



# Amecosy

## Service Instructions

NEONATAL CARE

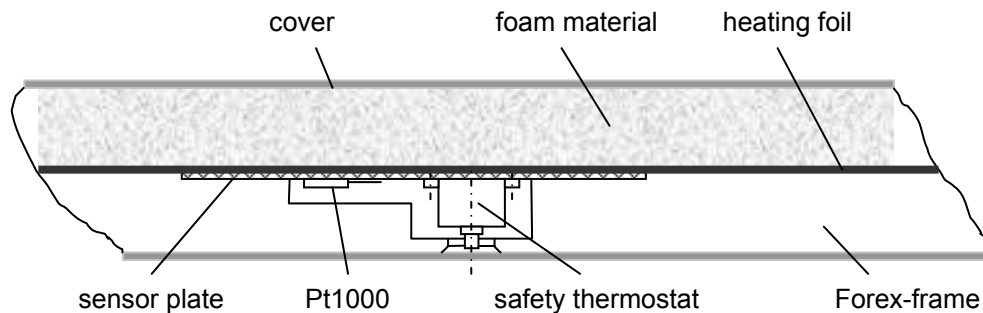
# Contents

	Page
<b>1. Technical description</b>	
1.1 Mattress construction	3
1.2 Control unit construction	4
<b>2. Technical Data</b>	6
<b>3. Environment and Disposal</b>	7
<b>4. Maintenance</b>	
4.1 General	7
4.2 Functional test, fault detection	8
4.3 Temperature test	11
4.4 Mattress repairs	12
4.5 Cleaning	12
<b>5. Schematic diagrams</b>	
5.1 Main circuit	13
5.2 Main board	14
<b>6. Spare parts</b>	
6.1 Mattress	15
6.2 Control unit	15
6.3 Testing devices	15
<b>7. Guarantee</b>	16

# 1. Technical description

## 1.1 Mattress construction

The heating mattress comprises a Forex frame, sensor plate, heating foil, sponge material, control cable and a cover.



The temperature between the heating foil and sponge material (heating temperature) is measured and controlled. The display shows the temperature calculated between the child and the cover.

The function:  $\mathcal{G}_{contactare\ a} = f(\mathcal{G}_{heating})$  is determined by the geometry and physical properties of the material and is recorded in the program memory.

Dynamic calibration is not necessary because of the manufacturing tolerances of the foam material.

The interchangeability of the mattress and control unit is guaranteed by using a precise Pt1000 sensor and a Identification-Resistor ( $R_{IDE}$ ) on the mattress.

The software supports three different mattress sizes (NC3 = small, NC2 = medium and NC1 = large).

The different specific heating capacities results in different heating up times: max. 90 minutes for the largest format (NC1 = large).

A bi-metal safety thermostat serves as an independent safety device by opening the heating circuit at a temperature of  $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$ . In this case the contact surface temperature reaches a maximum of  $41^{\circ}\text{C}$ . The temperature sensor can be reset mechanically.

It should be noted that the displayed temperature only corresponds to the effective contact surface temperature at a room temperature of  $24^{\circ}\text{C}$ . This means that for a drop in room temperature, for example from  $24^{\circ}\text{C}$  to  $20^{\circ}\text{C}$ , the reduction of the contact surface temperature has to be compensated for by appropriate wrapping up of the patient.

## 1.2 Control unit construction

### Features of the control unit

Temperature measurement and control ( $\pm 0.1^{\circ}\text{C}$ )  
Isolated transformer and low safety voltage ( $< 28\text{V RMS}$ )  
LCD graphic display (language independent)  
Semiconductor relays (unlimited number of switching cycles)  
Gold capacitors (no need for battery disposal)  
Nurse call (remote monitoring)  
Storage of settings in the case of power failure  
Interchangeability with different *amecosy* mattresses  
Volume of audible signal can be reduced  
Different alarm intervals  
Fault code display  
Flexible means of attachment

### Function of the control unit

The self test function is activated automatically by switching ON the unit (it checks the general functioning and the safety mechanism):

- LCD-Test (AMEDA -Logo)
- Read stored settings
- Identification of the mattress
- Configure control unit
- Check measurement circuit
- Check heating circuit
- LED- and buzzer test (manual\*)

\*The alarm test, LED and buzzer, must be done manually and insured the functioning of the acoustic and visual alarms.

The Ameda logo appears, the LCD is illuminated and the actual temperature is displayed. Press the "function select key" and select the adjustment of volume of the alarm. Increase or decrease the volume by pressing the "setting", the acoustic buzzer rings and the LED is blinking. The display shows the actual temperature of the mattress after approximately 6 seconds of having released the key (see also Operating Instructions page 11).

After these tests, the gold capacitor is charging. The battery symbol is now displayed during this charging time (approximately 1 hour).

If the actual temperature is less than  $14^{\circ}\text{C}$ , the measurement window must be reached within 10 minutes, otherwise 'Error 5' (sensor short circuit), is displayed.

If the actual temperature is less than the set value, but greater than  $14^{\circ}\text{C}$ , a blinking thermometer is displayed; the mattress is heating. The set value must now be reached within 2 hours, otherwise an alarm is given. During the warm up phase, the alarm for set value deviation is muted.

If the actual temperature is greater than the set value, but less than  $42^{\circ}\text{C}$ , an alarm is given and a blinking thermometer is displayed.

## LCD display

By pressing the button switches the display from the actual value change to the set value display or to the mode display.

In the set value display, the temperature can be set in the range 28°C to 38°C.

In the mode display, the cursor can be shifted by repeatedly pressing the mode button.

The available options can then be selected using the 'up/down' button.

A few seconds after the last input, the display changes automatically back to the actual value display from the mode or set value displays.

The settings entered are accepted and stored.

## Alarms

Alarms are given visually by a blinking LCD and acoustically by a buzzer.

All faults can be identified by the number given in the display:

<b><i>Fault no.</i></b>	<b><i>Fault description</i></b>
1	Incorrect program execution
2	Write error to EEPROM
3	Read error from EEPROM
4	Incorrect data read from EEPROM
5	Sensor short circuit (Pt 1000)
6	Sensor open circuit (Pt 1000)
7	No connection between mattress and control unit
8	Mattress cannot be identified
9	Measurement voltage (10V) incorrect
10	Safety thermostat actuated
11	Safety thermostat outside tolerance (replace)
12	Safety thermostat not actuated (replace)



The acoustic and visual alarms remain active for 10 minutes in the case of a power failure. The LCD does not remain active.

Set value deviations of  $\pm 1^\circ\text{C}$  are displayed by a blinking thermometer on the LCD.

## 2. Technical Data

### Control unit and mattress *amecosy*

The following specifications relate to the ambient temperature and are valid for room temperature of 24°C ±1°C.

	Control Unit	Mattress NC1	Mattress NC2	Mattress NC3
Dimensions [mm]	250x235x65	765x600x40	840x460x40	650x330x40
Weight [kg]	4.2	5.5	4.6	2.8
Cable Length [m]		1.8	1.8	1.8
Power Cord Length [m]	3.0			
Power max. [W]	130			
Mains Voltage	115V~ / 230V~ 50 / 60Hz (BSI 240V~ ±6%)			
Fuse	230V~ / 2.0AT 115V~ / 4.0AT			
Setting Accuracy	0.1°C			
Sensing Accuracy	0.5°C			
Setting Range	28°C - 38°C			
Safety Classification	1 Type BF  IP22			
Operating conditions: Temperature Atmospheric pressure Relative humidity	+15°C – +28°C 760kPa – 1060kPa 30 % – 90 % r. h.			
Storage- and Transport conditions: Temperature Atmospheric pressure Relative humidity	-30°C – +60°C 500kPa – 1060kPa 10 % – 90 % r. h.			
Norms	<b>CE</b> 0123 Complies with Medical Device Guideline MDD 93/42 EEC			
	Conforms with the WEE directive 200/96/EEC			

**Manufacturer:**  
Ardo medical AG  
Gewerbstrasse 19  
6314 Unterägeri Switzerland

### 3. Environment and Disposal



The equipment contains electronic parts. At the end of their useful life, the equipment and its accessories must be correctly disposed of according to local regulations or be returned to ARDO for correct disposal.

Mattress Cover	Polyamide cloth bonded to a PUR layer
Rigid core element	Closed cell hard foam
Foam Pad	Polyester based
Control Cable	PUR covered cable
Control Unit Housing	Lacquered Steel

#### Note

The control unit does not contain any batteries which need to be discarded.

### 4. Maintenance

#### 4.1 General

The **amecosy** heating mattress is maintenance-free except for the cleaning procedure.

To guarantee the operating safety, the following maintenance checks should be carried out:

- annual functional check according to 4.2
- annual temperature check according to 4.3

ARDO only accepts responsibility for the consequences with respect to the safety, reliability and performance of the equipment if the following conditions are satisfied:

- The installation, new setup, modifications or repairs and maintenance have been carried out by persons appointed by ARDO.
- The electrical installations in the designated rooms conform to the IEC regulations.
- The apparatus is used in accordance with the operating instructions.

If work is carried out by authorized persons, the user of the apparatus is to request a certification describing the nature and scope of the work carried out and, where appropriate, providing details of any changes to the nominal specifications or the working range. The certification should also contain the date of execution, the name of the inspector/service person as well as the company details with signature.

## 4.2 Functional test, fault detection

An auto-test is carried out when the apparatus is switched on. This thoroughly tests the electronics, and displays any faults with the corresponding fault number. The apparatus is not opened for the functional test.

If a fault is indicated in the apparatus or it is not functioning correctly, the following procedure must be observed:



**Before opening the apparatus or the mattress, the apparatus itself must be switched off and fully disconnected from the mains.**



**All repair work must be documented and confirmed with the name of the inspector / service person.**

### Control unit

- Connect the mattress to the control unit. Switch on the control unit.
- The Ameda logo appears, the LCD is illuminated and the actual temperature is displayed.
- The alarm test, LED and buzzer, must be done manually and insured the functioning of the acoustic and visual alarms.

Press the “function select key” and select the adjustment of volume of the alarm. Increase or decrease the volume by pressing the “setting”, the acoustic buzzer rings and the LED is blinking. The display shows the actual temperature of the mattress after approximately 6 seconds of having released the key (see also Operating Instructions page 11).

<b>Action</b>	<b>Display</b>	<b>Measure to be taken</b>
Switch on apparatus	LCD remains off	Check that mains is connected
		Check mains fuses and SI 1
		Connection front- / main board ok?
		Replace main board or front board
	No acoustic alarm	Replace main board
	LED is not on	Replace main board or front board
	Fault no. 1	Replace main board
	Fault no. 2	Replace main board
	Fault no. 3	Replace main board
	Fault no. 4	Replace main board
	Fault no. 5	Replace mattress
	Fault no. 6	Replace mattress
	Fault no. 7	Connect mattress
	Fault no. 8	Replace mattress
	Fault no. 9	Replace main board
	Fault no. 10	Reset safety thermostat
	Fault no. 11	Replace mattress
	Fault no. 12	Replace mattress



## Measurement accuracy

- Connect simulation test box to the mattress socket  
(Test box = ARDO Item No. 52.01.72)
- Simulation from 33°C, 15°C and 45°C

To speed up the time needed for the display to stabilize, the apparatus can be switched Off and On each time.

The following values must be displayed:

<i>Simulation</i>	<i>Display on control unit</i>
33.0°C	33.0 ±0.1°C
15.0°C	15.0 ±0.3°C
44.0°C	44.0 ±0.3°C

<i>Action</i>	<i>Display</i>	<i>Measure to be taken</i>
33.0°C simulated	Deviation larger than ±0.1°C	Set voltage between TP5 and TP6 (on main board) to <b>0.00V</b> (Pot 1)
44.0°C simulated	Deviation larger than ±0.3°C	Replace main board
15.0°C simulated	Deviation larger than ±0.3°C	Replace main board

## Safety circuit test

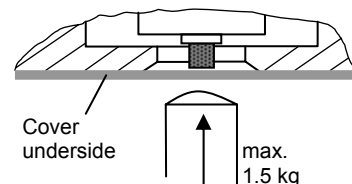
The safety circuit test is initiated using a sequence of manual push-button actions at the time of switching on the apparatus.

Sequence: Simultaneously press Set value-up ↑ and Set value-down ↓ buttons and switch on the apparatus using the mains switch on the rear panel.

- The test symbol appears on the display:



- The mattress is now heated to the cut-out temperature of the safety thermostat.
- If the test is successful, the display will change from 'start' to 'ok'.  
(For Serial No. >BY806000). (For Serial No. <BY806000 the switch-off of the safety thermostat must be verified by your fingers; the display remains 'start').
- After this test the safety thermostat must be mechanically reset by applying a blunt object (e.g. top of a pencil), or with your fingers, to the cover in the middle of the underside of the mattress.



<i>Set values</i>	<i>Actual value</i>	<i>Measure to be taken</i>
Indication: <b>ok</b>	safety thermostat switched-off	Reset safety thermostat
	Alarm <b>11</b>	Replace mattress
	Alarm <b>12</b>	Replace mattress

## Power failure alarm

- Operate the apparatus for 1 hour on the mains (Condenser C7 is charging)
- Disconnect mains with the mains cable
- Mains switch in ON position

Alarm must sound for 10 minutes (buzzer) and visual indicator (LED) must remain on.

<b>Action</b>	<b>Result</b>	<b>Measure to be taken</b>
Mains off	Alarm sound is less than 10 min	Replace main board (C7, U11)
	No alarm sound	Replace main board (Q4, T2, U2)
	LED not on	Replace front board (LED)

## Visual check of mattress

- Cover
- Foam material
- Control cable
- Forex-frame

<b>Part</b>	<b>Condition</b>	<b>Measure to be taken</b>
Cover	Holes, wear spots	Replace cover
Foam material	Deformation in lying area i.e. $H << 20$ mm	Replace foam material
Control cable	Defective cable and / or plug	Replace mattress
Forex-frame	Broken	Replace mattress

## 4.3 Temperature test

### Surface temperature

The surface temperature is measured according to the 'Conditions for acceptable thermal dissipation', see IEC 601-2-35.

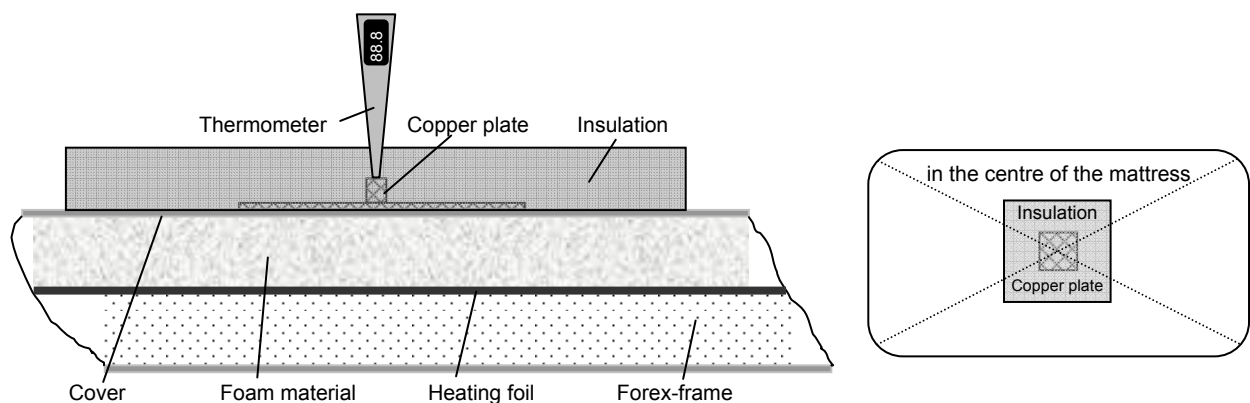
- Room temperature  $24.0^{\circ}\text{C} \pm 1$ , no convection
- Set value of  $37.0^{\circ}\text{C}$
- In the centre of the mattress
- Using cover with an insulating layer according to IEC 601-2-35 Annex BB (ARDO Item No. 52.01.73)
- On a copper plate measuring  $60 \times 60 \times 0.5 \text{ mm}$  (ARDO Item No. 52.01.74)
- Using a thermometer, which only absorbs a minimum of heat (ARDO Item No. 52.01.75)
- After a warming-up time of 3 hours (Display:  $37.0^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$ )

#### Procedure:

- Make a hole in the middle of the insulation layer with the thermometer.
- Fill the receptacle of the copper plate with thermally conductive paste and place the copper plate in the middle of the mattress.
- Insert the thermometer with insulation into the receptacle.

The insulating layer must lie on the surface of the mattress without any air gap.

Set the value on the control unit to  $37.0^{\circ}\text{C}$ . After the warming-up time of minimum 3 hours the temperature is read off the thermometer.



The temperature, measured on the copper plate between the mattress surface and the insulation layer must be:  $37.0^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ .

Set value	measured Actual value	Measure to be taken
$37.0^{\circ}\text{C}$	$<36.5$ or $>37.5^{\circ}\text{C}$	Check measurement system Check the room temperature Replace the foam material Replace the mattress

## 4.4 Mattress repairs

### Replacing the cover

- Remove the locking screw of the zipper
- Open the zipper
- Remove the cover
- Carefully fit a new cover  
(take note of the position of the foam material at the edges)
- Close the zipper
- Refit the locking screw

### Replacing the foam material

- Remove the locking screw of the zipper
- Open the zipper
- Remove the cover
- Completely remove the foam material with adhesive layer from the frame and the heating foil.
- Check the heating foil for mechanical damage and clean
- Apply the self-adhesive foam material flush with the frame after first removing the protective film.
- Carefully refit the cover  
(make sure it fits correctly with the foam material at the edges.)
- Close the zipper
- Refit the locking screw

## 4.5 Cleaning



**Before cleaning the control unit must be disconnected from the mains by removing the mains cable.  
The ON/OFF switch does not isolate the apparatus from the mains.**

The mattress and the control unit can be disinfected and cleaned using wipe-on disinfectant.



### Note

Never autoclave either the mattress or the control unit!  
Do **not** remove the cover to clean!

No other cleaning and decontamination procedures should be used than those, which the manufacturer recommends. Disinfecting agents which are based upon Aldehyde, Glycol derivatives or Quaternary compounds are recommended.

Specific Brand Names as listed below have been tested and approved:

Terralin®

Perform®

Buraton 10F®

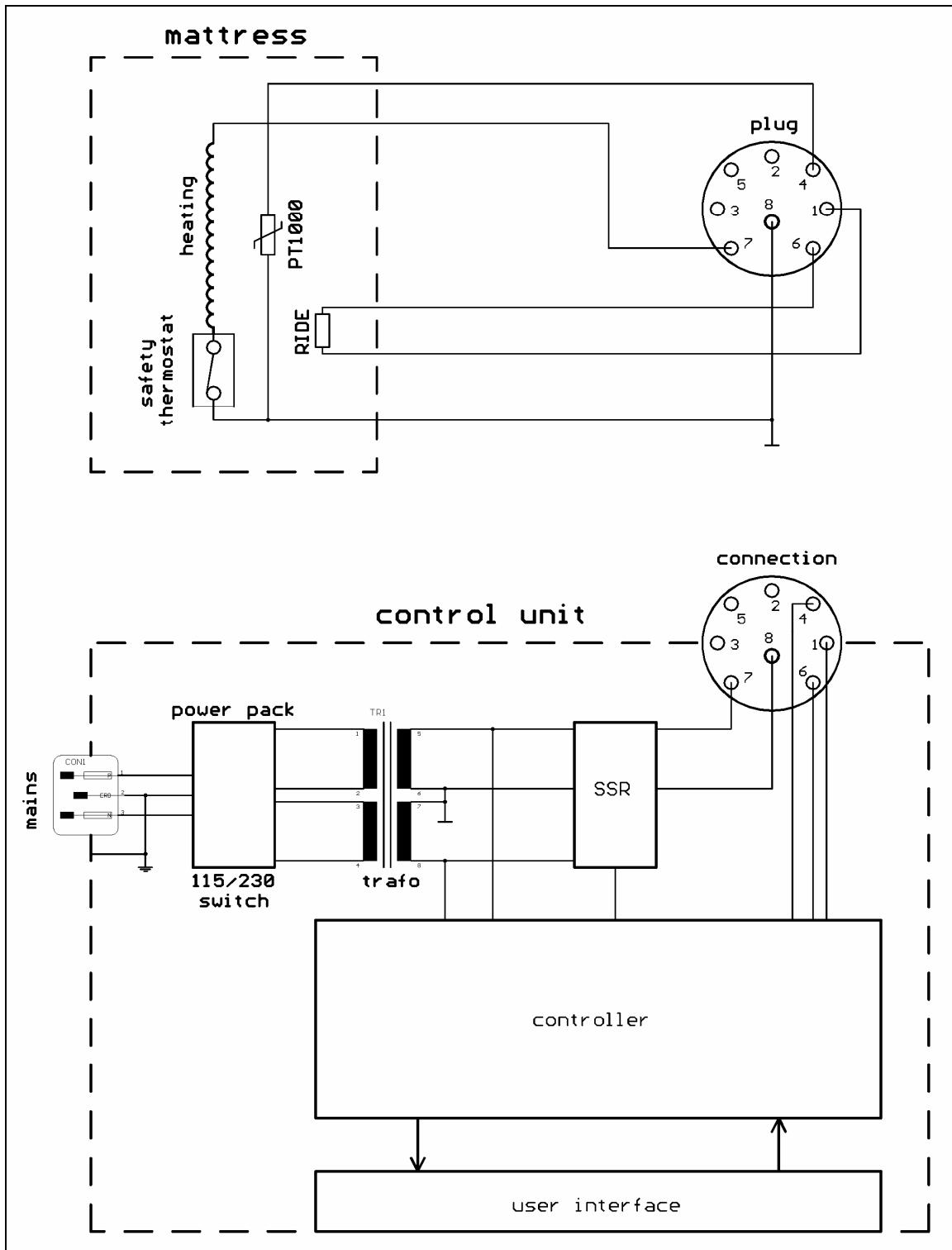
Barrycidal 36®

## 5. Schematic diagrams

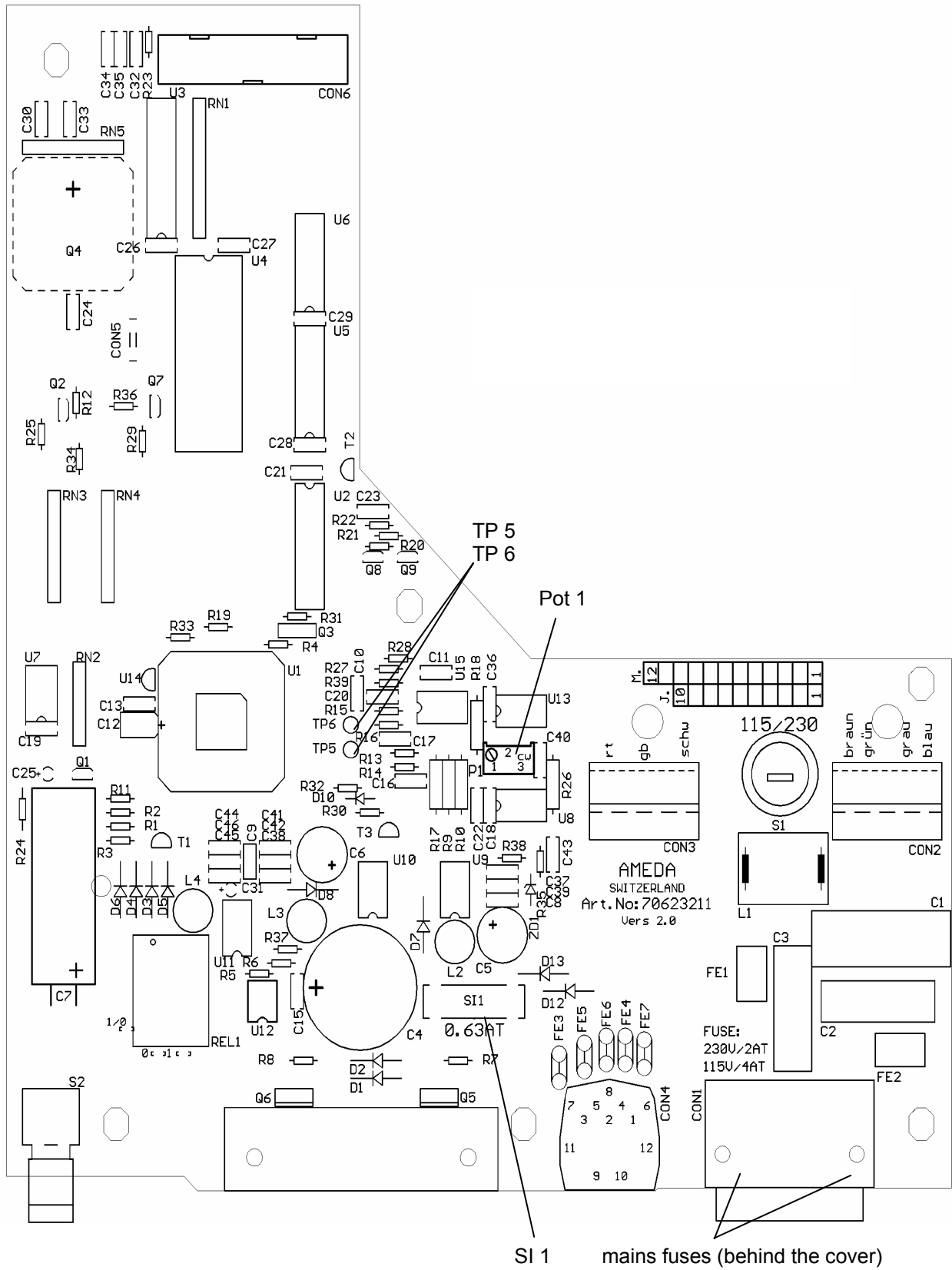
### 5.1 Main circuit diagram

Control Cable

Pin	Color old	Color new
1	brown	brown
4	yellow	yellow
6	red	pink
7	orange	white
8	black	gray



## 5.2 Main board



## 6. Spare parts

### 6.1 Mattress

Pos.	Item No.	Description	Bezeichnung
1	52.01.77	Cover NC 1 (600 x 765 mm)	Überzug NC 1 (600 x 765 mm)
2	52.01.78	Cover NC 2 (460 x 840 mm)	Überzug NC 2 (460 x 840 mm)
3	52.01.79	Cover NC 3 (330 x 650 mm)	Überzug NC 3 (330 x 650 mm)
4	52.01.80	Foam material NC 1 (600 x 765 x 20 mm)	Schaumstoff NC 1 (600 x 765 x 20 mm)
5	52.01.81	Foam material NC 2 (460 x 840 x 20 mm)	Schaumstoff NC 2 (460 x 840 x 20 mm)
6	52.01.82	Foam material NC 3 (330 x 650 x 20 mm)	Schaumstoff NC 3 (330 x 650 x 20 mm)
7	44.00.09	Mattress cpl. NC 1 (for amenic)	Matratze kpl. NC 1 (für amenic)
8	44.00.10	Mattress cpl. NC 2 (for ametherm)	Matratze kpl. NC 2 (für ametherm)
9	44.00.11	Mattress cpl. NC 3 (for cradle)	Matratze kpl. NC 3 (für cradle)

### 6.2 Control Unit

Pos.	Item No.	Description	Bezeichnung
10	52.01.83	Mains fuse 2AT / 230V (10 pieces)	Netzsicherung 2AT / 230V (10 Stück)
11	52.01.84	Mains fuse 4AT / 115V (10 pieces)	Netzsicherung 4AT / 115V (10 Stück)
12	52.01.85	Fuse SI1 0.630AT (10 pieces)	Sicherung SI1 0.630AT (10 Stück)
13	52.01.86	Main board	Grundprint
14	52.01.87	Front board	Frontprint
15	52.01.88	Front foil	Frontfolie
16	52.01.70	Mains cable 3 m (Schuko)	Netzkabel 3 m (Schuko)

### 6.3 Testing Devices

Pos.	Item No.	Description	Bezeichnung
17	52.01.71	Service kit complete (Pos. 18 – 22)	Servicekit komplett (Pos. 18 – 22)

#### Servicekit

Pos.	Item No.	Description	Bezeichnung
18	52.01.72	Test box (temperature simulation)	Testbox (Temperatur Simulation)
19	52.01.73	Foam isolation	Schaumstoff-Isolation
20	52.01.74	Copper measuring plate	Kupfer Messplatte
21	52.01.75	Thermometer (digital)	Thermometer (digital)
22	52.01.76	Heat conducting paste	Wärmeleitpaste

## 7. Guarantee

The warming mattress *amecosy* has a guarantee period of 2 years.

### General Conditions

Ardo medical AG warrants for material and production faults of the manufactured products. The guarantee period can be taken from the respective operating instructions. Faulty material is replaced free of charge within the guarantee period, assumed the device was not used improperly. Wearing parts are excluded. For ensuring guarantee and faultless functioning of the device, the notes of the operating instructions have to be observed. Furthermore, only original spare parts by Ardo medical AG may be installed and/or used.

The right to guarantee is waived, when non-authorized persons interfere with the device or alterations not conforming to the standard IEC 601 and EN 10079-1 are carried out. There is no right to guarantee exceeding the described scope of guarantee, as liability to consequential damages etc.

### Service

Please turn to the following addresses for service, maintenance or any questions to this product or any other product by Ardo medical AG:

**Switzerland**                      Ardo medical AG  
Gewerbstrasse 19  
6314 Unterägeri  
Switzerland  
T +41 (0)41 754 70 70  
F +41 (0)41 754 70 71  
info@ardo.ch  
www.ardo.ch

**International**                      Authorized Importer

Unterägeri, June 2003

Ardo medical AG  
Gewerbstrasse 19  
6314 Unterägeri  
Switzerland  
T +41 (0)41 754 70 70  
F +41 (0)41 754 70 71  
info@ardo.ch - www.ardo.ch

Customer Service office:

