

# **Biegler**

**Blood and Infusion Warmer**

**Test Documentation**

**BW 585**

**PCB Version BW 585 V1.2**

## 1. Technical Data

### Technical Data - BW 585

Model	BW 585
Voltage	230 VAC
Frequency	50 Hz
Power consumption	300 W
Preheating time	max. 40 sec
Operating temp.	37 - 41°C
Safety cut-off	three-fold
Moisture resistance	IPX4
Protection class	I
Protection grade	B
Dimensions	140 x 190 x 230 mm
Weight	2.0 kg
Fuses	230VAC      1,6A slow (primary) 0,25A slow (secondary)

## 2. Notes for the User

### Manufacturer's Responsibility

Biegler or the Company's authorised dealers shall only be responsible for the equipment's safety, reliability and performance if:

- the operating instructions are adhered to during use
- the electrical installations in the room where the equipment is used meet the statutory technical requirements
- modifications, repairs or adjustments are or were carried out solely by Biegler or authorised personnel
- only original Biegler spare parts are used for repairs (also applies to power supply cable).

If the buzzer or red warning light comes on, remove the infusion or transfusion tube from the heating element immediately.

### WARRANTY

Biegler Medizinelektronik guarantees this device against material and manufacturing defects for a period of **twelve months** from the date of purchase. The warranty also covers spare parts and workmanship. All claims must be accompanied by an invoice or proof of purchase and submitted within the warranty period. The warranty does not apply if the device has suffered damage, been tampered with, misused or not maintained in accordance with the operating instructions.

### 3. Safety Cut-off

#### 42°C

- Set the temperature-measurement-equipment in the right position
- switch on the warmer
- after about one minute: warm up the heat exchanger by means of a hot-air blower very slowly
- audio and visual alarms are set off (by software)
- the heating circuit will shut off
- once it has cooled down, the equipment is ready for restart again
- if there is a malfunction, the equipment cannot be operated again until the fault has been found by the service organisation

#### 42,5°C

- Set the temperature-measurement-equipment in the right position
- switch on the warmer
- after about one minute: warm up the heat-exchanger by means of a hot-air blower very slowly
- audio and visual alarms are set off (by hardware comperator)
- the heating circuit will shut off
- once it has cooled down, the equipment is ready for restart again
- if there is a malfunction, the equipment cannot be operated again until the fault has been found by the service organisation

#### 45°C

- if there is a problem with the first and the second safety cut-off, the heating circuit is opened by a thermal time delay
- once it has cooled down, the safety cut-off of the soft- and hardware must be tested
- if these tests have a positive result, the equipment is ready for operation again
- this safety cut-off sequence could also be activated, if the blood-warmer is placed too near a heating source or is exposed to direct sun-radiation

### 3. Safety Cut-off

#### 37°C

- If the temperature of the heat-exchanger drops below 37°C, the low temperature alarm will be activated, the first LED of the temperature control will flash and an intermittent audio alarm will sound. The heating circuit will not shut off. If the temperature increases to the normal values, the both alarms will stop

#### Difference-alarm

- if the difference of the values of the two temperature channels is  $>0,5^{\circ}\text{C}$ , the electronic cut-off triggered by the software activates both alarms and the heating circuit shuts off

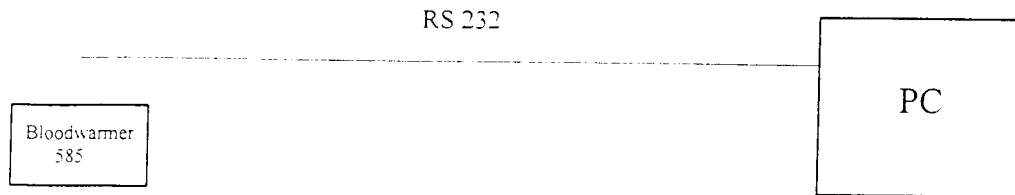
**IMPORTANT:** If there is any fault in the safety cut-off circuits, the blood-warmer must be checked by a local authorized service organisation !

# Operating Instructions

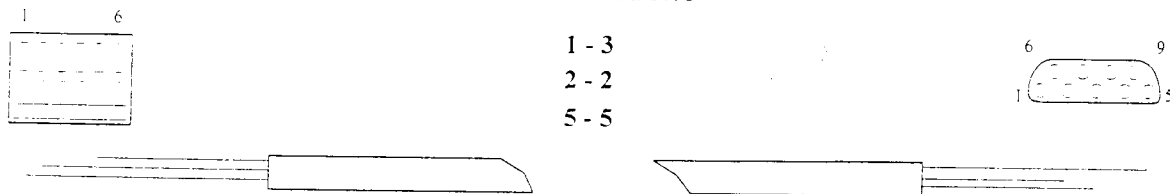
# Bloodwarmer

## 585

### Communication Kabel

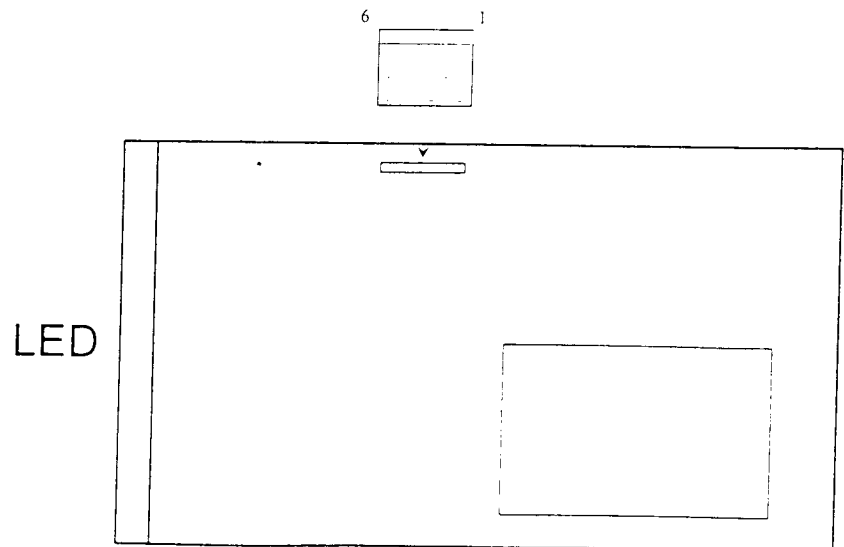


### Detail :



### Connection Place on the board

Hyperterminal settings . 19 200, 8, n, 1



## 4. Temperature Adjustment

### 1) Preparing to set the temperature

- Start the test program on the computer
- Plug the PC – BW 585 connecting cable into the test socket with the flat side facing outwards
- Connect the blood warmer to the power supply
- Once the BW has been connected to the power supply, it is in stand-by mode (the red LED is illuminated and the operating state displayed on the monitor)
- Turn trimmer P5 to the left as far as it will go

### 2) Setting the controller and monitoring

- Switch on the blood warmer (the green LED indicates ON)
- Trimmers P3 – control (t reg on the monitor) and P6 – monitoring (UW on the monitor) have to be set to the same temperature
- Adjust P3 and P6 until the temperature on the heat exchanger is 38.5 °C and the reading for t reg and UW is 38.5
- The temperature displayed on the device must also be 38.5°C.

### 3) Checking the settings at maximum temperature (41°C)

- Adjust the SET temperature to 41°C in stand-by mode
- After heating up briefly, the temperature on the heat exchanger should be  $41 \pm 0.3^\circ\text{C}$ . The readings for t reg and UW should both be  $41 \pm 0.1^\circ\text{C}$ .
- The temperature displayed on the device must also be 41°C

IMPORTANT: if the difference is outside the tolerance, repeat the adjustment procedure from Section 2

### 4) Setting the safety cut-off

- Switch on the blood warmer and preset it to 41°C
- Wait for the BW to heat up (approx. 1 minute)
- Press the “e” key on the computer  
The blood warmer is now in set mode which is indicated by the two LEDs flashing (stand-by and ON).  
The device will now heat up to 42.5°C.  
Wait for the temperature to stabilise (approx. 1 minute)
- Turn trimmer P5 **slowly** to the right until the alarm buzzer is activated
- Let the blood warmer cool down
- Heat up the device again (start by pressing “e”) and check the safety cut-off setting again

## 4. Temperature Adjustment

### 5) Checking the safety cut-off at 42.5°C

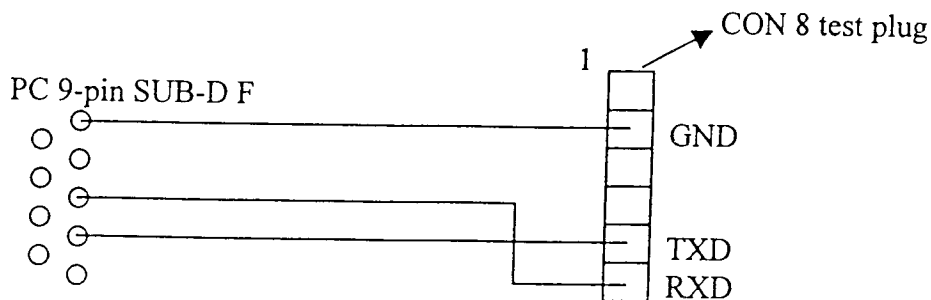
- Switch on the device
- Set maximum temperature (41°C) and wait for the aluminium heat exchanger to heat up
- Blow hot air onto the heat exchanger from a distance of approx. 10 cm, heating it up slowly and evenly until the alarm is triggered

### Service interface

The BW 585 is equipped with a service interface. The serial interface supplies a range of data which can prove very useful when calibrating and troubleshooting. The BW 585 can be connected direct to a PC or terminal with a suitable cable (see below) and the data displayed using a standard terminal program (Hyper Terminal).

Data format:  
19,200, n, 8, 1

### PC power lead



Hyper terminal settings:  
19,200, 8, n, 1

NOTE: all input in "LOWER CASE"



## 4. Temperature Adjustment

### Input

Protocol:	“s”	Stand-by
	“r”	Run
	“t”	Test mode (alarm off)
	“e”	Set mode (42.5°C, internal alarm not activated)
	“n”	Normal mode

### Readings displayed

Protocol:	“t soll”	Set temperature
	“t reg”	Sensor 1 control temperature
	“UW”	Sensor 2 monitoring temperature
	“t mean”	Mean temperature
	“S/I”	Difference between set and actual
	“max Dif”	Difference between Sensor 1 and Sensor 2
	“P%”	Heating power in % (Maximum: 280 W)
	“err”	Error counter
	“t”	Time window for undertemperature alarm
	“s”	Heating rate

### Error codes:

The BW585 differentiates between various errors and display them on the bar graph

■□□□□□□□	Low temperature alarm (1 <sup>st</sup> LED flashes)
□■□□□□□□■	Temperature difference between Sens1 and Sens2>1 °C
□□■□□□□□■	Sens1>42°C
□□□■□□□□■	Sens2>42°C

## 1. CONTINUOUS TEST

### 1.1 General

- Start-up at 38,5 °C
- After approx. 15 min. measure the temperature at the heat exchanger
- After 24 h measure the temperature again

During this test the initial and final values must be within the tolerance range and the measurements must be taken under the same ambient conditions.

The final temperature may deviate from the initial value by  $\pm 0.5^\circ\text{C}$ .

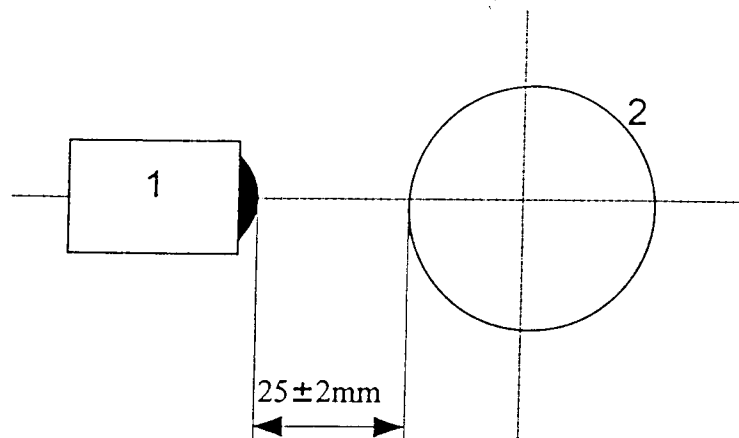


Fig. 1.1.1 Measurement set-up

- 1 IR thermometer  
2 Heat exchanger (BW ring)

Measuring instrument used: HORIBA infrared thermometer IT 330  
Accuracy:  $\pm 1\%$ ,  $\pm 1$  digit at full scale  
Emission: black body

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## 2.READY FOR USE

### 2.1 General

- Start-up
- Time how long it takes for the operating temperature to be reached

The initial temperature should be the same as the ambient temperature.  
The time taken must be less than 60 sec.

For arrangement of heat exchanger and measuring instrument, see Fig.1.1.1

## 3.OPERATING TEMPERATURE CHECK

### 3.1 General

The following checks must not be performed until the equipment has heated up (control circuits in steady state).

The preliminary election of the temperature is 41 °C.

The heat exchanger temperature should be  $41 \pm 0.5^{\circ}\text{C}$  with the display reading  $41^{\circ}\text{C}$ .

For arrangement of heat exchanger and measuring instrument, see Fig.1.1.1


## 4.THERMAL PROTECTION CHECK - ELECTRONIC CUT-OFF

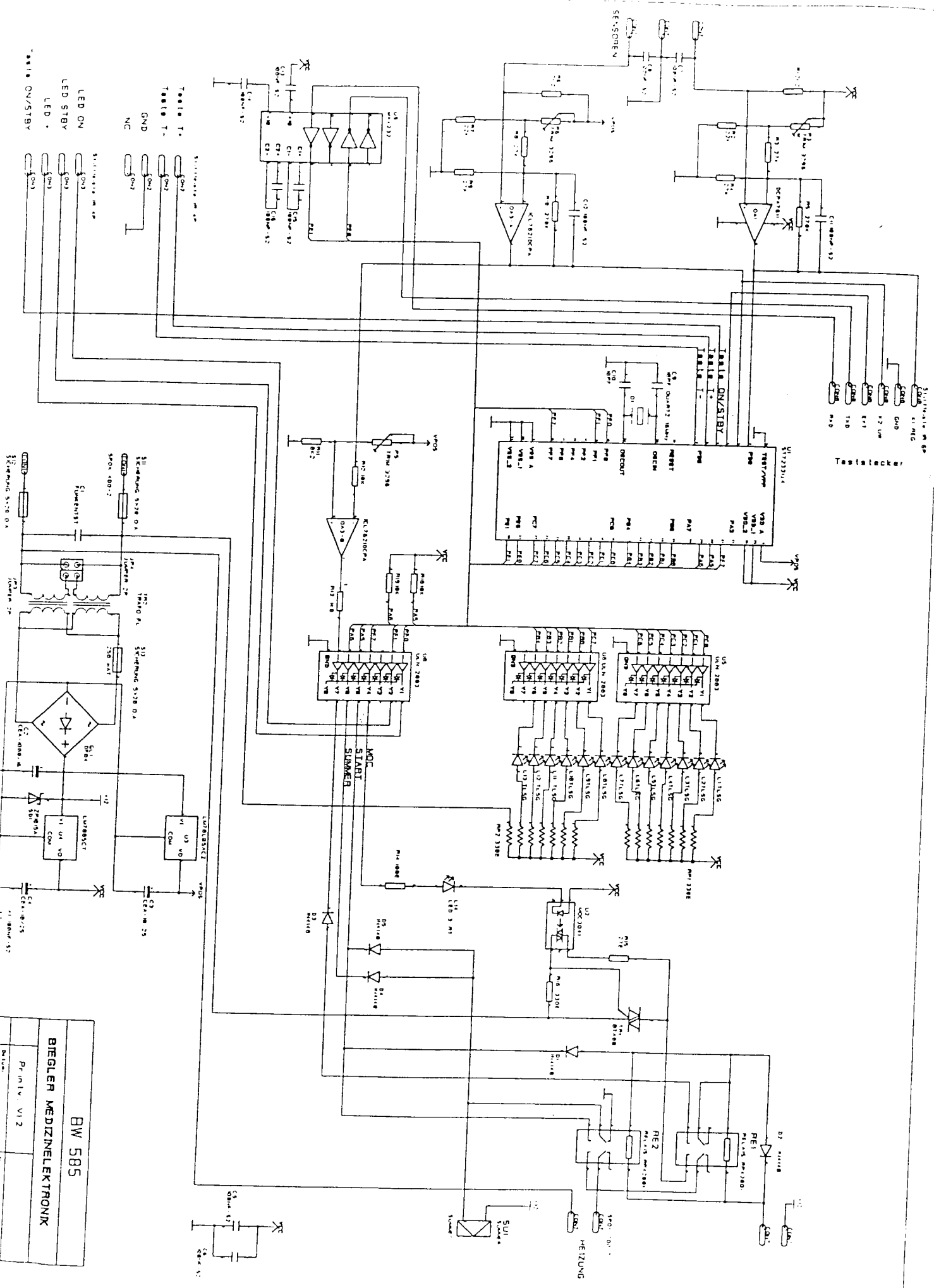
### 4.1 General

- Start-up
- Check operating temperature
- Slowly heat up the BW ring with hot air
- When the display jumps from the last green LED to the orange LED, the electronic cut-off should be triggered ( $<42,5^{\circ}\text{C}$ ).

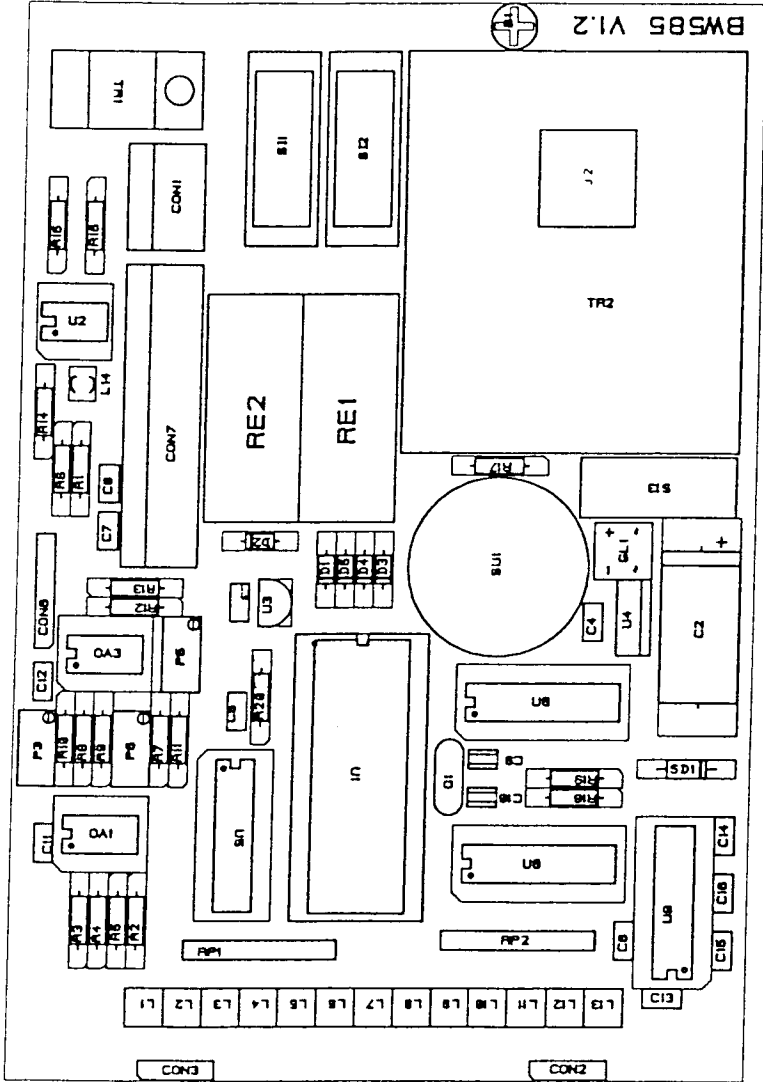
If the mechanical safety cut-off is triggered, check the cut-off temperature of the overtemperature fuses ( $45^{\circ}\text{C}$ ).

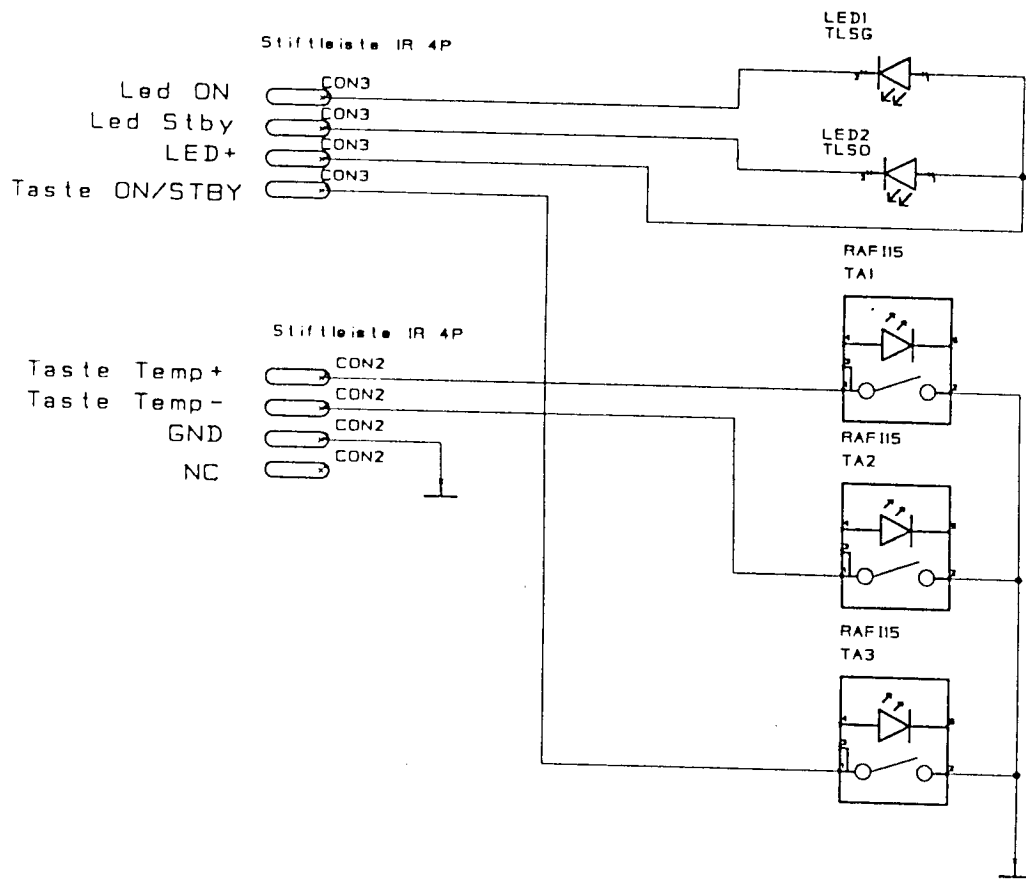
For arrangement of heat exchanger and measuring instrument, see Fig.1.1.1

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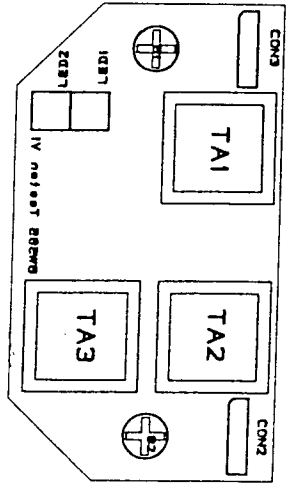


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**BIEGLER MEDIZINELEKTRONIK**  
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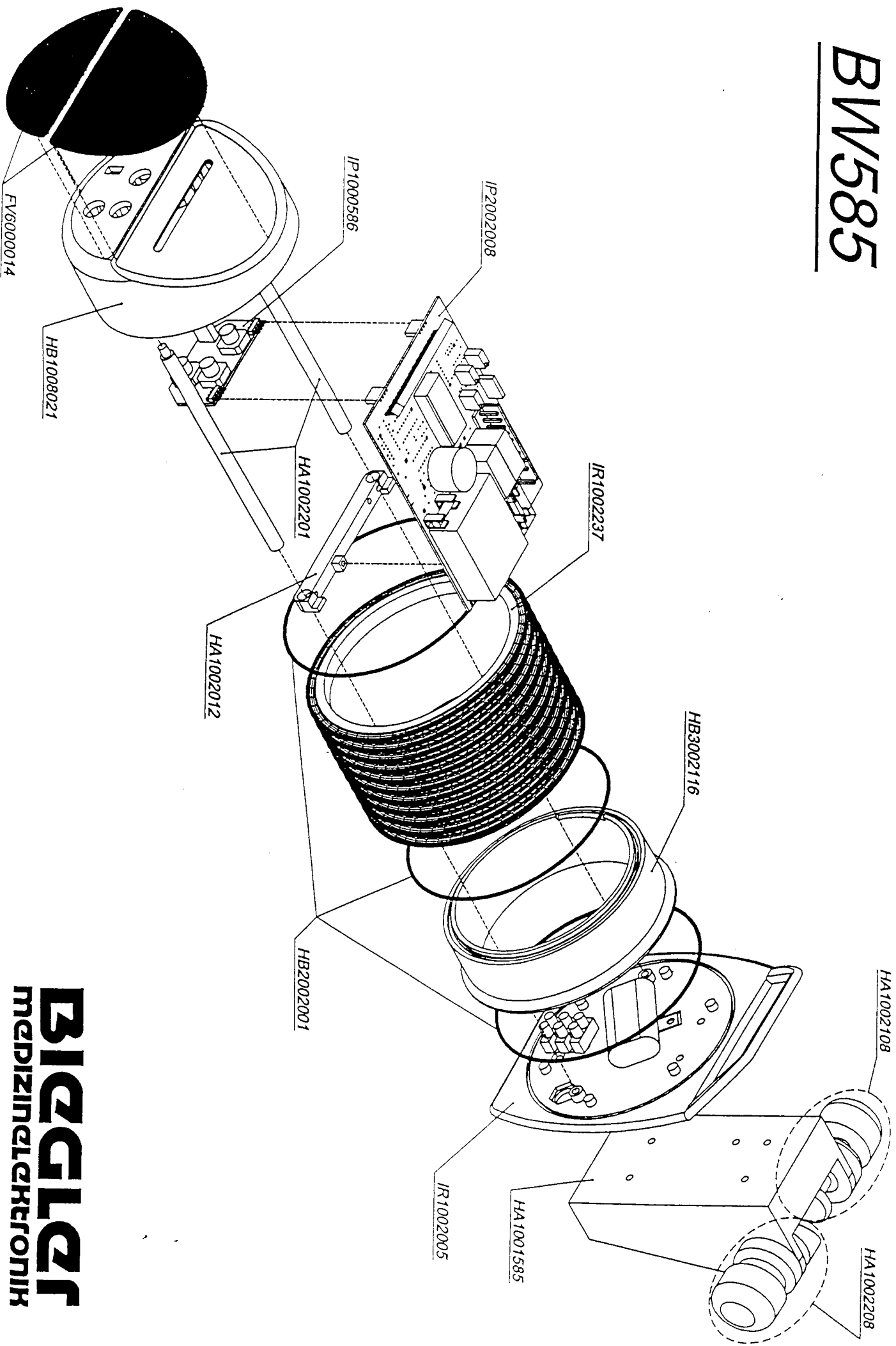




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