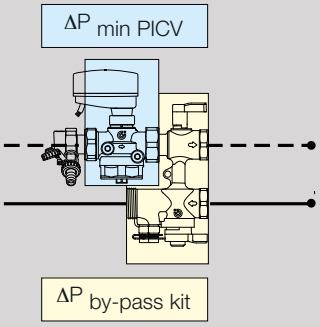
	DN 15	DN 20	DN 25
Kv kit bypass (m³/h)	5,5	8,1	9,6

Minimum differential pressure required

To choose the pump you need to add the minimum pressure difference required by the kit to the fixed pressure drops of the most disadvantaged circuit.
The minimum Δp of the connection and regulation kit is obtained:

$$\Delta P_{min\ group} = \Delta P_{by\text{-}pass\ kit} + \Delta P_{min\ PICV}$$

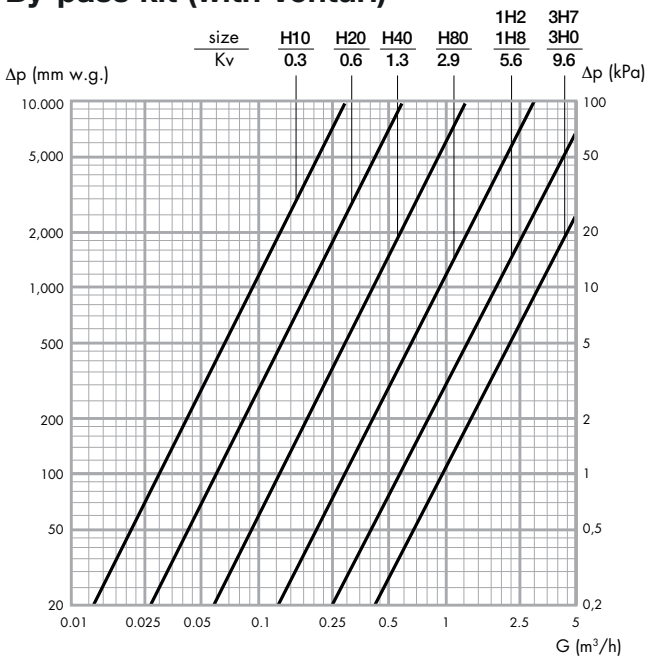
where:
$\Delta p_{bypass\ kit}$ = by-pass kit pressure drop
$\Delta p_{min\ PICV}$ = minimum PICV pressure drop



Hydraulic characteristics of the kit with Venturi device

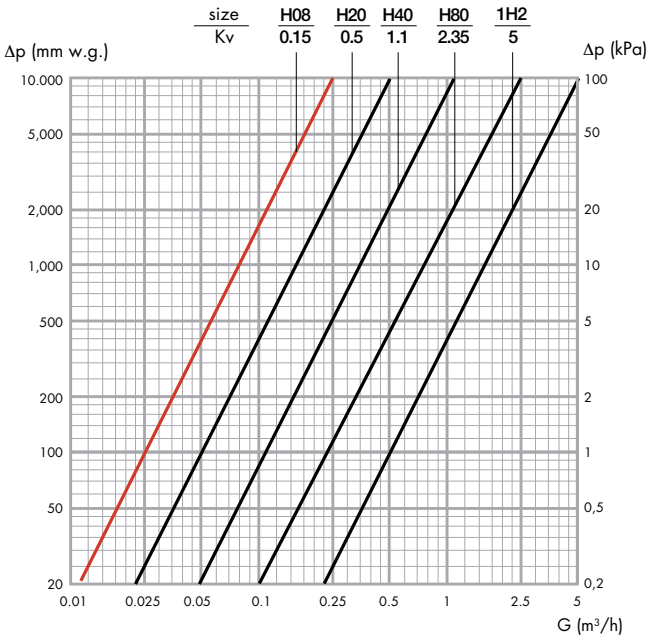
	DN	Kv Venturi (m³/h)		1	2	3	4	5	6	7	8	9	10
149400 H10 0.02-0.10 m³/h	15	0.25	0,02-0,1 (m³/h)	0.02	0.04	0.06	0.08	0.1	-	-	-	-	-
			Δp min PICV (kPa)	25	25	25	25	25	-	-	-	-	-
			Δp by-pass kit (kPa)	0.5	1.8	4	7.1	11.1	-	-	-	-	-
149400 H20 0.10-0.20 m³/h	15	0.50	0,1-0,2 (m³/h)	-	-	-	-	0.1	0.12	0.14	0.16	0.18	0.2
			Δp min PICV (kPa)	-	-	-	-	25	25	25.5	25.5	26	26
			Δp by-pass kit (kPa)	-	-	-	-	2.8	4	5.4	7.1	9	11.1
149400 H40 0.20-0.40 m³/h	15	1.10	0,2-0,4 (m³/h)	-	-	-	-	0.2	0.24	0.28	0.32	0.36	0.40
			Δp min PICV (kPa)	-	-	-	-	26	26.5	26.5	27	27	27
			Δp by-pass kit (kPa)	-	-	-	-	2.4	3.4	4.6	6.1	7.7	9.5
149400 H80 0.40-0.80 m³/h	15	2.35	0,4-0,8 (m³/h)	-	-	-	-	0.4	0.48	0.56	0.64	0.72	0.8
			Δp min PICV (kPa)	-	-	-	-	26	27	27.5	28	28.5	29
			Δp by-pass kit (kPa)	-	-	-	-	1.9	2.7	3.7	4.9	6.2	7.6
149500 H10 0.02-0.10 m³/h	20	0.25	0,02-0,1 (m³/h)	0.02	0.04	0.06	0.08	0.1	-	-	-	-	-
			Δp min PICV (kPa)	25	25	25	25	25	-	-	-	-	-
			Δp by-pass kit (kPa)	0.5	1.8	4	7.1	11.1	-	-	-	-	-
149500 H20 0.02-0.20 m³/h	20	0.50	0,1-0,2 (m³/h)	-	-	-	-	0.1	0.12	0.14	0.16	0.18	0.2
			Δp min PICV (kPa)	-	-	-	-	25	25	25.5	25.5	26	26
			Δp by-pass kit (kPa)	-	-	-	-	2.8	4	5.4	7.1	9	11.1
149500 H40 0.20-0.40 m³/h	20	1.10	0,2-0,4 (m³/h)	-	-	-	-	0.2	0.24	0.28	0.32	0.36	0.40
			Δp min PICV (kPa)	-	-	-	-	26	26.5	26.5	27	27	27
			Δp by-pass kit (kPa)	-	-	-	-	2.4	3.4	4.6	6.1	7.7	9.5
149500 H80 0.40-0.80 m³/h	20	2.35	0,4-0,8 (m³/h)	-	-	-	-	0.4	0.48	0.56	0.64	0.72	0.8
			Δp min PICV (kPa)	-	-	-	-	26	27	27.5	28	28.5	29
			Δp by-pass kit (kPa)	-	-	-	-	1.9	2.7	3.7	4.9	6.2	7.6
149500 1H2 0.80-1.20 m³/h	20	5.00	0,84-1,2 (m³/h)	-	-	-	-	-	-	0.84	0.96	1.08	1.2
			Δp min PICV (kPa)	-	-	-	-	-	-	26.5	27	27.5	28
			Δp by-pass kit (kPa)	-	-	-	-	-	-	2.3	2.9	3.7	4.6
149600 1H8 1.20-1.80 m³/h	25	5.00	1,26-1,8 (m³/h)	-	-	-	-	-	-	1.26	1.44	1.62	1.8
			Δp min PICV (kPa)	-	-	-	-	-	-	25	25	25	25
			Δp by-pass kit (kPa)	-	-	-	-	-	-	5.1	6.6	8.4	10.3
149600 3H0 1.8-3.00 m³/h	25	9.60	1,8-3 (m³/h)	-	-	-	-	-	1.8	2.1	2.4	2.7	3
			Δp min PICV (kPa)	-	-	-	-	-	35	35	35	35	35
			Δp by-pass kit (kPa)	-	-	-	-	-	3.5	4.8	6.3	7.9	9.8
149600 3H7 1.85-3.70 m³/h	25	9.60	1,85-3,70 (m³/h)	-	-	-	-	1.85	2.22	2.59	2.96	3.33	3.70
			Δp min PICV (kPa)	-	-	-	-	45	45	43	43	43	43
			Δp by-pass kit (kPa)	-	-	-	-	3.7	5.4	7.3	9.5	12	14.9

By-pass kit (with Venturi)



	H10	H20	H40	H80	1H2-1H8	3H0-3H7
Kv kit bypass (m³/h)	0,3	0,6	1,3	2,9	5,6	9,6

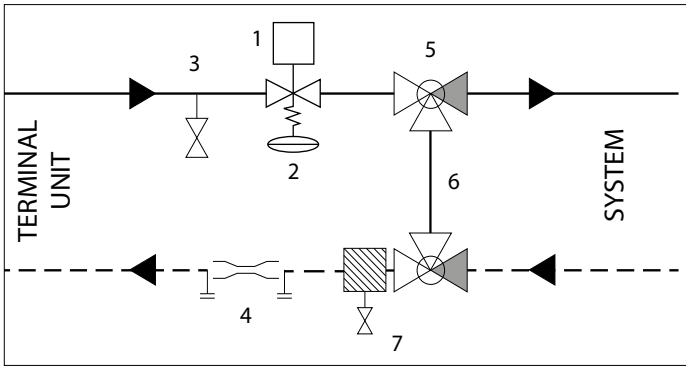
Venturi



	H10	H20	H40	H80	1H2-1H8	3H0-3H7
Kv Venturi (m³/h)	0,25	0,5	1,1	2,35	5,0	9,6

Operating principle

The kit layout is shown in the diagram below:



1. Actuator (optional)
2. Pressure independent control valve (PICV)
3. Fill/drain cock (optional)
4. Venturi device for flow rate measurement with connections for pressure test ports (in 149.00 codes only)
5. Three-way shut-off valve
6. By-pass
7. Shut-off valve with built-in strainer

The kit allows to:

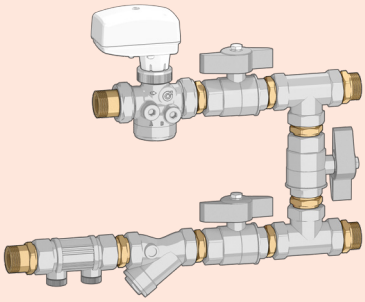
- regulate and maintain the flow rate of the terminal unit constant as the differential pressure conditions of the main circuit change by means of the pressure independent control valve PICV (2);
- isolate the terminal unit through the three-way shut-off valves (5-7);
- bypass the flow through the three-way shut-off valves (5-7) and the integrated by-pass (6);
- filter the inlet water to the terminal unit through the strainer located inside the shut-off valve (7);
- measure the flow rate passing through the terminal unit using the Venturi device with the pressure test ports (4), which make it easy to connect the measuring instrument (in 149.00 codes only);
- clean the circuit and drain the water through the drain cock (optional) (3)

Construction details

Compact body

The kit is designed specifically for small dimensions, compact and easy to install to facilitate the terminal unit connection to the main circuit.

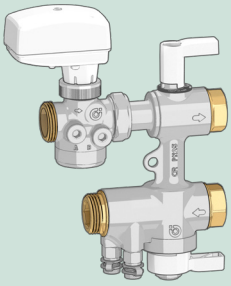
Individual components assembled in site



20 hydraulic connections

Laborious installation and with high risk of hydraulic leakage

Pre-assembled kit

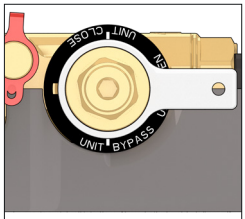


4 hydraulic connections

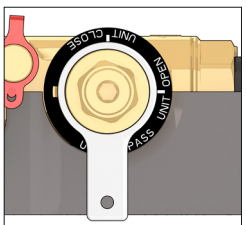
Ease of installation and low risk of hydraulic leakage

Three-way ball valve

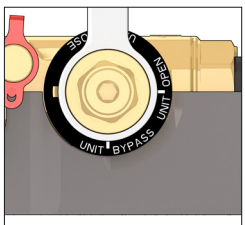
The shut-off valves have been designed with three ways to minimize the dimensions and connections of the kit. The internal ball is designed to open the straight path (A) (for normal operation), the by-pass path (B) (for passage through the by-pass) or to completely close the passage and isolate the circuit of the terminal unit (C).



A - UNIT OPEN



B - UNIT BY-PASS

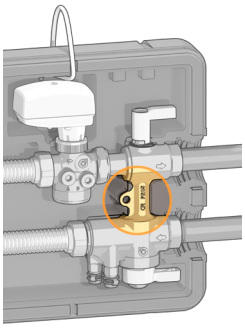


C - UNIT CLOSE

Integrated by-pass

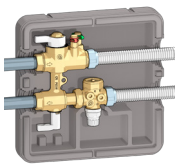
The kit is equipped with a by-pass, which is an indispensable element for each terminal circuit. The by-pass allows to:

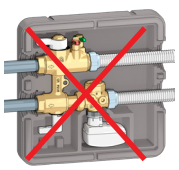
- perform the flushing, washing and cleaning operations of the main circuit pipes without the medium passing through the terminal unit;
- shut off and carry out maintenance operations on the terminal unit.



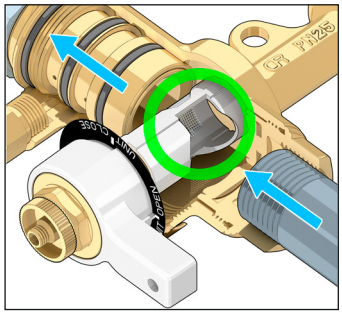
Installation versatility

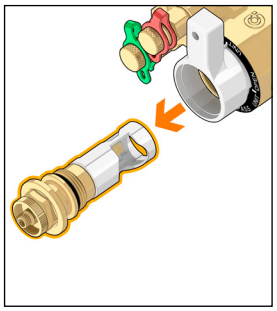
The kit, without actuator, can be installed in any position.
With an actuator fitted the valve can be installed in any position except upside down.





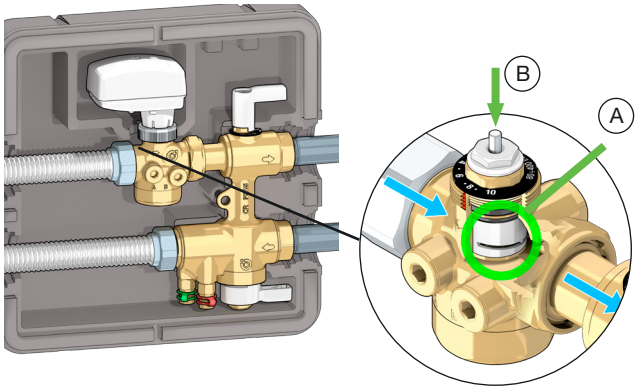
Built-in strainer
The components of a heating and air conditioning system are exposed to degradation caused by the impurities contained in the system circuit. If impurities in the thermal medium are not removed, they can impair operation of the units or components, such as boilers, heat exchangers, or terminal appliances in the circuits, especially during system commissioning.
The cartridge strainer in the kit mechanically blocks the impurities in the thermal medium (before they reach the terminal unit) and captures them by mechanical selection through a specific wire filter mesh.



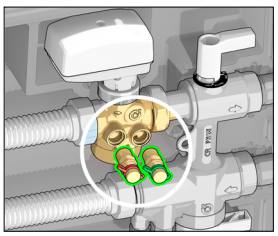


Integrated PICV
The kit is equipped with a pressure independent control valve (PICV) capable of regulating the flow rate and keeping it constant even when the differential pressure conditions of the system change.
The flow rate is adjusted:

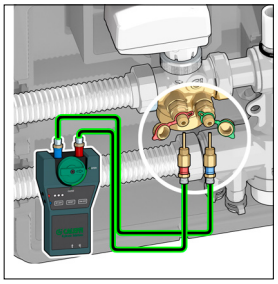
- **manually** on the automatic flow rate regulator, to restrict the maximum value. The adjustment is made turning the locking nut and positioning it on the relative adjustment number: this opens/closes the cross section (A)
- **automatically** by the flow rate control valve in combination with a proportional (0–10 V) or ON/OFF actuator, in accordance with the thermal load requirements of the cross section of the circuit to be controlled. The actuator adjusts the flow rate from the maximum value to the minimum value by acting on the vertical displacement of the control stem (B).



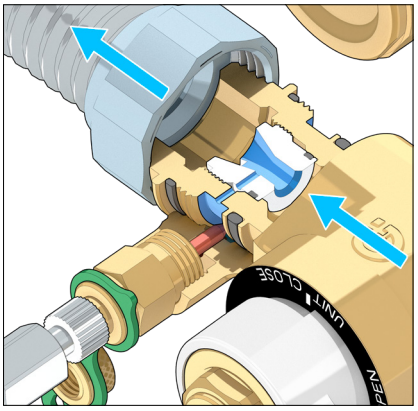
Pressure test ports
The pressure independent control valve has connections for upstream and downstream quick-fit pressure test ports (Caleffi code 100000), to be inserted into the connections with the system cold and not pressurised.



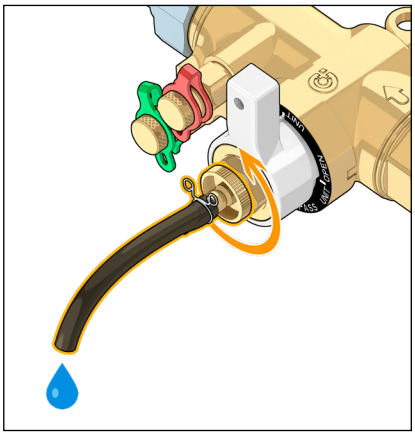
During operation, the valve Δp across the valve can be measured (with the differential pressure meter, Caleffi code 130005/6) to check if the valve is operating in the correct Δp range.



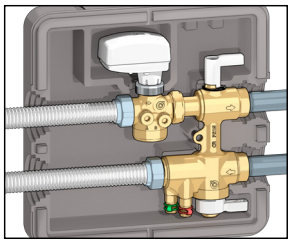
Flow rate meter (in the predisposed versions)
The kit contains a flow rate metering device based on the Venturi effect. The possibility of measuring the flow rate in a simple way facilitates system setting and commissioning operations.
The metering device contains a diaphragm that, by restricting the cross-section of the channel, speeds up the medium and generates increased Δp (as measured) at the ends in order to guarantee precise flow rate measurement. Each differential pressure value (measured at the ends of the diaphragm through the quick-fit pressure test ports) has a corresponding accurate flow rate value, known as the diaphragm Kv value.



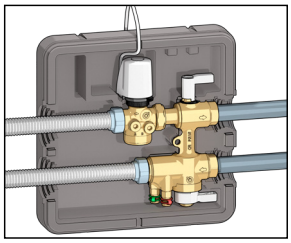
Drain cock with rubber hose
The kit is complete with drain cock and rubber hose for flushing and draining.



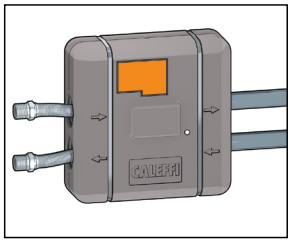
Use with actuators
The kit is designed to function with a proportional linear actuator (code 145014). When controlled by a regulator, the valve can modulate the flow rate in accordance with the system thermal load.



As an alternative to a proportional linear actuator, the valve can also be controlled with an ON/OFF type thermo-electric actuator 656 series, for simpler temperature control logic.



For heating operation, cut the insulation at the actuator, following the slots.

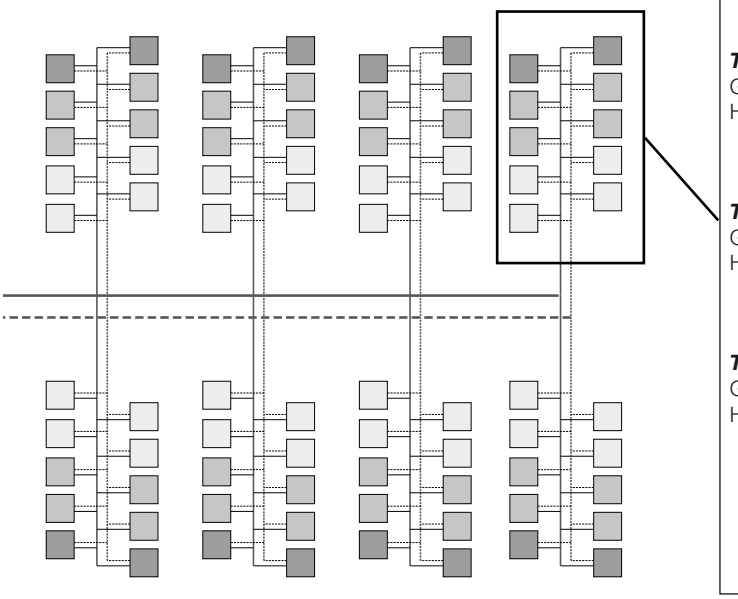


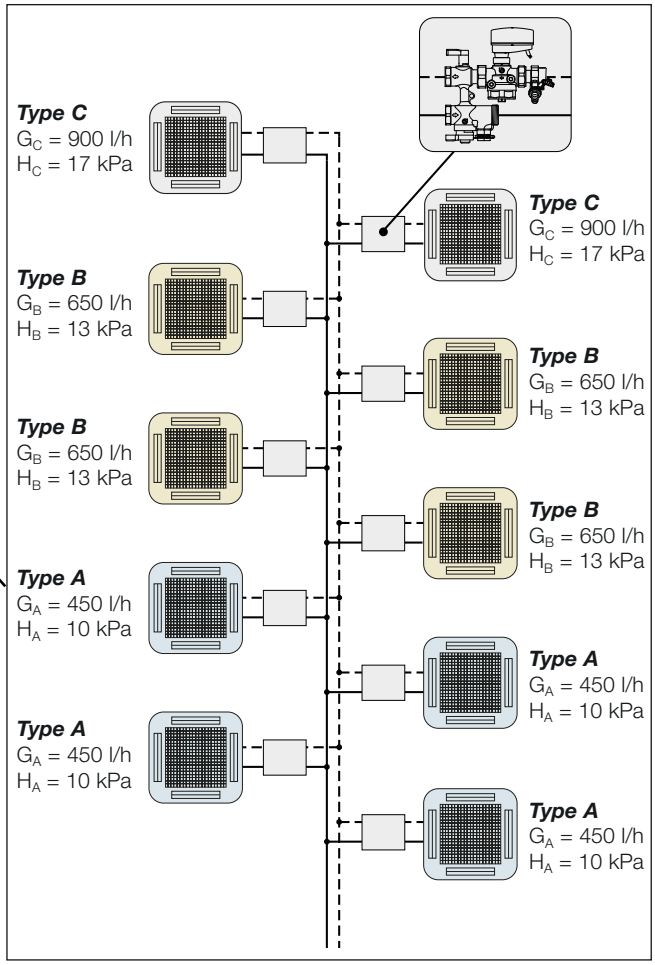
SIZING

Design data
A system size is set up to serve 80 fan coils divided into 8 secondary circuits, as shown in the image below.
In each secondary branch (see box) the system must serve 3 types of fan coil.
The following design data are adopted:

Type A	- Ga = 450 l/h	- Ha = 10 kPa
Type B	- Gb = 650 l/h	- Hb = 13 kPa
Type C	- Gc = 900 l/h	- Hc = 17 kPa

where:
G = design flow rate
H = fan coil design pressure drop



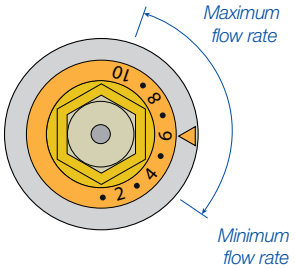


Kit size selection
Each fan coil is served by a kit for which it is necessary to choose:
1- the body size
2- the flow rate range and the related flow rate preset.

1) Kroup without Venturi device
If the choice is directed to a kit without a Venturi device, proceed as follows:

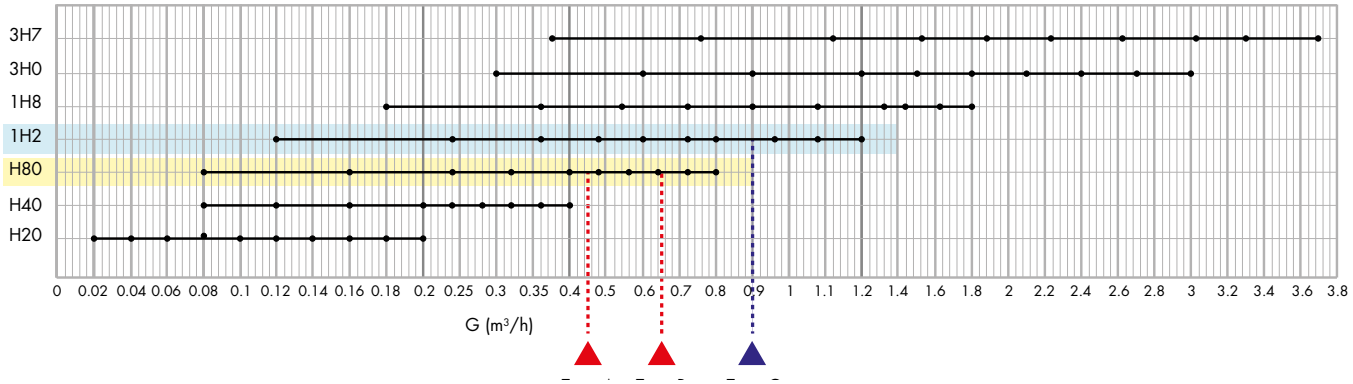
1. The choice of the size is made according to the required flow rates and, if possible, with diameters equal to those of the connections to the batteries of the fan coils.
2. When, as in this case, the pressure independent control valves also work as modulating valves, it is preferable to use the highest possible pre-adjustment positions.

For example, it is preferable to use adjustment positions of the locking nut from 10 to 4 to make the adjustment more stable.
For this reason, for type A and B the flow rate range H80 is chosen, available in sizes DN 15 or DN 20.
For type C, the next size 1H2 is chosen, available exclusively in DN 20.



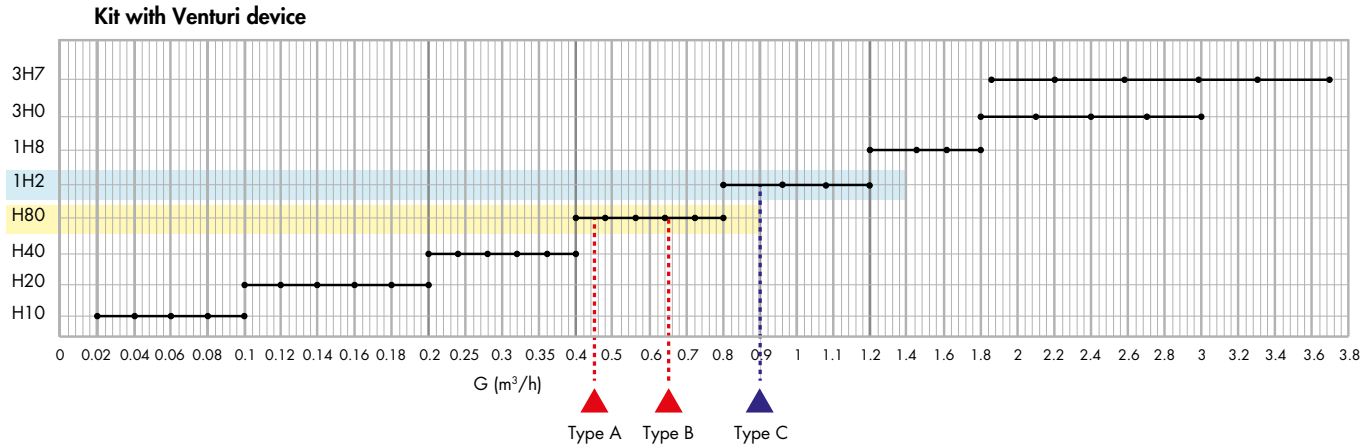
The following sizes can be chosen:
- Type A and B flow rate range H80 - DN size 20
- Type C flow rate range 1H2 - DN size 20

Kit without Venturi device



2) Kit with Venturi device
If the choice is directed towards a kit with Venturi device, it is sufficient to identify the correct flow rate range.

The following sizes can be chosen:
- Type A and B flow rate range H80 - DN size 20
- Type C flow rate range 1H2 - DN size 20



Determination of the ΔP requested at the detachments towards the terminals

Their value is determined with the formula:

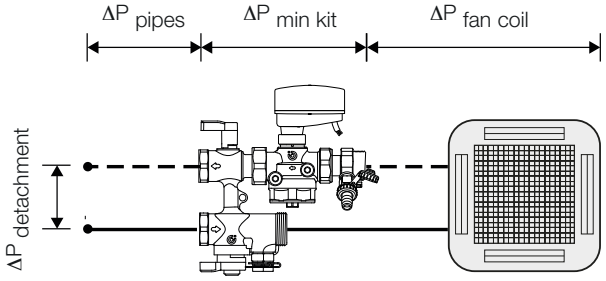
$$\Delta P_{detachment} = \Delta P_{pipes} + \Delta P_{min\ kit} + \Delta P_{fan\ coil}$$

where:

ΔP_{pipes} = pressure drops in the main line-fan coil connection sections (for the sake of simplicity we assume 2 kPa)

$\Delta P_{min\ kit}$ = minimum ΔP of connection and regulation kit
- Type A = 10 kPa
- Type B = 13 kPa
- Type C = 17 kPa

$\Delta P_{fan\ coil}$



1) Kit without Venturi device
The pressure drop of the kit is obtained from the corresponding table known the flow rate and the size of the 149 series kits chosen:

$$\Delta P_{min\ group} = \Delta P_{by\text{-}pass\ kit} + \Delta P_{min\ PICV}$$

Type A
Ga = 450 l/h flow rate range H80 - DN size 20
$\Delta P_{min\ PICV}$ = 27 kPa
$\Delta P_{by\text{-}pass\ kit} \approx 0$ kPa

Type B
Gb = 650 l/h flow rate range H80 - DN size 20
$\Delta P_{min\ PICV}$ = 28 kPa
$\Delta P_{by\text{-}pass\ kit}$ = 0,6 kPa

Type C
Gc = 900 l/h flow rate range 1H2 - DN size 20
$\Delta P_{min\ PICV}$ = 27 kPa
$\Delta P_{by\text{-}pass\ kit}$ = 1,4 kPa

Based on these values the $\Delta P_{min\ kit}$ are:

Type A $\Delta P_{min\ kit}$ = 27 + 0 = 27 kPa
Type B $\Delta P_{min\ kit}$ = 28 + 0,6 = 28,6 kPa
Type C $\Delta P_{min\ kit}$ = 27 + 1,4 = 28,4 kPa

The pressure drops at the detachments are:
Type A $\Delta P_{detachment}$ = 2 + 27 + 10 = 39 kPa
Type B $\Delta P_{detachment}$ = 2 + 28,6 + 13 = 43,6 kPa
Type C $\Delta P_{detachment}$ = 2 + 28,4 + 17 = 47,4 kPa

2) Kit with Venturi device
The pressure drop of the group is obtained from the corresponding table known the flow rate and the size of the 149 series groups chosen:

$$\Delta P_{min\ kit} = \Delta P_{by\text{-}pass\ kit} + \Delta P_{min\ PICV}$$

Type A
Ga = 450 l/h flow rate range H80 - DN size 20
$\Delta P_{min\ PICV}$ = 27 kPa
$\Delta P_{by\text{-}pass\ kit}$ = 2,7 kPa

Type B
Gb = 650 l/h flow rate range H80 - DN size 20
$\Delta P_{min\ PICV}$ = 28 kPa
$\Delta P_{by\text{-}pass\ kit}$ = 4,9 kPa

Type C
Gc = 900 l/h flow rate range 1H2 - DN size 20
$\Delta P_{min\ PICV}$ = 27 kPa
$\Delta P_{by\text{-}pass\ kit}$ = 2,9 kPa

Based on these values the $\Delta P_{min\ kit}$ are:

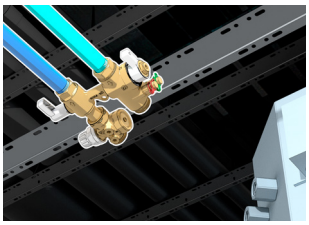
Type A $\Delta P_{min\ kit}$ = 27 + 2,7 = 29,7 kPa
Type B $\Delta P_{min\ kit}$ = 28 + 4,9 = 32,9 kPa
Type C $\Delta P_{min\ kit}$ = 27 + 2,9 = 29,9 kPa

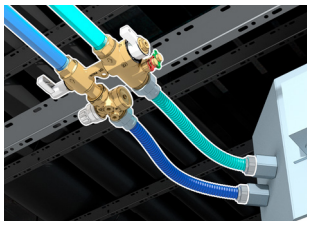
The pressure drops at the detachments are:
Type A $\Delta P_{detachment}$ = 2 + 29,7 + 10 = 41,7 kPa
Type B $\Delta P_{detachment}$ = 2 + 32,9 + 13 = 47,9 kPa
Type C $\Delta P_{detachment}$ = 2 + 29,9 + 17 = 48,9 kPa

Determination of system flow rate and head
Considering that the kit stabilizes the flow rate on all the branches and makes it independent from the various actions, the flow rates that cross the network are exactly the design ones.
Once the flow rates in the various sections have been determined, the pressure drops of the pipes are calculated with the usual formulas.

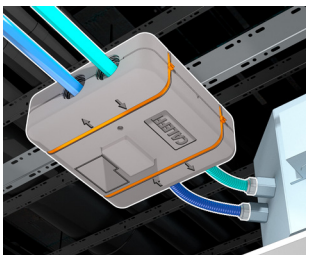
INSTALLATION

Connect the connection and and regulation kit to the main pipe and then to the terminal unit using flexible pipes.

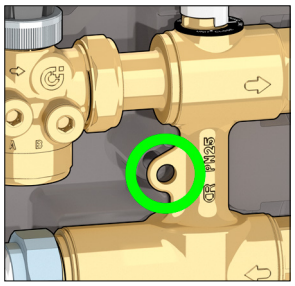


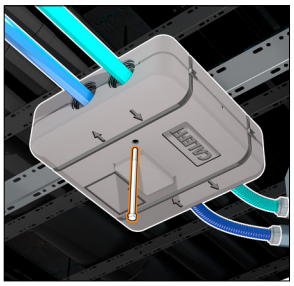


The insulation can be closed with the clamps housed in the appropriate spaces.

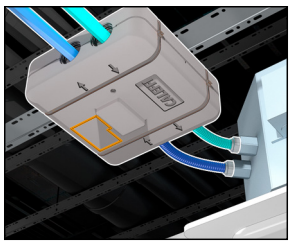


Bracketing
The unit is fitted for bracketing with threaded bar.



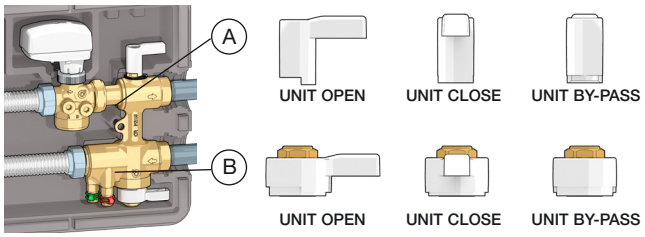


Use in heating system
In order to use the kit with actuator in a heating system, it is necessary to remove the insulation part (pre-cut) that covers the actuator, to avoid overheating.

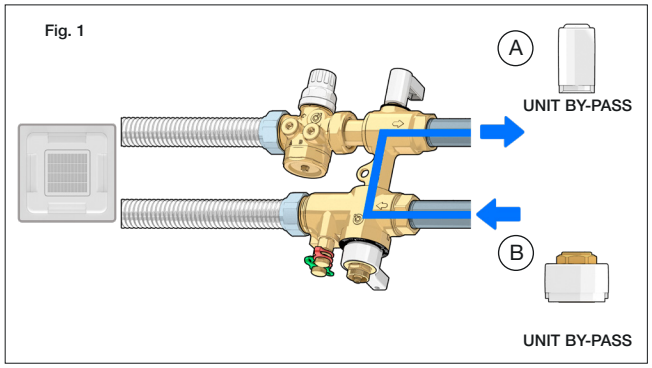


COMMISSIONING

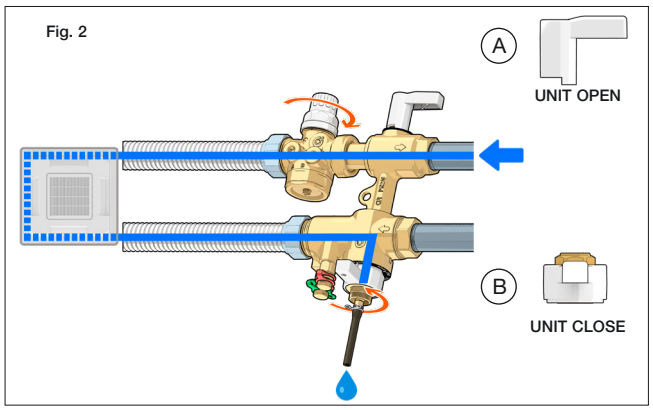
Using different positions of the three-way ball valves (hereinafter referred to as valve A and valve B), different operation configurations can be obtained.



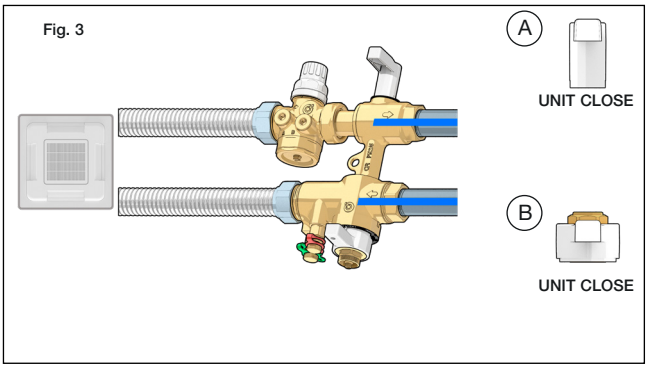
1) Wash in by-pass
Clean the main circuit, by simple washing or using specific products, with the exception of the single terminal unit.
Place both lever A and lever B on "UNIT BY-PASS".



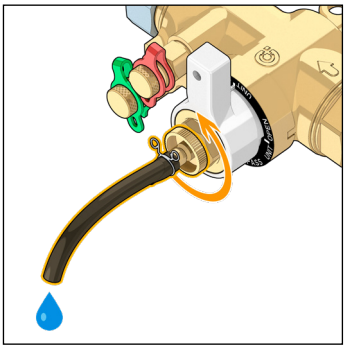
2) Terminal unit washing
Position lever A at "UNIT OPEN" and lever B at "UNIT CLOSE", screw on the rubber hose and unscrew the drain cock.



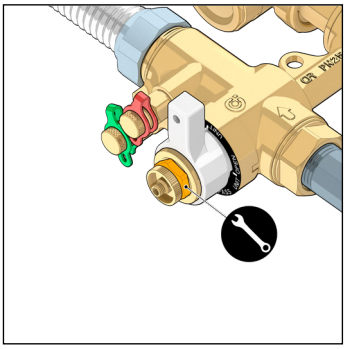
3) Strainer cleaning
To clean the strainer position both levers on “UNIT CLOSE”.



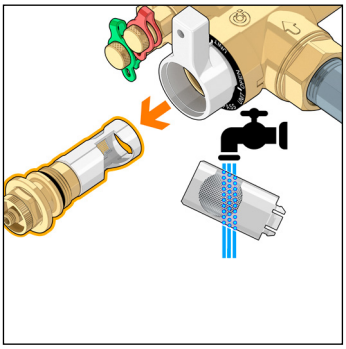
Loosen the locking nut (by about 2 turns) to drain the water from the terminal unit circuit.



Unscrew the strainer cartridge with a 20 mm spanner.

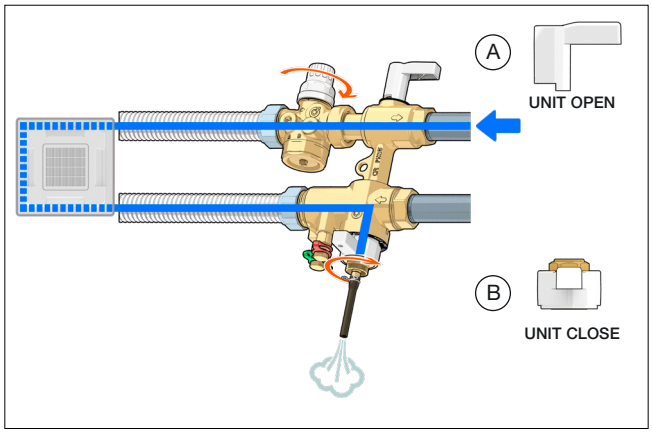


Remove the strainer holder cartridge and clean the strainer under running water.

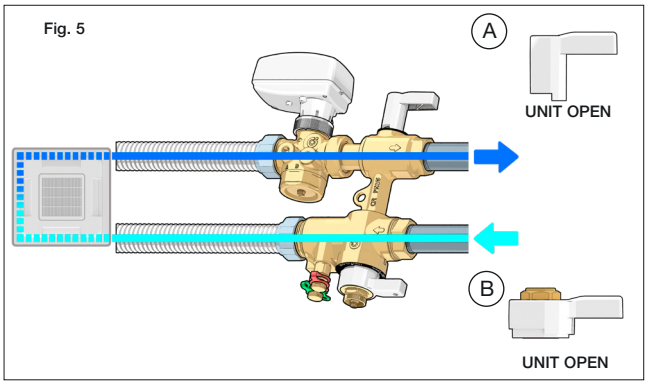


Caution
Tighten the cock locking nut fully and check that there are no leaks.

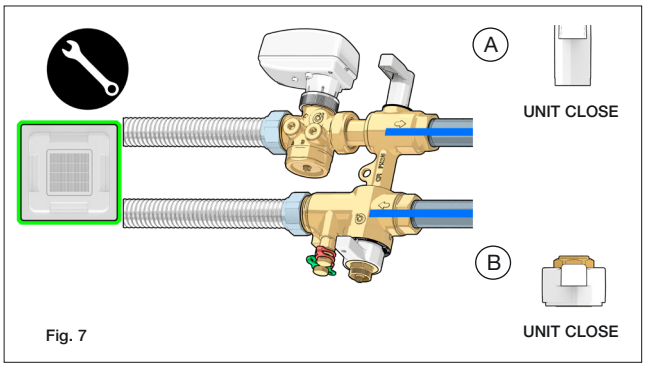
4) Filling
Position lever A at "UNIT OPEN" and lever B at "UNIT CLOSE", and open the PICV with the corresponding knob.
Close the drain cock as soon as the air is completely eliminated.



5) Normal operation
Normal operation involves positioning both valves on "OPEN".
Water passes through the strainer before entering in the terminal unit, protecting the unit against any residues and impurities present in the main circuit water.



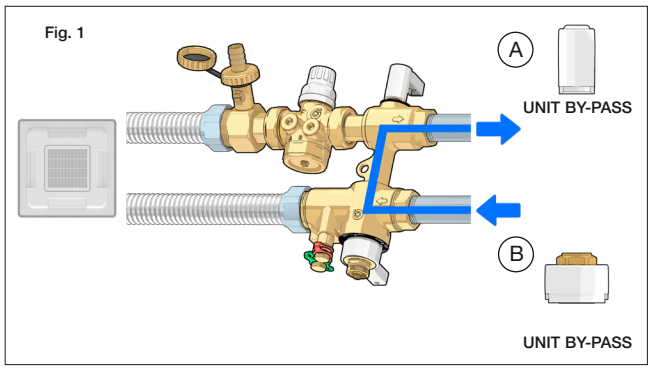
Isolate the line
It is possible to exclude the terminal unit and thus isolate the secondary circuit. This configuration is generally used to perform maintenance on the terminal unit.



COMMISSIONING WITH THE OPTIONAL DRAIN COCK

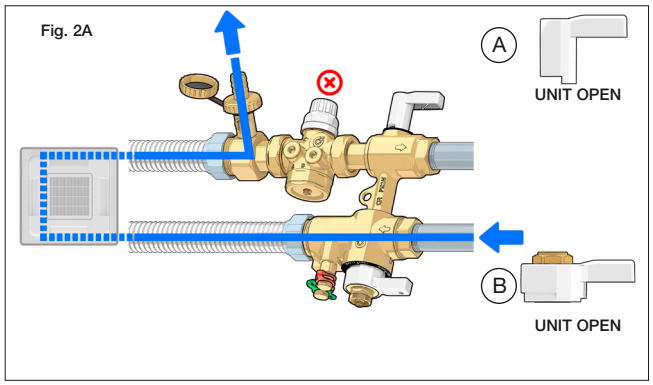
If the kit has the optional drain cock, it can be commissioned as follows.

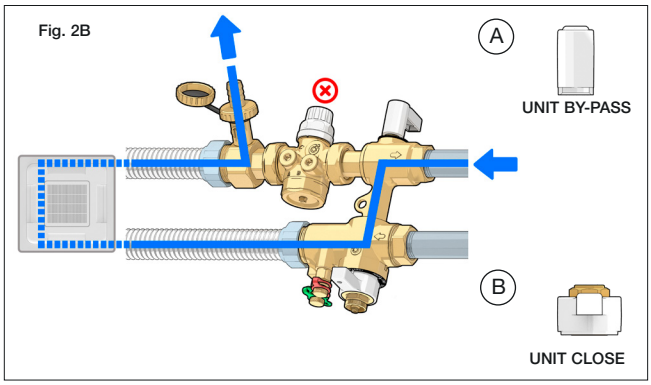
1) Wash in by-pass
Clean the main circuit, by simple washing or using specific products, with the exception of the single terminal unit.
Place both lever A and lever B on "UNIT BY-PASS".



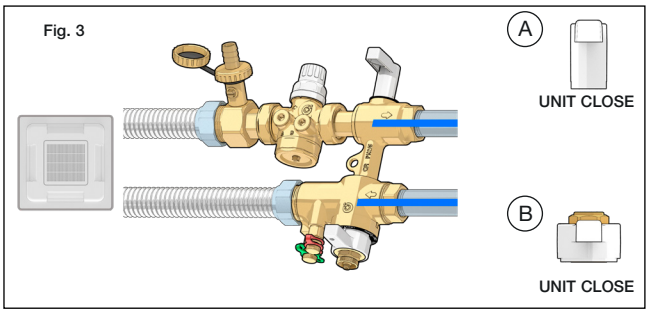
2) Terminal unit washing
Position both levers at “UNIT OPEN”, close the PICV using the knob and open the optional drain cock; in this way it is possible to flush the terminal unit using water from the main circuit without it passing through the PICV (Fig. 2A).

In cases where it is necessary, it is possible to wash the terminal unit even with the configuration shown in fig.2B. In this case, set lever A to "UNIT BY-PASS" and lever B to "UNIT CLOSE".

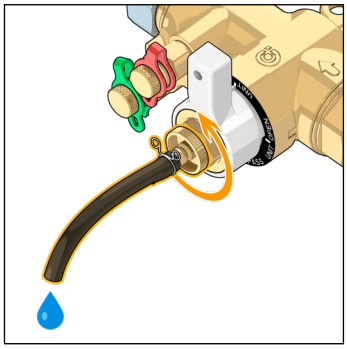




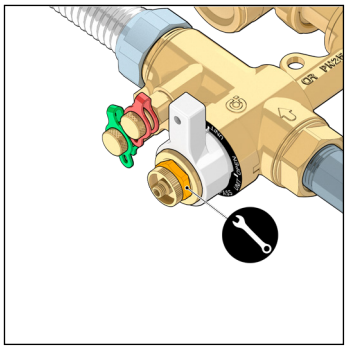
3) Strainer cleaning
To clean the strainer position both levers on “UNIT CLOSE”.



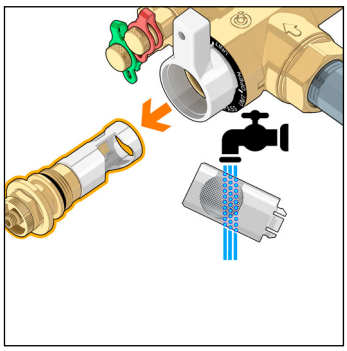
Loosen the locking nut (by about 2 turns) to drain the water from the terminal unit circuit.



Unscrew the strainer cartridge with a 20 mm spanner.



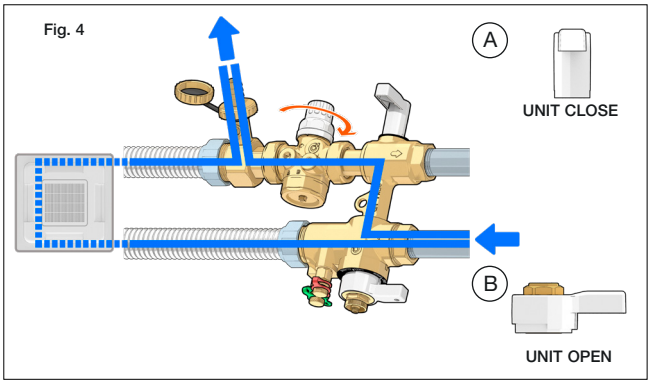
Remove the strainer holder cartridge and clean the strainer under running water.



Caution
Tighten the cock locking nut fully and check that there are no leaks.

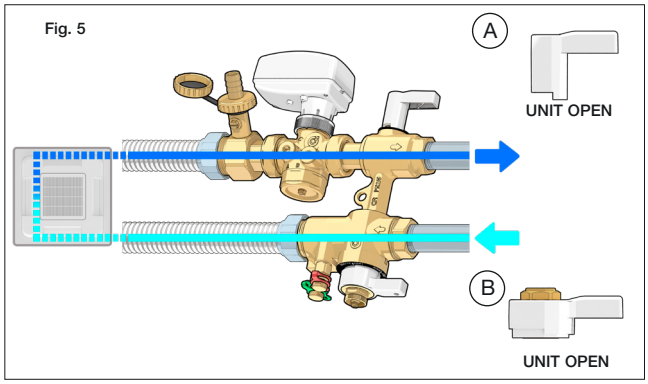
4) Filling
Place lever A on "UNIT CLOSE" and lever B on "UNIT OPEN", open the PICV using the appropriate knob.
Close the drain cock (optional) as soon as the air is completely eliminated.

Fig. 4



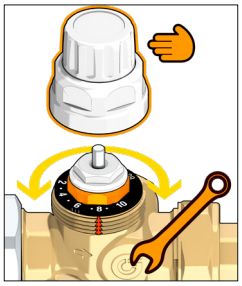
5) Normal operation
Normal operation involves positioning both valves on "OPEN".
Water passes through the strainer before entering in the terminal unit, protecting the unit against any residues and impurities present in the main circuit water.

Fig. 5



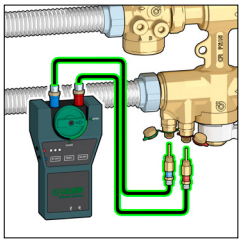
Maximum flow rate regulation

Adjust the maximum flow rate using the PICV adjustment nut. See section "Maximum flow rate regulation".



Check the PICV setting by measuring the flow rate passing through the terminal unit using the Venturi device. See section "Flow rate measurement".

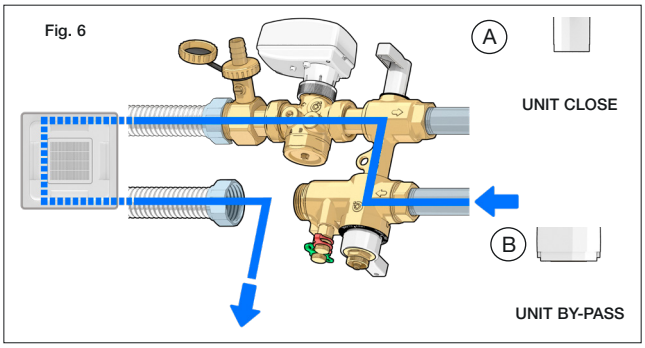
Install the actuator and carry out the electrical connections.



Additional use configurations

Terminal unit back wash
In cases where it is required it is possible to back wash the terminal unit.
Place lever A on "UNIT CLOSE" and lever B on "UNIT BY-PASS" and wash unloading through the open flexible pipe.
This configuration can be performed with the PICV actuator installed.

Fig. 6



Isolate the line
It is possible to exclude the terminal unit and thus isolate the secondary circuit. This configuration is generally used to perform maintenance on the terminal unit.

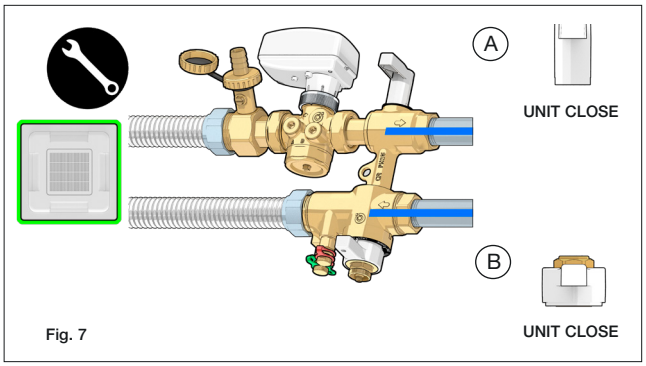


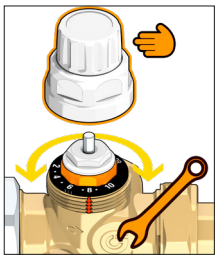
Fig. 7

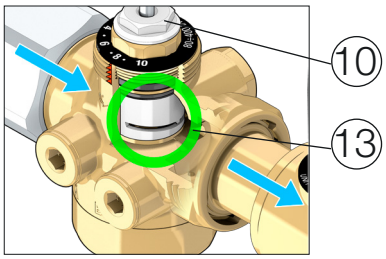
FLOW RATE REGULATION

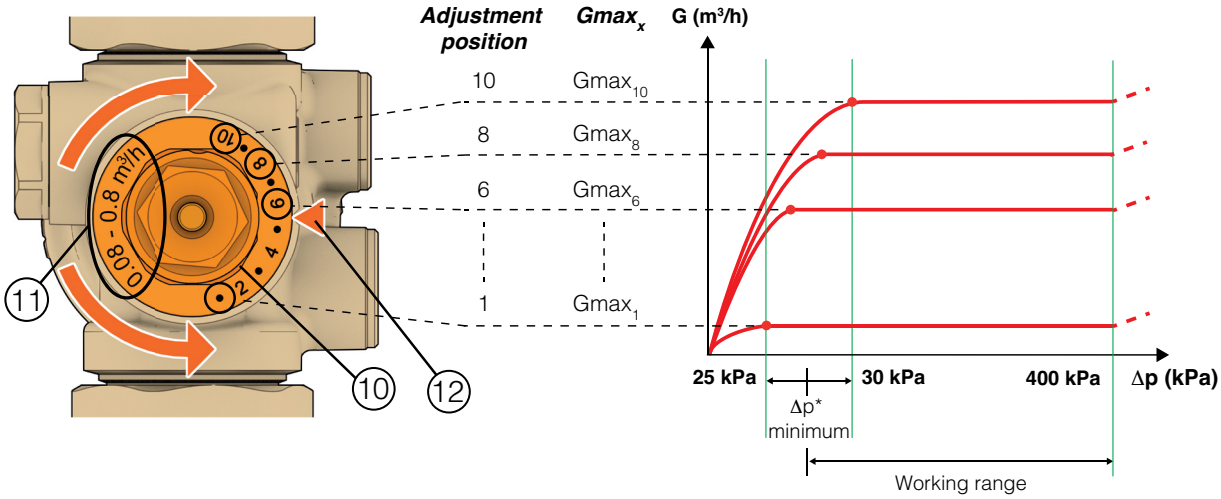
Maximum flow rate regulation

Unscrew the protective cap by hand to gain access to the maximum flow rate adjustment 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 slot (12) on the valve body is the physical positioning reference. Turning the locking nut (10), which determines the number associated with the **“Adjustment position”**, opens/closes the cross section in the external obturator (13).

Hence, each cross section set on the locking nut corresponds to a specific Gmax value.

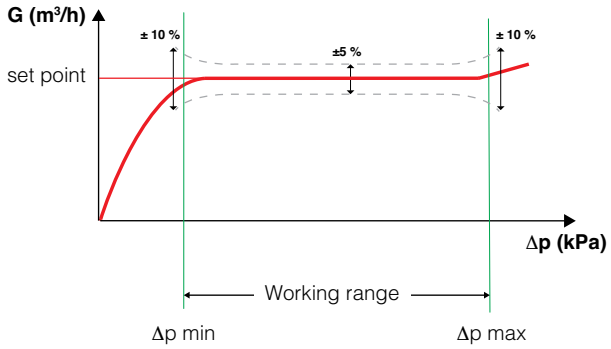






** For more details, see “Hydraulic characteristics of the kit without Venturi device”*

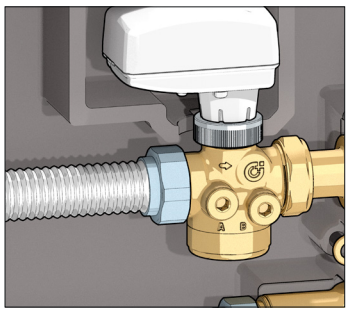
Flow rate accuracy

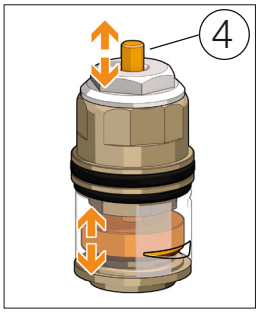


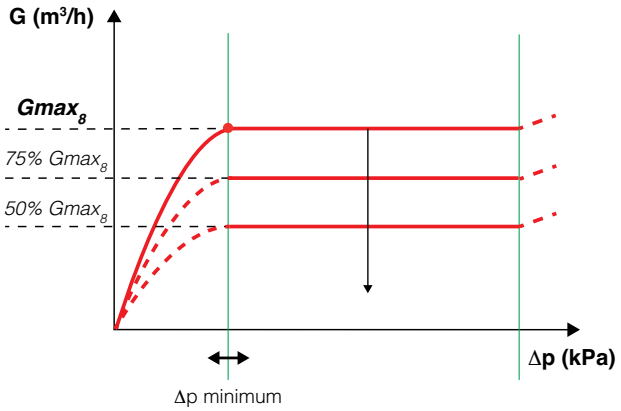
Automatic flow rate regulation with actuator and external regulator

After regulating the maximum flow rate, it is possible fit the actuator (0–10 V) to the valve, code 145013.

Under the control of an external regulator the actuator can change the flow rate from the maximum value set (E.g.: $Gmax_8$) down to the minimum value, depending on the thermal load to be controlled while keeping the systems automatically balanced. The actuator acts on the vertical displacement of the control stem (4). This results in additional opening/closing of the maximum cross section by the internal obturator. *For example, if the maximum flow rate has been set to position 8, the actuator can regulate the flow rate automatically from $Gmax_8$ to completely closed (zero flow rate).*





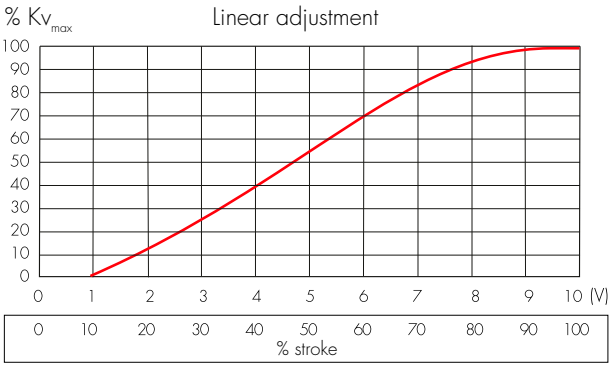


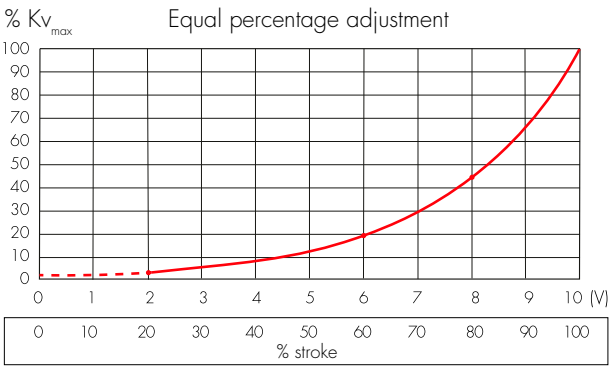
Valve regulating characteristics

The valve regulating characteristic 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 hydraulic characteristic Kv of the device.

The motor is factory set 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.



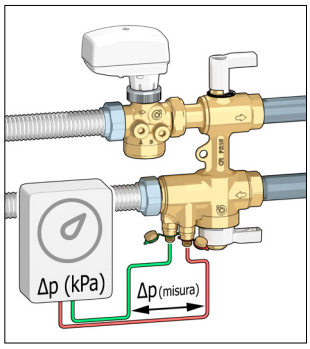


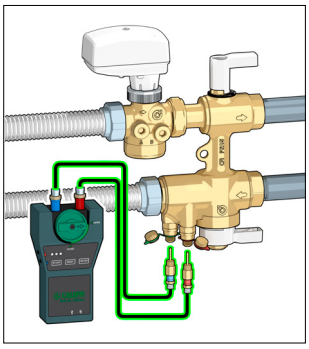
FLOW RATE MEASUREMENT

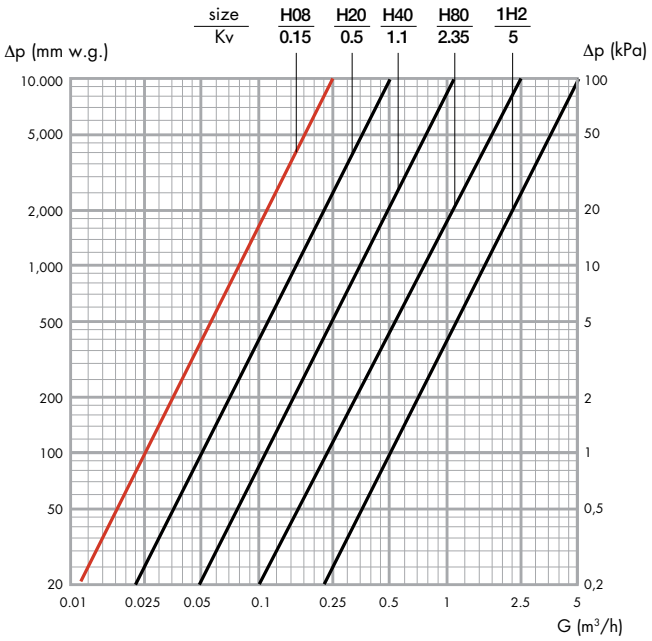
Connect a differential pressure meter to the Venturi device pressure test ports on the kit.
Reading the Δp on the measuring device, to obtain the flow rate G you can refer to the characteristic Venturi diagram of the size being used.
Or, analytically, you can calculate the flow rate by applying the equation:

$$G = Kv_{Venturi} \times \sqrt{\Delta p_{Venturi}} \quad (1.1)$$

	H10	H20	H40	H80	1H2-1H8	3H0-3H7
Kv Venturi (m³/h)	0,25	0,5	1,1	2,35	5,0	9,6



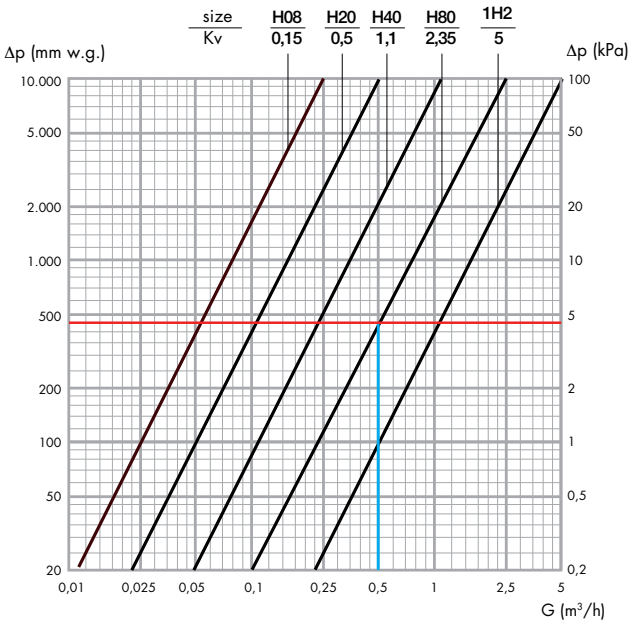




Example of flow rate measurement

Reading a $\Delta p_{Venturi}$ of 4,5 kPa (red line) on an H80 valve and using the characteristic Venturi chart for the valve in question, the x-axis gives a flow rate of 0,5 m³/h (blue line).
Instead, to proceed analytically using the ratio (1.1), a measurement of $\Delta p_{Venturi}$ equal to 4.5 kPa (bearing in mind that the $Kv_{Venturi}$ of the H80 valve is equal to 2,35) leads to the calculation of a flow rate

$$G = 2{,}35 \times \sqrt{0{,}045} = 0{,}5 \text{ m}^3/\text{h} \quad (1.1)$$

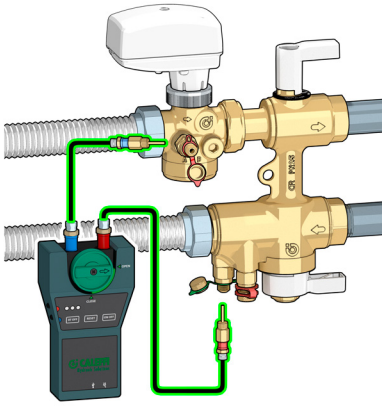


Example of correction for liquid with different density

Liquid density ρ' = 1,1 Kg/dm³
Measured pressure drop $\Delta p_{Venturi}$ = 4.5 kPa
Reference pressure drop Δp' = 4,5 / 1,1 = 4,1 kPa
With this value you use the Venturi diagram for the dimension used or the formula (1.1) and obtain the corresponding flow rate (G) equal to 0,47 m³/h.

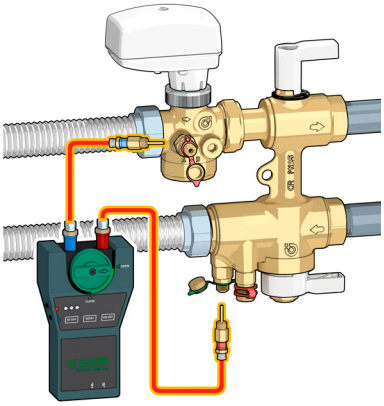
Δp measurement

Connecting the measuring instrument to the low pressure connection of the Venturi device and to the high pressure connection of the PICV it is possible to measure the working Δp of the terminal unit circuit.



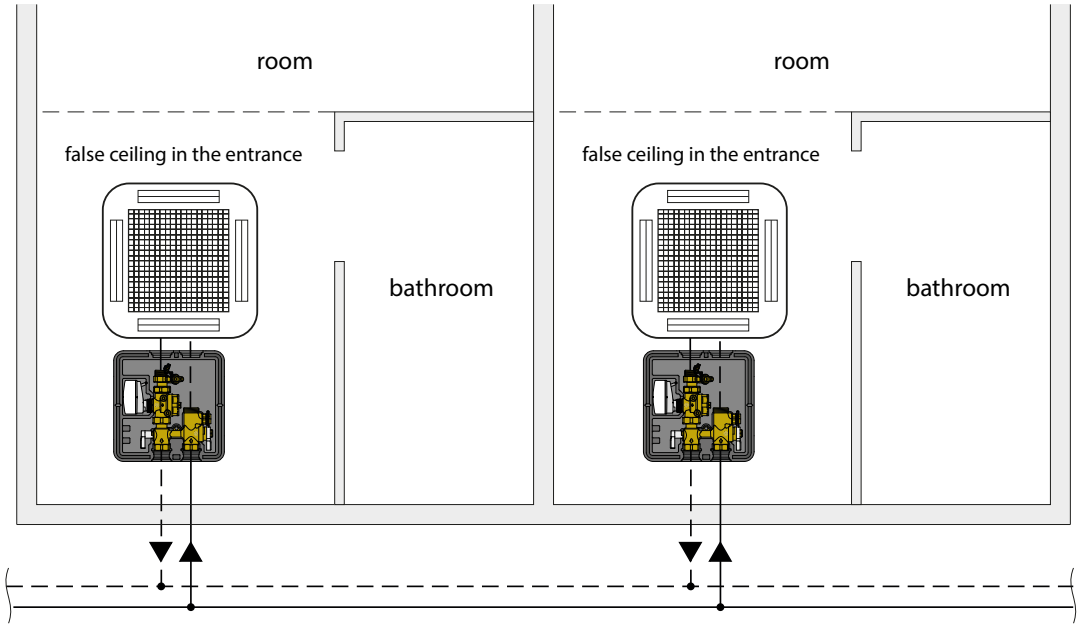
ΔT measurement

Connecting the measuring instrument by means of appropriate probes (optional) to any low pressure test port connection of the Venturi device and to one of the PICVs it is possible to measure the working ΔT of the terminal unit circuit.

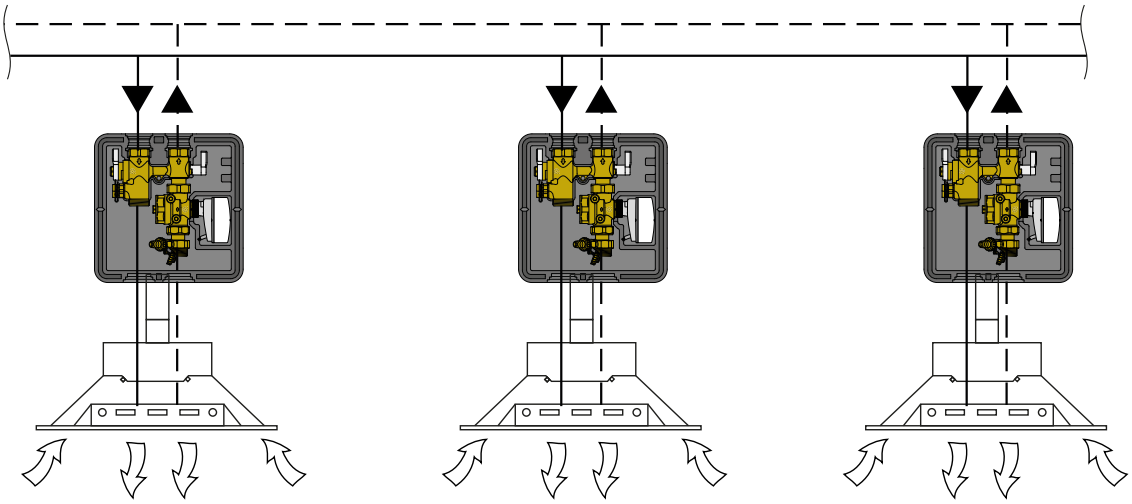


APPLICATION DIAGRAMS

Installation in false ceiling for fancoil service



Installation to serve cold beams



145

Proportional linear actuator for 145 series control valve.
Electric supply: 24 V (AC)/(DC).
Control 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
145013	24 V

6565

Proportional thermo-electric actuator for 145 series FLOWMATIC® control valve and 149 series kit.
Quick-coupling installation with fixing clip adapter.
Normally closed.
Electric supply: 24 V (AC)/(DC).
Running power consumption: 1.2 W.
Control signal: 0–10 V.
Ambient temperature range: 0–60 °C.
Protection class: IP 54.
Connection: M 30 p.1,5.
Electric supply cable: 1 m.
Feedback signal: 0–10 V.

Code	Voltage V
656524	24

6565

Thermo-electric actuator for 145 series FLOWMATIC® control valve and 149 series kit.
Quick-coupling installation with fixing clip adapter.
Normally closed.
Electric supply: 230 V (AC) or 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.
Electric supply cable: 1 m.

Code	Voltage V
656502	230
656504	24

Drain cock for 149 series.

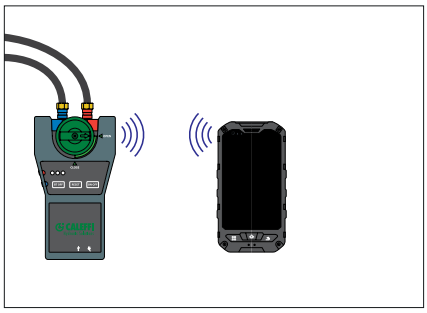
Code		Utilisation
F0000680	3/4" M x 3/4" F	DN 15
F0000681	1" M x 1" F	DN 20
F0000682	1 1/4" M x 1 1/4" F	DN 25

130

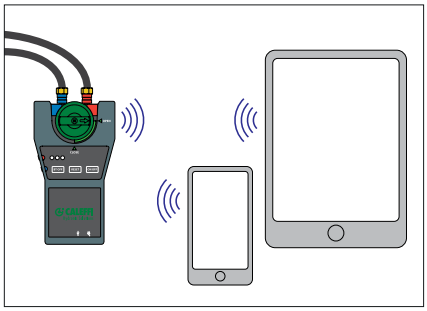
Electronic flow rate and differential pressure meter. Supplied with shut-off valves and connection fittings. May be used for Δp measurements and setting balancing valves.
Bluetooth® transmission between Δp meter and remote control unit. Versions with remote control unit with Android® application for Smartphone and Tablet.
Measurement range: 0–1000 kPa.
Static P_{max}: 1000 kPa.
Battery electric supply.

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

Transmission via Bluetooth® to the terminal with Android® app (code 130006)



Transmission via Bluetooth® to the terminal with Android® app (code 130006)



100

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

Code
100000

SPECIFICATION SUMMARY

149 series

Connection and regulation kit for HVAC terminal units in heating and cooling systems. Complete with: pressure independent control valve, three-way shut-off valves, integrated by-pass, Venturi device with pressure test ports (for dedicated versions only), strainer cartridge, rubber hose and pre-formed shell insulation in EPP.
DN size 15, DN 20 and DN 25. Main connections on system side 1/2" F (from 1/2" to 1"); terminal unit side 3/4" M (from 3/4" to 11/4"). Connections centre distance: 80 mm. Pressure test port connections 1/4" F (ISO 228-1) with cap (only for dedicated versions). Connection for actuators code 145013 and 6565 series thermo-electric actuators M30 p.1,5.
Flow rate regulation range of the kit with Venturi device: 0,02–0,10 m³/h (code 149..0 H10);
0,01–0,20 m³/h (code 149..0 H20); 0,20–0,40 m³/h (code 149..0 H40); 0,40–0,80 m³/h (code 149..0 H80); 0,80–1,20 m³/h (code 149..0 1H2); 1,20–1,80 m³/h (code 149..0 1H8); 1,80–3,00 m³/h (code 149..0 3H0); 1,85–3,70 m³/h (code 149..0 3H7). Flow rate adjustment range of the group without Venturi device: 0,02–0,20 m³/h (code 149..0 H20); 0,08–0,40 m³/h (code 149..0 H40); 0,08–0,80 m³/h (code 149..0 H80); 0,12–1,20 m³/h (code 149..0 1H2); 0,18–1,80 m³/h (code 149..0 1H8); 0,3–3,00 m³/h (code 149..0 3H0); 0,37–3,70 m³/h (code 149..0 3H7). 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. Dispersion class V according to EN60534-4.
Linear or equipotential flow rate adjustment characteristic, which can be set up by actuator depending on the characteristics of the terminal unit.
Maximum working pressure 25 bar. Maximum differential pressure with actuator code 145013 (and 6565 series) installed 5 bar. Nominal working Δp range 25–400 kPa. Accuracy 5 %. Working temperature range -10–120 °C. Ambient temperature range 0–50 °C.
Strainer mesh size 800 µm. Medium: water and glycol solutions; max. percentage of glycol 50 %.
Dezincification resistant alloy body and adjustment headwork; stainless steel strainer mesh; EPDM diaphragm, obturator and seals.

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 0–10 V. Protection class IP 54. Ambient temperature range 0–50 °C. Connection M30 p. 1,5. Supply cable length 2 m.

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. Supply cable length 1 m. Automatic valve stroke 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. Supply cable length 1 m.

Code 100000

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

Code 130005

Electronic flow rate and differential pressure meter without remote control unit, with Android app. Supplied with shut-off valves and connection fittings. Differential pressure 0–1000 kPa. Static pressure: < 1000 kPa. System temperature: -30–120 °C.

Code 130006

Electronic flow rate and differential pressure measuring station with remote control unit and with Bluetooth transmission. Supplied with shut-off valves and connection fittings.
Differential pressure 0–1000 kPa. Static pressure: < 1000 kPa. System temperature: -30–120 °C.

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

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