

Modulating digital controller for heating and cooling



01122/05 GB

series 161



Function

The modulating digital controller can be used with three-pole motorised mixing valves with rotation times ranging between 30 and 240 seconds. It performs both the set **point and the modulating regulation**. In the modulating mode, **the controller automatically varies the flow temperature depending upon the actual value of the system return temperature**, which is detected to indicate the instantaneous ambient load and thus reduce system operating times and power overloads.

The controller is equipped with flow and return temperature sensors and a wiring box for ease of use when mounted on the wall. It can also be connected from the back by means of a standard recessed electrical box.



Product range

Code 161000	Modulating digital controller for heating and cooling, with flow/return sensors
Code 150050	Relative humidity sensor
Code 150051	Converter
Code 150052	Transformer

Technical specification

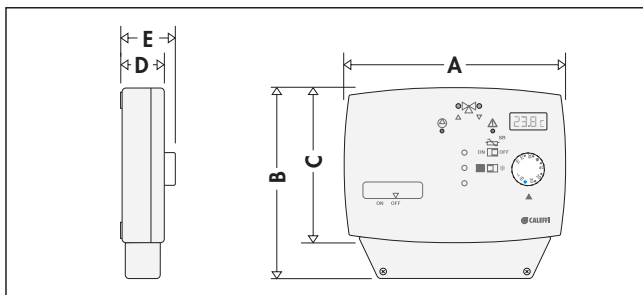
Controller

- Three poles	
- Electric supply:	230 V - 50 Hz
- Setting temperature range:	7-78°C
- Protection class:	IP 42

Flow/return temperature sensors

NTC type	
Working temperature range:	-10-125°C
Time constant:	2,5 s
Response:	10.000 Ω at 25°C
Beta value:	25/85°C 3977 ±1,5%
Two-wire cable with 1/8" M connection	
Cable length:	0,55 m

Dimensions



Code	A	B	C	D	E	Weight (kg)
161000	133	129	90	35	42	0,31

Relative humidity control components (optional)

Transformer

- Electric supply:	230 V - 50 Hz
- Power consumption:	10,5 VA
- Max. ambient temperature:	50°C
- DIN bar clamps	

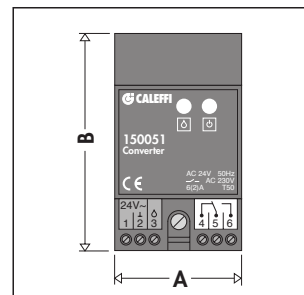
Converter

- Electric supply:	24 V - 50 Hz
- Microswitch contacts rating:	6 (2) A (230 V)
- Max. ambient temperature:	50°C
- DIN bar clamps	

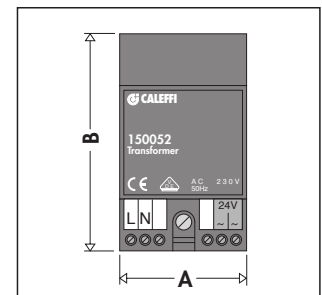
Relative humidity limit sensor

- Electric supply:	24 V - 50 Hz
- RH% limit:	80-85%

Dimensions

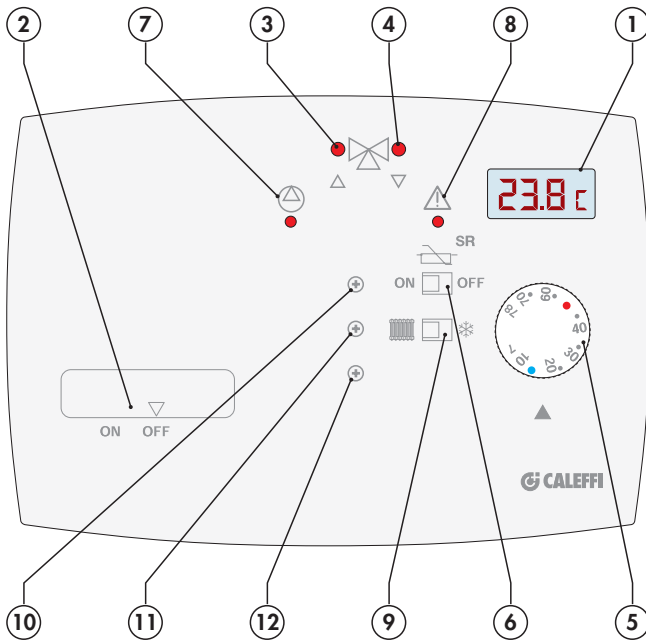


Code	A	B	Weight (kg)
151051	54	89	0,12



Code	A	B	Weight (kg)
151052	54	89	0,38

Digital temperature controller



The front panel contains the following functions:

- 1) Three-digit LCD display for: temperature measured or calculated and setting programmed delays in the system.
 - Temperature range displayed: 0–99°C with a 0,1°C resolution.
- 2) Controller function selector ON/OFF.
- 3) Mixing valve on opening: LED on.
- 4) Mixing valve on closing: LED on.
- 5) Selector for setting flow temperature.
 - Temperature range 7–78°C
 - Factory setting:
 - heating: max 50°C
 - cooling: min 14°C
- 6) Return sensor switch.
 - Sensor off: OFF
 - Sensor on: ON
 - Factory setting: **ON**
- 7) Pump operating (ON): LED permanently on.
- 8) Safety temperature (ST) LED. Continuously lit when the limit indicated by the safety thermostat or [safety humidistat](#) is reached. Also continuously lit if flow/return sensors malfunction (see flow/return sensor paragraph).
- 9) Heating/[cooling](#) function exchange switch.
- 10) Adjuster for maximum duration of impulse on valve. Adjustable 0,2–6 s. *Factory setting: 2,5 s.*
Calculation of impulse value:

$$T_{\text{pulse}} \text{ (s)} = \frac{\text{Rotation time of actuator (s)}}{40}$$

Example:

$$T_{\text{actuator rotation}} = 120 \text{ s}$$

$$T_{\text{pulse}} = 120/40 = 3 \text{ s}$$
- 11) Adjuster for time delay in reading return sensor. Adjustable 1–360 s. *Factory setting: 20 s.*
- 12) Adjuster of valve-motor mechanical time delay. Adjustable 1–30 s. *Factory setting: 13 s.*

Operation

The temperature controller receives the activation signal from the ambient thermostat to start the pump and operate the mixing valve. The controller operates the mixing valve according to two logic approaches depending on whether the return sensor is on or off.

Set point regulation: return sensor off. Selector 6) OFF.

In this case the flow temperature FT is held constant at the value set using the selector 5) both for heating and for [cooling](#). The setting is shown on the display 1).

Modulating regulation: return sensor on. Selector 6) ON.

In this case the flow temperature FT is modified as a function of the temperature measured by the return sensor RT. This keeps the actual thermal output of the slab and as consequence the ambient thermal load under control. The thermal response time of the system is thus reduced to a minimum.

$$RT_{\text{set}} = FT_{\text{set}} - 35\% (FT_{\text{set}} - 20^\circ\text{C})$$

$$FT_{\text{calculated}} = FT_{\text{set}} + (RT_{\text{set}} - RT)$$

Example

$$FT_{\text{set}} = 40^\circ\text{C}$$

$$RT_{\text{set}} = 40 - 0,35 \cdot (40 - 20) = 33^\circ\text{C}$$

$$FT_{\text{calculated}} = 40 + (33 - RT)$$

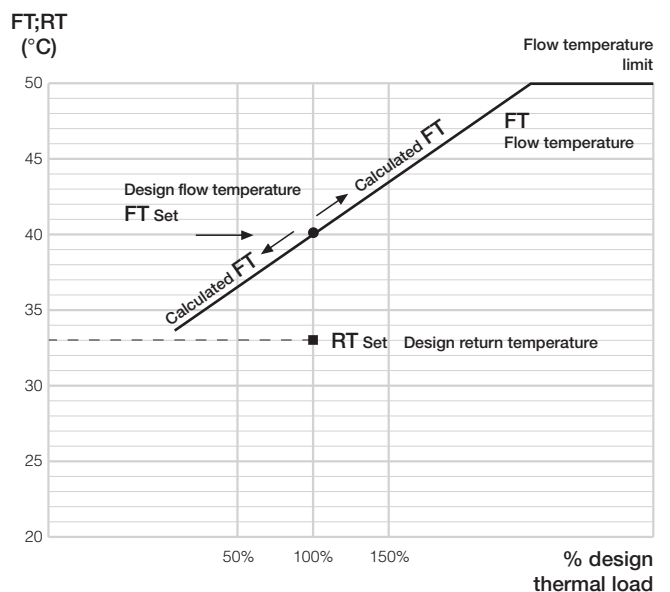
The new FT value calculated is given on the display 1), with a small side bar showing.



Each time the FT is calculated, the actual FT is displayed for 5 seconds, after which the new calculated FT is shown. Changes to FT stop when the RT reaches the RT_{set} .

The return sensor is switched off for the [cooling](#) function.

Curve correction with return sensor



- 11) Adjuster for time delay in reading return sensor. Adjustable 1–360 s. *Factory setting: 20 s.*

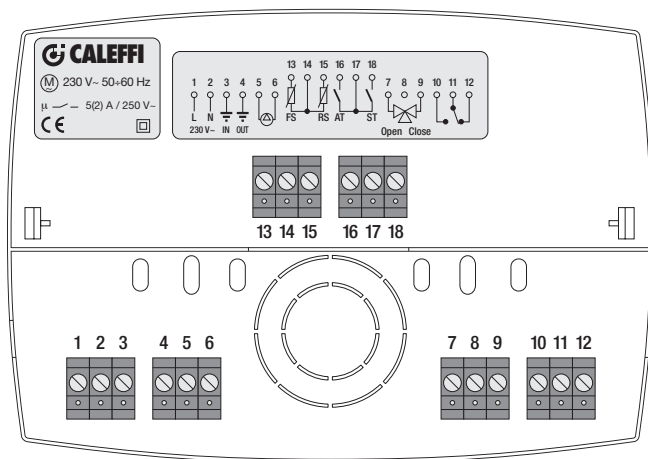
- 12) Adjuster of valve-motor mechanical time delay. Adjustable 1–30 s. *Factory setting: 13 s.*

Display

The three-digit LCD display shows the following parameters:

- flow temperature set using the selector 5). the flow temperature measured appears after 5 seconds.
- the flow temperature calculated with the return sensor off.
- the flow temperature calculated with the return sensor on.
- the maximum duration of the impulse to the valve, selected using the adjuster 10). Displayed for 5 seconds.
- delay time for acquiring the return temperature, selected using the adjuster 11). Displayed for 5 seconds.
- valve-motor mechanical delays, selected using the adjuster 12). Displayed for 5 seconds.

Back panel



The terminals for the various electrical components are located on the back panel.

Electric supply

- 1 Supply 230 V~ "Live"
- 2 Supply 230 V~ "Neutral"
- 3 Earth

Pump control

- 4 Earth
- 5 Pump control 230 V~ "Live"
- 6 Pump control 230 V~ "Neutral"

Mixing valve control

- 7 Valve control on opening
- 8 Common C
- 9 Valve control on closing

Auxiliary microswitch

- 10 Auxiliary outlet NA
- 11 Auxiliary common outlet C
- 12 Auxiliary outlet NC

Flow/return sensor

- 13 Flow temperature sensor
- 14 Common C
- 15 Return temperature sensor

Ambient thermostat/safety thermostat

- 16 Ambient thermostat contact
- 17 Common C contact for ambient thermostat/ common C contact for safety thermostat and [humidity sensor converter](#).
- 18 Contact for safety thermostat and [humidity sensor converter](#).

Heating safety thermostat

If the safety thermostat signals a flow temperature greater than set value, the following state is set: pump OFF, mixing valve closed. The thermostat terminal is NC; if it is not connected, the temperature controller is set off.

Auxiliary microswitch

The controller is equipped with an auxiliary microswitch which can be used to control other equipment.

Example:

For Heating, to switch the boiler on or off.

Terminal NA-Pump off-ambient thermostat OFF or safety thermostat ON (boiler off).

Terminal NC-Pump on-ambient thermostat ON (boiler on).

For Cooling, to switch chiller unit on or off.

Terminal NA-Pump off-ambient thermostat OFF or RH% limit sensor on (chiller unit OFF).

Terminal NC-Pump on-ambient thermostat ON (chiller unit ON).

Contacts rating: 5 A (230 V).

Flow/ return sensor

The flow/return temperature sensor are of the NTC type. If the sensor detects electrical resistance that indicates a short circuit, the following operating state is set: pump OFF, mixing valve closed, LED 8) permanently on.

Table of sensor resistance values

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-20	97.060	10	19.903	40	5.327	70	1.752	100	680
-15	72.940	15	15.714	45	4.370	75	1.480	105	592
-10	55.319	20	12.493	50	3.603	80	1.255	110	517
-5	42.324	25	10.000	55	2.986	85	1.070	115	450
0	32.654	30	8.056	60	2.488	90	915	120	390
5	25.396	35	6.530	65	2.083	95	787	125	340

Flow temperature limit for heating or cooling

Maximum heating and [minimum cooling flow temperatures](#) can be set with the controller.

Dip switches are located on the back of the temperature control panel for this purpose.

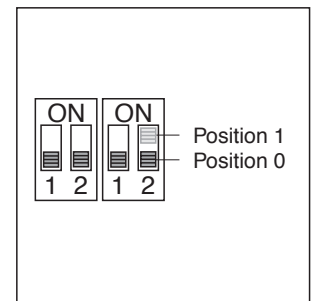
Different switch configurations give different limit temperatures.

Factory setting: - heating: max 50°C

- cooling: min 14°C.

Table of temperature limit dip switch positions

Dip switch setting	Maximum limit (C°)	Minimum limit (C°)
0 0 0 0	50	14
0 0 1 0	54	13
0 1 0 0	58	12
0 1 1 0	62	11
1 0 0 0	66	10
1 0 1 0	70	9
1 1 0 0	74	8
1 1 1 0	78	7



Maximum cooling temperature limit

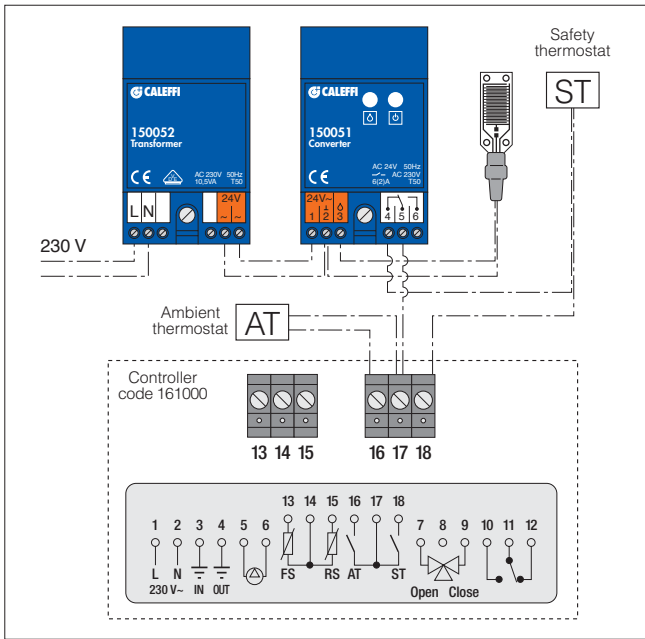
Cooling flow temperature cannot be set greater than 25°C.

Control of relative humidity

When the temperature controller is used for cooling, the relative humidity sensor must be used. The function of this sensor is to detect the maximum relative humidity limit in order to prevent the formation of condensation in the cooling thermal slab. It is set at RH=80-85%. When this level is reached the following operating state is set: pump ON, mixing valve closed.

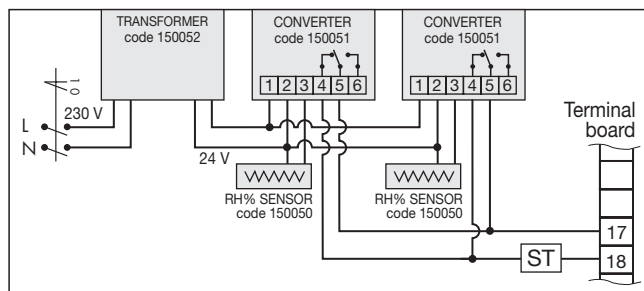
Connection of the humidity sensor

The humidity sensor is connected to the temperature controller through a special transformer and converter.

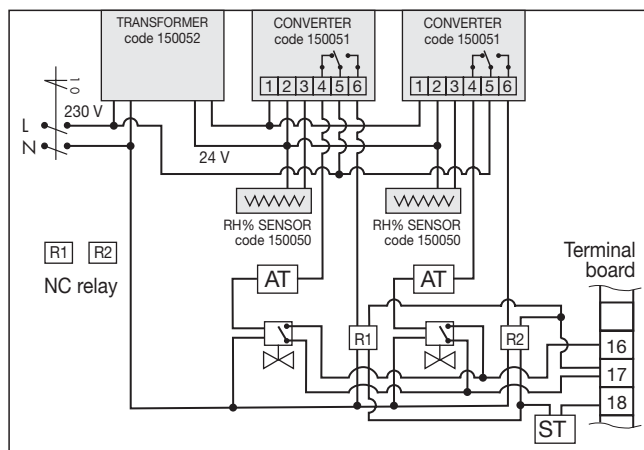


In order to control different zones that are at risk of condensation forming, the humidity sensor should be connected to a special interface kit (transformer, converter and humidity sensor). Up to 12 converters and sensor can be connected to a single transformer.

Example of connecting several sensors to several manifolds



Example of connecting to several zone valves

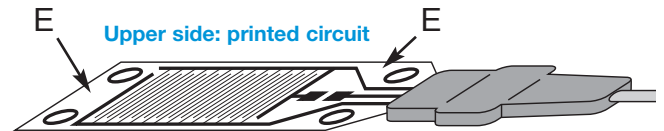


Testing the humidity sensor

The functioning of the sensor must be checked at the start of each cooling season by placing a damp wad of cotton wool on the surface; this should cause the mixing valve to be switched off and switch on the red LED, 8), on the front of the control panel.

Location of the humidity sensor

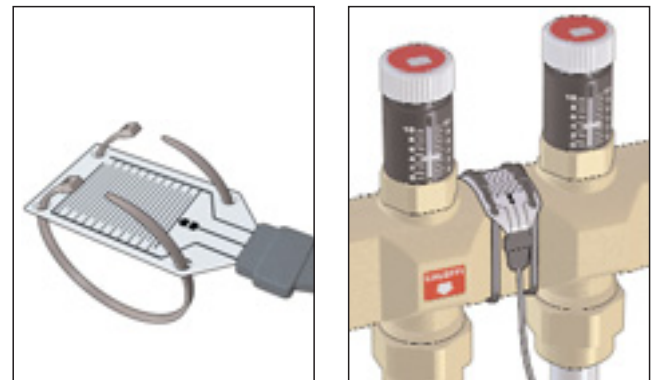
The humidity sensor is located at the point where humidity is most likely to form which will depend on the system design. It is positioned with the carbon printed surface facing upwards as in the diagrams.



Inferior side: placed on the cooling surface

Layouts for the correct positioning of the max RH% limit sensor.

The sensor should be fixed to the manifold installed in the position where the RH% relative humidity value has not to exceed the safety limits. Fix by inserting the two straps contained in the package through the holes in the sensor.



The maximum heat energy that the panel can produce, in relation to the climate values recorded, can be reached by controlling the parameters below.

- Minimum flow temperature can be set using the selector 5) on the front panel.
- Maximum RH% limit, controlled through RH% sensor.
- Room temperature controlled through room thermostat.
- Room temperature and relative humidity controlled through a dedicated fan-coil or dehumidifier.

N.B.: Through the RH% limit sensor, possible formation of condensation is anticipated. **In areas with cooling, adequate air treatment must always be present.**

Accessories



738 •

Ambient chrono-thermostat, battery operated.
With self-learning programme.
 Weekly programmable clock.
 Suitable for phone programmer.
 Three temperature levels.
 Minimum programming: 30 minutes.



Code

738107 120 x 90 x 20 mm

Mixing valves

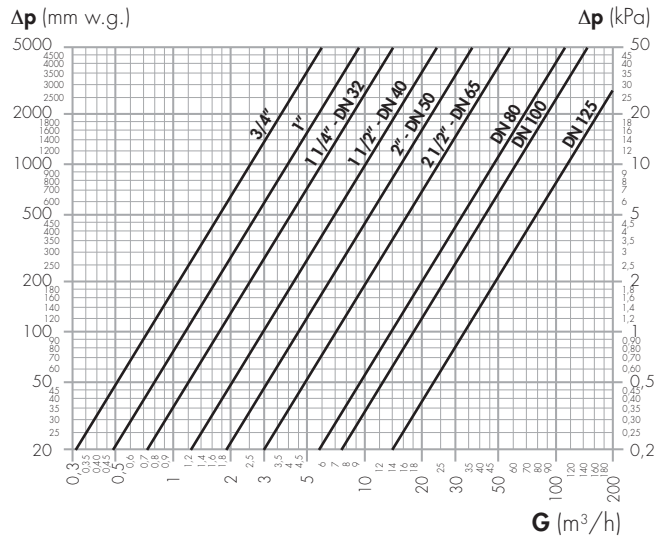


610

Three-way butterfly mixing valve.
Threaded connections.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Three-way butterfly mixing valve.
Flanged connections.
To be coupled with flat counterflanges
EN 1092-1 (ISO 7005-1), PN 6.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Hydraulic characteristics

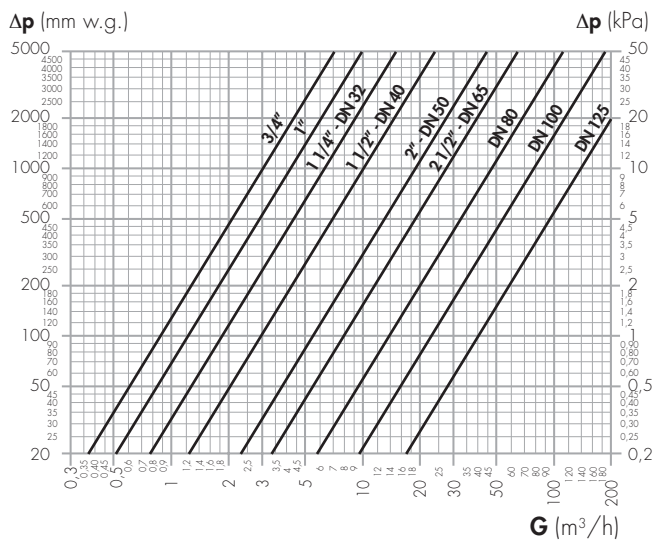


611

Four-way butterfly mixing valve.
Threaded connections.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Four-way butterfly mixing valve.
Flanged connections.
To be coupled with flat counterflanges
EN 1092-1 (ISO 7005-1), PN 6.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Hydraulic characteristics

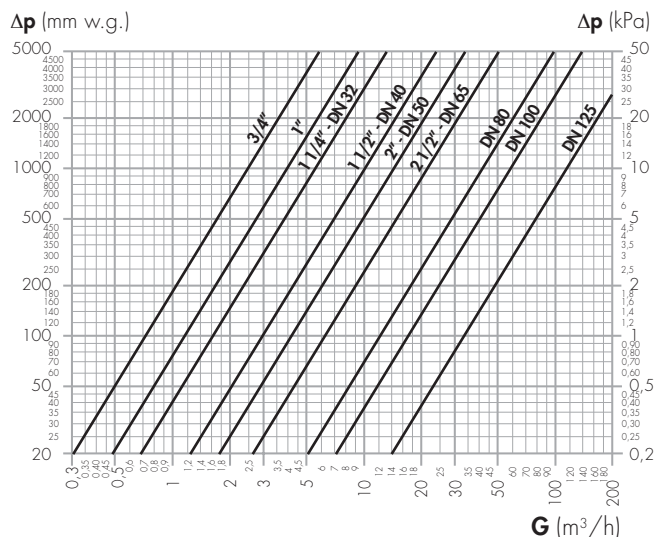


612

Three-way sector mixing valve.
Threaded connections.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Three-way sector mixing valve.
Flanged connections.
To be coupled with flat counterflanges
EN 1092-1 (ISO 7005-1), PN 6.
Max. working pressure: 6 bar.
Working temperature range: 2–110°C.
Heavy series.

Hydraulic characteristics





6370

Actuator for mixing valves 610, 611, 612 series from 3/4" to 1 1/2".
With adapter.
With auxiliary microswitch.



Technical specification

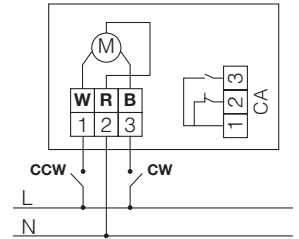
Three poles
Electric supply: 230 V or 24 V - 50 Hz
Power consumption: 3 VA
Auxiliary microswitch contacts rating: 1 A
Protection class: IP 42
Operating time: 60 s (90° rotation)
Dynamic torque: 15 N·m

Power supply

1 - W = counter clockwise rotation (CCW)
2 - R = common
3 - B = clockwise rotation (CW)

Auxiliary microswitch (CA)

1 - CA = common
2 - CA = NC terminal
3 - CA = NA terminal



6370

Actuator for mixing valves 610, 611, 612 series from 2" to 5".
With adapter.
With auxiliary microswitch.



Technical specification

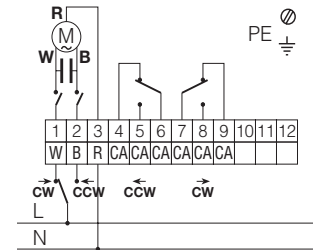
Three poles
Electric supply: 230 V or 24 V - 50 Hz
Power consumption: 3 VA
Rating of auxiliary microswitch contacts: 1 A
Protection class: IP 42
Operating time: 180 s (90° rotation)
Dynamic torque: 35 N·m

Power supply

1 - W = clockwise rotation (CW)
2 - R = counter clockwise rotation (CCW)
3 - B = common

Auxiliary microswitch (CA)

7 - CA = common
8 - CA = NA terminal
9 - CA = NC terminal
4 - CA = NC terminal
5 - CA = NA terminal
6 - CA = common



636

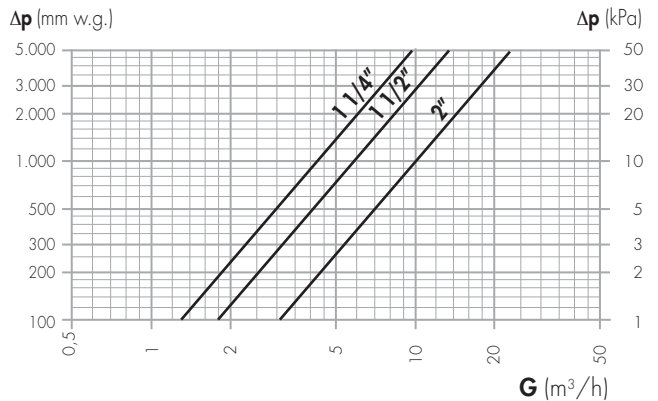
Three-way motorised piston valve with manual opening.
Full bore.
With auxiliary microswitch.
The valve can be transformed into a two-way valve by blanking off the central third way.



Technical specification

Three poles
Electric supply: 230 V or 24 V - 50 Hz
Max. working pressure: 16 bar
Max. working temperature: 110°C
Protection class: IP 44
Operating time: 90 s

Hydraulic characteristics



6371

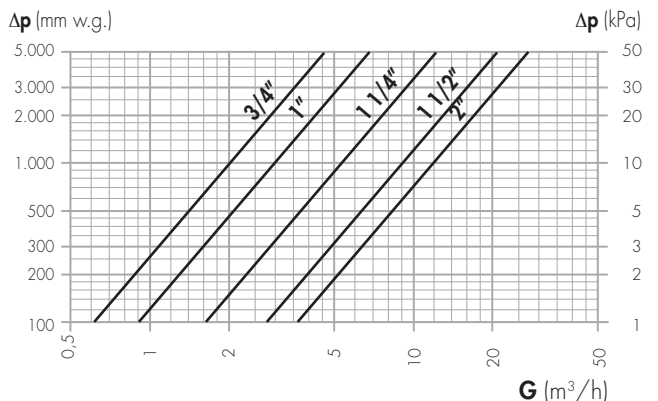
Three-way motorised ball valve with manual opening. "T" drilling.
With auxiliary microswitch.










Technical specification

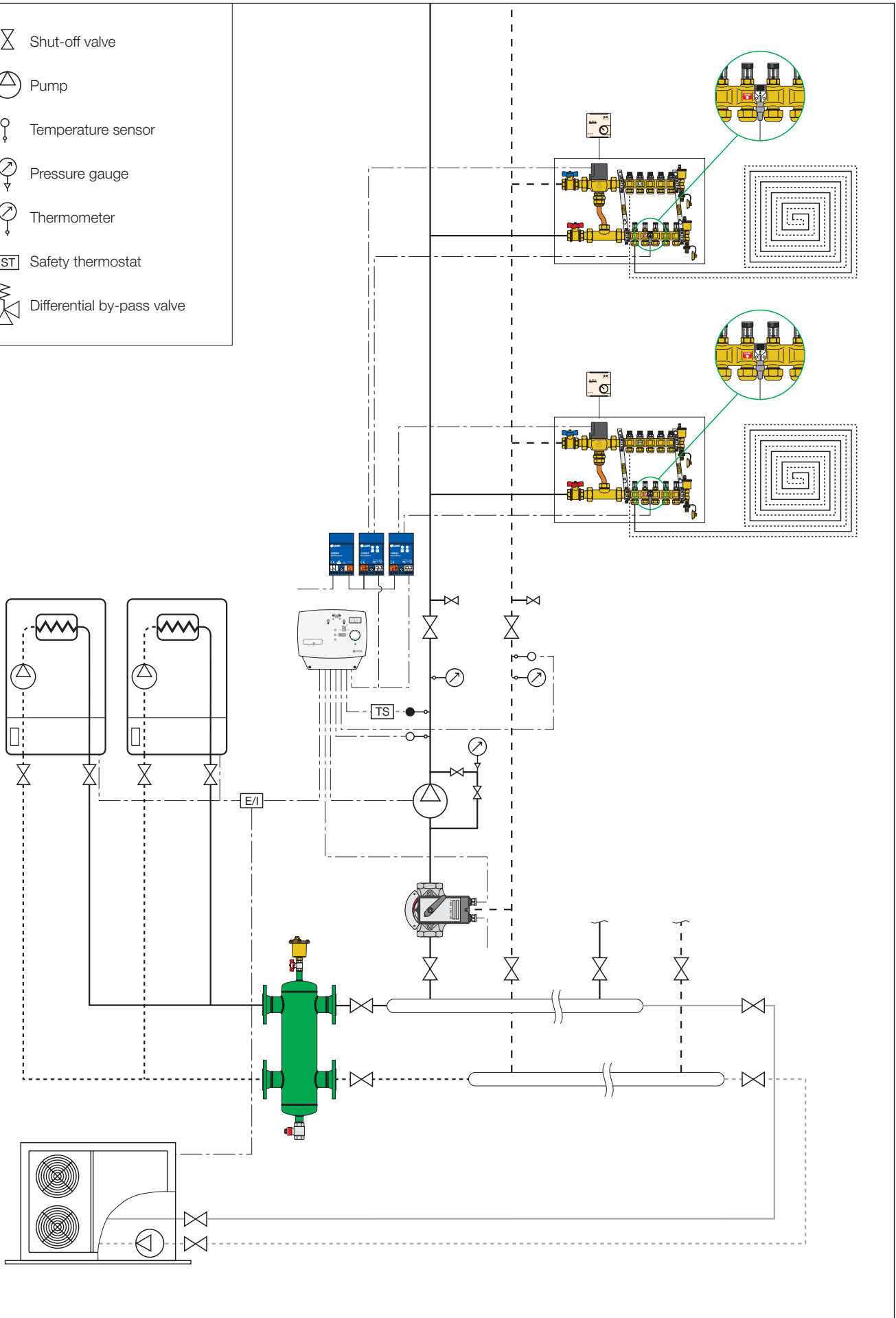
Three poles
Electric supply: 230 V or 24 V - 50 Hz
Max. working pressure: 40 bar
Working temperature range: -10–100°C
Max. ambient temperature: 55°C
Power consumption: 3/4" and 1"; 3 VA
1 1/4"-2"; 5 VA
Rating of auxiliary microswitch contacts: 1 A
Protection class: IP 42
Operating time: 60 s (90° rotation)

Hydraulic characteristics



Application diagram

-  Shut-off valve
-  Pump
-  Temperature sensor
-  Pressure gauge
-  Thermometer
-  Safety thermostat
-  Differential by-pass valve



SPECIFICATION SUMMARIES

Code 161000

Digital controller for heating and cooling. Electric supply 230 V - 50 Hz. Setting temperature range: 7–78°C. Protection class IP 42. Complete with NTC F/R sensors. Working temperature range: -10–125°C; Time constant: 2,5 s; Response 10,000 at 25°C. Beta value 25/85°C 3977 ±1,5%. Two-wire cable with 1/8" M connection, length 0,55 m.

Series 610

Three-way butterfly mixing valve with manual control. Heavy series. Threaded 3/4" F connections (from 3/4" to 2 1/2"). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Series 610

Three-way butterfly mixing valve with manual control. Heavy series. Flanged DN 50 connections (from DN 50 to DN 125). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Series 611

Four-way butterfly mixing valve with manual control. Heavy series. Threaded 3/4" F connections (from 3/4" to 2 1/2"). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Series 611

Four-way butterfly mixing valve with manual control. Heavy series. Flanged DN 50 connections (from DN 50 to DN 125). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Series 612

Three-way sector mixing valve with manual control. Heavy series. Threaded 3/4" F connections (from 3/4" to 2 1/2"). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Serie 612

Three-way sector mixing valve with manual control. Heavy series. Flanged DN 50 connections (from DN 50 to DN 125). Cast iron body and rotor. Aluminium cover and handle. NBR seals. Working temperature range: 2–110°C. Maximum working pressure: 6 bar. Can be motorised.

Series 636

Three-way motorised piston valve. 1 1/4" F connections (from 1 1/4" to 2"). Brass body. Stainless steel stem. Self-extinguishing ABS motor cover. Maximum working pressure: 16 bar. Maximum working temperature: 110°C. Three-pole regulated servomotor. Electric supply 230 V (ac) (or 24 V (ac)). Power consumption 3.7 VA. Operating time 90 s. Protection class IP 44. Maximum ambient temperature 50°C. Equipped with 3 A auxiliary microswitch.

Series 6371

Three-way motorised ball valve with "T" drilling. Threaded 3/4" F connections (from 3/4" to 2"). Nickled brass body and ball. PTFE seals. Working temperature range: -10–100°C. Maximum working pressure: 16 bar. maximum differential pressure: 10 bar. Actuator: electric supply 230 V or 24 V - 50 Hz. Power consumption: 3 VA. Dynamic torque: 15 N·m (3/4" and 1": 15 N·m; 1 1/4" and 1 1/2": 20 N·m; 2": 35 N·m). Operating time 60 s. Protection class IP 42. Maximum ambient temperature: 50°C. Equipped with 1 A auxiliary microswitch.

Series 6370

Three-pole regulating actuator for 3/4" (from 3/4" to 5") mixing valves. Electric supply 230 V (ac) (or 24 V (ac)). Power consumption: 3 VA. Dynamic torque: 15 N·m (from 3/4" to 1 1/2": 15 N·m; from 2" to 5": 35 N·m). Operating time: 60 s (from 3/4" to 1 1/2": 60 s; from 2" to 5": 180 s). Protection class: IP 42. Maximum ambient temperature: 50°C. Equipped with 1 A auxiliary microswitch.

We reserve the right to change our products and their relevant technical data, contained in this publication, at any time and without prior notice.

