

# Technical Documentation

Babytherm® 8004/8010  
Open Care Unit



Revision 5.0  
6132.300  
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# General





## 1 Symbols and Definitions

### WARNING

A **WARNING** statement provides important information about a potentially hazardous situation which, if not avoided, could result in death or serious injury.

### CAUTION

A **CAUTION** statement provides important information about a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to the user or patient or in damage to the equipment or other property.

### NOTE

A **NOTE** provides additional information intended to avoid inconvenience during operation.

Definitions according to German standard DIN 31051:

Inspection	= examination of actual condition
Maintenance	= measures to maintain specified condition
Repair	= measures to restore specified condition
Servicing	= inspection, maintenance, and repair

## 2 Notes

This Technical Documentation conforms to the IEC 60601-1 standard.

Read each step in every procedure thoroughly before beginning any test. Always use the proper tools and specified test equipment. If you deviate from the instructions and/or recommendations in this Technical Documentation, the equipment may operate improperly or unsafely, or the equipment could be damaged.

It is our recommendation to use only Dräger parts and supplies.

The maintenance procedures described in this Technical Documentation may be performed by qualified service personnel only. These maintenance procedures do not replace inspections and servicing by the manufacturer.

The information in this Technical Documentation is confidential and may not be disclosed to third parties without the prior written consent of the manufacturer.

This Technical Documentation is for the purpose of information only. Product descriptions found in this Technical Documentation are in no way a substitute for reading and studying the Instructions for Use/Operating Manual enclosed with the product at the time of delivery.

Know-how contained in this Technical Documentation is subject to ongoing change through research and development and Dräger Medical reserves the right to make changes to this Technical Documentation without notice.

**NOTE**

Unless otherwise stated, reference is made to laws, regulations or standards (as amended) applicable in the Federal Republic of Germany for equipment used or serviced in Germany. Users or technicians in all other countries must verify compliance with local laws or applicable international standards.

# Function Description



**1 Babytherm 8004**

The Babytherm 8004 is an open care unit for warming premature babies, neonates and infants with a body weight of up to 8 kg.

The Babytherm 8004 uses a radiant warmer which can be set to “manual mode” or to “baby control mode” (skin-temperature control).

The Babytherm 8004 may be used in delivery rooms, obstetric units, neonatal wards, pediatric wards and pediatric intensive care units.. The Babytherm 8004 may be operated by doctors or by nursing staff under the supervision of a doctor.

**WARNING**

**Risk of burns! Children who are in shock have a considerably lower skin temperature than normal and would be overheated when using the skin-temperature control mode. Do not use the skin-temperature control mode in children who are in shock!**

**WARNING**

**Risk of hypothermia! Children who have a fever have a considerably higher skin temperature than normal and would get hypothermia when using the skin-temperature control mode. Do not use the skin-temperature control mode in children who have a fever!**

**WARNING**

**Risk of incorrect measurements! When using the skin-temperature sensor in “skin-temperature control” mode to measure rectal temperature, the core temperature would be measured and controlled. Never use the skin-temperature sensor to measure rectal temperature.**

The Babytherm 8004 consists of the radiant warmer, the control unit, the bed assembly and the wheeled frame.

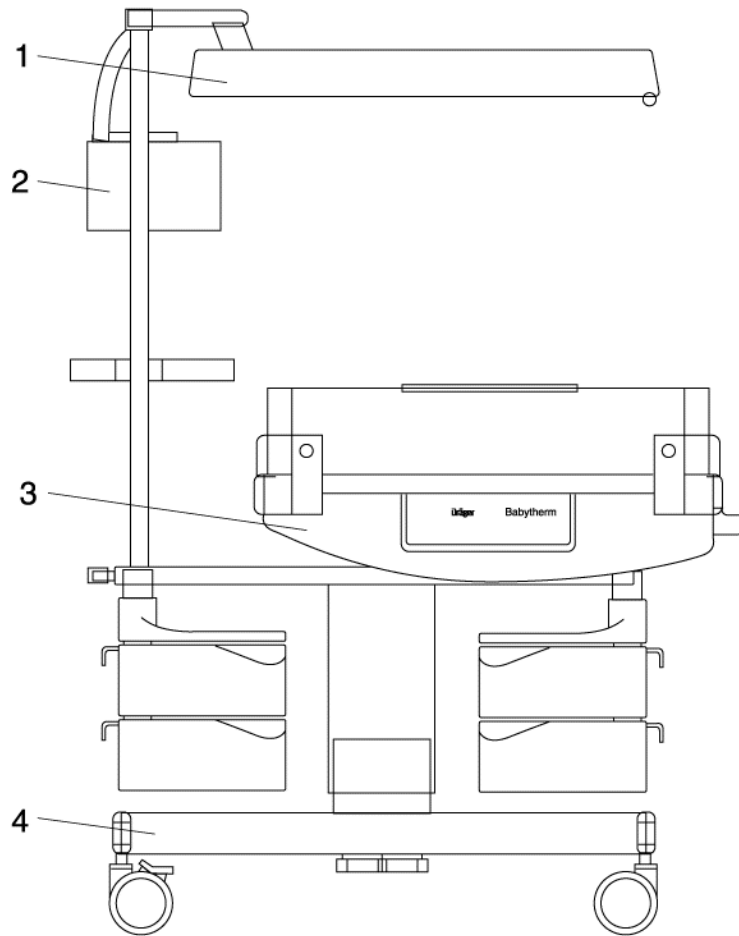


Figure 1 Babytherm 8004 (front view)

Legend

1	Radiant warmer
2	Control unit
3	Bed assembly
4	Trolley without electrical height adjustment Trolley with electrical height adjustment (option)

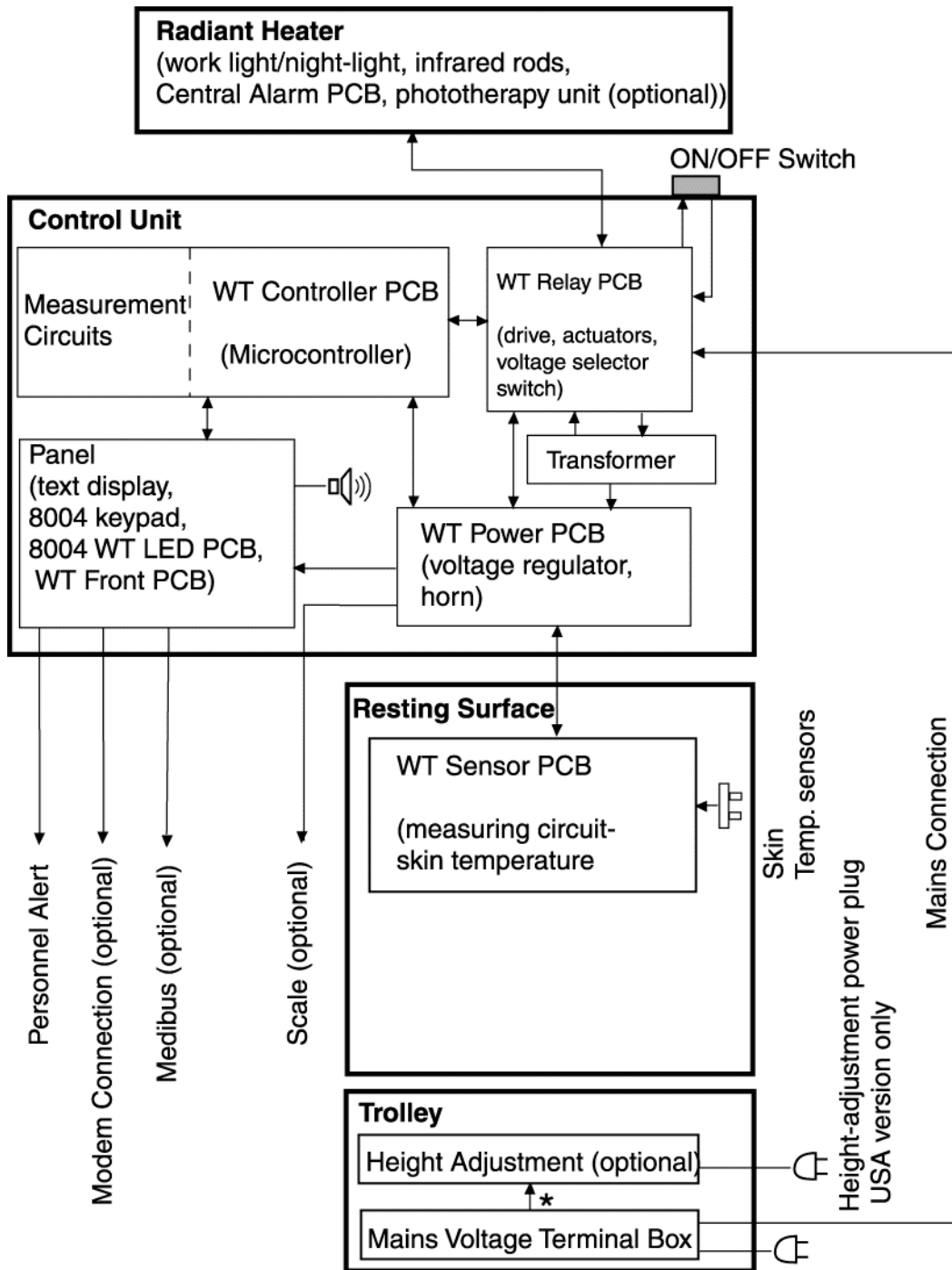


Figure 2 Block diagram of the Babytherm 8004

\* The connection from the mains voltage terminal block to the height adjustment does not exist in USA units

1.1 Radiant warmer

The radiant warmer emits a preset amount of heat. A multicore cable connects the radiant warmer to the control unit.

The radiant warmer contains the following parts:

- Two infrared elements (total power 600 W)
- Energy-saving lamp (7 W)
- Energy-saving lamp (23 W)
- Central Alarm PCB
- Six halogen lamps (50 W) for phototherapy (option)
- Switched Mode Power Supply PCB for phototherapy (option)

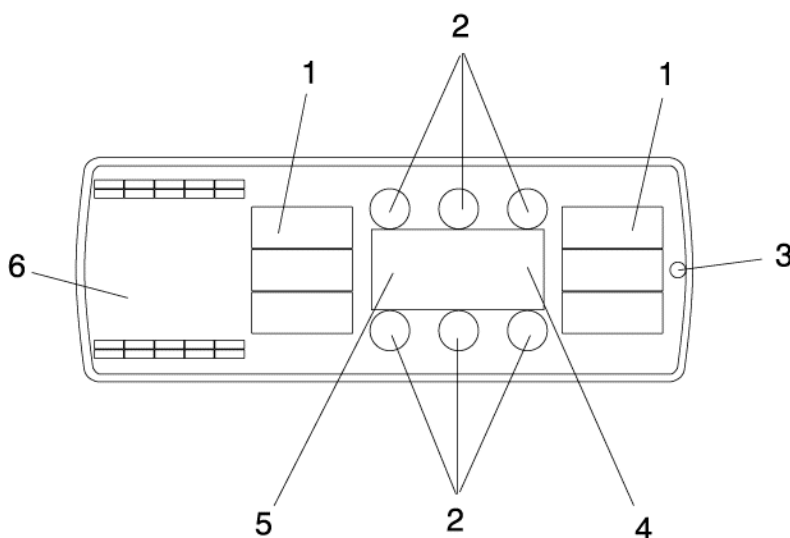


Figure 3 Radiant warmer (bottom view)

Legend

1	Infrared element
2	Halogen lamps for phototherapy
3	Central Alarm PCB
4	Energy-saving lamp 1
5	Energy-saving lamp 2
6	Switched Mode Power Supply PCB for phototherapy (option)

**NOTE**

If the work light button is pressed, both energy-saving lamps (energy-saving lamp 1 and 2) come on. If the night light button is pressed, only energy-saving lamp (1) comes on.



1.2 Control unit

The control unit controls the functions of the Babytherm 8004.

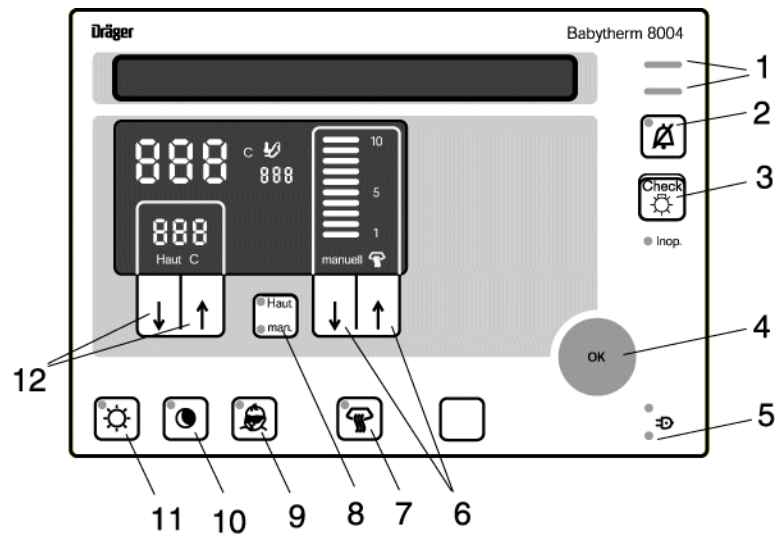
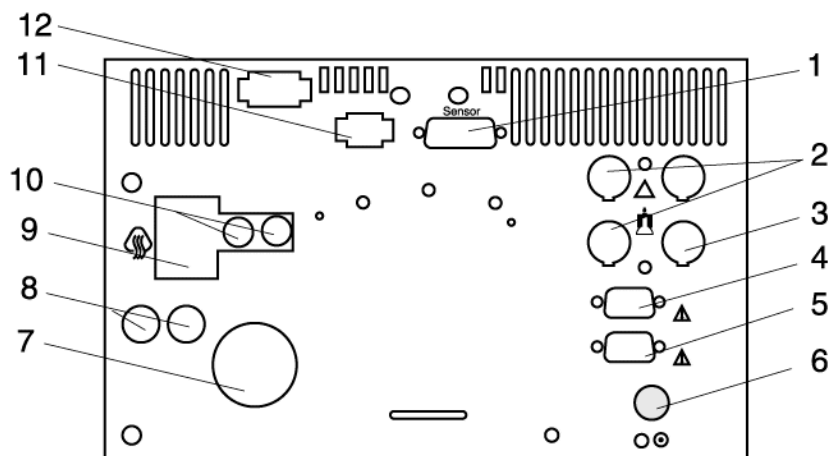


Figure 4 Control unit of the Babytherm 8004 (front view)

Legend

1	Alarm LED (red alarm LED = Warning, yellow alarm LED = Caution)
2	15-minute alarm silence button
3	Check button (for checking LEDs, 7-segment displays, audible alarm)
4	OK button
5	Operation indicators (green LED = ON, red LED = mains power failure)
6	Radiant warmer heat levels setting
7	Radiant warmer ON/OFF button
8	"Skin/man." button (toggles between manual mode and skin-temperature control mode)
9	Phototherapy ON/OFF button (option)
10	Night light ON/OFF button (energy-saving lamp 1)
11	Work light ON/OFF button (energy-saving lamps 1 and 2)
12	Skin-temperature control target value setting



**Figure 5** Control unit of the Babytherm 8004 (rear view), cover plate removed

**Legend**

1	WT Sensor PCB socket
2	Maximum of 3 connections for auxiliary equipment (workplace), nurse call (connection for central alarm)
3	Connection for internal paging system, nurse call (connection for central alarm)
4	RS 232 interface (modem), option
5	RS 232 interface (BabyLink), option
6	Control unit ON/OFF switch
7	Mains voltage selector
8	Fuses
9	Radiant warmer connection
10	Fuses
11	Mattress heater connection
12	Mains voltage supply connection

The control unit contains the following assemblies:

- ON/OFF switch
- Toroidal-core power transformer
- WT Power PCB
- WT Relay PCB
- WT Controller PCB
- Front (WT LED 8004 PCB, membrane keypad 8004, text display, WT Front PCB, loudspeaker)

- 1.2.1 ON/OFF switch** The ON/OFF switch is used to switch the mains voltage (single-pole) ON or OFF.
- 1.2.2 Toroidal-core power transformer** The toroidal-core power transformer supplies the electronic assembly and the mattress heater with the following AC voltages:
- approx. 24 VAC
  - approx. 9 VAC
- 1.2.3 WT Power PCB** The WT Power PCB has the following function blocks:
- Bridge rectifier
  - Voltage regulator (+5 VD)
  - Voltage regulator (+5 V LED)
  - GoldCap
  - Charging circuit (GoldCap)
  - Mains power failure detection (powerfail)
  - Buzzer (mains power failure)
  - Alarm LED control (mains power failure)
  - Serial data transfer
  - Multiplexer
  - Addressing and controlling of actuators and safety relays

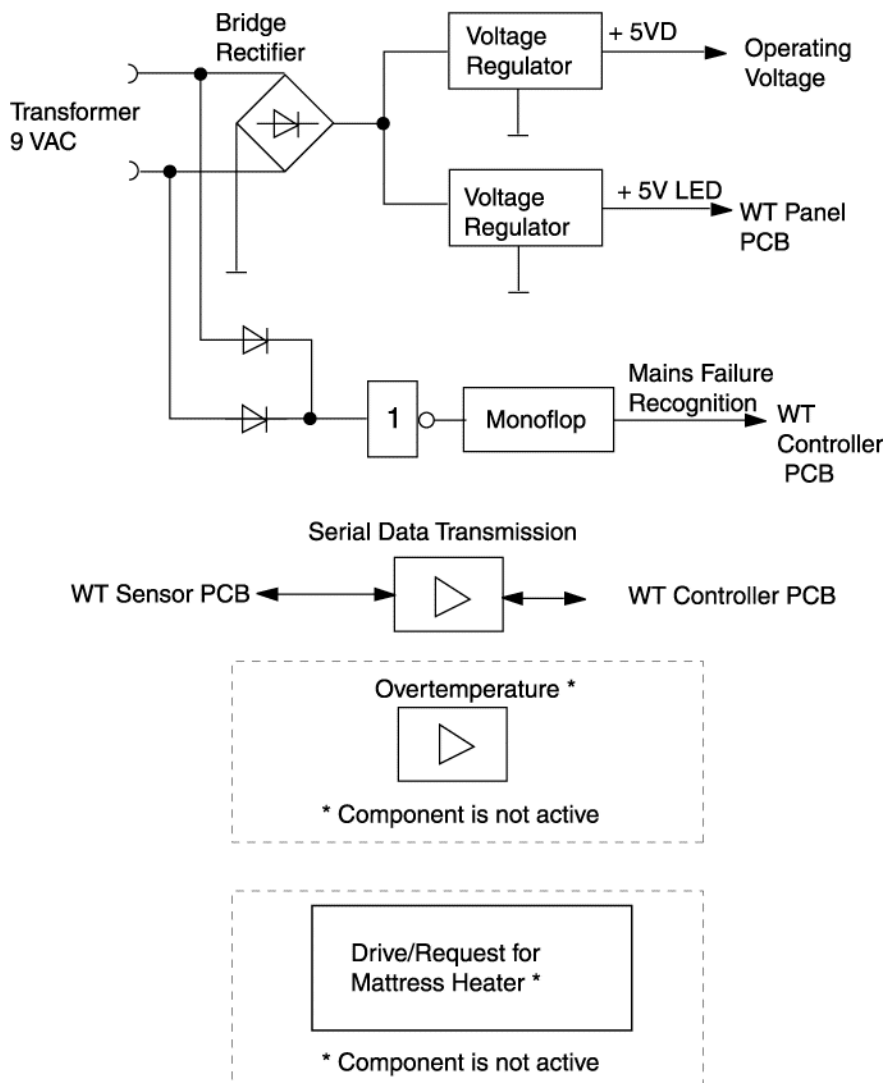


Figure 6 Block diagram 1 of WT Power PCB

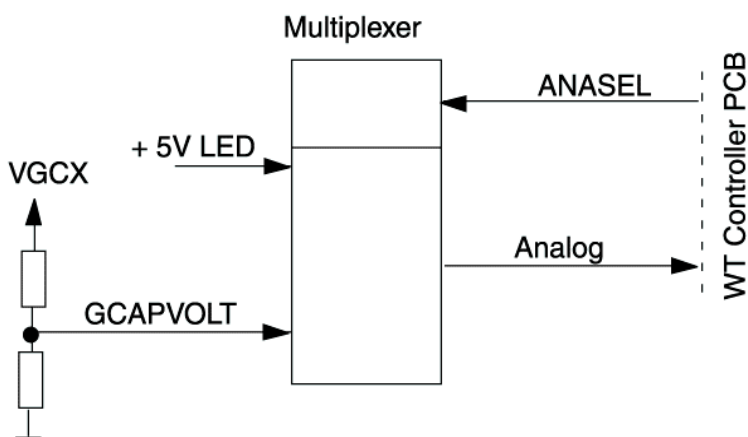
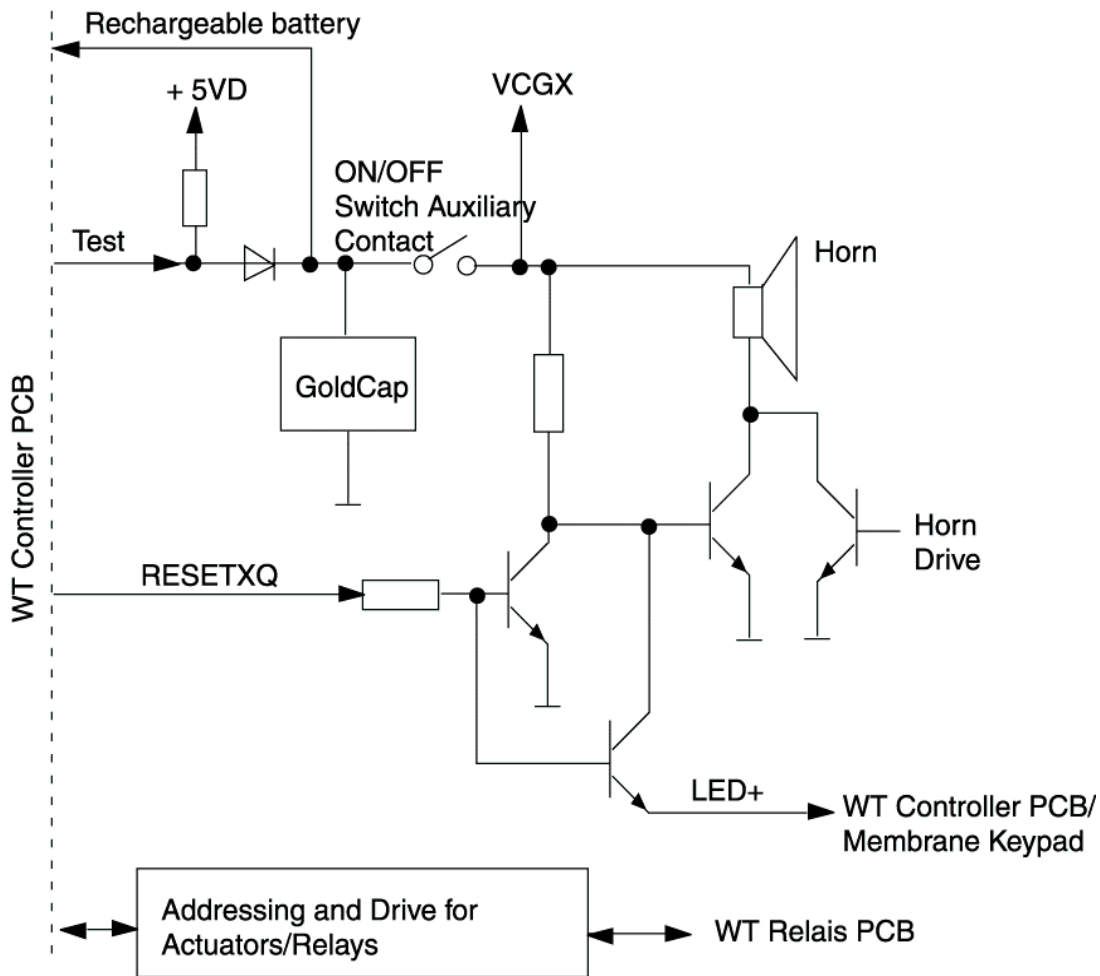


Figure 7 Block diagram 2 of WT Power PCB

**Bridge rectifier**

The toroidal-core power transformer supplies the bridge rectifier input with approx. 9 VAC which are used to generate an unregulated direct voltage (9 VDC).

**Voltage regulator (+5 VD)**

A voltage regulator uses the unregulated direct voltage (9 VDC) to generate the regulated operating voltage (+5 VD).

**Voltage regulator (+5 V LED)**

A voltage regulator uses the unregulated direct voltage (9 VDC) to generate the regulated operating voltage (+5 V LED).

**GoldCap**

In the event of a mains power failure, the GoldCap capacitor supplies the buzzer and the power failure LED with operating voltage. The GoldCap voltage “battery” buffers also the RAM of the microcontroller.

**Charging circuit (GoldCap)**

The internal operating voltage +5 VD charges the GoldCap by means of a resistor-diode charging circuit. The charging circuit is switched off at 1-second intervals for test purposes.

**Mains power failure detection (powerfail)**

A monoflop monitors the mains power supply failure.

**Buzzer (mains power failure)**

A GoldCap capacitor supplies the buzzer with operating voltage in the event of a mains power failure.

**Alarm LED control (mains power failure)**

A GoldCap capacitor supplies the alarm LED with operating voltage in the event of a mains power failure.

**Serial data transfer**

A driver module amplifies the serial measurement data of the skin temperature and the test signals.

**Multiplexer**

The multiplexer applies the voltages (GCAPVOLT, +5 V LED) to the WT Controller PCB for checking.

**Addressing and controlling of actuators and relays**

An addressing module, a shift register and an amplifier module control the actuators and the safety relay from the radiant warmer.

1.2.4 WT Relay PCB

The relays on the WT Relay WT control the energy-saving lamps, the infrared elements, the Central Alarm PCB and the phototherapy assembly (option) of the radiant warmer. A thyristor controls the infrared elements.

The WT Relay PCB carries the following subassemblies:

- Mains voltage selector
- Control and feedback of the infrared elements
- Safety relay of the infrared elements
- Relay for the energy-saving lamps and phototherapy assembly (option)
- Control of the Central Alarm PCB

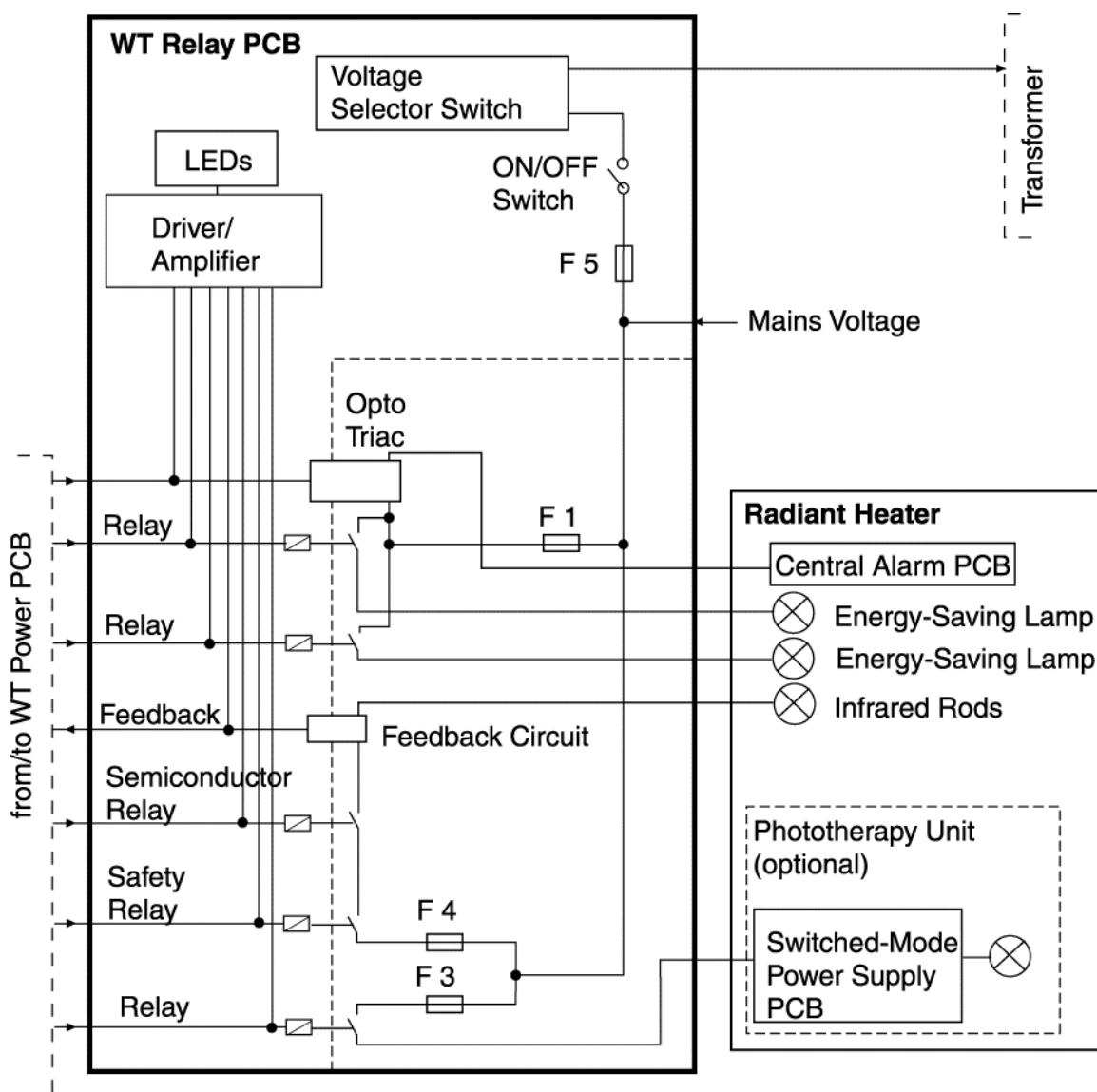


Figure 8 Block diagram of the WT Relay PCB

**Mains voltage selector**

The mains voltage selector adapts the primary circuitry of the toroidal-core power transformer to the local mains voltage.

**Control and feedback of the infrared elements**

An optocoupler controls the triac which supplies the infrared elements with mains voltage. This current flow generates a feedback signal via the optocoupler.

**Safety relay of the infrared elements**

In the event of a malfunction (e.g. “Inop”), the safety relay switches off the mains voltage to the infrared elements.

**Relay for the energy-saving lamps and phototherapy assembly (option)**

The relays supply the energy-saving lamps and the the phototherapy assembly (option) with mains voltage.

**Control of the Central Alarm PCB**

An opto-triac on the WT Relay PCB controls the central alarm light. The forced-tripped opto-triac supplies the Central Alarm PCB with mains voltage.

**1.2.5 WT Controller PCB**

The WT Controller PCB carries the following subassemblies:

- Microcontroller
- Quartz
- EPROM
- EEPROM
- RAM
- Watchdogs
- Driver modules
- Multiplexer and A/D converter



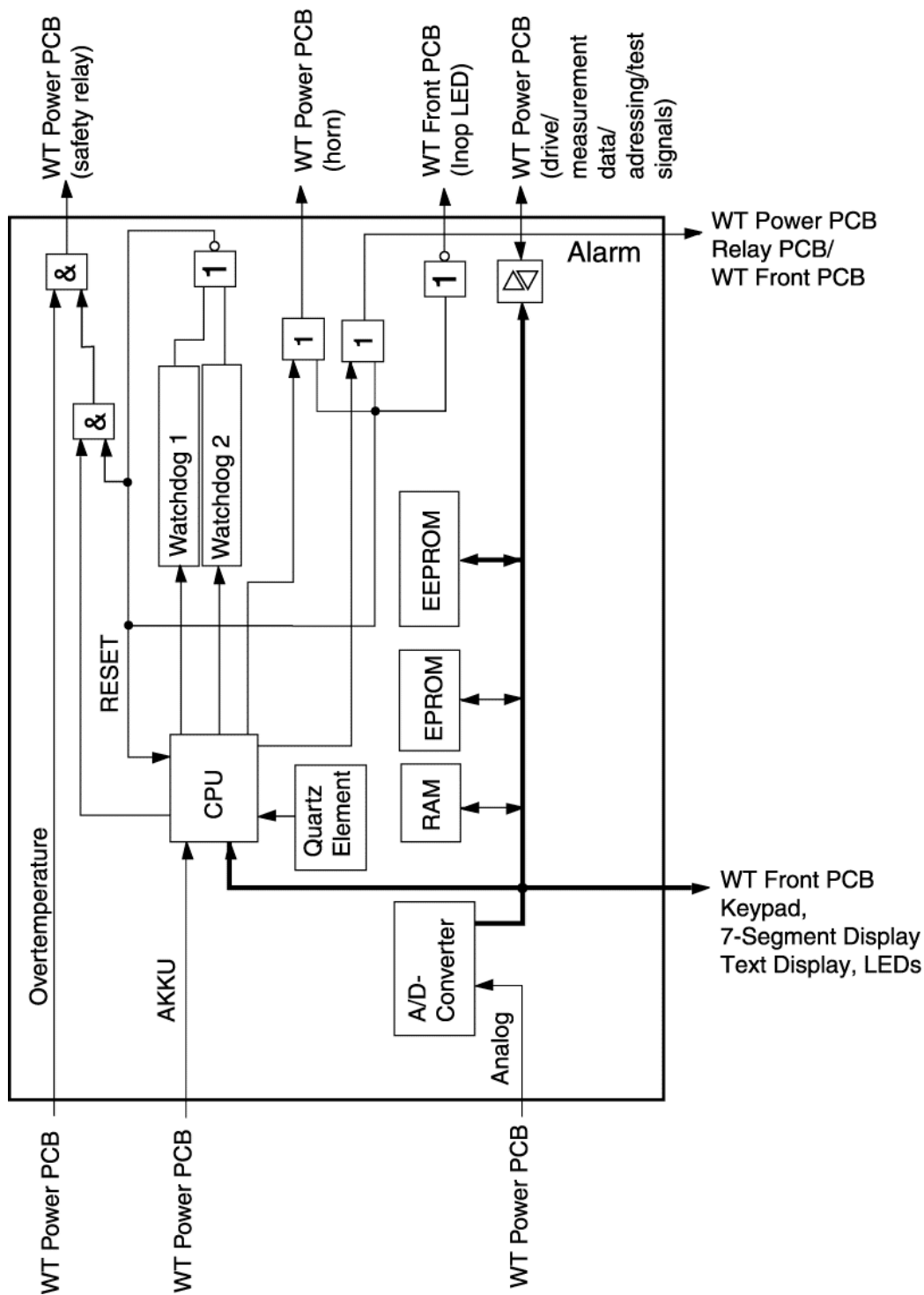


Figure 9 Block diagram of the WT Controller PCB

**Microcontroller**

The microcontroller controls and monitors the program of the Babytherm. The microcontroller has one 2-kByte RAM. The set values are stored and buffered in this RAM. The RAM buffer voltage “battery” is generated by the GoldCap.

**Quartz**

The quartz generates a clock frequency of about 32 kHz. The microcontroller uses this clock frequency to generate 16 kHz.

**EPROM**

The EPROM contains the software program of the Babytherm.

**EEPROM**

The device configuration data are stored in the EEPROM.

**RAM**

The RAM is a random-access memory.

**Watchdogs**

The watchdogs monitor the software program sequence of the microcontroller. The watchdogs are counter modules that are clocked by a separate quartz.

An "EMERGENCY STOP" signal is generated if the microcontroller does not reset the counter modules.

**Driver modules**

The driver modules amplify and regulate the signals for the actuator control.

**Multiplexer and A/D converter**

The multiplexer converts the +5 VLED voltage and the GoldCap voltage into a digital data word. This data word is sent to the microcontroller for evaluation.

**1.2.6 WT Sensor PCB**

The WT Sensor PCB carries the following subassemblies:

- Receiver and transmitter for serial data transfer
- Selection logics of test signals
- Amplifier of skin-temperature measurement
- Test circuit (36 °C skin temperature)
- A/D conversion with multiplexer

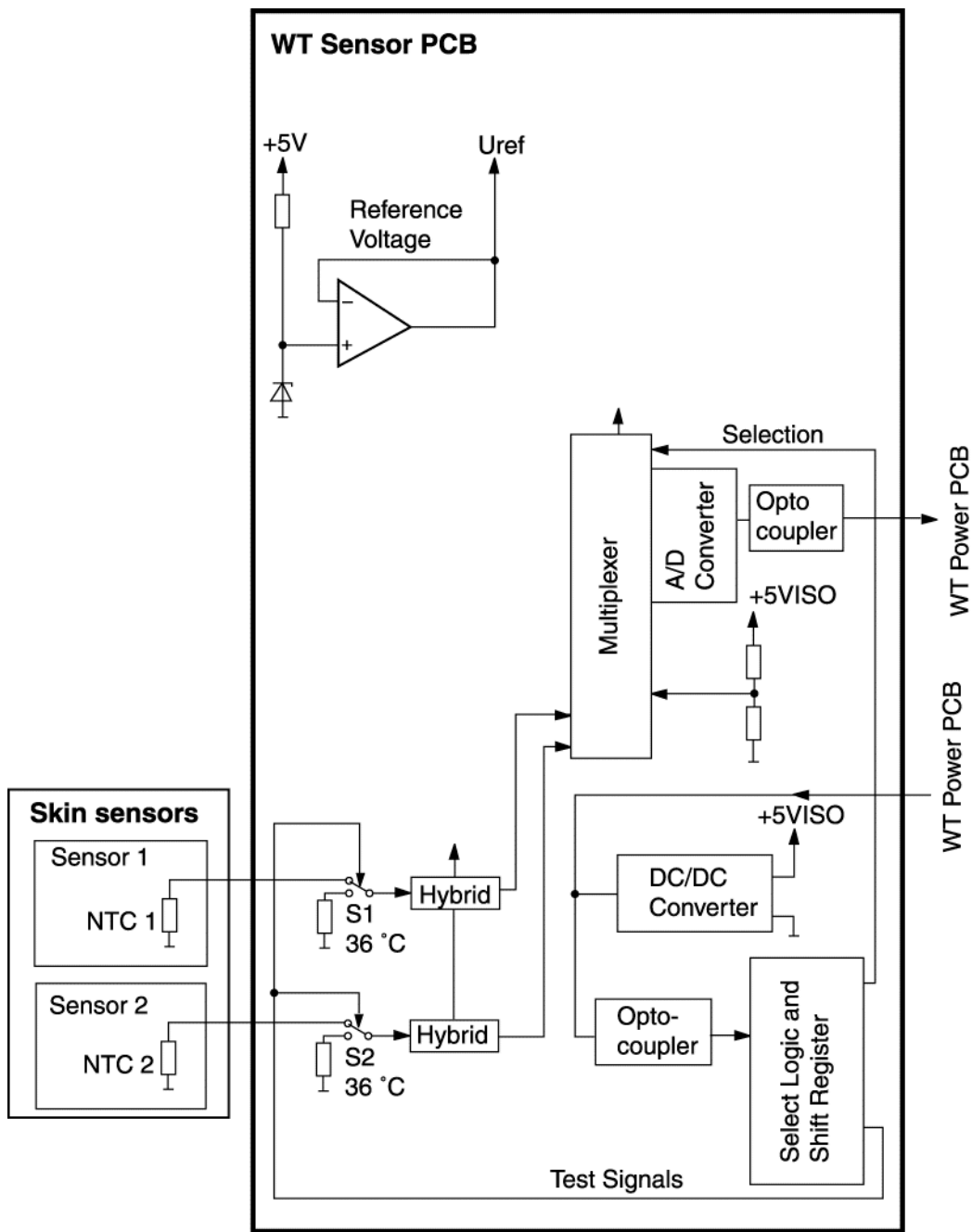


Figure 10 Block diagram of the WT Sensor PCB

**Receiver and transmitter for serial data transfer**

Optocouplers supply the serial skin-temperature measured values and the operating voltage of the Sensor PCB to the WT Power PCB. One optocoupler receives the serial test signals for the measuring circuits.

**Selection logics of test signals**

An addressing module and a shift register convert the serial test signals into parallel data.

The test signals activate the skin-temperature test circuit (36 °C).

**Amplifier of skin-temperature measurement**

Two skin-temperature hybrids measure the skin temperature.

**Test circuit (36.0 °C skin temperature)**

The software checks the skin-temperature hybrids.

The test circuits are provided with reference resistors. They are located at the inputs of the skin-temperature hybrids. The output voltage values of the skin-temperature hybrids correspond to a temperature of 36.0 °C.

**A/D conversion with multiplexer**

The multiplexer transmits the analog measuring signals of the skin temperature to the integrated A/D converter. The serial output signal of the A/D converter is applied to an optocoupler.

**1.3 Front**

The front comprises the following subassemblies:

- WT LED 8004 PCB
- Membrane keypad 8004
- Text display
- WT Front PCB
- Loudspeaker

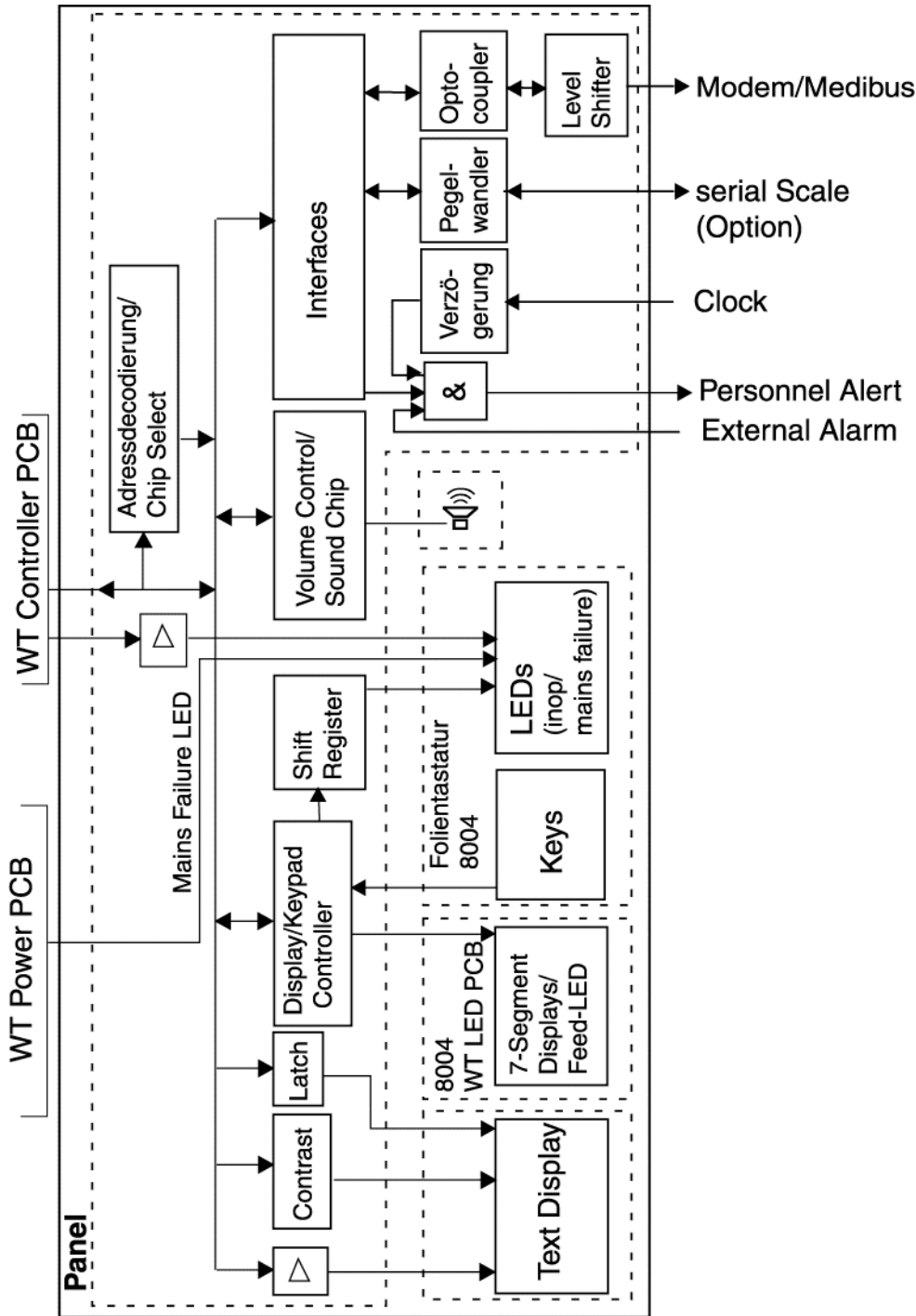


Figure 11 Block diagram of the front

1.3.1 WT LED 8004 PCB

The WT LED 8004 PCB carries the 7-segment displays for the measured skin temperature and the foot symbol LED.

1.3.2 Membrane keypad 8004

The membrane keypad 8004 has a key matrix, keys and LEDs.

1.3.3 Text display (LC display)

The text display shows plain text messages (advisory messages, warnings, alarms, and prompts).

**1.3.4 Loudspeaker**

In the event of alarms or messages, the loudspeaker issues an audible alarm signal. A volume control and a soundchip control the loudspeaker.

**1.3.5 WT Front PCB**

A port module read the key matrix. LED control is carried out by means of decoders, shift registers, and multiplex signals.

The WT Front PCB carries the following subassemblies:

- Address decoding and chip select
- Soundchip with volume setting
- Text display contrast setting
- Text display latch control
- Voltage supply to text display backlight
- Nurse call
- Interface modules
- Level converter
- Optocoupler
- Display module
- LED matrix control

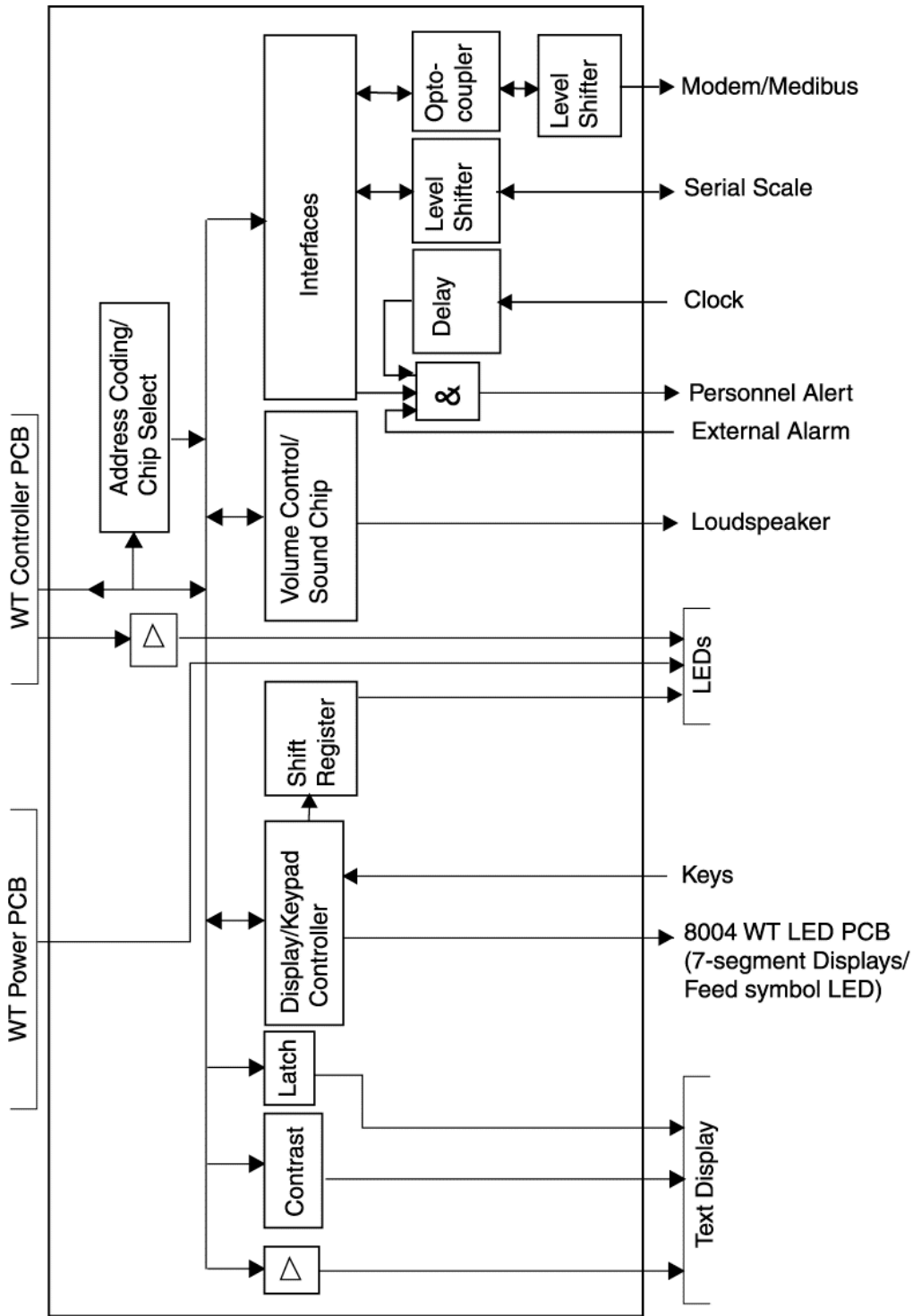


Figure 12 Block diagram of the WT Front PCB

**Address decoding and chip select**

Addressing and selection modules select the different hardware components.

**Soundchip with volume setting**

The microcontroller connects the output signal of the soundchip to the output signal of the volume control. The connected output signal is amplified and transmitted to the loudspeaker.

The microcontroller can control the volume of the volume control via the software.

**Text display contrast setting**

An amplifier module is used to set the contrast of the test display.

**Text display latch control**

Latch modules provide digital control of the text display.

**Voltage supply to the text display backlight foil**

A switch-mode regulator supplies the text display backlight foil with a voltage of about 1 to 5 V.

**Nurse call**

A relay is activated in the event of an alarm. The relay functions as a switch. An external alarm device (e.g. nurse call) can be connected to the switch.

An alarm delay prevents the nurse call from being activated immediately after pressing the check key.

**Interface modules**

The interface modules connect the data bus to the peripheral equipment (Medibus, modem, scales).

**Level converter**

The level converters adapt the interface of the WT Front PCB to the interfaces of the peripheral equipment.

**Optocoupler**

Optocouplers electrically isolate the modem, the Medibus and the central alarm from the WT Front PCB.

**Display module**

The display module supplies the 7-segment display with operating voltage and selects the individual key. The display module stores a key operation in the internal memory area and puts this information on the data bus.

**LED matrix control**

A shift register and a selection logics control the LED matrix.



## 2 Babytherm 8010

The Babytherm 8010 is an open care unit for warming premature babies, neonates and infants with a body weight of up to 8 kg.

The Babytherm 8010 uses a radiant warmer, which can be set to “manual mode” or to “baby control mode” (skin-temperature control), and a heated gel mattress.

The Babytherm 8010 may be used in delivery rooms, obstetric units, neonatal wards, pediatric wards and pediatric intensive care units.. The Babytherm 8010 may be operated by doctors or by nursing staff under the supervision of a doctor.

### WARNING

**Risk of burns! Children who are in shock have a considerably lower skin temperature than normal and would be overheated when using the skin-temperature control mode. Do not use the skin-temperature control mode in children who are in shock!**

### WARNING

**Risk of hypothermia! Children who have a fever have a considerably higher skin temperature than normal and would get hypothermia when using the skin-temperature control mode. Do not use the skin-temperature control mode in children who have a fever!**

### WARNING

**Risk of incorrect measurements! When using the skin-temperature sensor in “skin-temperature control” mode to measure rectal temperature, the core temperature would be measured and controlled. Never use the skin-temperature sensor to measure rectal temperature.**

The Babytherm 8010 consists of the radiant warmer, the control unit, the bed assembly and the wheeled frame.

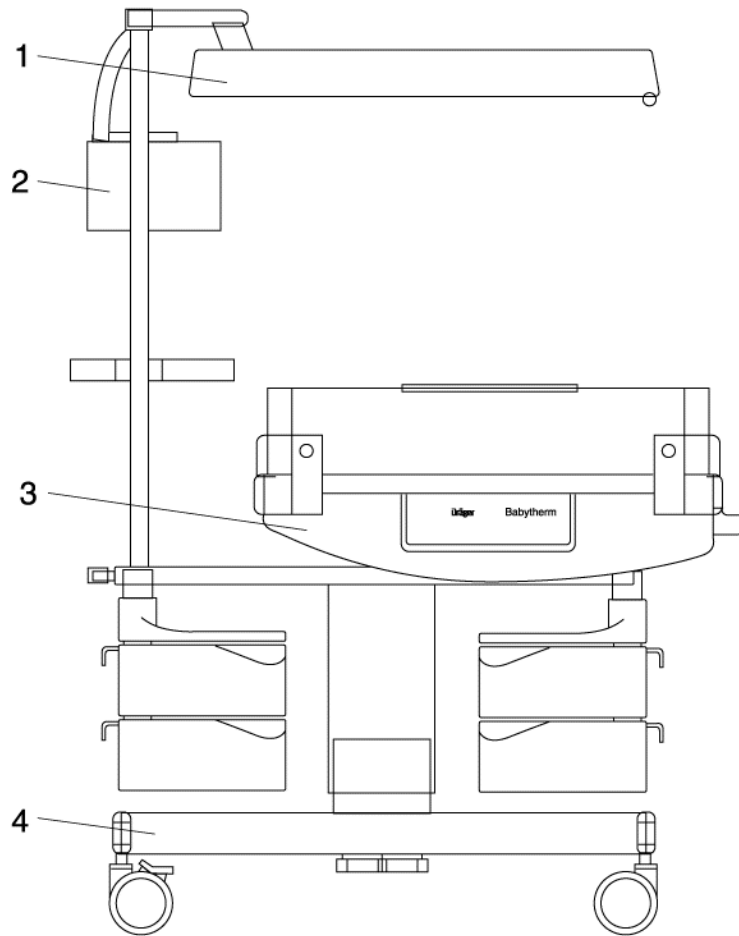


Figure 13 Babytherm 8010 (front view)

Legend

1	Radiant warmer
2	Control unit
3	Bed assembly
4	Trolley without electrical height adjustment Trolley with electrical height adjustment (option)

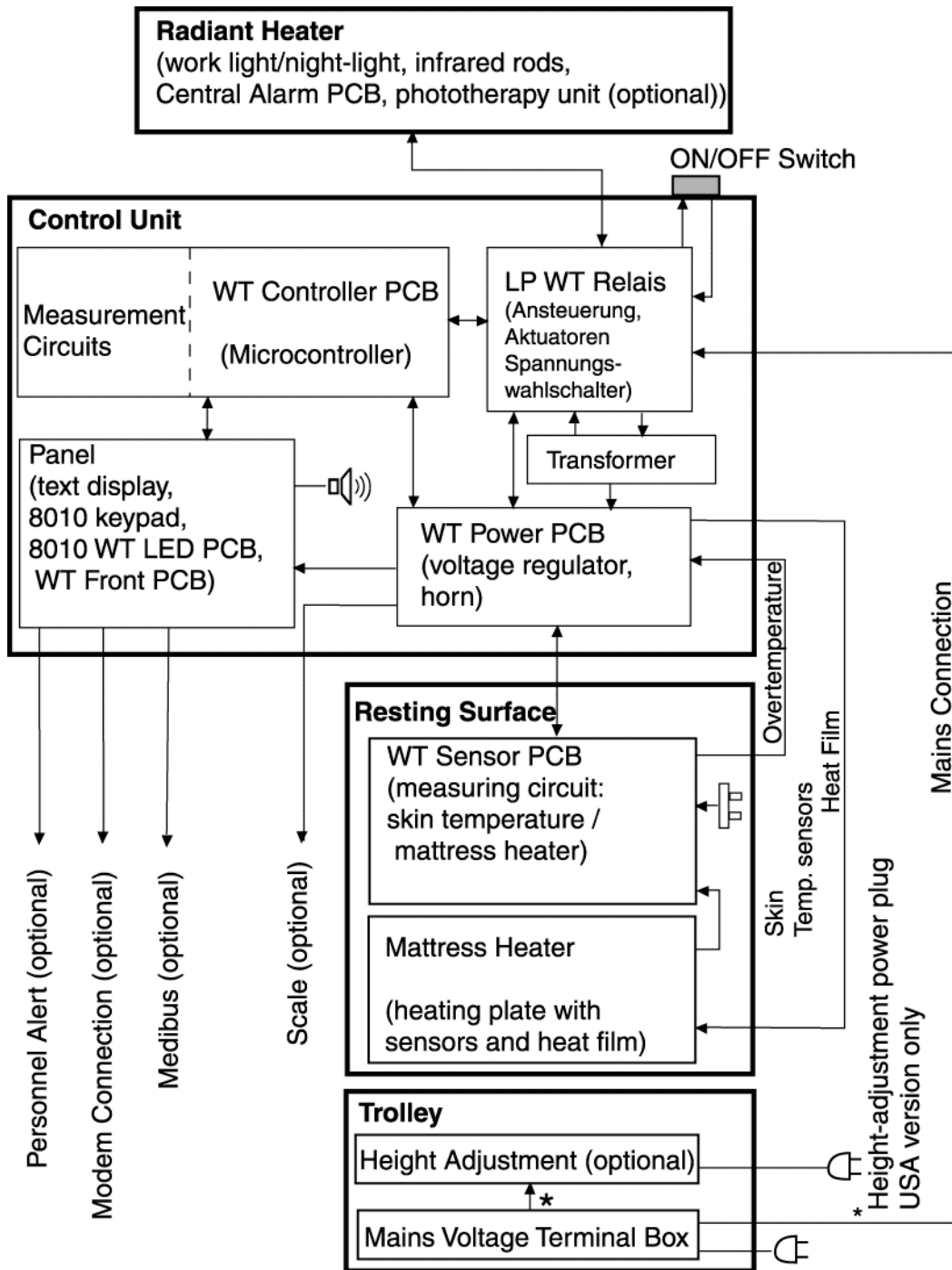


Figure 14 Block diagram of the Babytherm 8010

\* The connection from the mains voltage terminal block to the height adjustment does not exist in USA units

2.1 Radiant warmer

The radiant warmer emits a preset amount of heat. A multicore cable connects the radiant warmer to the control unit.

The radiant warmer contains the following parts:

- Two infrared elements (total power 600 W)
- Energy-saving lamp (7 W)
- Energy-saving lamp (23 W)
- Central Alarm PCB
- Six halogen lamps (50 W) for phototherapy (option)
- Switched Mode Power Supply PCB for phototherapy (option)

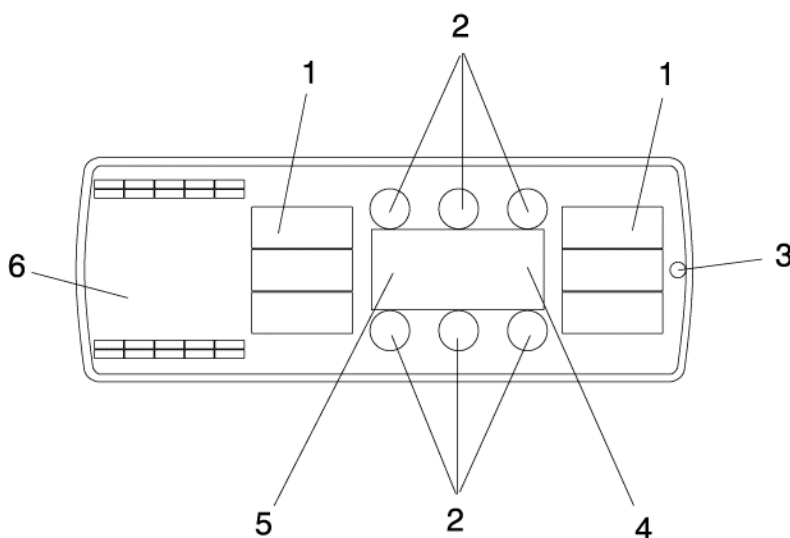


Figure 15 Radiant warmer (bottom view)

Legend

1	Infrared element
2	Halogen lamps for phototherapy
3	Central Alarm PCB
4	Energy-saving lamp 1
5	Energy-saving lamp 2
6	Switched Mode Power Supply PCB for phototherapy (option)

**NOTE**

If the work light button is pressed, both energy-saving lamps (energy-saving lamp 1 and 2) come on. If the night light button is pressed, only energy-saving lamp (1) comes on.

2.2 Control unit

The control unit controls the functions of the Babytherm 8010.

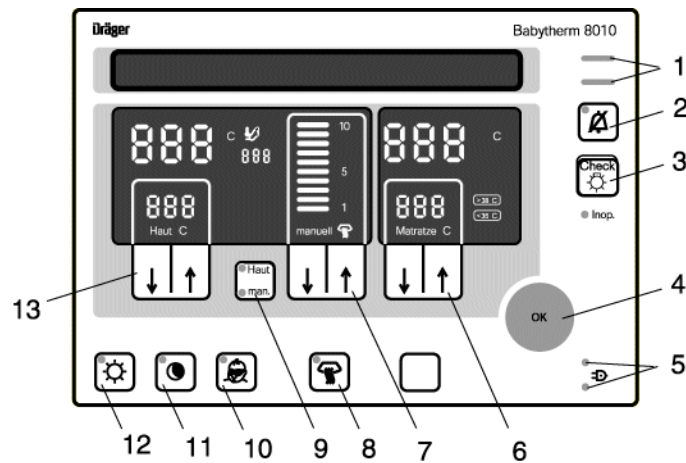


Figure 16 Control unit of the Babytherm 8010 (front view)

Legend

1	Alarm LED (red alarm LED = Warning, yellow alarm LED = Caution)
2	15-minute alarm silence button
3	Check button (for checking LEDs, 7-segment displays, audible alarm)
4	OK button
5	Operation indicators (green LED = ON, red LED = mains power failure)
6	Mattress heater target value setting
7	Radiant warmer heat levels setting
8	Radiant warmer ON/OFF button
9	"Skin/man." button (toggles between manual mode and skin-temperature control mode)
10	Phototherapy ON/OFF button (option)
11	Night light ON/OFF button (energy-saving lamp 1)
12	Work light ON/OFF button (energy-saving lamps 1 and 2)
13	Skin-temperature control target value setting

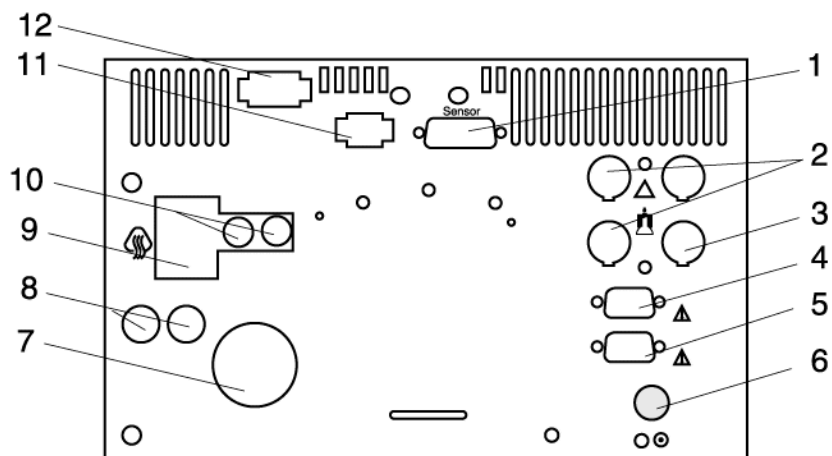


Figure 17 Control unit (rear view), cover plate removed

Legend

1	WT Sensor PCB socket
2	Maximum of 3 connections for auxiliary equipment (workplace), nurse call (connection for central alarm)
3	Connection for internal paging system, nurse call (connection for central alarm)
4	RS 232 interface (modem), option
5	RS 232 interface (BabyLink), option
6	Control unit ON/OFF switch
7	Mains voltage selector
8	Fuses
9	Radiant warmer connection
10	Fuses
11	Mattress heater connection
12	Mains voltage supply connection

The control unit contains the following assemblies:

- ON/OFF switch
- Toroidal-core power transformer
- WT Power PCB
- WT Relay PCB
- WT Controller PCB
- Front (WT LED 8010 PCB, membrane keypad 8010, text display, WT Front PCB, loudspeaker)

2.2.1 ON/OFF switch

The ON/OFF switch is used to switch the mains voltage (single-pole) ON or OFF.

**2.2.2 Toroidal-core power transformer**

The toroidal-core power transformer supplies the electronic assembly and the mattress heater with the following AC voltages:

- approx. 24 VAC
- approx. 9 VAC

**2.2.3 WT Power PCB**

The WT Power PCB has the following function blocks:

- Bridge rectifier
- Voltage regulator (+5 VD)
- Voltage regulator (+5 V LED)
- GoldCap
- Charging circuit (GoldCap)
- Mains power failure detection (powerfail)
- Buzzer (mains power failure)
- Alarm LED control (mains power failure)
- Serial data transfer
- Multiplexer
- Addressing and controlling of actuators and safety relays
- Mattress heater control/scan

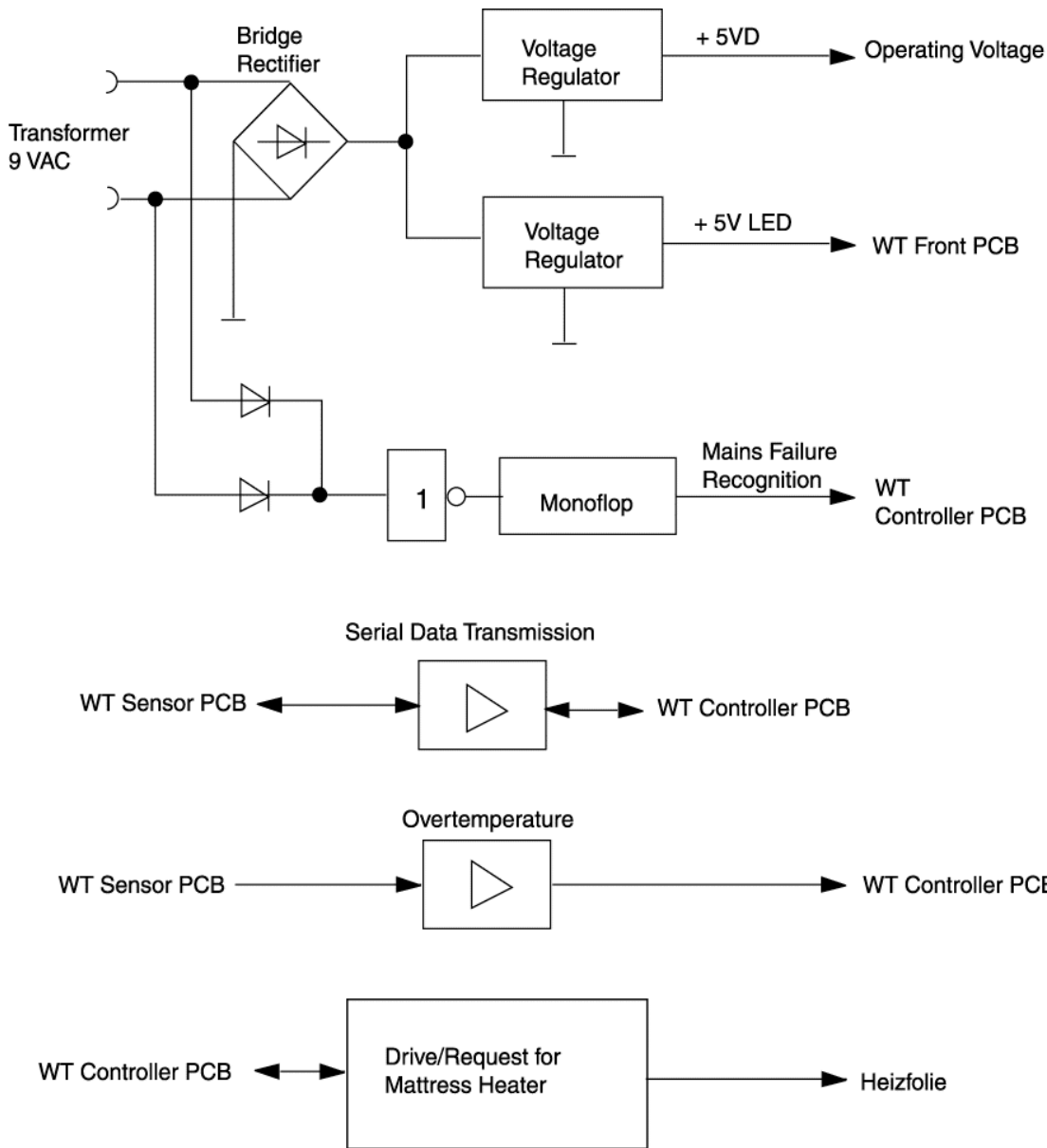


Figure 18 Block diagram 1 of WT Power PCB



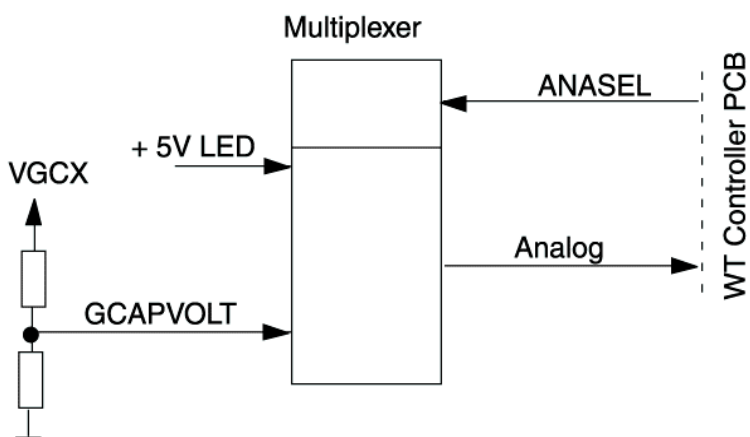
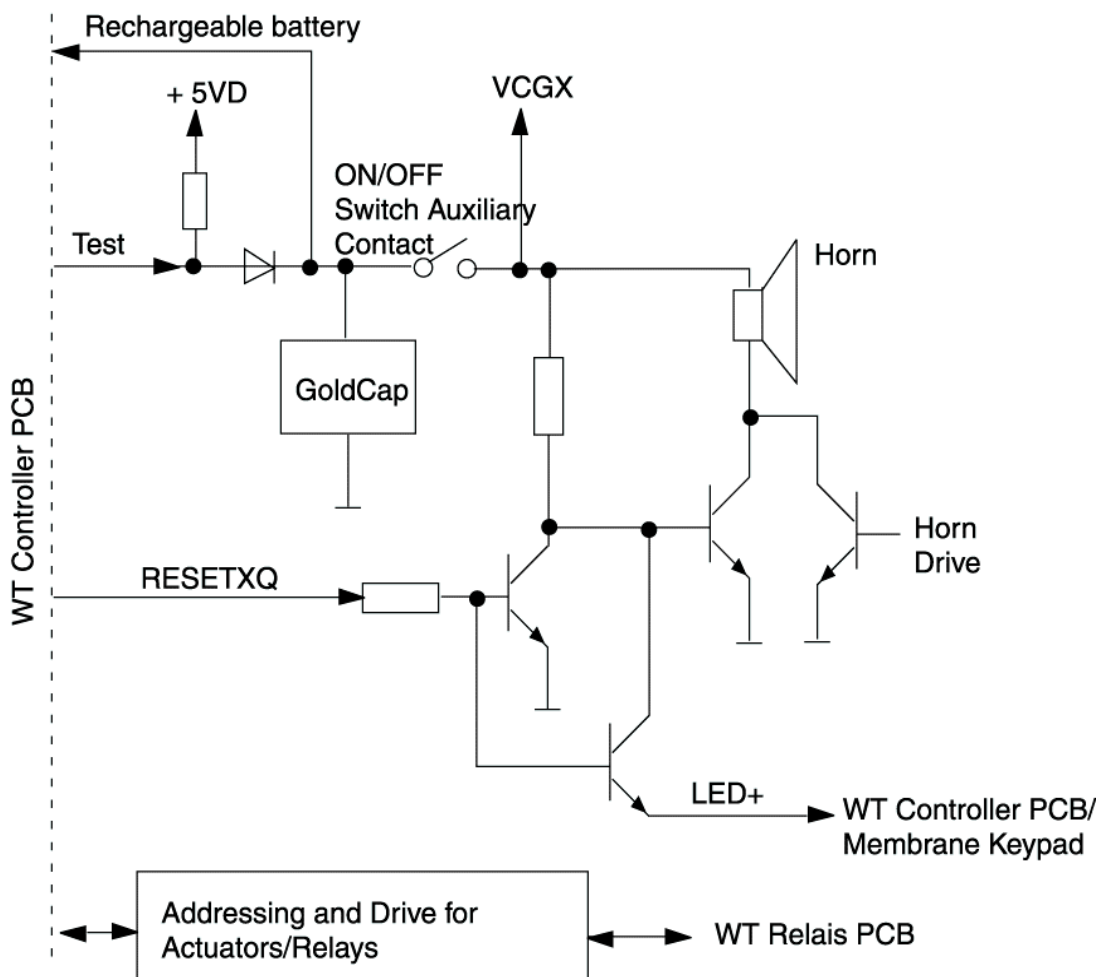


Figure 19 Block diagram 2 of WT Power PCB

**Bridge rectifier**

The toroidal-core power transformer supplies the bridge rectifier input with approx. 9 VAC which are used to generate an unregulated direct voltage (9 VDC).

**Voltage regulator (+5 VD)**

A voltage regulator uses the unregulated direct voltage (9 VDC) to generate the regulated operating voltage (+5 VD).

**Voltage regulator (+5 V LED)**

A voltage regulator uses the unregulated direct voltage (9 VDC) to generate the regulated operating voltage (+5 V LED).

**GoldCap**

In the event of a mains power failure, the GoldCap capacitor supplies the buzzer and the power failure LED with operating voltage. The GoldCap voltage “battery” buffers also the RAM of the microcontroller.

**Charging circuit (GoldCap)**

The internal operating voltage +5 VD charges the GoldCap by means of a resistor-diode charging circuit. The charging circuit is switched off at 1-second intervals for test purposes.

**Mains power failure detection (powerfail)**

A monoflop monitors the mains power supply failure.

**Buzzer (mains power failure)**

A GoldCap capacitor supplies the buzzer with operating voltage in the event of a mains power failure.

**Alarm LED control (mains power failure)**

A GoldCap capacitor supplies the alarm LED with operating voltage in the event of a mains power failure.

**Serial data transfer**

A driver module amplifies the serial measurement data (skin temperature, mattress temperature and overtemperature) and the test signals.

**Multiplexer**

The multiplexer applies the voltages (GCAPVOLT, +5 V LED) to the WT Controller PCB for checking.

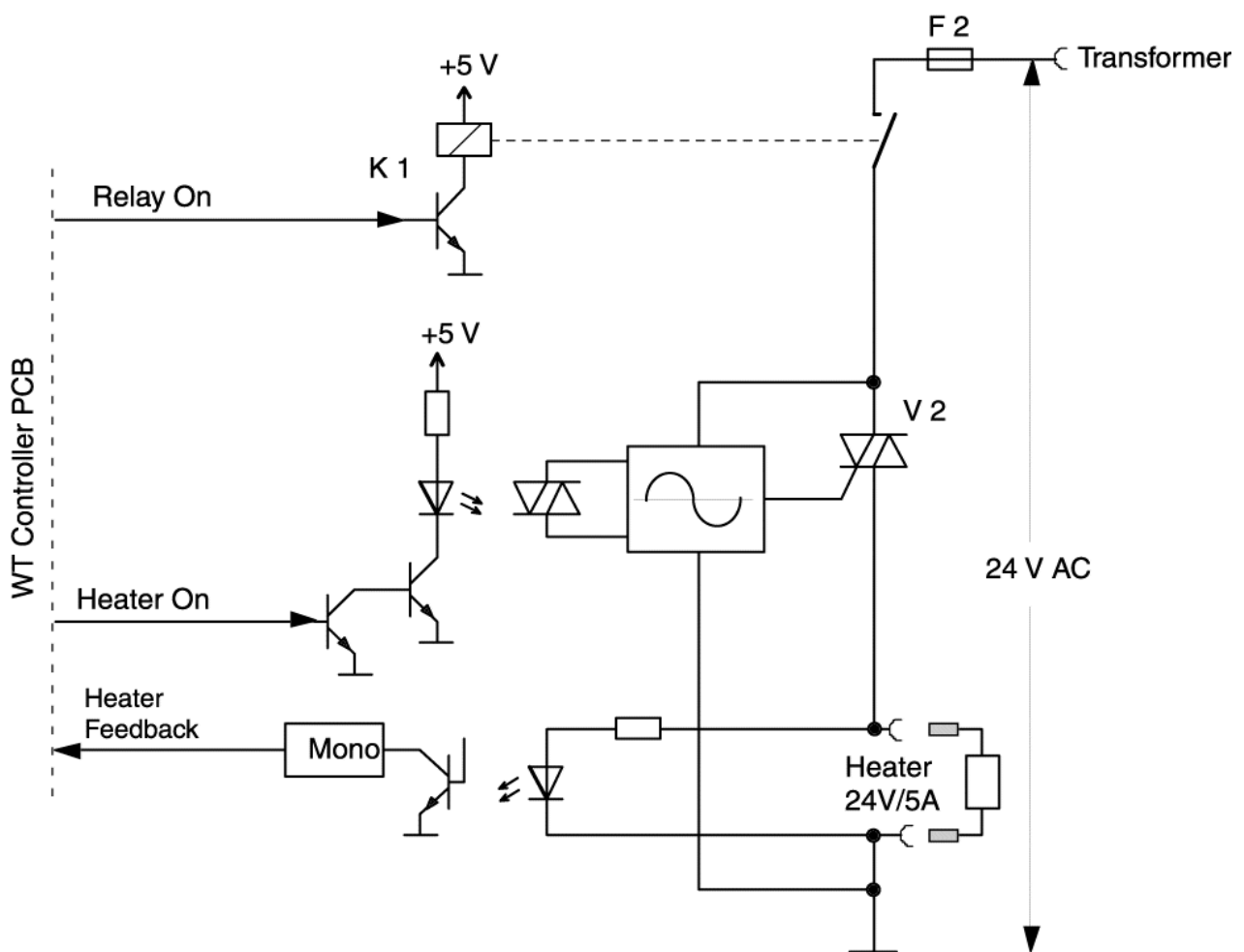
**Addressing and controlling of actuators and relays**

An addressing module, a shift register and an amplifier module control the actuators and the safety relay from the radiant warmer.

**Mattress heater control and scan**

The operating voltage of the mattress heater is approx. 24 VAC. The heating circuit is electrically isolated from the direct voltage and protected with a fuse. In the event of a malfunction, a safety relay interrupts the heating circuit. During operation, a triac switches the heater. An upstream zero voltage and phase group switch switches the heater on only during the positive pass of the AC voltage and off during the negative pass of the AC voltage.

The voltage drop at the mattress heater and a parallel-connected optocoupler generate pulses which activate a monoflop. The output of the monoflop signals the operating status of the mattress heater.



**Figure 20** Block diagram 3 of WT Power PCB

2.2.4 WT Relay PCB

The relays on the WT Relay WT control the energy-saving lamps, the infrared elements, the Central Alarm PCB and the phototherapy assembly (option) of the radiant warmer. A thyristor controls the infrared elements.

The WT Relay PCB carries the following subassemblies:

- Mains voltage selector
- Control and feedback of the infrared elements
- Safety relay of the infrared elements
- Relay for the energy-saving lamps and phototherapy assembly (option)
- Control of the Central Alarm PCB

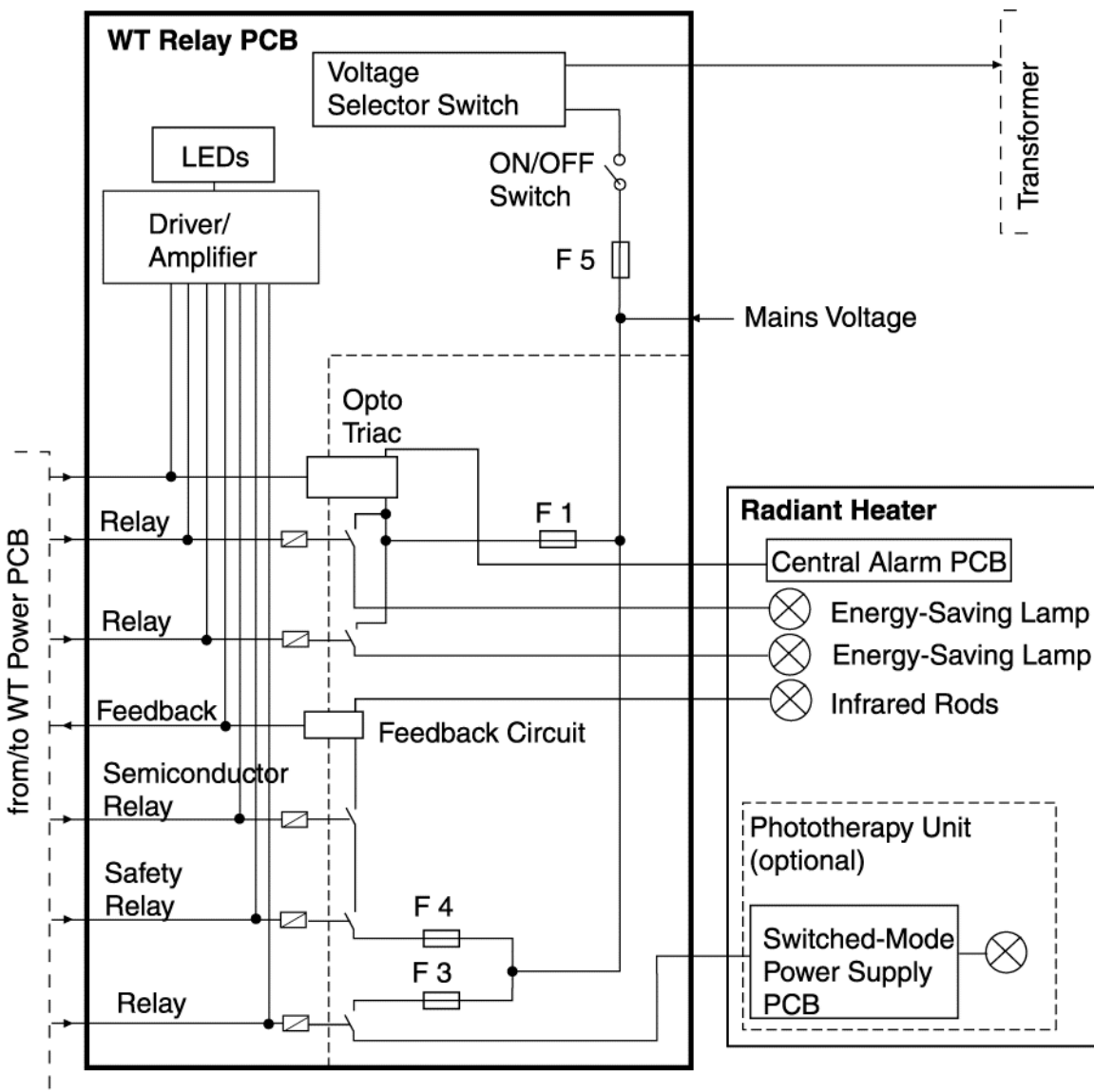


Figure 21 Block diagram of the WT Relay PCB

Mains voltage selector

The mains voltage selector adapts the primary circuitry of the toroidal-core power transformer to the local mains voltage.

**Control and feedback of the infrared elements**

An optocoupler controls the triac which supplies the infrared elements with mains voltage. This current flow generates a feedback signal via the optocoupler.

**Safety relay of the infrared elements**

In the event of a malfunction (e.g. "Inop"), the safety relay switches off the mains voltage to the infrared elements.

**Relay for the energy-saving lamps and phototherapy assembly (option)**

The relays supply the energy-saving lamps and the the phototherapy assembly (option) with mains voltage.

**Control of the Central Alarm PCB**

An opto-triac on the WT Relay PCB controls the central alarm light. The forced-tripped opto-triac supplies the Central Alarm PCB with mains voltage.

**2.2.5 WT Controller PCB**

The WT Controller PCB carries the following subassemblies:

- Microcontroller
- Quartz
- EPROM
- EEPROM
- RAM
- Watchdogs
- Driver modules
- Multiplexer and A/D converter
- Connection and control of the mattress heater safety relay

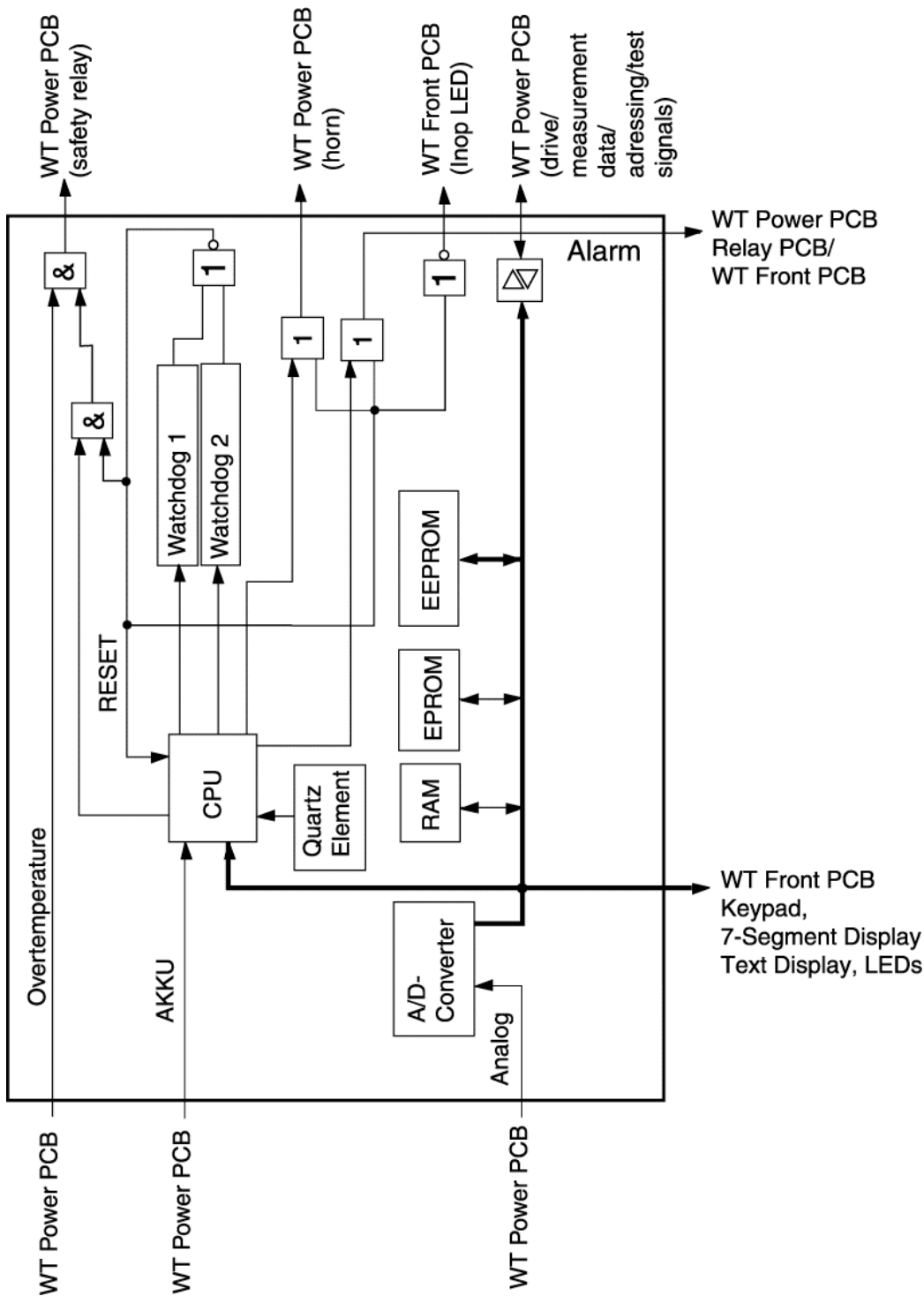


Figure 22 Block diagram of the WT Controller PCB

**Microcontroller**

The microcontroller controls and monitors the program of the Babytherm. The microcontroller has one 2-kByte RAM. The set values are stored and buffered in this RAM. The RAM buffer voltage “battery” is generated by the GoldCap.

**Quartz**

The quartz generates a clock frequency of about 32 kHz. The microcontroller uses this clock frequency to generate 16 kHz.

**EPROM**

The EPROM contains the software program of the Babytherm.

**EEPROM**

The device configuration data are stored in the EEPROM.

**RAM**

The RAM is a random-access memory.

**Watchdogs**

The watchdogs monitor the software program sequence of the microcontroller. The watchdogs are counter modules that are clocked by a separate quartz.

An "EMERGENCY STOP" signal is generated if the microcontroller does not reset the counter modules.

**Driver modules**

The driver modules amplify and regulate the signals for the actuator control.

**Multiplexer and A/D converter**

The multiplexer converts the +5 VLED voltage and the GoldCap voltage into a digital data word. This data word is sent to the microcontroller for evaluation.

**Connection and control of the mattress heater safety relay**

The overtemperature signal from the WT Power PCB and the output signal of the watchdogs are connected to the control signal of the mattress heater safety relay.

If an overtemperature is present at the mattress heater or if the watchdogs are not reset regularly, the mattress heater safety relay on the WT Power PCB switches off.

**2.2.6 WT Sensor PCB**

The WT Sensor PCB carries the following subassemblies:

- Receiver and transmitter for serial data transfer
- Selection logics of test signals
- Measuring amplifier (skin temperature, mattress heater)
- Overtemperature comparators
- Test circuit (41.6 °C mattress heater)
- Test circuit (36 °C skin temperature)
- A/D conversion with multiplexer



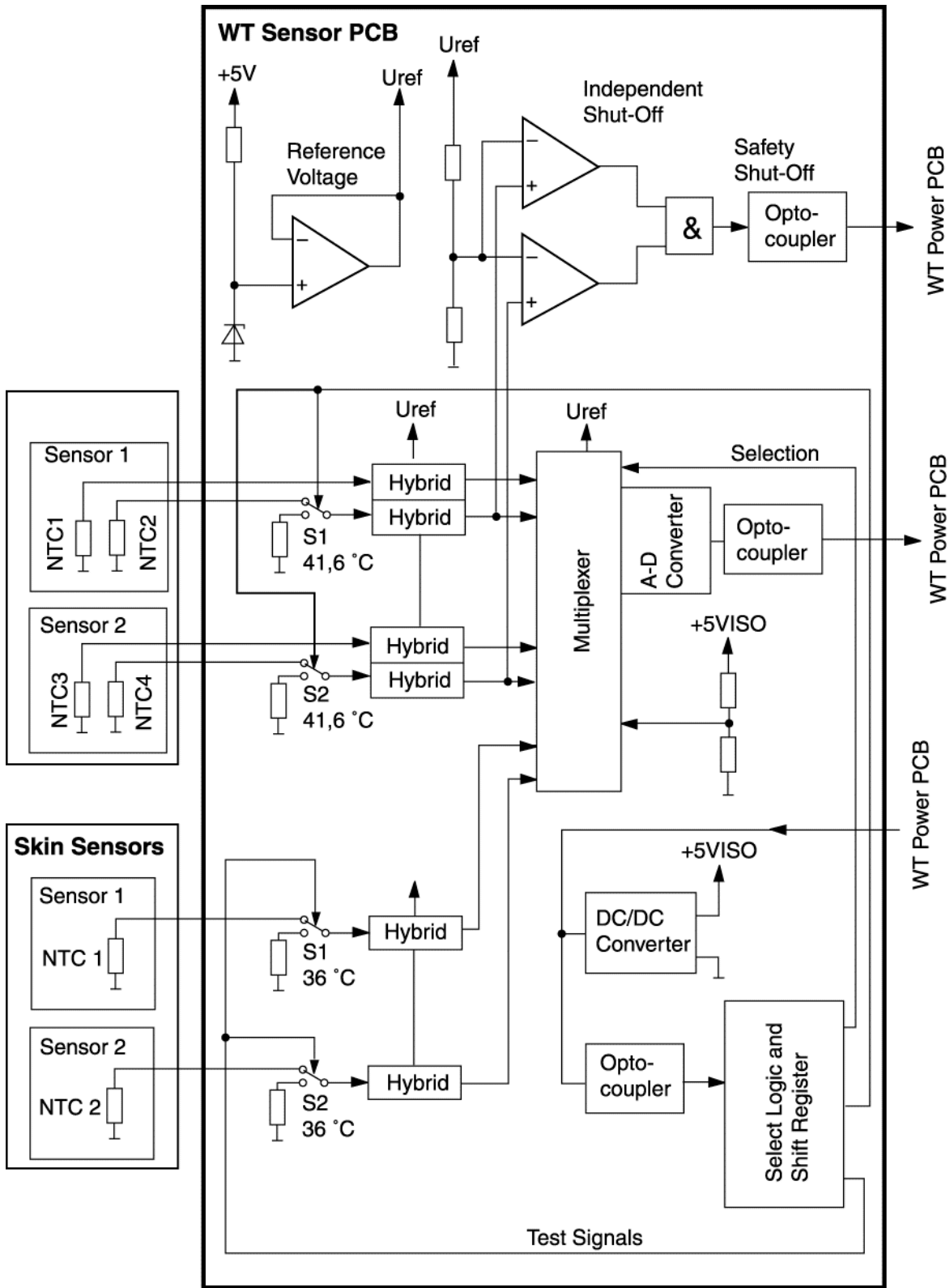


Figure 23 Block diagram of the WT Sensor PCB

### Receiver and transmitter for serial data transfer

Optocouplers transmit the serial measured data (mattress heater, skin temperature) to the WT Power PCB. An optocoupler receives the serial test signals for the measuring circuits. An optocoupler transmits the overtemperature signal to the Power PCB.

### Selection logics of test signals

An addressing module and a shift register convert the serial test signals into parallel data.

The test signals activate the following test circuits:

- Overtemperature of mattress heater (41.6 °C)
- Skin temperature (36 °C)

### Measuring amplifier (skin temperature, mattress heater)

Two skin-temperature hybrids measure the skin temperature.

Four measuring amplifiers (NTCs) measure the mattress temperature in pairs. The NTCs are fitted in pairs to the mattress heater. The measured values of one measuring pair must not deviate by more than 0.5 °C from each other. Both measuring pairs must not deviate by more than 5 °C from each other. One measuring amplifier for each pair evaluates the overtemperature of the mattress heater (greater than/equal to 41.6 °C).

### Overtemperature comparators

Two comparators evaluate the signals for the mattress heater overtemperature. The comparators are adjusted to a voltage value that corresponds to a mattress temperature of greater than/equal to 41.6 °C.

If the mattress temperature reaches or exceeds 41.6 °C, the output level of the respective comparators goes towards zero volt. The safety relay of the mattress heater is switched off by the hardware.

### Test circuit (41.6 °C mattress heater)

A test circuit checks the function of the mattress heater overtemperature comparator at regular intervals.

### Test circuit (36.0 °C skin temperature)

The software checks the skin-temperature hybrids.

The test circuits are provided with reference resistors. They are located at the inputs of the skin-temperature hybrids. The output voltage values of the skin-temperature hybrids correspond to a temperature of 36.0 °C.

### A/D conversion with multiplexer

The multiplexer transmits the analog measuring signals of the skin temperature to the integrated A/D converter. The serial output signal of the A/D converter is applied to an optocoupler.

2.3 Front

The front comprises the following subassemblies:

- WT LED 8010 PCB
- Membrane keypad 8010
- Text display
- WT Front PCB
- Loudspeaker

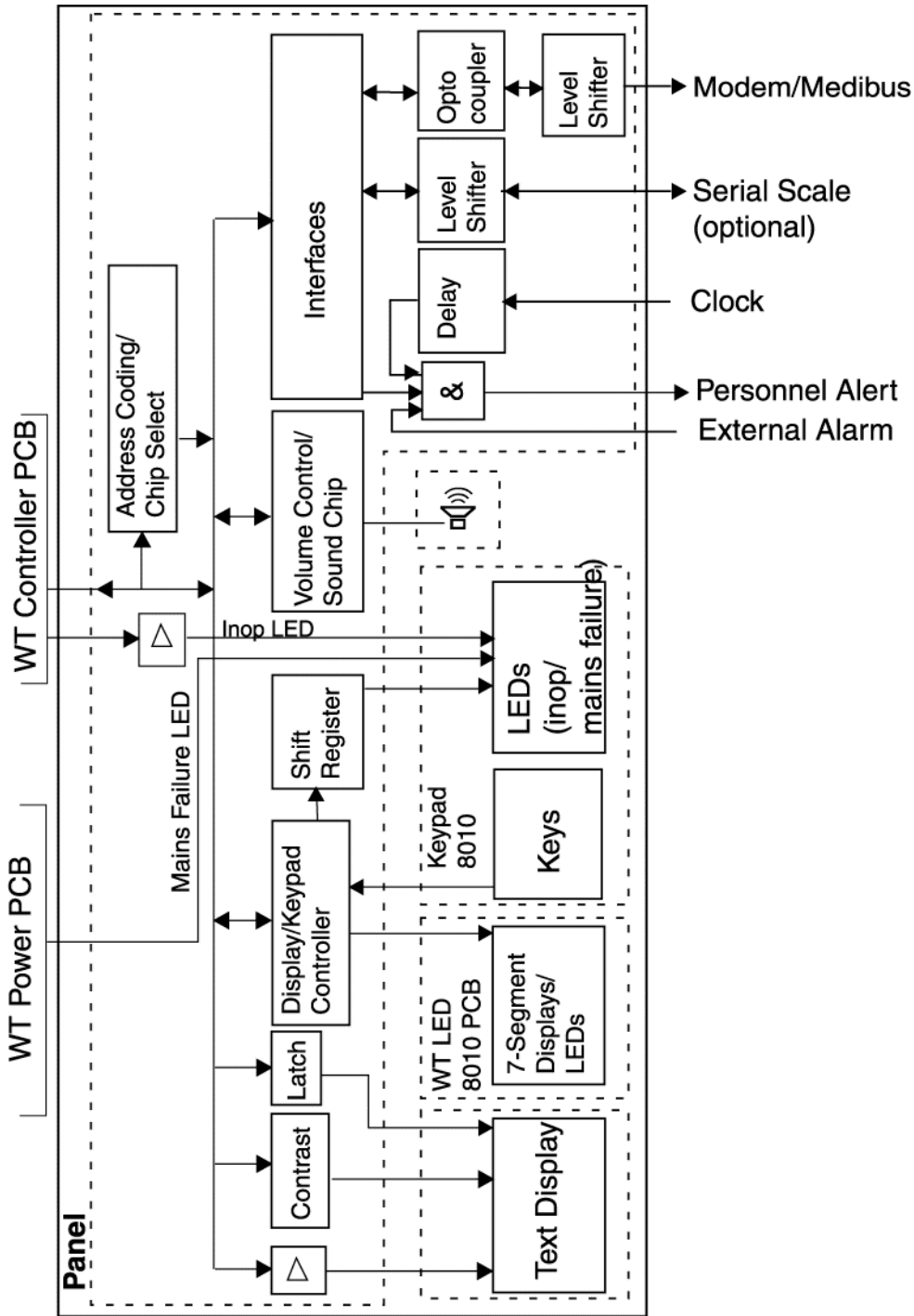


Figure 24 Block diagram of the front

- 2.3.1 WT LED 8010 PCB** The WT LED 8010 PCB carries the 7-segment displays for the measured skin temperature and the foot symbol LED.
- 2.3.2 Membrane keypad 8010** The membrane keypad 8010 has a key matrix, keys and LEDs.
- 2.3.3 Text display (LC display)** The text display shows plain text messages (advisory messages, warnings, alarms, and prompts).
- 2.3.4 Loudspeaker** In the event of alarms or messages, the loudspeaker issues an audible alarm signal. A volume control and a soundchip control the loudspeaker.
- 2.3.5 WT Front PCB** A port module read the key matrix. LED control is carried out by means of decoders, shift registers, and multiplex signals.
- The WT Front PCB carries the following subassemblies:
- Address decoding and chip select
  - Soundchip with volume setting
  - Text display contrast setting
  - Text display latch control
  - Voltage supply to text display backlight
  - Nurse call
  - Interface modules
  - Level converter
  - Optocoupler
  - Display module
  - LED matrix control

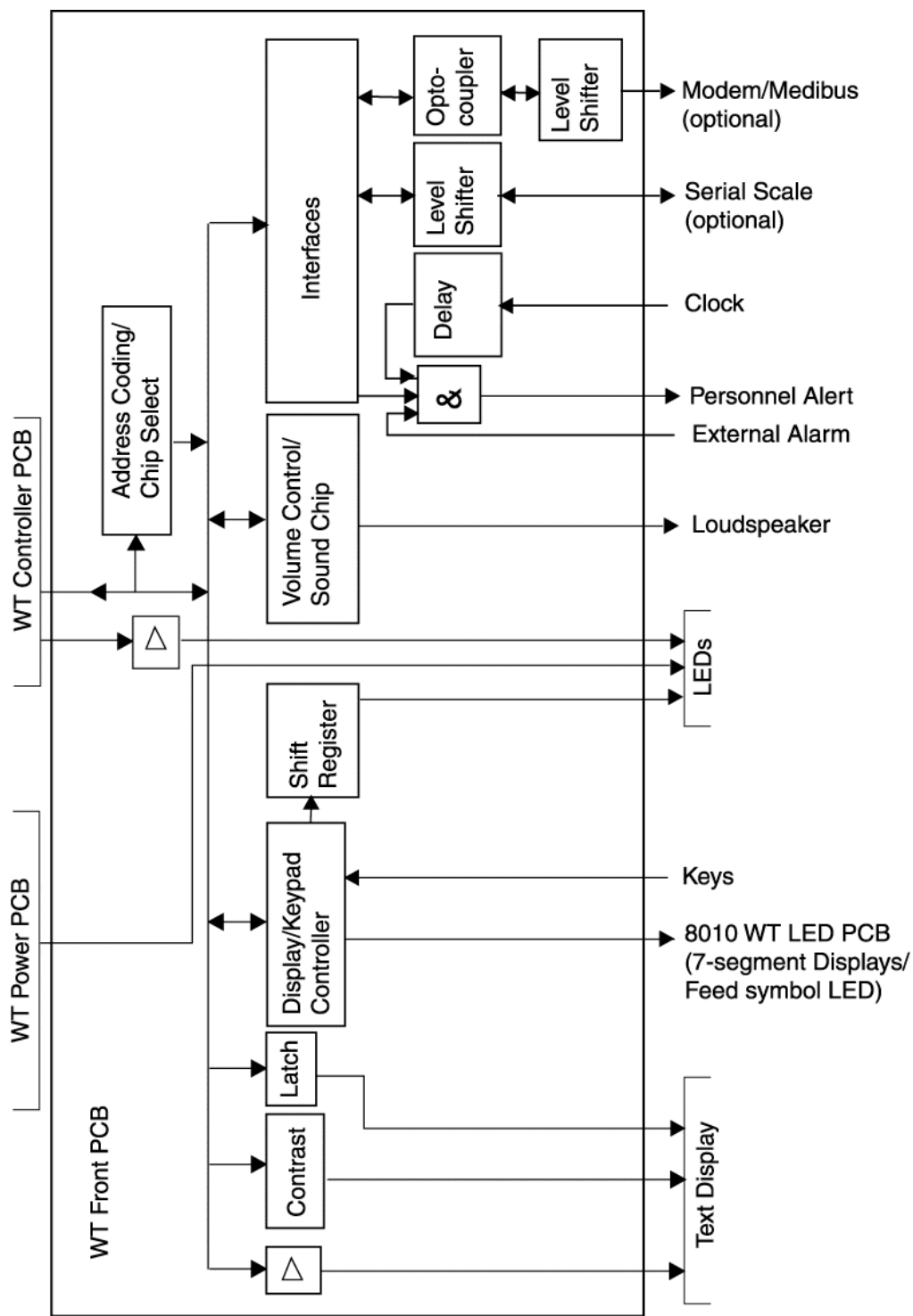


Figure 25 Block diagram of the WT Front PCB

**Address decoding and chip select**

Addressing and selection modules select the different hardware components.

**Soundchip with volume setting**

The microcontroller connects the output signal of the soundchip to the output signal of the volume control. The connected output signal is amplified and transmitted to the loudspeaker.

The microcontroller can control the volume of the volume control via the software.

**Text display contrast setting**

An amplifier module is used to set the contrast of the test display.

**Text display latch control**

Latch modules provide digital control of the text display.

**Voltage supply to text display backlight foil**

A switch-mode regulator supplies the text display backlight foil with a voltage of about 1 to 5 V.

**Nurse call**

A relay is activated in the event of an alarm. The relay functions as a switch. An external alarm device (e.g. nurse call) can be connected to the switch.

An alarm delay prevents the nurse call from being activated immediately after pressing the check key.

**Interface modules**

The interface modules connect the data bus to the peripheral equipment (Medibus, modem, scales).

**Level converter**

The level converters adapt the interface of the WT Front PCB to the interfaces of the peripheral equipment.

**Optocoupler**

Optocouplers electrically isolate the modem, the Medibus and the central alarm from the WT Front PCB.

**Display module**

The display module supplies the 7-segment display with operating voltage and selects the individual key. The display module stores a key operation in the internal memory area and puts this information on the data bus.

**LED matrix control**

A shift register and a selection logics control the LED matrix.

- 3 Trolley**
- The trolley has a small or a large trolley plate. The trolley plate is fitted to the column metal shell by means of wedges.
- The Babytherm is available with different trolleys:
- Babytherm without electrical height adjustment
  - Babytherm with electrical height adjustment (optional)
- 3.1 Electrical height adjustment (option)**
- The trolley with electrical height adjustment has an adjustable working height of 885 mm to 1180 mm (small height-adjustable column) or 950 mm to 1245 mm (large height-adjustable column).
- 3.2 Options**
- Swivel cupboard
  - Infusion stand
  - Canopy
  - Swivel table

#### 4 Bed assembly

The bed assembly is provided with a mattress heater.

The bed assembly has the following subassemblies:

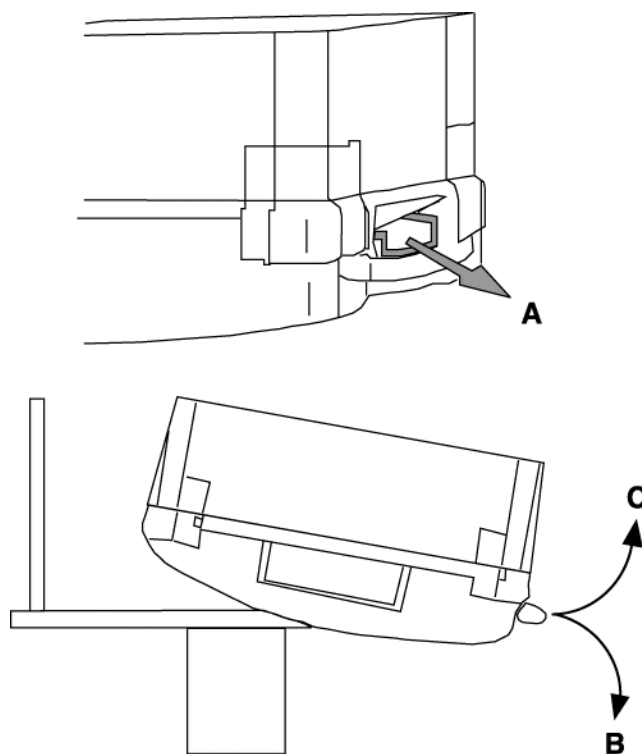
- Bed assembly
- Bottom part of tilt mechanism, screwed to base plate
- Tilt mechanism
- 4 panel mounts

The following side panels can be attached to the bed assembly:

- High side panels (23 cm)
- Low side panels (15 cm)
- Inner panels (7 cm)

The bed assembly can be latched in different positions in finely graduated steps. By tilting the bed the head of the patient can be moved to the maximum head-up position (20°) or to the maximum head-down position (15°).

- Pull the unlocking handle in direction of **A**.
- Pushing the handle down (**B**) will change the head-up position. Pulling the handle up (**C**) will change the head-down position.

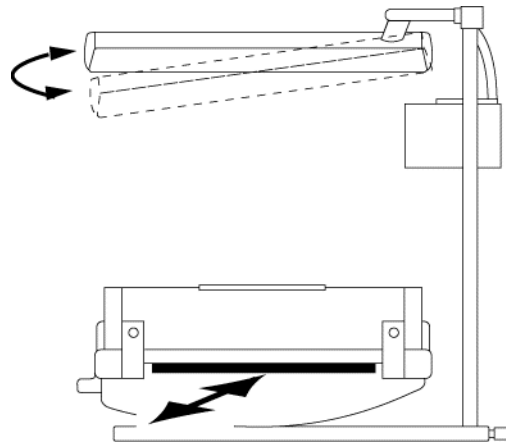


**Figure 26** Tilting the bed



#### 4.1 X-ray drawer

The Babytherm 8010 comes with an X-ray tray.



**Figure 27** Babytherm 8010 with X-ray tray

## 5 Mattresses

The Babytherm 8010 can be equipped with different types of mattresses.

### 5.1 Gel mattress

The gel mattress fits snugly to the body contours of the patient. This produces a large contact surface which transports the heat to the patient and avoids pressure spots (anti-decubitus effect).

The gel is a good heat accumulator. If the mains power supply is interrupted, e.g. for in-hospital transportation, the patient is warmed for about another 15 minutes given a sufficient insulation (bed pillow, canopy). If the gel mattress is cold, heat is dissipated from the patient.

The viscosity of the gel does not change even when the bed is tilted. The gel mattress is covered with a soft, non-irritant layer.

#### WARNING

**Danger of burns to the patient! Do not use the gel mattress in units which allow a mattress tray heating temperature of more than 40 °C. The patient would be heated to more than 40 °C. Use the gel mattress only in units which allow a mattress tray heating temperature of less than 40 °C.**

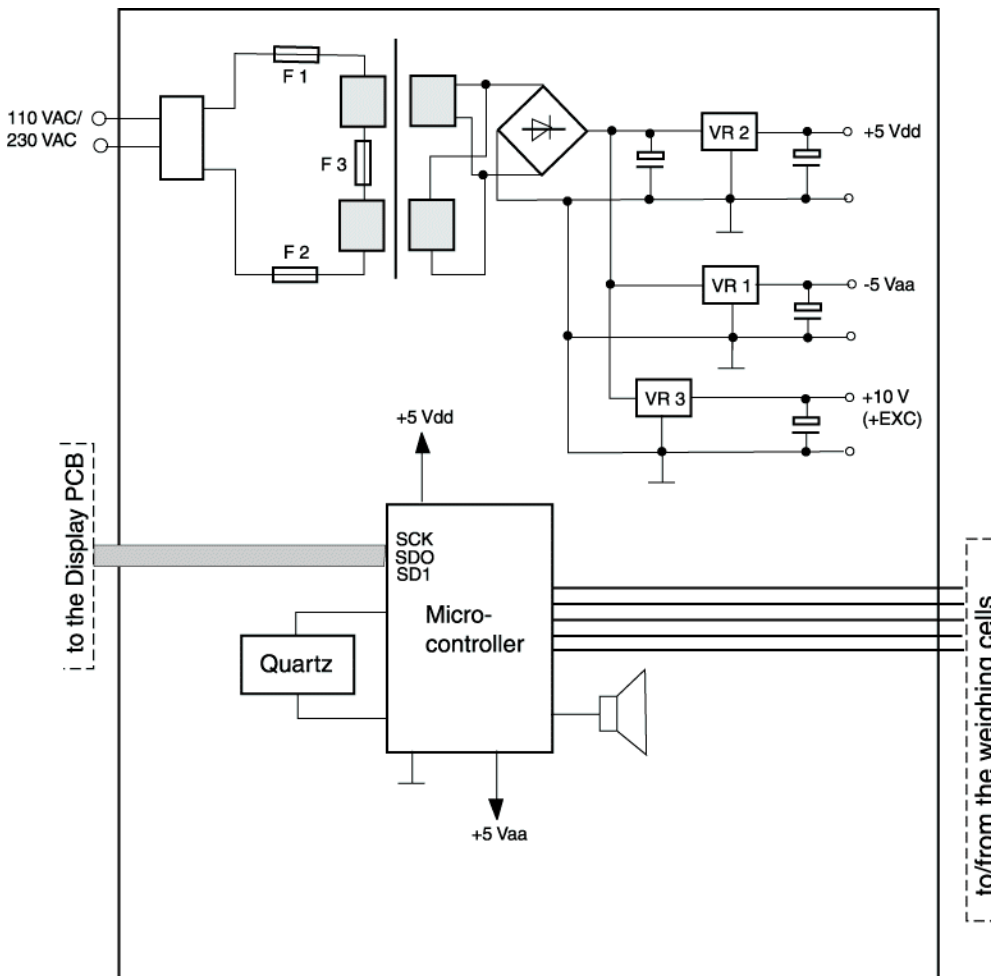
#### WARNING

**Risk of hypothermia in the patient! Do not use the gel mattress when the mattress tray heater is switched off! Always switch the mattress tray heater on when using the gel mattress.**

#### CAUTION

**Risk of irreversible damage to the gel mattress! Sharp objects may irreversibly damage the gel mattress. Keep sharp objects away from the gel mattress.**

- 5.2 Foam mattress** Use the foam mattress when operating the Babytherm 8010 without the mattress tray heater.
- 6 Pneumatic aspiration** The Babytherm offers two suction methods:
- Suction (–0.9 bar)
  - Suction (–0.5 bar)
- An ejector generates a stepless vacuum. The oxygen or compressed-air system supply the suction device. All contaminated plastic parts can be autoclaved at 134 °C.
- 7 Scales (Scale-Tronix)** The scales allows the operator to weigh the patient directly on the bed.
- The scales comprise the following subassemblies:
- Main PCB
  - Display PCB
  - Front Panel PCB
  - Weighing unit with weighing cells
- 7.1 Main PCB** The supply voltage of the Main PCB is 110 VAC to 127 VAC or 200 VAC to 240 VAC, depending on the local mains voltage used. From this voltage the Main PCB generates the operating voltages +5 Vdd and +5 Vaa.
- The Main PCB comprises the following subassemblies:
- Voltage selector
  - Transformer
  - Rectifier
  - Voltage regulator
  - Microcontroller
  - Quartz
  - Piezo loudspeaker
  - Reference voltage generation



**Figure 28** Block diagram of the Main PCB

- 7.1.1 Voltage selector** The voltage selector is used to adapt the scales' mains supply voltage to the local mains voltage.
- 7.1.2 Transformer** The transformer transforms the mains voltage into a 12 VAC output voltage.
- 7.1.3 Rectifier** The bridge rectifier rectifies the 12 VAC voltage into a 12 VDC voltage.
- 7.1.4 Voltage regulator** Two voltage regulators use the 12 VDC voltage to generate the operating voltages +5 Vdd and +5 Vaa.
- 7.1.5 Microcontroller** The microcontroller CS5532 has an internal 24-bit analog/digital converter, amplifiers and filter modules.
- 7.1.6 Quartz** The quartz clocks the microprocessor with 4.9152 MHz.
- 7.1.7 Piezo loudspeaker** The piezo loudspeaker issues audible signals. The operating voltage is +5 Vdd.

**7.1.8 Reference voltage generation**

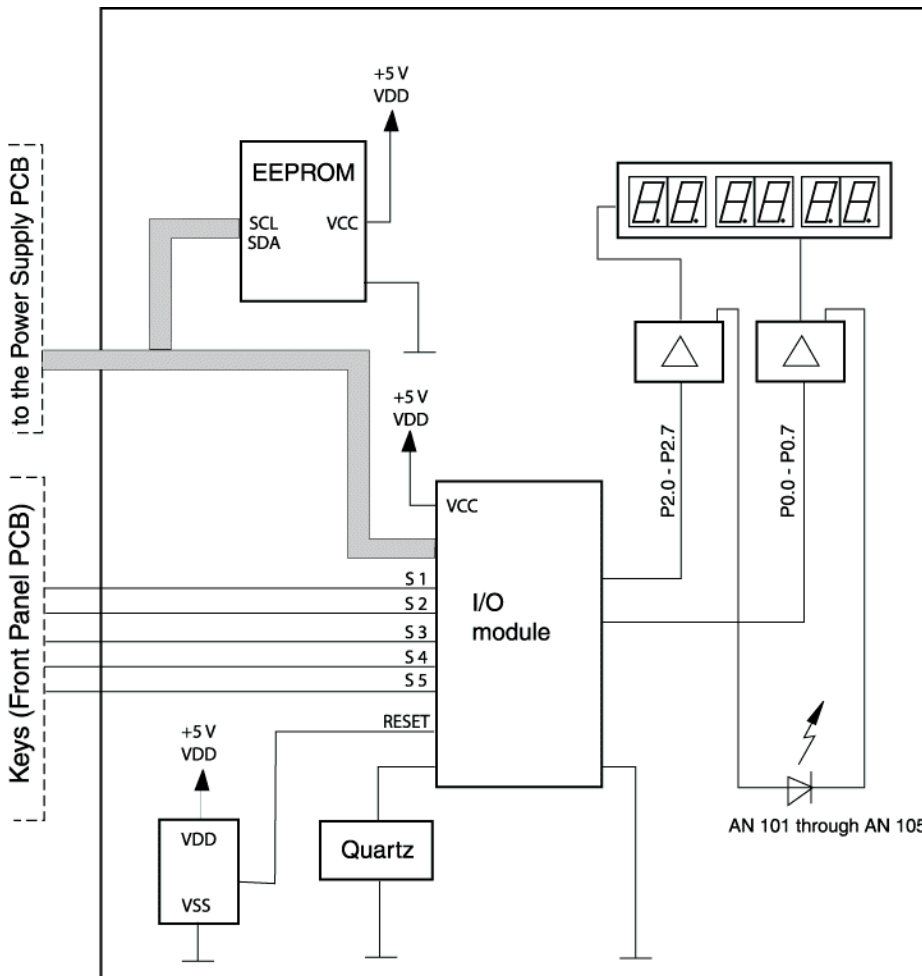
A voltage regulator regulates the transformer output voltage to 10 VDC (+EXC). The 10 VDC is the supply voltage to the weighing unit and weighing cells.

**7.2 Display PCB**

The Display PCB visually indicates the zero setting, the no-load weight and the measured weight on six 7-segment displays and the desired weight setting and weighing prompts by means of LEDs.

The Display PCB has the following subassemblies:

- EEPROM (electrically erasable, programmable read-only memory)
- I/O module
- LEDs
- 7-segment displays control
- 7-segment displays
- Quartz
- +5 V voltage monitoring



**Figure 29** Block diagram of the Display PCB

- 7.2.1 EEPROM** The device configuration data are stored in the EEPROM.
- The EEPROM is connected to the serial data bus of the microcontroller. The EEPROM characterizes the machine (enabled options, serial number, etc.).
- 7.2.2 Microcontroller** The microcontroller CS5532 has an internal 24-bit analog/digital converter, amplifiers and filter modules.
- 7.2.3 LEDs** Five LEDs indicate the following functions:
- Weight in “pounds”
  - Weight in “ounces”
  - Weight in “kilograms”
  - “Lift” baby
  - “Lower” baby
- 7.2.4 LEDs control** Two integrated circuits amplify the output signals of the microcontroller. The amplified output signals are applied to the LEDs and the 7-segment displays.
- 7.2.5 7-segment displays** The six 7-segment displays show the following:
- Dots (upon power-on of the scales and during zero setting)
  - Digits (empty weight and measured weight)
- 7.2.6 Quartz** The quartz clocks the microprocessor with 22.1184 MHz.
- 7.2.7 +5 V voltage monitoring** An IC (IC = integrated circuit) monitors the +5 V operating voltage.
- If the voltage falls below or exceeds a specific value stored in the unit, the IC sends a “reset” signal to the microprocessor. The microprocessor stops the program and restarts it.
- 7.3 Front Panel PCB** The Front Panel PCB comprises the front membrane with the following keys:
- ON/OFF switch (start/standby)
  - Weight in “Lb” and “oz” and “Kg”
  - Lift the baby (reweigh)
  - Place baby on bed (weigh)
- The keys are directly connected to the input of the microcontroller.
- 7.4 Weighing cells** The weighing cell are very sensitive and accurate components. They generate an output voltage which is directly proportional to the weight. The weighing platform has four separate weighing cell on the same level, one at each corner of the weighing platform. The individual weighing cells are connected in parallel in order to “add up” the weight measured at each corner. 10 VDC operating voltage (+EXC and -EXC) is applied to the four individual weighing cells. The output signals of the weighing cells are “+SIG” and “-SIG”.



# Maintenance Procedures





## 1 Worklight

### 1.1 General information about the worklight

The large energy-saving lamp of the radiant heater must be replaced if it is faulty.

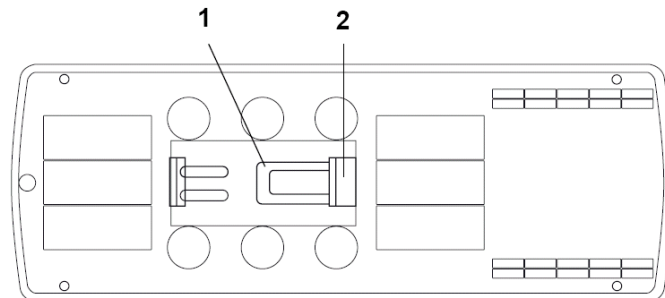
### 1.2 Dismounting/replacing the worklight

- Plug the Babytherm power cord into the mains socket-outlet.
- Set the electrical height adjustment (option) of the Babytherm to the lowest position.
- Unplug the Babytherm power cord from the mains socket-outlet.

#### WARNING

**Risk of burns! The infrared rods or the protective screen may cause burns if touched shortly after use of the radiant heater. Allow the radiant heater to cool off for at least 15 minutes before servicing.**

- Swivel the radiant heater in your direction.
- Remove the faulty energy-saving lamp **1** (worklight) by holding the lamp mount **2** and by turning the energy-saving lamp counter-clockwise.



**Fig. 1:** Radiant heater actuators (underside); removing the worklight.

- Fit the new energy-saving lamp **1** (worklight) by holding the lamp mount **2** and by turning the energy-saving lamp clockwise (hand-tight).
- Plug the Babytherm power cord into the mains socket-outlet.
- Switch the Babytherm on.
- Press the worklight button on the control unit.

Both energy-saving lamps (worklight and nightlight) of the radiant heater come on.

## 2 Nightlight

### 2.1 General information about the nightlight

The small energy-saving lamp (nightlight) of the radiant heater must be replaced if it is faulty.

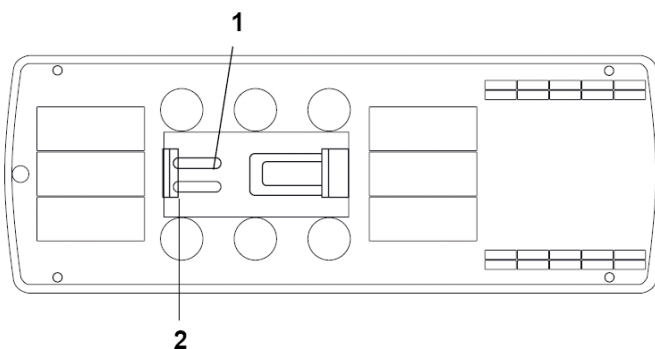
### 2.2 Dismounting/replacing the nightlight

- Plug the Babytherm power cord into the mains socket-outlet.
- Set the electrical height adjustment (option) of the Babytherm to the lowest position.
- Unplug the Babytherm power cord from the mains socket-outlet.

#### WARNING

**Risk of burns! The infrared rods or the protective screen may cause burns if touched shortly after use of the radiant heater. Allow the radiant heater to cool off for at least 15 minutes before servicing.**

- Swivel the radiant heater in your direction.
- Remove the faulty energy-saving lamp **1** (nightlight) by holding the lamp mount **2** and by turning the energy-saving lamp counter-clockwise.



**Fig. 2:** Radiant heater actuators (underside); removing the nightlight.

- Fit the new energy-saving lamp **1** (nightlight) by holding the lamp mount **2** and by turning the energy-saving lamp clockwise (hand-tight).
- Plug the Babytherm power cord into the mains socket-outlet.
- Switch the Babytherm on.
- Press the nightlight button on the control unit.

The small energy-saving lamp (nightlight) on the radiant heater comes on.

### 3 Phototherapy lamps (option)

#### 3.1 General information about the phototherapy lamps

Have the phototherapy lamps (halogen lamps) replaced with a complete set of lamps by trained service personnel after 1000 operating hours or if one or more phototherapy lamps fail.

#### 3.2 Checking the phototherapy lamps

- Plug the Babytherm power cord into the mains socket-outlet.
- Switch the Babytherm on.
- Press the phototherapy button on the control unit.
- Press the OK button.

All phototherapy lamps (halogen lamps) come on.

- Press the phototherapy button again.
- Press the OK button.

All phototherapy lamps (halogen lamps) are off.

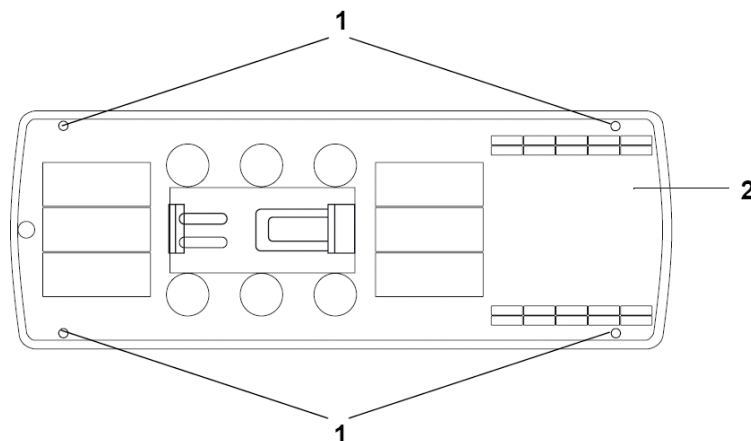
### 3.3 Dismounting/replacing the phototherapy lamps

- Plug the Babytherm power cord into the mains socket-outlet.
- Set the electrical height adjustment (option) to the lowest position.
- Unplug the Babytherm power cord from the mains socket-outlet.

**WARNING**

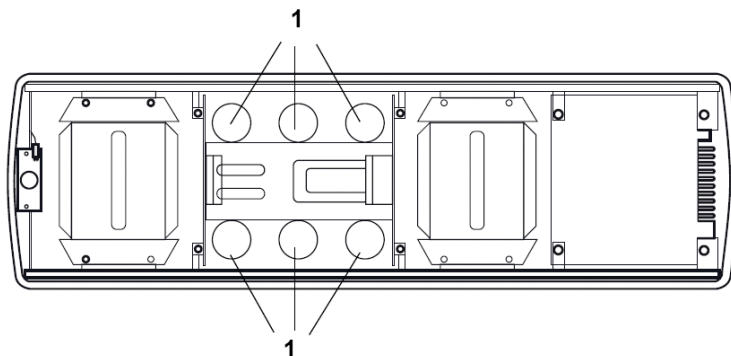
**Risk of burns! The infrared rods or the protective screen may cause burns if touched shortly after use of the radiant heater. Allow the radiant heater to cool off for at least 15 minutes before servicing.**

- Swivel the radiant heater in your direction.
- Remove the screws and washers **1** which secure the cover **2** and set the cover aside.



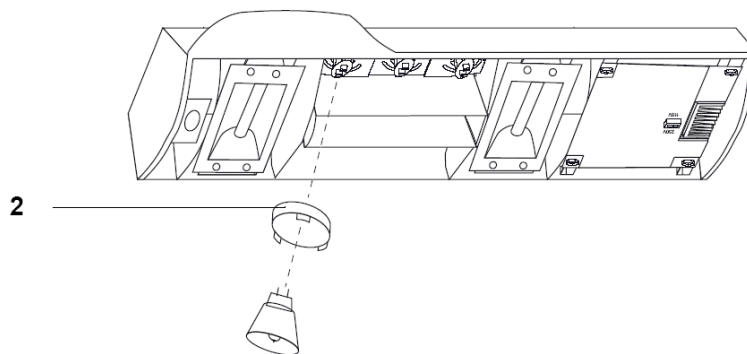
**Fig. 3:** Radiant heater (bottom view), removing the cover.

- Pull the phototherapy lamps **1** including the spacers **2** out of the lamp holders.



**Fig. 4:** Radiant heater (bottom view); removing phototherapy lamps and spacers.

- Fit the new phototherapy lamps including spacers **2** into the radiant heater. Pay attention to the fitting position of the spacers (see the following Figure).



**Fig. 5:** Radiant heater (bottom view); fitting phototherapy lamps and spacers.

- Refit the radiant heater cover to the radiant heater.
- Plug the Babytherm power cord into the mains socket-outlet.
- Switch on the Babytherm at the power switch.
- Press the phototherapy button on the control unit.
- Press the OK button on the control unit.

All phototherapy lamps (halogen lamps) of the Babytherm radiant heater come on.

- Press and hold the OK button **1** for approx. 3 seconds.

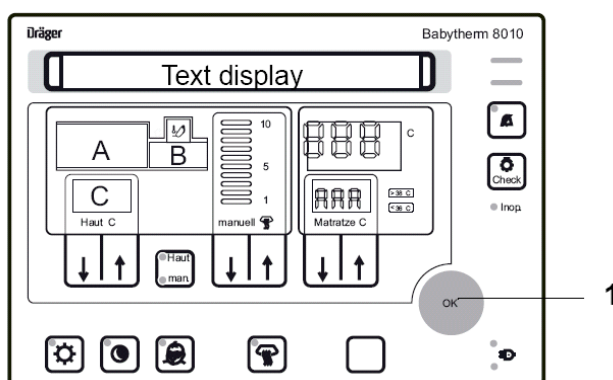


Fig. 6: Control unit; using the configuration mode.

Message on the text display:

**Configuration mode  
Starting with OK**

- Press the OK button **1** (see Figure 6) again to confirm access to configuration mode.

Message on the text display:

**Configuration mode  
Mode c01: Software version**

- Select mode c04 using the arrow keys 1.

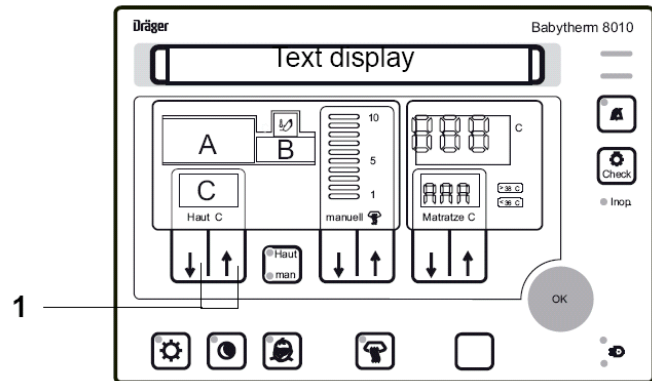


Fig. 7: Control unit; using the configuration mode.

Message on the text display:

**Configuration mode**  
**Mode c04: Time counter phototherapy**

- Reset the time counter of the phototherapy by pressing the alarm key 2 for at least 3 seconds.

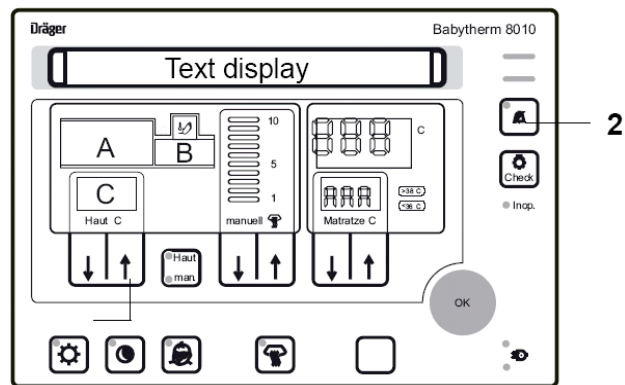


Fig. 8: Using the configuration mode.

**Exiting the configuration mode:**

- Press the OK button to exit the configuration mode.





# **Annex**

**Parts catalog**

**Test List**

**Technical Information**

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## Parts catalog

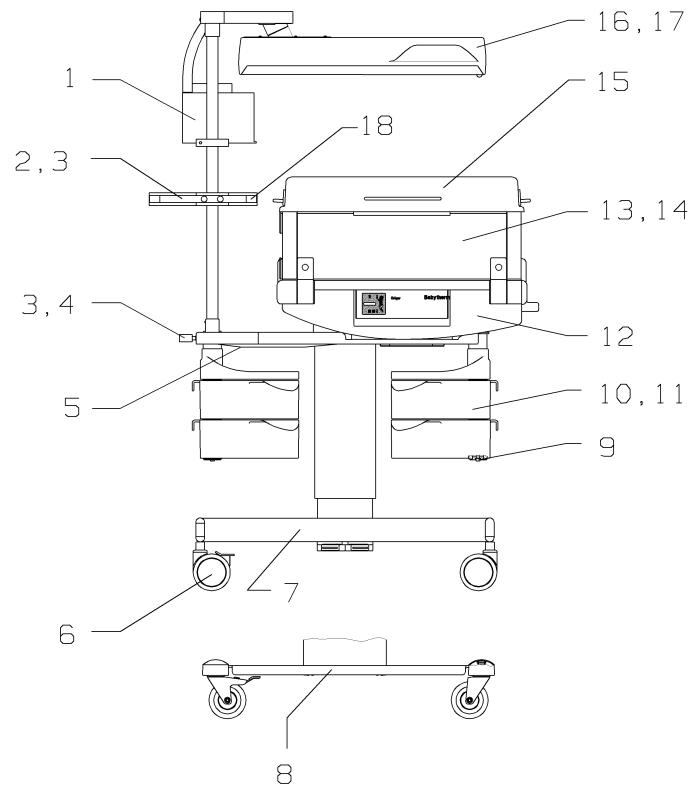
Babytherm 8010/8004



Revision: 2005-10

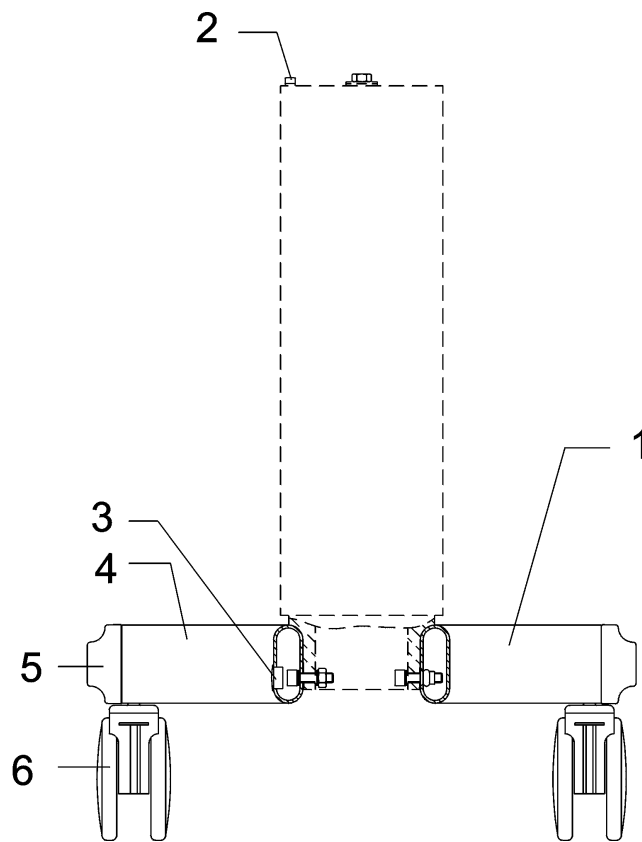
6132.300





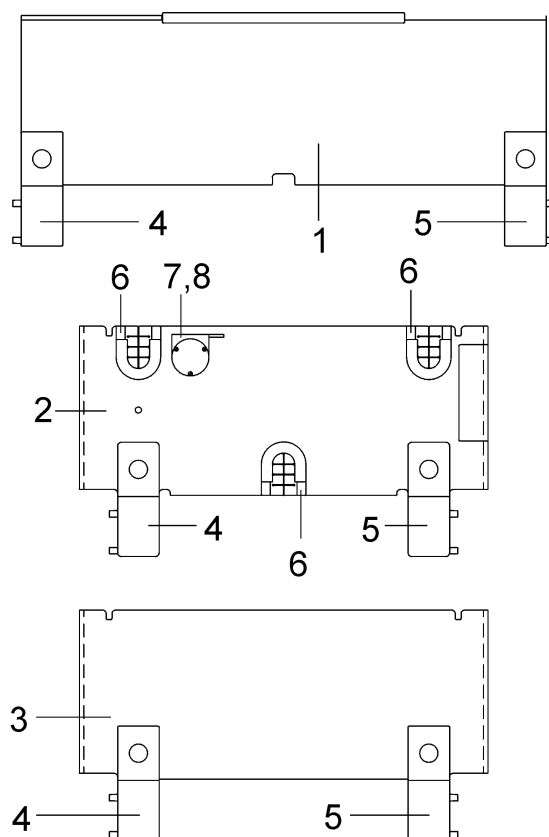
Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
11	2M20642	INSERT	1.000	St	
15	2M30392	HINGED HOOD	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



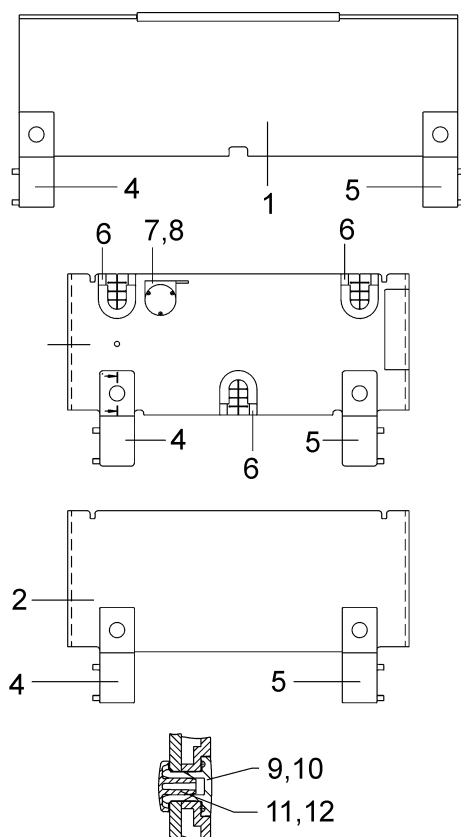
Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
3	2M18020	CAP	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
1	2M20931	SIDE PANE (23 CM)	1.000	St	
2	2M20932	FRONT PANE (23 CM)	1.000	St	
3	2M20937	REAR PANE (23 CM)	1.000	St	
6	2M20434	TUBE BUSHING	1.000	St	

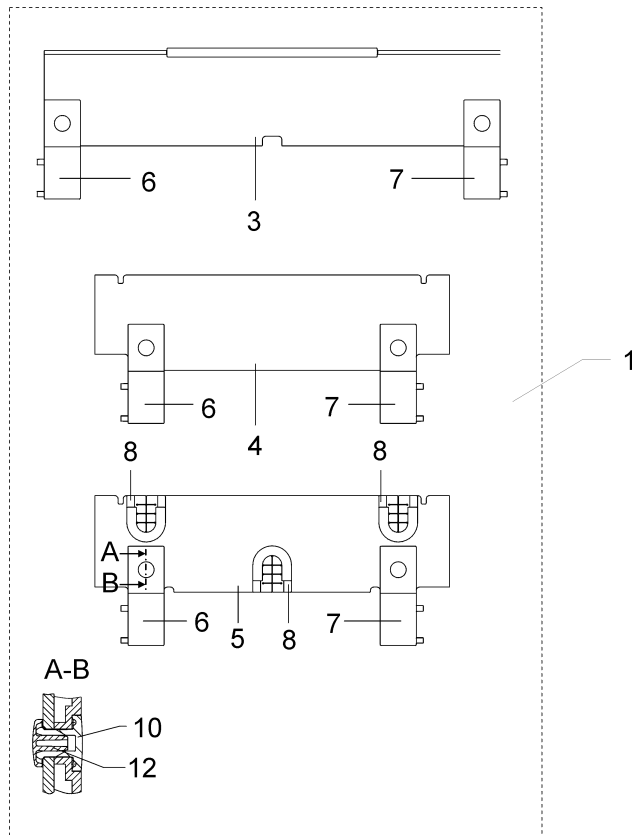
Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
1	2M20931	SIDE PANE (23 CM)	1.000	St	
2	2M20932	FRONT PANE (23 CM)	1.000	St	
6	2M20434	TUBE BUSHING	1.000	St	

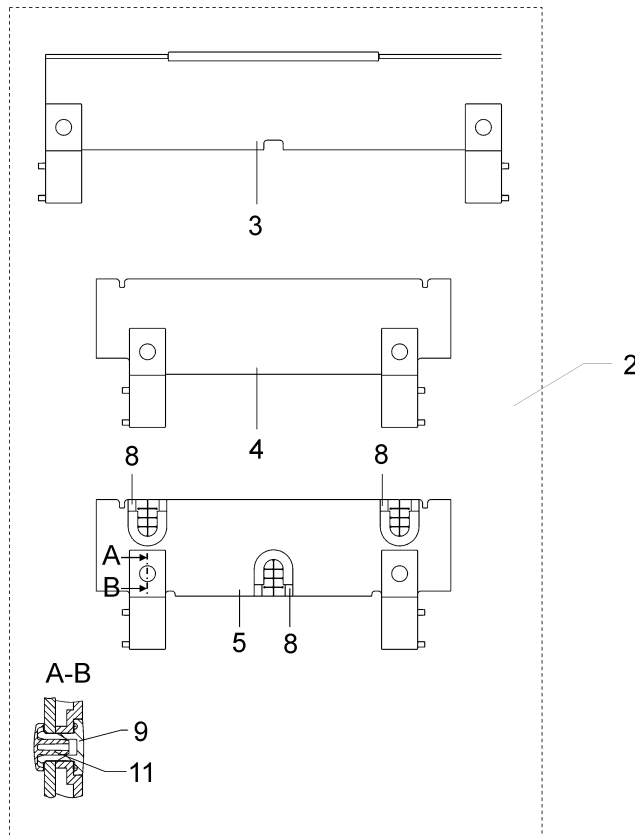
Items that are shown in the illustration but are not listed below the illustration are not available as spare parts





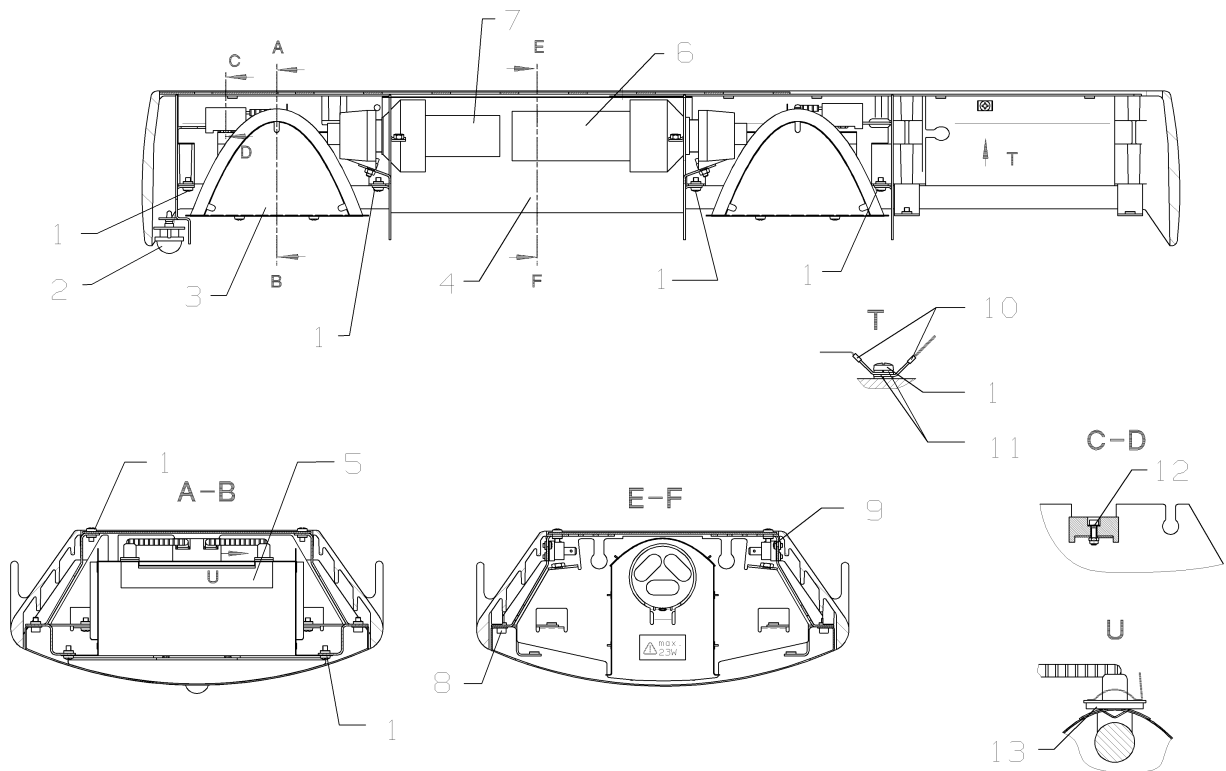
Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
1	2M21032	SIDE WALLS,HEIGHT 15CM	1.000	St	
3	2M20886	SIDE PANE (15 CM)	1.000	St	
4	2M20891	FRONT PANE (15CM)	1.000	St	
5	2M20892	REAR PANE (15 CM)	1.000	St	
8	2M20434	TUBE BUSHING	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



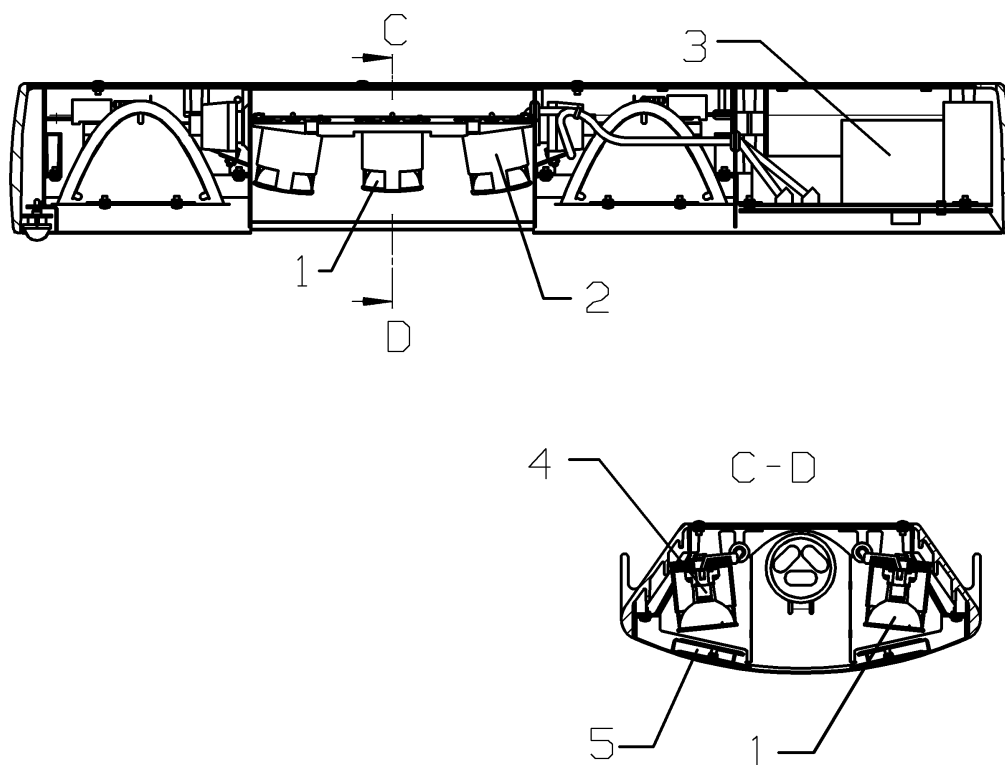
Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
2	2M30242	SIDE WALLS,HEIGHT 15CM WHITE	1.000	St	
3	2M20886	SIDE PANE (15 CM)	1.000	St	
4	2M20891	FRONT PANE (15CM)	1.000	St	
5	2M20892	REAR PANE (15 CM)	1.000	St	
8	2M20434	TUBE BUSHING	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



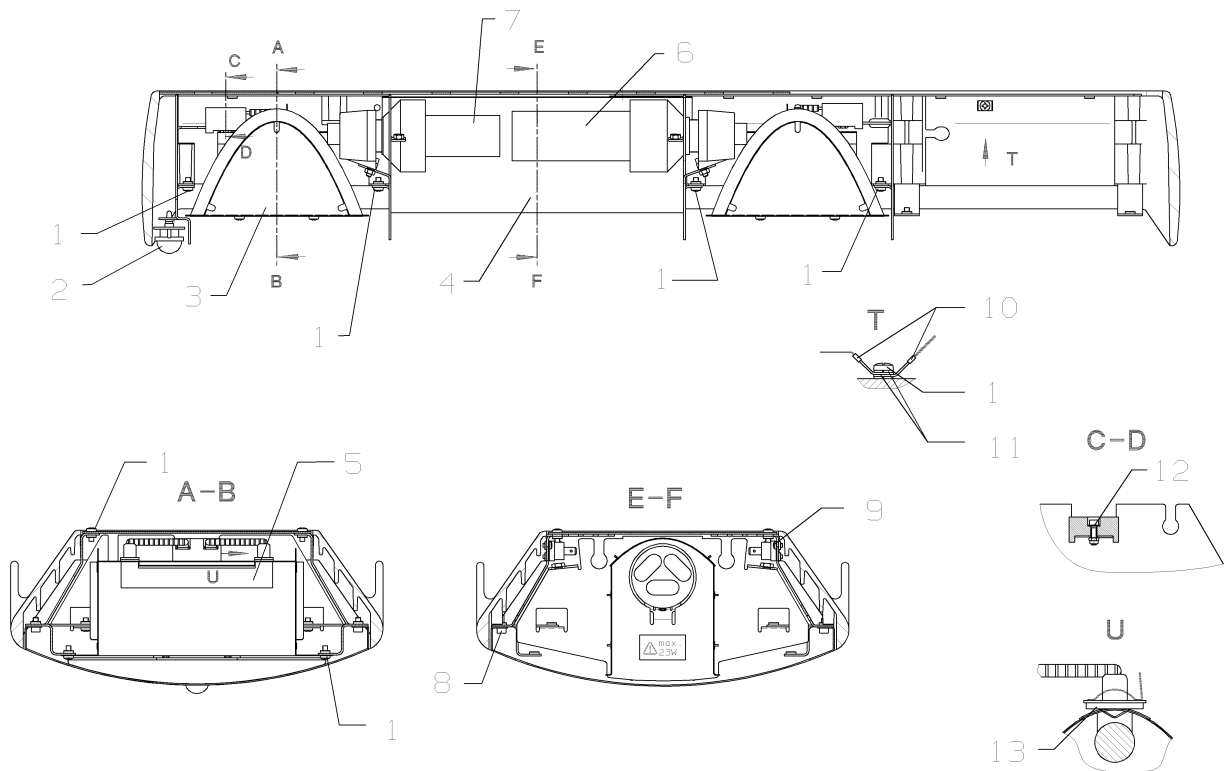
Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
6	2M30079	INCANDESCENT LAMP 23W 230V	1.000	St	
7	2M30078	INCANDESCENT LAMP 7W 230V	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



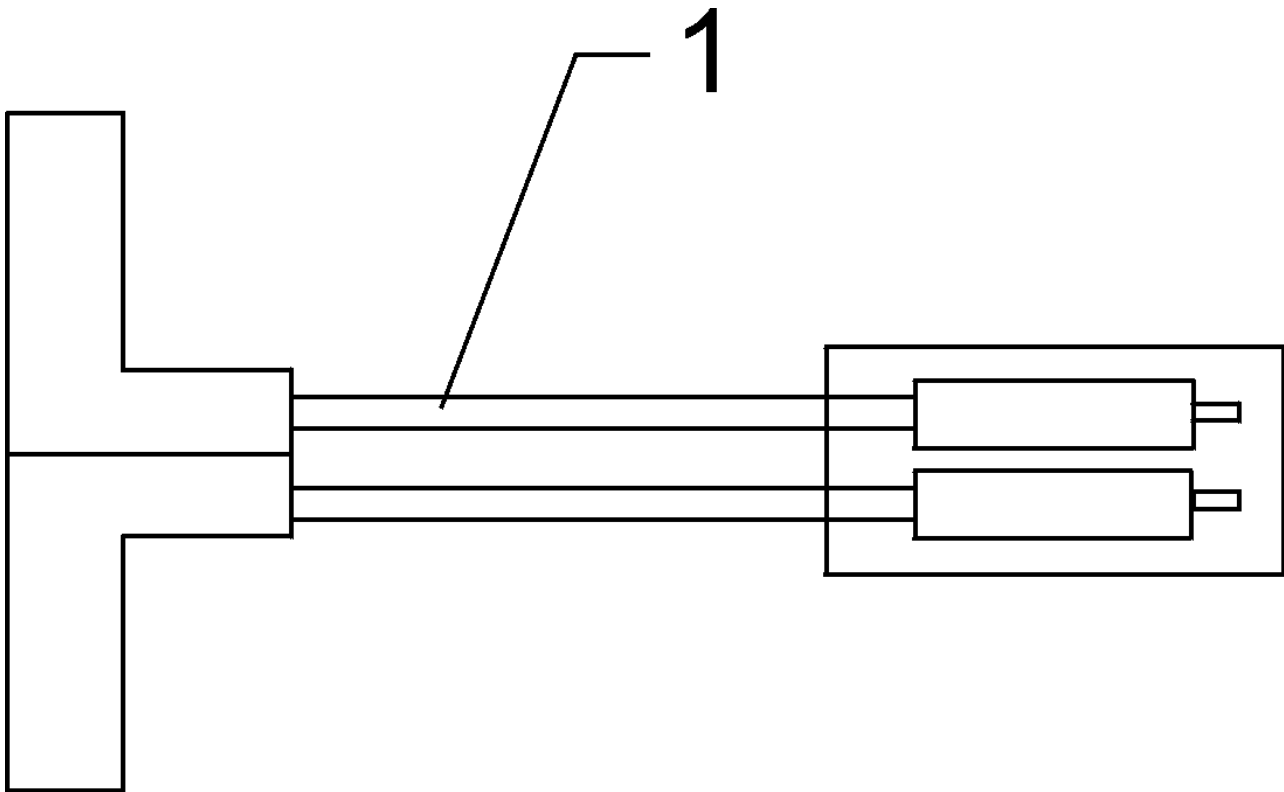
Item No.	Part No.	Description	Qty.	Qty. unit	Remark
1	2M30084	HALOGENLAMP 12V 50W	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



Item No.	Part No.	Description	Qty.	Qty.u nit	Remark
6	2M30160	LAMP 23W/120V	1.000	St	
7	2M30161	LAMP 9W/120V	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts



Item No.	Part No.	Description	Qty.	Qty. unit	Remark
	2M11111	THERMOMETER	1.000	St	
1	7911314	SENSOR TEST CONNECTOR	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Assembly	Description	Part No.
<b>Accessories/Consumables</b>		
	ASPIRATION HOSE	M25780
	CAPSULE FOR O2-DETECTOR (DW)	6850645
	CYLINDER CAP WITH VALVE	2M85012
	GEL-MATTRESS / BABYTHERM 8000	2M20827
	HALOGENLAMP 12V 50W	2M30084
	HOOK	2M21293
	INCANDESCENT LAMP 23W 230V	2M30079
	INCANDESCENT LAMP 7W 230V	2M30078
	Matress, Babytherm	2M21012
	MATTRESS-CLOTH/BT8000	2M21272
	RECEPTACLE	2M85594
	REPAIR-KIT FOR GEL-MATTRESS	2M21324
	SECRETION CONTROL GLASS	M07582
	SENSOR HOUSING OXYDIG	6850250
	SET OF 5 BACTERIA FILT.(CH102)	6723976
	SET OF WASTE BAGS	M26240
	ThermoPad (50pc)	MX11002
	ThermoTrace Core (5pc)	MX11000
	ThermoTrace Peripheral (5pc)	MX11001
	TUBE BUSHING	2M20434
<b>Basic Unit</b>		
	HINGED HOOD	2M30392
	HOOK	2M21293
	INSERT	2M20642
<b>BRONCH.ASPIR.</b>		
	BACTERIA FILTERS	CH00102
<b>HANDLES</b>		
	END PIECE	2M20696
<b>Maintanance Parts/Service Sets</b>		
	HALOGENLAMP 12V 50W	2M30084
	SET OF 5 BACTERIA FILT.(CH102)	6723976

<b>Assembly</b>	<b>Description</b>	<b>Part No.</b>
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**Manuals\Techn.Documentation**

	IFU Babytherm 8004/8010 sv	9029463
	UM Babytherm 8004/8010 hu	9037777
	UM Babytherm 8004/8010 no	9037775
	UM Babytherm 8004/8010 pl	9037774
	USER MAN BABYTHERM ES (CE)	9029460
	USER MAN BABYTHERM GERMAN CE	9029457
	USER MAN BABYTHERM NL (CE)	9029461
	USER MAN BT 8004/8010 FR	9029459
	USER MAN BT 8004/8010 RU	9029467
	USER MAN BT 8010/8004 EN	9029458



Assembly	Description	Part No.
<b>Modification Kits/Options</b>		
	ADAPTOR O2 (NIST/DIN)	M32493
	Aspiration hose holder	2M85239
	BABYLINK CABLE BL.8000	8306488
	Basket 150	M26146
	Basket 300	M26145
	Basket 600	M25121
	COMPACT RAIL	2M85337
	COMPR.AIR DISTRIBUTOR W.CLAMP	2M19090
	Connecting hose holder	2M85446
	DEPOSIT PLATE	2M21158
	DOUBLE CLAMP	G13147
	HANDLE,CPL. / BT.8000	2M21161
	HINGED HOOD	2M30392
	Holder for litter bags	M24695
	HOSE SUPPORT	2M21191
	Humidifier-bubbler	2M85834
	Humidifier-nebulizer	2M85835
	Infusion support	2M21514
	MiniOx3000 oxygen monitor	2M22464
	Mounting bracket for rail	2M22460
	O2/AIR-HOSE NIST 1,5MDIN PROBE	M34410
	O2/AIR-HOSE NIST 3M DIN PROBE	M34411
	O2/AIR-HOSE NIST 5M DIN PROBE	M34412
	O2-DISTRIBUTOR W.CLAMP	2M18810
	O2-Flowmeter 16L,R.S.	2M86551
	O2-HOOD	2M19250
	O2-HOSE NIST 1,5M DIN-PROBE	M34401
	O2-HOSE NIST 3M DIN PROBE	M34402
	O2-HOSE NIST 5M DIN PROBE	M34403
	O2-Sensor MiniOx 3000	2M22461
	RAIL SEPARATE 400MM	G13851
	RAIL SEPARATE 600MM	G13829
	RAIL SEPARATE 800MM	G14449
	RAIL-HOLDER LONG	G13821
	RAIL-HOLDER SHORT	G13822
	SET OF CABLES A.HOSE SUPPORTS	G13171
	SUPPORT	2M21342
	TABLE INCLINABLE,COMPLET	2M21186

Assembly	Description	Part No.
<b>Panes, Hinges, 15 cm</b>		
	FRONT PANE (15CM)	2M20891
	INNER WALLS F. BABYTHERM	2M20936
	innerpanell, France	2M30261
	REAR PANE (15 CM)	2M20892
	SIDE PANE (15 CM)	2M20886
	SIDE WALLS,HEIGHT 15CM	2M21032
	SIDE WALLS,HEIGHT 15CM WHITE	2M30242
	TUBE BUSHING	2M20434
<b>Panes, Hinges, 23 cm</b>		
	FRONT PANE (23 CM)	2M20932
	INNER WALLS F. BABYTHERM	2M20936
	innerpanell, France	2M30261
	REAR PANE (23 CM)	2M20937
	SIDE PANE (23 CM)	2M20931
	SIDE WALLS,HEIGHT 23CM	2M21034
	SIDE WALLS,HIGH 23CM,WHITE	2M30301
	TUBE BUSHING	2M20434
<b>Phototherapie</b>		
	HALOGENLAMP 12V 50W	2M30084
<b>Products concerned</b>		
	BABYTHERM 8010 100V-240V	FR00105
	BT8004 220-240V MODULAR SYSTEM	FR00104
<b>Radiant Heater 120V</b>		
	LAMP 23W/120V	2M30160
	LAMP 9W/120V	2M30161
<b>Radiant Heater 230V</b>		
	INCANDESCENT LAMP 23W 230V	2M30079
	INCANDESCENT LAMP 7W 230V	2M30078
<b>Tools</b>		
	SENSOR TEST CONNECTOR	7911314
	THERMOMETER	2M11111
<b>Trolley, large f. var.column</b>		
	CAP	2M18020

## Test List

### Babytherm 8004/8010

Serial no.: \_\_\_\_\_

Folder no.:  
6132.300

Installation site: \_\_\_\_\_

Edition:  
10/99



This test list can be processed with standard commercially available test aids and tools, but does not replace the inspections and maintenance work carried out by the manufacturer.

<b>1</b>	<b>Test Equipment</b>	<b>1</b>
<b>2</b>	<b>Accompanying Documents (applies only to Germany)</b>	<b>1</b>
<b>3</b>	<b>General Condition</b>	<b>2</b>
3.1	Trolley without Electrical Height Adjustment .....	2
3.2	Trolley with Electrical Height Adjustment (optional) .....	2
3.3	Control Unit .....	2
3.4	Radiant Heater .....	3
3.5	Resting Surface .....	3
3.6	Base Plate .....	3
3.7	Foam Mattress (Babytherm 8004) .....	4
3.8	Gel Mattress (Babytherm 8010) .....	4
3.9	Swivel Cabinet (optional) .....	4
3.10	Hook Rail (optional) .....	4
3.11	Side Handle on Resting Surface (optional) .....	4
3.12	Hood (optional) .....	4
<b>4</b>	<b>Tests as per VDE 0751 Part 1 (follow to local legislation, standards and regulations)</b>	<b>5</b>
4.1	Checking the Protective Conductor Resistance .....	5
4.2	Checking the Equivalent Leakage Current .....	6
4.3	Checking the Patient Leakage Current .....	7
<b>5</b>	<b>Functional Tests</b>	<b>8</b>
5.1	Checking the LEDs, the LED Strip and the Buzzer in the Control Unit as well as Central Alarm Lamp in the Radiant Heater 8	
5.1.1	Checking the Infrared Rods in the Manual Mode .....	8
5.1.2	Checking the Infrared Rods in the Skin Mode .....	8
5.1.3	Checking the Work Light in the Radiant Heater .....	9
5.1.4	Checking the Night Light in the Radiant Heater .....	9
5.1.5	Checking the Phototherapy Lamps in the Radiant Heater (option) .....	9
5.1.6	Checking the Mattress Heater (Babytherm 8010) .....	9
5.1.7	Checking the Mains Failure Alarm .....	10

## Contents

<b>6</b>	<b>Place fully functional unit at customer's disposal.</b>	<b>10</b>
<b>7</b>	<b>Tested</b>	<b>10</b>

## 1 Test Equipment

VDE tester	79 01 234
Short-circuit female connector VDE 0751	79 00 765
Short-circuit female connector for skin- temperature sensor	79 10 484

## 2 Accompanying Documents (applies only to Germany)

Instructions for Use GA 6132.300 e (class BF)

Logbook

Instructions for Use for special accessories



### 3 General Condition

#### 3.1 Trolley without Electrical Height Adjustment

Mains connection

Mains fuses

Wheels

Caps at tubular ends of trolley

Trolley

#### 3.2 Trolley with Electrical Height Adjustment (optional)

Mains connection

Mains fuses

Mains fuses of column

Wheels

Caps at tubular ends of trolley

Foot pedals

Trolley

#### 3.3 Control Unit

On/off switch

Mains fuses

Keypad



### 3.4 Radiant Heater

Mount

Swivel function

Protective guard

Infrared rods

Working light

Night light

Phototherapy lamps (optional)

Filters (optional)

### 3.5 Resting Surface

Lower section

Upper section

Outer panels  
(panels must always properly engage in corners of housing)

Corners of outer panel mounts

Inner panels (optional)

Tube entry ports

Resting surface adjustment with locking lever

### 3.6 Base Plate

Mount

Base plate

Standard rails

Stand

Shelf

This test list can be processed with standard commercially available test aids and tools, but does not replace the inspections and maintenance work carried out by the manufacturer.

**3.7 Foam Mattress (Babytherm 8004)**

Foam mattress

**3.8 Gel Mattress (Babytherm 8010)**

Gel mattress

**3.9 Swivel Cabinet (optional)**

Swivel cabinet/swivel cabinets

**3.10 Hook Rail (optional)**

Hook rail

**3.11 Side Handle on Resting Surface (optional)**

Side handle

**3.12 Hood (optional)**

Hood

Hood holder

## 4 Tests as per VDE 0751 Part 1 (follow to local legislation, standards and regulations)

Condition of power cord

Mains fuses

Main fuses should match the values specification on nameplate.

### NOTE

Test electrical safety using the common power cord of the Babytherm 8004 or the Babytherm 8010.

### WARNING

The resting surface of the mattress heater is not to be earthed on the Babytherm 8004 or Babytherm 8010 of class BF.

### 4.1 Checking the Protective Conductor Resistance

This section describes how to measure the protective conductor resistance of the trolley, column, electrical height adjustment (optional), mount of the control unit, and mattress heater (Babytherm 8010).

- Plug the power cord of the Babytherm into the VDE tester.
- Connect COM test probe into the COM test socket of the VDE tester.
- Plug the power cord of the VDE tester into the mains power outlet.
- Switch on the VDE tester.
- Apply the COM test probe to the trolley, column, electrical height adjustment (optional), mount of the control unit, and the aluminium plate of the mattress heater (Babytherm 8010) and, at the same time, press the “protective conductor button” on the VDE tester.

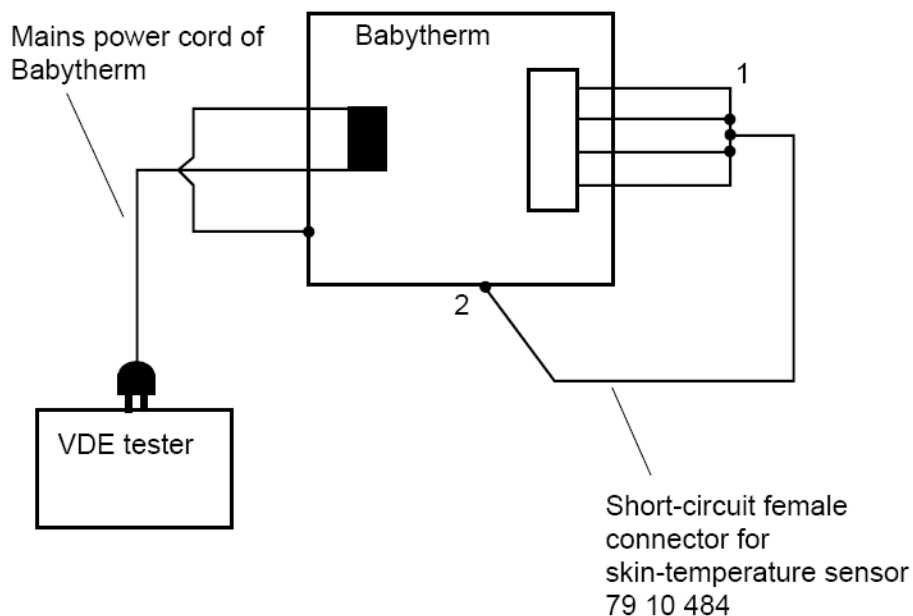
The protective conductor resistances of the trolley, column, electrical height adjustment (option), mount of the control unit should be equal to or lower than 0.2 Ohm.

The protective conductor resistance of the aluminium plate of the mattress heater (Babytherm 8010) should be  $\infty$  Ohm.

This test list can be processed with standard commercially available test aids and tools, but does not replace the inspections and maintenance work carried out by the manufacturer.

## 4.2 Checking the Equivalent Leakage Current

- Plug the power cord of the Babytherm into the VDE tester.
- Plug the power cord of the VDE tester into the mains power outlet.
- Switch on the Babytherm.
- Switch on the VDE tester.
- Press the foot pedals of the optional electrical height adjustment and press, at the same time, the “leakage current” button on the VDE tester.



**Abb. 1:** Equivalent Leakage Current Test Setup

### Legend

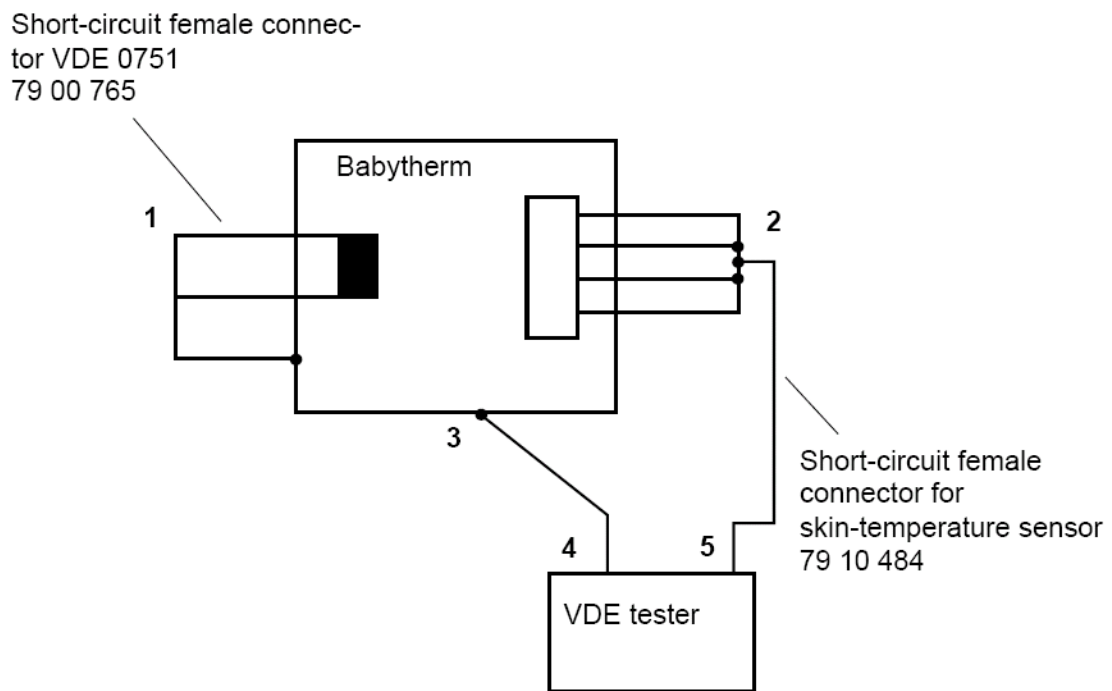
- 1 Sensor connections
- 2 Unit earth (earthing stud)

The equivalent leakage current should be equal to or lower than 1.0 mA.



### 4.3 Checking the Patient Leakage Current

- Plug the power cord of the Babytherm into the VDE tester (see Figure below).
- Plug the power cord of the VDE tester into the mains power outlet.
- Switch on the VDE tester.
- Switch on the Babytherm.



**Abb. 2:** Patient Leakage Current Test Setup

#### Legend

- 1 Short-circuit in mains connector (connector item no. 7900765)
- 2 Skin temperature sensor short circuit (item no. 7910484)
- 3 Unit earth (earthing stud)
- 4 Socket SL (previously COM) on portable tester
- 5 Socket ABL on portable tester

The patient leakage current should be equal to or lower than 4.0 mA.

This test list can be processed with standard commercially available test aids and tools, but does not replace the inspections and maintenance work carried out by the manufacturer.

## 5 Functional Tests

### 5.1 Checking the LEDs, the LED Strip and the Buzzer in the Control Unit as well as Central Alarm Lamp in the Radiant Heater

- Plug the power cord of the Babytherm 8004 into the mains power outlet.
- Switch on the control unit.
- Press the "Check" key.

The LEDs and the LED strip on the control unit come on. The central alarm lamp in the radiant heater comes on. The buzzer in the control unit sounds.



#### 5.1.1 Checking the Infrared Rods in the Manual Mode

- Switch on the control unit.
- Set "manual mode" on control unit.

The infrared rods heat up.



#### 5.1.2 Checking the Infrared Rods in the Skin Mode

- Connect skin-temperature sensors to the Babytherm.
- Switch on the control unit.
- Set "skin mode" on control unit.
- Place fingers firmly around ends of skin-temperature sensor cables.

The infrared rods heat up. The temperature displayed on the control unit increase.



### 5.1.3 Checking the Work Light in the Radiant Heater

- Switch on the control unit.
- Press the work light key.

The energy-saving lamps (work light and night light) in the radiant heater come on.

Press the work light key again.

The energy-saving lamps (work light and night light) in the radiant heater go out.

### 5.1.4 Checking the Night Light in the Radiant Heater

- Switch on the control unit.
- Press the night light key.

The small energy-saving lamp (night light) comes on.

- Press the night light key again.

The small energy-saving lamp (night light) goes out.

### 5.1.5 Checking the Phototherapy Lamps in the Radiant Heater (option)

- Switch on the control unit.
- Press the phototherapy key.
- Press the OK key.

All phototherapy lamps (halogen lamps) come on.

- Press the phototherapy key again.
- Press the OK key.

All phototherapy lamps (halogen lamps) go out.

### 5.1.6 Checking the Mattress Heater (Babytherm 8010)

- Place the gel mattress on the resting surface.
- Switch on the control unit.

The mattress heater warms up to the specified value.

This test list can be processed with standard commercially available test aids and tools, but does not replace the inspections and maintenance work carried out by the manufacturer.

### 5.1.7 Checking the Mains Failure Alarm

- Unplug the power cord of the Babytherm from the mains power outlet.
- Switch on the control unit.

The red LED on the control unit comes on. The buzzer for mains failure alarm sounds.

- Plug the power cord of the Babytherm into the mains power outlet.

The Babytherm continue to operate with the previous specified settings.

- Plug the power cord of the Babytherm into the mains power outlet.

The Babytherm continue to operate with the previous specified settings.

## 6 Place fully functional unit at customer's disposal.

## 7 Tested

Date: \_\_\_\_\_

Name: \_\_\_\_\_



2005-11-09

**Technical Documentation for Babytherm 8004/8010 according to EMC standard IEC/EN 60601-1-2: 2001**

**General Information**

The EMC conformity includes the use of following external cables, transducers and accessories (see the following table):

Designation	Order no.
ThermoTrace, skin-temperature sensor, yellow	MX11000
ThermoTrace, skin-temperature sensor, white	MX11001
MediCable, Babylink cable	8306488

The Babytherm 8004/8010 should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is inevitable, the Babytherm 8004/8010 should be observed to verify normal use in the configuration in which it will be used.

Other equipment which can be used adjacent to or stacked with the Babytherm 8004/8010 are listed in the Instructions for Use manual, in the Order List chapter.

**Electromagnetic Emissions**


Electromagnetic Emissions		
Babytherm 8004/8010 is intended for use in the electromagnetic environment specified below. The operator should assure that is used in such an environment.		
Emissions	Compliance according to	Electromagnetic environment
RF emissions (CISPR 11)	Group 1	The Babytherm 8004/8010 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class A	The Babytherm 8004/8010 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions (IEC 61000-3-2)	Not applicable	Not applicable because RF emissions are class A.
Voltage fluctuations / flicker (IEC 61000-3-3)	Not applicable	Not applicable because RF emissions are class A.

Information re electromagnetic emissions (IEC 60101-1-2: 2001, table 201)

## Electromagnetic Immunity

Electromagnetic Immunity			
Babytherm 8004/8010 is intended for use in the electromagnetic environment specified below. The operator should assure that is used in such an environment.			
Immunity against	IEC 60601-1-2 test level	Compliance level (Babytherm 8004/8010)	Electromagnetic environment
electrostatic discharge, ESD (IEC 61000-4-2)	contact discharge: 6 kV air discharge: 8 kV	6 kV 8 kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
electrical fast transients / bursts (IEC 61000-4-4)	power supply lines: 2 kV longer input / output lines: 1 kV	2 kV  Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
surges on AC mains lines (IEC 61000-4-5)	common mode: 2 kV differential mode: 1 kV	2 kV 1 kV	Mains power quality should be that of a typical commercial or hospital environment.
power frequency magnetic field 50/60 Hz (IEC 61000-4-8)	3 A/m	Not applicable	In close vicinity to Babytherm 8004/8010, no equipment with extraordinary power frequency magnetic fields (power transformers, etc.) should be operated.
voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)	dip >95%, 0.5 periods dip 60%, 5 periods dip 30%, 25 periods dip >95%, 5 seconds	>95%, 0.5 per. 60%, 5 per. 30%, 25 per. >95%, 5 sec.	Mains power should be that of a typical commercial or hospital environment. If operator requires continued operation during power mains interruptions, it is recommended to power the Babytherm 8004/8010 from an uninterruptible supply or a battery.
radiated RF (IEC 61000-4-3)	80 MHz – 2.5 GHz: 10 V/m	10 V/m	Recommended separation distance from portable and mobile RF transmitters with transmission power $P_{EIRP}$ to Babytherm 8004/8010 including its lines: $1.84 \text{ m} * P_{EIRP}^{X1}$
RF coupled into lines (IEC 61000-4-6)	150 kHz – 80 MHz: 10 V within ISM bands, 3 V outside ISM bands <sup>X2</sup>	10 V  3 V	Recommended separation distance from portable and mobile RF transmitters with transmission power $P_{EIRP}$ to Babytherm 8004/8010 including its lines: $1.84 \text{ m} * P_{EIRP}^{X1}$

Information re electromagnetic immunity (IEC 60601-1-2: 2001, tables 202, 203, 204)

<sup>X1</sup>: For  $P_{EIRP}$  the highest possible "equivalent isotropic radiated power" of the adjacent RF transmitter has to be inserted (value in Watt). Also in the vicinity of equipment marked with the symbol  interference may occur. Field strengths from fixed, portable or mobile RF transmitters at the location of Babytherm 8004/8010 should be less than 3 V/m in the frequency range from 150 kHz to 2.5 GHz and less than 1 V/m above 2.5 GHz.

<sup>X2</sup>: ISM bands in this frequency range are: 6.765 MHz - 6.795 MHz, 13.553 MHz - 13.567 MHz, 26.957 MHz - 27.283 MHz, 40.66 MHz - 40.70 MHz.

## Recommended separation distances

<b>Recommended separation distances between portable and mobile RF telecommunication devices and the Babytherm 8004/8010</b>			
<b>max. P<sub>EIRP</sub> (W)</b>	<b>3 V/m distance* (m)</b>	<b>1 V/m distance* (m)</b>	<b>Note</b>
0.001	0.06	0.17	
0.003	0.10	0.30	
0.010	0.18	0.55	
0.030	0.32	0.95	e.g. WLAN 5250 / 5775 (Europe)
0.100	0.58	1.73	e.g. WLAN 2440 (Europe), Bluetooth
0.200	0.82	2.46	e.g. WLAN 5250 (not in Europe)
0.250	0.91	2.75	e.g. DECT devices
1.000	1.83	5.48	e.g. GSM 1800- / GSM 1900- / UMTS- mobiles, WLAN 5600 (not in Europe)
2.000	2.60	7.78	e.g. GSM 900 mobiles
3.000	3.16	9.49	

Information re separation distances (IEC 60601-1-2: 2001, tables 205 and 206)

\* 3 V/m distance to transmitters with frequencies from 150 kHz to 2.5 GHz, otherwise 1 V/m distance.





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Directive 93/42/EEC  
concerning Medical Devices

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