

# GTH21 | TRANSFORMER FAN SPEED CONTROLLER FOR HEATING AND COOLING

Mounting and operating instructions



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## SAFETY AND PRECAUTIONS

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Read all the information, the datasheet, Modbus map, mounting and operating instructions and study the wiring and connection diagram before working with the product. For personal and equipment safety, and for optimum product performance, make sure you entirely understand the content before installing, using or maintaining this product.



For safety and licensing (CE) reasons, unauthorised conversion and /or modifications of the product are inadmissible.



The product should not be exposed to abnormal conditions, such as extreme temperatures, direct sunlight or vibrations. Long-term exposure to chemical vapours in high concentration can affect the product performance. Make sure the work environment is as dry as possible; avoid condensation.



All installations shall comply with local health and safety regulations and local electrical standards and approved codes. This product can only be installed by an engineer or a technician who has expert knowledge of the product and safety precautions.



Avoid contact with energised electrical parts. Always disconnect the power supply before connecting, servicing or repairing the product.



Always verify that you apply appropriate power supply to the product and use appropriate wire size and characteristics. Make sure that all the screws and nuts are well tightened and fuses (if any) are fitted well.



Recycling of equipment and packaging should be taken into consideration and these should be disposed of in accordance with local and national legislation / regulations.



In case there are any questions that are not answered, please contact your technical support or consult a professional.

## PRODUCT DESCRIPTION

The GTH21 series of transformer fan speed controllers regulate the rotational speed of single-phase voltage controllable motors in steps by varying the output voltage according to the measured temperature. They are equipped with an auto-transformer and control the speed of fans in automatic or manual mode (in five steps) according to the input provided by the connected temperature sensor. The unregulated output is also controlled in function of the measured temperature and can be used to control a valve (e.g. hot water supply). The settings can be adjusted via Modbus RTU communication.

## ARTICLE CODES

Article code	Rated max. current [A]	Fuse [A]
<b>GTH21-75L22</b>	7,5 A	T 10 A-H (5*20 mm)
<b>GTH21100L22</b>	10 A	T 12,5 A-H (5*20 mm)

## INTENDED AREA OF USE

- Applications where a single phase voltage controllable motor and a valve must be controlled in function of temperature (heating or cooling)
- For indoor use, surface mounted
- Clean air with non-aggressive, non-combustible gases
- The ideal controller for hot water air heaters in warehouses, workshops, greenhouses, stables, sheds, etc.

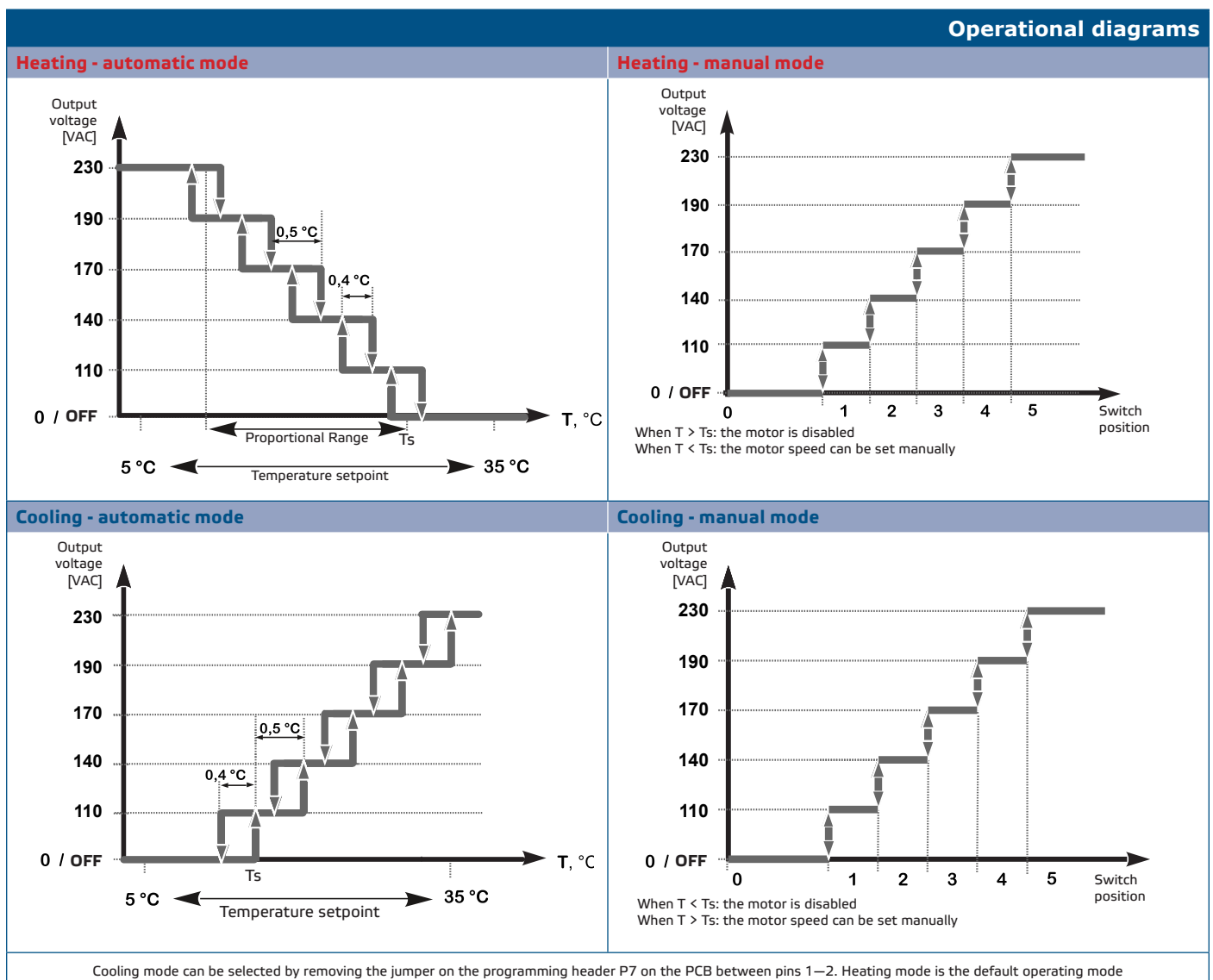
## TECHNICAL DATA

- Fan speed controller for heating or cooling applications
- 7-step rotary switch: Off position + manual 5-step control + Auto mode
- Unregulated output to control an external valve for hot water supply
- Manual or automatic fan speed selection, selectable by switch
- LEDs for status indication on PCB
- Standalone or Modbus controlled
- Temperature mode (heating/cooling) selection via jumper on the PCB or Modbus
- Potentiometer for temperature setpoint (range 5–35 °C) in 1 °C scale
- Input for external PT500 temperature probe (PT500 temperature probe is not included)
- Metal enclosure for easy wall fixing
- Protection standard: IP54 (according to EN 60529)
- Operating ambient conditions:
  - ▶ Temperature: -10–35 °C
  - ▶ Rel. humidity: < 95 % rH (non-condensing)

## STANDARDS

- Low Voltage Directive 2014/35/EU **CE**
  - ▶ EN 60529:1991 Degrees of protection provided by enclosures (IP Code) Amendment AC:1993 to EN 60529
  - ▶ EN 60730-1:2011 Automatic electrical controls for household and similar use - Part 1: General requirements
- EMC directive 2014/30/EU:
  - ▶ EN 60730-1:2011 Automatic electrical controls for household and similar use - Part 1: General requirements
  - ▶ EN 61000-6-1:2007 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light industrial environments
  - ▶ EN 61000-6-3:2007 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments Amendments A1:2011 and AC:2012 to EN 61000-6-3
- RoHS Directive 2017/2102/EU

## OPERATIONAL DIAGRAMS



Cooling mode can be selected by removing the jumper on the programming header P7 on the PCB between pins 1–2. Heating mode is the default operating mode

## WIRING AND CONNECTIONS

<b>L</b>	Power supply, line (230 VAC / 50–60 Hz)	
<b>N</b>	Power supply, neutral	
<b>PE</b>	Protective earth	
<b>U2</b>	Regulated output to motor - line	
<b>U1</b>	Regulated output to motor - neutral	
<b>PE</b>	Protective earth	
<b>L1</b>	Unregulated temperature based output, line	
<b>N</b>	Unregulated temperature based output, neutral	
<b>PE</b>	Protective earth	
<b>A</b>	Modbus RTU communication, signal A	
<b>/B</b>	Modbus RTU communication, signal /B	
<b>Temp</b>	External temperature probe PT500	
<b>Connections</b>	Cable cross section	max. 2,5 mm <sup>2</sup>
	Modbus RTU communication / RS485	Cat5 cable / UTP

### **ATTENTION**

*Make sure you use cables with an appropriate diameter to connect the fans to the GTH21 controller.*

## MOUNTING INSTRUCTIONS IN STEPS

Before you start mounting the unit, read carefully “**Safety and Precautions**” and follow these steps. Choose a smooth solid surface for installation (a wall, panel, etc.).

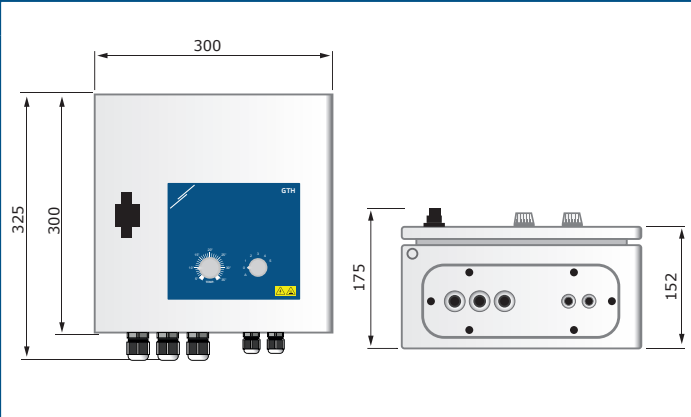
### Follow these steps:

- 1.** Open the door of the controller. Mind the wires that connect the rotary switch with the autotransformer.
  - 2.** Mount the enclosure using corrosion resistant screws or bolts. Mind the correct mounting position and unit mounting dimensions (see **Fig. 1 Mounting dimensions** and **Fig. 2 Mounting position**). The mounting holes are on the inside back panel of the enclosure and are covered with blanking plugs.
  - 3.** Pay attention to the following instructions in order to minimize the operating temperature:
    - 3.1** Respect the distances both between the wall / ceiling and the device and between two devices as shown in **Fig. 2**. In order to ensure sufficient ventilation of the controller, clearance on every side has to be maintained.
    - 3.2** When installing the device, please keep in mind that the higher you install it, the warmer the device will get. For example, in a technical room the correct installation height can be of great importance. Do not install the device above heating equipment or heat sources.
    - 3.3** If maximum ambient temperature cannot be adhered to, please provide extra forced ventilation / cooling.
- Not respecting the abovelisted rules can reduce service life and relieves the manufacturer of any responsibilities.**
- 4.** Once secured in position, the mounting screws or bolts should be sealed to maintain the IP rating of the enclosure
  - 5.** Because the controller enclosure is made of metal, it must be earthed and bonded to other existing metal surfaces

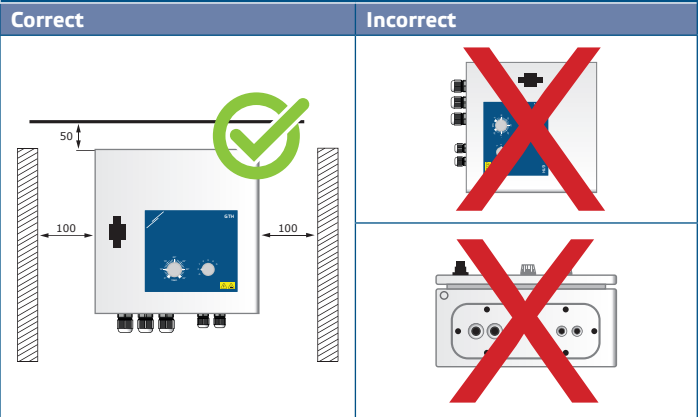
## ATTENTION

*It is recommended that you install appropriate protective circuit on the input as this transformer controller is not internally short-circuit proof. Recommended automatic circuit breaker with "C" characteristics should be selected according to the transformer rated maximum current.*

**Fig. 1 Mounting dimensions**



**Fig. 2 Mounting position**

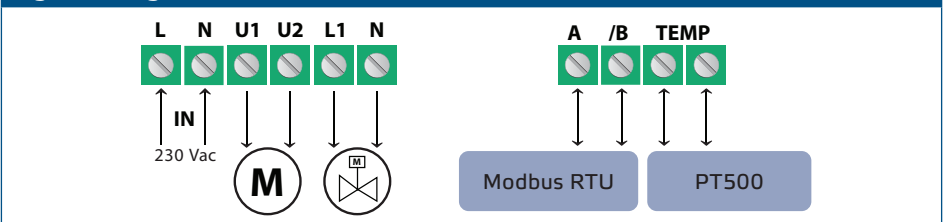


6. Fix the unit onto the wall / panel.
7. Insert the cables through the cable glands and do the wiring according to the wiring diagram (see **Fig. 3**) while adhering to the information from section **"Wiring and connections"** above.
  - 7.1 Connect the power supply line (terminals L, N and PE).
  - 7.2 Connect the motor(s) (terminals U1, U2 and PE).
  - 7.3 Connect the external temperature probe (terminals TEMP).
  - 7.4 Connect the valve output (L1, N). It can be used to supply a 230 VAC heating / cooling valve, when the knob is not at '0' position (see **Table 1** below).
  - 7.5 Connect the Modbus RTU communication cables.

## ATTENTION

*A safety isolator / disconnect switch should be installed on the mains electricity side of all motor drives.*

**Fig. 3 Wiring and connections**



8. Close the cover.
9. Tighten the cable glands.

## ATTENTION

*The earth wire (green-yellow) of the electrical supply and of any equipment connected to the controller must be connected to the terminals marked as PE.*

## OPERATING INSTRUCTIONS

**ATTENTION**

*Make sure the connections are correct before you power the unit.*

**ATTENTION**

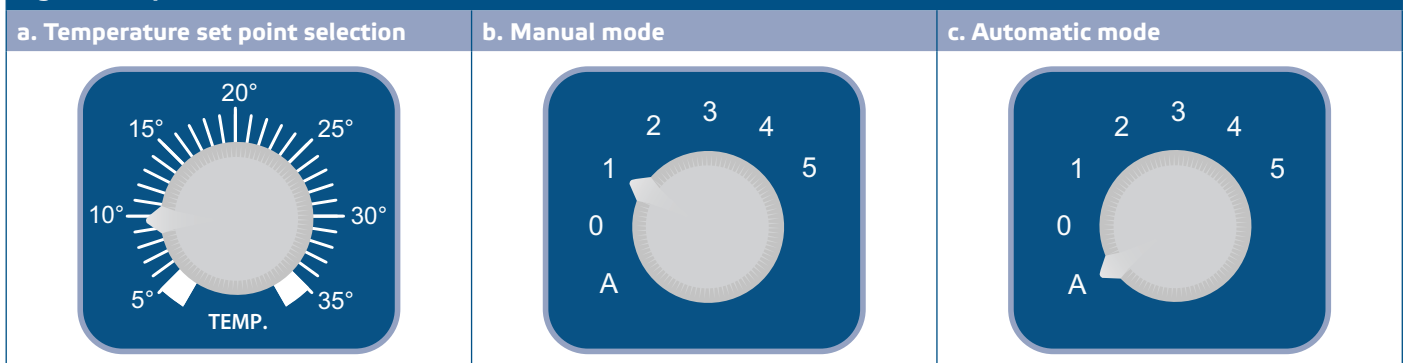
*Make sure the mains supply voltage is within the admissible rated maximum current of the product.*

**ATTENTION**

*Several fans can be connected in parallel to the controller as the maximum total current of all must not exceed the current rating of the controller.*

1. Switch off the mains power supply before connecting any power cables.
2. Install the PT500 temperature probe in an appropriate zone in order to measure the relevant ambient temperature.
3. Plug the GTH21 into the mains electricity network.
4. Select the operating mode by turning the control switch / knob on the right to the relevant position (**Fig. 4**).

**Fig. 4 Knob positions**



### 4.1 Manual mode

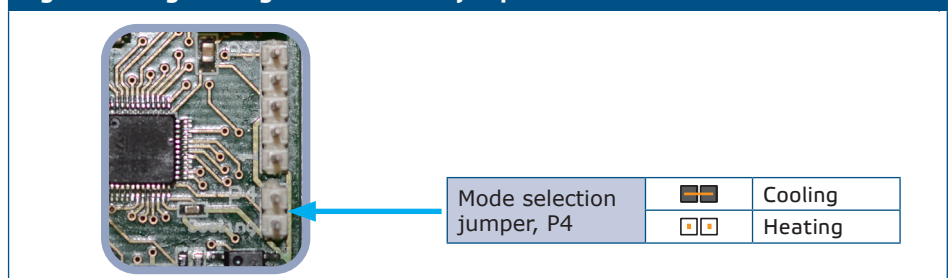
In manual mode, the fan speed can be selected manually via the position switch (position 1–5) - see **Fig. 4b**.

In **heating mode**, the motor will be enabled at the selected speed if the measured temperature is lower than the set temperature. Once the measured temperature increases the set temperature, the motor will be disabled.

In **cooling mode**, the motor will be enabled as long as the measured temperature is higher than the set temperature.

The unregulated output is activated (230 VAC) while the motor is enabled. The operating mode is selected via placing the jumper onto the P header. The default mode (no jumper) is heating. Cooling mode is activated via placing the jumper onto the header. See **Fig. 5** below.

**Fig. 5 Heating/cooling mode selection jumper**





The standard configuration of the output voltages is as indicated in **Table 1** below.

However, because more than 5 output voltages are available, it is possible to adjust the 5 steps by changing the internal wiring.

### 4.2 Automatic mode

When Auto mode has been selected, the controller changes the five speeds automatically according to the setpoint temperature selected via the temperature potentiometer (**Fig. 5a**). The speed changes by increasing / decreasing the temperature by 1 °C.

**Table 1 Output voltage**

Knob position	0	-	1	2	3	4	5	Auto mode
Wires		-						
Regulated output [VAC]**	0	80*	110	140	170	190	230	According to temperature setpoint
Unregulated output [VAC]	0	Heating mode: 0 VAC if Temperature > Temperature setpoint 230 VAC if Temperature < Temperature setpoint Cooling mode: 0 VAC if Temperature < Temperature setpoint 230 VAC if Temperature > Temperature setpoint						
Speed	Off	Low	Low	Medium	Medium	High	High	According to measured temperature

\* Available but not connected.  
 \*\*In heating mode, the motor will be disabled when  $T > T_s$ . In cooling mode, the motor will be disabled when  $T < T_s$ .

### 4.3 Overwrite mode

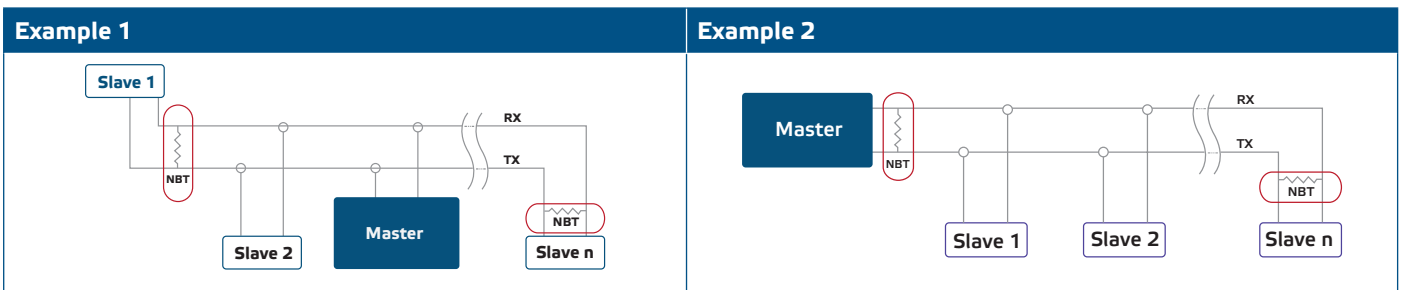
Overwrite mode turns off all controls except Modbus RTU communication. When this mode is selected, both the regulated and unregulated outputs are controlled via Modbus master devices via holding registers 13 to 16.

## NOTE

For the complete Modbus register data, see the Modbus Register Map of the product. This is a separate document linked to the article code on the website containing the list of registers.

### Network Bus Termination (NBT) Resistor

This resistor is controlled via Modbus RTU Holding register 9. By default, the NBT resistor is disconnected. Set the NBT resistor to be connected or not according to the following examples:



## NOTE

On a Modbus RTU network, two bus terminators (NBTs) need to be activated.

## VERIFICATION OF INSTALLATION

### ATTENTION

*Use only tools and equipment with non-conducting handles when working on electrical devices.*

**Safe operation depends on proper installation. Before start up, ensure the following:**

- The mains supply is connected correctly.
- The speed regulator must be properly earth protected.
- During operation, the unit must be closed.
- Protection is provided against electrical shock.
- The cables are the appropriate size and fuse-protected.
- There is sufficient air flow around the unit.

**Verification of operation:**

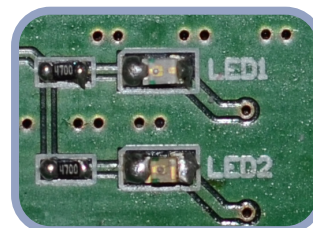
- Switch ON the mains supply.
- Set the temperature to the minimum position (5 °C).
- The connected fan must stop – (if the ambient temperature is higher than the selected setpoint value).
- The heater / valve must be OFF.
- Set the temperature setpoint to the maximum position (35 °C).
- The connected fans must run at max speed (230 VAC) – if the measured temperature is below the setpoint value.
- The heater / valve must be ON.

**If the unit does not work according to the instructions, the wiring connections and settings need to be checked.**

**LED indications**

- Green LED1 on the PCB indicates the current status of the regulated output (U1 and U2). It flashes as many times as the currently selected step, i.e. once for step 1, twice for step 2, etc., then it is off for two seconds and so on.
- Green LED2 on indicates the status of the unregulated output (L1 and N). It is on if the output is active (230 VAC) and off in case it is inactive (0 VAC).

**Fig. 6 LED indications**



### ATTENTION

*The unit is supplied with electrical energy at voltages high enough to inflict personal injury or threat to health. Take the relevant safety measures.*

### ATTENTION

*Disconnect and confirm that there is no live current flowing to the unit before servicing.*

### ATTENTION

*Avoid exposing the controller to direct sunlight!*

## TRANSPORT AND STORAGE

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Avoid shocks and extreme conditions; stock in original packing.

## WARRANTY AND RESTRICTIONS

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Two years from the delivery date against defects in manufacturing. Any modifications or alterations to the product after the date of publication relieve the manufacturer of any responsibilities. The manufacturer bears no responsibility for any misprints or mistakes in this data.

## MAINTENANCE

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In normal conditions this product is maintenance-free. If soiled, clean with a dry or damp cloth. In case of heavy pollution, clean with a non-aggressive product. In these circumstances the unit should be disconnected from the supply. Pay attention that no fluids enter the unit. Only reconnect it to the supply when it is completely dry.