

# Heat pump-boiler integration unit

## 106 series HYBRICAL®



01233/13 GB

HYBRICAL



### Function

The integration unit allows two heat generators to be connected to a single air conditioning system.

The diverter valve diverts the fluid arriving from the heat pump or from the boiler towards the terminals of the system.

The electronic regulator and the outside temperature probe manage the switching on of the appropriate generator.



### Product range

Code 106160	Heat pump-boiler integration unit with connection kit	size DN 25 (1")
106 Series	Heat pump-boiler integration unit	sizes DN 32 (1 1/4"), DN 50 (1 1/2" and 2")
Code 106060	Diverter kit	size DN 25 (1")

### Technical specifications

#### Diverter valve

Materials:

- Body:	brass EN 12165 CW617N
- Ball:	brass EN 12164 CW614N, chrome plated
- Ball seal	PTFE with EPDM O-Ring
- Control stem seal:	double EPDM O-ring
- Union seal:	EPDM O-ring

#### Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Maximum working pressure:	(size 1") 10 bar (size 1 1/4" - 2") 16 bar
Maximum differential pressure:	10 bar
Connections:	1" M - 1 1/4" M - 1 1/2" M - 2" M (ISO 228-1)

#### Connection kit (only for size 1")

Materials:

- Pipes:	copper EN 12735-1 CW-DHP
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#### Insulation

Material:	closed cell expanded PE-X
Thickness:	15 mm
Density:	- inner part 30 kg/m <sup>3</sup> - outer part 80 kg/m <sup>3</sup>
Thermal conductivity (DIN 52612):	- at 0°C 0,038 W/(mK) - at 40°C 0,045 W/(mK)
Coefficient of resistance to diffusion of water vapour (DIN 52615):	>1.300
Working temperature range:	-10-110°C
Reaction to fire (DIN 4102):	class B2

#### Actuator

##### Synchronous motor

Electric supply:	230 V (ac)
Power consumption:	6 VA
Auxiliary microswitch contact rating:	6 (2) A (230 V)
Protection class:	IP 65
Operating time:	50 s (90° rotation)
Electric supply cable length:	0,8 m
Dynamic torque:	9 N·m

##### Electronic regulator

Electric supply:	230 V (ac)
Power consumption:	7 VA
Contact rating on switch-over:	2 A (230 V)
Protection class:	IP 54
Protection class:	II
Selectable temperature range:	-60-150°C
Factory intervention hysteresys:	2 K
Intervention hysteresis range:	0,1-20 K

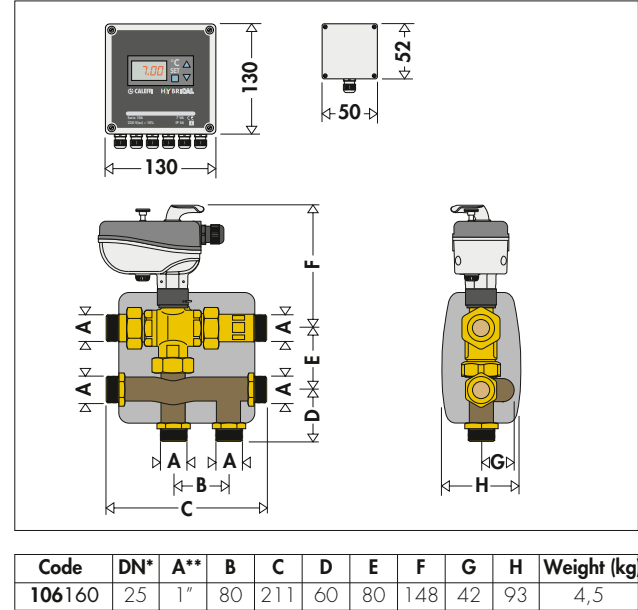
#### Outside probe

Cable length:	1,5 m
Temperature measurement range:	-20-45°C
Type of probe:	NTC

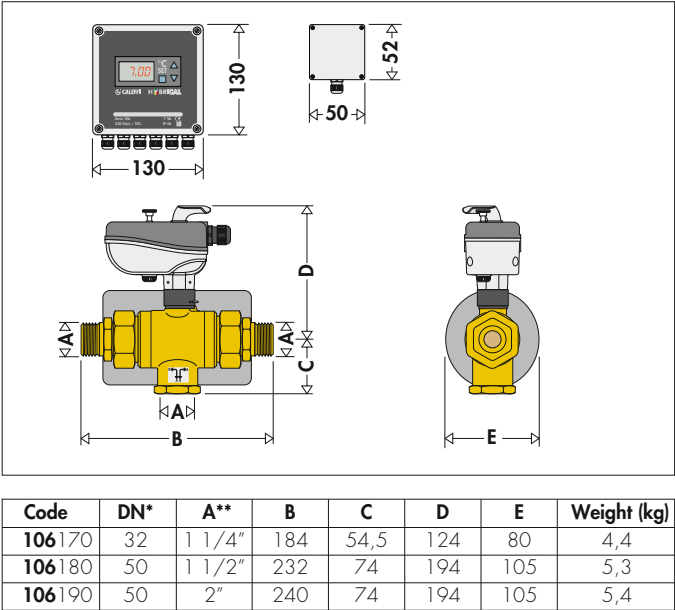
#### Ambient, transportation, storage conditions

Operation:	-10-55°C EN 60721-3-3 Cl. 3K3, max. humidity 85%
Transportation:	-30-70°C EN 60721-3-2 Cl. 2K3, max. humidity 95%
Storage:	-20-70°C EN 60721-3-1 Cl. 1K2, max. humidity 95%

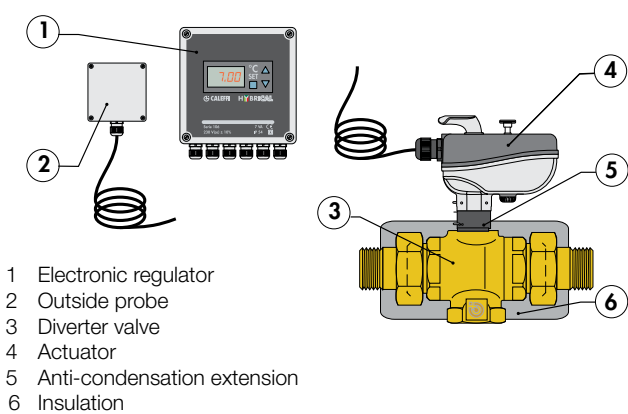
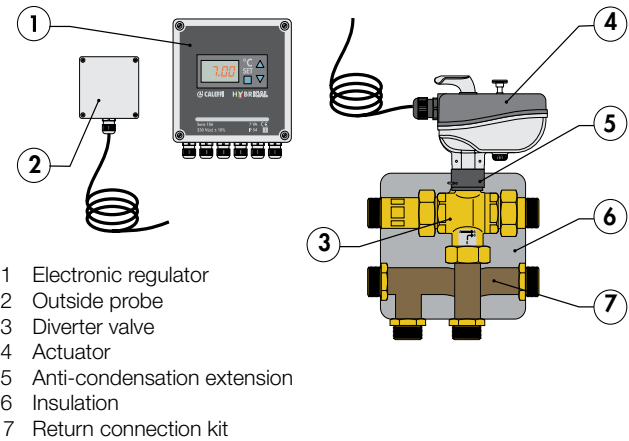
Dimensions



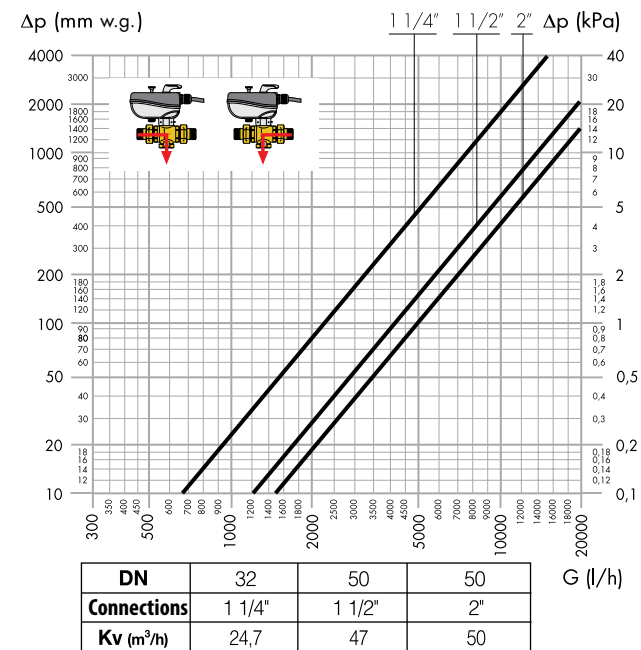
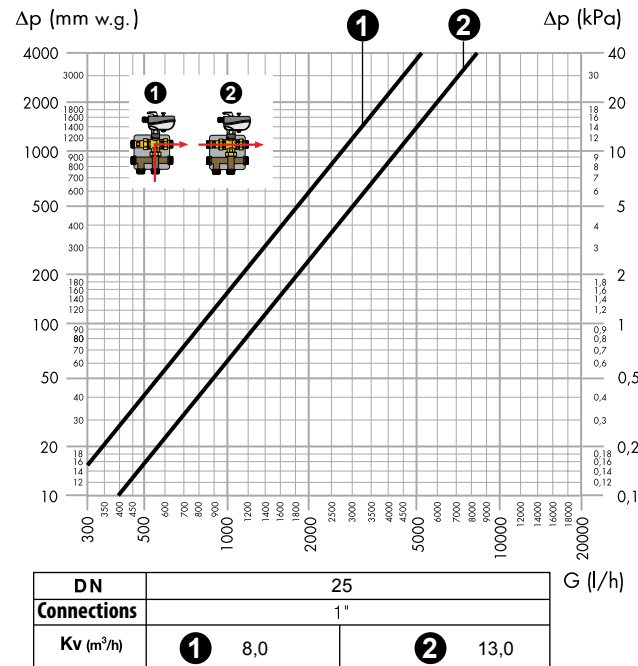
\* body valve  
\*\* connections



Characteristic components



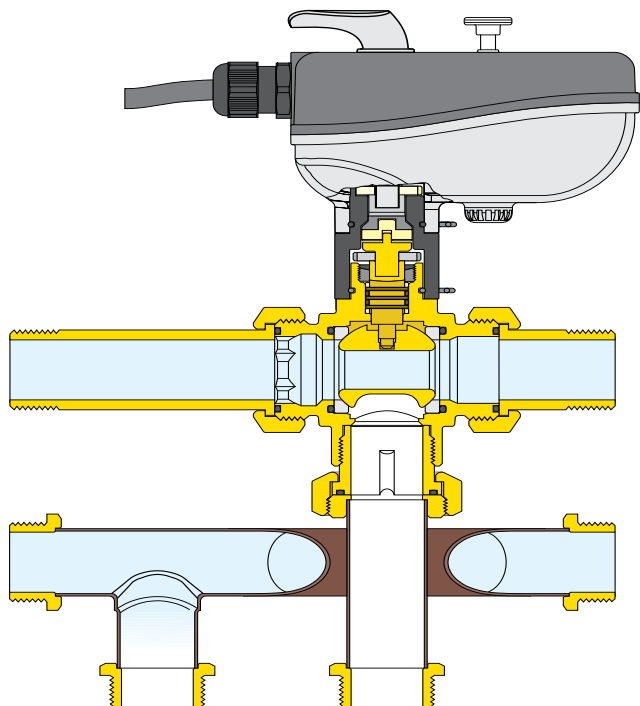
Hydraulic characteristics



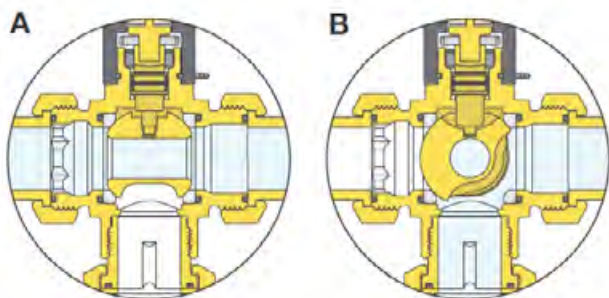
## Construction details

### Diverter valve size 1"

The diverter valve of the integration unit and of the diverter kit has a compact design that adapts easily to existing systems. More than one kit can be connected in series to meet the needs of more complex systems.



The ball inside the diverter valve has been designed to optimise and balance passages in the two configurations of use.

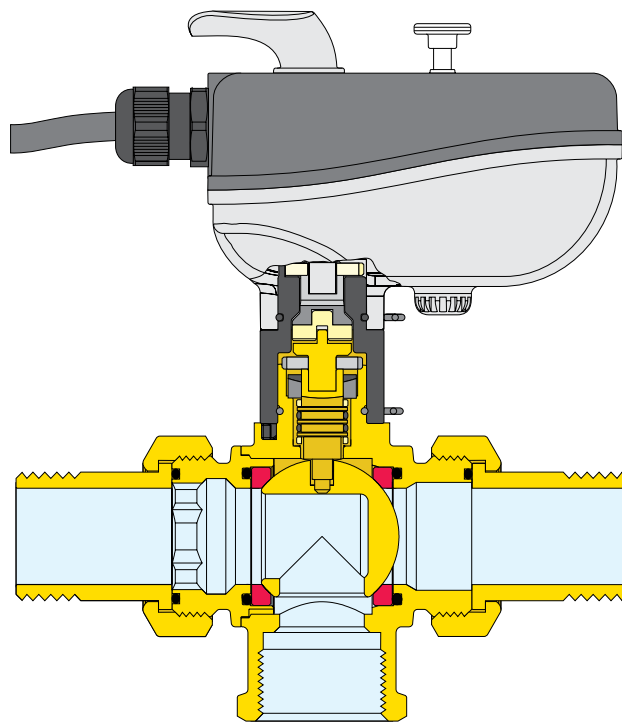


### Return connection kit (only size 1")

The return connection kit, which allows direct coupling to the kit of the heat pump, boiler and system circuits, has been designed to facilitate the realisation of the system and to obtain compact and aesthetically valid solutions.

### Diverter valve sizes 1 1/4" - 1 1/2" - 2"

The valve has a union with a flat seat. Using the ball shut-off mechanism enables high differential operating pressures and, when fully open, low head losses. The low torque values when opening/closing, together with an adequate actuator dynamic torque, make for short operating times.



### Thermal decoupler

Between the valve body and the actuator there is a polymer thermal decoupler PIC, which contains two stainless steel stems and a central insulating ring. This prevents the transmission of heat from the electric actuator to the thermal medium. This prevents condensation build-up inside the actuator.



## Actuator

### Open/close

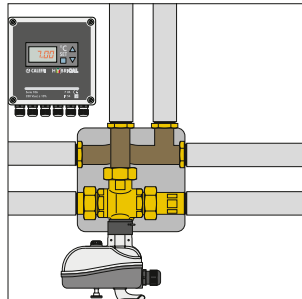
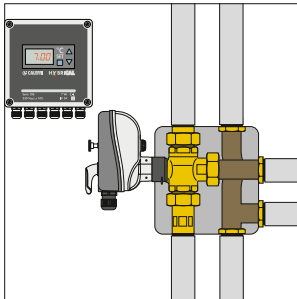
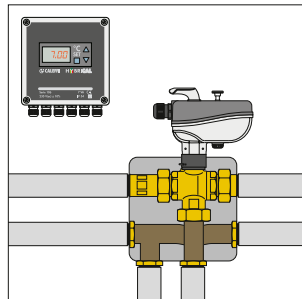
The actuator is equipped with a control lever (2), for valve manual opening/closing, that can be operated by pressing the button (1). The lever also acts as a position indicator.

The fixing of the actuator to the valve body, by means of a stainless steel clip, enables quick disassembly in order to check and operate the control stem of the ball with the aid of a screwdriver.

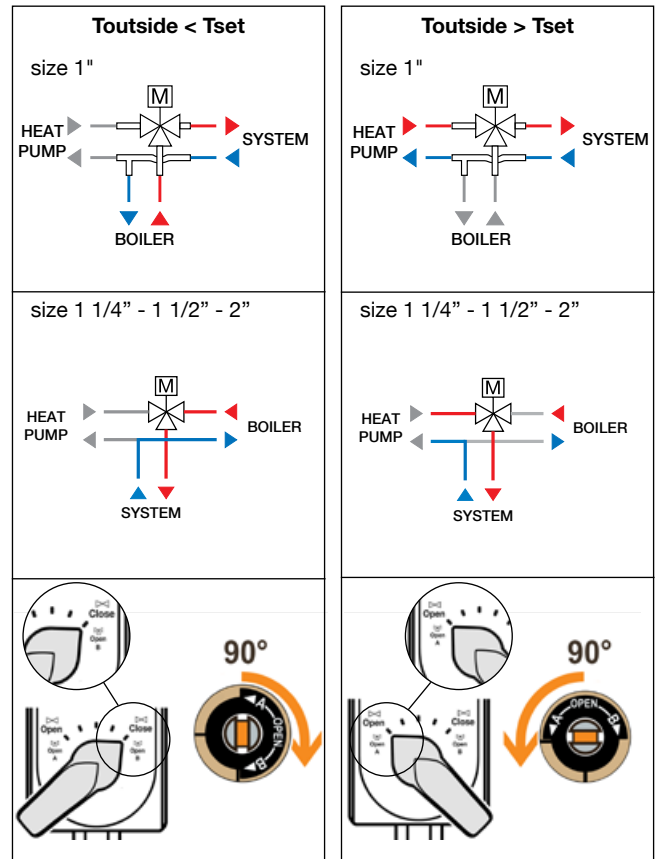


### Protection class

The valve can be installed in a vertical, horizontal or upside-down position, as shown in the figure, as the actuator is certified with an IP 65 protection class.



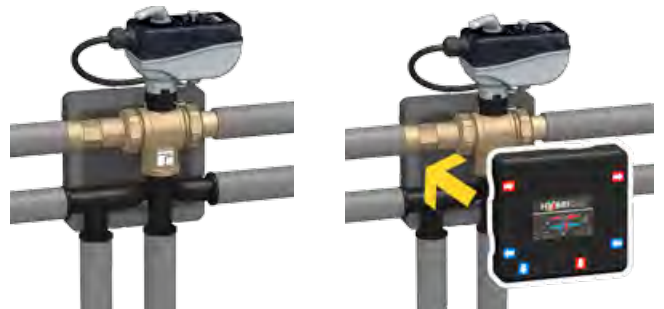
## Directions of flow and position indicator



## Insulation

The hot pre-formed shell insulation, supplied in the package, prevents condensation build-up on the valve body surface, so that the kit can also be used in cooling systems.

This system, moreover, ensures not only perfect thermal insulation, but also the resistance to the diffusion of water vapour from the ambient toward inside.



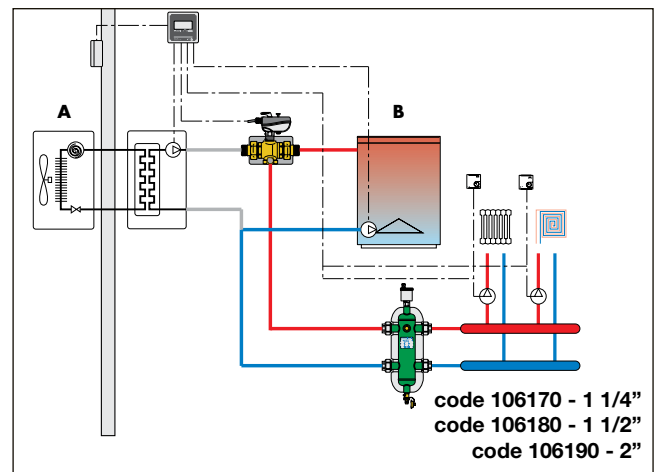
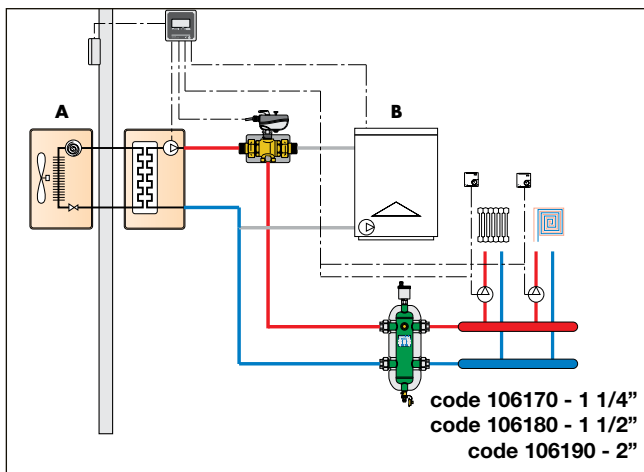
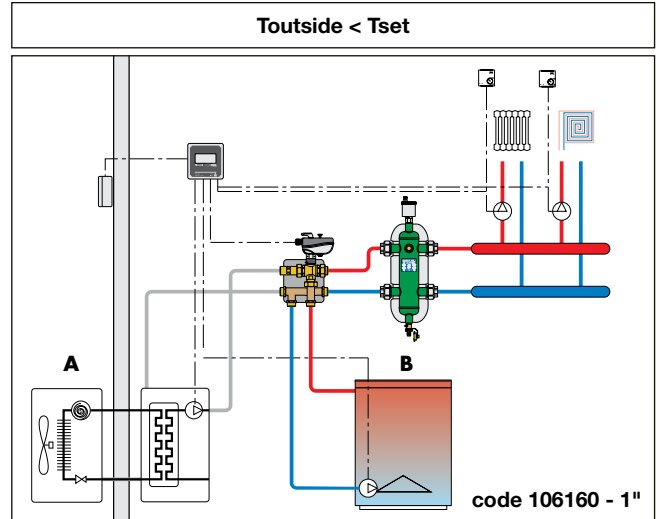
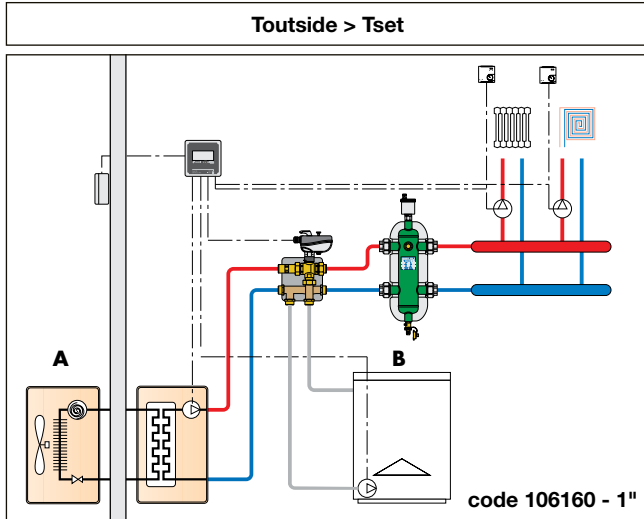
### Operating principle

The 106 series integration unit provides a simple means of connecting the hydraulic circuits of the heat pump and boiler to the heating system terminals, using the return connecting kit which allows the circuits to be joined together in a compact way.

Function is controlled by the electronic regulator which automatically activates and manages the heat pump (A) or the boiler (B) depending on the temperature of the outside air measured by the probe.

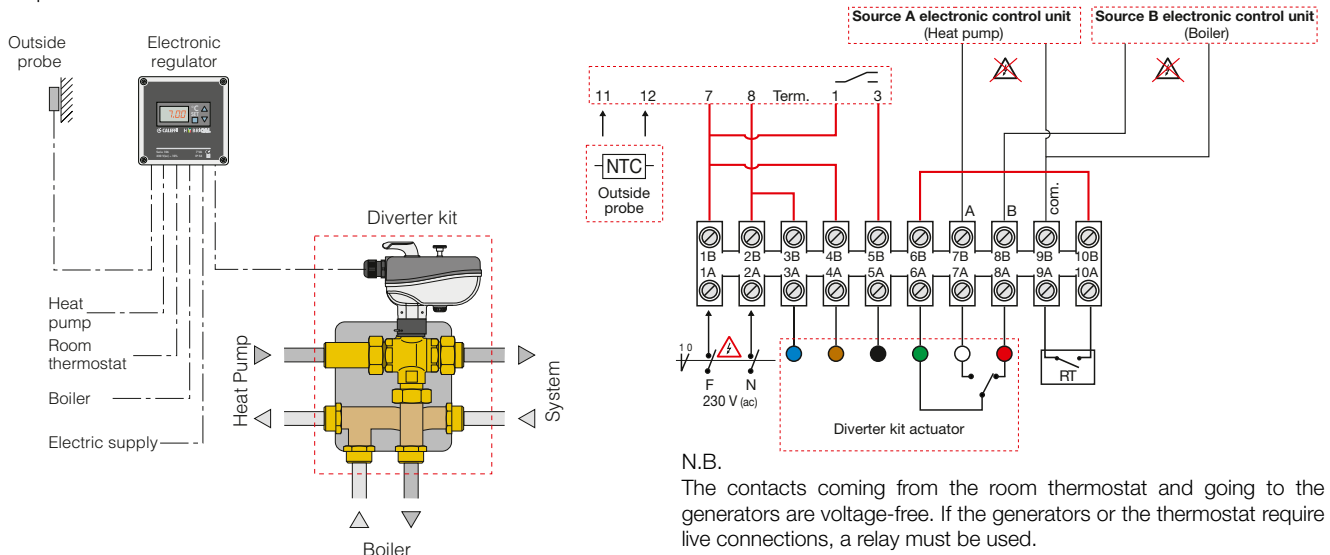
The regulator activates the heat pump (A) when requested by the room thermostat and the outside air temperature has risen above the switching temperature set on the regulator (setpoint temperature). It activates the boiler (B) when requested by the room thermostat and the outside air temperature is below the switching temperature.

The switching over is made by means of a diverter switch that closes the contact of the thermostat towards the boiler (B) or the heat pump (A), through auxiliary relays if needed.



### Electronic regulator and electric connections

The regulator manages the system operating controls. It has a terminal board with six connections for the electric supply, outside probe, diverter kit, heat pump, boiler and room thermostat. From the display, you can view and set the switching temperature and view the temperature read by the outside probe.



## Switching temperature

This is the set-point temperature set on the regulator at which switching occurs between the two generators.

### • Outside temperature rising

When the outside temperature rises and reaches the set-point value (switching temperature) the regulator (with the consent of the room thermostat) switches off the generator B (generally the boiler) and controls diversion of the diverter valve: when diversion reaches about 90% opening towards the source A, the auxiliary microswitch starts the generator A (generally the heat pump).

### • Outside temperature decreasing

When the outside temperature decreases, the regulator switches off the source A (heat pump) below the set-point corrected with hysteresis and activates (with the consent of the room thermostat) the source B (boiler).

Switching takes place with a delay (hysteresis) to avoid hunting in the operation of the two generators.

Example:

Temperature set-point = 6°C

Source A switch-on temperature = T set-point = 6°C

Source A switch-off temperature and source B switch-on temperature

= T set-point - hysteresis = 6-2 = 4°C

## Calculation of the switching temperature

The switching temperature is the limit temperature below which it is not convenient to heat with a heat pump.

Generally it is convenient to use a heat pump rather than a gas boiler only if the heat pump is able to work with an efficiency (COP) higher than the coefficient R (ratio between the cost of the electric kWh and the thermal kWh).

$$COP > R$$

Coefficient

$$R = \frac{C \text{ (kWh.e)} \cdot PCI \cdot \eta}{C_{\text{gas}}}$$

C(kWh,e):

cost of electric kWh

$C_{\text{gas}}$ :

cost per Nm<sup>3</sup> gas

PCI:

gas lower calorific value (kWh/Nm<sup>3</sup>)

$\eta$ :

combustion efficiency

Combustion efficiency generally varies within the range of the following values:

$\eta = 0,70-0,80$

old boilers

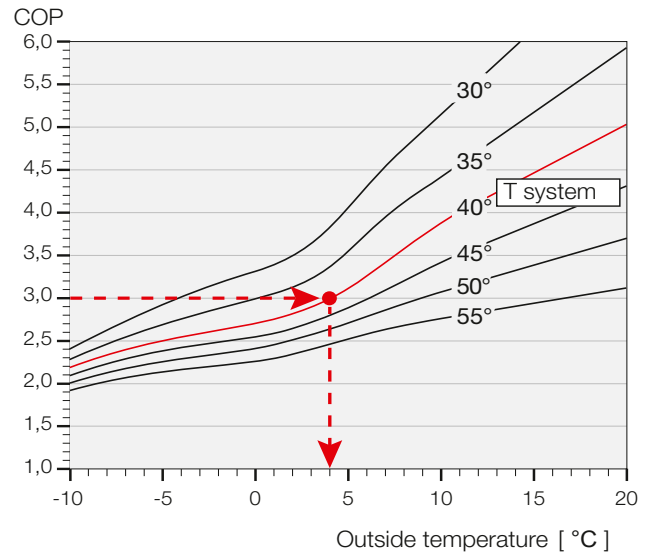
$\eta = 0,90-0,95$

new boilers without condensation

$\eta = 0,95-1,05$

new boilers with condensation

After having calculated the coefficient R, the switching temperature is determined with the COP/temperature diagram supplied by the heat pump manufacturer (similar to the one shown below as an example): a minimum value of COP is assumed equal to the coefficient R obtained and, depending on the system operating temperature, the switching temperature is obtained.

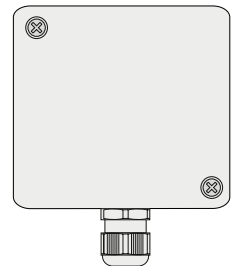


## Outside temperature probe

The probe must be located at a minimum height of 2,5 m on the coldest wall of the building, normally facing north. In any case it must never be exposed to the rays of the sun.

In addition the probe must never be installed near doors, windows, air ejectors or other sources of heat, nor even under balconies. To avoid errors in measurement, the hole, through which the cable connecting to the control unit passes, must also be sealed. Lastly, the probe cannot be painted.

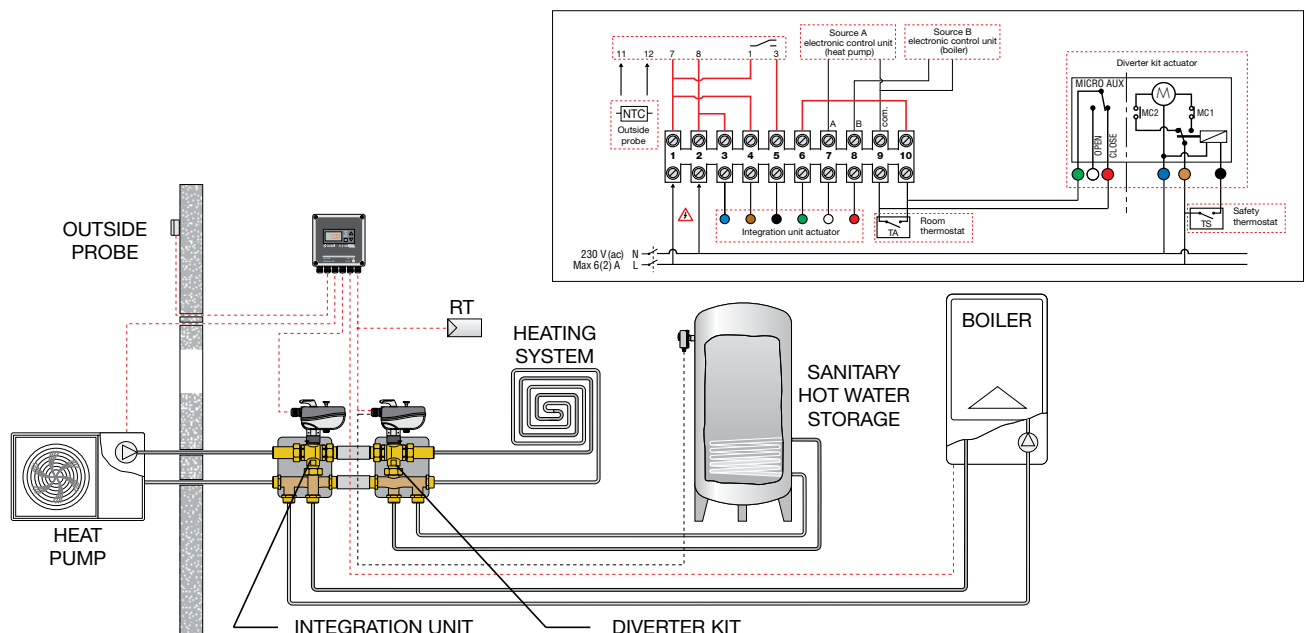
The probe is supplied with a cable 1,5 m long which may be extended to a maximum length of 100 m.



## INTEGRATION UNIT AND DIVERTER KIT

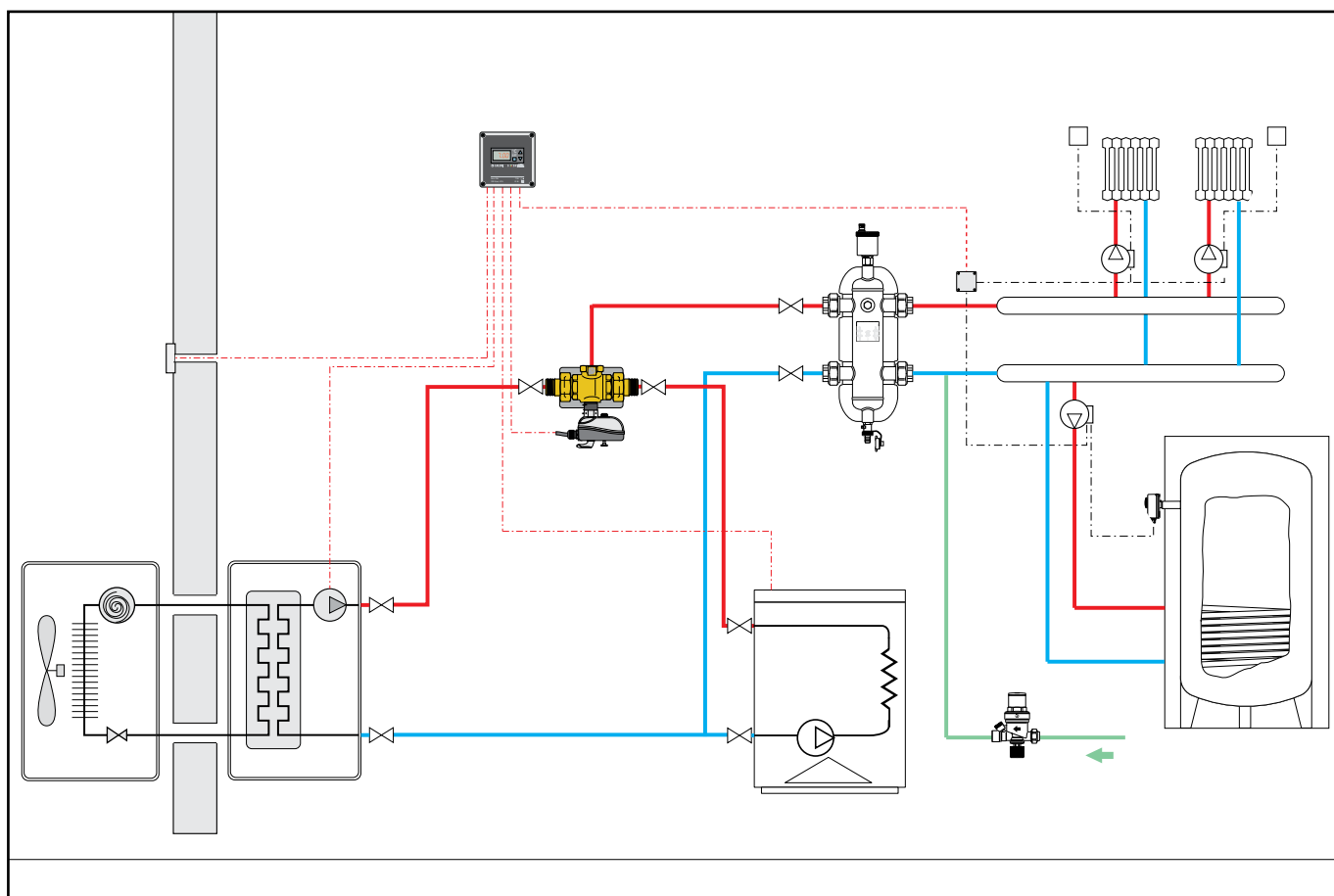
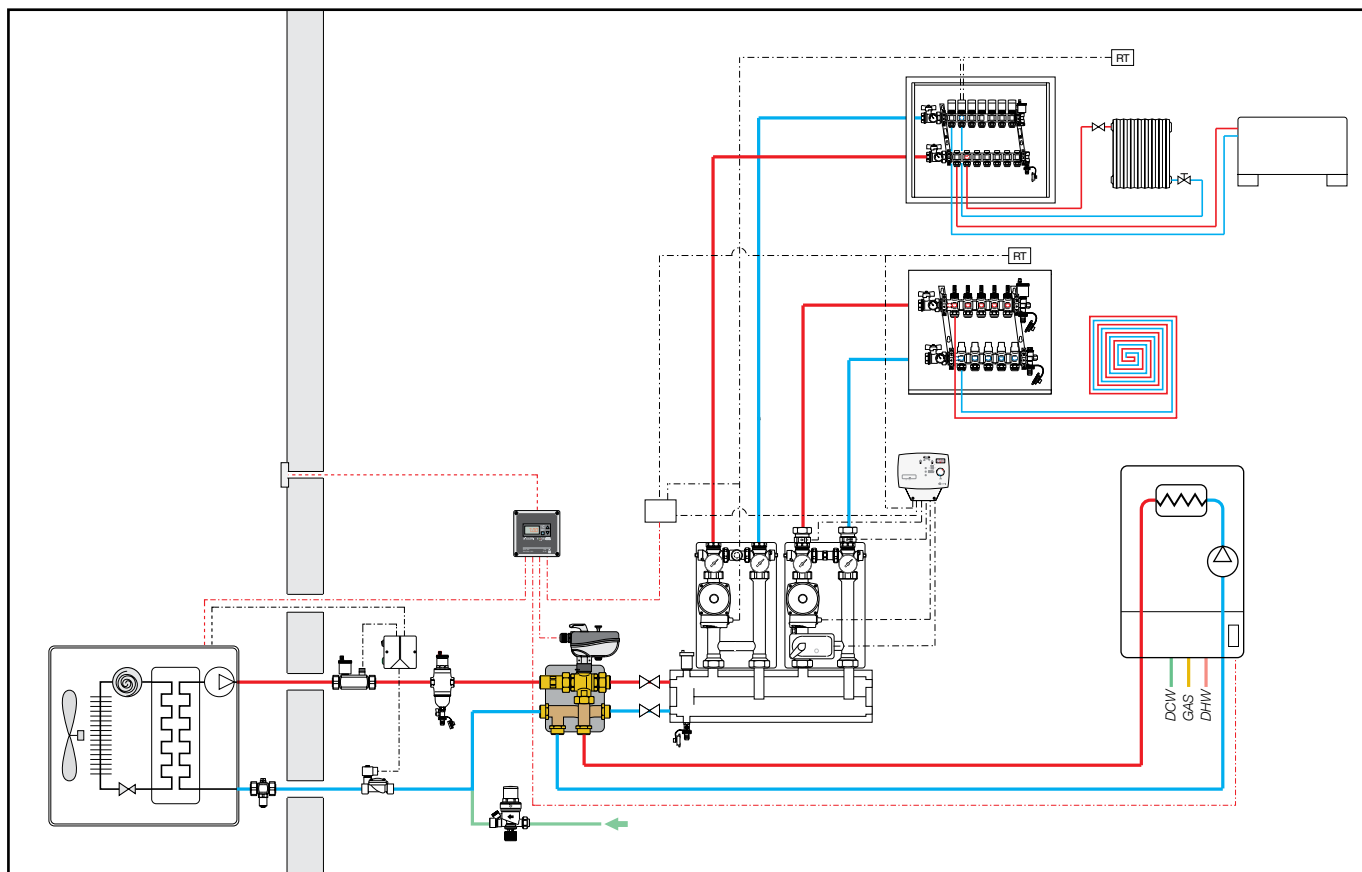
### Operating principle

The code 106060 diverter kit can be installed downstream of the integration unit in order to connect several circuits while maintaining a solution that is compact and easy to install. The actuator of the diverter kit cannot be managed by the electronic regulator of the integration unit but must be controlled by an external auxiliary contact. In this example the diverter kit is used to manage the priority of domestic water storage with respect to the heating system: the actuator is managed by the immersion thermostat located on the storage; the auxiliary microcontact of the actuator must be electrically connected in parallel to the TA to control starting of the generator. When the storage temperature falls below the thermostat set-point the contact opens, causing the diverter kit to switch and activating one of the two generators.





## Application diagrams



## Product range



# 106

Heat pump-boiler integration unit,  
with connection kit

Code	Size	
<b>106160</b>	1"	230 V



# 106

Heat pump-boiler integration unit

Code	Size	
<b>106170</b>	1 1/4"	230 V
<b>106180</b>	1 1/2"	230 V
<b>106190</b>	2"	230 V



# 106

Diverter kit

Code	Size	
<b>106060</b>	1"	230 V

## SPECIFICATION SUMMARY

### 106 series

Heat pump-boiler integration unit. Complete with:

- Diverter valve. Brass body. Sizes from DN 20 to DN 50. Connections 1" (from 1" to 2") M (ISO 228-1). Ball bore: full (size 1"), reduced (sizes from 1 1/4" to 2"). Brass body. Chrome plated brass ball. Control stem seal with double EPDM O-Ring. PTFE ball seal with EPDM O-Ring EPDM O-Ring union seals. Medium water and glycol solutions; maximum percentage of glycol 50%. Maximum working pressure 10 bar (size 1"), 16 bar (sizes from 1 1/4" to 2"). Maximum differential pressure 10 bar. Actuator electric supply 230 V (ac); power consumption 6 VA; with auxiliary microswitch, auxiliary microswitch contact rating 6 (2) A (230 V); dynamic torque 9 N·m. Operating time 50 seconds (90° rotation) Protection class IP 65. Electric supply cable length 0,8 m. Ambient conditions for valve with actuator: medium working temperature range -10–110°C; ambient temperature: operation -10–55°C EN 60721-3-3 Cl. 3K3, maximum humidity 85%; transportation: -30–70°C EN 60721-3-2 Cl. 2K3, maximum humidity 95%; storage: -20–70°C EN 60721-3-1 Cl. 1K2, maximum humidity 95%.
- Connection kit (only for code 106160). Copper pipe. Size 1" M (ISO 228-1).
- Insulation in closed cell PE-X.
- Electronic regulator. Selectable temperature range: -60–150°C. Intervention hysteresys: 2K. Intervention hysteresis range: 0,1–20 K. Electric supply 230 V (ac). Power consumption: 7 VA. Contact rating on switch-over 2A (230 V). Protection class: IP 54. Protection class: II.
- Outside temperature probe. Measurable temperature range: -20–45°C. Cable length: 1,5 m.

### Code 106060

Diverter kit for heat pump and boiler. Complete with:

- Diverter valve. Brass body. Size DN 20. Connections 1" M (ISO 228-1). Ball bore: full. Brass body. Chrome plated brass ball. Control stem seal with double EPDM O-Ring. PTFE ball seal with EPDM O-Ring EPDM O-Ring union seals. Medium water and glycol solutions; maximum percentage of glycol 50%. Maximum working pressure 10 bar. Maximum differential pressure 10 bar. Actuator electric supply 230 V (ac); power consumption 6 VA; with auxiliary microswitch, auxiliary microswitch contact rating 6 (2) A (230 V); dynamic torque 9 N·m. Operating time 50 seconds (90° rotation) Protection class IP 65. Electric supply cable length 0,8 m. Ambient conditions for valve with actuator: medium working temperature range -10–110°C; ambient temperature: operation -10–55°C EN 60721-3-3 Cl. 3K3, maximum humidity 85%; transportation: -30–70°C EN 60721-3-2 Cl. 2K3, maximum humidity 95%; storage: -20–70°C EN 60721-3-1 Cl. 1K2, maximum humidity 95%.
- Connection kit. Copper pipe. Size 1" M (ISO 228-1).
- Insulation in closed cell PE-X.

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