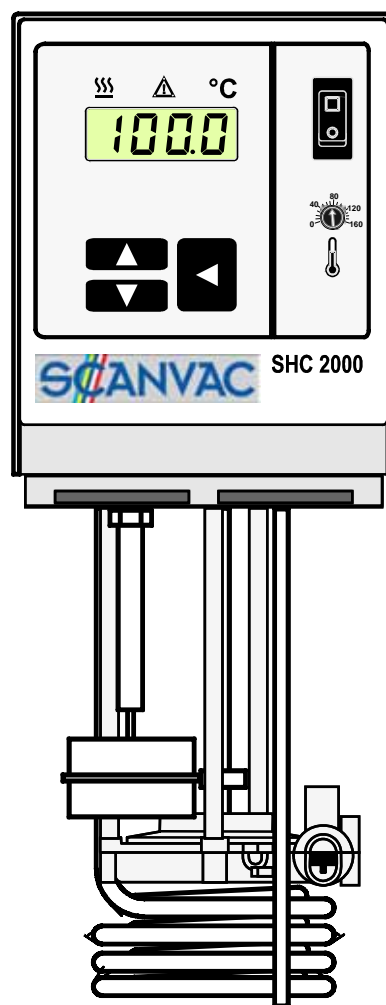


# Operating Manual

Circulator  
SHC 2000



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## **Congratulations!**

You have made an excellent choice.

ScanCool thanks you for the trust you have placed in us.

This operating manual has been designed to help you gain an understanding of the principles of operating and possibilities of our circulators. For optimum utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

## **Unpacking and checking**

Unpack the circulator and accessories and check for damages incurred during transit. These should be reported to the responsible carrier, railway, or postal authority, and a request for a damage report should be made. These instructions must be followed fully for us to guarantee our full support of your claim for protecting against loss from concealed damage. The form required for filing such a claim will be provided by the carrier.

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## Operating manual

### Description

The circulators SHC 2000 are designed for temperature application to specific fluids in a bath tank.

- The circulators are operated via the splash-proof keypad. The implemented microprocessor technology allows to set and to store the setpoint that can be indicated on the LED temperature display.
- The PID temperature control adapts the heat supplied to the thermal requirements of the bath.
- Safety installations conforming to IEC 61010-2-010.  
The excess temperature protection is a safety installation independent from the control circuit.  
The safety value is set using a tool (screwdriver).  
If the low level protection device is triggered, a complete shutdown of the heater and circulating pump is effected.
- The circulator conforms to the relevant requirements specified by European guidelines.



The circulators are not conceived for direct temperature application to food and luxury articles or pharmaceutical and medico-technical products. Direct temperature application means: Unprotected contact of the object with the bath medium (bath fluid).

### Operator responsibility – Safety recommendations

The products of ScanCool warrant a safe operation if installation, operation and maintenance is carried out according to common safety regulations. This section informs you about potential dangers that may arise from operating the circulator and also mentions the most important safety precautions

#### Persons:

The operator is responsible for the qualification of the personnel operating the units. The operator should be constantly informed about the dangers involved with their job activities as well as preventive actions.

Make sure all persons expected to carry out operation, installation and maintenance of the unit read and understand the safety information and operating instructions.

When using hazardous materials, the circulator may only be operated by persons that are absolutely familiar with these materials and the circulator. These persons must be fully aware of possible risks.

If you have any questions concerning the operation of your unit or the information in this manual, please contact us!

**Contact** ScanCool  
Nøglegaardsvej 20  
Vassingerød  
3540 Lynge Denmark

### Handling:

You received a product conceived for industrial use. Nevertheless, avoid strikes to the housing, vibrations and damages to the keypad foil (keys, display) or contamination. Make sure the product is regularly checked for proper condition. Regularly check (at least every 2 years) the proper condition of the mandatory, warning, prohibition and safety labels.

Take care that the mains supply features a low impedance to avoid any negative affects on the instrument being operated in the same mains.

This unit is designed for operation in a controlled electromagnetic environment. This means that transmitting devices (e.g. cellular phones) should not be used in the immediate vicinity.

Magnetic radiation may influence other units with components susceptible to magnetic fields

(e.g. a monitor). We recommend to keep a minimum distance of 1 m.

Permissible ambient temperature: max. 40 °C, min. 5 °C.

Permissible relative air humidity: 50 % (40 °C).

Do not store in an aggressive atmosphere. Protect from contaminations. Do not expose to sunlight.

### Operation:

Only qualified personnel is authorized to perform configuration, installation, maintenance and repairs of the circulator.

Routine operation can also be carried out by untrained personnel who should however be instructed by trained personnel. The summarized user guidance (short manual) and the specification table with information on individual parameters are sufficient for this.

### Use:

The bath can be filled with flammable materials. Fire hazard!

There might be chemical dangers depending on the bath medium used.




Observe all warnings for the used materials (bath fluids) and the respective instructions (safety data sheets).

Insufficient ventilation may result in the formation of explosive mixtures. Only use the unit in well ventilated areas.


Only use recommended materials (bath fluids). Only use non-acid and non corroding materials.

When using hazardous materials, **the user must** attach the enclosed safety labels to the front of the unit so they are well visible: The yellow warning label W09 (danger area) and the blue mandatory label M018 or Semi S1-0701 Table A1-2 #9 (Carefully read the user information prior to beginning operation).

## SHC 2000

Warning label W09: Colours: yellow, black		Danger area. Attention! Observe instructions. (operating manual, safety data sheet)
Mandatory label M018 Colours: blue, white		Carefully read the user information prior to beginning operation Scope: EU
Semi S1-0701 Table A1-2 #9		Carefully read the user information prior to beginning operation Scope: NAFTA

Particular care and attention is necessary because of the wide operating range. There are thermal dangers: Burn, scald, hot steam, hot parts and surfaces that can be touched.

Warning label W26: Colours: yellow, black		Hot surface warning. (The label is put on by ScanCool )
--	---	--

Observe the instructions in the manuals for instruments of a different make that you connect to the circulator, particularly the respective safety recommendations. Also observe the pin assignment of plugs and technical specifications of the products.

### Disposal:

The product may be used with oil as bath fluid. These oils fully or partially consist of mineral oil or synthetic oil. For disposal, observe the instructions in the safety data sheets.

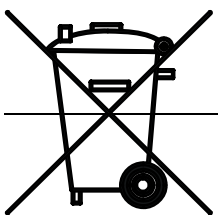
Please observe the regulations for disposal which are effective in the country of operation.

#### Valid in EU countries

Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

This directive requires electrical and electronic equipment marked with a crossed-out trash can to be disposed of separately in an environmentally friendly manner.

Contact an authorized waste management company in your country. Disposal with household waste (unsorted waste) or similar collections of municipal waste is not permitted!



**Technical specifications**

SHC 2000		
Working temperature range	°C	20 ... 150
Operating temperature range	°C	-35 ... 150
Temperature stability	°C	±0,01
Temperature selection		digital
Temperature indication		LED
Resolution	°C	0.1
Temperature control		PID
Heater wattage (at 230 V)	kW	2,0
Heater wattage (at 115 V)	kW	1,0
Pump capacity		
Flow rate.	l/min at 0 bar	15
Pressure	maxbar at 0 liter	0,35
Overall dimensions (WxDxH)	cm	13x16x33
Usable bath depth	cm	8 ... 20
Weight	kg	4,1
Ambient temperature	°C	5 ... 40
Mains power connection 230 V/50 Hz	V/ Hz	190-253 / 50
Current input at 230 V	A	9
Mains power connection 230 V/60 Hz	V/ Hz	190-253 / 60
Current input at 230 V	A	9
Mains power connection 115 V/60 Hz	V/ Hz	103-127 / 60
Current input at 115 V	A	9

All measurements have been carried out at:

rated voltage and frequency      operating temperature: 70 °C

ambient temperature: 20 °C      bath fluid: water

Technical changes without prior notification reserved.

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Safety installations according to IEC 61010-2-010:

Excess temperature protection	adjustable from 0 °C ... 170 °C
Low liquid level protection	float switch
Classification according to DIN 12876-1	class III
Alarm message	optical + audible (permanent)

Environmental conditions according to IEC 61 010-1:

Use only indoor.

Altitude up to 2000 m - normal zero.

Ambient temperature: +5 ... +40 °C (for storage and transportation)

Air humidity:

Max. rel. humidity 80 % for temperatures up to +31 °C,

linear decrease down to 50 % relative humidity at a temperature of +40 °C

Protection class according to IEC 60 529 IP21

Power supply: corresponds to Class I; according to VDE 0106 T1

**not for use in explosive atmosphere**

Max. mains fluctuations of  $\pm 10$  % are permissible.

Overvoltage category II

Pollution degree 2

Standards for interference resistance

EN 61326: 1997 + A1: 1998 + A2: 2001 + A3: 2003

Emitted interferences

The unit adheres to the threshold values for emitted interferences according to table 3.

Interference resistance

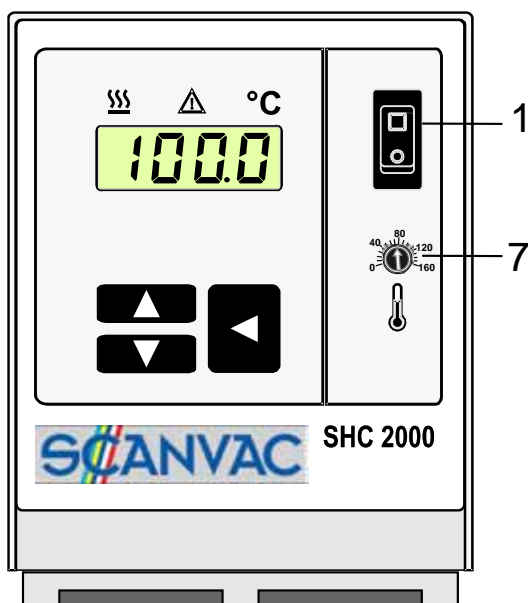
The unit conforms to the requirements according to table B.1.



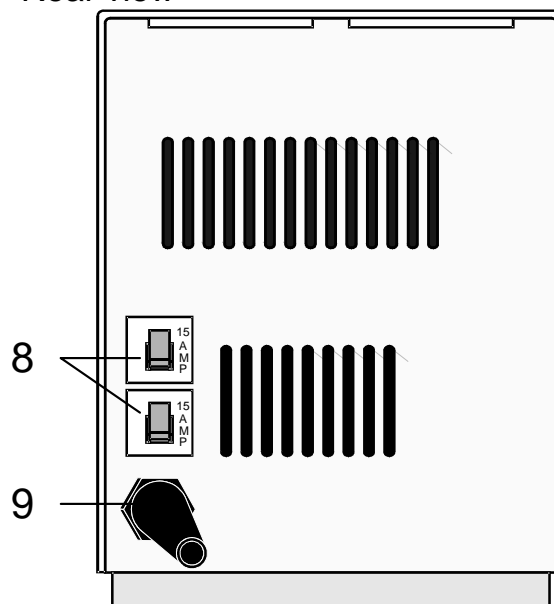
## Operating instructions









### 1. Operating controls and functional elements

Front view



Rear view



- |           |   |   |
|-----------|---|---|
| 1         |   | Mains power switch, illuminated                                       |
| 2         |   | Edit keys (increase/decrease setting)                                 |
| 3         |    | Enter key (store)   |
| 4         |    | LED temperature display, menu indication                              |
| 5         |    | Control indicator – Heating   |
| 6         |    | Control indicator – Alarm   |
| 7         |    | Adjustable excess temperature protection according to IEC 61010-2-010 |
| Rear view |   |   |
| 8         |    | Mains circuit breakers (resettable) 15 A                              |
| 9         |   | Mains power cable with plug   |

## 2. Safety notes for the user



In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle. „Warning of a dangerous situation (Attention ! Please follow the documentation).“  
The danger is described according to an alarm keyword.  
Read and follow these important instructions.



**Warning:**

Describes a possibly highly dangerous situation. If this is not avoided, serious injury and danger to life could result.



**Caution:**

Describes a possibly dangerous situation. If this is not avoided, slight or minor injuries could result.  
A warning of possible damage can also be contained in the text.



**Notice:**

Describes a possibly harmful situation. If this is not avoided, the product or anything in its surroundings can be damaged.

## 3. Preparations

### 3.1. Installation



**Caution:**

Securely fix the immersion circulator. The heater may not be in contact with the wall of the bath tank. Keep a distance of at least 15 mm.  
Units not adequately fixed may drop into the bath tank.

**Danger of electric shock!**

First pull out the power plug to disconnect the unit from the power supply net. Then take the immersion circulator out of the bath tank.  
Make a service technician check the instrument before it is used again.

### 3.2. Bath fluids



**Caution:**

Carefully read the safety data sheet of the bath fluid used, particularly with regard to the fire point!

If a bath fluid with a fire point of  $\leq 65$  °C is used, only supervised operation is possible.

**Water:**

The quality of water depends on local conditions.

Ferrous water can cause corrosion - even on stainless steel.

Chloric water can cause pitting corrosion.

No liability for use with water.

Danger of freezing at working temperatures  $< 5$  °C.

#### Recommended bath fluids:

Bath fluids	Temperature range
Water	5 °C ... 80 °C
Mixture water/glycol	-30 °C ... 50 °C
Silicon oil	-40 °C to 150 °C
The maximum permissible viscosity is 30 mm <sup>2</sup> /s	



**Notice:**

Please contact ScanCool before using other than recommended bath fluids. ScanCool takes no responsibility for damages caused by the selection of an unsuitable bath fluid.

Unsuitable bath fluids are liquids which e.g.

- are very highly viscous (much higher than 30 mm<sup>2</sup> /s [30 cSt] at the respective working temperature)
- have corrosive characteristics or
- tend to cracking.



**Caution:**

The temperature controlling i.e. of fluids in a reactor constitutes normal circulator practice.

We do not know which substances are contained within these vessels. Many substances are:

- inflammable, easily ignited or explosive
- hazardous to health
- environmentally unsafe

i.e.: **dangerous**

**The user alone is responsible for the handling of these substances!**

The following questions shall help to recognize possible dangers and to reduce the risks to a minimum.

- Are all tubes and electrical cables connected and installed?  
Note:  
sharp edges, hot surfaces in operation, moving machine parts, etc.
- Do dangerous steams or gases arise when heating?  
Is an exhaust needed when working?
- What to do when a dangerous substance was spilled on or in the unit?  
Before starting to work, obtain information concerning the substance and determine the method of decontamination.

### 3.3. Tubing

- Recommended tubing:

	Temperature range
CR <sup>®</sup> tubing	-20 °C ... 120 °C
Viton tubing	-50 °C ... 200 °C



**Warning:** Tubing:

At high working temperatures the tubing used for temperature application and cooling water supply represents a danger source. A damaged tubing line may cause hot bath fluid to be pumped out within a short time.

This may result in:

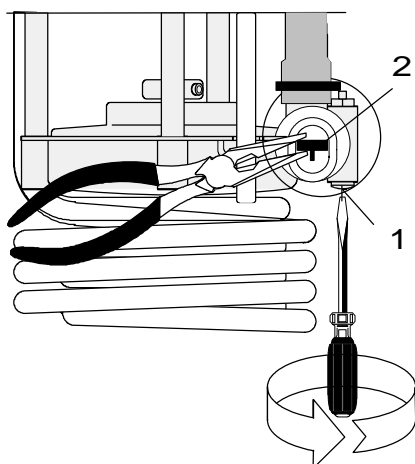
- Burning of skin
- Difficulties in breathing due to hot atmosphere



**Safety recommendations**

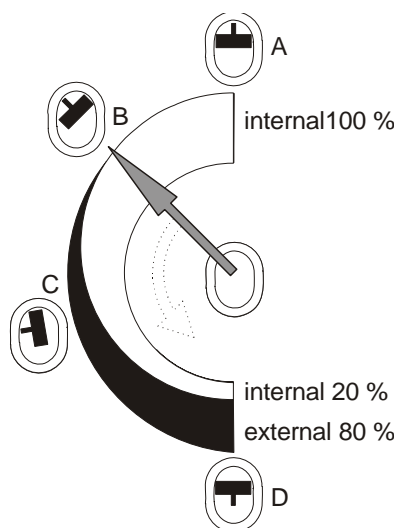
- Employ suitable connecting tubing.
- Make sure that the tubing is securely attached.
- Avoid sharp bends in the tubing, and maintain a sufficient distance from surrounding walls.
- Regularly check the tubing for material defects (e.g. for cracks).
- Preventive maintenance: Replace the tubing from time to time.

### 3.4. Adjusting the pump flow



The pump flow is pre-adjusted in the factory and can be modified to suit user requirements.

- Using a screwdriver turn the screw (1) anti-clockwise by 360 °.
- Using flat pliers turn the marking of the slide (2) to the desired position.
- Tighten the screw.



#### Examples:

##### Internal applications in the bath

- A 100 % internal bath circulation  
(for large bath tanks)
- B Reduced internal bath circulation  
(for smooth surface of bath fluid)

##### External/internal applications

- C 40 % external discharge,  
60 % internal circulation  
(for large bath tanks)
- D 80 % external discharge,  
20 % internal circulation  
(for small bath tanks)



**Caution:** Securely attach all tubing to prevent slipping.

## 4. Operating procedures

### 4.1. Power connection



#### **Caution:**

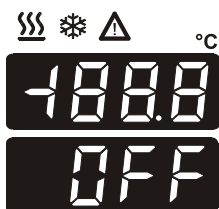
Only connect the unit to a power socket with earthing contact (PE – protective earth)!

We disclaim all liability for damage caused by incorrect line voltages!

Check to make sure that the line voltage matches the supply voltage specified on the identification plate.

## SHC 2000

### 4.2. Switching on / Start - Stop

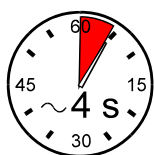


- Switching on:


Turn on the mains power switch (1).

- ① The unit performs a self-test. All segments of the 4-digit LED temperature DISPLAY and all indicator lights will illuminate (as illustrated on the left).

The display "**OFF**" indicates the unit is ready to operate (standby mode).



#### Start:

- Press enter  for about 4 seconds.  
The LED temperature DISPLAY indicates the actual bath temperature.






#### Stop:

- Press enter  for about 4 seconds.

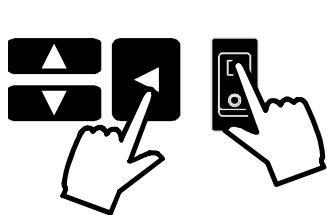
### 4.3. Setting the temperatures


Factory setting:  
25 °C

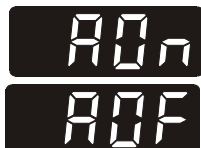
- ① Setting can be carried out in the start/stop condition.

1. Press one of the keys   for a short moment. The setpoint value instead of the actual value is indicated on the display for about 8 seconds. The value can now be changed.
2. Change value:  
Press  to set a higher value.  
Press  to set a lower value.  
Keep the keys depressed for the value to change fast.
3. Press enter  to store the value.

#### 4.4. Automatic / non-automatic start mode



- ① Keep depressed enter  and
- ② turn on the circulator with the mains power switch.



For a short while the LED temperature DISPLAY indicates the effective start mode:

⇒ AUTOSTART on.

⇒ AUTOSTART off.

#### NOTE:

The circulator has been configured and supplied by ScanCool according to N.A.M.U.R. recommendations. This means for the start mode, that the unit must enter a safe operating state after a power failure (non-automatic start mode). This safe operating state is indicated by „OFF“ on the LED temperature display. A complete shutdown of the main functional elements such as heater and circulating pump is effected simultaneously.

Should such a safety standard not be required, the AUTOSTART function (automatic start mode) may be activated, thus allowing the start of the circulator directly by pressing the mains power switch or using a timer.



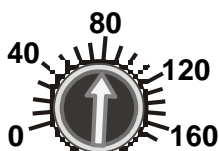
#### Warning:

For supervised or unsupervised operation with the AUTOSTART function, avoid any hazardous situation to persons or property.

The circulator does no longer conform to N.A.M.U.R. recommendations.

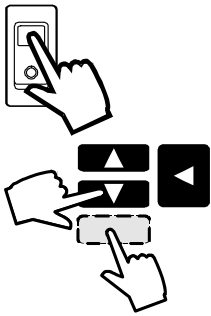
Take care you fully observe the safety and warning functions of the circulator.

#### 4.5. Sensor calibration

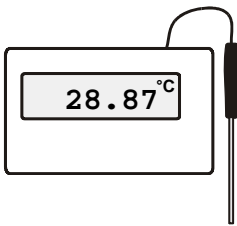


- Calibration of the working sensor is performed at a temperature of 30 °C.
- Place the circulator for example on a 5 litres stainless steel bath and fill the bath with deionized water.
- Set the safety temperature to approx. 80 °C.
- Place a **calibrated** thermometer (resolution: 0.01 °C) in the middle of the bath to measure the actual bath temperature.

## SHC 2000










30.0



28.9

CAL

1. Turn on the circulator with the mains switch.
2. Start the unit  
Press enter  for about 4 seconds.
3. Start the calibration:  
Press the hidden key and the  key at the same time.  
The controller attempts to heat up to the working temperature (30 °C). The LED temperature DISPLAY indicates the actual bath temperature.
4. When the working temperature is reached, wait until the circulator maintains a constant bath temperature (after about 3 minutes).
5. Read the bath temperature from the **calibrated** thermometer and set the rounded value on the circulator. (example: 28.87 °C rounded to 28.9 °C).

- Setting the temperature  
Press one of the keys   for a short moment.  
The setpoint value instead of the actual value is indicated on the display. The value can now be changed.
- Change value:  
Press  to set a higher value.  
Press  to set a lower value.  
Keep the keys depressed for the value to change fast.
- Press enter  to store the value.

- For a short while the LED temperature DISPLAY indicates the message „**CAL**“.

- ① Notice:  
If the determined value is bigger than the tolerance limit of  $\pm 5$  °C, the value is ignored for the input!



## 4.6. Timer function

With the timer function the operating time can be limited to an allowed time.

### 4.6.1. Setting the time

① The setting can only be made in the Stop status.



Factory setting:





Max. time:




33 h 19 min.

#### 1. Calling the timer function:

Hold the Enter key  pressed and activate the edit key  shortly. The time which was set last, is shown.

#### 2. Setting the time:

Activate key  to set a higher value .

Activate key  to set a lower value .

Activate the key shortly for single step, hold the key pressed for quick enumeration.

#### 3. Store the set value with the Enter key .

Example: 120 minutes





① This time remains stored until something is changed.

### 4.6.2. Timer operation



Timer operation


#### • Starting the timer:

Hold the Enter key  pressed and activate the edit key  shortly.

① The bath temperature is shown. In case of timer operation the comma in the display is blinking. The set time is counted up to zero. When the time has elapsed, the circulator stops.

- **Interrupting the timer** / Failure of power supply voltage:  
If there is a power failure, or if the unit is switched off at the mains switch, the circulator memorizes the position of the timer. When the power supply is switched on again, the circulator only works off the remaining time.

#### • Canceling the timer operation:

Press the key  for approx. **4 seconds**.  
The timer can be restarted.

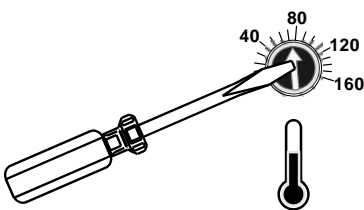
## 5. Safety installations according to IEC 61010-2-010

### 5.1. Excess temperature protection



This safety installation is independent of the control circuit. When the temperature of the bath fluid has reached the safety temperature, a complete shutdown of the heater and pump is effected.

The alarm is indicated by optical and audible signals (continuous tone) and on the LED-DISPLAY appears the error message "Error 14".



**Setting range:** 0 °C to 160 °C

- Using a screwdriver turn the setting screw to the desired value.

**Recommendation:**

Set the excess temperature protector at 5 to 10 °C above the working temperature setpoint.



**Warning:**

The excess temperature protection should be set at least 25 °C below the fire point of the bath fluid used.

In the event of wrong setting there is a fire hazard!

We disclaim all liability for damage caused by wrong settings!

### 5.2. Low liquid level protection



This safety installation is independent of the control circuit.

If the low liquid level protection device (according to IEC 61010-2-010) is triggered, a complete shutdown of the heater and circulating pump is effected.

The alarm is indicated by optical and audible signals (continuous tone) and on the LED-DISPLAY appears the error message "Error 01".

- ① Turn off the unit with the mains switch, refill bath fluid and turn the unit on again!



**Warning:**

For refill always use the same bath fluid type that is already in the bath. Bath oils must not contain any water contaminants. Explosion hazard at higher temperatures!

**Recommendation:**

Only replenish bath fluids at a bath temperature of below 70 °C!

**Notice:**

Check the safety installations at least twice a year!

- Excess temperature protection according to IEC 61010-2-010  
With a screwdriver turn back the adjustable excess temperature protection until the shut-down point (actual temperature).
- Low level protection according to IEC 61010-2-010  
To check the function of the float, it can be manually lowered with a screwdriver for example.

## 6. Troubleshooting guide / Error messages



Whenever the microprocessor electronics registers a failure, a complete shutdown of the heater and circulating pump is performed. The alarm light "△" illuminates and a continuous signal tone sounds.

The LED temperature display indicates the cause for the alarm in form of a code.



Press enter  to quit the audible signal.



- The circulator is operated without bath fluid, or the liquid level is insufficient.  
Replenish the bath tank with the bath fluid.
- Tube breakage has occurred (insufficient filling level due to excessive bath fluid pumped out). Replace the tubing and replenish the bath tank with the bath fluid.



- Cable of the working temperature sensor interrupted or short-circuited.



- Defect of the working or excess temperature sensor.  
Working temperature and excess temperature sensors report a temperature difference of more than 25 °C.



- Error in A/D converter

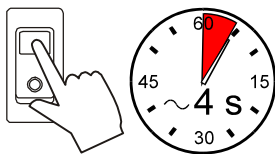
## SHC 2000



- The excess temperature value lies below the working temperature setpoint.  
Set the excess temperature to a higher value.



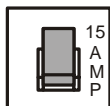
- Cable of the excess temperature sensor interrupted or short-circuited.



After eliminating the malfunction, press the mains power switch off and on again to cancel the alarm state.  
If the unit cannot be returned to operation, contact an authorized service station.

### **Disturbances that are not indicated.**

The electronic pump motor is overload-protected by an electronic current limiter. If viscosity of the bath fluid is or becomes too high, the motor stops running.



Mains circuit breakers (resettable) 15 A.

## 7. Safety recommendations

Follow the safety recommendations to prevent damage to persons or property. Further, the valid safety instructions for working places must be followed.



- Only connect the unit to a power socket with earthing contact (PE – protective earth)!
- Place the instrument on an even surface on a pad made of **non-inflammable** material.
- Do not stay in the area below the unit.
- Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit.
- Observe the fire point of the bath medium used.  
The excess temperature protection should be set at least 25 °C below the fire point.
- Never operate the unit without bath fluid in the bath.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflowing of the fluid.
- Prevent water from penetrating into the hot bath oil.
- Exercise caution when emptying hot bath fluids!  
Check the temperature of the bath fluid prior to draining.
- Observe the limited working temperature range when using plastic bath tanks.
- Employ suitable connecting tubing.  
Make sure that the tubes are securely attached.
- Never operate damaged or leaking equipment.
- Always turn off the unit and disconnect the mains cable from the power source before performing any service or maintenance procedures, or before moving the unit.
- Always empty the bath before moving the unit.
- Never operate equipment with damaged mains power cables.



- Some parts of the bath cover and the pump connections may become extremely warm during continuous operation. Therefore, exercise particular caution when touching these parts.

## 8. Cleaning / repairing the unit

**Caution:**

Always turn off the unit and disconnect the mains cable from the power source before cleaning the unit.

Prevent humidity from entering into the circulator.

Electrical connections and any other work must be performed by qualified personnel only.

**Cleaning:**

For cleaning the bath tank and the immersed parts of the circulator, use low surface tension water (e.g., soap suds).

Clean the outside of the unit using a wet cloth and low surface tension water.

The circulator is designed for continuous operation under normal conditions. Periodic maintenance is not required.

The tank should be filled only with a bath fluid recommended by ScanCool . To avoid contamination, it is essential to change the bath fluid from time to time.

**Repairs:**

Before asking for a service technician or returning a circulator for repair, please contact an authorized service station.

When returning the unit:

- Clean the unit in order to avoid any harm to the service personnel.
- Attach a short fault description.
- During transport the unit has to stand upright. Mark the packing correspondingly.
- When returning a unit, take care of careful and adequate packing.
- ScanCool is not responsible for damages that might occur from insufficient packing.

## **Declaration of Conformity**

We declare under our responsibility, that the following product

**Model: SHC2000**

to which this declaration relates is in conformity with the following standard(s) directives or other normative document(s):

**DS/EN ISO 12100-1: 2003 Safety of machinery  
(basic concepts – General principles)**

**DS/EN ISO 12100-2: 2003 Safety of machinery  
(Technical principles and specifications)**

**EN 60204-1: 2006 Safety of machinery  
(Electrical equipment of machines – General requirements)**

**DS/EN 61010-1: 2001 Safety requirements for electrical equipment for measurement,  
control and laboratory use  
(General requirements)**

**DS/EN 61000-6-3: 2002, DS/EN 61000-6-1: 2002  
Electromagnetic compatibility  
(Generic immunity/emission standard)**

**EN 1050: 1997 Safety of machinery  
(Principles for risk assessment)**

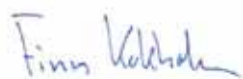
following the provisions of:

**Directive 98/37/EEC Machinery**

**Directive 2006/95/EEC, per August 2007  
(Electrical equipment designed for use within certain voltage limits)**

**Directive 89/336/EEC Electromagnetic compatibility**

**Lynge, November 2009**



**Finn Kokholm  
Managing Director**



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