DeltaSol® AX HE

RESOL®

Differential temperature controller

Manual for the specialised craftsman

Installation
Operation
Functions and options
Troubleshooting

11206323

Thank you for buying this RESOL product.
Please read this manual carefully to get the best performance from this unit.
Please keep this manual safe.

Safety advice

Please pay attention to the following safety advice in order to avoid danger and damage to people and property.

Instructions

Attention must be paid to the valid local standards, regulations and directives!

Information about the product

Proper usage

The differential temperature controller is designed for electronically controlling solar thermal, heating and air conditioning systems in compliance with the technical data specified in this manual.

Improper use excludes all liability claims.

CE Declaration of conformity

The product complies with the relevant directives and is therefore labelled with the CE mark. The Declaration of Conformity is available upon request, please contact the manufacturer.

Note
Strong electromagnetic fields can impair the function of the device.
➔ Make sure the device as well as the system are not exposed to strong electromagnetic fields.

Target group

These instructions are exclusively addressed to authorised skilled personnel.

Only qualified electricians should carry out electrical works.

Initial installation must be effected by the system owner or qualified personnel named by the system owner.

Description of symbols

WARNING!   Warnings are indicated with a warning triangle!
➔ **They contain information on how to avoid the danger described.**

Signal words describe the danger that may occur, when it is not avoided.

• **WARNING** means that injury, possibly life-threatening injury, can occur.

• **ATTENTION** means that damage to the appliance can occur.

Note
Notes are indicated with an information symbol.

Cross reference
A book symbol indicates a cross reference to another chapter.

➔ Arrows indicate instruction steps that should be carried out.

Disposal

• Dispose of the packaging in an environmentally sound manner.

• At the end of its working life, the product must not be disposed of as urban waste. Old appliances must be disposed of by an authorised body in an environmentally sound manner. Upon request we will take back your old appliances bought from us and guarantee an environmentally sound disposal of the devices.

DeltaSol® AX HE **differential temperature controller**

RESOL®

The DeltaSol® AX HE controller is the simplest solution for all differential controls. Equipped with an electromechanical relay and a PWM output, the DeltaSol® AX HE controller manages the speed control of a high-efficiency pump.

Additionally, the controller offers an antifreeze function and an adjustable target temperature for minimum or maximum temperature limitation. The enclosed silicone sealing cord guarantees a protection against dripping water.

Contents

139

45

112 mm

Drill hole positions

1   Overview

- **Adjustable temperature difference 2 … 16 K, hysteresis 1.6 K**
- **1 PWM output for speed control of a high-efficiency pump**
- **Antifreeze function adjustable by DIP switch**
- **Maximum or minimum temperature limitations adjustable by DIP switch**
- **Protection against dripping water**

Technical data

Inputs: 2 Pt1000 temperature sensors
Outputs: 1 electromechanical relay (changeover), 1 PWM output
PWM frequency: 1000 Hz
PWM voltage: 11.0 V
Switching capacity: 4 (1) A 240 V~ (electromechanical relay)
Total switching capacity: 4 A 240 V~
Power supply: 100 … 240 V~ (50 … 60 Hz)
Supply connection: type Y attachment
Standby: 0.39 W
Mode of operation: Type 1.B
Rated impulse voltage: 2.5 kV
Functions: antifreeze function, maximum or minimum temperature limitation
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting
Indication / Display: 1 operating control LED
Operation: 3 potentiometres, 4 DIP switches, 1 jumper
Protection type: IP 20 / DIN EN 60529
(with seal IP 22)
Protection class: II
Ambient temperature: 0 … 40 °C
Degree of pollution: 2
Dimensions: Ø 139 mm, depth 45 mm

2   Installation

2.1   Mounting

WARNING!	**Electric shock!**
⚠️	Upon opening the housing, live parts are exposed!
	➔ **Always disconnect the controller from power supply before opening the housing!**

ℹ️ Note

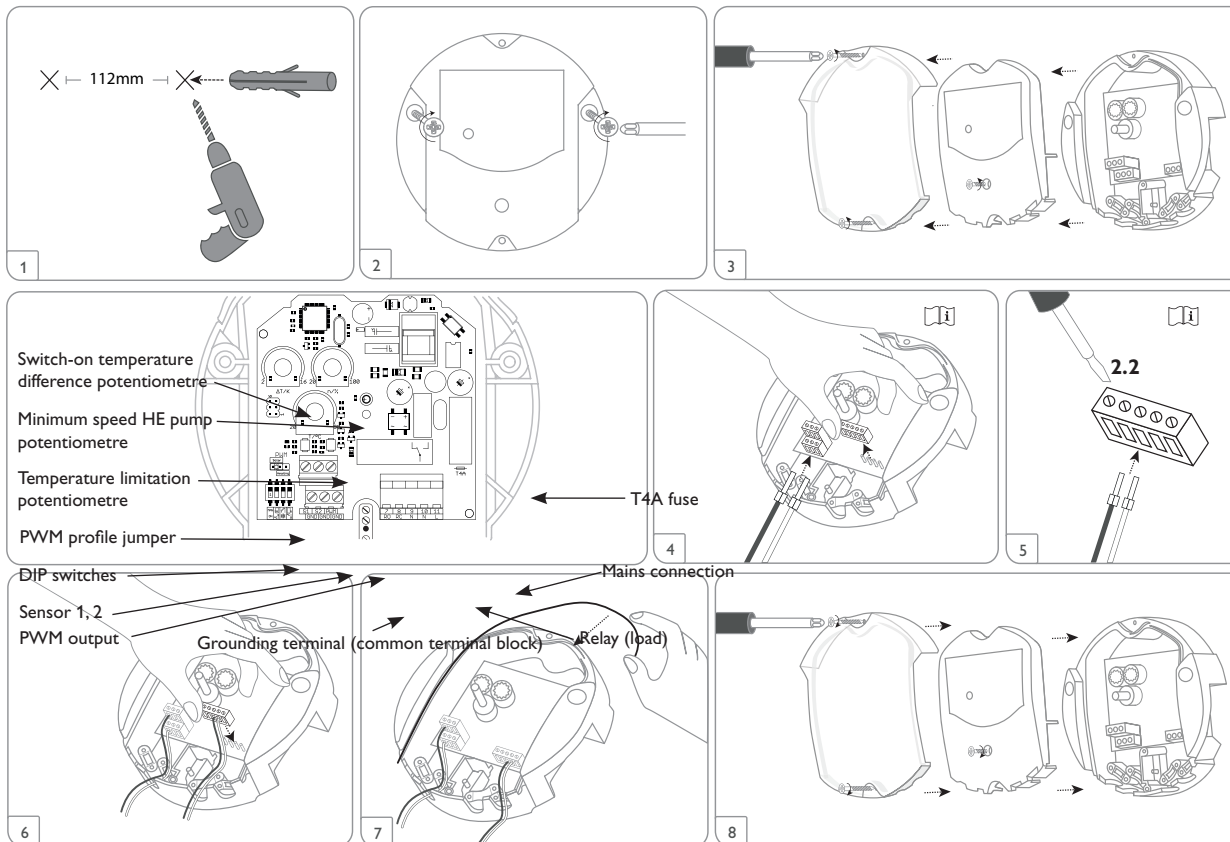Strong electromagnetic fields can impair the function of the device.

➔ Make sure the device as well as the system are not exposed to strong electromagnetic fields.

The unit must only be located in dry interior rooms.
The controller must additionally be supplied from a double pole switch with contact gap of at least 3 mm.
Please pay attention to separate routing of sensor cables and mains cables.

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In order to mount the device to a wall, carry out the following steps:

112mm

1

2

3

Switch-on temperature difference potentiometre

Minimum speed HE pump potentiometre

Temperature limitation potentiometre

PWM profile jumper

T4A fuse

2.2

DIP switches

Mains connection

Sensor 1, 2

PWM output

Grounding terminal (common terminal block)

Relay (load)

4

5

6

7

8

2.2 Electrical connection

WARNING!	Electric shock!
⚠️	Upon opening the housing, live parts are exposed! ➔ **Always disconnect the device from power supply before opening the housing!**

ATTENTION!	ESD damage!
⚠️	Electrostatic discharge can lead to damage to electronic components! ➔ **Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!**

ℹ️ Note
Connecting the device to the power supply must always be the last step of the installation!

The controller is supplied with power via a mains cable. The power supply of the device must be 100 … 240 V~ (50 … 60 Hz).

The controller is equipped with 1 electromechanical relay to which a load such as a pump, a valve, etc. can be connected

• Relay 1
  7 = normally open contact
  8 = normally closed contact
  9 = neutral conductor (N)
  Grounding terminal ⏚ (common terminal block)

• Speed control of a HE pump is possible via a PWM signal. The pump has to be connected to the relay (power supply) as well as to the PWM output of the controller.
  For connection, use the terminals marked **PWM** and **GND**.

• Connect the **temperature sensors** (S1 and S2) to the corresponding terminals with either polarity:
  S1 / GND
  S2 / GND

• The **mains connection** is at the terminals:
  10 = neutral conductor (N)
  11 = conductor (L)
 Grounding terminal ⏚ (common terminal block)

3 Operation and function

3.1 Flashing codes

The operating control lamp indicates the current status of the controller.

Colour	Permanent	Flashing	Fast flashing
Green	Device operational, loading inactive	Loading active	Antifreeze function active
Red	Maximum temperature limitation	Sensor defective	
Red/green		Relay in manual mode	
Off	No mains supply		

3.2 DIP switches and potentiometres
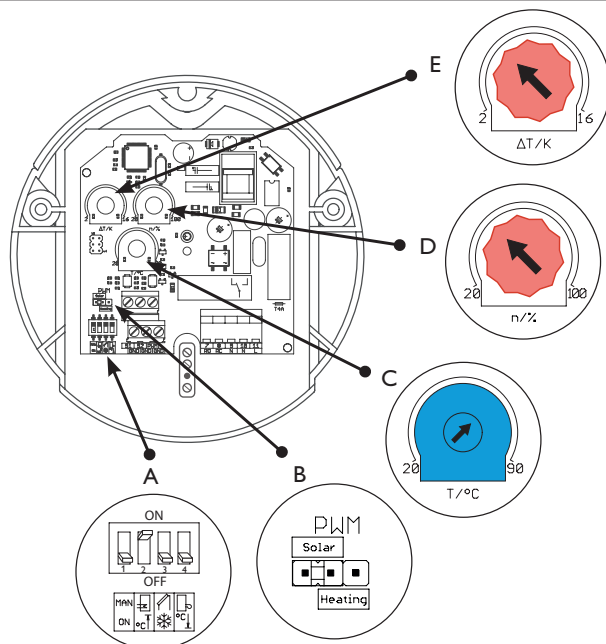
The DIP switches (A) can be used for activating (ON) or deactivating (OFF) the following functions:

• Manual mode (DIP switch 1)
• Maximum temperature limitation (DIP switch 2)
• Antifreeze function (DIP switch 3)
• Minimum temperature limitation (DIP switch 4)

With the potentiometre on the left-hand side (E), the switch-on temperature difference can be adjusted (in K).

With the potentiometre on the right-hand side (D), the minimum speed of the HE pump can be adjusted, see chap. 3.8 on page 8.

With the lower potentiometre (C), the temperature for the maximum or minimum temperature limitation can be adjusted (in °C).

With the jumper (B), the PWM profile of the output signal (solar or heating) can be selected.

i **Note**
Pump speed control is only possible if a HE pump with a PWM input is used.

3.3 Switch-on temperature difference

E

Adjustment range: 2 … 16 K
Factory setting: 6 K

The controller calculates the temperature difference between the temperature sensors S1 and S2. If the difference is larger than or identical to the switch-on value adjusted with the potentiometer E, the relay will be switched on. The operating control LED flashes green. If the temperature difference falls below the set value by 1.6 K (non adjustable hysteresis), the controller deactivates the relay.

3.4 Manual mode

A
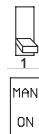
Deactivated by default
(DIP switch in OFF position)
Controller in automatic mode

For commissioning or maintenance work, the relay can be permanently energised by means of the manual mode. The manual mode can be activated or deactivated respectively with DIP switch 1. If the manual mode is active, the operating control lamp flashes red and green.

3.5 Maximum temperature limitation

A   C
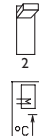
Activated by default
(DIP switch in ON position)
Adjustment range: 20 … 90 °C
Factory setting: 60 °C

With DIP switch 2, the temperature limitation can be activated as a maximum temperature limitation. The limit temperature can be adjusted by means of the potentiometer C. The sensor connected to the terminals S2 is used as the reference sensor. If the store temperature reaches the adjusted maximum temperature, the store will no longer be loaded in order to avoid damage caused by overheating. If the store temperature exceeds the maximum value, the operating control lamp flashes red.

3.6 Antifreeze function

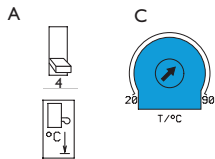A
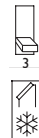
Deactivated by default
(DIP switch in OFF position)

With DIP switch 3, the antifreeze function can be activated. The antifreeze function activates the loading circuit between the collector and the store when the collector temperature falls below +4 °C. This will protect the fluid against freezing or coagulating. If the temperature at S1 reaches +5 °C, the pump will be switched off.

When the antifreeze function is active, the operating control lamp flashes quickly.

i **Note**
Since this function uses the limited heat quantity of the store, the antifreeze function should be used in regions with few days of temperatures around the freezing point.
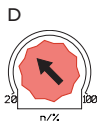
3.7 Minimum temperature limitation

A   C

With DIP switch 4, the temperature limitation can be activated as a minimum temperature limitation. The limit temperature can be adjusted by means of the potentiometer C. The sensor connected to the terminals S1 is used as the reference sensor. The minimum collector temperature is the minimum switch-on temperature which must be exceeded for the solar pump (R1) to switch on.

Deactivated by default (DIP switch in OFF position), default setting upon activation: 60 °C

3.8 Minimum speed (speed control via PWM signal)

D

With potentiometre D, a relative minimum speed can be adjusted for a HE pump connected to the relay. If the temperature difference reaches or exceeds the switch-on temperature difference, the pump switches on at 100 % speed for 10 s. Then, the speed is reduced to the minimum pump speed value. If the temperature difference reaches the adjusted nominal value, the pump speed increases by one step (10 %).
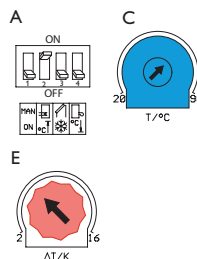
Adjustment range:
20 … 100 %
Factory setting: 30 %
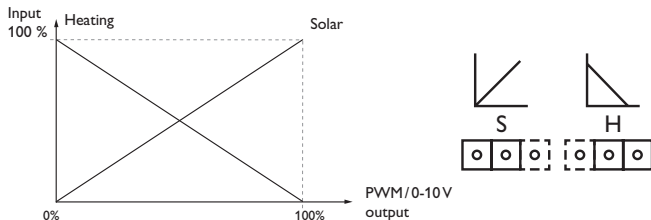
3.9 PWM profile

By means of the three-pole jumper on the left-hand side above the output terminals, the PWM profile for the HE pump can be selected.
Jumper position left: Output signal not inverted (solar pump)
Jumper position right: Output signal inverted (heating pump)

4 Examples

4.1 Standard solar system with 1 store

A   C

E

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference, the pump (R1) will be switched on and the store will be loaded. If the temperature difference falls by 1.6 K (non-adjustable hysteresis) below the adjusted temperature difference, the pump will be switched off.
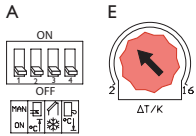
S1 = Collector sensor
S2 = Store sensor
RO = Solar pump
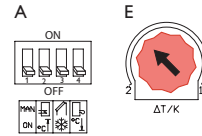
⏚ Use grounding terminals!
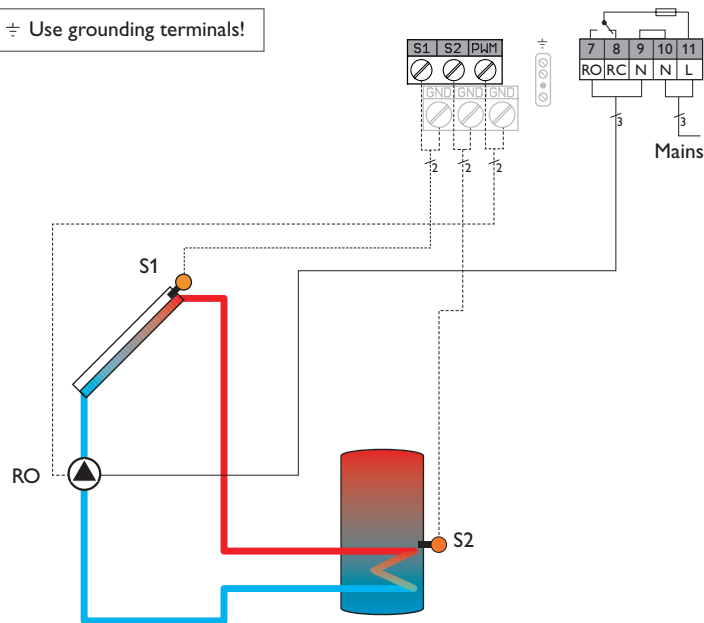
4.2 Heating circuit return preheating

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on value, the controller switches the 3-port valve. The heat of the store is used for increasing the return temperature of the heating circuit. If the temperature difference falls by 1.6 K (non-adjustable hysteresis) below the adjusted temperature difference, the valve will be put into its initial position.

S1 = Store sensor
S2 = Heating circuit return sensor
RO = 3-port valve
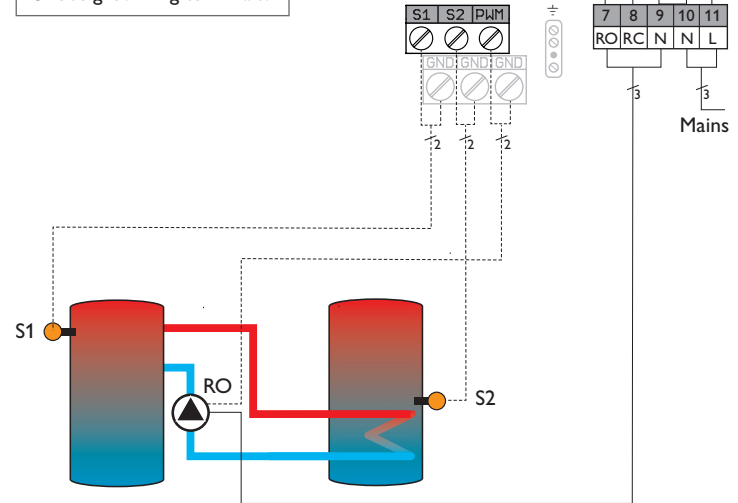
4.3 Heat exchange control

When the temperature difference between sensor 1 (store 1) and sensor 2 (store 2) exceeds the adjusted value, the circulating pump will be activated. Heat will be transferred from store 1 into store 2. If the temperature difference falls by 1.6 K (non-adjustable hysteresis) below the adjusted temperature difference, the pump will be switched off.

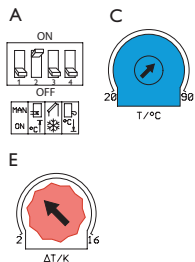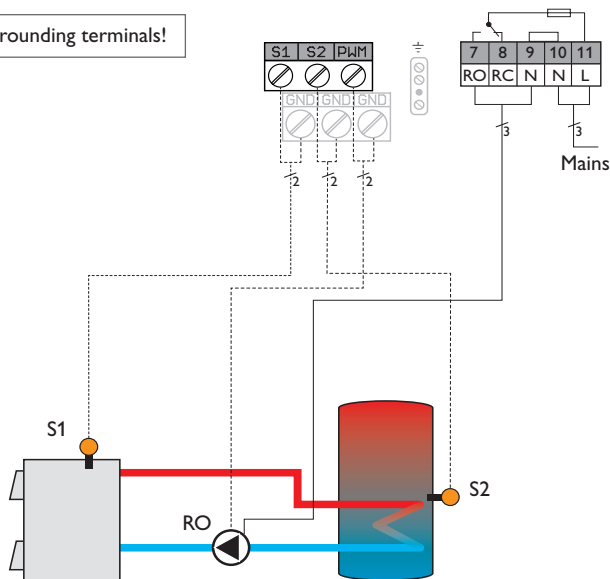S1 = Sensor store 1
S2 = Sensor store 2
RO = Circulating pump

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4.4   Store loading by means of a solid fuel boiler

A

C

E

The controller calculates the temperature difference between solid fuel boiler sensor S1 and store sensor S2. The relay (RO) is energised when both switch-on conditions are fulfilled:

- the temperature difference has exceeded the switch-on value
- the temperature at the solid fuel boiler sensor has exceeded the minimum temperature

If the temperature difference falls by 1.6 K (non-adjustable hysteresis) below the adjusted temperature difference, the pump will be switched off.

S1 = Solid fuel boiler sensor
S2 = Store sensor
RO = Circulating pump

5   Accessories

SP10 Overvoltage protection device

HR230 Auxiliary relay

6   Troubleshooting

Spare fuse
(inside the cover)

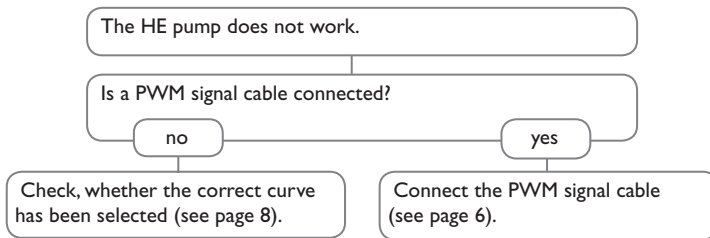In the case of an error, please check the following:

Check the power supply of the controller. Is it disconnected?

no

yes

The fuse of the controller could be blown. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

Check the supply line and reconnect it.

The HE pump does not work.

Is a PWM signal cable connected?

no — Check, whether the correct curve has been selected (see page 8).

yes — Connect the PWM signal cable (see page 6).

Disconnected temperature sensors can be checked with an ohmmeter. Please check if the resistance values correspond with the table.

°C	°F	Ω Pt1000	°C	°F	Ω Pt1000
-10	14	961	55	131	1213
-5	23	980	60	140	1232
0	32	1000	65	149	1252
5	41	1019	70	158	1271
10	50	1039	75	167	1290
15	59	1058	80	176	1309
20	68	1078	85	185	1328
25	77	1097	90	194	1347
30	86	1117	95	203	1366
35	95	1136	100	212	1385
40	104	1155	105	221	1404
45	113	1175	110	230	1423
50	122	1194	115	239	1442

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i **Note:**
For answers to frequently asked questions (FAQ) see www.resol.com.

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