FCPlus
Fan Coil Controller

EN

CONTENTS

1 HOW TO USE THIS MANUAL

This manual is designed to permit quick, easy reference with the following features:

References

***References* column:**
A column to the left of the text contains *references* to subjects discussed in the text to help you locate the information you need quickly and easily.

Cross references

Cross references:
All words written in *italics* are referenced in the subject index to help you find the page containing details on this subject; supposing you read the following text:
"when the alarm is triggered, the ***compressors*** will be shut down"
The italics mean that you will find a reference to the page on the topic of compressors listed under the item compressors in the index.
If you are consulting the manual "on-line" (using a computer), words which appear in italics are hyperlinks: just click on a word in italics with the mouse to go directly to the part of the manual that discusses this topic.

Icons for emphasis:

Some segments of text are marked by icons appearing in the *references* column with the meanings specified below:

Take note: information on the topic under discussion which the user ought to keep in mind

Tip: a recommendation which may help the user to understand and make use of the information supplied on the topic under discussion

Warning! : **information which is essential for preventing negative consequences for the system or a hazard to personnel, instruments, data, etc., and which users MUST read with care.**

2 INTRODUCTION

2.1 General Description

2.1.1 FCPLUS

FCPLUS is an electronic controller for fan-coils designed to *control* valves with on-off actuators, electrical heaters if present and the three fan speeds. Once the unit has been set correctly, it controls the following fan coil units:

- 2 pipes
- 2 pipes with *electric heaters*
- 4 pipes
- independent wall thermostat
- ceiling-mounted installations
- floor-mounted fan coil installations

In all cases, automatic *control* of the three fan speeds based on the offset between the ambient temperature and the set point is possible.

Typical applications

- Household
- Residential
- Small commercial areas (offices, hospitals, hotels)

Main characteristics

- One family that is now even more comprehensive with a simple modern design
- One controller for a variety of system and machine requirements;
- Easy to use and install
- Less risk of damaging electronics
- Maximum focus on comfort and energy savings
- *Hot Start*
- *Too Cool*
- *Post ventilation*
- *Periodic Ventilation*
- Economy Input or Window Contact
- Automatic fan speed
- Low noise level with solid state technology
- *Control of range*.....
- Ventilation selectable in dead zone
- Remote air probe (optional accessory)
- Vertically installed for easier on board-*installation*
- Operating and probe alarm *LEDs*

2.2 Interface

2.2.1 "Automatic Mode Selection" Interface – 4 positions

FC PLUS

FC PLUS **- "Automatic Mode Selection" – 4 positions**

2.2.2 "ON-OFF" Interface – 2 positions

FC PLUS **- "ON-OFF" – 2 positions**

Knob

- Set point: from 5° to 35°C with ±0.5° stop-click;
- plugs to limit set point range or block it at a specific value

Slide switches*

- 1 fan switch to *control* fan speed: High/Medium/Low/*Auto*
- 1 switch to select mode: OFF/*Heating***/*Cooling****/*Auto*

LEDs

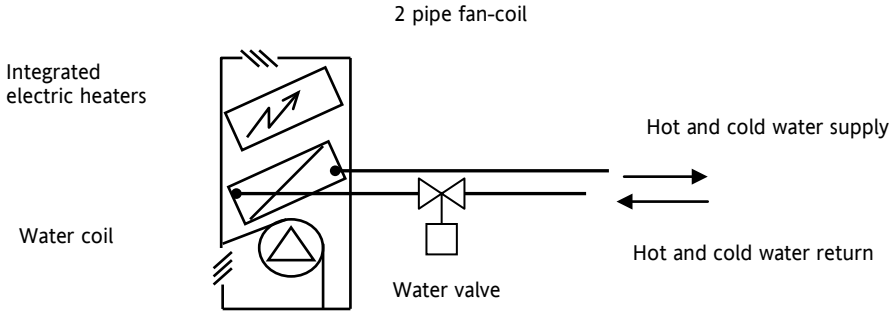
- *Heating* LED **(red)**
- *Cooling* LED **(green)**
- Thermostat request LED **(yellow)**

NOTE: * Slide switches are also referred to in the text as *Sliders*
** *Heating* is referred to as ***HEATING*** or **WINTER** mode
*** *Cooling* is referred to as ***COOLING*** or **SUMMER** mode

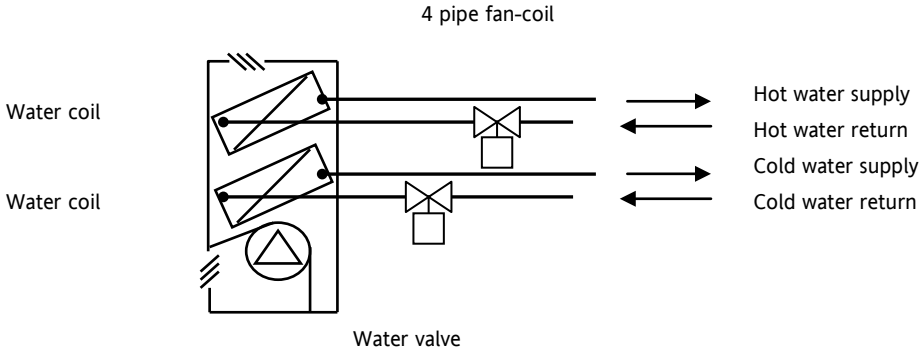
2.3 Example of fan-coil system

A typical fan-coil system with 2 and 4 pipes can be seen in the diagram below:

2 pipe system



4 pipe system



Control of Fan

OUTLET FAN

The fan is situated immediately in front of the *finned coil*; it works by taking up the ambient air using the inlet duct.
The air passes through the battery and is then emitted into the environment.
If the controller is installed on the fan-coil unit itself, another return air probe situated in the inlet air flow measures the ambient temperature. However, in this case, the measurement is only valid if there is enough inlet air flow to prevent or reduce stratification in the environment.

Finned coil

Valve

WATER COIL – WATER *VALVE*

It consists of a water-air exchanger placed in the internal environment that the inlet air flow passes through.
The exchanger is supplied with hot or cold water normally produced by a chiller or boiler.
A double supply circuit for the coil (4 pipes) is possible. The 4 pipe configuration requires two water valves and two independent exchangers or one single exchanger (2 pipes). It is often important to determine the temperature of the battery supply water. A water probe placed on the downstream side of the coil and *valve* return is used for this purpose.

Electric heaters

ELECTRIC HEATERS

The electric coil can be used to heat the air if hot water is not available or contribute to *heating* water when there is not enough.

2.4 Available models

2.4.1 FC PLUS Models

6+6 versions of **FC BASICOM** are commercially available. Each version has different functional characteristics.

FP U320/B – FP U120/B
The ideal model for wall-*mounting*; automatically controlled fan speed

FP U32E/B – FP U12E/B
Basic model with economy input for reduced set point

FP U32W/B – FP U12W/B
Basic model with window contact for energy saving

FP U320/S – FPU120/S
Universal model with remote probe inputs

FP U32E/S – FPU12E/S
Universal model with economy input for reduced set point + remote probes

FP U32W/S – FPU12W/S
Universal model with window contact for energy saving + remote probes

Refer to the summary table below:

Table of models

Explanation of product codes:

Number	Code	Description
Model	**FP**	**PLUS fan coil**
1°	U	Universal model, fan coil system with 2 or 4 pipes selectable
2°	3	Slider 1 (mode): Off / *Heating* / *Cooling* / Automatic
	1	Slider 1 (mode): ON/OFF
3°	2	Presence of electric *heating* selectable
4°	0 E W	No voltage input Economy input present Window Contact input present
5°	/B /S	Basic Model – without remote probes Model with *remote water and air probe* inputs

(*) Note The *digital input*, if present, can be powered or free from voltage, NO or NC 230V~, 115V~, 24V~, ... depending on model.

--> For information on product codes and characteristics of the models, see the sales data sheets:

- **CT122706 *FCPLUS* ITA**
- **CT122707 *FCPLUS* GB**
- **CT122708 *FCPLUS* D**

Accessories

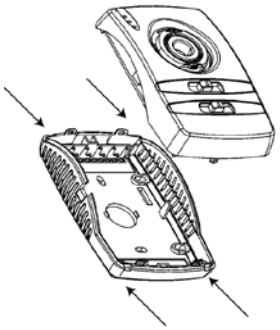
Remote water and air probe

Remote water and air probe

- NTC temperature probe, plastic cover 7x25, reinforced insulation, PVC cable, cable length = 1.5m
- NTC temperature probe, plastic cover 6x40, reinforced insulation, PVC cable, cable length = 1.5m

3 INSTALLATION

The ***FC PLUS*** wall-mounted version consists of two parts:
- the first (connector base unit) is fastened to the wall and contains the connectors;
- the second (main *interface*) contains the electronics and all the controls and can be connected to the first part with a simple snap-on connector.



This makes *installation* easy and prevents damage to the electronic parts during *installation*.
Use a small screwdriver to separate the connector base unit from the main *interface*. Place the screwdriver in the special holes (in the side of the casing) and twist slightly until the two parts come apart.

FC PLUS can also be installed in a fan-coil unit.
An additional remote air probe must be installed in the return air flow of the unit.

3.1 Recommendations

- ***INSTALLATION*** **MUST BE CARRIED OUT BY QUALIFIED PERSONNEL ONLY!**
- Due to the numerous *functions* and versions of controllers available, models offer different *functions* and options.
- The description of the controllers in this document is general and is provided for information only.
- For detailed information on the *functions* available, please contact an authorized dealer or the Sales Office of Eliwell.
- **Before *installation*, always read the labels fitted on the device.**

- Relative humidity above 90%, non-condensing
- Strong vibrations or knocks
- Exposure to continuous jets of pressurized water
- Exposure to aggressive and polluting atmospheres that may cause corrosion and oxidation (e.g. sulphuric or ammonical substances, salt mist, fumes)
- Presence of high magnetic or radiofrequency interference (e.g. near transmitting antennas)
- Exposure to direct sunlight or atmospheric agents.

When connecting controllers to each other or *accessories*, electric loads and other devices, pay special attention to the following:

- Incorrectly connected supply voltage may damage the controller.
- Suitable wire terminals for connectors must be used. Unscrew the terminal screw, insert the wire terminal and fasten the screw. Check fastening by lightly pulling the cable. Do not use automatic starters (or adjust them to a torque below 50 N*cm)
- Potential electromagnetic interference: use separate cables for high and low voltage loads. Keep the temperature probe cables and *digital input*s as far apart as possible from cables with inductive or power loads.
- Never place the power cables and temperature probe cables in the same conduit. The remote probe cables must be kept separate from the power devices (e.g. power relay). The distance covered by these cables must be kept to a minimum.
- Never apply loads exceeding those indicated in this specification to the outputs.
- When connecting loads, carefully observe the load *wiring diagrams*

3.2 Mounting

The controller must be mounted in a place where:
- The controller can be easily accessed
- There are no blinds, cabinets, shelves, etc....
- Free circulation of air is guaranteed
- There is no direct sunlight
- There are no draughts (e.g. open doors or windows)
- It does not come into contact with sources of heat and *cooling*
- There is no external wall
- It is installed on the wall at approx. 1.5 m above floor level

3.3 Wiring diagrams

3.3.1 Wiring recommendations

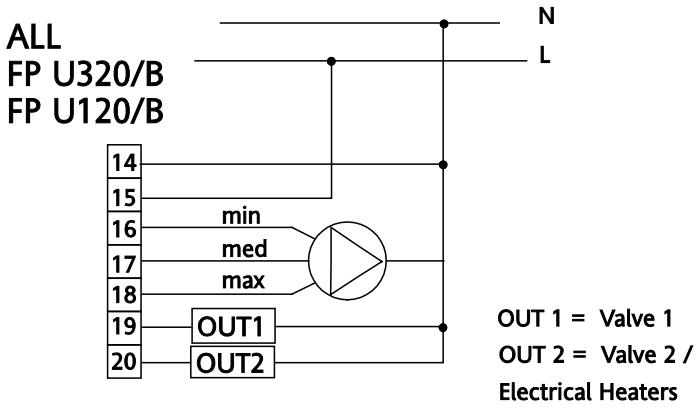
The device has screw connectors for connecting cables with a maximum cross-sectional area of 1.5 mm² (for power contacts; only one conductor per terminal).
Always switch off machine before working on electrical *connections*. Make sure that the power voltage complies with the device voltage. Only use supplied screws. Do not install the device on metal surfaces. Do not insert objects of any kind into the slots of the device (regardless of whether the device is on or off).
The probe requires no connection polarity and can be extended using an ordinary bipolar cable (note that if the probe is extended, this affects the electromagnetic compatibility of the instrument: special care must be used when wiring). Only use the supplied probes.
Make sure there is a minimum distance of 8 mm between the instrument components/*accessories* and the accessible parts (cables, sensors, etc.).

Connections

The loads must be connected to the *FCPLUS* as shown below:

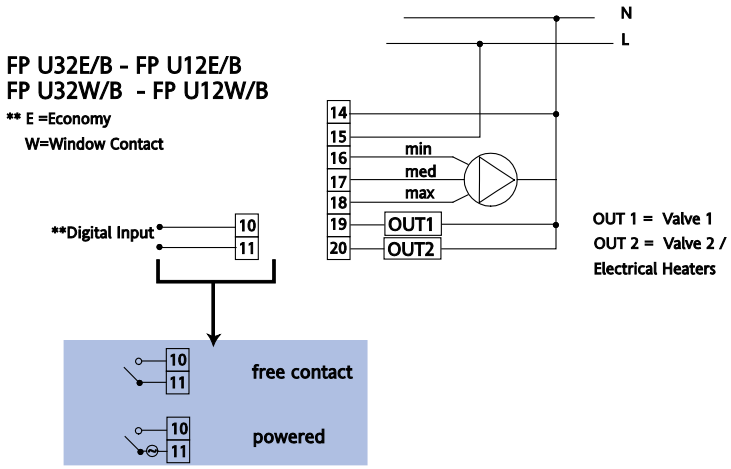
FP U320/B – FP U120/B

FP U320/B – FP U120/B
This model has no inputs



FPU32E/B - FPU32W/B * FPU12E/B - FPU12W/B

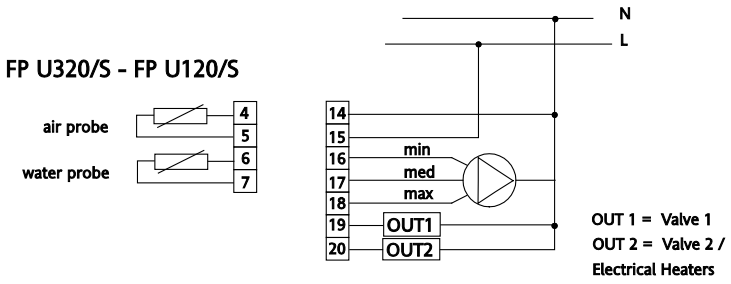
FPU32E/B - FPU32W/B * FPU12E/B – FPU12W/B



--> **Models with remote probes (/S)**

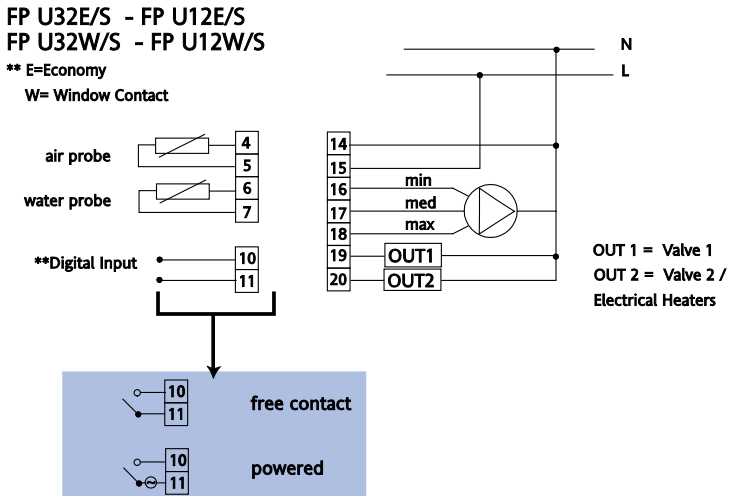
FP U320/S – FP U120/S

FP U320/S – FP U120/S



FPU32E/S - FPU32W/S * FPU12E/S – FPU12W/S

FPU32E/S - FPU32W/S * FPU12E/S – FPU12W/S



3.4 Analogue inputs

3.4.1 Analogue inputs/Probes

Three *analogue inputs* are available:

Number	Description	**Probe** range	**Measurement** range
ST1	Ambient temperature probe (always internal) Probe mounted on board in wall-mounted installations.	-50°C +110°C	-50°C +55°C
ST2	Optional sensor; it inhibits operating of ST1 if present. Used for regulating ambient temperature, it is mounted on the device in ceiling-mounted or floor-mounted installations. For information on *connections*, see diagram.	-50°C +110°C	-50°C +110°C
ST3	Optional probe; it enables *Hot Start* and *Too Cool functions* when present. This sensor, which must be installed on the downstream side of the water *valve*, is used to *control* the water temperature.	-50°C +110°C	-50°C +110°C

Note: inputs 1 and 2 are expressed to the nearest ten degrees Celsius with reference to O (zero) Celsius.

If the measurement range is exceeded, the probe is considered faulty.
Measurement resolution is 1/4 di C°.
Measurement error is:

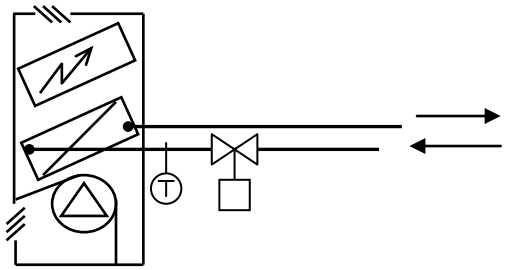
- less than 1°C between +5°C and 50°C;
- less than 2°C between -20°C and 100°C;

3.4.2 Temperature set point

Number	Description	Use
ST1 (selector knob)	Potentiometer input: Used to set the controller set point. Ranging from a minimum set point of 5 C° to a maximum set point of 35 C°.	-105° +105° from average point

Related topics: Set point selector knob and *Control of range*

Note The presence of the water probe is automatically detected by the controller during start-up.



Water probe mounted downstream

The water probe (*analogue inputs*) must always be mounted on the water pipe on the upstream or downstream side of the *valve* and as near as possible to the coil. In *4 pipe system*s, it must always be mounted on the hot water and not the cold water circuit.

3.5 Digital input

Available on Economy and Window Contact models: free from voltage or powered at low/high voltage, depending on model.

3.6 Digital outputs

TRIAC

The *digital outputs* consist of 5 TRIACs

Number	Function	Description
FAN	*Control* of Outlet Fan (see Operating of fan on demand)	Starts ventilation. The fan *control* cursor takes the phase to three different terminals so that the 3 fan speeds can be manually selected.
OUT1	*Valve Control*	Allows water to flow into the coil.
OUT2	*Control* of *valve* or *electric heaters*	If the electric heater coil is present, the *TRIAC* controls if. If not, it is controlled in the same way as the second *valve* on a *4 pipe system*.

OUTPUTS	2 pipes	2 pipes with ***electric heaters***	4 pipes
OUT1	*Heating valve* / *cooling*	Not used	*Cooling valve*
OUT2	Not used	*Electric heaters*	*Heating valve*

3.7 Dip Switches

There are **5** ***Dip Switches*** on the back of the electronic board. Their *functions* are listed below:
Locate the *dip switches* on the rear of the board (see Fig. position C), then configure the system according to needs.

Dip Switch no.	ON	OFF	Description
1		x	floor-mounted device
	x		ceiling-mounted device
2		x	Ventilation on demand (1)
	x		Continuous ventilation (2)
3	x		*thermostat control on valve*
		x	*thermostat control on fan*

DIP switch no.	4	5	Description
4-5	**OFF**	**OFF**	2 pipe device without *electric heaters*
	ON	**OFF**	4 pipe device
	OFF	**ON**	2 pipe device with *control electric heaters*
	ON	**ON**	2 pipe device with integrated *electric heaters*

NOTES
(1) on request in heat mode; continuous in cool mode
(2) no *Hot Start* and *Too Cool*

3.7.1 Device characteristics - Configuration of dip switches 4-5

DIP switches **4-5 - Table A**

Dip Switch no.	4	5	2 pipes	4 pipes	*Electric heaters*	Fan speed	ST1 mandatory	*Heating*	*Cooling*	*Electric heaters*
ALL MODELS	OFF	OFF	x	-	-	3	B models	OUT1	OUT1	-
ALL MODELS	ON	OFF	-	x	-	3	B models	OUT2	OUT1	-
	OFF	ON	x	-	x	3	B models	-	OUT1	OUT2
	ON	ON	x	-	x	3	B models	OUT1	OUT1	OUT2

NOTE:
- indicates NOT USED

To access the *DIP switches*, proceed as follows:

- First, use a small screwdriver to separate the connector base unit from the main *interface*. Place the screwdriver in the special holes (in the side of the casing) and twist slightly until the two parts come apart.
- If you turn the back of the main *interface* around, you can see the *DIP switches* installed on the printed circuit board.

DIP switches **4-5 - Table B**

		Dip Switch Configuration			
		Dip4 OFF DIP5 OFF	**Dip4 ON DIP5 ON**	**Dip4 OFF Dip5 ON**	**Dip4 ON Dip5 OFF**
Type of system	System	2 pipes	2 pipes	2 pipes	4 pipes
	Electric heaters	NO	Integrated	*Control*	NO
Outputs	*Heating*	OUT 1	OUT 1	-	OUT 2
	Cooling	OUT 1	OUT 1	OUT 1	OUT 1
	Electric heaters	NO	OUT 2	OUT 2	NO

4 USER INTERFACE

FCPLUS has two main controls:

- Selector knob
- 2 *sliders*

4.1 Set point selector knob - FC PLUS

A potentiometer used to set the operating set point.
The operating set point varies according to the angle set from 5 to 35 degrees Celsius.
The range from the central point of the potentiometer is +/- 105° degrees.

4.1.1 Clicking of selector knob

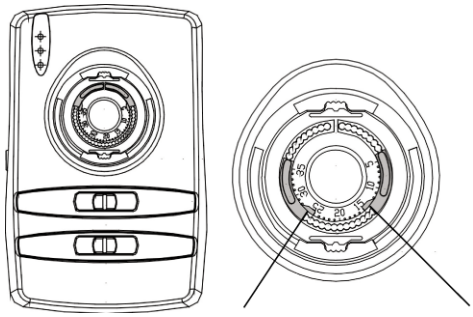
A sensitive mechanism that clicks approximately every 0.5°C for more accurate setting.

4.1.2 Control of range

The set point can be controlled on all models by establishing a minimum and maximum value using 2 pegs placed underneath the selector knob. If the two pegs are assembled close to each other, the set point can be blocked at a specific value.
Proceed as follows:

1. Use a small screwdriver to separate the connector base unit from the main *interface*. Place the screwdriver in the special holes (in the side of the casing) and twist slightly until the two parts come apart.
2. Before going on to the next stage, turn the selector knob to its median position if you want to restrict the range (minimum/maximum). If you want to block the set point, place the selector knob in the block value position you require. If you turn the back of the main *interface* around, you can see a hole halfway along the electronic board. Lightly press the pin connected to the knob until is comes away from the main *interface*.
3. You can now remove the knob on the main *interface* touchpad and access the range *control*. Once the pegs have been placed in the required position, reassemble the selector knob correctly in the *interface*.

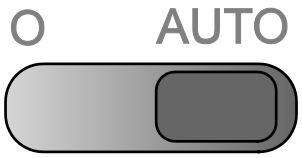
- Factory setting of limit pegs at 5°C and 35°C:
- Example of limit range between 15°C and 25°C:



4.2 Sliders

2 4-position *sliders*, depending on the *interface*, are supplied to select the operating mode and fan speed.

4.2.1 Slider Operation - “Automatic Mode Selection” Interface – 4 positions



4.2.2 Slider Operation - “ON-OFF” Interface – 2 positions

4.2.3 Fans slider

REGULATING
The desired temperature can be regulated and set using the selector knob on the instrument keypad.

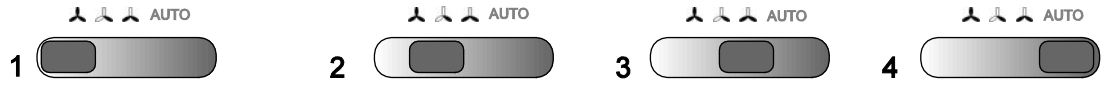
OPERATING
Operating modes can be selected and set using the slider on the instrument keypad:

“Automatic Mode Selection” Interface – 4 positions

“ON-OFF” Interface – 2 positions

1. Device off
2. *Heating* setting **– "Automatic Mode Selection"** ***interface*** **only**
3. *Cooling* setting **– "Automatic Mode Selection"** ***interface*** **only**
4. Automatic selection setting

In the same way, the fans can be set to three different speeds or automatic mode:

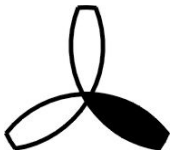


Fans at maximum speed
1. Fans at medium speed
2. Fans at minimum speed
3. Automatic selection setting

4.2.4 Fan control slider

Positions 1-2-3
Switches the phase selected by the fan *TRIAC* to three motor windings to give three different fan speeds: High/Medium/Low.


High Speed:


Medium Speed:


Low Speed:

Position 4

Indicates automatic speed (AUTOFAN) See relevant chapter

4.2.5 Operating mode slider

According to the model (see *table of models*), the operating mode off/*Heating*/*Cooling* or *AUTO* can be selected

Off mode:

***Heating* mode:**
– With "Automatic Mode Selection"

***Cooling* mode:**
***interface* only -**

***AUTO* mode:**

AUTO

4.3 LEDs

The device has 3 *LEDs*:

LED1 yellow
"CALL"

LED 2 green
COOL

LED red
HEAT

4.3.1 Table of the functions associated to the LEDs

Function	LED1 YELLOW	LED2 GREEN	LED3 RED
Cooling plus thermostat request	**ON**	**ON**	OFF
Heating plus thermostat request	**ON**	OFF	**ON**
Operation in *Cooling* mode	OFF	**ON**	OFF
Operation in *Heating* mode	OFF	OFF	ON
Hot Start on	**ON**	OFF	flashing
Too Cool on	**ON**	flashing	OFF

The 3 *LEDs* are used to indicate the mode that the controller is operating in:

Thermostat Request LED: (YELLOW)
Permanently on in ON REQUEST mode
Cooling **LED: (GREEN)**
Permanently on with ACTIVE *COOLING* MODE
Flashing: indicates that the temperature controller is not satisfied but the water temperature probe has not given permission to start the fan.
Heating **LED: (RED)**
Permanently on with ACTIVE *HEATING* MODE
Flashing: indicates that the temperature controller is not satisfied but the water temperature probe (2 pipe model) has not given permission to start the fan.

Alarm signalling

4.3.2 Table of the signals associated to the LEDs

Signal	LED1 YELLOW	LED2 GREEN	LED3 RED
Power supply (Lamp Test)	Blinking (3 seconds)	Blinking (3 seconds)	Blinking (3 seconds)
Air probe error	flashing	flashing	flashing
Faulty **water** probe	- (no signal)	- (no signal)	- (no signal)

- All *LEDs* will flash for three seconds when the controller is switched on.
- All *LEDs* continue to flash to indicate a state of alarm.
- An alarm is emitted if the air *control* probe is damaged, disconnected or short circuits until the problem is resolved.

If the water probe is damaged, no signal is issued

5 TEMPERATURE CONTROL FUNCTIONS

5.1 Operating modes

According to the models and options available, ***FCPLUS*** works in the following *operating modes*:

Operating modes

- *COOLING* (summer setting)
- *HEATING* (winter setting)
- *AUTO* (automatic selection of summer – winter setting)

Cooling

Cooling: this is the "summer" operating mode; the unit is configured to generate cold air.
NOTE: *COOLING*←→"summer" settings are used as synonyms

Heating

Heating: this is the "winter" operating mode; the unit is configured to generate hot air.
NOTE: *HEATING*←→"winter" settings are used as synonyms

Auto

Auto: the unit is configured to switch automatically from *cooling* to *heating* and vice versa depending on the temperature values detected by the air probe.
NOTE: *AUTO*←→AUTOCHANGE OVER are used as synonyms

The loads controlled in the different *operating modes* are shown in the table below:

Operating mode table

Mode	Setting	Controlling
HEATING	MANUAL	• *Valve*: water (for 2 pipe fan-coil), hot water (for 4 pipe fan-coil) • Fan (3 speeds set manually or automatically) • Electric heater (2 pipes)
COOLING	MANUAL	• *Valve*: water (2 pipes), hot water (4 pipes) • Fan (3 speeds set manually or automatically)
AUTO	AUTOMATIC	Controlled dynamically in the following modes: • *HEATING* • *COOLING*

Manual change over

The summer/winter setting (*Cooling*/*Heating*) can be manually set locally.

Automatic change-over

- The operating mode is automatically selected according to the temperature detected by the air temperature probe.

5.2 Control

FCPLUS controls the loads according to a set point that can be set using the knob

Depending on the model, the following temperature controllers are available:

- **TEMPERATURE *CONTROL*:** controls the *valve* in COOL/HEAT mode;
- **FAN:** controls the fans in COOL/HEAT mode;
- ***ELECTRIC HEATERS*:** controls the *electric heaters* in HEAT mode.

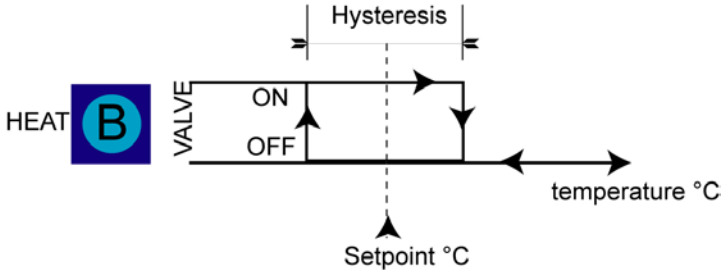
Depending on how the *dip switches* are configured **(see *Installation* chapter, paragraph on *Dip Switches*)**, the following is determined.

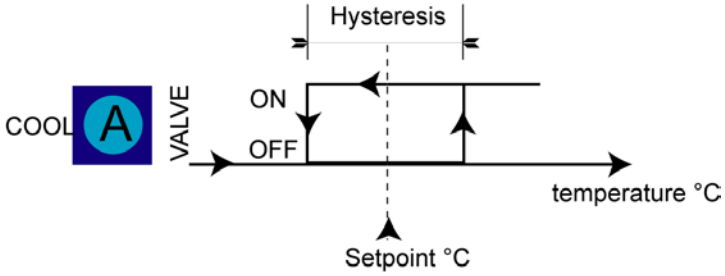
5.3 Thermostat control on valve

In this case, fans are managed according to the operating mode selected (*Cooling* or *Heating*) as follows:

A. **In Cool mode** the fans run at the speed set with the fan slider or specified by the Autofan controller, and can be disabled by the *Too Cool* function only.
The speed shall be equivalent to the one set with the Fan slider (managed in *AUTO* mode if this mode is selected).

B. In *Heating* mode, the fan follows the *valve* status (observing the activation delay time) and behaves as follows:
   i. fan ON 60 seconds after the *valve* open command (signalled by flashing of the red LED);
   ii. fan OFF when *valve* close command is given.
   iii. the *HOT START*, *POST VENTILATION* and PERIODICAL VENTILATION (**see chapter *Functions*)** are also enabled.





→IF the water probe is PRESENT:
If the controller is ON (fans on), the speed will be:

- manually set by the user (Min – Med – Max speeds permitted)
- set by *AUTO*_FAN at automatic speed if the fan slider is positioned to *Auto* mode.

→Water probe POSITIONING:

5.3.1 Probe upstream or downstream from the valve

The valves and fans are managed differently according to the position of the water probe.

- **If P50=0, i.e. the water probe is installed downstream from the *valve*:**
  The *Hot Start* and *Too Cool functions* stop the fan, but not the *valve*.
  -->The position of DIP 2 has no effect on the status of the fans in *Hot Start* and *Too Cool* mode.

- **If P50 = 1, i.e. the water probe is installed upstream from the *valve*:**
  The *Hot Start* and *Too Cool functions* stop the *valve*, but not the fan.
  -->The position of DIP 2 has no effect on the status of the fans in *Hot Start* and *Too Cool* mode.

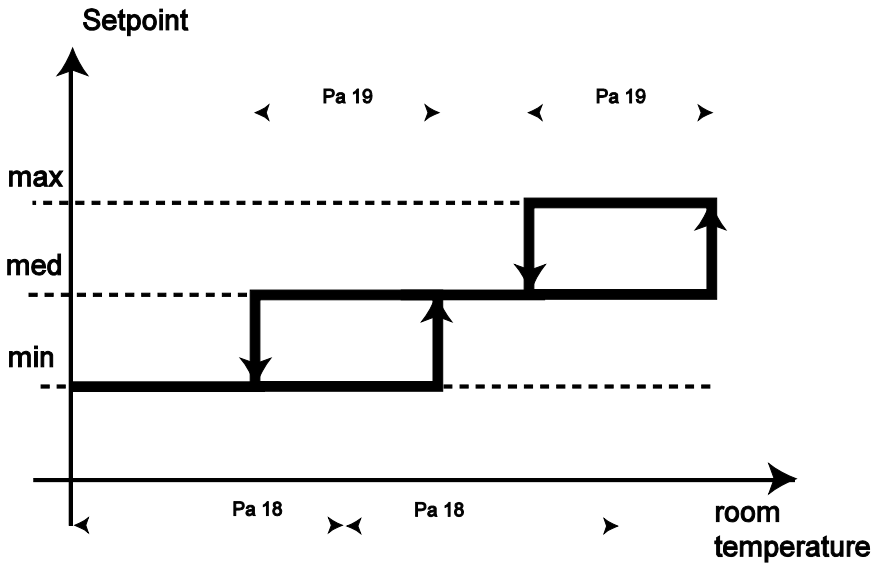
NOTE:
For 4 or 2 pipe machines with temperature *control* integrated in the fan, parameter **P50** has no effect **(see paragraph Temperature *control* integrated in fan)**.

5.3.2 AUTO FAN – Temperature control on valve

Speed of the fans is automatically controlled according to the offset between the ambient temperature and the temperature set with the set point.
The graphs related to fan *control* for temperature *control* on the *valve* are shown below.

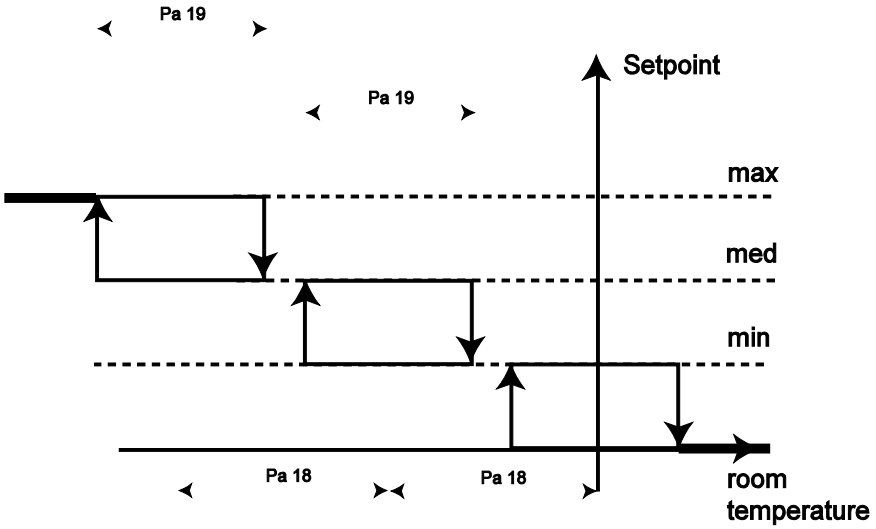
AUTOFAN COOL MODE temperature control on valve

AUTOFAN COOL MODE temperature control on valve



AUTOFAN HEAT MODE temperature control on valve

AUTOFAN HEAT MODE temperature control on valve

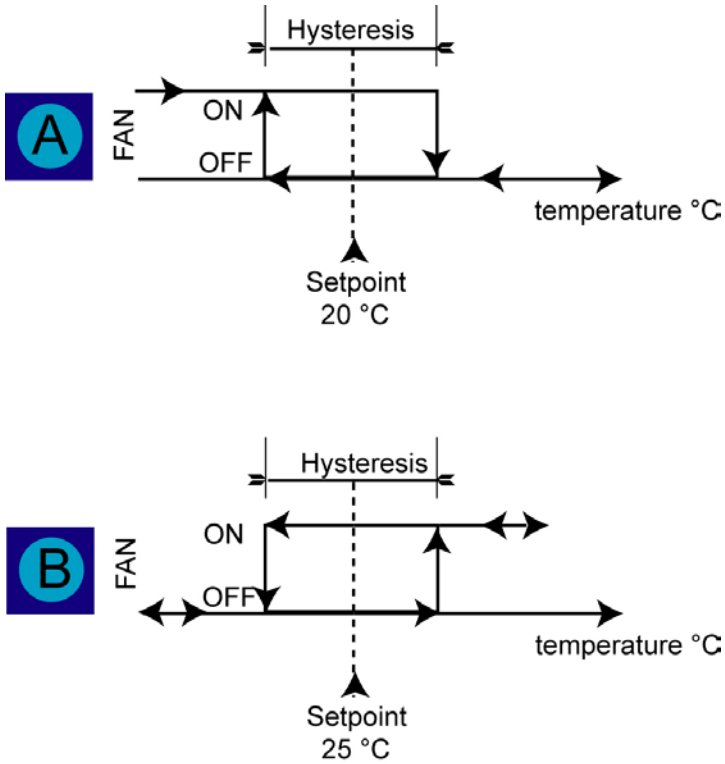


Note: the Set point label in the axis of abscissas in the above graphs refers to the Set point value set by the user using the potentiometer.

The step intervention differential is equal to parameter 18 and the intervention hysteresis equals parameter 19.

5.3.3 Thermostat control on fan

This type of temperature *control* only uses the fans, the *valve* is not used (the hot or cold water goes into the coil inside the Fan Coil), and the temperature controller works by enabling or inhibiting fan consent (observing the Heat and Cool set



points).

The fans are controlled in the same way as the valves using the same set points and the same hysteresis.
If the controller is ON (fans on), the speed will be:

- manually set by the user (Min – Med – Max speeds permitted)
- set by *AUTO*_FAN at automatic speed if the fan slider is positioned on *Auto* mode.

With *thermostat control on fan*s the *Periodic Ventilation*, *Hot Start* and *Too Cool functions* are activated. (see *Functions* section)

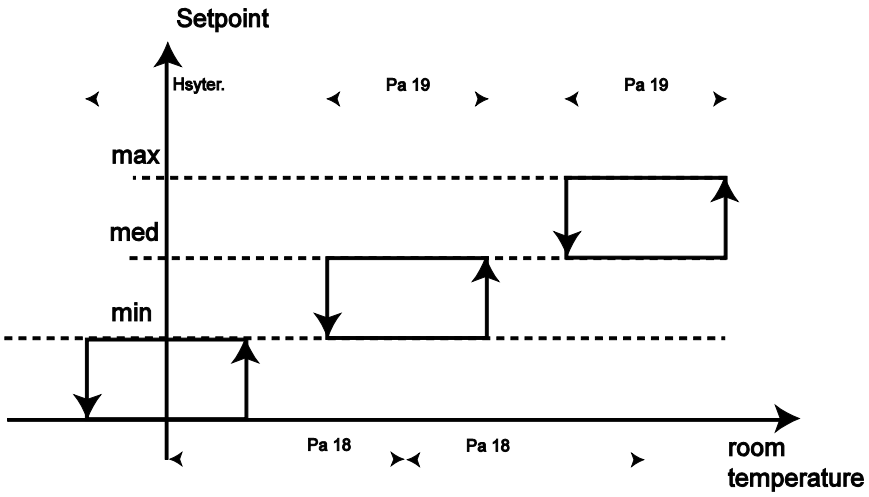
5.3.4 AUTO FAN with temperature control on fan

Speed of the fans is automatically controlled according to the offset between the ambient temperature and the temperature set with the set point.

The graphs related to fan *control* for temperature *control* on the fan are shown below.

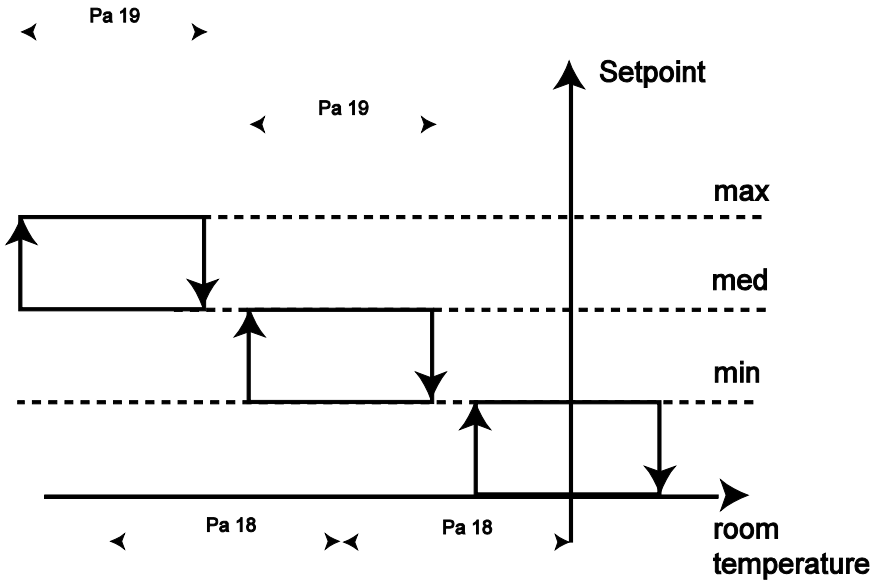
AUTOFAN COOL MODE temperature control on fan

AUTOFAN COOL MODE temperature control on fan



AUTOFAN HEAT MODE temperature control on fan

AUTOFAN HEAT MODE temperature control on fan



Ventilation with *electric heaters* and *post ventilation*

If the *electric heaters* are present and activated (both integrated and regulated), the fan speed is forced to maximum speed and the fan must switch itself off with a delay equal to parameter 07 after the last shut down of the *electric heaters*.

5.3.5 Load control

The status of outputs OUT1 e OUT2 varies according to the type of device:
The status shown in the table refers to when the temperature controller is not satisfied;
if the controller is satisfied, the output marked as ACTIVE in the table would be INACTIVE.

type of machine	output (OUT)	HEAT	COOL
2 PIPES Without *electric heaters*	OUT1	OUTPUT ACTIVE	OUTPUT ACTIVE
	OUT2	-	-
2 PIPES *Control electric heaters*	OUT1	-	OUTPUT ACTIVE
	OUT2	OUTPUT ACTIVE	-
2 PIPES Integrated *electric heaters*	OUT1 [*VALVE*]	OUTPUT ACTIVE	OUTPUT ACTIVE
	OUT2 [RES.]	OUTPUT ACTIVE IF T_{H2O} < Pa 05-Pa06 OUTPUT INACTIVE IF T_{H2O}> Pa 05	-
4 PIPES	OUT1	Not used	OUTPUT ACTIVE
	OUT2	OUTPUT ACTIVE	-

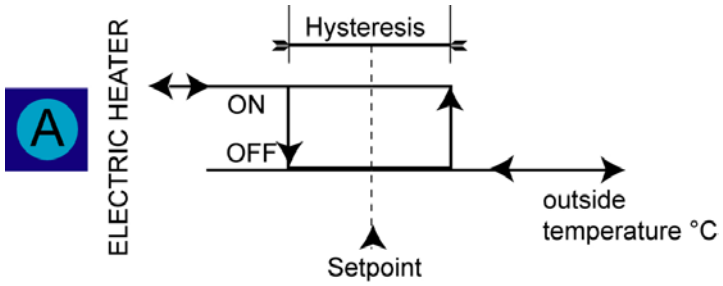
NOTE:

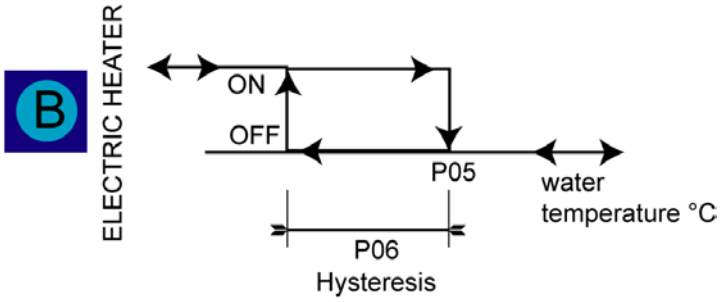
- indicates NOT USED
- *VALVE*: *Valve*
- RES. : electric heater
- $T_{H2O:}$ water temperature

5.3.6 Electric heaters

The *electric heaters* can work

A. in *Control* mode





B. in Integration mode

A- *Control electric heaters*

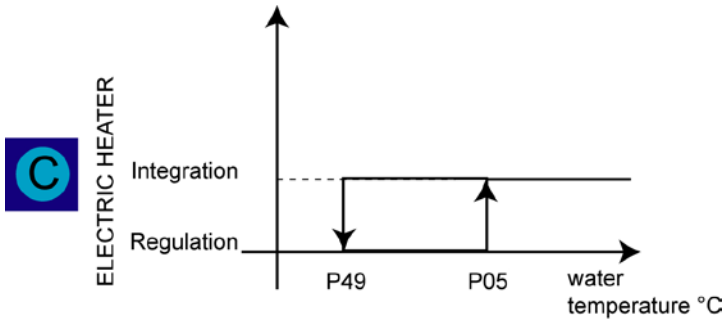
If *control electric heaters* are required, the heat is only controlled by the *electric heaters* and corresponds to the HEAT step on the diagrams **(point A)**
If this is the case, the digital output OUT2 is used to drive (indirectly using a suitable relay) a electric heater coil.

B - Integrated *electric heaters*

If integrated *electric heaters* are to be used, the controller will use **(point B)**

- water and *electric heaters* if the temperature of the H_2O is lower than Pa 05 – Pa06 (°C);
- If the temperature of water T_{H2O} < P49, the device switches from the integrated *electric heaters* to the *control electric heaters* **(point C)**
- water if the temperature of the H_2O is higher or equal to Pa 05 °C; hysteresis equal to Pa 06 °C is applied

C- Switching of the *electric heaters* operating mode



If the Fancoil unit is configured with "2 pipes and integrated *electric heaters*" (Dip4 and Dip5 ON), the operating mode of the *electric heaters* is automatically selected by the controller **according to the temperature of water**.

- If the temperature of water (T_{H2O}): T_{H2O} < P05 °C, *electric heaters* will be configured in integration mode **(point B)**
- If the temperature of water (T_{H2O}): T_{H2O} < P49 °C, the device switches from integrated *electric heaters* to *control electric heaters* to prevent the circulation of excessively cold water in the pipes.

The *valve*, which is open during the *control* with integrated *electric heaters*, must be closed when the *control electric heaters* are selected. The *valve* will be reopened only when the integrated *electric heaters* are selected.
If the water temperature after a reset ranges from P49 to P05, the integrated *electric heaters* are enabled.

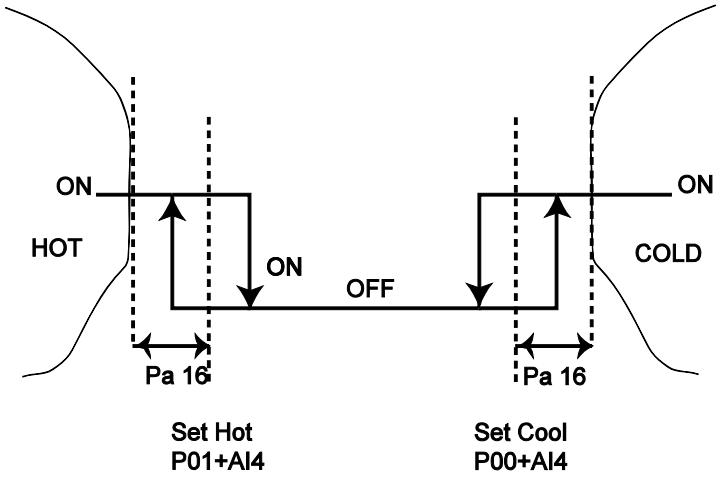
6 FUNCTIONS

6.1 Automatic Change over

Function always enabled

- 2/*4 pipe system*s
- *Heating*/*Cooling* mode

The *Automatic Change-over* function **(*AUTO*-CHANGE OVER)** automatically selects the *Heating*/*Cooling* mode according to the ambient temperature and enables the controller to *control* machine operating independently.



(**)

- The Heat mode is selected if:
  value read by the ambient probe (*control* or remote) < ***Heat set point for change-over*** (according to set point in *Heating* + delta changeover)

- The Cool mode is selected if:
  value read by the ambient probe (*control* or remote) < ***Cool set point for change-over*** (according to set point in *Heating* + delta changeover)

As soon as the machine goes into *Auto* Change Over mode (at start-up or from another mode) ventilation is forced into medium speed with duration set by the parameter (fan duration for change-over).

- during ventilation all resources (except for fans) stay OFF;
- the *LEDs* stay as they were for the previous state.

When ventilation is completed, the controller establishes which mode to go into according to **.

If the temperature value falls within the “dead zone”, the controller will remain in the mode that it was in prior to the selected phase.
If the main temperature controller is satisfied for a minimum period equal to the change-over delay time ***Periodic ventilation****** is effected**.**
When the On period has terminated, the controller verifies the presence of change-over conditions.

***OFF periods specified by P20 (*Automatic change-over* delay)
and On periods specified by parameter P25 (fan duration for change-over),
The fan OFF time meter is reloaded each time the On period is completed and each time the temperature controller is not satisfied; OFF time begins when the temperature controller is satisfied.

If the ambient temperature falls within the dead zone (OFF area on graph) at Power-ON, the board goes into the condition prior to Power-OFF (or if it was in Heat mode, it stays in this condition).
The fans behave in the same way as cases of manual Heat/Cool operating.

Decalibration of Set point (see relevant paragraph)
The temperature controller set points are determined by the decalibration caused by ceiling or floor-mounted *installation*.
the temperature value for entering a mode refers to the non-decalibrated set point
---

6.2 Hot Start

Function active if...
This function is only active in *heating* mode.
The *Hot Start* function controlled by the "temperature" is only available in the models with a water probe for:

- *2 pipe system*s without electric heater**
- *4 pipe system*s

**** In *2 pipe system*s with temperature *control* on *valve*, the *Hot Start* function varies depending on whether the water probe is positioned upstream or downstream from the *valve* (see paragraph *Valve* upstream or downstream from the *valve* in the *Temperature control functions* chapter)**

NOTE: PRESENCE OF WATER PROBE (REMOTE) NECESSARY (see *diagram of water probe mounted upstream*/downstream)

The *Hot Start* function stops cold air from entering the winter operating environment.
Its involves preheating the exchanger (*finned coil*) before activation of fans.
Ventilation will only start when the water probe detects a temperature above (**Pa 08) degrees °C.**
If this does not occur, it waits for permission from the probe.

If the **WATER** probe is not present (or is faulty):

- the *HOT START* is ignored and the fans follow normal temperature *control*.

LED signalling
While the *Hot Start* delay is in progress (controlled by the timer or water probe), the red LED (*heating*) will continue to flash quickly.
Once the delay is over and the fan has started, the red LED remains permanently ON.

Water probe
The water probe (*analogue inputs*) must always be mounted on the water pipe on the upstream/downstream side of the *valve* and as near as possible to the coil (if mounted downstream). In *4 pipe system*s, it must always be mounted on the hot water and not the cold water circuit.

diagram of water probe mounted downstream

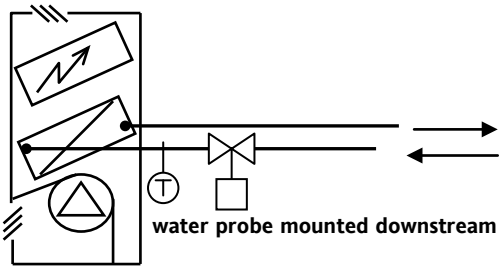
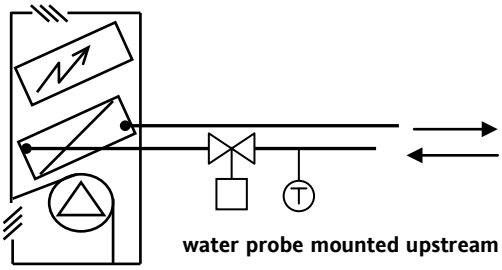


diagram of water probe mounted upstream



6.3 Too Cool

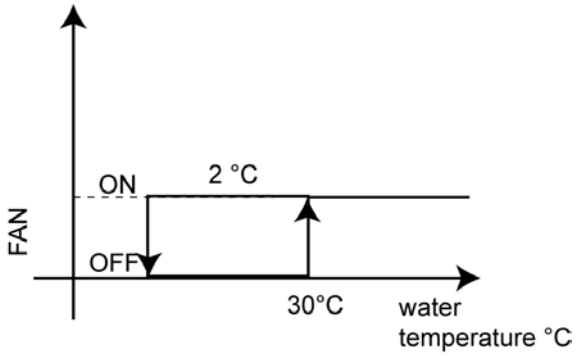
Function active if...
This function is active in *Cooling* mode only.
The *Too Cool* function controlled by the "temperature" is only available in models with a water probe for:

- *2 pipe systems***

**** In *2 pipe systems* with temperature *control* on *valve*, the *Too Cool* function varies depending on whether the water probe is positioned upstream or downstream from the *valve* (see paragraph *Valve* upstream or downstream from the *valve* in the *Temperature control functions* chapter)**

NOTE: PRESENCE OF WATER PROBE (REMOTE) NECESSARY (see *diagram of water probe mounted upstream*/downstream)
NOTE: This function is not active on *4 pipe systems*

The *Too Cool* function stops hot air from entering the summer operating environment.
It involves activating the fans when the water temperature is sufficiently cold.
Ventilation will only start when the water probe detects a temperature that is lower than or equal to (**Pa 08) degrees °C.**
If the probe is not present (or is faulty):



- ventilation is activated as in normal temperature *control*.

NOTE: There is fixed hysteresis for *valve control* of 2°C

6.3.1 Blocking Hot-Start and Too- Cool functions from Power –On.

The Too-Cool and Hot-Start *functions* are disabled by default when powering on for the first time
At the first Power-On, irrespective of the water temperature, the fans operate at the speed set by the fan slider; the Hot-Start and Too-Cool *functions* are ignored.
This function allows the installer to test the fans once the machine is installed without having to wait for the water temperature to give permission for them to be activated.
This block is active for approximately 10 minutes.
When the machine is powered, two cases may arise:

- If power supply is cut off while the time is being counted (within 10 minutes), the counter is reset at the next Power-ON and the fans operate as described above.
- If the counter goes to zero (10 minutes or more have elapsed), the Hot-Start and Too-Cool *functions* remain active even if the device is switched off

6.4 Periodic ventilation

Function always enabled

- 2/*4 pipe systems*
- *Heating*/*Cooling* mode

If the ventilation is not activated by a parameter-set period (according to whether it is floor or ceiling-mounted), it is activated for a parameter-set period at the end of the cycle so that the air on the ambient air probe is recycled.

This is to prevent stratification of the air in the premises that would give an inaccurate reading of the air temperature.

The tables below indicate the duration and frequency of the cycles;

- during the ON cycles, the fan speed is set to MINIMUM.
- at each change-over (Heat →Cool, Cool →Heat, OFF→ Cool, OFF →Heat) the start-up of the fans is forced to Minimum speed for a parameter specified duration

6.4.1 Fan activation cycles in HEATING Mode

Difference between ambient temperature and set point	Activation cycles	
	OFF	ON
Floor-mounted configuration	Pa 10	Pa 13
Ceiling-mounted configuration	Pa 11	Pa 14

6.4.2 Fan activation cycles in COOLING Mode

Difference between ambient temperature and set point	Activation cycles	
	OFF	ON
Floor and ceiling-mounted configuration	Pa 12	Pa 15

6.5 Post Ventilation

Function active if:

- *2 pipe system*s with *electric heaters* are present
- The device is in *Heating* mode

The fan continues to operate for (Pa 07) minutes after deactivation of the *electric heaters*.

This function prevents overheating in the fan-coil unit and protects the *electric heaters*.

6.6 Set point Decalibration

Function active if:

- The device is ceiling mounted
- The device is in *Heating* mode

If the ceiling-mounted configuration is selected (with dip-switch 1) the set point in the heat mode is increased by a value equal to (Pa 21)

Type of *installation*

- floor-mounted *installation*

Mode

- *Cooling*

If the floor-mounted configuration is selected (with dip-switch) the set point in the cool mode is increased by a value equal to (Pa 28)

6.7 Economy / Window Contact

Models

- **FCU32E/S: *Economy (E)* function available**
- **FCU32W/S: *Window Contact (W)* function available**

6.7.1 Economy (E)

The Economy mode can be selected by way of a 24V~ power supply (digital voltage input) in the dedicated terminals (see *wiring diagrams*).

This function "shifts" the set point as described below.

- In *HEATING* mode (winter setting): the set point is (Pa 27) °C
- In *COOLING* mode (winter setting): the set point is (Pa 26) °C

This function can be used to save energy consumption, at night time or during a holiday period, for example.

6.7.2 Window Contact (W)

By way of a window contact, the controller can be put on stand-by when the window contact is at 24V~. The aim of this function is to avoid wasting energy when the window is opened by staff.
This function "shifts" the set point as described below.

- In *HEATING* mode (winter setting): the set point is (Pa 27) °C
- In *COOLING* mode (winter setting): the set point is (Pa 26) °C

The contact MUST be energized.

7 PARAMETERS

Parameters can be set so that the *FCPLUS* is fully configurable.

- **They are factory set and therefore CANNOT BE modified**

7.1 Table of parameters

The following table indicates the *FCPLUS parameters* referred to in previous sections of this manual.

- The Par. column indicates the parameter name
- The Description column indicates the parameter function
- The LOW_LIM and HIGH_LIM columns indicate the minimum and maximum values of the parameter
- The U.M. column indicates the unit of measurement of the parameter
- The Models column indicates the default value (non-modifiable) of the parameter for each model

According to the relevant model, check the default value of the parameter that you want the configuration value for:
Example: the setting of parameter P26 Set point Economy *Cooling* **for model U320/S is 28.0°C and 35.0°C for model U32E/S.**

Configuration parameters

The following table summarizes all the *FCPLUS parameters*.

Par.	Description	LOW_LIM	HIGH_LIM	U.M	Models	
						ECONOMY
					U320/B U320/S U32W/B U32W/S	U32E/B U32E/S
P00	*Cooling* set point	10,0	50,0	°C	20,0	20,0
P01	*Heating* set point	10,0	50,0	°C	20,0	20,0
P02	Selector knob temperature offset	0,0	15,0	°C	15,0	15,0
P03	Wall temperature controller hysteresis	0,0	10,0	°C	0,4	0,4
P04	Built-in temperature controller hysteresis	0,0	10,0	°C	0,4	0,4
P05	Integrated electrical heater set point	10,0	100,0	°C	41,0	41,0
P06	Differential of integrated *electric heaters*	0,0	10,0	°C	2,0	2,0
P07	Fan post-ventilation if heaters active	0	255	Sec	20	20
P08	*Hot start* set point	10,0	50,0	°C	35,0	35,0
P09	Fan ON- *valve* ON in *Heating* mode delay	0	255	Sec	60	60
P10	Periodic fan OFF time in *Heating* mode (floor)	0	255	Min.	10	10
P11	Periodic fan OFF time in *Heating* mode (ceiling)	0	255	Min.	10	10
P12	Periodic fan OFF time in *Cooling* mode	0	255	Min.	30	30
P13	Periodic fan ON time in *Heating* mode (floor)	0	255	Sec	30	30
P14	Periodic fan ON time in *Heating* mode (ceiling)	0	255	Sec	30	30
P15	Periodic fan ON time in *Cooling* mode	0	255	Sec	30	30
P16	AUTOMODE changeover differential	0,0	25,0	°C	2,0	2,0
P17	*TOO COOL* set point	0,0	255,0	°C	25,0	25,0
P18	*AUTO* fan differential	0,0	10,0	°C	1,0	1,0
P19	*AUTO* fan hysteresis	0,0	10,0	°C	1,0	1,0
P20	*AUTO* change-over delay	0,0	255	Min.	30	30
P21	*Heating* mode set point offset (ceiling)	0,0	25,0	°C	0,0	0,0
P22	AI1 offset	-12,8	12,7	°C	0,0	0,0
P23	AI2 offset	-12,8	12,7	°C	0,0	0,0
P24	AI3 offset	-12,8	12,7	°C	-2,5	-2,5
P25	AUTOMODE pre-ventilation	0	255	Sec	30	30
P26	*Cooling* mode Economy set point	10,0	50,0	°C	28,0	35,0
P27	*Heating* mode Economy set point	0,0	50,0	°C	14,0	5,0
P28	*Cooling* mode set point offset (floor)	-12,8	12,7	°C	-2,0	-2,0
...						
P49	Electric heater integration/*control* mode switching set point	0,0	100,0	°C	0	0
P50	Selection of probe A13 position	0	1	Flag	0	0

8 TECHNICAL DATA

8.1 Technical Data

8.1.1 TECHNICAL DATA (EN 60730-2-9)

Classification:	automatic electronic temperature controller for built-in or stand-alone installation on a surface
Installation:	wall-mounted using the rear hood as a drilling template
in terms of connection:	device with flexible, external and removable cable with Y connection
Control type:	1.B
Pollution rating:	2
Material class:	IIIa
Overvoltage category grade:	II
Nominal impulsive voltage:	2500V
Operating temperature:	0÷+55 °C
Storage temperature:	-20÷+85 °C
Supply voltage:	230V~ ±10% 50/60 Hz
Consumption:	10W max
Software Class:	A
Ball test temperature:	80°C

8.1.2 FURTHER INFORMATIONS - MECHANICAL CHARACTERISTICS

Maximum admissible current on contacts:	1A max (230V~ FAN TRIAC) 0.5 max (230V~ VALVE TRIAC)
Protection class:	IP30
Casing:	plastic resin PC+ABS
Dimensions mm (Lxwxh):	120x80x40mm
Operating humidity (non-condensing):	10÷90% RH (non condensing)
Storage humidity (non-condensing):	10÷90% RH (non condensing)

8.1.3 FCPLUS I/O Technical Data

	TOT	No.	THERMOSTAT
Analogue Inputs	3	1	air probe on *control*
		1	1 remote air probe (optional):
			cover 4.7 X 27 mm;
			plastic resin tube;
			length of cable: 1.5 m
		1	remote water probe (optional):
			cover 6 X 23 mm;
			plastic resin tube;
			length of cable: 2 m
Digital input (*)	1	1	Depending on model
Dip Switches	5	5	dip switch
Digital Outputs	5	5	outputs for *valve* and fan *control*
LEDs	3	3	*LEDs* (SUMMER /WINTER/ REQUEST)

(*) Note The *digital input*, if present, can be powered or free from voltage, NO or NC 230V~, 115V~, 24V~, ... depending on model.

8.1.4 FCPLUS Mechanical Technical Data

Unit dimensions	80x120x40 mm
*Mounting** (floor or ceiling)	wall-mounted using the base as a drilling template, device-mounted (floor or ceiling)
Colour of casing	• Keypad: white; • Base unit: white.
Connections	screw terminal block for wires with 2.5 mm^2 maximum diameter
Compliance	CE LV-EMC

***Note:**

- you can distinguish between wall-mounted and device-mounted versions by checking to see if a remote air probe is present or not.
- If there is no probe, it is a wall-mounted model.

8.2 Declaration of compliance

The device has been designed to be used in electromechanical systems in the air conditioning sector and in devices called fan-coils in particular.

The device complies with the following standards **EN 60730-2-9**

Note1: if the device is used as a component, compliance with the directives is guaranteed for the board but not certification of the machine on which it is installed. The latter is the manufacturer's responsibility.

Note2: All the electrical parts of the instrument are subjected to dangerous voltage levels and shall not be accessible directly: reinforced insulated devices must be used.

9 USE OF DEVICE

For safety reasons, the device should always be used in accordance with the manufacturer's instructions.
All the electrical parts of the instrument are subjected to dangerous voltage levels and shall not be accessible directly: reinforced insulated devices must be used.
The device should always be protected from water and dust.

Uses other than those described above are forbidden. Therefore, all protection devices required to comply with the product requirements and to ensure the necessary level of safety must be installed externally.

10 RESPONSIBILITY AND RESIDUAL RISKS

Eliwell is not liable for damage due to:

- unspecified installation/use and, in particular, in contravention of the safety requirements of established legislation or specified in this document;
- use on equipment which does not provide adequate protection against electrocution, water and dust in the actual installation conditions;
- use on equipment which allows toolfree access to dangerous components;
- tampering with and/or alteration of the products;
- installation/use on equipment which does not comply with established legislation and standards.

11 DISCLAIMER

12 ANALITIC INDEX

Eliwell Controls S.r.l.
Via dell' Industria, 15 Zona Industriale Paludi
32010 Pieve d' Alpago (BL) Italy
Telephone +39 0437 986 111
Facsimile +39 0437 989 066

Sales:
+39 0437 986 100 (Italy)
+39 0437 986 200 (other countries)
saleseliwell@invensys.com

Technical helpline:
+39 0437 986 300
E-mail *techsuppeliwell@invensys.com*

www.eliwell.com

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