DUAL THERMOSTAT DTH6000

GELEC

INDUSTRIAL ELECTRONICS

CONTENTS

PRECAUTIONS!

There are no serviceable parts inside the **DTH6000** unit. Not to be opened by any unauthorized person. All repairs to the device must be carried out by the manufacturer, or a qualified service engineer.

Improper handling may result in serious personal injury and considerable material damage. All connection and maintenance work must be carried out by qualified personnel.

RISK OF ELECTRIC SHOCK!

Use the correct voltage. The DTH6000 is designed for use with specific voltage only. Connection to a different voltage may cause fire, electric shock or other damage.

Always cut the power off before connecting or disconnecting the unit.

Do not touch the plug and the connectors with wet hands.

Disconnect the DTH6000 before cleaning it, to avoid the risk of electric shock.

Attempting to use a malfunctioning DTH6000 can be dangerous.

Do not block the ventilation slots on the cabinet of the DTH6000.

Keep liquids away from the DTH6000.
Spillage into the cabinet may result to fire, electric shock, or equipment damage. If a small object or liquid falls/spills into the DTH6000 cabinet, unplug the unit immediately. Have the unit checked by a qualified service engineer before using it again.

I. MANUFACTURER'S WARRANTY, GENERAL TERMS AND CONDITIONS

Thank you for purchasing our product.

Our products have been manufactured with the latest technology, the highest quality components and have gone through rigorous quality control tests at the factory, before shipment. Make sure that the part number and type indicated in the identification label and pack correspond to the part number or type of your order. After receiving, inspect the unit to ensure that no damage have been caused during transportation.

GELEC and GELEC's authorized distributors warrant to the original purchaser that the product shall be free from defect in material and/or workmanship. The warranty period begins on the purchase date (proof of purchase by invoice or delivery note) and is valid for one (1) year.

In the event of malfunction during the warranty period attributable directly to faulty material and/or faulty construction and functional defects, GELEC and authorized distributors will, at their option, either repair or replace the faulty product with the same or similar model.

GELEC and authorized distributors shall have no obligation under this warranty, however, in the following cases:

‣ Any defect caused by freight damage, accident, disaster, faulty maintenance or improper handling.
‣ Any defect caused by modification, alteration, abuse, misuse or incorrect installation.
‣ Any defect of the product caused by improper repair by third party other than GELEC and GELEC's authorized distributors.
‣ Any incompatibility of the products with subsequent technical innovations or regulations.
‣ Any defect of the product caused by external equipment.
‣ Any defect of the product on which the original manufacturer's labeling has been altered or removed.
‣ Any damage on external/connected equipment, or by extension on every part of the whole application, caused by a possible improper device operation.

In case of complaint please contact our company or send the unit un-dismantled to your local dealer. Any necessary replacement parts and necessary repair work are totally covered free of charge.

All products are designed and produced by the manufacturer GELEC Co. Ltd to be in compliance with the EU norms applying to them. GELEC is not responsible for direct or indirect damages or malfunction caused by improper use or installation of the DTH6000.

2.   DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT
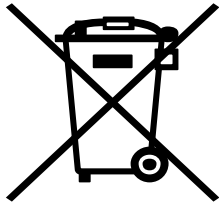
This symbol, found on your product, indicates that this should not be treated as household waste when you wish to dispose it.

It should be handed over to an applicable collection point for the recycling of electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product.

The recycling of materials will help to preserve natural resources.

3.   DUAL THERMOSTAT DTH6000

This operator's manual explains the functions and operation of the **DTH6000**. It also gives some troubleshooting tips as well as general precautions to be taken when operating the unit. In order to ensure the best performance and effective use of the DTH6000, we recommend that you read the information in this manual carefully and follow the instructions contained.

This manual is a complete guide to the DTH6000 with information on unit maintenance, unit installation and instructions on how to operate it. Do not touch any part of the DTH6000 the manual does not cover. Keep the manual for immediate reference. It should help in solving any operational questions you may have.

No part of this manual may be quoted, reproduced, stored in a retrieval system, transmitted, transcribed or translated into any other language in any form or by any means, electronic, mechanical, or otherwise, without prior written permission of **"Gelec & Co. LP"**.

Although every effort has been made to ensure that this manual provides up to date information, please note that the contents in this manual and the unit specifications are subject to change without notice.
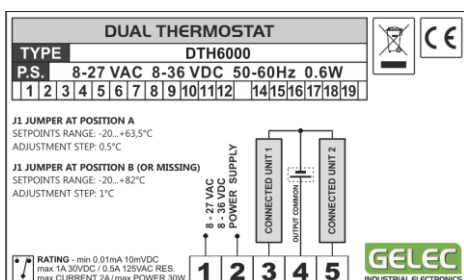
Do not forget to refer the exact type and version of your DTH6000 whenever you contact the manufacturer, asking for any further information. You can find this information on the identification label inside the unit.

4.   GENERAL DESCRIPTION

The DTH6000 is a microprocessor based, dual setpoint programmable thermostat with an incorporated digital temperature sensor. It provides two relay outputs with separate temperature setpoints for controlling two different devices in temperature-based procedures. Selectable hysteresis feature and three operating modes (HEATING, COOLING, HEATING/COOLING) are available, covering any application model.
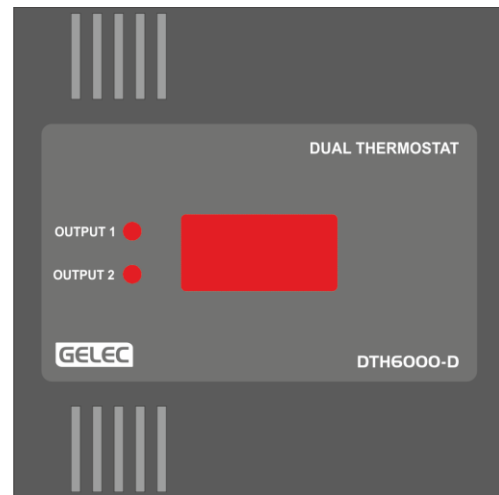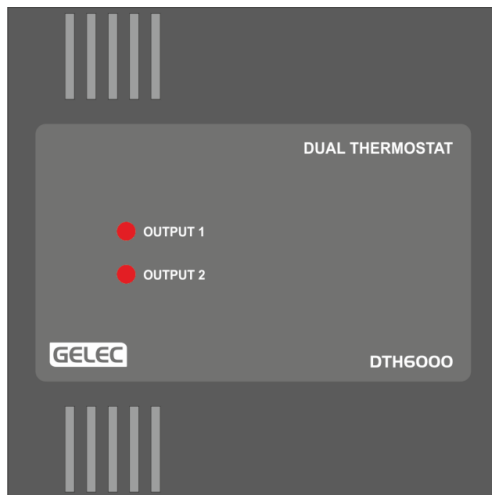
It is composed of an electronic board inside a thermostat suitable casing, approved for electronic devices. It is designed to be installed at the inside of an electrical control panel, or inside a room/space where temperature control is needed.

DTH6000 can be used in industrial or general purpose applications, such as ambient temperature control, fan control, overheating protection/alarm, industrial refrigerators, etc.

FEATURES

‣   Two temperature setpoint ranges
    -20°C … 63,5 °C / 0,5 °C steps
    -20°C … 82 °C / 1 °C steps
‣   Operating mode selection for each output (*HEATING*/COOLING)
‣   Adjustable hysteresis value (0, 1, 2, 3 °C)
‣   Smart dip-switch configuration
‣   Sensor measurement resolution 0.0625°C (±0.25°C accuracy)
‣   LED indicators displaying output status
‣   DTH6000-D version with temperature indication
‣   Error detection
‣   8-27 VAC / 8-36 VDC power supply
‣   Easy installation (wall mounting)
‣   Suitable to replace GCDTH5000 units

The unit configuration can be done by using the three on-board dip-switches. Several parameters give the ability to customize the operation of the DTH6000 to your application. Through the dip-switches, the user can configure the following device parameters:

- Temperature setpoint range (0,5 or 1 °C steps).
- Temperature setpoint for each output (negative/positive values).
- Operating mode (*HEATING, COOLING, HEATING/COOLING*).
- Hysteresis value for both outputs (0, 1, 2, 3 °C).

5. MAIN FEATURES

SETPOINT RANGES / RESOLUTION

The DTH6000 provides two setpoint value ranges with either **0.5°C**, or **1°C** adjusting steps, depending on the application's precision needs. The desirable range can be selected with the jumper **J1**, which is located at the electronic board (see the relative drawing).

The available setpoint value ranges are:

-20 °C … +63.5 °C , with 0.5°C adjustment steps.
-20 °C … +82 °C , with 1°C adjustment steps.

Note that these steps refer only to the setpoint selection and not the sensor's actual measurement potential. The incorporated high accuracy (±0.25°C) temperature sensor has a measurement range of -40°C … +125°C with a measurement resolution of 0.0625 °C.

INDICATION LEDs

At the front side of the unit there are two LEDs displaying the status of the outputs and any error detected in the configuration of the unit. Temperature indication is also available through a 3-digit 7-segment display, in the DTH6000-D version.

The LEDs (*OUTPUT1/OUTPUT2*) during the unit's operation can have the following behavior:

Constant light, as long the corresponding relay output remains enabled and the heating/cooling process is on duty (N.O. contact closed).

Slow flashing, when the unit is powered and both outputs are not enabled, to indicate that the unit operates normally.

Quick flashing, if an error in the configuration of the unit has been detected. Advise the relative section in this manual to see how you can solve the error.

HYSTERESIS

Four hysteresis values can be selected (0, 1, 2, 3 °C) through the configuration dip-switch, for avoiding rapid relay changes when the temperature reaches the selected setpoints. The selected hysteresis value applies for both digital outputs.

E.g. the output is set to Heating Mode, set at 15°C with 1°C hysteresis and ambient temperature is 10°C. The relay will activate the connected heating unit until the ambient temperature reaches 15°C, but it will not start again until the ambient temperature drops to 14°C.

RELAY OUTPUT

The digital outputs of the DTH6000 are potential free (voltage free common) DPDT relay contacts and they are Normally Open when not operating. Each output is enabled or disabled, according to its assigned temperature setpoint and the operating mode specified.

The outputs are disengaged during a possible Error state, as a protective method to avoid faulty temperature control process. Read the relative section in this manual.

OPERATING MODES

Adjusting the operating mode of each digital output, enables the user to configure the unit's overall working mode. Two programmable operating modes for each digital output are available, *COOLING MODE* and *HEATING MODE*. These operating modes are assigned properly to the relay outputs in order the unit to control the ambient temperature in a desirable way or for any other temperature-based procedure.

Assigning to both outputs the same working mode, sets the unit's overall working mode to **COOLING** or **HEATING** *MODE* respectively, while if different working mode is set for each output, the unit's overall working mode is set to **HEATING/COOLING** *MODE*. By setting the device in HEATING/COOLING mode and by connecting properly one Heating and one Cooling device you can keep the application temperature within the two selected setpoints.

Advise the following diagrams to comprehend the unit's behavior during temperature changes.

DUAL THERMOSTAT DTH6000 - HEATING MODE

Power

SP1/SP2

HYSTERESIS

Ambient temperature

Target temperature (Tt)

Differential temperature (Tt - Hys)

DTH6000 OPERATING

IF BOTH OUTPUTS ARE OFF THE LEDS FLASH EVERY FEW SECONDS

LED 1/2 — ON | ON

OUTPUT 1/2 — HEATING | OFF | HEATING | OFF

Initializing
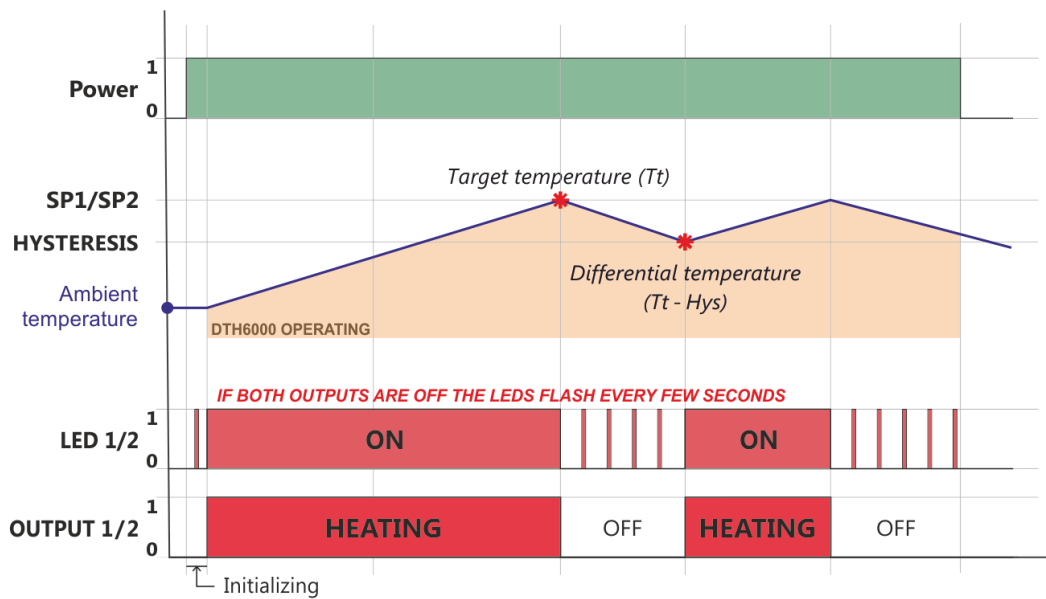
DUAL THERMOSTAT DTH6000 - COOLING MODE

Power

Ambient temperature

HYSTERESIS

SP1/SP2

Differential temperature (Tt + Hys)

Target temperature (Tt)

DTH6000 OPERATING

IF BOTH OUTPUTS ARE OFF THE LEDS FLASH EVERY FEW SECONDS

LED 1/2 — ON | ON

OUTPUT 1/2 — COOLING | OFF | COOLING | OFF

Initializing
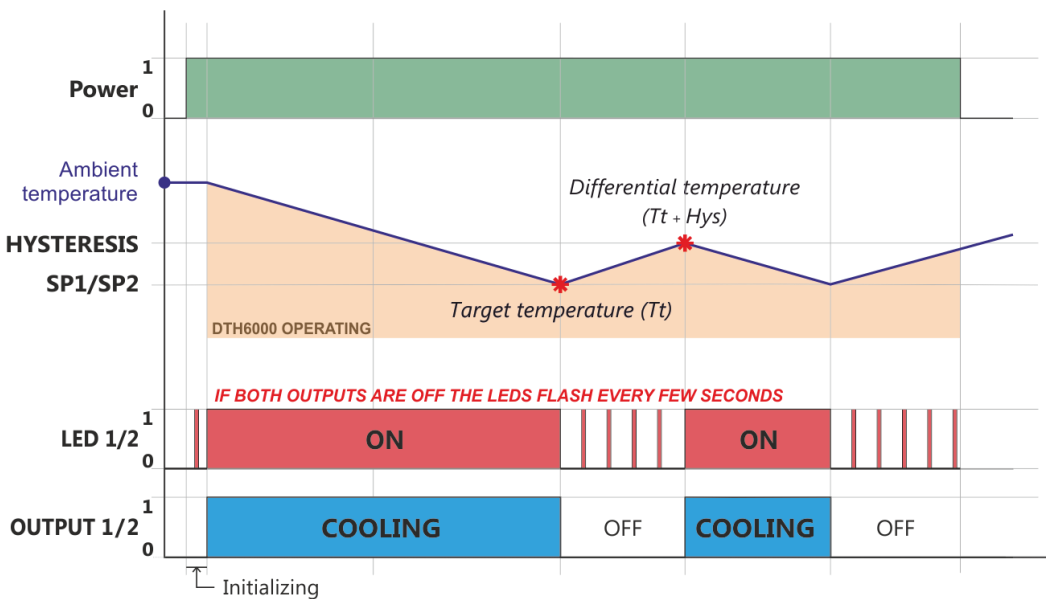
ERROR DETECTION

DTH6000 is able to identify a wrong configuration from the user and enters in *Error State*. During the error state, the relay outputs remain de-activated as a protective method to avoid faulty temperature control process and the indication LEDs on the front panel flash in a specific intense rate *(50% ON/50% OFF)*, indicating that an error has occurred. Resolve the matter, in order to have a proper operation of the unit.

Below are the conditions that cause an Error state.

1. **HEATING/COOLING MODE , HEATING SP > COOLING SP**
   Different operating modes have been assigned to the two outputs (HEATING /COOLING MODE), but the HEATING temperature setpoint is larger than the COOLING temperature setpoint.

   ✓ In HEATING/COOLING MODE, the HEATING setpoint must be smaller than the COOLING setpoint, or equal to it.

2. **HEATING/COOLING MODE , HEATING SP = COOLING SP , HYSTERESIS = 0ºC**
   Different operating modes have been assigned to the two outputs (HEATING /COOLING MODE), the setpoints have the same values and HYSTERESIS value is set to 0ºC.

   ✓ In HEATING/COOLING MODE, you can have equal setpoints if you want a specific and constant application temperature, but the HYSTERESIS value should be 1ºC or higher.

3. **SETPOINT < -20ºC**
   One (or both) of the temperature setpoints has been set to a value smaller than the unit's low operating threshold

   ✓ A setpoint value should be higher than -20ºC

6. DEVICE CONFIGURATION

ELECTRONIC BOARD

At the back side of the DTH6000 electronic board you can find:

- One jumper for the setpoint range selection **(J1)**
- Two 8-pos dip-switches for the setpoints selection *(SP1 VALUE , SP2 VALUE)*
- One 4-pos configuration dip-switch *(CONFIG)*
- A 5-pin male connector for the female connector insertion
- The instructions table explaining dip-switches possible values
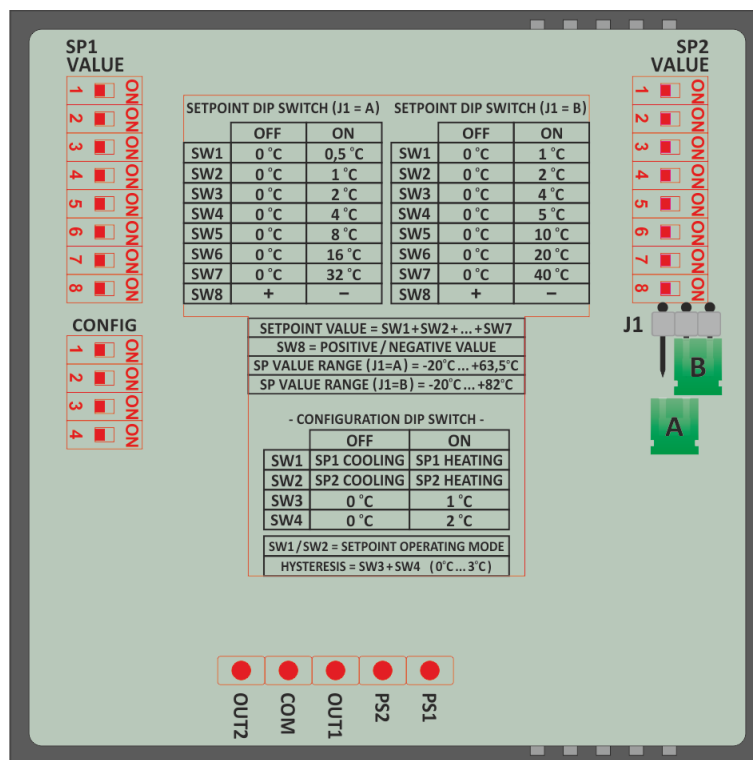
J1 JUMPER - Selection of the setpoint value range

The desirable setpoint value range can be selected with jumper **J1**. If the jumper is not mounted on the PCB, consider it to have the position B.

- **When jumper J1 is at position A:**
  The setpoint value range is **-20 ºC … +63.5 ºC** , with **0.5ºC adjustment steps**.

- **When jumper J1 is at position B (or missing):**
  The setpoint value range is **-20 ºC … +82 ºC** , with **1ºC adjustment steps**.

SP1 VALUE / SP2 VALUE - Selection of the temperature setpoints

The 8-pos dip-switches *SP1 VALUE / SP2 VALUE* are used to specify the *Output1 / Output2* temperature setpoints respectively. The ON/OFF position of each switch represents a value.

Depending on the J1 jumper position, the SP1/SP2 dip-switches represent a table of values. As seen on the instructions table, when **J1 → A** you should advise the table on the left, while when **J1 → B** you should advise the table on the right.

The temperature setpoint value is the sum of SW1-SW7 values, while SW8 specifies whether the selected setpoint is positive or negative.

Have a look at the example below, in order to comprehend the dip-switches function.

Example: SP1 = -9ºC , SP2 =+54ºC

▪ J1 jumper → position B   *(SP1/SP2 dip-switches represent the values of the right table)*

▪ Check the value options and calculate which sum of them equals 9, which is your SP1. You need 4+5, which according to the right table are the values of SW3 and SW4. Set them to **ON** position and have the rest to OFF position, which represents the zero (0). Set SW8 to **ON**, because the desired setpoint value is negative.

So the *SP1 VALUE* dip-switch in order to represent **-9ºC** should be configured like this:

$$\textbf{SP1} = \text{SW1} + \text{SW2} + \textbf{SW3} + \textbf{SW4} + \text{SW5} + \text{SW6} + \text{SW7} \ / \ (\textbf{SW8})$$
$$\textbf{-9} = 0 + 0 + \textbf{4} + \textbf{5} + 0 + 0 + 0 \ / \ (\textbf{negative})$$

▪ Check the value options and calculate which sum of them equals 54, which is your SP2. You need 4+10+40, which according to the right table, are the values of SW3, SW5, SW7. Set them to **ON** position and have the rest to OFF position, which represents the zero (0). Set SW8 to OFF, because the desired setpoint value is positive.

So the *SP2 VALUE* dip-switch in order to represent **+54ºC** should be configured like this:

$$\textbf{SP2} = \text{SW1} + \text{SW2} + \textbf{SW3} + \text{SW4} + \textbf{SW5} + \text{SW6} + \textbf{SW7} \ / \ (\text{SW8})$$
$$\textbf{+ 54} = 0 + 0 + \textbf{4} + 0 + \textbf{10} + 0 + \textbf{40} \ / \ (\text{positive})$$

If your application requires 0,5 degree setpoint steps, set the J1 jumper at position A in order to use the left table's values and configure the setpoints as described above.

Notice that the selected setpoints must be higher than -20ºC, which is the unit's minimum operating temperature.

CONFIG - Configuration of the device

The 4-pos dip-switch *CONFIG* is used to specify the operating mode of each output (SW1,SW2) and the hysteresis value of both outputs (SW3,SW4).

SW1: When set to ON, Output1 operates in HEATING MODE, while when set to OFF Output1 operates in COOLING MODE.

SW2: When set to ON, Output2 operates in HEATING MODE, while when set to OFF Output2 operates in COOLING MODE.

When an output is set to COOLING mode and the other to HEATING mode, the setpoint for COOLING mode, should be either larger than the setpoint for HEATING mode or equal, with hysteresis larger than zero (0). If it is smaller, the unit enters in Error state disengaging its outputs.

SW3/SW4: The hysteresis value is the sum of SW3-SW4 values. According to the instructions table, the hysteresis configuration options are the below.

$$\textbf{0°C} : SW3 \rightarrow OFF , SW4 \rightarrow OFF$$
$$\textbf{1°C} : SW3 \rightarrow ON , SW4 \rightarrow OFF$$
$$\textbf{2°C} : SW3 \rightarrow OFF , SW4 \rightarrow ON$$
$$\textbf{3°C} : SW3 \rightarrow ON , SW4 \rightarrow ON$$

5-PIN MALE CONNECTOR - Unit connections

The on-board male connector is used for the unit's power supply and the connections with the external equipment controlled by DTH6000. Please refer to Electrical Section for further instructions.

A proper configuration is very important for the total operation and should be done by an installer/engineer familiar with the specific application and device operation. Modifications by unauthorized personnel can damage the device, the connected equipment and by extension the whole application.

7. ELECTRICAL SECTION

The DTH6000 has a wide power supply range. Supply with either **8-27VAC** or **8-36VDC** regulated, unregulated or stabilized.

Its maximum power consumption is approx. **0.6W** (0.8W for DTH6000-D) in total operation, when both output relays are activated. The connection polarity **(+/-)** is not crucial, as there is an internal bridge rectifier.

The DTH6000 is designed for use with specific voltage only. Connection to a different voltage may cause fire, electric shock or other damage. There is not an electrical safety fuse in the internal power circuit.

- CONNECTION TERMINALS -

Terminals #1 - #2

Connect the power source to the terminals #1 and #2. Specific polarity **(+/-)** is not crucial.

Terminals #3 - #4 - #5

Use these terminals for the connection of the external equipment. Advise the connection diagram and connect the heating/cooling units accordingly.

Take care not to exceed the contact range electric characteristics. Any wrong configuration at the connection wiring of the output relays may cause fire, malfunction or permanent damage to the unit.

The unit is equipped with an incorporated 5mm pitch, snap blocking connector. Insert and screw only one wire in each terminal (clamp opening size 2,5 x 2 mm) in order to be in compliance with VDE norms. Take care to apply the recommended tightening torque.

The cable should be solid up to 2.5mm^2 (IMQ); 14AWG (UL), or stranded up to 1.5mm^2 (IMQ); 14AWG (UL), 4-6mm stripping length.

Advise the following diagrams in order to have a proper connection between the unit and your equipment. You can also find a quick connection guide inside the unit for quick reference.

!! Always cut the power off before connecting or disconnecting the unit. !!

CONNECTION DIAGRAM FOR DTH6000

DUAL THERMOSTAT DTH6000

OUTPUT 1   OUTPUT 2
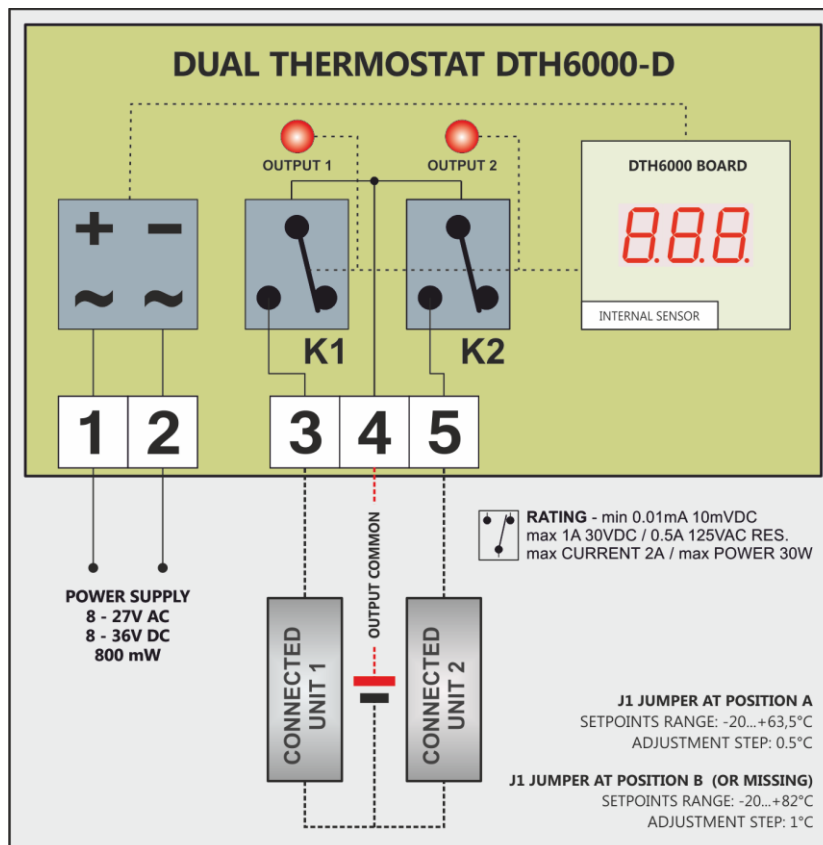
DTH6000 BOARD

K1   K2

INTERNAL SENSOR

1   2   3   4   5

POWER SUPPLY
8 - 27V AC
8 - 36V DC
600 mW

OUTPUT COMMON

CONNECTED UNIT 1

CONNECTED UNIT 2

RATING - min 0.01mA 10mVDC
max 1A 30VDC / 0.5A 125VAC RES.
max CURRENT 2A / max POWER 30W

J1 JUMPER AT POSITION A
SETPOINTS RANGE: -20...+63,5°C
ADJUSTMENT STEP: 0.5°C

J1 JUMPER AT POSITION B (OR MISSING)
SETPOINTS RANGE: -20...+82°C
ADJUSTMENT STEP: 1°C

CONNECTION DIAGRAM FOR DTH6000-D

DUAL THERMOSTAT DTH6000-D

OUTPUT 1   OUTPUT 2

DTH6000 BOARD

$8.8.8.$

K1   K2

INTERNAL SENSOR

1   2   3   4   5

POWER SUPPLY
8 - 27V AC
8 - 36V DC
800 mW

OUTPUT COMMON

CONNECTED UNIT 1

CONNECTED UNIT 2

RATING - min 0.01mA 10mVDC
max 1A 30VDC / 0.5A 125VAC RES.
max CURRENT 2A / max POWER 30W

J1 JUMPER AT POSITION A
SETPOINTS RANGE: -20...+63,5°C
ADJUSTMENT STEP: 0.5°C

J1 JUMPER AT POSITION B (OR MISSING)
SETPOINTS RANGE: -20...+82°C
ADJUSTMENT STEP: 1°C

8. INSTALLATION & MAINTENANCE

DTH6000 is a complete unit including an electronic board with connection terminals, in a self-extinguishing ABS casing, suitable for thermostat applications and wall mounting.

Place the DTH6000 unit in an appropriate location in order to have the best operation. Select an open space which has an average ambient temperature and avoid placing it near cooling/heating devices, open windows etc.

Install the DTH6000 unit in an upright position to maximize the sensing precision. The incorporated sensor is behind the bottom ventilation slots, exploiting the draught of air between the bottom and top slots. It is important that there is adequate space below and above the unit for the air circulation and the slots are free of dust/ dirt during operation.

Follow the below wall assembly/disassembly instructions for of the DTH6000.

ASSEMBLY METHOD

1. Place the enclosure *Base* on the wall with hooks facing down.
2. Secure the base with *no. 2* screws in their respective locations on the diagonal position.
3. Match the pivots at the top of the base with their respective locations in the *Cover*.
4. When the *Cover* is hooked to the *Base* on the upper part, rotate towards the coupling area of the *Base*. Ensure that the male connectors match with the terminal block and you have a proper insertion.
✓ Finally press the *Cover* to the wall to hook it to the *Base*.

DISASSEMBLY METHOD

1. Place a screwdriver in one of the two fastening areas at the bottom of the *Cover*.
2. Press the screwdriver inside the *Enclosure* until releasing the *Cover* from the *Base*.
✓ Unhook the *Cover* from the base pivots.

Keep liquids away from the unit. Spillage into the cabinet may cause equipment damage, electric shock or fire. If a small object or liquid falls/spills into the DTH6000 cabinet, disconnect the unit immediately. Have the unit checked by a qualified service engineer before using it again.
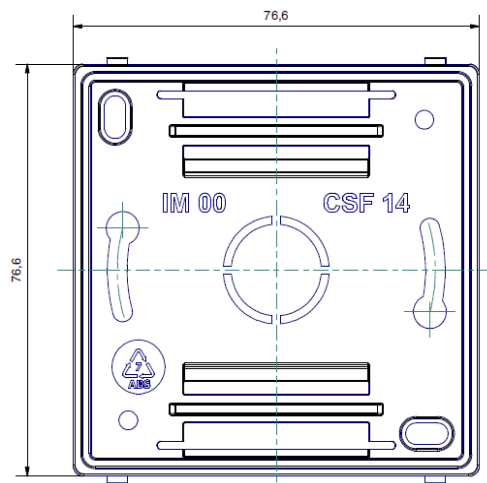
!! Always cut the power off before assembling/disassembling the unit. !!

Always follow the instructions given by the manufacturer and use the DTH6000 in accordance to its specifications.

9. DIMENSIONS
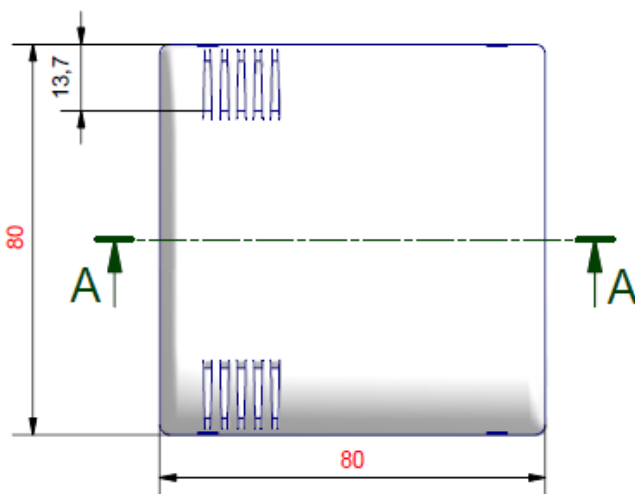
- Cover front side -   - Base back side -

10. TECHNICAL SPECIFICATIONS

GENERAL DATA	
Dimensions L x W x H (mm)	80 x 80 x 36 / (3.15 x 3.15 x 1.42 in)
Weight	71 gr.
Enclosure	Self-extinguishing ABS
Mounting	Wall mounting
Degree of protection	IP20
Features	
Setpoints	2x independent setpoints Heating , Cooling , Heating / Cooling mode
Temperature sensor resolution	0.0625 °C (±0.25°C accuracy)
Device temperature resolution	0.1 °C
Temperature standard	Celsius
Target temperature adjustment resolution	0.5 °C / 1 °C
Target temperature adjustment range	-20 °C ... 63,5 °C (when resolution 0.5 °C) -20 °C ... 82 °C (when resolution 1 °C)
Sensor calibration	Factory pre-calibrated
Protective functions	Configuration error detection
Unit operating conditions	
Ambient temperature under bias	-20 °C ... 82 °C
Storage temperature	-25 °C ... 85 °C
ELECTRICAL DATA	
Operating voltage (AC values at 50/60 Hz)	10-27 VAC / 10-36 VDC
Power consumption	0.6 W max (0.8 W for DTH6000-D)
Relay contact characteristics	
Digital output	2 DPDT Relays - Potential free
Resistance (initial)	Maximum 50 mΩ at 1A 6 VDC
Rating (resistive)	0.5A 125 VAC or 1A 30 VDC
Max carrying current	2A
Max switching power	62.5 AV, 30 W
Max switching voltage	250 VAC - 220 VDC
Max switching current	2A
Min switching load	0.01 mA 10 mVDC
Contact life	min 1×10^8 operations (mechanical) min 5×10^5 operations (electrical 1 A-30 VDC)
Connector characteristics	
Pitch	5mm
Solid wire section	0.05 mm^2 ÷ 2,5 mm^2 (IMQ)* 30÷14 AWG (UL)
Stranded wire section	0.05 mm^2 ÷ 2,5 mm^2 (IMQ)* 30÷14 AWG (UL)
Stripping length	4-6 mm
Locking type	Snap blocking
Insertion force per pole	max 2 N

Withdrawal force per pole	min 1,2 N
Recommended / Highest tightening torque	0,5 / 0,6 Nm
STANDARDS	
In conformance with the following standards:	CE

Specifications are subject to change without prior notice.

GELEC

INDUSTRIAL ELECTRONICS

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