

# **US-T**

## **Temperature Control Unit**

# **Manual**

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## 2 Safety Instruction

### 2.1 General Safety Instructions

- Read safety instructions and the operating instructions prior to operation of the device.
- Pay attention to all safety warnings.
- Make sure that neither liquids nor foreign bodies get inside the device.
- Keep the device away from dust, sand and dirt.
- Do not put the device near sources of heat.
- Connect the device only to the power source indicated in the operating instructions or on the AC Adapter for Power-and-Control Unit.
- If the device is not in use, disconnect from mains.
- The device should only be repaired by qualified personnel.

### 2.2 Special Safety Instructions

- Ensure sufficient ventilation of Peltier-Heat-Transfer Head US-T/DS.

- Keep Power-and-Control Unit US-T/DR and upper part of Peltier-Heat-Transfer Head US-T/DS away from water or high moisture areas.
- Immerse only tip of heat-transfer rod into liquid/suspensions. Choose filling level of cuvette accordingly.

### 3 Introduction

- The US-T Temperature Control Unit is designed to control temperatures of suspensions in a 10 mm x 10 mm x 45 mm cuvette situated in one of the following the Walz optical units: ED-101US/MD (for DUAL-PAM-100 and MULTI-COLOR-PAM), ED-101US/M (for XE-PAM and PAM-101) or ED-101US/MP (for PHYTO-PAM).
- The temperature spread of almost 30 K (see Chapter 7, page 15) permits informative investigations of temperature dependence of photosynthesis.
- In the new version of the US-T unit, the Pt100 temperature sensing resistance and the heat transfer rod of the US-T/DS head are separated (Fig. 4, page 12). This configurations permits accurate adjustment of temperatures in the suspension.
- Furthermore, for exact temperature control and to provide more system information to the user, the electronics of the US-T/DR unit has been thoroughly updated (see Chapter 5, page 12).

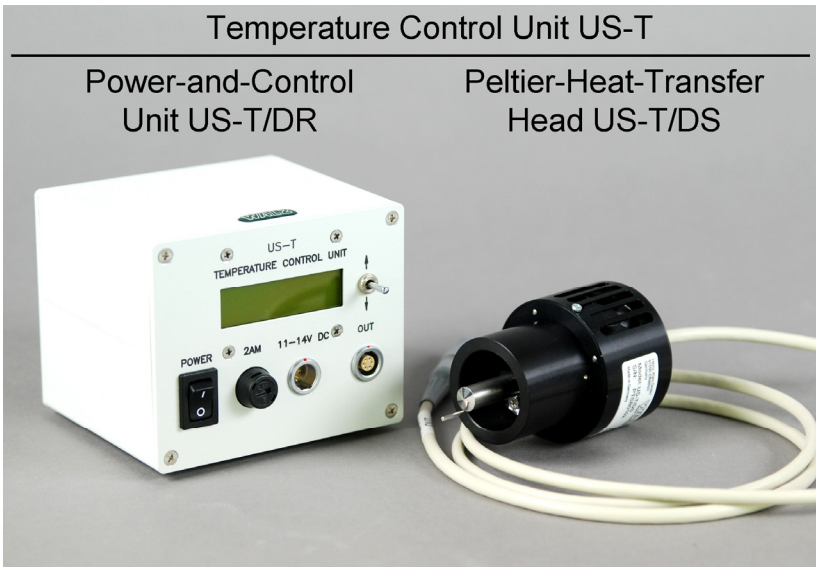




## 4 Components and Setup

### 4.1 Extent of Delivery

- Power-and-Control Unit US-T/DR
- Peltier-Heat-Transfer Head US-T/DS
- AC Adapter for Power-and-Control Unit
- US-T Temperature Control Unit Manual



**Fig. 1:** Power-and-Control Unit US-T/DR and Peltier-Heat-Transfer Head US-T/DS

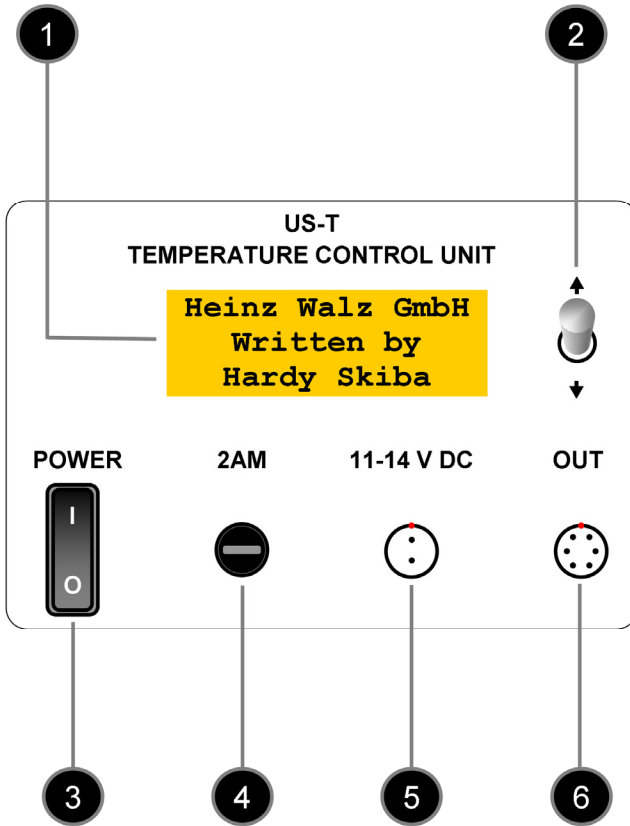


Fig. 2: Front panel of Power-and-Control Unit US-T/DR

- 
- ① Three-line LCD Display  
Display for target temperature (Set:) and current temperature at resistance thermometer Pt100 (Actual:). Access to adjustments of target temperature and LCD contrast.
- 
- ② Toggle Switch  
Switch for settings of temperature and LCD contrast. On/off switch for temperature control.
- 
- ③ Power switch
- 
- ④ Fuse  
Holder for 2 Ampere middle time-lag fuse.
- 
- ⑤ Charge socket  
Socket for AC adapter.
- 
- ⑥ Socket to connect Peltier-Heat-Transfer Head US-T/DS
- 
- Back panel** Standard USB-B socket for connection to computer  
Connection for device service.
-

## 4.2 Setup of Components

- Place Power-and-Control Unit US-T/DR on smooth surface in dry environment.

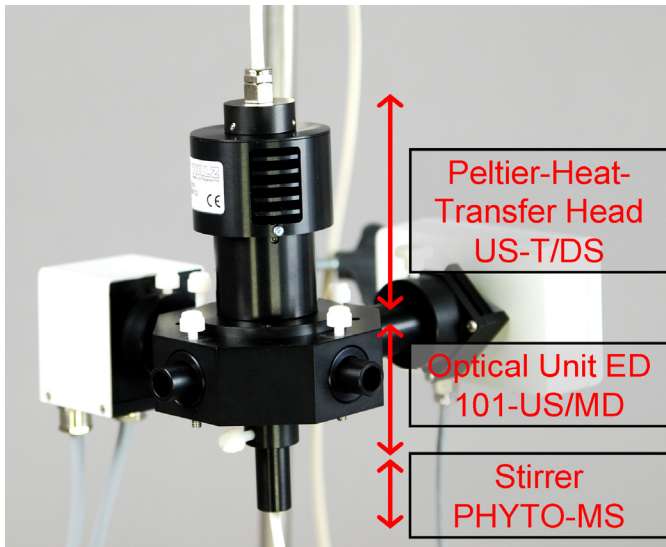
**Note:** Do not force a plug into the wrong socket. When round sockets are red marked, orientate plug so that the red dot on the plug coincides with the red mark of the socket. Do not try to disconnect a plug by pulling at the cable. Disconnect round plugs by pulling at the rippled metal part.

- Connect AC adapter and Peltier-Heat-Transfer Head to Power-and-Control Unit US-T/DR (see Fig. 2, page 8).

**Note:** The Pt100 rod is delicate. Insert Pt100 and head transfer rod very careful into cuvette! Do not try to turn the Peltier-Heat-Transfer Head US-T/DS when Pt100 and head transfer rod are inside the cuvette.

- Place cuvette with stir bar in a Walz ED-101US-type optical unit. Add suspension to cuvette. Normally, the tip of the heat transfer rod is sufficiently immersed when a volume of 1.5 mL is added, that is, the conical tip of the heat transfer rod is completely dipped into the suspension. Using larger volumes increases the fraction of suspension which is not exposed to actinic and measuring light without significantly improving the efficiency of temperature control.

- Carefully place Peltier head on top of Walz optical unit (Fig. 3). Positioning the Pt100-rod opposite to the illuminated surface minimizes shading by this rod (Fig. 4, page 12). When fluorescence is detected at right angles to illumination, positioning the Pt100-rod opposite to the detection side minimizes shading of fluorescence by the rod.
- Switch on stirrer and control unit of US-T.
- Adjust temperature and contrast as described in the next section.



**Fig. 3:** Peltier-Heat-Transfer Head US-T/DS on top of an ED-101US/MD optical unit

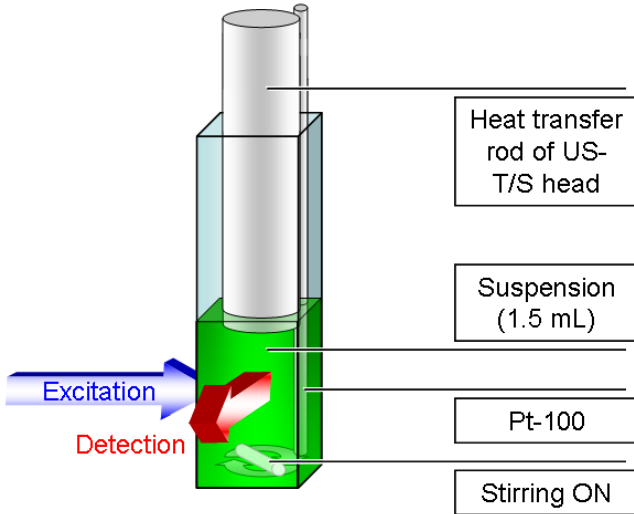


Fig. 4: Heat transfer rod and Pt100 thermometer in standard 10 mm x 10 mm cuvette.

## 5 Operation of Control Unit US-T/DR

### Initial Display

Set:	--.°C
Actual:	21.7°C
↓ Control ON ↓ Last TempSet: 20.0°C ↑ LCD Contrast ↑	

1<sup>st</sup> line: target temperature.

2<sup>nd</sup> line: temperature measured by Pt100 thermometer.

3<sup>rd</sup> line (moving message): information on (a) toggle direction to enter temperature control mode, (b) last active target temperature, and (c) toggle direction to adjust LCD contrast.

---

### Set target temperature

- Toggle down once: 3<sup>rd</sup> line changes (see below).

<b>Set:</b>	--.°C
<b>Actual:</b>	21.7°C
<b>Set Temp.: ↑ ↓</b>	

- Toggle up/down to increase/decrease target temperature. Input, 0.0°C - 50.0°C. Achievable highest/lowest temperature is ambient temperature + 15 K / - 12 K.

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### Set LCD contrast

- Toggle up once. 3<sup>rd</sup> line changes (see below).

<b>Set:</b>	--.°C
<b>Actual:</b>	21.7°C
<b>Set LCD Contrast: ↑ ↓</b>	

- Toggle up/down to increase/decrease contrast.

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### Online Display (automatically activated after 5 s delay)

<b>Set:</b>	25.0°C
<b>Actual:</b>	23.2°C
<b>↓ Temp. Set ↓ ↑ Control OFF ↑ SysTemp: 25°C</b>	
<b>Peltier: U= 5.39V, I= 0.93A</b>	

1<sup>st</sup> line: see before.

2<sup>nd</sup> line: see before.

3<sup>rd</sup> line (moving message): Information on (a) toggle direction to set target temperature, (b) toggle direction to leave temperature control mode, (c) temperature in Power-and-Control Unit US-T/DR (d) voltage and current of Peltier element. Negative values indicate heating, positive values indicate cooling.

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### Set new target temperature

- Toggle down once, toggle up/down to increase/decrease target temperature.

### Leave temperature control mode

- Toggle down twice
-

## 6 Hints for Users

Efficient stirring is mandatory to quickly arrive at target temperature and to avoid temperature gradients. Therefore, optimize stirring under visual control.

The time to arrive at target temperature can be several minutes, depending on starting and ambient temperatures. Therefore, test time requirements before scheduling of experiments.

Target temperature may be reached after over- or undershoot. Therefore, watch temperature for about 30 s before concluding that target temperature is reached.

For optical reasons, the space for stirring at the bottom of the cuvette and the layer just below the heat-transfer rod fall outside the illuminated part of the cuvette from which most of fluorescence is detected. Stirring mixes continuously illuminated and non-illuminated cuvette contents. In the presence of stirring, illumination over longer time scales ( $> 10$  s) results in similar light exposure of all particles of the suspensions. Stirring during short time illumination ( $t \ll 1$  s), however, may result in heterogeneously exposed particles. Therefore, when homogeneously illuminated particles are required for fast fluorescence inductions, switching off stirring prior to measurements can be advantageous.



## 7 Specifications US-T

### 7.1 Power-and-Control Unit US-T/DR

**Display:** Three line LCD display

**Control range:** 0 °C to 50 °C at 0.1 K steps

**Operating voltage:** 11 V - 14 V DC

**Maximum Peltier current:** 1 A

**Size:** 105 mm x 90 mm x 130 mm (W x H x D)

**Weight:** 0.57 kg

### 7.2 Peltier Heat-Transfer Head US-T/DS

**Achievable temperatures:** 12 K below ambient temperature, 15 K above ambient temperature (Quartzcuvette placed in Optical Unit for Suspensions ED-101US/MD with 1.5 mL water and stirrer PHYTO-MS on)

**Size:** Ø 55 mm, 110 mm height

**Cable length:** 130 cm

**Weight:** 0.29 kg (including cable)

### 7.3 AC Adapter

**Input:** 100 V - 240 V AC 1.5 A 50-60 Hz

**Output:** 12 V DC 5.5 A

**Size:** 130 mm x 56 mm x 30 mm (L x W x H)

**Weight:** 0.50 kg (including cables)

Subject to change without prior notice

## 8 Warranty

All products supplied by the Heinz Walz GmbH, Germany, are warranted by Heinz Walz GmbH, Germany to be free from defects in material and workmanship for one (1) year from the shipping date (date on invoice).

### 8.1 Conditions

This warranty applies if the defects are called to the attention of Heinz Walz GmbH, Germany, in writing within one year (1) of the shipping date of the product.

1. This warranty shall not apply to any defects or damage directly or indirectly caused by or resulting from the use of unauthorized replacement parts and/or service performed by unauthorized personnel.
2. This warranty shall not apply to any product supplied by the Heinz Walz GmbH, Germany which has been subjected to misuse, abuse, abnormal use, negligence, alteration or accident.
3. This warranty does not apply to damage caused from improper packaging during shipment or any natural acts of God.
4. This warranty does not apply to underwater cables, batteries, fiberoptics, cables, lamps, gas filters, thermocouples, fuses or calibrations.

## 8.2 Instructions

**To obtain warranty service, please follow the instructions below:**

1. The Warranty Registration form must be completed and returned to Heinz Walz GmbH, Germany.
2. The product must be returned to Heinz Walz GmbH, Germany, within 30 days after Heinz Walz GmbH, Germany has received written notice of the defect. Postage, insurance, custom duties, and/or shipping costs incurred in returning equipment for warranty service are at customer expense. Accompany shipment by the Walz Service and Repair form:  
<http://www.walz.com/downloads/global/Service03.pdf>
3. All products being returned for warranty service must be carefully packed and sent freight prepaid.
4. Heinz Walz GmbH, Germany is not responsible or liable, for missing components or damage to the unit caused by handling during shipping. All claims or damage should be directed to the shipping carrier.

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