

Convertible radiator valve for one-pipe and two-pipe systems

455 series



Function

The 455 series convertible radiator valve can be used both on one-pipe and two-pipe radiator systems.

It is fitted for thermostatic control head, thermo-electric actuator and radio wave control, to automatically regulate the ambient temperature.

The valve must be installed only at the radiator lower connection, which is used both as medium inlet and medium outlet.

Reference documentation

- Tech. Broch. 01034 Thermostatic radiator valves
- Tech. Broch. 01009 Convertible radiator valves with thermostatic option. Thermostatic control heads
- Tech. Broch. 01042 Thermo-electric actuator
- Tech. Broch. 01118 Radio wave temperature control systems

Product range

Valve

455 series Convertible radiator valve for one-pipe and two-pipe systems, for copper, single and multi-layer plastic pipes _____ sizes 1/2", 3/4", 1" right, 1" left

Thermostatic control heads, thermo-electric actuator and radio wave control

- 200 series Thermostatic control head with built-in sensor with liquid-filled element, adjustment scale from 0 to 5 corresponding to 0-28°C
- 201 series Thermostatic control head with remote sensor with liquid-filled element, adjustment scale from 0 to 5 corresponding to 0-28°C
- 202 series Thermostatic control head with built-in sensor with liquid-filled element and LCD type ambient temperature indicator, adjustment scale from 0 to 5 corresponding to 0-28°C
- 209 series Tamper-proof / anti-theft cap for use in public places for 200 series and 202 series thermostatic control heads
- 6561 series Thermo-electric actuator _____ electric supply 230 V (ac) or 24 V (ac/dc)
- 741 series Electronic actuator with radio receiver - 868 MHz _____ electric supply C-size batteries

Technical specifications

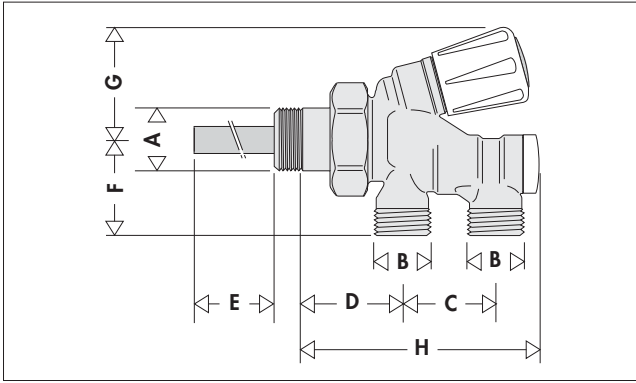
Materials

Body:	brass EN 1982 CB753S, chrome plated
Headwork:	brass EN 12164 CW614N
Obturator control stem:	stainless steel
Spring:	stainless steel
Seals:	EPDM
Control knob:	ABS
Probe holder (deflector):	POM
Probe:	brass EN 1249 CW508L
Lockshield:	brass EN 12164 CW614N

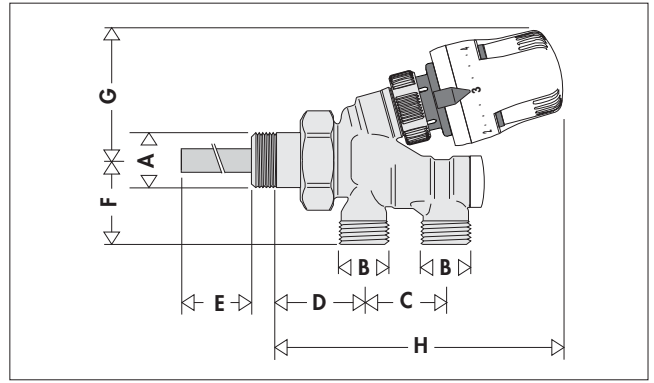
Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	30%
Max. working pressure:	10 bar
Working temperature range:	5-100°C
Max. differential pressure (with thermostatic control head):	1 bar
Flow rate to radiator for one-pipe version:	
- with manual control knob:	50%
- with thermostatic control head (proportional band 2K):	30%
Threaded connections:	
- radiator:	1/2", 3/4", 1" right, 1" left
- pipes:	23 p.1,5, centre distance 40 mm
Probe length:	300 mm
Probe diameter:	- 1/2" and 3/4" 11 mm - 1" 14 mm
Conversion from one-pipe to two-pipe mode and vice versa by means of 10 mm Allen key.	

Dimensions



Code	A	B	C	D	E	F	G	H	Mass (kg)
455400	1/2"	23 p. 1,5	40	44,5	267	27,5	48	103	0,61
455500	3/4"	23 p. 1,5	40	44,5	267	27,5	48	103	0,62
455600	1" D	23 p. 1,5	40	44,5	264	27,5	48	103	0,65
455601	1" S	23 p. 1,5	40	44,5	264	27,5	48	103	0,65



Code	A	B	C	D	E	F	G	H	Mass (kg)
455400 + 200	1/2"	23 p. 1,5	40	44,5	267	27,5	64	147	0,78
455500 + 200	3/4"	23 p. 1,5	40	44,5	267	27,5	64	147	0,79
455600 + 200	1" D	23 p. 1,5	40	44,5	264	27,5	64	147	0,82
455601 + 200	1" S	23 p. 1,5	40	44,5	264	27,5	64	147	0,82

Operating principle

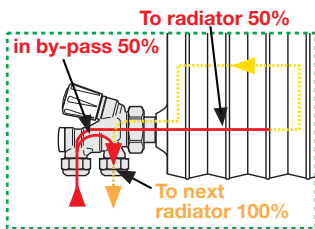
The 455 series valve can be used in both one-pipe and two-pipe distribution systems.

In one-pipe systems, radiators are connected in series with respect to the same manifold outlet. However the 455 series valve, when configured for this type of system, sends only the 50% of the flow rate (30% with thermostatic control head) to the radiator, whereas the remaining medium is by-passed and conveyed to the next radiator. In this way the radiators can be shut off individually (for isolation or maintenance) while allowing radiators further

downstream in the system to continue operating. Furthermore, the temperature can be regulated automatically using thermostatic control heads or thermo-electric actuators.

In two-pipe systems, all radiators are connected in parallel with respect to all the manifold outlets. In this type of system, the 455 series valve sends to the radiator the 100% of the inlet flow rate. The 455 series valve, in two-pipe mode, incorporates in a single device the dual function of a convertible valve and a lockshield valve, a feature of systems where the medium inlet valve is connected to the radiator upper connection and the lockshield valve to the lower connection.

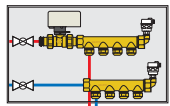
One-pipe system



Inlet: 200 l/h - 75°C
By-pass: 100 l/h - 75°C
Heat exchange: 100 l/h - 65°C
To next radiator: 200 l/h - 70°C

Example: Flow rate in ring G = 200 l/h
 Medium temperature at ring inlet 75°C
 Temperature difference in radiator $\Delta T = 10^\circ\text{C}$

200 l/h - 70°C
 100 l/h - 70°C
 100 l/h - 60°C
 200 l/h - 65°C
 200 l/h - 65°C
 100 l/h - 55°C
 200 l/h - 60°C

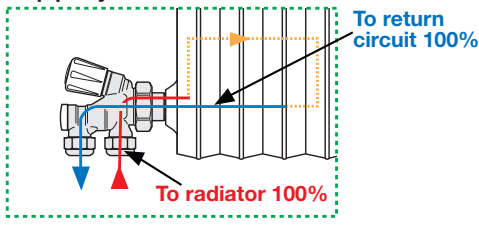


75°C

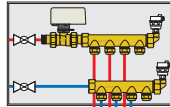
70°C

65°C

Two-pipe system



Example: Flow rate to each radiator G = 100 l/h
 Medium temperature at radiator inlet 75°C
 Temperature difference in radiator $\Delta T = 10^\circ\text{C}$

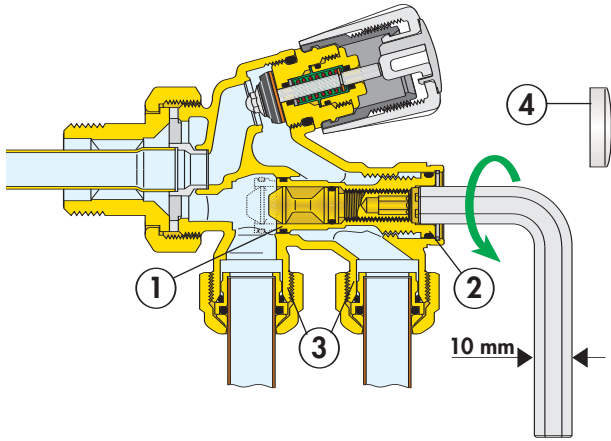


75°C

Conversion of valve from one-pipe to two-pipe mode

The valve is converted from one-pipe to two-pipe mode by shutting off the by-pass (1) on the mobile sleeve (2) located above the outlet connections (3).

The valve is provided preconfigured for one-pipe function, e.g. with the sleeve (2) in the forward position and the by-pass (1) open. To convert the valve from the one-pipe factory configuration to the two-pipe configuration, remove the plastic cap (4) and fully unscrew the sleeve (2) to the withdrawn position, by turning the outermost 10 mm hexagonal head screw. To revert to the one-pipe configuration, carry out the procedure in reverse order, fully screwing down the sleeve to the forward position.

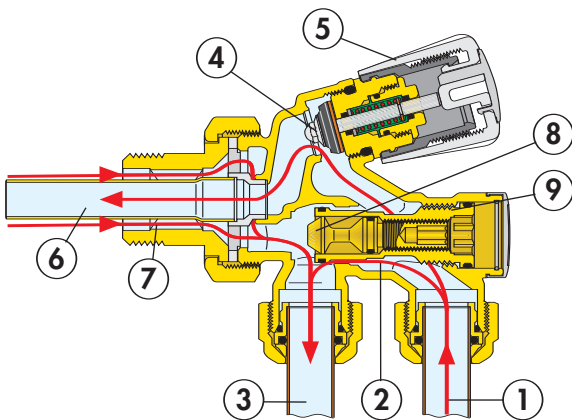


One-pipe application

In the one-pipe configuration, the 50% of the flow rate circulating in the ring passes through the radiator (30% with thermostatic control head). The figure below shows the path taken by the medium: the water enters from the right-hand connection (1) and is divided into two parts. One part is by-passed (2) and sent to the next radiator via the left-hand connection (3), the second part enters the radiator passing through the obturator (4) (controlled using the knob (5)) and the probe (6). After the heat exchange, the medium exits the radiator through the apertures outside the probe (7) and, mixing with the by-passed flow rate, reaches the downstream radiator.

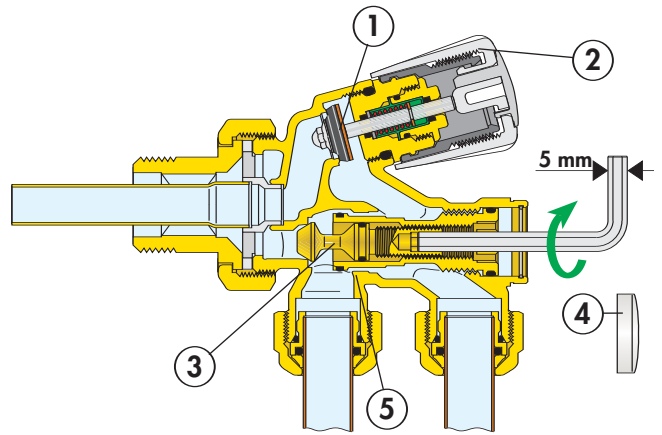
In the one-pipe configuration, **the pipe connections are interchangeable**, therefore the valve can be used with flows in opposite directions to those indicated in the figure, in order to adapt it to any installation requirement.

Using the 455 series valve in combination with a thermostatic control head, the flow rate entering the radiator is reduced from 50% to 30% of the flow rate arriving at the radiator inlet. This is due to an increase in head losses caused by the continuous modulation of the thermostatic control head.



Radiator shut-off

The radiator can be isolated, for maintenance or other operations, by fully closing the obturator (1) using the knob (2) and, after having removed the plug (4), shutting off the lockshield (3) using the 5 mm Allen key. In this configuration, the flow rate still reaches the heat emitters further downstream via the by-pass (5).

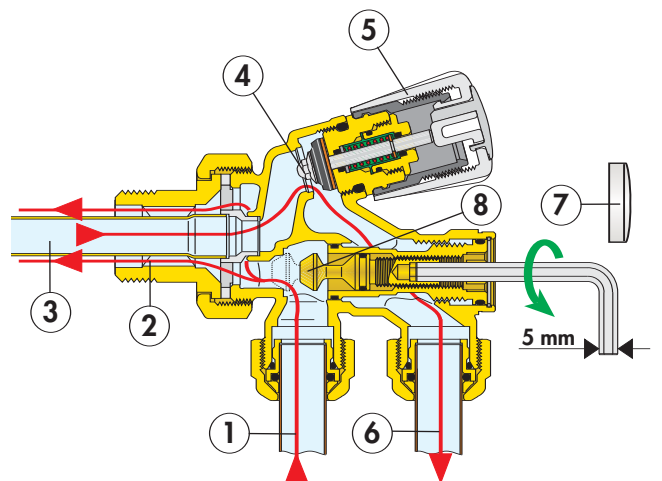


Two-pipe application

In the two-pipe configuration, the 100% of the flow rate circulating in the pipe also passes through the heat emitter. In this version it is suggested **that the connection (1) nearest the radiator is used as the inlet (flow) connection**.

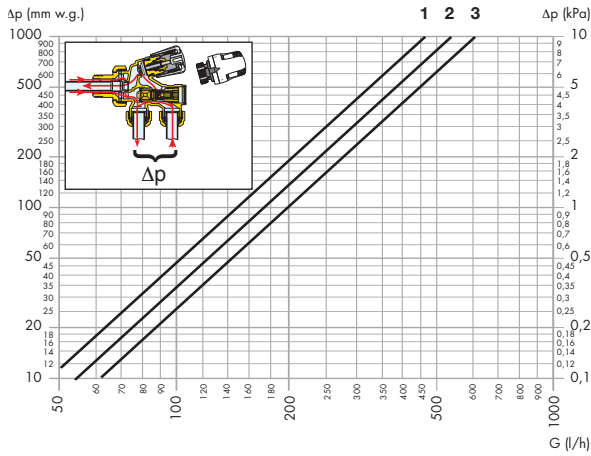
The medium enters the radiator through the aperture (2) outside the probe (3), circulates in the radiator to achieve the heat exchange and exits the radiator via the plastic end cap (4) (controlled using the knob (5)) and the outermost connection (6).

In the two-pipe configuration, circuit balancing may be required on each radiator by means of the lockshield on each valve. To perform this operation, first remove the plastic end cap (7) and fully screw down the pre-regulation lockshield valve (8) using a 5 mm Allen key. Balancing is achieved by unscrewing the lockshield (8) by the number of turns needed to reach the desired flow rate value.



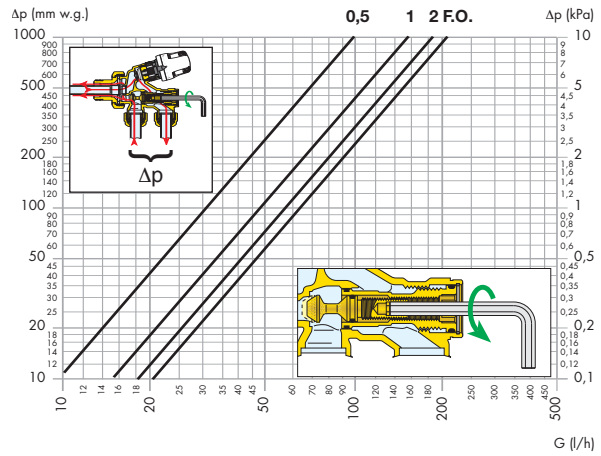
Hydraulic characteristics

455 series valve, ONE-PIPE configuration: overall hydraulic characteristics of the valve with lockshield valve built into the horizontal sleeve in the “fully open” position. Head losses measured at the pipe connections.



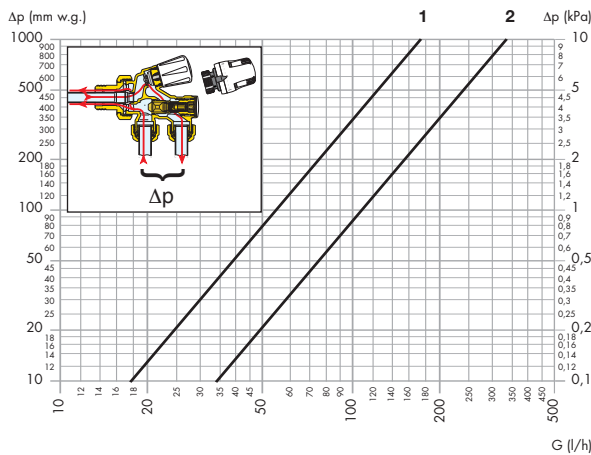
	Curve 1: knob fully closed, 100% of the flow rate in by-pass.	$Kv_{0,01}=145$ l/h $Kv=1,45$ m ³ /h
	Curve 2: thermostatic control head instead of the control knob, proportional band 2K, 30% of flow rate to radiator, 70% in by-pass.	$Kv_{0,01}=170$ l/h $Kv=1,7$ m ³ /h
	Curve 3: knob fully open, 50% of flow rate to radiator, 50% in by-pass.	$Kv_{0,01}=200$ l/h $Kv=2,0$ m ³ /h

455 series valve TWO-PIPE configuration: variation of the overall hydraulic characteristics of the valve with a thermostatic control head during balancing by means of the lockshield valve built into the horizontal sleeve. Proportional band 2K. Head losses measured at the pipe connections.



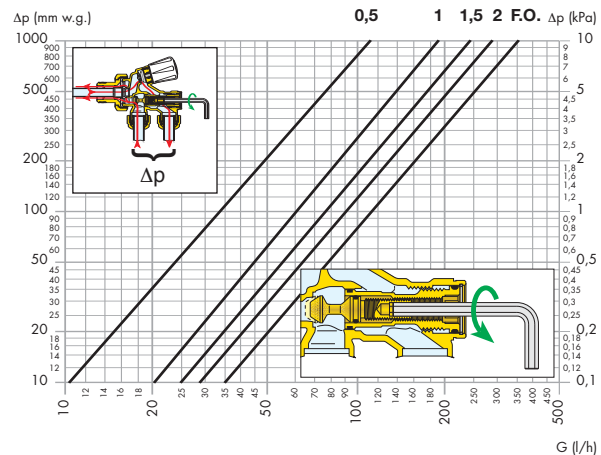
No. of lockshield valve turns	0,5	1	1,5	2	2,5	3	F.O.
Kv (m³/h)	0,31	0,47	0,55	0,57	0,58	0,61	0,62
Kv_{0,01} (l/h)	31	47	55	57	58	61	62

455 series valve TWO-PIPE configuration: overall hydraulic characteristics of the valve with lockshield valve built into the horizontal sleeve in the “fully open” position. Head losses measured at the pipe connections.



	Curve 1: thermostatic control head instead of control knob, proportional band 2K, 100% of flow rate to radiator. By-pass not active in two-pipe mode.	$Kv_{0,01}=55$ l/h $Kv=0,55$ m ³ /h
	Curve 2: knob fully open, 100% of flow rate to radiator. By-pass not active in two-pipe mode.	$Kv_{0,01}=110$ l/h $Kv=1,1$ m ³ /h

455 series valve TWO-PIPE configuration: variation of the overall hydraulic characteristics of the valve with shut-off control knob fully open during balancing by means of the lockshield valve built into the horizontal sleeve. Head losses measured at the pipe connections.



No. of lockshield valve turns	0,5	1	1,5	2	3	F.O.
Kv (m³/h)	0,34	0,62	0,78	0,91	1,09	1,15
Kv_{0,01} (l/h)	34	62	78	91	109	115

Construction details

Versatile installation

The 455 series valve can be installed in both new and old systems. The tilted control knob reduces the overall dimensions of the valve, enabling it to be used in confined spaces. The 455 series valve is suitable in the case of building renovations or modernisation of existing heating systems. The system can be constructed by laying out the pipes in the floor slab only or by using the skirting board to route the pipes, leaving the walls intact.

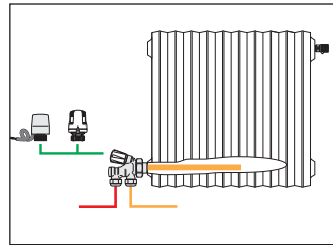
Sizing method

Valve sizing

To correctly size the system, 455 series valves are chosen by identifying the overall head loss, according to the flow rate, by means of the hydraulic characteristic diagrams in the left-hand column of the previous page. The overall head losses of the valve, used in combination with the thermostatic control head, have been calculated with a proportional band of 2K (EN 215 standard).

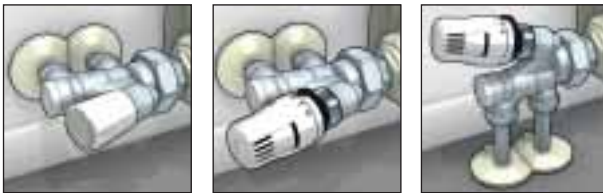
Probe sizing

After having checked with the manufacturer whether the radiator is suitable for installation in a mono or two-pipe system, the correct operation of the valve is guaranteed by the structure of the body and by the body-probe connection, whereas the length of the probe does not affect the performance of the valve and is therefore appropriate. Nevertheless the probe can be extended by means of the 453 series extension, even if this is not strictly necessary.



Installation

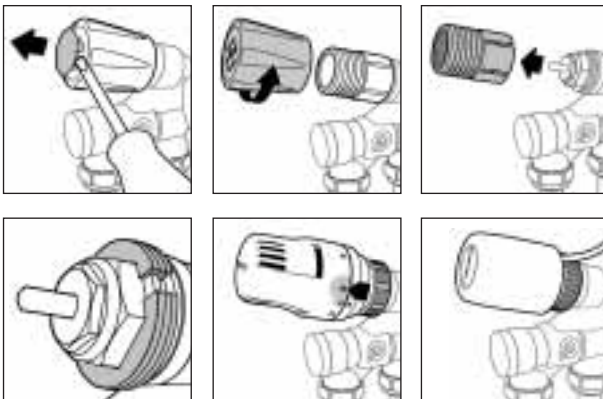
The 455 series valves must always be installed with the probe horizontal, but the pipe connections can face the wall or point towards the floor.



Combination with thermo-electric actuators

The 455 series valves can be used in combination with the 6561 series thermo-electric actuator, instead of the manual control knob.

Combination with thermostatic control heads and thermo-electric actuators



Conversion to thermostatic valve

The 455 series valves can be converted to thermostatic valves applying the thermostatic control heads 200, 201 and 202 series instead of the manual control knob. The thermostatic control head can be used with the pipe connections either facing the wall or pointing to the floor. The sensor built into the control head is far enough from the valve body and is able to perform a correct ambient temperature reading, without being influenced by the heat radiated by the valve body itself.

Thermostatic control heads or thermo-electric actuators must always be installed in a horizontal position. The sensible element of thermostatic control heads must never be installed in niches, radiator cabinets, behind curtains or exposed to direct sunlight, otherwise false readings may occur.



Accessories



Code

200000

200

 [tech. broch. 01034](#)

Thermostatic control head for convertible radiator valves; built-in sensor with liquid-filled element. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C. With adapter.



Code

201000

201

 [tech. broch. 01034](#)

Thermostatic control head for thermostatic and convertible radiator valves; with remote sensor. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C. Length of capillary pipe: 2 metres. With adapter.



Code

202000

202

Thermostatic control head for radiator valves; built-in sensor with liquid-filled element. With LCD type ambient temperature indicator. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C. Ambient temperature display range from 16°C to 26°C. With adapter. Patent application: N° MI2007U000405

**209** **tech. broch. 01034**

Tamper-proof / anti-theft cap for use in public places.
To be used with special Allen key code 209001.

Code

209000**209** **tech. broch. 01034**

Special Allen key for tightening tamper-proof anti-theft cap.
To be used with 209 series tamper-proof caps.

Code

209001**472**

Thermostatic control head with remote adjusting knob, liquid-filled element.
Working temperature range: 6-28°C.
Length of capillary pipe: 2 metres.

Code

472000**6561** **tech. broch. 01042**

Thermo-electric actuator.
Normally closed.
Electric supply: 230 V (ac) or 24 V (ac)/(dc).
Power consumption: 3 W.
Protection class: IP 44 (in vertical position).
Supply cable: 80 cm.
With adapter.



Code

656102 230 V**656104** 24 V**741** **tech. broch. 01118**

Electronic actuator with radio receiver - 868 MHz.
For convertible or thermostatic radiator valves.
Can be combined with 740 series systems.
Electric supply: 2 x 1,5 V C-size alkaline batteries.
Protection class: IP 30.



Code

741000

SPECIFICATION SUMMARY

455 series

Convertible one/two-pipe radiator valve, fitted for thermostatic control heads, thermo-electric actuators and radio wave controls. Connections for copper, single and multi layer plastic pipes 23 p.1,5 from 10 to 18 mm. Centre distance 40 mm. Brass body, chrome plated. Manual control knob, white RAL 9010, in ABS. Probe holder (deflector) in POM. EPDM gaskets. Brass probe 300 mm. Brass lockshield valve. Working temperature range 5-100°C. Maximum working pressure 10 bar. Maximum differential pressure (with thermostatic control head fitted) 1 bar. Convertible from one-pipe to two-pipe mode and vice versa by means of Allen key. Flow rate to radiator for the one-pipe version 50% with manual control knob (30% with thermostatic control head).

200 series

Thermostatic control head for thermostatic and convertible radiator valves. Built-in sensor with liquid-filled element. Maximum ambient temperature 50°C. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C, with the possibility of locking and limiting the temperature. Frost protection cut-in at 7°C. With adapter.

201 series

Thermostatic control head for thermostatic and convertible radiator valves. Remote sensor with liquid-filled element. Maximum ambient temperature 50°C. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C, with the possibility of locking and limiting the temperature. Frost protection cut-in at 7°C. With adapter.

202 series

Thermostatic control head with temperature indicator. Maximum ambient temperature 50°C. Graduated scale from 0 to 5 corresponding to a temperature adjustment range from 0°C to 28°C, with the possibility of locking and limiting the temperature. Frost protection cut-in at 7°C. Ambient temperature display range from 16 to 26°C. With adapter.

209 series

Tamper-proof / anti-theft cap for thermostatic control head, for use in public places.

6561 series

Thermo-electric actuator. Normally closed. Electric supply 230 V (ac); 24 V (ac); 24 V (dc). Starting current 1 A. Working current 13 mA (230 V (ac)), 140 mA (24 V (ac) - 24 V (dc)). Power consumption 3 W. Protection class IP 44 (in vertical position). Maximum ambient temperature 50°C. Operating time from 120 to 180 seconds. Length of supply cable 80 cm.

Code 741000

Electronic actuator with radio receiver. Electric supply 2 x 1,5 V C-size alkaline batteries. Maximum power consumption 9 mA. Autonomy 1 year. Reception frequency 868 MHz. Protection class IP 30. Insulation class III. Maximum signal range in free air 120 m.

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