

# Service Manual

## Radiant Warmer *Ceratherm 600-2*



Swiss Made

CE 0123



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## 1. General

### **IMPORTANT!**

This service manual is intended for the exclusive use of authorized persons who have been trained by Nufer Medical AG in the use, maintenance and repair of the Ceratherm 600-2 radiant warmer.

**The service manual is meant to be used together with the user manual.**

### **IMPORTANT!**

Nufer Medical AG shall not assume any responsibility for any manipulations which have been carried out on the Ceratherm 600-2 radiant warmer by a non authorized person. Nufer Medical is not liable for the improper functioning of the radiant warmer if it is not operated according to the user manual or if the maintenance recommendations in this manual are not dully observed and followed.

The personnel repairing this radiant warmer should read this manual carefully and should fully understand all instructions contained therein. The manual should be kept so that it can be easily referred to. It is advised to store it in an easily accessible place. If you do not understand something, contact a Nufer Medical agent in order to obtain further information.

### **CAUTION!**

The Ceratherm 600-2 radiant warmer may only be used with spare parts and accessories recommended by Nufer Medical AG. The functional safety of the radiant warmer is not guaranteed if non approved materials are used. The safety of the patient may be endangered.

This manual contains the latest data available. It is subject to further modifications in accordance with technical improvements.

## 2. Precautions

The radiant warmer must not be used in rooms where there is a risk of explosion, i.e. in the immediate vicinity of anesthetic gases.

The distance between the surface on which the patient lies and the lower edge of the radiant warmer must not be less than 80 cm. The distance between the ceiling and the upper edge of the radiant warmer must not be less than 50 cm. If these instructions are not followed, prolonged exposure to the heat radiation may cause burns or fire.

The radiant warmer must be used in horizontal position only and the heat ray pointed downwards.

Contact with the protective grating and the reflector should be avoided:

**„Danger of burns“**

The protective grating on the upper side of the radiant warmer must always be free in order to ensure adequate removal of heat. Do not place any object, sheets or flammable materials on the protective grating. **„Danger of fire“**

If the underlay is changed, for example by the use of dark sheets, heating cushions, etc., the support surface may reach excessively high temperatures and thus influence the body temperature of the infant or patient.

After the radiant warmer has been switched on, an acoustic and visual alarm is given after 15 minutes. This can be reset for a further 15 minutes with the red button.

The infant or patient must never be left unattended under the operating radiant warmer.

It is vital that an independent temperature check of the infant or patient is carried out at regular intervals by supervising personnel.

It is recommended that the use of the radiant warmer is restricted to trained medical personnel who are aware of the general risks when using radiant warmers.

Use of the radiant warmer can notably increase fluid loss by the infant or patient.

When using the radiant warmer over incubators, care must be taken to ensure that there is sufficient space between the lower edge of the radiant warmer and heat-sensitive material, such as perspex or acrylic glass. The distance must not be less than 80 cm. Set the heating power to max. level 3 (75%).

If the radiant warmer housing is removed, there is a danger of an electric shock. The mains cable has to be removed from the radiant warmer before every opening of the housing. Maintenance and service work must be carried out only by trained personnel.

The storage temperature of the radiant warmer must be between  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .

Concerning the disposal we recommend to send back the radiant warmer either to the supplier or to the respective distributor or the radiant warmer has to be disposed according the respective disposal regulations.

### 3. Definitions and Symbols

#### **Note, Important, Caution and Warning**

**Note:**

The remark „Note“ is used in the text to indicate procedures or conditions which might otherwise be overlooked or incorrectly understood. A note may also be used to clarify apparently contradictory or confusing situations.

**Important:**

Similar to Note, but used when greater emphasis is necessary.

**Caution:**

The remark „Caution“ is used to draw attention to a procedure which must be followed exactly in order to avoid damaging or destroying the instrument.



**Warning:** The remark „Warning“ is used in the text to draw attention to dangerous situations in connection with the operation, cleaning or maintenance of the instrument if there is a possibility of injury or danger of death to the operator or to the patient.



Attention: consult accompanying documents



Indicates that this device is in compliance with EU-Directive 93/42/EEC/Annex II.3. 0123 is the Notified Body Number.



Danger! High Voltage!



AC Power



Attention Hot surface



Power ON



Power OFF



Equipotential plug



Type B



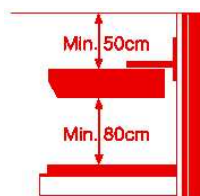
Equipment may not be disposed with the usual, unsorted domestic waste  
WEEE 2002/96/EC directive (Waste Electrical and Electronic Equipment)



Do not place any object, sheets or materials on the protective grating. „**Danger of fire**“



Do not touch the heating element or guard „**Danger of burns**“



The distance between the surface on which the patient lies and the lower edge of the radiant warmer must not be less than 80 cm. The distance between the ceiling and the upper edge of the radiant warmer must not be less than 50 cm.

## 4. Recommended mains cables

Maximum

- Power Cord for Europe: (CEE 7/7 SCHUKO)
- Power Cord for United Kingdom (BS 1363-Requires A BSI 1362 Fuse Rated At 13 Amps In the Plug)
- Power Cord for Australia & China (AS-3112)
- Power Cord for Switzerland (SEV 1011)
- Power Cord for Italy (CEI 23-16/VIII)
- Power Cord for Denmark (Afsnit 107-2-01)
- Power Cord for Israel (SI 32)

Maximum length: 2 m

## 5. Technical data

The technical data of the Ceratherm 600-2 heat radiant are shown in Table below. All technical data may be changed without prior notice.

<b>CERATHERM 600-2</b>	
Designation	Ceratherm 600-2 radiant warmer
Order number	521A-60022-CH (or 521A-60020-EX)
<b>CONFORMITY</b>	
	CE-marked (CE 0123), Directive 93/42/EEC Appendix II,
IP-protection against liquid ingress	IP20
Applied part	Typ B
Protection class	I
Medical device classification: (MDD)	IIb
Regulations & Electrical safety	EN 60601-1-1, EN 60601-2-21
Electromagnetic compatibility	EN 60601-1-2
Certification	ISO 13485, ISO 9001
<b>TEMPERATURE AN HUMIDITY REQUIREMENT</b>	
Operating temperature range	+5 °C to +30 °C
Storage temperature range	-10 °C to +50 °C
Relative humidity (permissible)	20 to 90 %; no condensation
<b>POWER SUPPLY</b>	
AC power supply	230 V +/- 10%, 50 - 60Hz
Power consumption	max. 630 VA
<b>SAFETY &amp; INFORMATION</b>	
Heating element	Ceramic, 600 Watt
Lighting	12 V / 20 Watt halogen
Alarm	Acoustic and visual alarm after 15 minutes with automatic heat reduction to a preset value (25 %)
Installation	Horizontal, heating downwards
Mounting possibilities	Wall mounting, wall mounting with double-hinged arm, ceiling anchorage with height adjustment, mobile stand, cart DINO-MOBIL
Transport	In original packaging
Disposal	Recyclable
Technical safety check	The technical safety check must be performed at least every 24 months or after 10'000 hours of operation. Control has to be performed according to the procedure described in this service manual.
<b>MEASUREMENT / MATERIAL</b>	
Dimension radiant warmer	210 x 90 x 550 mm (W x H x D)
Dimension Trolley	610 x 820 x 100 mm (W x H x D)
Dimension standpipe	170 cm / 195 cm (max. Height)
Weight radiant warmer	4.9 kg (radiant warmer alone)
Housing material	ABS
Grating + reflector	Stainless steel



## 6. Operating Instructions

### 6.1 Scope of application

The radiant warmer is intended for warming baby changing tables and for maintaining the body temperature of infants. The built-in ceramic radiator has very good radiation properties and generates invisible infrared radiation in the region of 3  $\mu\text{m}$ . The skin very readily absorbs this radiation spectrum and the patients' skin color is not altered.

### 6.2 General description

The Ceratherm 600-2 has 4 heat output settings, which can be individually set in the range 25%-99%.. These output settings are indicated by the yellow indicator's (① - ④). Only one heat output setting can be active during operation. The choice of output setting is made by pressing the reverse button (⑤) or the forward button (⑥). The heating indicator (⑩) lights when the element is being heated. When the radiant warmer unit is switched on, a time interval begins. After 15 minutes a 5 second audible alarm and a continuous flashing red alarm indicator are triggered. 8 seconds later, the heat output of the radiant warmer reduces to the 25% level with a corresponding change in the duty cycle\* of heating monitor indicator (⑩). If the alarm is cancelled by pressing button ⑦, the time interval starts again and the radiant warmer returns to the original heat output setting. Alarm cancellation also deactivates the flashing red alarm.

(\*) Duty Cycle: the relative length of time when the heating monitor indicator is lit compared to the length of time when it is unlit.

### 6.3 Installation

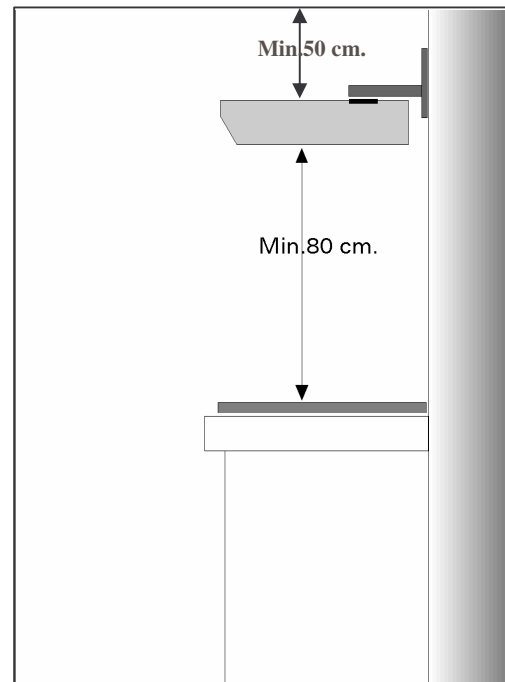
After removing the packaging, compare the instrument data on the identification plate with the available connection data. Electrical connection is made via a 230 VAC 50/60 Hz mains socket protected with a 6A fuse.

The wall holder (fixed or movable) must be fastened in solid masonry (chalky sandstone, brickwork or concrete) with suitable wall plugs and screws.

Mount the radiant warmer in such a way that there is a distance of at least 80 cm and not more than 100 cm between the surface on which the patient lies and the lower edge of the radiant warmer. The distance between the ceiling and the upper edge of the radiant warmer must not be less than 50 cm

#### **WARNING**

The distance between the surface on which the patient lies and the lower edge of the radiant warmer must not be less than 80 cm. The distance between the ceiling and the upper edge of the radiant warmer must not be less than 50 cm. If this instruction is not observed, prolonged exposure to heat radiation may cause burns.

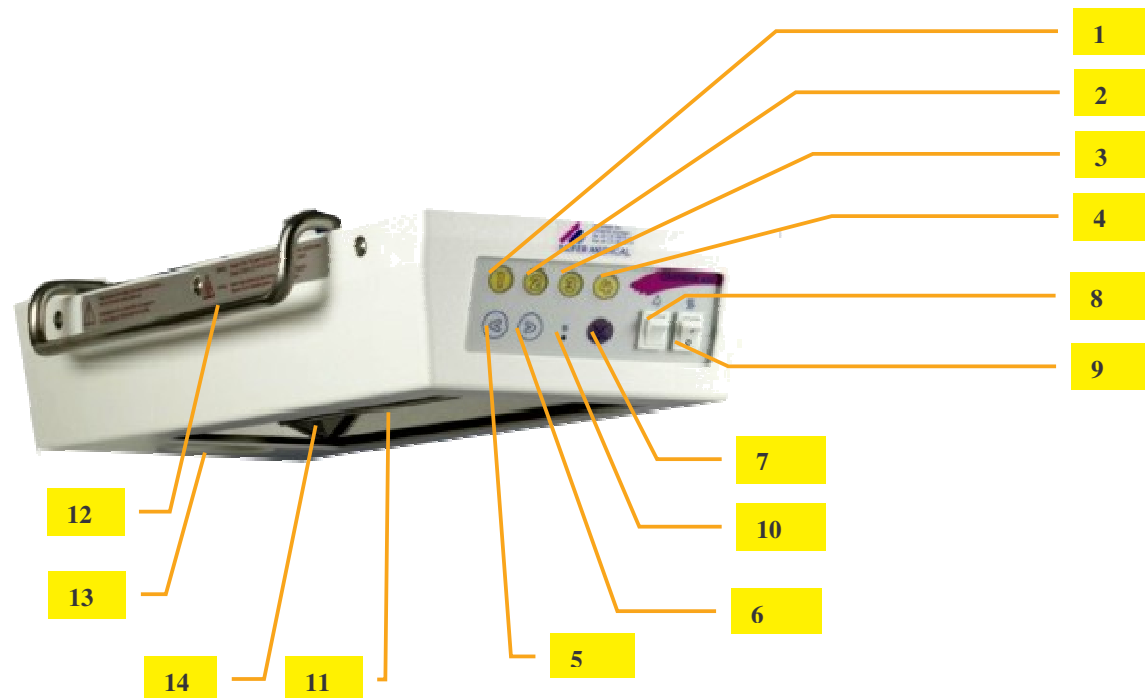


### 6.4 Mounting possibilities

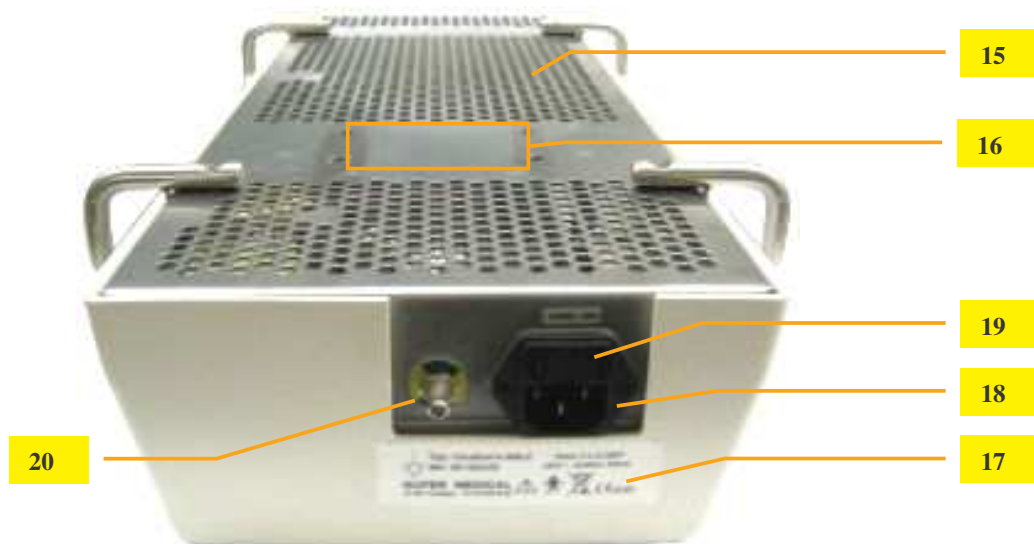
- Wall mounting with fixed holder
- Wall mounting with double-hinged arm
- Ceiling mounting with rotatable extension arm
- Wall mounting with pivotable extension arm
- Mobile stand
- Cart DINO-MOBIL
- Special versions on request

## 6.5 Controls, displays and connections

This section of the manual describes the controllers, displays and connections of the Ceratherm 600-2 radiant warmer.



Number	Designation	Function
1-4	LED yellow	Display of selected output setting
5+6	Forward/reverse button	Button for selecting output setting
7	Alarm button	Display and reset button for alarm
8	Lighting switch	Switching on/off halogen lamp
9	Main switch	Switching unit on and off
10	LED heating monitor	Indicates heating activity
11	Reflector	Heat emission
12	Hand grip	To adjust the radiant warmer
13	halogen lamp	Patient lighting
14	Ceramic heating unit	heat generation



Number	Designation	Function
15	Protective grating	heat protection shield and ventilation
16	Radiant warmer attachment	To attach the radiant to the wall- / ceiling- / trolley mounting
17	Label	Contains serial number, power connection and fuse information, and various symbols
18	Power socket	Power socket to connect 220-240V / 50Hz
19	Fuse	Mains fuses 2 x 3,15 AT
20	Equipotential plug	Adjusts potential differences. Regulation starting from class 4 rooms.

## 6.6 Start-up

1. Set radiant warmer on / off switch to ON. The heater is now switched on.
2. Using the forward and reverse buttons {(<) + (>)}, set the desired heat output to level ① to ④. The current heat output setting is shown by a lit yellow indicator ①, ②, ③ or ④. After about 5 – 10 minutes, the treatment surface is preheated.

**Note:** The heat output of the radiant warmer is set to zero when the reverse button (<) is repeatedly pressed until all yellow indicators (① – ④) are extinguished.

3. Set the light on / off switch to ON.  
The non dazzling halogen light is used for illuminating the treatment area.

## 6.7 Setting the heating power

The heating output can be set in accordance with actual requirements using the four heat output settings (① – ④). The factory adjustment corresponds to the following standard settings:

**Level ① = 25%      Level ② = 50%      Level ③ = 75%      Level ④ = 99%**

The heating output of the individual steps ① - ④ can be individually adjusted for special applications, e.g.:

**Level ①= 20%      Level ②= 40%      Level ③= 60%      Level ④= 80%**  
Contact Nufer Medical for programming details and cautions to be observed.

## 6.8 LED heating indicator

When the heating indicator is lit, the radiant warmer element is being heated. When high heat levels are selected, the heating indicator is lit for a longer period of time than when lower heat levels are selected. The relative amount of time that the heating indicator is on compared to when it is off, reflects the level of heat being generated by the radiant warmer.

## 6.9 Alarm

When the unit is switched on, a time interval begins which after 15 minutes triggers an audible alarm for 5 seconds and a continuous visual alarm in the form of a flashing red alarm indicator/button (7).

The alarm can be cancelled by pressing the alarm indicator/button (7), causing the alarm indicator to extinguish and the audible alarm signal to stop (if cancellation is carried out within the 5 second audible alarm period). If the alarm is not cancelled within 8 seconds, the heat output of the radiant warmer is reduced to a preset value (the safety setting – factory set to 25%). The acoustic signal stops and the red alarm LED continues to flash. The power level LED further indicates the preset value. Based on the tact of the heater control LED (10) one can recognize that the safety heat setting is activated. Use the alarm pushbutton to acknowledge the alarm. The 15 min. time interval restarts and the radiant warmer heats again with the level indicated by the heater control LED.



### WARNING!

The child must not be left unattended on the bed with the radiant warmer switched on.

## 6.10 Heating level use

The heating levels can be used as follows:

Table 1

**Level ①:** To keep the support surface warm for continuous operation

**Level ②:** For normal operation on changing and examination areas

**Level ③:** Additional warmth for resuscitation, the labor room or for the operating theatre

**Level ④:** For increased heat in the operating theatre, during anesthesia or for adults

<b>Level 1</b> = 25%	
<b>Level 2</b> = 50%	
<b>Level 3</b> = 75%	
<b>Level 4</b> = 99%	

## 7. Versions of Ceratherm 600-2

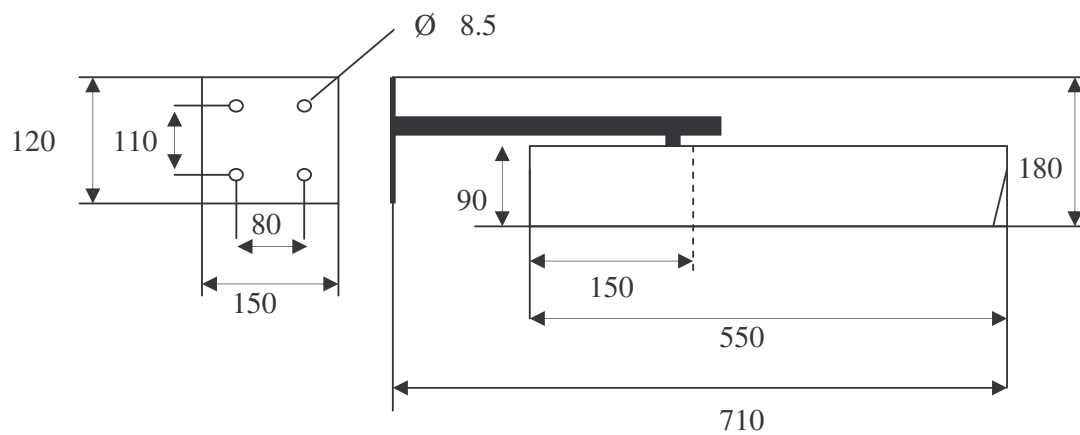
### 7.1 Radiant warmer Ceratherm 600-2 alone

Part Number: 521A-60020-CH (or 521A-60020-EX)



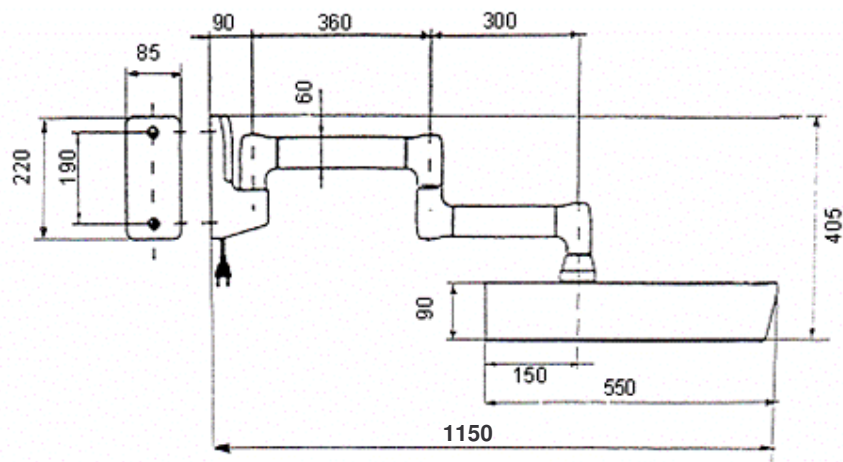
### 7.2 Radiant warmer Ceratherm 600-2 with fix wall mounting bracket (not pivotable)

Part Number: 521A-60023-CH (or 521A-60023-EX)



### 7.3 Radiant warmer Ceratherm 600-2 with double-hinged arm and wall mounting bracket, with integrated power supply cord

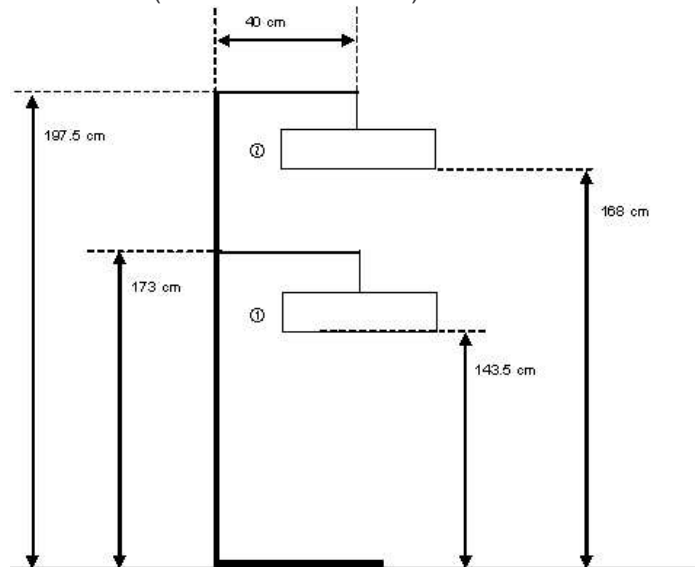
Part Number: 521A-60022-OND





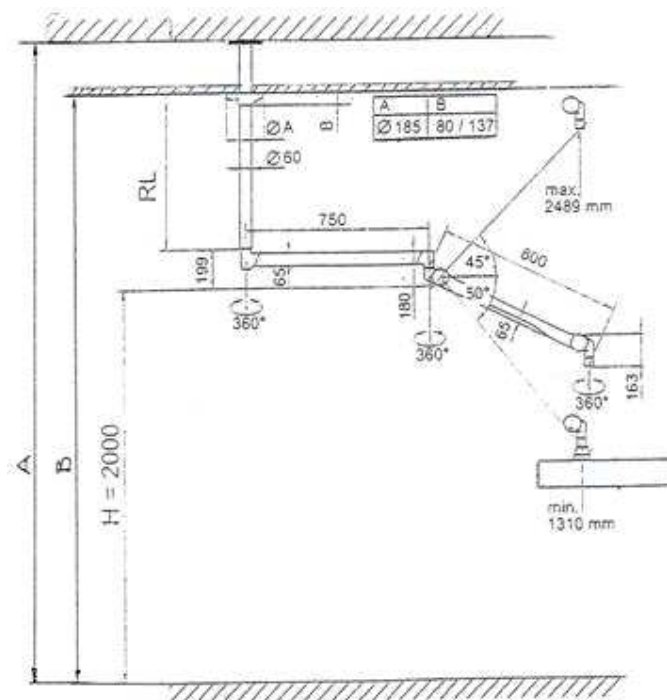
#### 7.4 Radiant warmer Ceratherm 600-2 SM on mobile floor stand

Part Number: 521A-60035-CH (or 521A-60035-EX)



### 7.5 Radiant warmer Ceratherm 600-2 with ceiling anchorage and height adjustment

Part Number: 521A-60024-CH (or 521A-60024-EX)

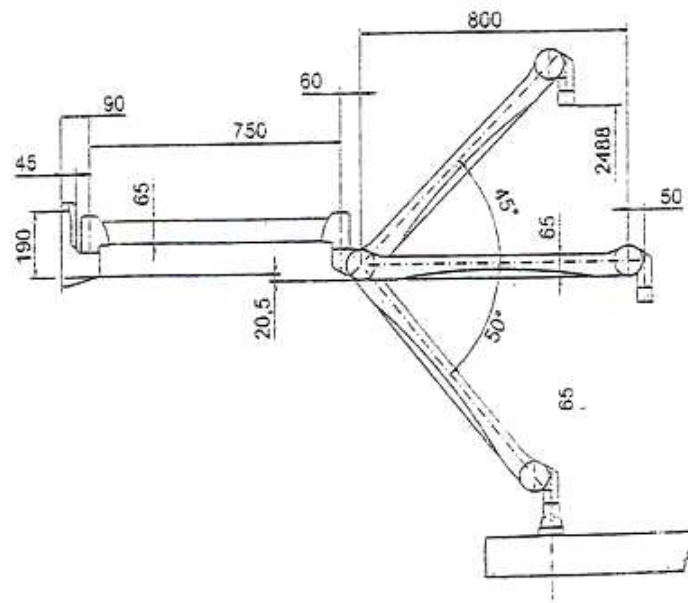


Important:

The measurements A and B are necessary for your purchase order.

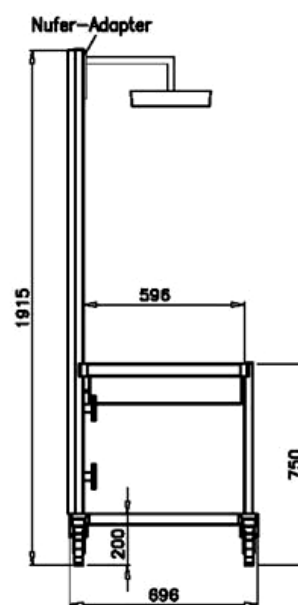
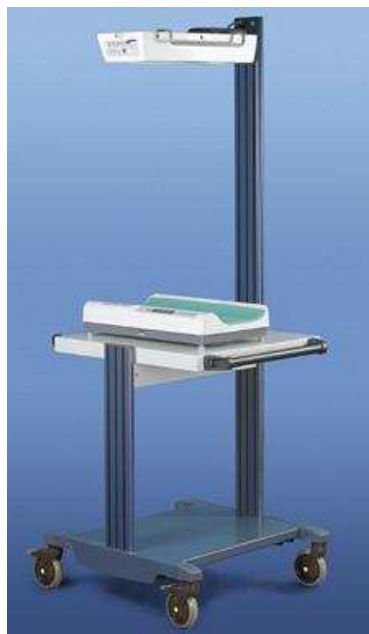
## 7.6 Radiant warmer Ceratherm 600-2 with double jointed arm wall mounting and height adjustment

Part Number: 521A-60025-CH (or 521A-60025-EX)



## 7.7 Radiant warmer Ceratherm 600-2 with DINO-MOBIL

Part Number: 521A-60028-CH (or 521A-60028-EX)



## 8. Repair and Maintenance

### **CAUTION!**

The safety standard check (SSC) has to be performed at least every 24 month or after 10'000 hrs of operation. The check has to be done in accordance to the *chapter 9*.

No special maintenance of the Ceratherm 600-2 radiant warmer is necessary. There are no wear and tear parts.

### **CAUTION!**

The Ceratherm 600-2 radiant warmer may only be used and repaired with accessories and spare parts which have been approved by Nufer Medical AG for safe technical use.

### **CAUTION!**

Nufer Medical AG shall not assume any responsibility for any manipulations which have been carried out on the Ceratherm 600-2 radiant warmer by a non authorized person.

### **CAUTION!**

Disconnect the mains cable from the power outlet before opening the housing!  
Observe the antistatic protection rules when disassembling the Ceratherm 600-2 radiant warmer (the use of an antistatic table mat and a grounded clip are recommended).

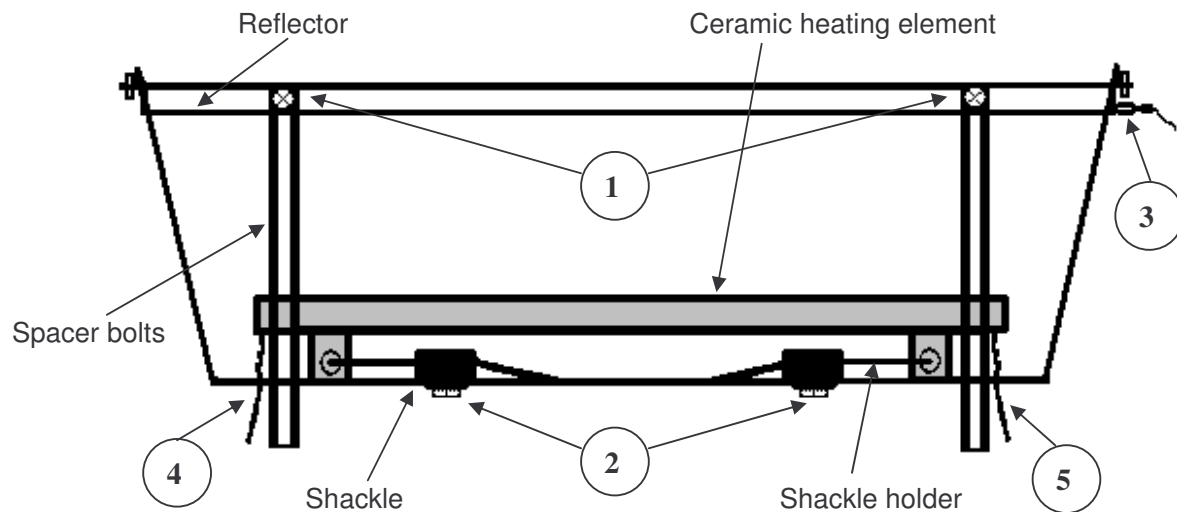
## 8.1 Replacing the ceramic heating element

**Step 1:** The housing must be dismantled from the chassis. For that purpose, release the 6 housing screws.



### WARNING!

The ceramic heating element may be hot. Do not touch the exposed element. Wait 15 minutes for the heating element to cool down before touching the surface.



**Step 2:** Release the 4 Philips screws (1) which carry the reflector on the spacer bolts. Detach the heating element leads (4) and (5) which are secured to the ceramic terminals. After removing the earth cable (3), release the two socket head screws (2) to separate the shackle holder from the reflector. The heating element can then be removed vertically from the reflector. Replace the heating element.

**Step 3:** Reassembling: Release the socket head screws (2) which carry the reflector on the spacer. The shackles must first be secured onto the heating element, the shackle holders placed on the shackles and the element inserted carefully into the reflector and mounted in position.

**Caution: The screws (2) must not touch the heating element!**

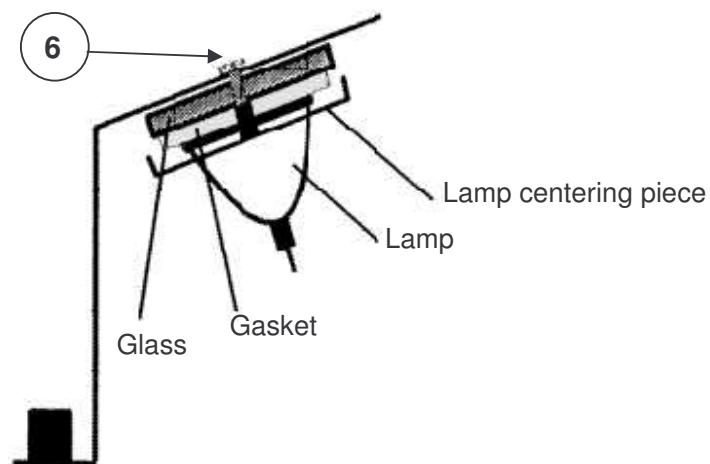
The reflector is now placed on the spacer bolts and mounted in position. Push the earth cable (3) onto the reflector and connect the two heating element leads (4 and 5) again. Now reassemble the housing. To switch the radiant warmer on again, proceed as indicated in the user manual.

## 8.2 Lamp replacement

**Step 1:** Remove the 6 housing screws.

**Step 2:** Detach the two screws (6) and carefully remove the lamp centering piece with its contents. To enable the lamp to be detached from the lamp centering piece, the lamp socket must also be removed.

**Step 3:** The new lamp can now be fitted as shown in the drawing. When reassembling, make sure that the lamp glass is in the correct position.



### 8.3 Replacing the electronic controller

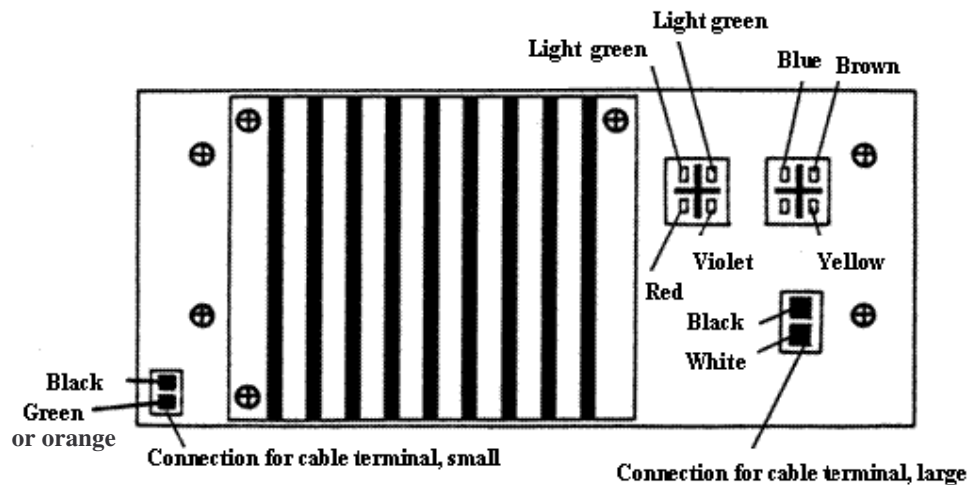
**Step 1:** Remove the 6 housing screws.

**Step 2:** Unplug the 2 connectors and all leads from the heating and light switch.

**Step 3:** Release the 3 head screws at front to enable the front to be removed from the chassis. The complete control unit with the front can now be exchanged.

**Step 4:** When reassembling, check the cable terminals and connectors to make sure that a good contact is obtained.

Control connection diagram (rear view)



### 8.4 Fuses

After each repair, the fuses on the instrument must be checked and if necessary replaced.

- There are two slow blow 3.15 AT fuses located in the power socket
- One slow blow 0.2 AT fuse located on the transformer (for controller)
- One slow blow 1.6 AT fuse located on the transformer (for lamp)

## 9. Technical Safety Check (SSC)

The technical safety check must be performed at least every 24 months or after 10'000 hours of operation.

<b>Nufer Medical AG</b> Ceratherm 600-2 Radiant warmer		Hospital: _____		
SN: _____				
Pos.	Description	Desired Value	Actual OK Value	Remark
<b><u>Mechanical Condition</u></b>				
1	Case (Chassis)			
2	Switches			
3	Rollers			
4	Chassis able to be blocked and adjusted in height			
5	Shock absorbers (available since 2003)			
6	Check if the 2 lamp holder screws are tight			
7	Check wall, ceiling and mobile mounting device: Paintwork, cracks on plastic parts, deformation, loose parts			
8	Every 2 years, check securing segment: Thickness minimum 1.5 mm and minimum length of 10.5 mm			
<b><u>Function Test</u></b>				
<b>9 Current measurements @ 230 VAC / 50Hz:</b>				
	Level 1 (Current varies but min. value must be checked)	Ca. 0.1 - 0.4 A		
	Level 4	Ca. 2.4 - 2.9 A		
10	Heating OK?			
11	Halogen lamp OK?			
<b><u>Heater Alarm</u></b>				
12	Acoustically after	15 min	min	
13	Visually after	15 min	min	
14	Alarm reset switch OK?			
<b><u>Electrical Safety</u></b>				
15	Connections checked			
16	Electrical safety test according IEC 601-1			
<b><u>Various/Cleaning</u></b>				
17	Dust removed, radiant warmer cleaned			
18	New service label attached			
Remarks:				
The device has passed the SSC and is safe for use				
Date:	Name:	Signature:		

## 10. Temperatures generated by the Ceratherm 600-2

**Table 2**

	1	2	3	4	5
Level					
1 (25%)	26.9 °C	27.3 °C	27.7 °C	27.3 °C	27.0 °C
2 (50%)	29.9 °C	30.9 °C	31.5 °C	31.3 °C	30.3 °C
3 (75%)	32.1 °C	34.6 °C	35.8 °C	34.0 °C	32.4 °C
4 (99%)	36.9 °C	38.6 °C	39.5 °C	38.5 °C	37.0 °C

The values were measured with an ambient temperature of 22° C and with a humidity of 25 %.

Depending on the ambient temperature and humidity, the measurements can vary.

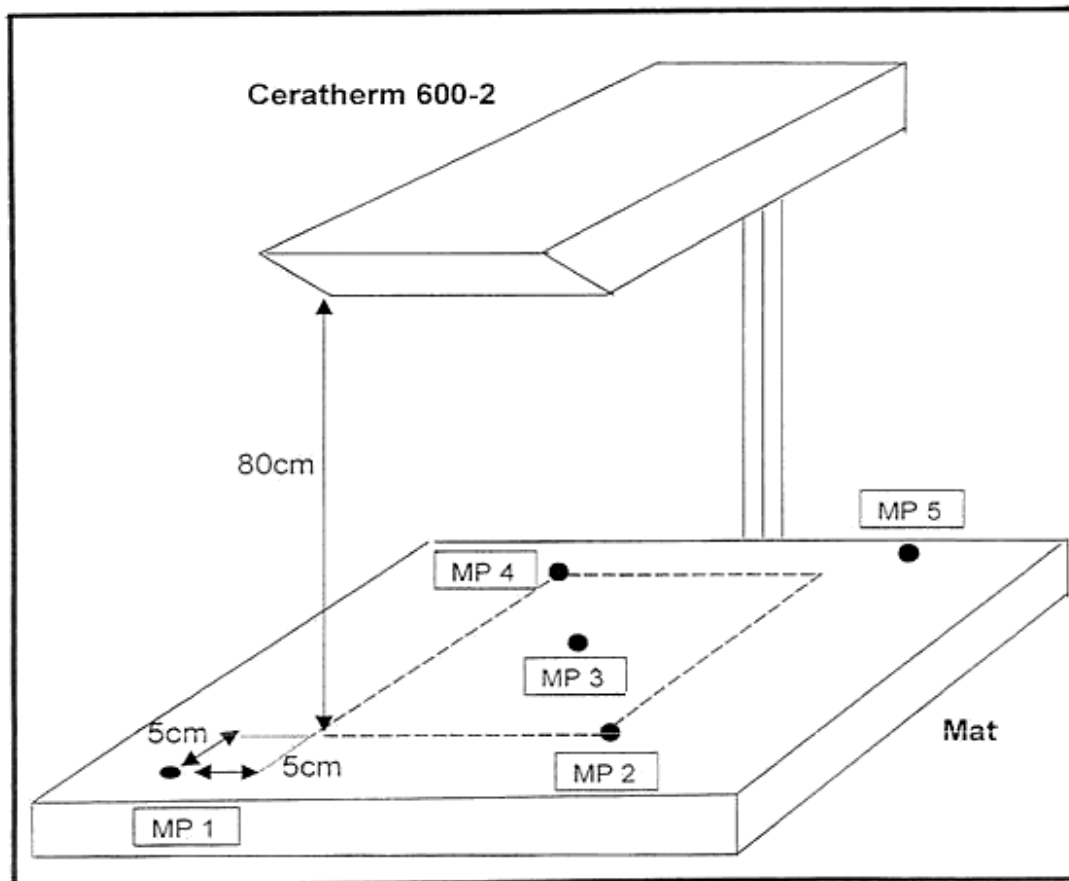
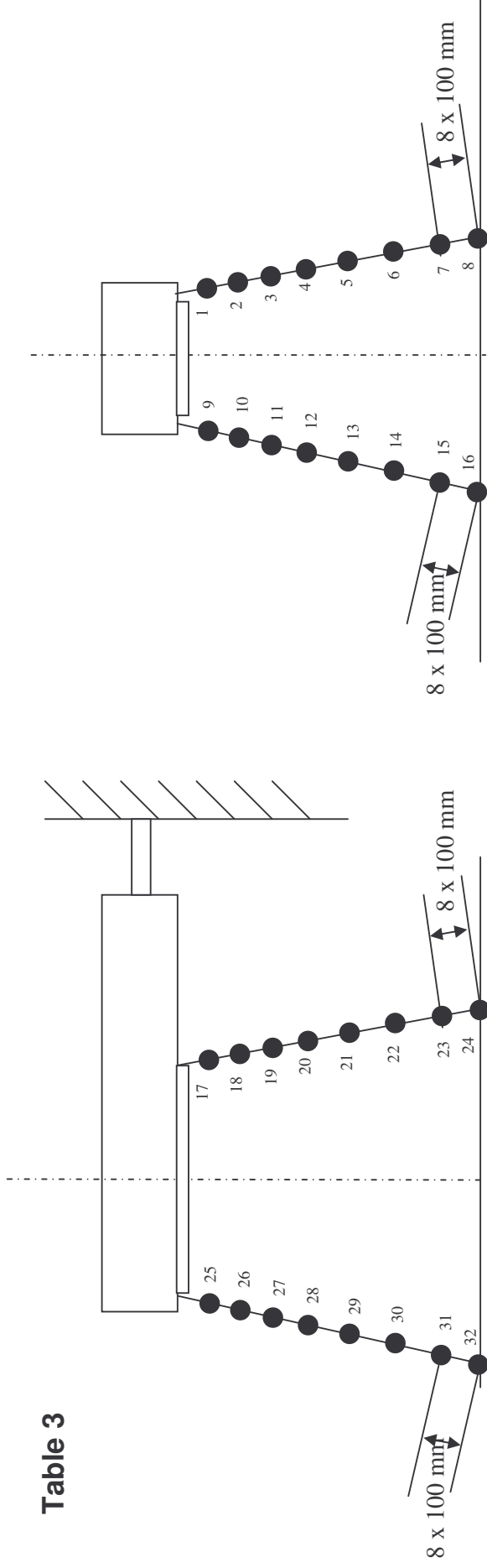




Table 3



Depending on the ambient temperature and humidity, the measurements can vary.

Pos.	Temperature °C	Pos.	Temperature °C	Pos.	Temperature °C
1	38.9	9	38.9	17	35.9
2	35.1	10	35.1	18	33.3
3	31.9	11	31.9	19	30.9
4	29.9	12	29.9	20	29.4
5	28.8	13	28.8	21	28.7
6	27.6	14	27.6	22	28.4
7	27.4	15	27.4	23	28.1
8	27.1	16	27.1	24	27.5

Temperature measurements made at ambient temp. of : 26.4 °C  
Ceratherm 600-2 set to Level 4  
Temperature measuring instrument : Fluke51 (M5), SN : 5355779, calibrated : 04/2007

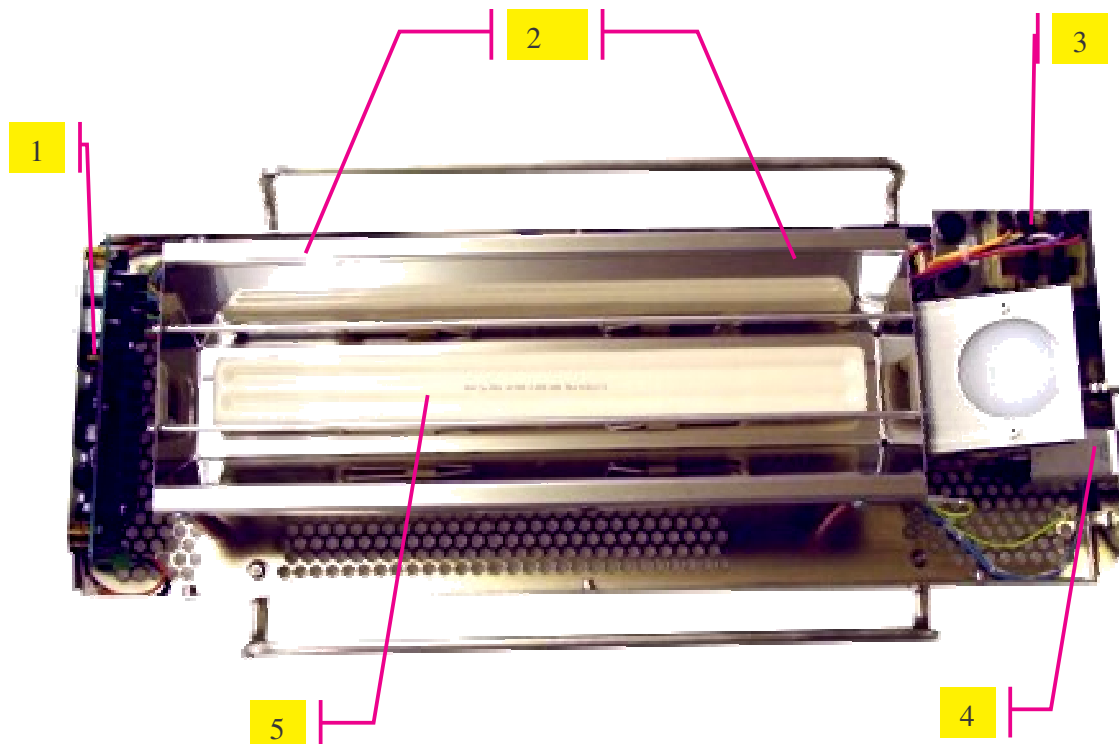
## 11. Cleaning and disinfection

The surfaces should be cleaned with a moist cloth and a cleaning agent or disinfectant. Liquids which enter the instrument may cause damage. After cleaning the surfaces, rub with a dry cloth.

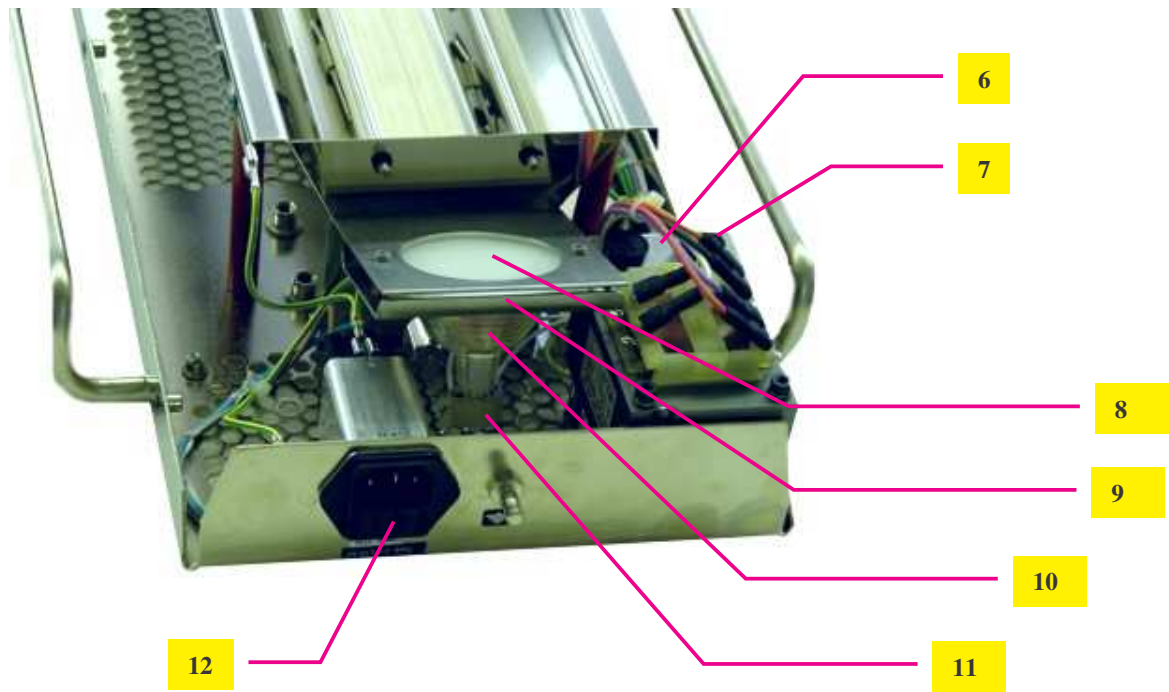
Disinfection should be carried out using only agents which do not attack plastic and aluminum parts. Observe the recommendations of the disinfectant manufacturer.

## 12. Spare Parts

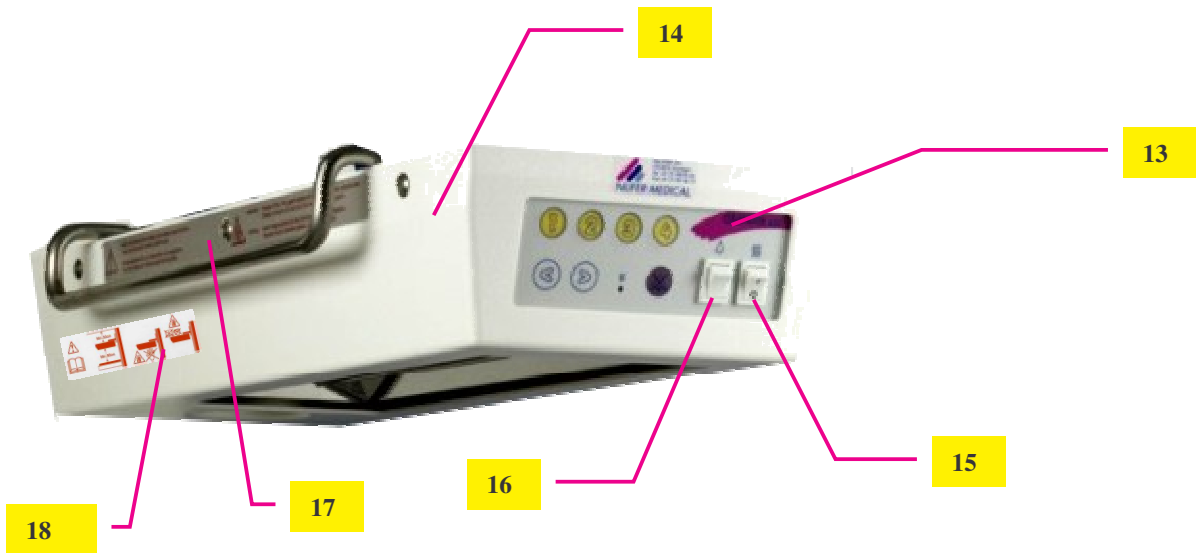
### Detail A



**Detail B**



**Detail C**



Pos. 12	521-175002	Fuse 3.15 AT
Pos. 6		Fuse 1.6 AT
Pos. 7		Fuse 0.2 AT



Pos. 3  
Art. 521-175502  
Transformer 36 VA



Pos. 12  
Art. 521-175503  
Mains input socket with filter

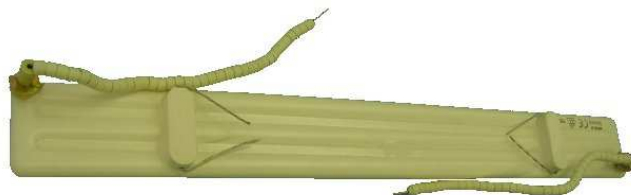


Pos. 1  
Art. 521-185001  
Controller

Pos. 1  
Art. 521-185001A-R  
Controller standard exchange (repair exchange)



Pos. 2  
Art. 521-175003  
Ceramic terminals, 3 poles



Pos. 5  
Art. 521-753011  
Ceramic heating element 600 W



Pos. 10  
Art. 521-0-BAB  
Halogen lamp 12V 20W



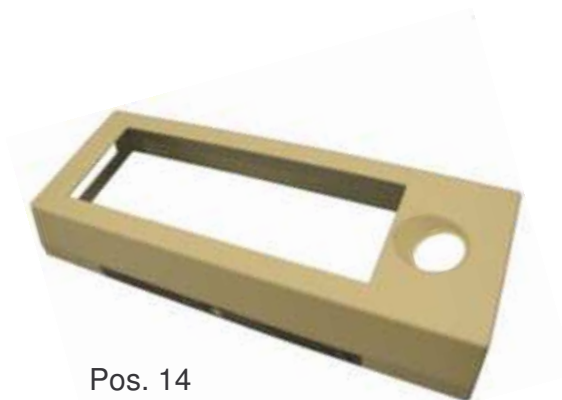
Pos. 9  
Art. 521-965002  
Flat gasket for lamp



Pos. 8  
Art. 521-960003  
Protective glass



Pos. 11  
Art. 521-175004  
Lamp socket with cable



Pos. 14  
Art. 521-7198  
Plastic housing (ABS, RAL 0910 white)



Pos. 13  
Art. 521-935000  
Front panel



Pos. 15  
Art. 521-18581105IO  
ON/OFF switch



Pos. 16  
Art. 521-18581105L  
Light switch



Pos. 17  
Art. 521-ZZ-03006 (IT / FR) 521-ZZ-03007 (EN / DE)  
Safety sticker text version (side of housing, limited availability)

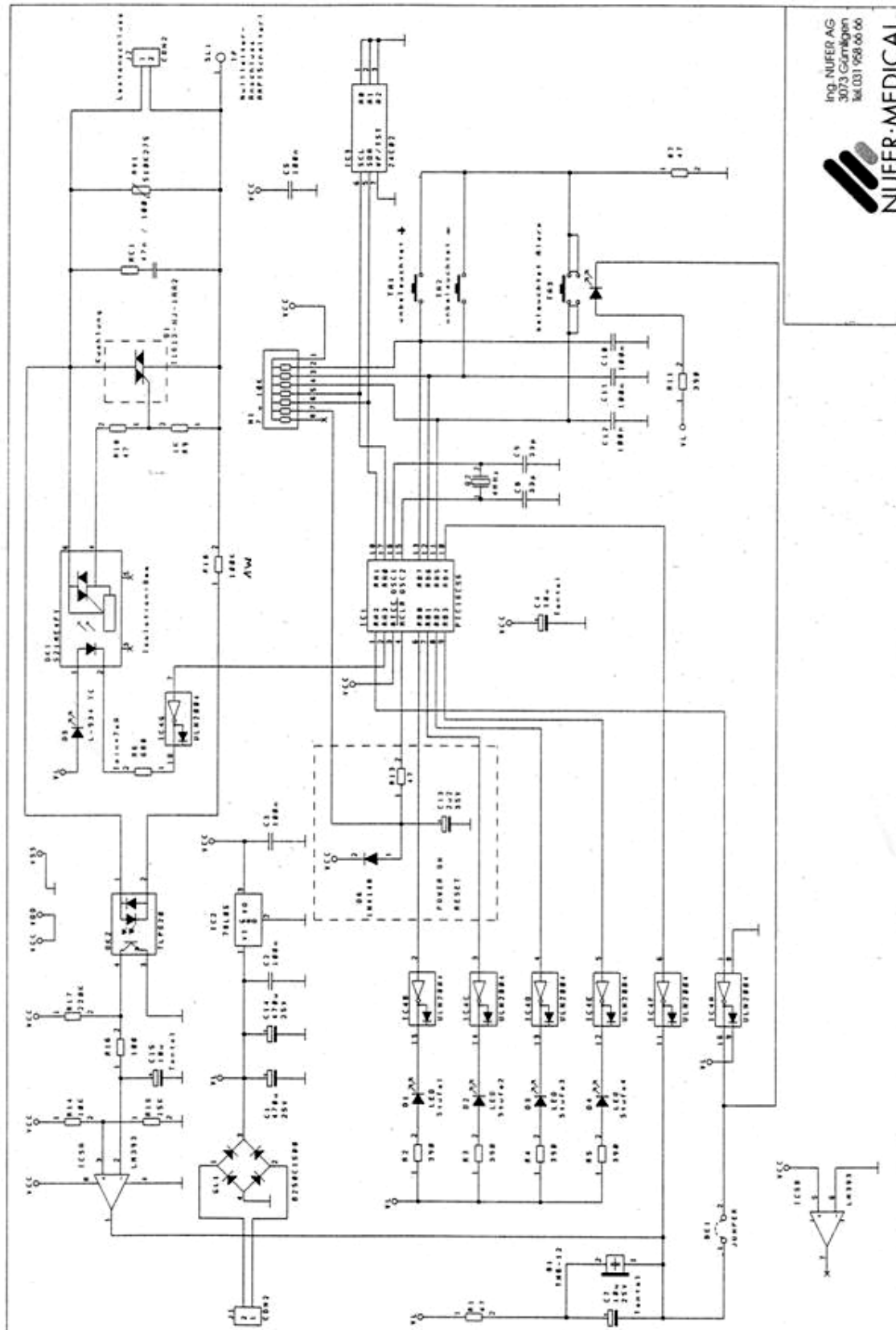


Pos. 18  
Art. 521-GF2704.07N  
Safety sticker new pictogram version (side of housing)



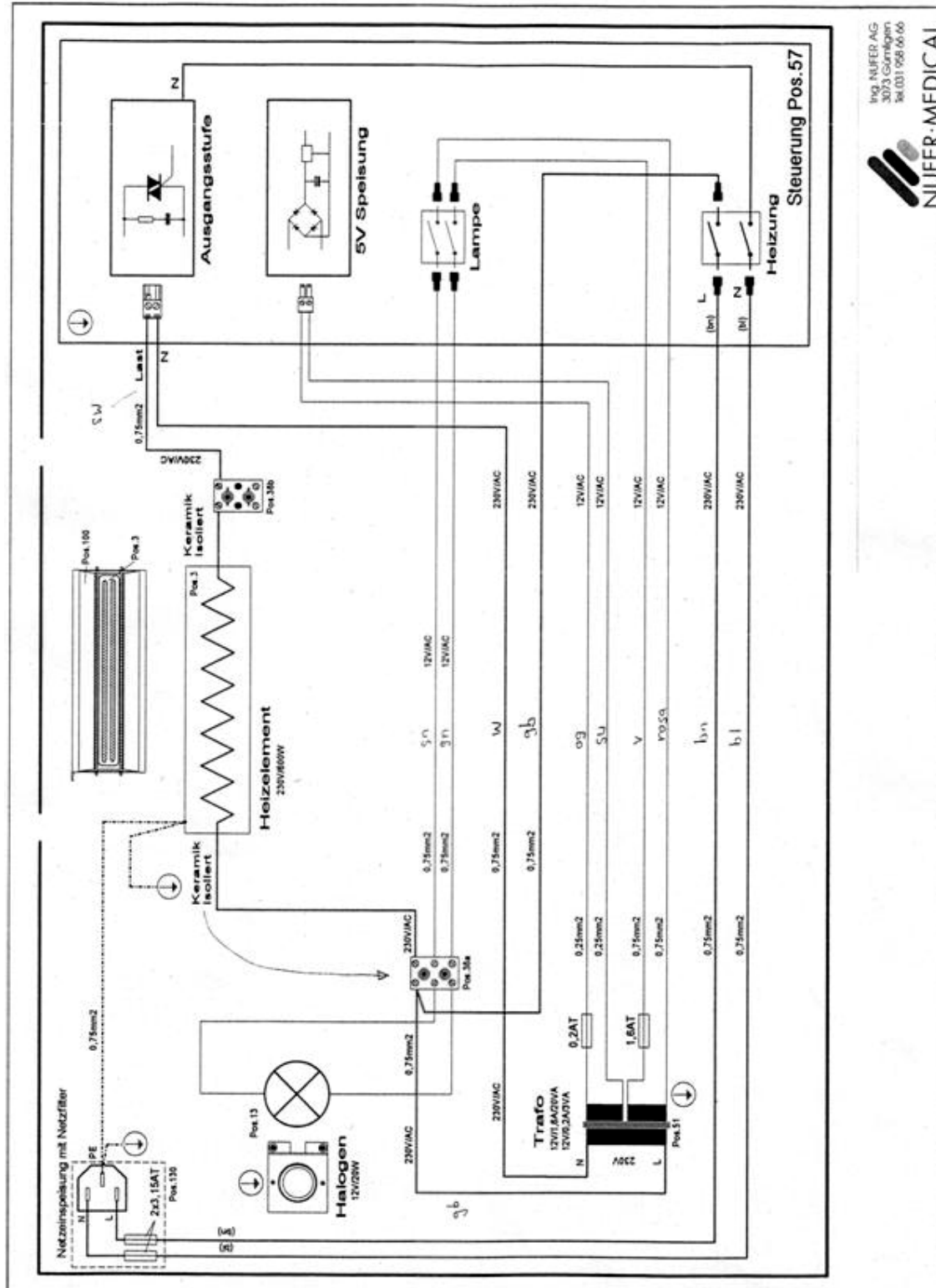
Art. 521-6003068  
Shock absorber (inside  
tube of mobile stand)

### 13. Schematic of controller



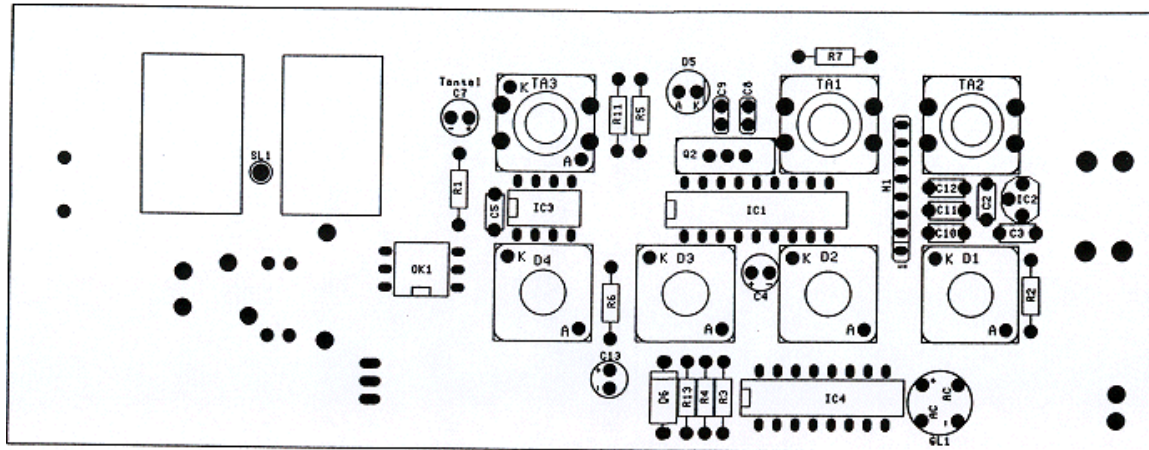


## 14. Schematic of power supply

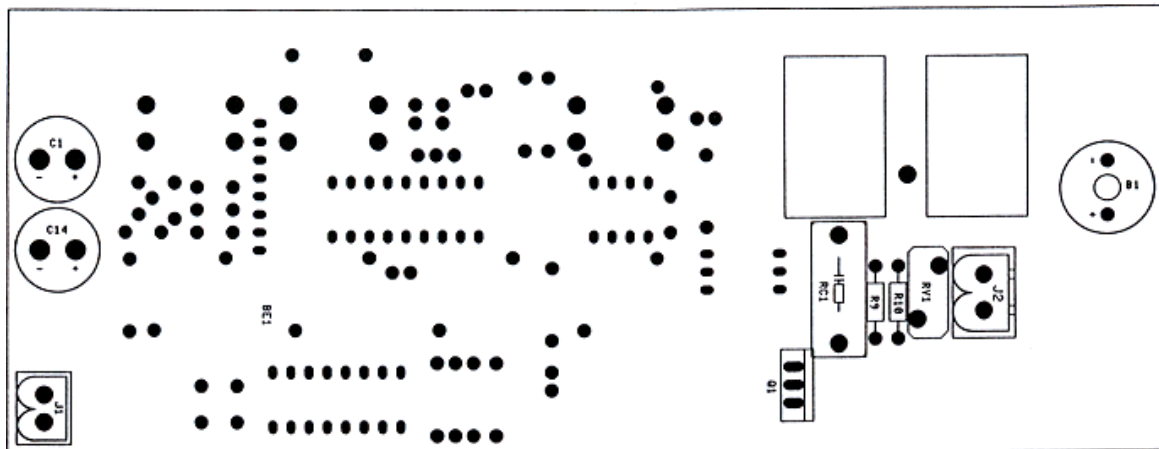




## 15. Layout controller board (top-view)



## 16. Layout controller board (bottom-view)



<b>17. Repair-Order-Form</b>			
<b>Nufer Medical AG / Gümligen, Switzerland</b>			
<b>Invoice number:</b>			
Customer Name and Address:			
Name of contact person:		Tel. Number:	
Ceratherm 600-2 radiant warmer	<b>Accessories:</b>	Wall mounting	
Serial Number:		Wall mounting with double-hinged arm	
		Ceiling anchorage with height adjustment	
		Mobile stand	
		Cart DINO-MOBIL	
<b>Detailed description of failure or problem:</b>			
<b>Expected work/repair:</b>			
Repair	<input type="checkbox"/>	Description:	
Warranty repair	<input type="checkbox"/>		
Ship exchange unit	<input type="checkbox"/>		
Other	<input type="checkbox"/>		
Date:		Signature:	



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[www.nufer-medical.ch](http://www.nufer-medical.ch)

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