WMT20

TERMOSTATO A DISPLAY PER FAN COIL CON USCITA VENTILATORE 0 .. 10V

37040 Bevilacqua (VR) - Italia
Via Roma, 996

FAN COIL CONTROLLER WITH DISPLAY AND 0..10V OUTPUT

THERMOSTAT MIT BILDSCHIRM FÜR FAN-COIL MIT AUSGANG FÜR VENTILATOR 0 .. 10V

THERMOSTAT AVEC ECRAN POUR VENTILO-CONVECTEURS ET SORTIE VENTILATEUR 0 .. 10V

TERMOSTATO CON DISPLAY PARA FAN COIL CON SALIDA VENTILADOR 0 .. 10V

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GARANZIA

Nell'ottica di un continuo sviluppo dei propri prodotti, il costruttore si riserva il diritto di apportare modifiche a dati tecnici e prestazioni senza preavviso. Il consumatore è garantito contro i difetti di conformità del prodotto secondo la Direttiva Europea 1999/44/CE nonché il documento sulla politica di garanzia del costruttore.
Su richiesta è disponibile presso il venditore il testo completo della garanzia.

WARRANTY

In the view of a constant development of their products, the manufacturer reserves the right for changing technical data and features without prior notice. The consumer is guaranteed against any lack of conformity according to the European Directive 1999/44/EC as well as to the manufacturer's document about the warranty policy.
The full text of warranty is available on request from the seller.

GARANTIE

Zur kontinuerlichen Weiterentwicklung der eigenen Produkte, behält sich der Hersteller das Recht vor, ohne vorherige Ankündigung, technische Änderungen an Produkten und Dienstleistungen vorzunehmen. Der Hersteller haftet für die Produktkonformität gemäß der Europäischen Richtlinie 1999/44/EG und dem Dokument zur Produktgarantiepolitik der Hersteller.
Auf Anfrage steht Ihnen beim Händler der ausführliche Produktgarantietext zur Verfügung.

GARANTIE

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GARANTÍA

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A pedido del cliente se encuentra disponible en el negocio vendedor el texto completo de la garantía.

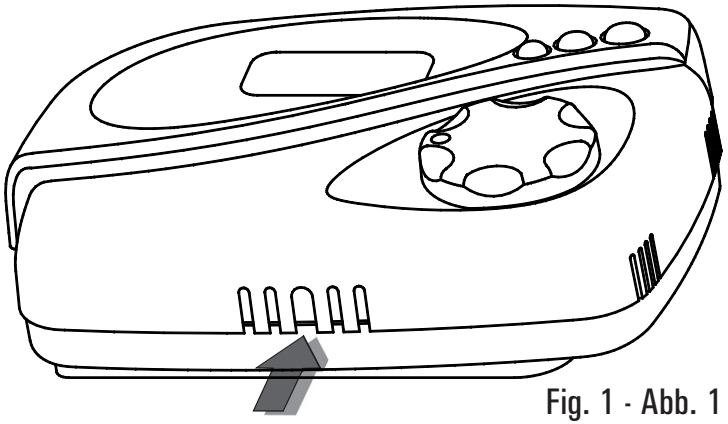


Fig. 1 - Abb. 1

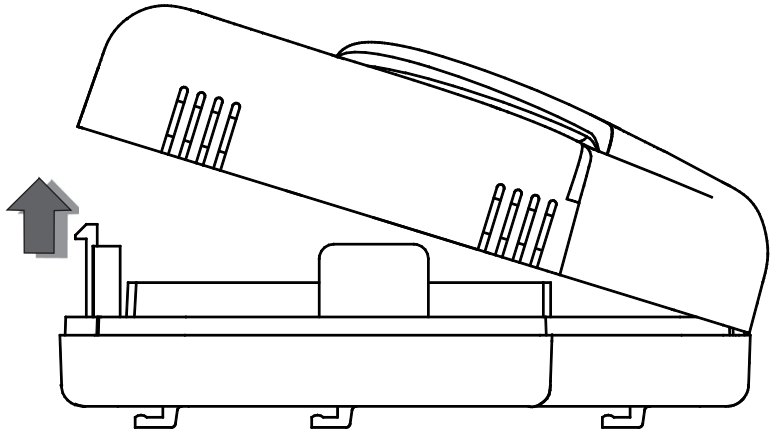


Fig. 2 - Abb. 2

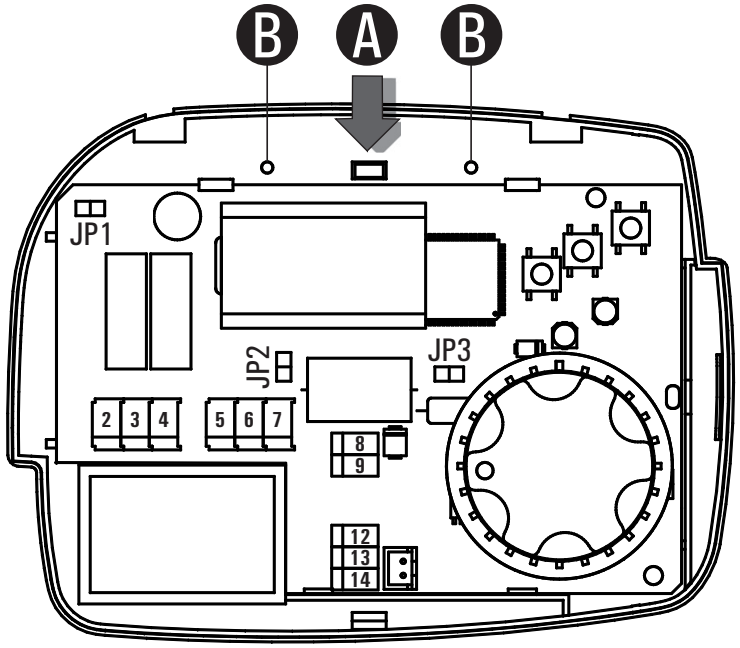


Fig. 3 - Abb. 3

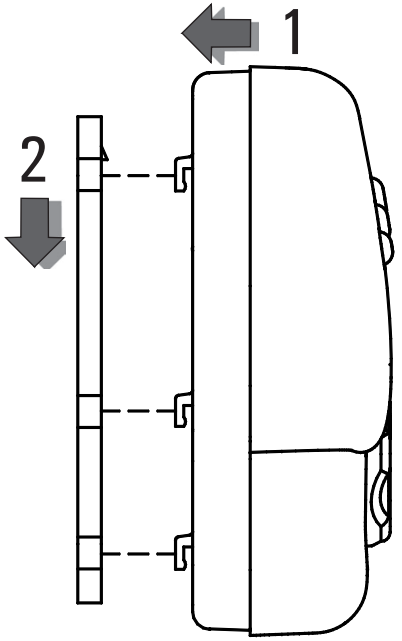
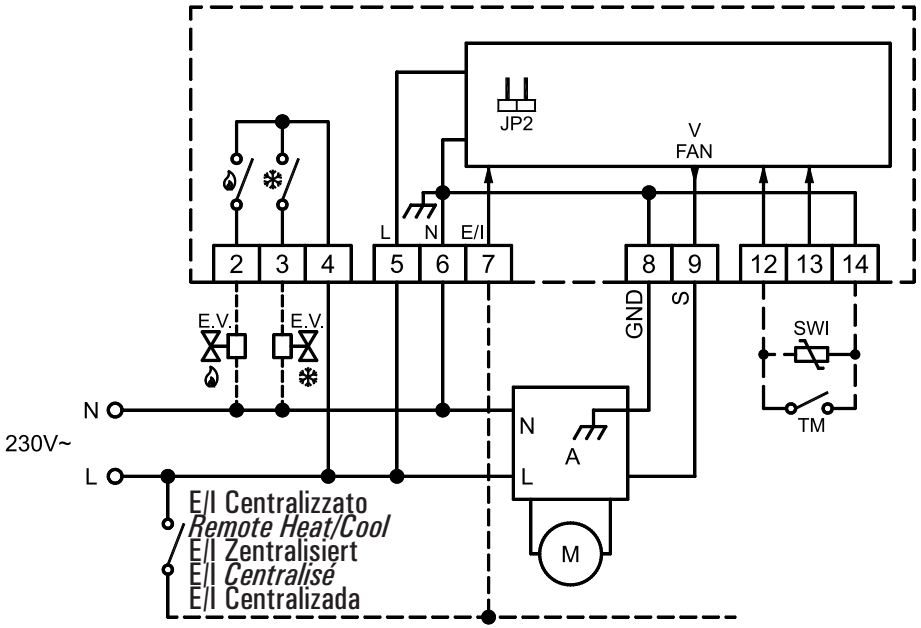


Fig. 4 - Abb. 4

SCHEMA DI COLLEGAMENTO | *WIRING DIAGRAM* / *SCHALTSCHEMA* / SCHÉMA DE BRANCHEMENT | *ESQUEMA DE CONEXIÓN*

LEGENDA | *EXPLANATION* / LEGENDE | *LÉGENDE* / REFERENCIA

V FAN: Uscita segnale 0..10V ventilatore | *0..10V fan signal output* | Signalausgang 0..10V Ventilator | *Sortie signal 0..10V ventilateur* | Salida señal 0..10V ventilador
SWI: Sonda acqua di mandata | *Room sensor* | Wasserzulaufsonde | *Sonde eau de refoulement* | Sonda agua de envío
TM: Termostato di minima | *Cut-off bimetallic thermostat* | Mindestthermostat | *Thermostat de minimum* | Termostato de mínima
M: Motore ventilatore | *Fan motor* | Motor des Ventilators | *Moteur ventilateur* | Motor ventilador
E/I: Estate/inverno centralizzata | *Remote Heat/Cool signal* | Sommer/Winter zentral | *Eté/hiver centralisé* | Verano/invierno centralizada
A: Azionamento per motore | *Motor drive unit* | Betätigung über den Motor | *Actionnement du moteur* | Accionamiento por motor
JP2: Selezione alimentazione a 24V ~ | *24V ~ selection* | Auswahl Anspeisung zu 24V ~ | *Sélection alimentation à 24V ~* | Selección alimentación a 24V ~



Nel caso di impianto a 2 tubi con un solo attuatore on/off, esso dovrà essere collegato sul morsetto 2.

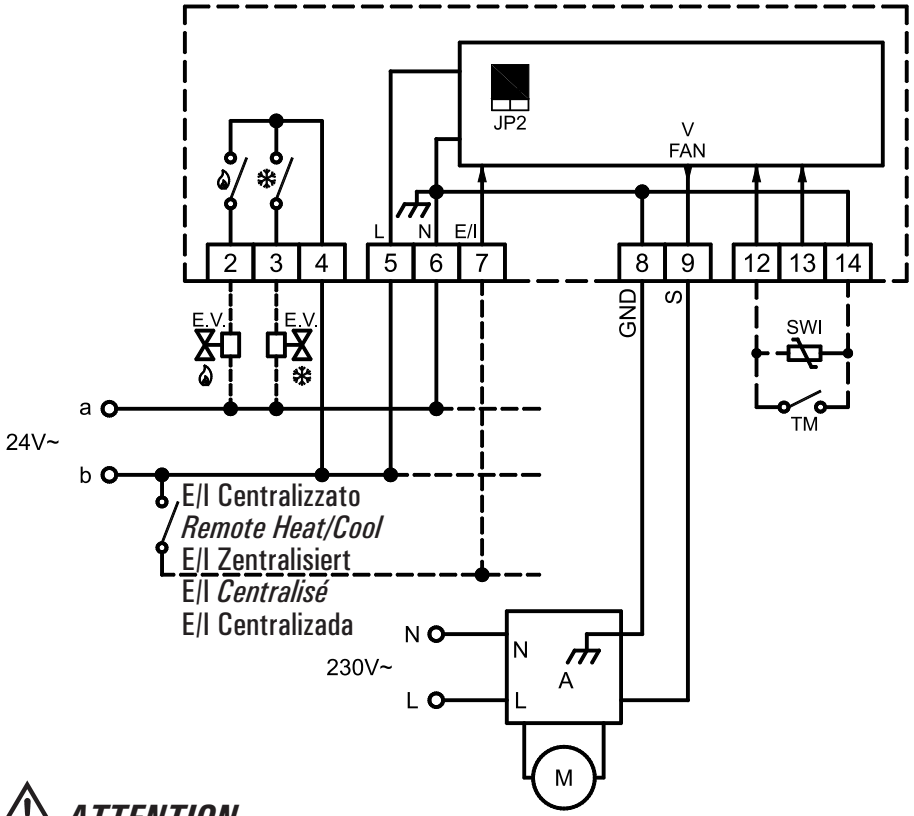
In case of 2 pipes system with single on/off actuator, it must be wired at terminal 2.

Im Falle einer Anlage mit 2 Rohren mit einem einzigen Aktuator on/off, muss dieser auf der Klemme 2 angeschlossen werden.

Dans le cas d'installation à 2 tubes avec un seul actuateur on/off, celui-ci devra être connecté sur la borne 2.

Si la instalación es a 2 tubos un sólo actuador on/off, este deberá conectarse al borne 2.

Fig. 5: Schema di collegamento per pilotaggio di due attuatori on/off a 230V ~ per impianto a 4 tubi e pilotaggio proporzionale del ventilatore.
Wiring diagram for 2 on/off 230V ~ actuators in 4 pipes system and proportional fan drive.
Schéma de connexion pour pilotage de deux actuateurs on/off à 230V ~ pour installation à 4 tubes et pilotage proportionnel du ventilateur.
Esquema de conexión para el pilotaje de dos actuadores on/off a 230V ~ para instalación a 4 tubos y pilotaje prporcional del ventilador.
Bild 5: Verbindungsschema für die Steuerung der beiden Aktuatoren on/off mit 230V ~ pro Anlage mit 4 Rohren und proportionaler Steuerung.



⚠ ATTENZIONE

Nel caso di alimentazione del termostato a 24V ~ è possibile che tale bassa tensione venga ad essere collegata al neutro 230V ~ tramite l'azionamento del motore, in questo caso la 24V ~ non si può più considerare bassissima tensione di sicurezza ed è cura dell'installatore garantire un adeguato isolamento.

⚠ WARNING

Should the thermostat be supplied with 24V ~ , such a low voltage may be connected to the 230V ~ Neutral through the motor drive. In this case, you cannot consider the 24V ~ as a very low safety voltage: hence, it will be the installer's duty to grant a proper insulation.

⚠ ACHTUNG

Im Falle einer Anspeisung des Thermostats von 24V ~ kann man diese Niedrigspannung an den Neutralpunkt von 230V ~ mithilfe der Betätigung des Motors anschließen. In diesem Fall kann man bei 24V ~ nicht mehr von Sicherheitsniedrigspannung sprechen. Es ist Aufgabe des Installateurs, für eine angemessene Isolierung Sorge zu tragen.

⚠ ATTENTION

En cas d'alimentation du thermostat en 24 V ~, il est possible que cette basse tension soit connectée au neutre de 230 V ~ au moyen du dispositif d'entraînement du moteur ; dans ce cas-là, la tension de 24 V ne peut plus être considérée comme très basse tension de sécurité et l'installateur doit donc garantir son isolement approprié.

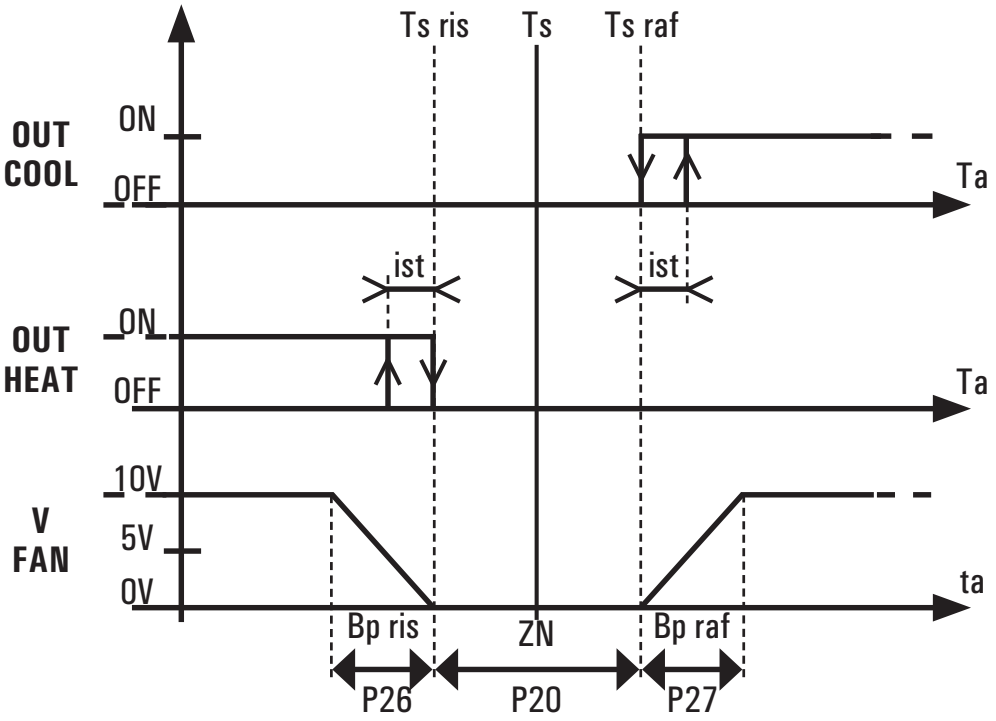
⚠ ATENCIÓN

Si la alimentación del termostato a 24V ~ , es posible que tal baja tensión se conecte al neutro 230V ~ mediante el accionamiento del motor, en este caso la 24V ~ no se puede conciderar bajísima tensión de seguridad y es responsabilidad del instalador garantizar un adecuado aislamiento.

Fig. 6: Schema di collegamento per pilotaggio di 2 attuatori on/off a 24V ~ per impianto a 4 tubi e pilotaggio proporzionale del ventilatore.
Wiring diagram for 2 on/off 24V ~ actuators in 4 pipes system and proportional fan drive.
Schéma de connexion pour pilotage de 2 actuateurs on/off à 24V ~ pour installation à 4 tubes et pilotage proportionnel du ventilateur.
Esquema de conexión para pilotaje de 2 actuadores on/off a 24V ~ para instalación a 4 tubos y pilotaje proporcional del ventilador.
Bild 6: Verbindungsschema Steuerung der 2 On/Off-Aktuatoren mit 24V ~ pro Anlage mit 4 Rohren u. proport. Steuerung des Ventilators.

PILOTAGGIO USCITE | *OUTPUT DRIVING / ANSTEUERUNG AUSGÄNGE* / PILOTAGE DES SORTIES | *PILOTAJE SALIDAS*

Fig. 7: Lo schema mostra il pilotaggio delle valvole in un impianto a 4 tubi con zona neutra. Analogamente, l'uscita valvola caldo (**OUT HEAT**) di un sistema a 2 tubi verrà pilotata allo stesso modo, in questo caso la **Ts** (temperatura di setpoint) coinciderà con **Ts ris** in inverno e **Ts raf** in estate.
Lo schema non tiene conto dell'eventuale azione del tempo integrativo e presuppone che l'uscita proporzionale del ventilatore (**V FAN**) sia configurata per azione diretta (**P07** = 0) e segnale 0..10V (**P33** = 0; **P34** = 100).
L'uscita proporzionale del ventilatore viene sempre spenta (0V) quando l'uscita della valvola, **OUT COOL** o **OUT HEAT**, è spenta (caso non visibile sullo schema).



*The scheme shows the valve control in a 4-pipe unit with neutral zone. Similarly, the heating valve output (**OUT HEAT**) in a 2-pipe system will be controlled in the same way. In this case, the **Ts** (setpoint temperature) will correspond to **Ts ris** in winter time, and to **Ts raf** in summer time.*
*The scheme shall not consider the integrating time action, if any, and shall suppose the fan proportional output (**V FAN**) is configured for the direct action (**P07** = 0) and 0..10V signal (**P33** = 0; **P34** = 100).*
*The fan proportional output is always turned off (0V) when the valve output, **OUT COOL** or **OUT HEAT**, is off (not shown on the scheme).*

Le schéma montre le pilotage des vannes dans un système à 4 tuyaux avec zone neutre. De façon analogue, la sortie de la vanne chaude (**OUT HEAT**) d'un système à 2 tuyaux sera pilotée de la même manière ; dans ce cas-là, la **Ts** (température du point de consigne) coïncidera avec la **Ts ris** en hiver et avec la **Ts raf** en été.
Le schéma ne tient pas compte de l'action éventuelle du temps d'intégration et présuppose que la sortie proportionnelle du ventilateur (**V FAN**) est configurée pour action directe (**P07** = 0) et pour un signal 0-10 V (**P33** = 0, **P34** = 100).
La sortie proportionnelle du ventilateur est toujours éteinte (0 V) quand la sortie de la vanne (**OUT COOL** ou **OUT HEAT**) est éteinte (ce cas n'est pas visible sur le schéma).

*El esquema muestra el pilotaje de las válvulas en una instalación a 4 tubos con zona neutra. Análogamente, la salida válvula calor, (**OUT HEAT**) de un sistema a 2 tubos será pilotada del mismo modo, en este caso la **Ts** (temperatura de setpoint) coincidirá con **Ts ris** en invierno y **Ts raf** en verano.*

*El esquema no tiene en cuenta la eventual acción del tiempo complementario y presupone que la salida proporcional del I ventilador (**V FAN**) esté configurada para acción directa (**P07** = 0) y señal 0..10V (**P33** = 0; **P34** = 100).*
*La salida proporcional del ventilador se apaga siempre (0V) cuando la salida de la válvula, **OUT COOL** o **OUT HEAT**, está apagada (caso non visible en el esquema).*

Abb. 7: Das Schema zeigt die Steuerung der Ventile in einer Anlage mit 4 Rohren mit neutralem Bereich. Analog dazu wird der Ausgang des Warmventils in einem System mit 2 Rohren gleich gesteuert. In diesem Fall entspricht die **Ts** (Setpointtemperatur) der **Ts ris** im Winter und der **Ts raf** im Sommer.
Das Schema berücksichtigt nicht die mögliche Wirkung der Zusatzzeit und setzt voraus, dass der proportionale Ausgang des Ventilators (**V FAN**) für eine direkte Betätigung (**P07** = 0) und für ein Signal 0..10V (**P33** = 0; **P34** = 100) konfiguriert ist.
Der proportionale Ausgang des Ventilators wird immer ausgeschaltet (0V), wenn der Ausgang des Ventils, **OUT COOL** oder **OUT HEAT**, ausgeschaltet ist (Fall, der auf dem Schema nicht ersichtlich ist).

LEGENDA | *EXPLANATION* / LEGENDE | *LÉGENDE* / REFERENCIA

OUT COOL: Uscita ON/OFF valvola freddo | *ON/OFF output for cool valve* | ON/OFF-Ausgang Kaltventil | *Sortie ON/OFF de la vanne froide* | Salida ON/OFF válvula frío

OUT HEAT: Uscita ON/OFF valvola caldo | *ON/OFF output for heat valve* | ON/OFF-Ausgang Warmventil | *Sortie ON/OFF de la vanne chaude* | Salida ON/OFF válvula calor

V FAN: Uscita proporzionale ventilatore | *Fan proportional output* | Proportionaler Ausgang Ventilator | *Sortie proportionnelle du ventilateur* | Salida proporcional ventilador

Ta: Temperatura ambiente | *Ambient temperature* | Umgebungstemperatur | *Température ambiante* | Temperatura ambiente

Ts: Temperatura setpoint (manopola) | *Setpoint temperature (knob)* | Temperatur Setpoint (Einstellgriff) | *Température du point de consigne (poignée)* | Temperatura setpoint (mando)

Ts ris: Temperatura setpoint in riscaldamento | *Heating setpoint temperature* | Temperatur Setpoint Heizungsmodus | *Température du point de consigne en mode chauffage* | Temperatura setpoint en calefacción

Ts raf: Temperatura setpoint in raffrescamento | *Cooling setpoint temperature* | Temperatur Setpoint Kühlungsmodus | *Température du point de consigne en mode refroidissement* | Temperatura setpoint en refrigeración

ist: Isteresi temperatura ambiente | *Ambient temperature hysteresis* | Hysterese Umgebungstemperatur | *Hystérésis de la température ambiante* | Histéresis temperatura ambiente

Bp ris: Banda proporzionale in riscaldamento | *Heating proportional band* | Proport. Bandbreite Heizungsmodus | *Bande proportionnelle en mode chauffage* | Banda proporcional en calefacción

Bp raf: Banda proporzionale in raffrescamento | *Cooling proportional band* | Proport. Bandbreite Kühlungsmodus | *Bande proportionnelle en mode refroidissement* | Banda proporcional en calefacción

ZN: Ampiezza zona neutra | *Neutral zone amplitude* | Reichweite neutraler Bereich | *Ampleur de la zone neutre* | Amplitud zona neutra

Fig. 8.

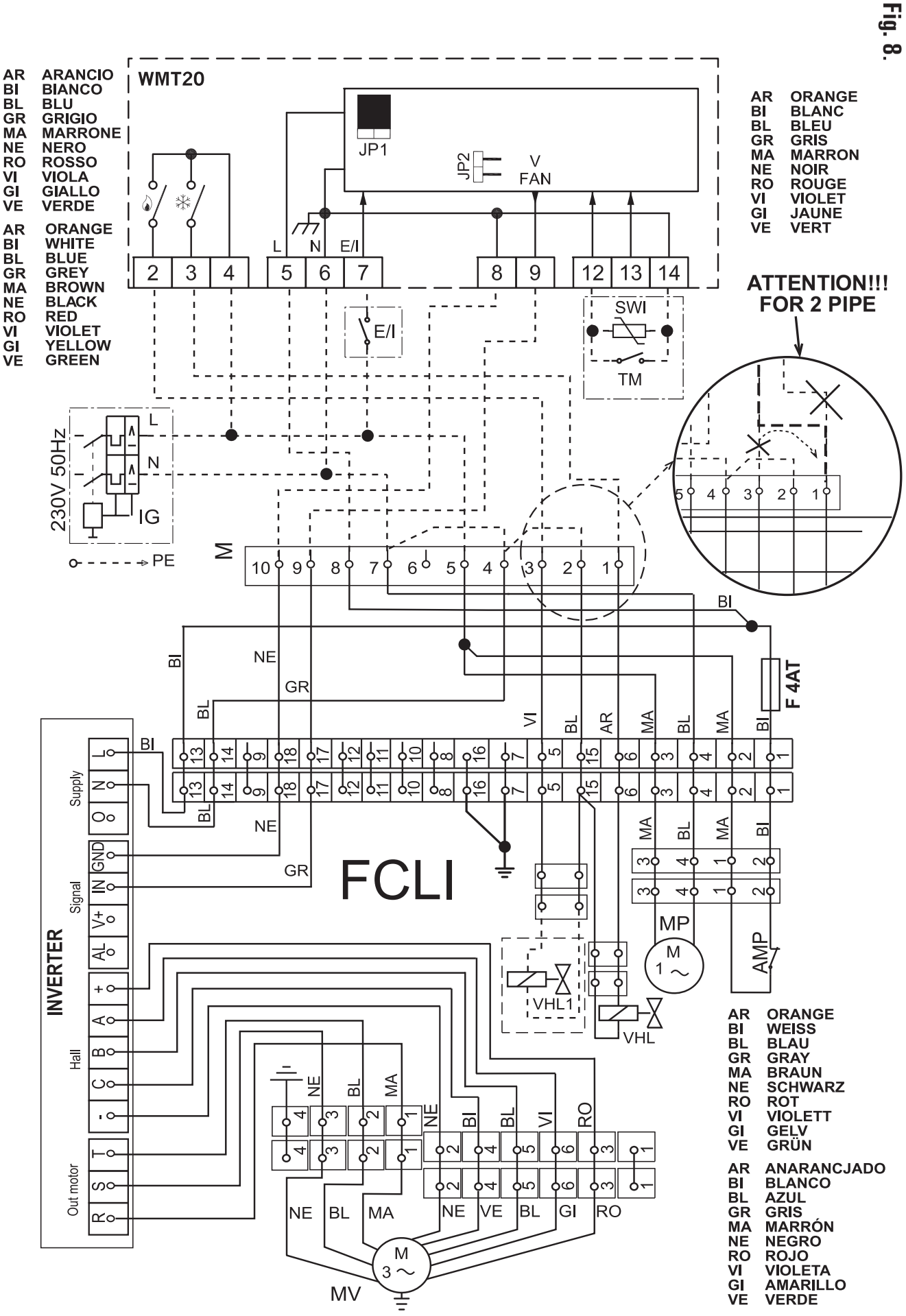

AR ARANCIO
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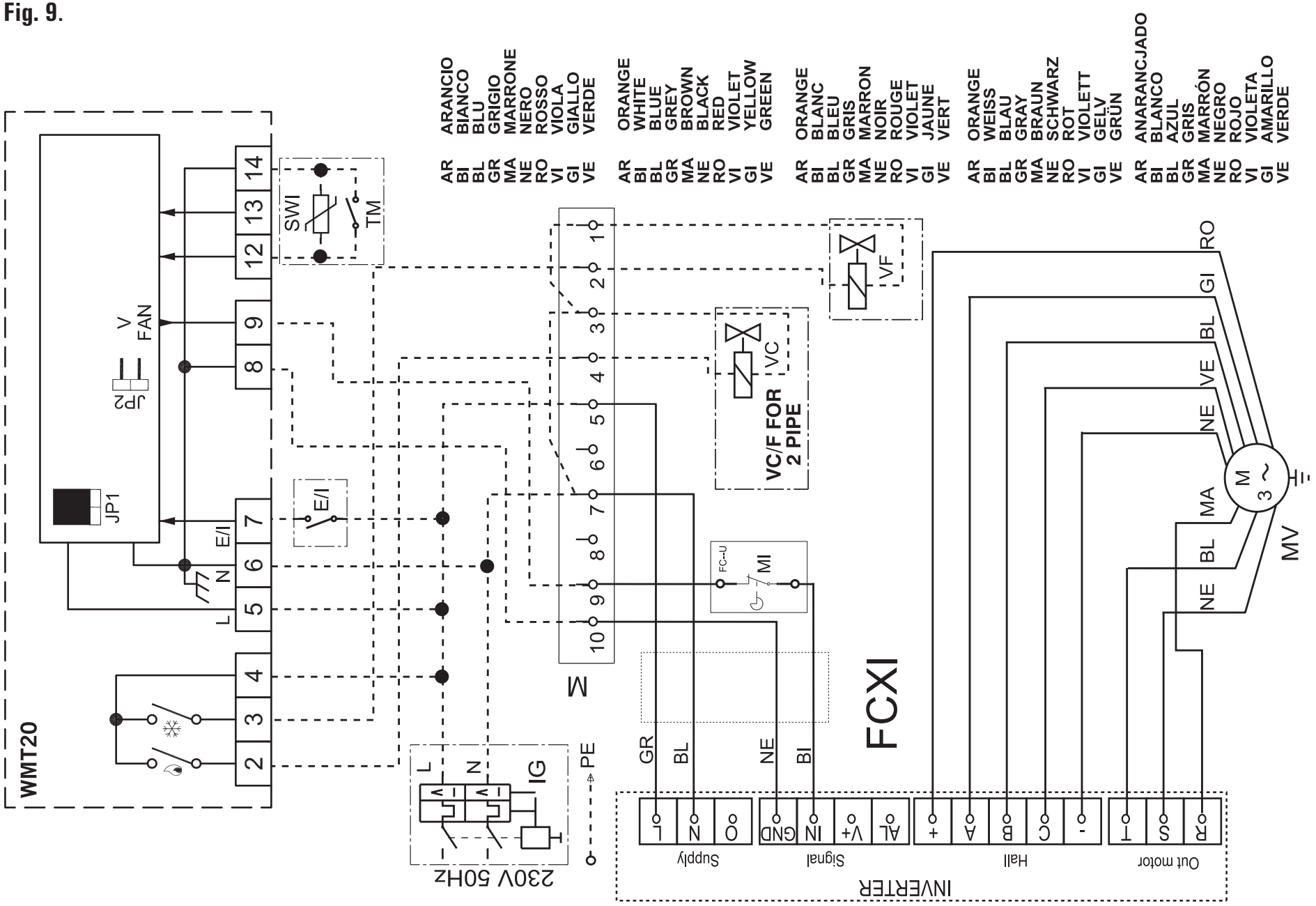
Fig. 9.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ORANGE BLANC BLEU GRIS MARRON NOIR ROUGE VIOLET JAUNE VERT
AR BI BL GR MA NE RO VI GI VE
ORANGE WEISS BLAU GRAY BRAUN SCHWARZ ROT VIOLETT GELV GRÜN
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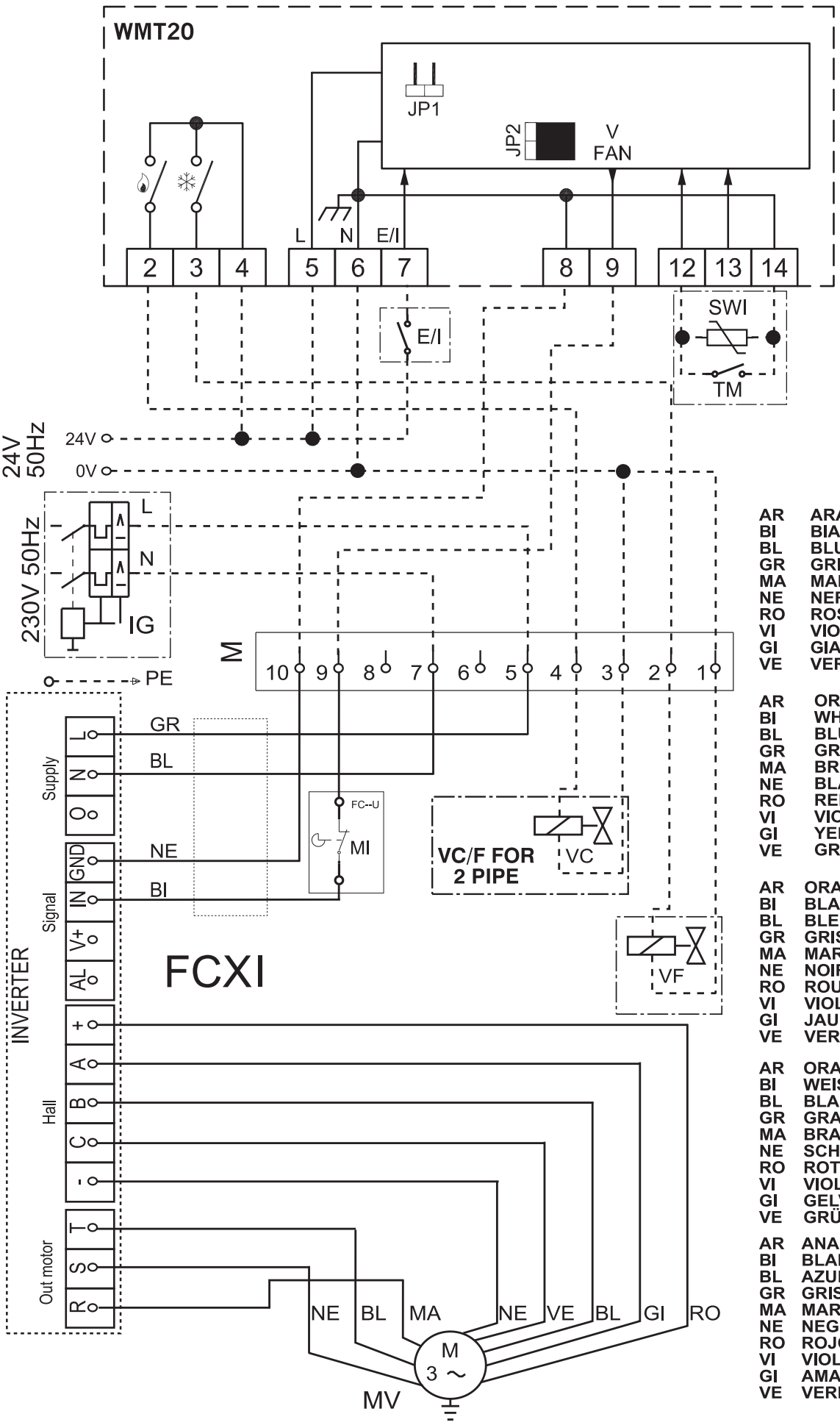

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NE NEGRO
RO ROJO
VI VIOLETA
GI AMARILLO
VE VERDE

Fig. 10.

INTRODUCTION

This digital controller is intended for temperature regulation in environments equipped with fan-coil heat-cool exchangers. It controls in continuous proportional fashion the fan speed with P or P + I algorithm in order to adjust the room temperature in the most suitable way.

OPERATION

The commands available for the user are three pushbuttons and the set-point knob.

- **'⏻' On/Off Key**

This button is used to turn on and off the controller: when the controller is turned off the display does not show the temperature, yet some symbols could still be turned on to show the active outputs.

- **'✣' Fan Speed key**

This button, when depressed once, makes the display show the current fan speed: this figure will be shown for a few seconds. After that the current room temperature will be displayed again.
When this button is depressed several times the fan speed is changed according to the following cycle:

where **FI1**, **FI2** and **FI3** mean the three '**FI**'xed fan speeds meanwhile AUT mean the '**AUT**'omatic fan speed.
More precisely **FI1** means the lowest speed, **FI2** the medium speed and **FI3** the fastest. Therefore when the controller is set on one of the three mentioned speeds, the fan will be activated when necessary at that (fixed) speed; in this situation the regulation is plain ON/OFF with hysteresis. Whenever the automatic speed is set instead, the controller performs the motor speed control in proportional way. (P or P+I), i.e. it will activate the fan at a speed as much high as the difference between the desired room temperature against the current one.

Through parameters **P30 P31 P32** the user can set the value of the three fixed speeds.

- **'📖' Menù key**

This button is used to change the display readout mode: when depressed once it makes the display show the set-point temperature. In case the controller is configured to show the supply pipe water temperature, this value will be displayed with a further button depression. In case the controller is configured to perform the 'Economy' function, this will be activated with a further action on this button. If 'Economy' was already active instead, depressing the button will result in changing the mode into 'Normal'.
When changing the readout, the controller informs the user about the parameter shown according to the following table:

tA	Room (ambient) temperature
SEt	Set-point temperature
tP	Supply pipe water temperature
ECO	Economy function Active

When the button is depressed several times the display readout cycles across the above mentioned temperatures. After a few inactivity seconds the display readout returns to the room temperature. In case the 'Economy' mode is activated, the controller always returns showing the '**ECO**' message and the temperature is not visible.

- **Knob**

The regulation knob allows the user to adjust the desired room temperature (set-point). The knob has no range printed: whenever it is moved the display readout jumps to the set-point temperature, thus showing the value currently setting. Even in this case after a few inactivity seconds the display readout returns to the room temperature.

DISPLAY

The regulator features a 3-digits LCD display to show temperatures and

settings. All temperatures shown must be intended in Celsius degrees (centigrade).
On the display there are also some symbols which report about the current state of the outputs: fan and valves.
The fan symbols are related to the fan motor state: when all fan symbols are turned off then the fan is actually off, meanwhile when some of them are turned on the state of the fan respects the following table:

speed 1 (LO) speed 2 (ME) speed 3 (HI)

The faster the fan speed the more fan symbols are turned on will be turned on as faster the fan speed gets. Besides the 'fan' symbols, the display can show two further symbols, which identify that the relevant valve is open.

heating valve open
cooling valve open

Symbols can also be flashing, to explain that the relevant output should be turned on, yet it is temporarily disabled by another function.
As an example, outputs are disabled in the following situations:
- The cut-off thermostat is inhibiting the fan;
- The window contact is inhibiting the regulation.

HEATING/COOLING SELECTION

Cooling (summer) or heating (winter) modes are selected by keeping the '📖', button depressed for some seconds, until the display shows one of the following words (meaning the current mode):

HEA Heating mode (winter)
COO Cooling mode (summer)

Then, by pressing the 'speed' button, the user can actually choose the desired mode, cycling between heating and cooling. Depressing any of the other buttons results in quitting the menu and in the storage of the preferred configuration data.

In case the controller is configured for remote or automatic heating/cooling selection it is not allowed to enter in the heating/cooling selection menu.

INSTALLATION

To install the controller follow these directions:

1. Remove the plastic cover pressing (with the help of a tool like a screwdriver) the plastic tooth located in the lower slot as indicated in Fig. 1 raising, at the same time, the front cover as indicated in Fig. 2.
2. Unmount the plate fixed at the controller back by pressing the plastic tooth shown in **A**, Fig. 3 and, at the same time, pull the plate to the bottom until it becomes free from the plastic base.
3. Fix the plate to the wall through the two holes using the correct distance between holes (60 mm or 83 mm).
4. Mount the controller base on the wall plate by fitting the base teeth in the relevant holes on the wall plate, then apply a slight pressure towards the bottom until the plate fixing tooth snaps (Fig. 4).
5. Make electrical wirings passing the cables through the rectangular opening and according to the ' Wiring ' section.
6. Use, as shown in **B**, Fig.4, the 2 screws supplied in order to securely fix the thermostat to the relevant back plate.
7. Close the controller coupling the two plastic teeth located in the upper back part of the plastic cover with the relevant holes of the base. Then, after ensuring that the knob is correctly coupling to its hole, apply a slight pressure on the front cover towards the wall until the closing plastic tooth snaps.

WIRINGS

This controller can be powered either with 230V ~ or with 24V ~.
The controller is factory configured by default for a 230V ~ operation with the relevant jumper in position JP1. For the 24V ~ operation it is necessary to move the jumper from position JP1 (Fig. 3) to position JP2 (Fig. 3). As shown in Fig. 5 and 6 terminals 5 and 6 are provided for power supply. Use the same supply voltage which powers the thermostat (terminals 5 and 6) to power the valves. In case the thermostat is powered with a safety

extra low voltage (24V ~) use this voltage also for energising the valves (terminals 2, 3 and 4), thus using 24V ~ powered valves, in order not to jeopardize the safety of the installation with unsafe voltages.
In case the thermostat is powered with 230V ~ use 230V ~ valves.
In case of 230V ~ mains power it is mandatory to respect Live and Neutral indication.
At terminal 7 an input for remote heating/cooling selection is made available. In case this function is not used, the same terminal input can be used to activate the 'Economy' mode.
A remote temperature sensor can be wired to terminals 13 and 14. The selection between internal or remote sensor is made through the configuration procedure.
Terminals 12 and 14 feature a further input to which several types of sensor can be wired in order to accomplish special functions: the user can wire a supply water temperature sensor for performing the 'changeover' and/or 'cu-toff thermostat'; as an alternative a bimetallic thermostat can be wired here, still for a 'cut-off thermostat' function; further a window contact can be wired.
Note: some limitations exist for the window contact: please read carefully the 'WARNING' section.
The preferred sensor type can be set in the configuration menu.
The fan is controlled in a continuous proportional way. It is necessary to connect a drive suitable to accept a 0..10V input signal and control the fan motor at the output.
The proportional output of the fan at terminal 9 and the reference earth at terminal 8 shall control the drive input, as shown in figure 5 and 6.
The input signal earth is often internally connected to the supply Neutral. In this case, it is possible not to connect the terminal 8 (output signal earth) because the earth is granted by the Neutral supply terminal (take care this Neutral is connected to terminal 6).
Should the thermostat be supplied with 24V ~ , such a low voltage may be connected to the 230V ~ Neutral through the motor drive. In this case, you cannot consider the 24V ~ as a very low safety voltage: hence, it will be the installer's duty to grant a proper insulation.
The device can control either one or two ON/OFF actuators, type NC or NO. The heat output is at terminal 2. The cool output is at terminal 3. On a 2-pipe unit, just one valve is used both for heat and cool. In this case, the control signal will be the heat signal at terminal 2.
Read carefully also the paragraph "WARNING".

TECHNICAL FEATURES

Power supply:	230V ~ -15% +10% 50Hz or 24V ~ -15% +10% 50Hz
Power absorption:	1,2W
Room temperature	
Regulation range:	5.0 .. 35.0 °C (configurable)
Sensor type:	NTC 4.7kΩ @ 25°C ±2%
Precision:	± 1.0 °C
Resolution:	0.1 °C
Display temp. range:	0.0 .. 40.0 °C
Supply pipe temperature	
Sensor type:	NTC 4,7kΩ @ 25°C ±2%
Precision:	± 2 °C in the 20 .. 50 °C range
Resolution:	1 °C
Display temp. range:	0 .. 99 °C
Differential:	2 °C
ON/OFF actuator outputs	
Contact capacity:	3A @ 250V ~ cosφ=1
Proportional outputs	
Signal range:	0..10 V⎓
Signal precision:	±0.26 V⎓
Minimum actuator impedance:	2,7 KOhm
Regulation	
Proportional band:	0.8 .. 8.0 °C

Integrative time:			1 .. 30 min
Neutral zone:			1.0 .. 11.0 °C
Impulse voltage rating:			II
Action type:			1.C
Pollution degrees:			2
Supply water sensor (optional):			Code SWI
Protection grade:			IP 20
Operating temperature:			0 .. 40 °C
Storage temperature:			-10 .. +50 °C
Humidity limits:			20 .. 80% RH (non condensing)
Case:	material:		ABS V0 self-extinguishing
	color:	cover:	signal white
		base:	light grey
		buttons:	light grey
		knob:	light grey
Size:			129 x 96 x 37 mm (W x H x D)
Weight:			~ 209 g

CERTIFICATE OF CONFORMITY

The product is compliant with the following directives:
- Electromagnetic compatibility directive: EMC 2004/108/EC
- Low voltage directive: LVD 2006/95/EC

and has been designed, produced and market under the provision of the following community standards:

- **EMC**: CEI-EN 60730-1 (2000) + A1(2004) + A12(2003) + A13(2004) + A14(2005) + A16(2007)
  CEI-EN 60730-2-9 (2002) + A1(2003) + A2(2005) + A11(2003) + A12(2004)
- **LVD**: CEI-EN 60730-1 (2000) + A1(2004) + A12(2003) + A13(2004) + A14(2005)
  CEI-EN 60730-2-9 (2002) + A1(2003) + A2(2005) + A11(2003) + A12(2004)

⚠ WARNING

- **The supply water sensor must be installed in a way that it can acquire the correct water temperature even in case the flow is stopped by the valve itself.**
- **Wiring the same remote temperature sensor to more than one controller is not allowed.**
- **All remote sensors, bimetallic contact and window contact must have a galvanic insulation against earth as well as against the mains power.**
- **In case precending two directions are not respected an irreversible product damage can follow.**
- **All remote sensors, bimetallic contact and window contact must be double insulation (or reinforced insulation) rated in case they are accessible to people.**
- **In case the reinforced insulation of the preceding point cannot be obtained, power the regulator with a 24V ~ low voltage through a safety transformer in full compliance with the safety standards.**
- **In case of 230V ~ or 24V ~ power supply through a non-safety transformer, terminals 5 to 14 carry a dangerous voltage: therefore all parts electrically connected to these must be properly insulated against the user accessible parts; also for terminals 7 to 14 wires insulated for 230V ~ must be used.**
- **The appliance must be wired to the electric mains through a switch capable of disconnecting all poles in compliance with the current safety standards and with a contact separation of at least 3 mm in all poles.**
- **Installation and electrical wirings of this appliance must be made by qualified technicians and in compliance with the current standards.**
- **Before wiring the appliance be sure to turn the mains power off.**

APPENDIX

Supply water sensor input

This controller features an input for a sensor mounted on the water supply pipe: when this sensor is used the controller can automatically understand whether it should be working in 'cooling' mode or in 'heating' mode: this function is called 'changeover' and it is based on the water temperature.
The water temperature is also used to perform the 'cut-off thermostat' function: this means that when the controller is in heating mode but the water in the pipe is too cold then the fan is automatically stopped until the water temperature goes above a set threshold.
At this input can alternatively be wired a bimetallic thermostat for the same 'cut-off' function. In case this function is not required, the same input can be used to wire a window contact, which will stop the temperature regulation whenever in the room the window will be open. When the regulation is inhibited by the window contact, symbols related to the active outputs will flash on the display.
Note: there are some limitations for the window contact use: please read carefully the 'WARNING' section.

Temperature acquisition

This controller acquires both the room temperature and the supply water temperature in the fan-coil exchanger with NTC type sensors. The room temperature is acquired and displayed with the above mentioned resolution in the range 0 .. 40°C.
In case the room temperature falls outside the operating range, the display shows '**Or**' (out of range). In case the sensor acts as an open or a short circuit the display shows '**EEE**' (error): no regulation is performed in this situation and all outputs are set as inactive.
The controller features an internal temperature sensor but an input for a remote sensor is also available. Through parameter **P11** in the 'installer configuration' one of these two sensors is selected for the regulation purpose. The supply water temperature in the fan-coil is acquired through a remote sensor and can be displayed with 1°C resolution in the 0 .. 99°C range. In case the acquired temperature falls outside the operating range mentioned, the display will show the letters '**Or**' (out of range). In case the sensor acts as an open circuit or a short circuit the display will show the letters '**EEE**' (error) and all functions related with this data are not performed. In case the system doesn't require the supply water sensor the user is allowed not to install and wire it. For what is related to the supply water sensor activation please refer to the explanations in paragraph 'Cut-off temperature function'.

Cut-off temperature function

The cut-off temperature function is used to inhibit the fan operation whenever, but only in heating mode, the supply water is not hot enough. In order to enable this function a supply water sensor (or even, alternatively, a bimetallic thermostat) must be wired to the proper terminals. In case the supply pipe sensor is used, the relevant threshold for this function (i.e. the value for the controller to decide when the supply water is hot enough) is defined by parameter **P25**.
In case this function is not needed parameter **P25** can be set to a very low value (as an example '0').
On the other hand when for this function a bimetallic thermostat is used, it is mandatory to set parameter **P08** to value '2': in this case the fan will be enabled only when the thermostatic contact is closed. When this type of thermostat is used the supply water temperature cannot be displayed, nor the automatic changeover function can be performed. Please refer to the section 'Installer Configuration' to set the parameters related to the above described functions. When the fan is stopped by the cut-off temperature function the 'fan' symbols on the display flash.

Economy function

The 'Economy' function allows to temporarily set an energy saving mode through a reduction of the actual set-point temperature by a step (configurable) when in heating mode, or increasing it by the same step when in cooling mode.
The value for this reduction step is set with parameter **P18**: when this is

set at 0.0 Economy function is actually disabled. Economy saving mode is started from the menu button, as explained in the 'Operation' section. In case the remote heating/cooling mode is not configured, terminal 7 can be used to start the 'Economy' function from remote even at the same time on several different regulators.
When the wire connected at this terminal is linked with the Live voltage of power supply, the function is started; the same function is terminated when this terminal is left unconnected (open). The regulator detects the state changes of the terminal, not the level itself, therefore it is always possible to override the Economy state set by terminal 7 with a manual action on the menu button.
When Economy mode is active, being an energy saving mode, the fan motor speed will be limited to the lowest one (first) or at the value set in **P30** in case of fan proportionally driven.

Dirty filter warning function

Fan-coils and other devices including a fan are often equipped with a filter for the air in the suction path, which needs a periodical maintenance and cleaning or replacement. This regulator can warn the user when the maintenance has to be made, provided the 'Dirty filter warning' function has been enabled.
The function is enabled by setting the time-to-maintenance value (each unit means 100 hours) in parameter **P35**: the regulator will count the operating time of the fan and when the value stored in **P35** (x 100 hours) is reached it will warn the user through a message on the display.
In this situation the regulator shows on the display, in place of the room temperature, the two words **FIL-TER** alternating. If any key is depressed the warning disappears and the display returns to its normal mode. Whenever the regulator is turned off and then on again, the warning will reappear. This is an extremely useful function for the maintenance service, which can easily check whether the filter needs to be cleaned.
In order to reset the warning and the relevant time-counter, once the cleaning has been made, just keep depressed the speed button for at least 10 seconds, until the regulator will confirm to have reset the warning by showing again the words **FIL-TER**.

Temperature regulation

This device can drive in a proportional way the fan speed in order to control room temperature with the highest comfort and energy saving. Nonetheless each different environment needs a different set for some parameters in order to get an accurate regulation.
Parameters devoted to the regulation accuracy are:
- Proportional band: **P26** and **P27**
- Integrative time: **P28** and **P29**

For each of the settings two parameters are available, because the user is allowed to set different values for heating and cooling mode. Proportional band, measured in °C, is intended as the difference between set-point and room temperature which is needed to change the fan speed from zero to maximum.
The narrower the proportional band, the fastest is the regulator to counteract temperature variations in the room.
Yet a value for this parameter too 'narrow' can result in room temperature oscillations or system instability. A value too 'wide' could result in the impossibility to reach the set-point temperature in the room. When the integrative time is set to zero, no integral action is made and therefore the regulation is purely proportional (P type). When an integrative time different from zero is set the resulting regulation is made of a Proportional plus an Integral action (P + I type).
The smaller the integrative time, the greater the influence of the integral action and vice-versa: with a greater integrative time the resulting integral action is softer.
A too soft or null integral action could result in the impossibility to reach the set-point temperature, meanwhile a too strong integral action could possibly generate oscillations in the room temperature. It is necessary to adjust these parameters according to the actual environment in which the regulator is installed for the purpose of the best possible regulation

accuracy.
The fan is driven in a proportional way except when a fixed speed is set **FI1..FI3**. With fixed speed, the fan can be only turned off or turned on at the fixed speed; there is no proportional regulation, actually it becomes ON-OFF regulation with relevant hysteresis set on parameter **P19**.
The fan will be turned on only when the valve is open, in order to avoid the fan operation together with a closed valve.

Installer configuration
The 'installer' configuration is used to setup the controller in order to get the best regulation in conjunction with the type of heating/cooling system installed. In order to enter the configuration menu, turn off the controller, then keep depressed both buttons '**on/off**' and '**menu**' together for some seconds, until the word '**COn**' (configuration) appears on the display. From this state on, each time the "menu" button is depressed a different parameter is displayed, identified with a '**P**' followed by a number, i.e. from **P01** to **P35**.
The end of configuration is indicated by the word '**End**': if now the 'menu' button is depressed once again the configuration is saved in a non-volatile memory and the controller jumps into the normal operation mode. In case the 'on/off' button is depressed, at any time the controller exits from the configuration menu, without saving the changes. When parameters are examined, if the 'speed' button is depressed once, the actual value of the parameter is displayed.
When the value is shown press again the 'speed' button to change the value. Parameters from **P01** to **P11** can be set by pressing several times in sequence the 'speed' button until the desired value is reached.
The following parameters, being variable in a wider range, can be modified by first pressing once the 'speed' button, so that the 'modify parameter' mode is entered, then turning the knob to modify the desired value. Upper and lower limits for the knob regulation are redefined each time according to the actual parameter allowable range. In order to disable the access to configuration menu to unauthorized users, an internal jumper, **JP3**, (shown in Fig. 3), can be removed; after this any attempt to enter in the configuration menu will result in an error message.

Configuration parameters explanation
All parameters used in the installer configuration are shown in Table 1 and explained in the following.

P01: System type selection.
2 pipes system: when configured for a two-pipes system the controller drives one valve only, wired at the 'heating' output terminal, both when heating and when cooling, as the same valve is going to control either hot or cool water flow.
4 pipes system: when configured for a four-pipes system the controller drives both valves outputs in order to activate either hot or cooling water according to the actual requirements of the controlled environment.

P02: This parameter sets the way the controller switches from the cooling mode (summer) to the heating mode (winter) and vice versa.
The switching can be either manual or automatic:
Manual: The user manually sets the heating or the cooling mode.
Automatic: The controller automatically selects the switching from the heating to the cooling mode or vice-versa.
This automatic operation is different according to the system type set with parameter **P01**.
If the system is a 4-pipes one, the controller operates with neutral zone thus activating the heating or cooling according to the set-point temperature. In case of a 2-pipes system the controller operates a changeover according to the supply water temperature. When the supply water temperature is low (that is below the threshold set with parameter **P23**) the controller switches to cooling mode.
On the opposite side, when this temperature is high (that is above the threshold set with parameter **P24**) the controller switches to heating mode. In case the supply temperature is neither too low nor too high the operating mode is kept unchanged, but it still can be changed manually. When the supply water sensor is not installed or is not properly working

then no automatic selection is performed and the manual switching is only allowed.
Remote selection: In a building with several regulators all inputs (terminal 7 of each regulator) can be wired together and driven by a remote signal coming from the furnace room.
In case the furnace leaves the remote signal 'floating', all regulators will be set into heating mode, meanwhile when remote signal is connected to the mains 'Live' all regulators will be set into cooling mode. In Fig. 5 and 6 is shown a wiring example for a remote heating/cooling selection.
Reversed remote selection: same as before but with reversed logic: terminal 7 floating sets cooling mode, while terminal 7 connected to mains 'Live' sets heating mode.

P03 and **P04**: these parameters set which outputs are controlled. When in heating mode parameter **P03** is used, when in cooling mode **P04** is used instead.
Each parameter sets whether temperature is to be regulated through valves, fan, or both. When valves only is chosen, the fan will be turned on even after temperature has reached the set-point; when fan only is chosen the valve will always be opened even after temperature has reached the set-point.

P05 and **P06**: These parameters tell the thermostat which valve is to be connected: either NC or NO. If the NC valve is connected, the water flow opens when it is supplied. On the contrary, if the NO valve is connected, the water flow is normally opened and will be closed only when it is supplied.

P07: This parameter tells the thermostat which type of proportional action is required at the proportional output of the fan.
Direct action: this means the thermostat gives an output signal of 0 V to turn off the fan-coil motor, and a maximum 10V signal to turn it on.
Indirect action: this means the thermostat gives an output signal of 10V to turn off the fan-coil motor, and a maximum 0 V signal to turn it on.

P08: This parameter sets the type of sensor connected to the supply water temperature input at terminals 12 and 14. When set to value 0 or 1 a temperature sensor is expected for the acquisition of water temperature. When 1 is set, the temperature value is also shown over the display, according to the user choice. In case 0 is set, the information coming from the temperature sensor is still used for the regulation purpose, even if its value is never shown.
Value '2' means that the device connected to terminals 12 and 14 is a bimetallic contact, which will act as cut-off thermostat only.
When the parameter is set to '3' a window contact can be wired at terminals 12 and 14: when this contact is closed the regulation is carried out as usual, meanwhile when it is left open regulation is stopped.
Note: some limitations exist for the window contact: please read carefully paragraph 'WARNING'.
If this parameter is set to '4' a 'reversed' logic is adopted for the window contact: open means usual regulation, closed means regulation stopped.

P09: This parameter enables the 'de-stratification' function in the environment. With this function the fan is turned on, at its lowest speed, for about 2.5 minutes every 15 minutes.
The function is only active when the fan should be turned off according to the room temperature.

P10: In case of a black-out the controller remembers its last state and, as soon as the power is applied again it restarts with the same settings (on/off, heating/cooling, etc.).
Anyway, in some situations it is requested for the controller to restart from a fixed state (i.e. always from off or from on).
This can be accomplished by setting parameter **P10** to '2' (always restart from 'on') or '3' (always restart from 'off').

P11: Room temperature sensor selection.
This parameter sets whether the temperature sensor used for regulation has to be the one internal to the controller or the external one wired to the terminals 13 and 14.

P12: With this parameter a slight correction (offset) for the acquired room temperature can be set.

Actually it could happen that in some installations, due to the sensor location (either internal or external) the temperature readout is not accurate.
By changing the value of this parameter the display readout can be corrected of the equivalent amount (in the -5.0 .. +5.0°C range), being this a value which is actually added to the acquired temperature value.

P13 and **P14**: These two parameters set the temperature limits for the set-point knob range when in heating mode.
In details **P13** is the lower limit, it can be configured in the range 5.0 .. 35.0°C while **P14** is the upper limit, whose value can be configured starting from the actual **P13** value until 35.0°C.
The maximum range is then 5 .. 35°C and it can be easily modified according to the installation needs.

P15 and **P16**: These two parameters set the temperature limits for the set-point knob range when in cooling mode according to the same logic as those in the former step.
In case the heating/cooling settings are modified, the temperature limits for the set-point knob are automatically modified in turn.
When the 'neutral zone' operation is selected, these two parameters will not be used and only the **P13** and **P14** values will be taken into account.

P17: This parameter defines an anti-freeze temperature (in °C), that is a minimum temperature which is maintained in the room even when the regulator is turned off (with the on-off button).
Regulation according to this temperature will only take place when the regulator is set in heating mode; the fan speed will be limited to the lowest one. Setting the value to 0.0 disables the anti-freeze function.

P18: This value defines the entity of a temperature reduction step (in °C) used to perform the 'Economy' function.
The actual set-point is therefore reduced (when in heating mode) or raised (when in cooling mode) by this step, once the 'Economy' function is made active. When this is set at 0.0 the 'Economy' function is actually disabled.

P19: This parameter defines the hysteresis in °C with which the ON/OFF outputs are controlled according to the ambient temperature variations.

P20: In case the controller is configured for a neutral zone operation this parameter determines the relevant amplitude in the range 1.0 .. 11.0°C. This value has to be intended centered across the temperature set with the knob.
In case the controller is configured for a different operation this parameter is not used.

P21: This parameter allows to set a delay time (in seconds) from the valve opening to the fan turn-on, in order to allow some time for the heat exchanger to heat-up or cool-down.

P22: This parameter allows to set a delay time (in seconds) from the valve closing to the fan turn-off, in order to allow some time for the heat exchanger to dissipate the residual heat.

P23 and **P24**: These parameters set the thresholds for the automatic changeover operation: in case this function is not performed these two parameters are not used.
Parameter **P23** is the lower threshold and can be modified in the range 0 .. 24°C, meanwhile **P24** is the upper threshold in the range 26 .. 48°C.

P25: This parameter sets the threshold for the cut-off temperature function: this function is active in heating mode when a supply water sensor is wired at the proper terminals. In case this function is not desired the parameter should be set to '0'.

P26 and **P27**: These parameters respectively represent the proportional band of the adjustment when the thermostat is set either in heating mode or cooling mode. Fig. 7 graphically shows the effect of the proportional band on the output.

P28 and **P29**: these parameters are used to set the integrative time respectively for regulation in heating mode and in cooling mode. When set to zero no integral action is performed.

P30 P31 P32: These parameters define the speed regimes associated to the fixed speeds settings **FI1**, **FI2**, **FI3**, as percentage of the full speed.

P33 and **P34**: These parameters respectively represent the lower limit and the upper limit of the output proportional signal of the fan. Parameters can be changed within the range 0 .. 10.0 V. This parameter permits to customize the output voltage; this can be useful to limit the minimum and maximum speed of the fan-coil motor.

P35: This parameter sets the time after which the 'Dirty Filter Warning' is shown; it can be set in the range 0..50 x 100h.
As an example '10' means that the warning will be shown after 10 x 100 = 1000 hours of fan operation. When set to 0 the function is disabled.

Room temperature correct acquisition
For a correct temperature acquisition it is mandatory to remember and apply the following tips:

- In order to have an accurate room temperature acquisition the controller must be installed far from heat sources, airstreams or cold walls (thermal bridges).
  When the remote sensor is used in conjunction with the controller, then this note is to be applied to the remote sensor itself.
- When a remote sensor is used, do not use the same duct for signal wires and power wires, as the temperature reading accuracy could be impaired.
  Wirings can be usefully made with bipolar screened cable , whose screen is only wired at the regulator side (terminal 14) with 1,5 mm² minimum cross section and 15 m. maximum length.
- In the normal operation with internal sensor, the controller conditions the signal acquired according an exclusive algorithm designed to compensate for the heat generated from its internal components.
  From this derives that the temperature value displayed at turn-on can be actually lower than the real one.
  This must be considered a normal behaviour: anyway in some minutes this difference should decrease down to zero.
- In case the controller should drive with its outputs large loads (whose current is close to the maximum rated value) it might happen that the internal components temperature raise.
  This temperature increase could in turn influence the room temperature acquisition when the internal sensor is used.
  This problem is not evidenced when the remote temperature sensor is used.
- When, for any reason, the room temperature accuracy is considered unsatisfactory (due to the above mentioned reasons), it can be corrected with parameter **P12**.
- **When the controller is powered with 230V~ it is mandatory to respect the live and neutral (L and N) position during wiring.**

Table 1: Installer configuration (Summary of the parameters involved in the 'installer' configuration).

DEFAULT											
	CON										
0	P01	**System type**	0	2-pipes system	1	4-pipes system					
0	P02	**Heating/cooling selection**	0	Manual	1	Automatic	2	Remote	3	Reversed remote	
3	P03	**Heating regulation**	1	Valves only	2	Fan only	3	Valves and fan			
3	P04	**Cooling regulation**	1	Valves only	2	Fan only	3	Valves and fan			
0	P05	**Heating output type**	0	NC ON/OFF valve	1	NA ON/OFF valve					
0	P06	**Cooling output type**	0	NC ON/OFF valve	1	NA ON/OFF valve					
0	P07	**Fan output type**	0	Direct action	1	Reversed action					
0	P08	**Supply water sensor input**	0	Do not show temperature	1	Show temperature	2	Bi-metallic contact	3	Window contact	4	Reversed window contact
0	P09	**De-stratification**	0	Never	1	Cooling only	2	Heating only	3	Always		
1	P 10	**On/Off state at power up**	1	Last	2	Always ON	3	Always OFF				
0	P 11	**Room temperature sensor**	0	Internal	1	External					

0.0	P 12	Room temperature correction (offset) (°C)	-5.0..5.0
10.0	P 13	Heating set-point knob lower limit (°C)	5.0..35.0
30.0	P 14	Heating set-point knob upper limit (°C)	5.0..35.0
10.0	P 15	Cooling set-point knob lower limit (°C)	5.0..35.0
30.0	P 16	Cooling set-point knob upper limit (°C)	5.0..35.0
0.0	P 17	Anti-freeze threshold temperature (°C)	0.0.. 15.0
0.0	P 18	Economy reduction (°C)	0.0..10.0
0.2	P 19	Ambient temperature hysteresis (°C)	0.2.. 1.0
3.0	P20	Neutral zone width (°C)	1.0..11.0
0	P21	Fan delay at turn-on (seconds)	0..600
0	P22	Fan delay at turn-off (seconds)	0..600
17	P23	Changeover lower threshold (°C)	0..24
30	P24	Changeover upper threshold (°C)	26..48
40	P25	Cut-off thermostat threshold temperature (°C)	0..99

2.0	P26	Heating proportional band (°C)	0.9..8.0
2.0	P27	Cooling proportional band (°C)	0.9..8.0
0	P28	Heating integrative time (minutes)	0..30
0	P29	Cooling integrative time (minutes)	0..30
33	P30	Fan MIN speed (FI1)	1.. 100
66	P31	Fan MED speed (FI2)	1..100
100	P32	Fan MAX speed (FI3)	1..100
0	P33	Fan-coil signal lower limit	0.0..10.0
10.0	P34	Fan-coil signal upper limit	0.0..10.0
0	P35	Dirty filter warning time (x 100 hours)	0..50
	End		