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Instruction Manual
Circulator DC10
including all Baths

Part No. 003-3046
1-1-061-2 / 11.2000

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1. Key to Symbols

1.1 Symbols used in this manual

! Warns the user of possible damage to the unit, draws attention to the risk of injury or contains safety notes and warnings.

☞ Denotes an important remark.

1 Indicates the next operating step to be carried out and...

⇒ ...what happens as a result thereof.

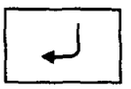
1.2 Symbols used on the unit


Caution: Read the instruction manual!


Adjustment possibility for setting the cut-off point for excess temperature protection


Menu selection


Value alteration (↓) higher / (↑) lower

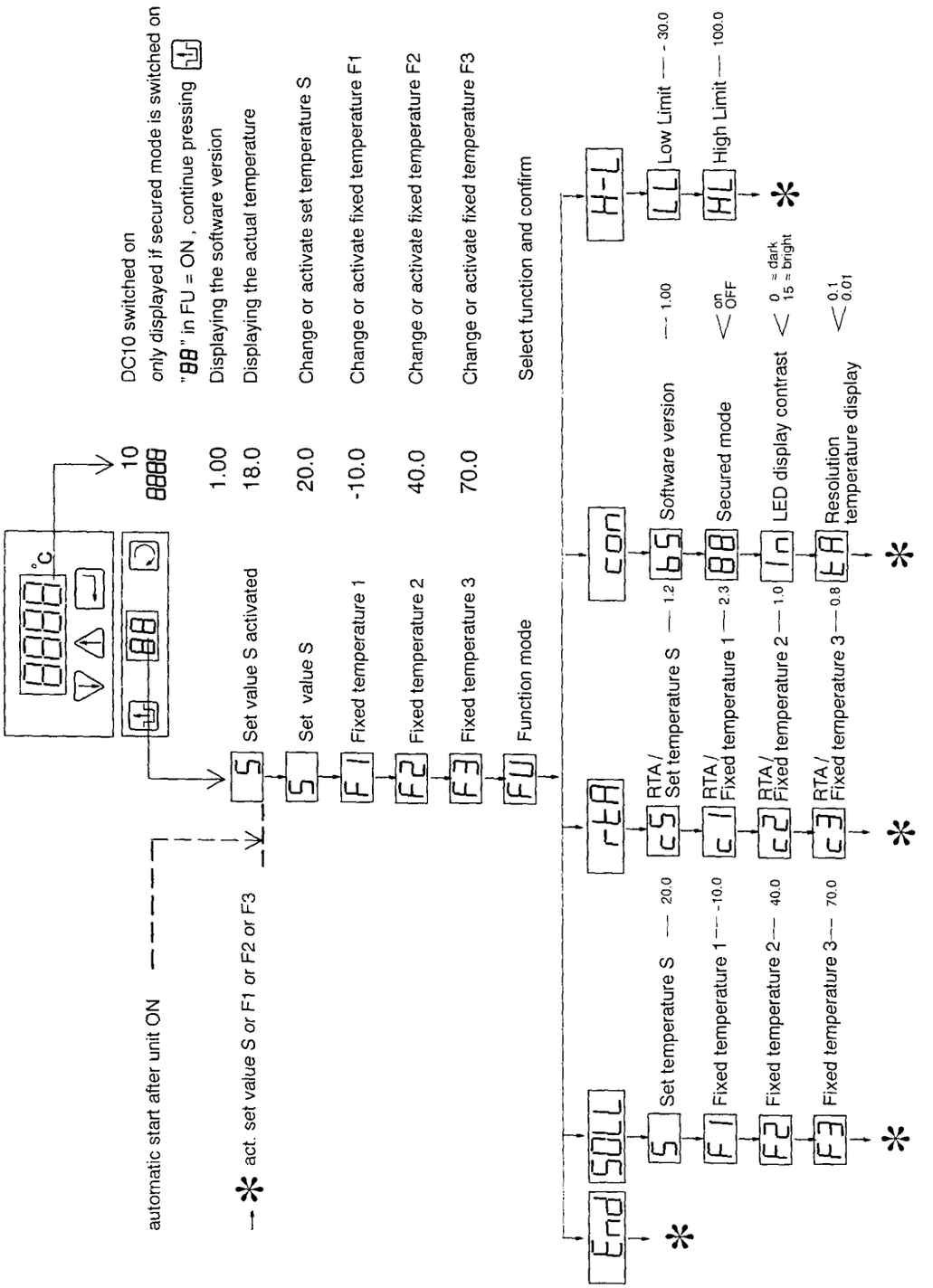

Enter key


Reset button (for usage after a fault or interruption)

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Key to Symbols

1.3 Menu Tree



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2. Quality Assurance

Dear customer,
HAAKE implements a **Q**uality **M**anagement **S**ystem certified according to EN 29001.
This guarantees the presence of organizational structures which are necessary to ensure that our products are developed, manufactured and managed according to our customers expectations. Internal and external audits are carried out on a regular basis to ensure that our **QMS** system is fully functional.
We also check our products during the manufacturing process to certify that they are produced according to the specifications as well as to monitor correct functioning and to confirm that they are safe. This is why we initiate this monitoring process of important characteristics already during manufacturing and record the results for future reference.

The "Final Test" label on the product is a sign that this unit has fulfilled all requirements at the time of final manufacturing.

Please inform us if, despite our precautionary measures, you should find any product defects. You can thus help us to avoid such faults in future.

3. Your Contacts at HAAKE

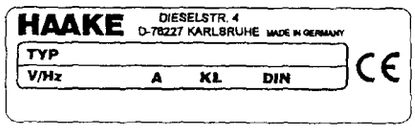
Please get in contact with us or the authorized agent who supplied you with the unit if you have any further questions.

Thermo Haake
Dieselstraße 4
D-76227 Karlsruhe

Tel. +49(0)721 4094-444
Fax +49(0)721 4094-418
E-mailhelpdesk@thermohaake.com

Thermo Haake (USA)
53 W. Century Road
Paramus, NJ 07652

Tel. 201 265 7865
Fax 201 265 1977
infousa@thermohaake.com



The following specifications should be given when product enquiries are made:

- **Unit name** printed on the front of the unit,
- **TYP** as specified on the name plate.
- **Version** of the operating software (see chap. 15.3).

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4. Safety Notes

These notes are intended to draw your attention to risks which only **YOU** can recognize and avoid or overcome. They are intended to enhance your own safety consciousness. We have set the highest quality standards for ourselves and this unit during development and production. Every unit meets relevant safety regulations. **The correct unit usage and proper handling is however solely your responsibility.**

The intended workplace should correspond to a laboratory or pilot plant environment. The user should have an education level which is at least equivalent to a trained laboratory worker or specialized chemist. The following list should be seen as an example.

! **The device may not be operated if there are any doubts regarding a safe operation due to the outer appearance (e.g. damages).**

! **A safe operation of the instrument cannot be guaranteed if the user does not comply with this instruction manual.**

! **Ensure that this manual is always at hand for every unit operator.**

! **Only use this unit solely for the intended application.**

! **Repairs, alterations or modifications must only be carried out by specialist personnel. Considerable damage can be caused by improper repairs. The Thermo Haake service department is at your disposal for repair work.**

! **Do not operate the unit with wet or oily hands.**

! **Do not expose the unit to spray water or immerse it in water.**

! **Do not clean the unit with solvents (fire risk!), a wet cloth soaked in household detergent is normally sufficient.**

! **This device is not designed according to the standard EN 60601-1: 1990 (DIN VDE 0750-1 and IEC 601-1) and should not be operated in rooms used for medical purposes and/or in the vicinity of patients.**

! **Do not move the unit from the position where it was set up during operation or when it is still hot. There is a high risk of burns!**

! **Only use water or water with anti-freeze as bath liquid.**

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Safety Notes

! **The temperature controlling i.e. immersing of test tubes, Erlenmeyer flasks or similar objects directly within the circulator constitutes normal circulator practise.**
We do not know which substances are contained within these vessels. Many substances are dangerous:

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

You alone are responsible for the handling of these substances! Our advice:

- If in doubt, consult a safety specialist.
- Read the product manufacturer's or supplier's EC Safety Data Sheet according to directive 91/155/EEC.
- Read relevant regulations concerning dangerous materials.
- Observe relevant guidelines for laboratories in your country.

The following measures were taken for the protection of the operator:

- Protection Class I according to VDE 0106 T1
  i.e. protection against electric shocks by grounding all parts which carry the risk of electric contact.

☞ The device must only be connected to mains receptacles with a protective ground.

- Protection IP 20 according to EN 60529
  i. e. regarding the protection against accidently touching live parts and damage by foreign matter, it has been ensured that foreign bodies with a thickness or diameter of more than 12 mm cannot penetrate.

☞ No special precautions were taken against the penetration of water and dust. The device should therefore not be used in a dusty atmosphere or in the neighborhood of spray water.

☞ Do not insert wires or tools in any of the openings.

! **Complete separation from the mains is required when:**

- **all dangers caused by this device are to be avoided,**
- **cleaning is carried out,**
- **repairs or maintenance by specialist personnel is about to be carried out**

Complete separation means:
Pull out the mains plug!

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5. Unit Description

This device contains safety elements according to category NFL making it suitable for unattended continuous operation with non-combustible substances as bath liquid (water or water with antifreeze).

The circulator pump motor is protected against thermal overloading. Two pump speeds can be selected.

The safety element measures the surface temperature of the heating element. If this exceeds a certain temperature (due to e.g. a leakage in the liquid circuit or a liquid shortage), the safety element is triggered.

The DC10 circulators offer the possibility of setting this cut-off temperature variably.

5.1 Safety features

The comprehensive safety system is designed on the principle of the concept of the "single fault" (EN 61010). This assumes that two separate faults do not occur simultaneously. This system therefore offers protection against *one* (single) fault. This one fault will effectively occur automatically if you...

- do not read this manual,
- do not correctly set the excess temperature protection, i.e. your safety reserves have already been used up.

Such faults can include e.g.:

Fault in the temperature control unit:
⇒ Excess temperature ⇒ poss. fire danger

Leakage in the liquid circuit or
Evaporation of heat transfer liquid:
⇒ Low liquid level ⇒ poss. fire danger, destruction of polyacrylic bath vessel

Pump blocked or
Great portion of antifreeze in the bath liquid:
⇒ Motor overheating ⇒ poss. fire danger

Or also:
Excess temperature protection level not correctly set:
⇒ poss. fire danger

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If a safety feature is triggered...

- Fault Indentification System (FIS) indicates the fault,
- the **safety-relevant components** of the heating unit (heating element and motor) are switched off immediately i.e. the safety circuit transfers the unit to a stable, safe condition,
- the heat transfer liquid in the heating unit gradually adjusts to ambient temperature, but...

! **For units with switched on compressor cooling, this cooling remains functional and thus cools the heat transfer liquid to the lowest reachable temperature.**

5.2 Applications

Open-bath circulators:

For temperature controlling samples within the circulator's own bath.

Heating and refrigerated circulators:

For temperature controlling closed temperature control circuits such reactors, heat exchangers or similar objects. Separate open vessels cannot be temperature controlled as these circulators are only equipped with a pressure pump.

5.3 Temperature ranges

Working temperature range:

The temperature range of the circulator without additional heating or cooling sources.

Operating temperature range:

The temperature range of the circulator which can be reached if additional heating or cooling sources are used.

Tap water can be used as a cooling source. In this case the minimum working temperature possible is approx. 3°C above that of the tap water temperature.

! **High operating temperatures mean the unit surfaces heat up. Protective measures must be taken!**

5.4 Unit combinations

A complete, ready-to-use circulator always consists of a temperature control module, a bath vessel (B3, K15, K20, W13, etc.) and a connecting element which attaches the temperature control module to or on the bath.

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6. Unpacking / Setting Up

6.1 Transportation damage?

- Notify carrier (forwarding merchant, railroad) etc.
- Compile a damage report.

Before return delivery:

- Inform dealer or manufacturer
  (Small problems can often be dealt with on the spot).

6.2 Ambient conditions according to DIN EN 61010

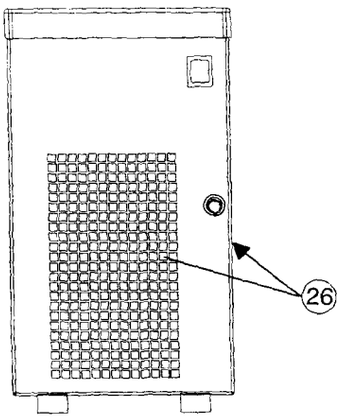
- indoors, max. 2000 meters above sea level,
- ambient temperature 5 ... 40° C,
- relative humidity max. 80%/31°C (→ 50%/40°C)
- excess voltage category II, contamination level 2

6.3 Resting time after transportation (only for refrigerated circulators)

As we can unfortunately not guarantee that our refrigerated circulators are always transported according to our recommendations (i.e. upright), lubrication oil can leak from the compressor into the cooling circuit.
If the refrigerated circulator is started up whilst still in this state, the compressor may be damaged to the lack of oil.

Therefore:

! Rest the unit for 24 hours after setting up.



6.4 Ventilation

☞ Keep all ventilation grids **26** free from obstruction to ensure unhindered air circulation.

! Blocked ventilation grids lead to increased unit heating which in turn reduces the cooling capacity and thus impairs correct functioning.

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6.5 Information concerning the CE sign

Thermo Haake circulators and cryostats carry the CE sign which confirms that they are compatible with the EU guideline 89/336/EEC (electromagnetic compatibility). The tests are carried out according to module H (official sheet L380 of the European Community) as our quality assurance system is certified according to DIN / ISO 9001.

The specialist basic standards to be applied are EN 50081-2 for interference emission and EN 50082-2 for interference resistance. The following tests were carried out:

for	according to	
EN 50081	EN 55011 class B	(interference voltage)
	EN 55011 class B	(interference radiation)
EN 50082	EN 61000-4-2	(discharging static electricity)
	ENV 50140	(electromagnetic HF field, amplitude modulated)
	EN 61000-4-4	(quick transient interference variable)
	ENV 50141	(high-frequency asymmetrical, amplitude modulated)
	EN 61000-4-8	(magnetic field with power-engineered frequency)

There are thus no limitations placed on usage. A declaration of conformity can be supplied with the ordered unit on request.

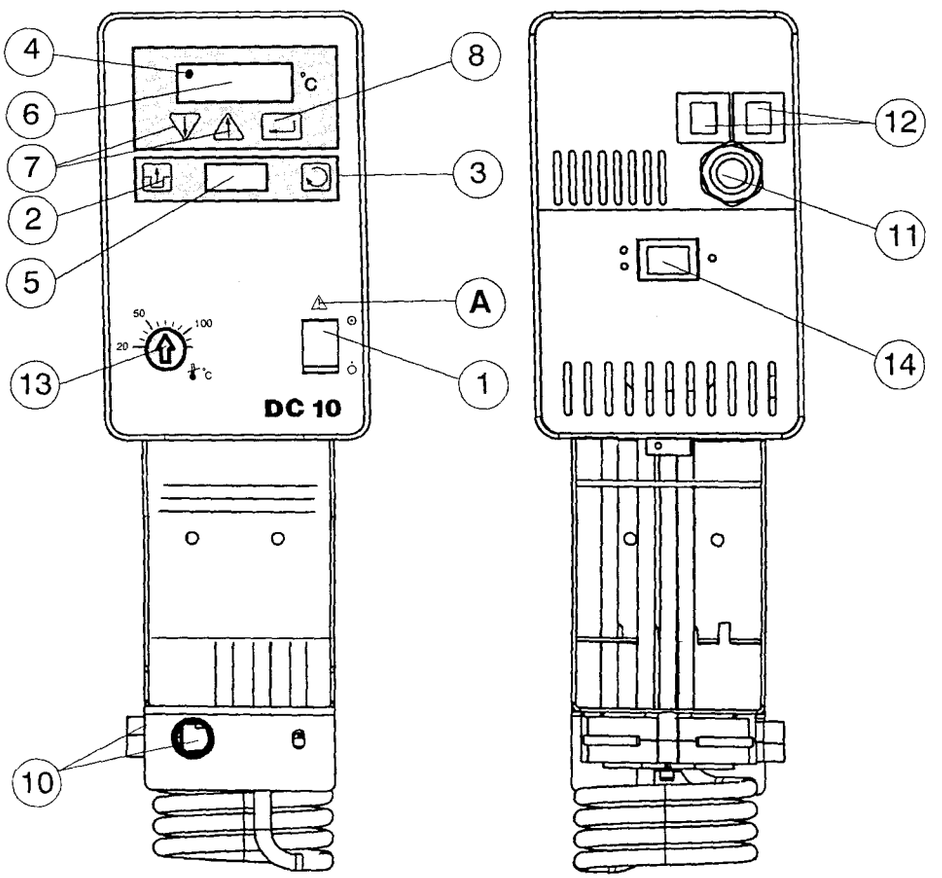
Our strict standards regarding minimum operating quality and the resulting considerable amount of time and money spent on development and testing reflect our commitment to guarantee the high level of quality of our products even under extreme electromagnetic conditions. Practice however also shows that even units which carry the CE sign such as monitors or analytical instruments can be affected if their manufacturers accept an interference (e.g. the flimmering of a monitor) as the minimum operating quality under electromagnetic compatibility conditions. For this reason we recommend you to observe a minimum distance of approx. 1 m from such units.

The CE-sign also certifies the conformity with the EU-directive 72/23/EWG (low voltage regulation). The applied standards are EN61010-1 and EN61010-2-010.

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7. Functional and Operating Elements

7.1 Temperature control module DC10



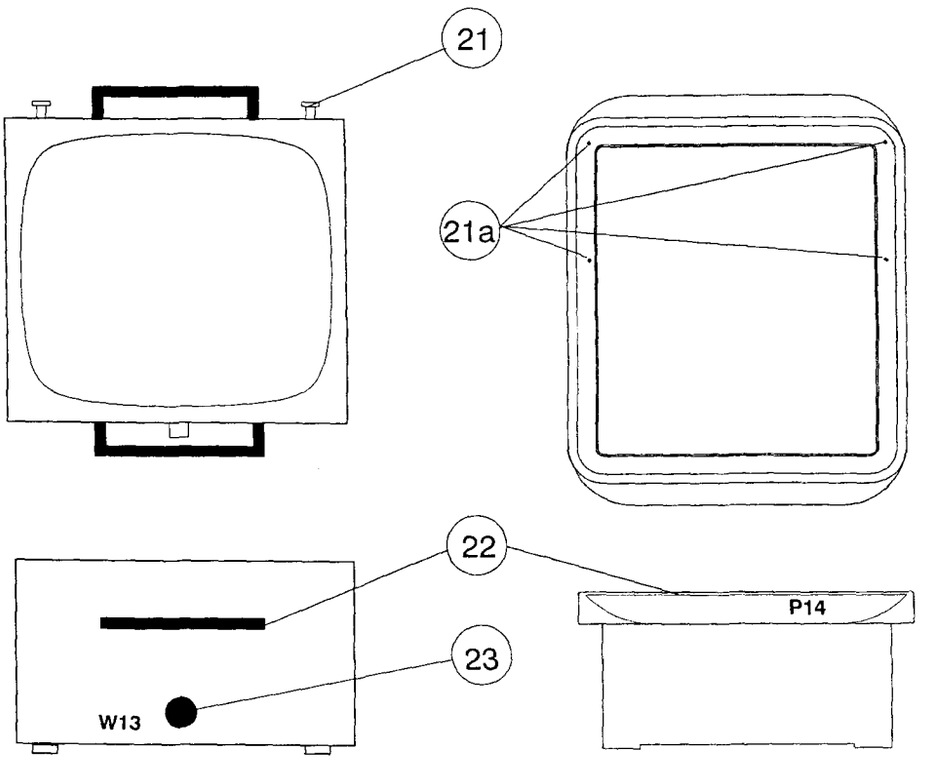
A Symbol: Read the instruction manual!

1 Mains switch
2 Reset button
3 Menu selection key
4 Heating control display
5 Menu position display
6 Set or actual temperature display
7 Value alteration (↓) higher (↑) lower
8 Enter key
10 Pump outlet (depending on requirements, one of the opening must be closed).
11 Mains cable
12 Fuses (if this fuse is triggered, see chap. 12.4)
13 Excess temperature setting dial
14 Speed reduction switch for TRS system

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7.2 Bath vessel "W" and integral bath "P" (example model)

! The working temperature must be limited to +100°C.

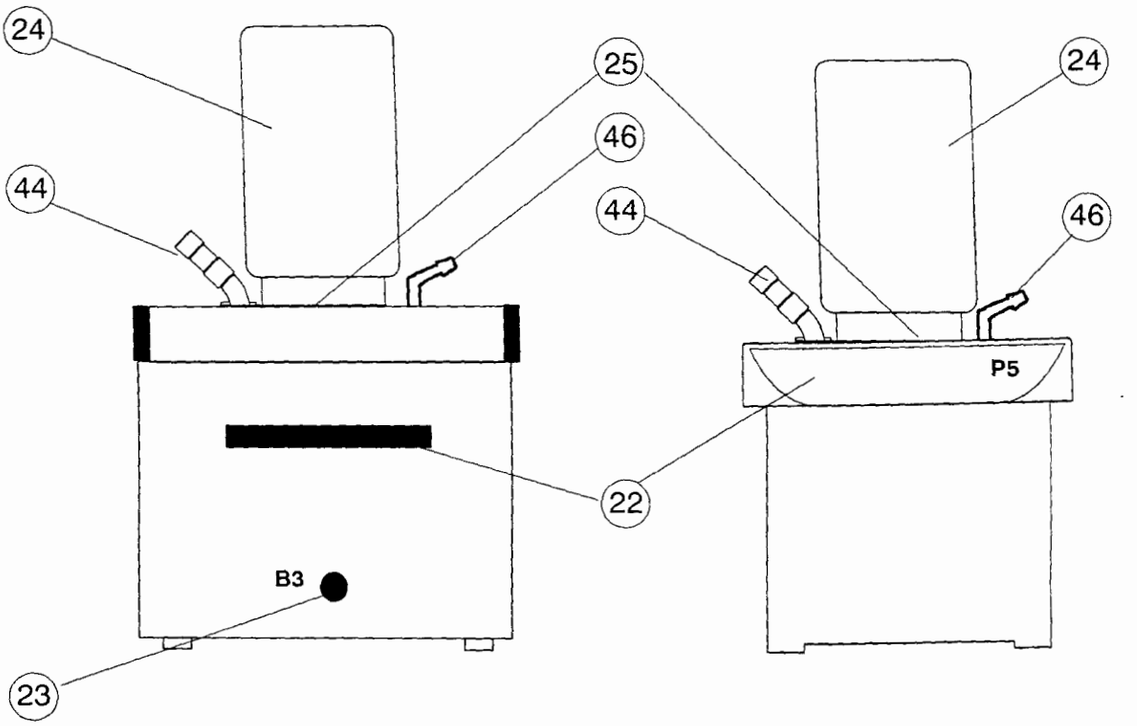


21 Mounting screws for angled holder or bath bridge
21a Tapped holes for attaching the bath bridge
22 Handle
23 Drainage nozzle

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7.3 Bath vessel "B3" and integral bath "P5"

! The working temperature must be limited to +100°C.

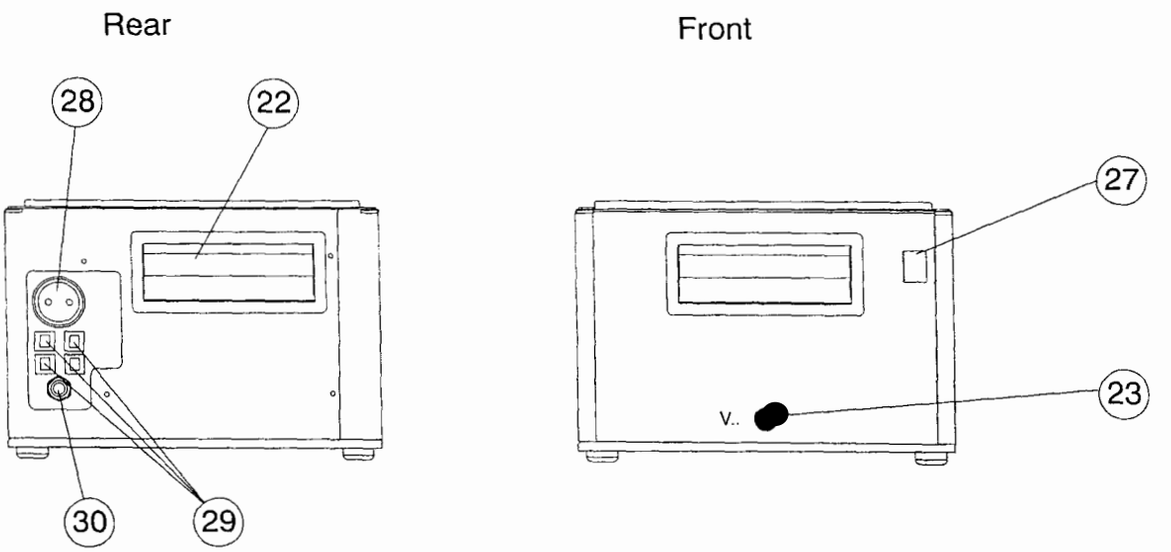


22 Handle
23 Drainage nozzle
24 Temperature control module with intermediate plate
25 Bath opening (with plastic bath covering as a standard feature)
44 Pump connections
(front = to external object)
(rear = return from external object)
46 Connections for tap water cooling
(The flow direction can be chosen arbitrarily.)

! Depending on the equipment variant, the content of delivery does not always include **44** and **46** but these items can be retro-fitted.

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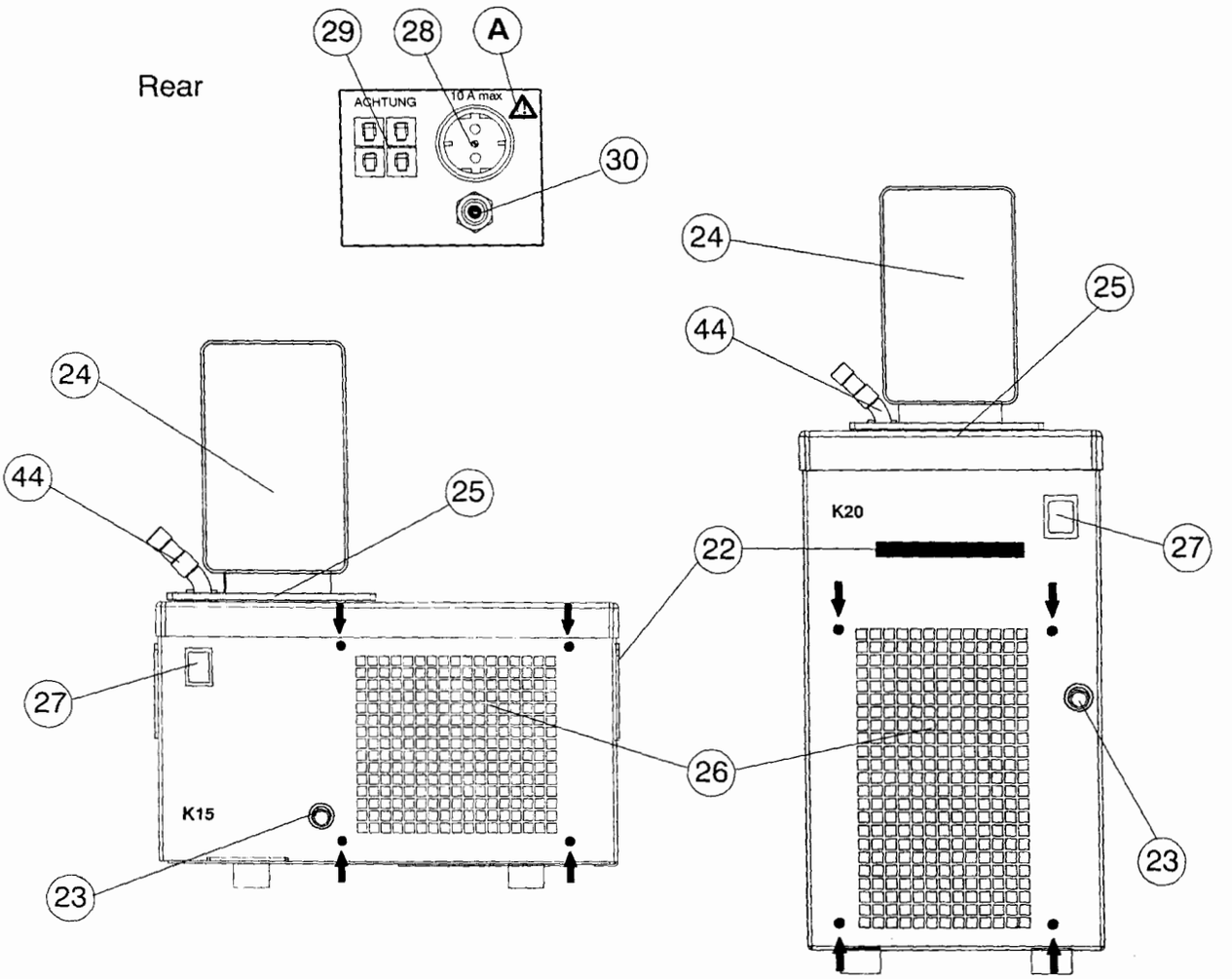
7.4 Bath vessel V15 / V26



22 Handle
23 Drainage nozzle
27 Cooling unit mains switch
28 Mains socket for temperature control unit
29 Fuses (if this fuse is triggered, see chap. 12.4)
30 Mains cable

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7.5 Bath vessel K15 / K10 / K20



A Symbol: Read the instruction manual!
22 Handle
23 Drainage nozzle
24 Temperature control module with intermediate plate
25 Bath opening (with plastic bath covering as a standard feature)
26 Ventilation grid (removeable, four mounting points: ⬇)
27 Cooling unit mains switch
28 Mains socket for temperature control unit
29 Fuses (if this fuse is triggered, see chap. 12.4)
30 Mains cable
44 Pump connections
(front = to external object)
(rear = return from external object)

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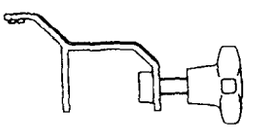
8. Assembly

The complete program is based on individual modular components which have all been separately tested to the highest standards. In order to guarantee a high degree of availability, the components are kept on stock as separate units by us, our dealers and representatives, and grouped together just prior to shipment to our customers according to their order. These units are packed individually in order to ensure safety during transport. Therefore there are a few simple assembly steps left to be carried out by the customer.

You require:

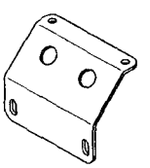
1 screwdriver – size no. 2 (for Phillips screws)

As an **immersion circulator** with bracket mounting



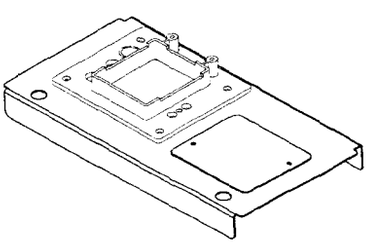
see **page 20**

As an **open-bath circulator** with angled mounting and bath vessel with **stainless steel W13 – W46**



see **page 21**

As an **open-bath circulator with bath bridge H62** and bath vessel with **stainless steel W13 – W46** or **polyacrylic bath W12P / W18P**

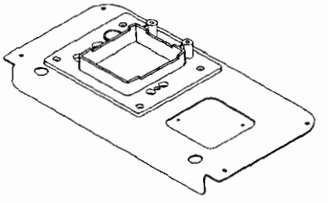


see **page 22**

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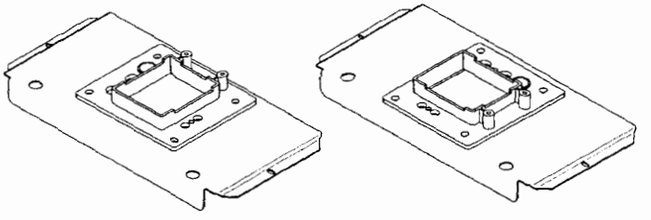
Assembly

As an **open-bath circulator with bath bridge H64** and **integral bats P14 / P21**



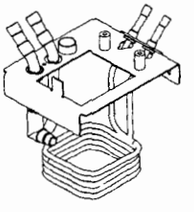
see **page 23**

As an **open-bath circulator with bath bridge H66 or H67** and **bath vessel V15 / V26**



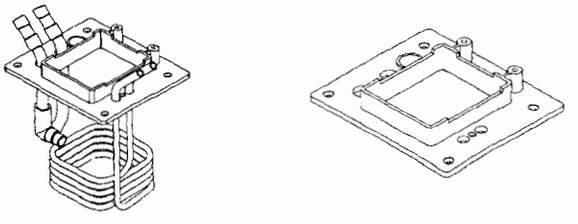
see **page 24**

As a combined **open-bath and heating circulator with bath bridge H63** and **polyacrylic bath W5P**



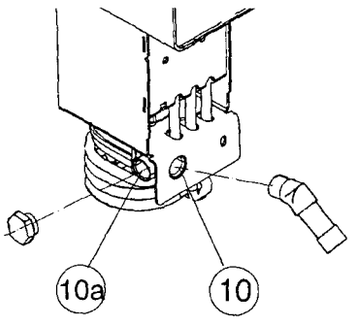
see **page 28**

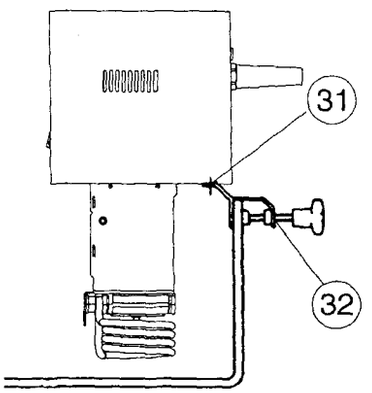
As a combined **open-bath and heating circulator with bath bridge** and **Integral bath P5/U**

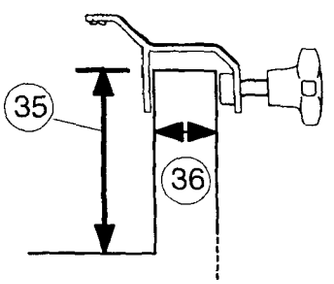


see **page 28/29**

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8.1 Immersion circulators with bracket mounting

1 Screw angled nozzle onto pump outlet **10** and hexagon plug screw onto pump outlet **10a** on the side.

Attach bracket mounting for bath vessel **32**:

2 Stand the temperature control module upside-down,

! **Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.**

3 Unscrew pair of screws **31** and remove spacers

4 Attach bracket mounting using these screws.

All containers which fulfill the following conditions can be used as the bath vessel:

- perpendicular walls,
- corrosion-resistant,
- minimum bath depth 150 mm (**35**),
- wall thickness max. 26 mm (**36**).

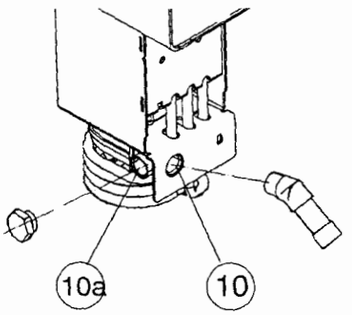
! **Polyacrylic and other plastic vessels are instable at higher temperatures, therefore:**

- **Only use under supervision!**
- **Set the excess temperature protection accordingly**
  (***below*** 65°C for polyacrylic baths)!
- The usage of a bath bridge is highly recommended in order to avoid a one-point load on the bath vessel!

☞ ***Further on page 33*** *"Filling".*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.***
Afterwards further ***on page 30.***

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8.2 Open-bath circulators with angled mountings

1 Screw angled nozzle onto pump outlet **10** and hexagon plug screw onto pump outlet **10a** on the side.

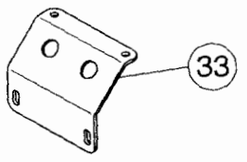
Attach angled mounting for bath vessel **33**:

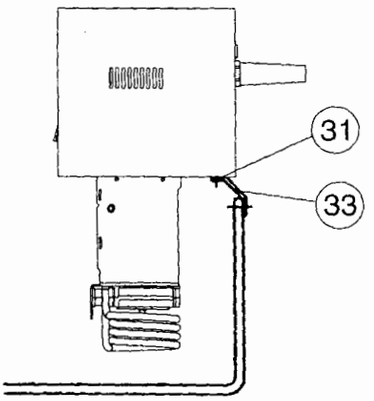
2 Stand the temperature control module upside-down,

! **Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.**

3 Unscrew pair of screws **31** and remove spacers,

4 Attach bracket mounting using these screws.

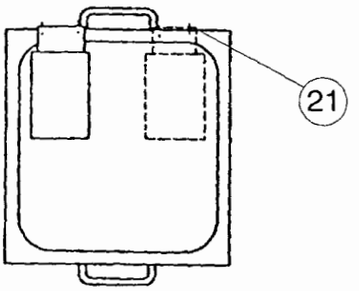




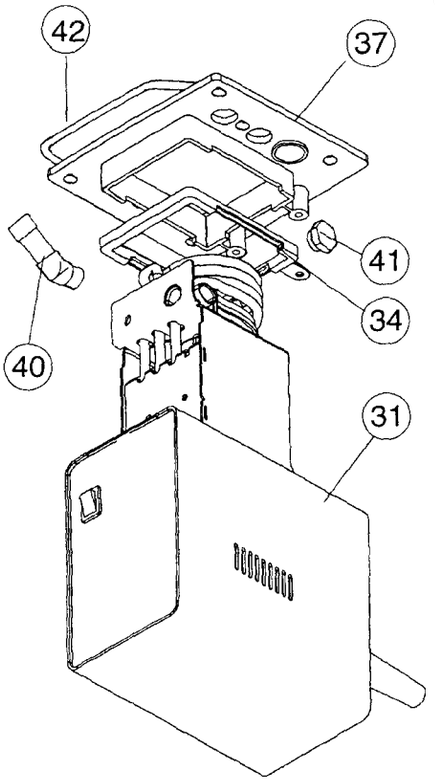
5 Attach the temperature control module to the rear side of the bath using the thumbwheel screws **21.**

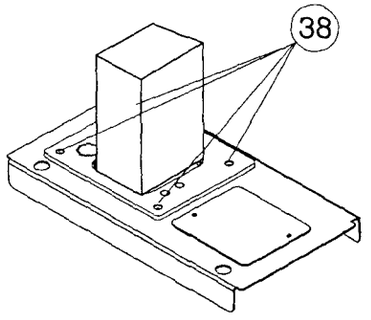
☞ ***Further on page 33*** *"Filling".*

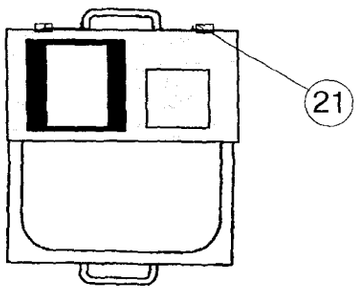
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.*** *Afterwards further* ***on page 30.***



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8.3 Open-bath circulators with bath bridge and stainless steel or polyacrylic baths

Preparation:

1 Stand the temperature control module upside-down,

! **Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.**

2 Unscrew and remove pair of screws **31** and hexagon plug screw **41** (pump outlet on the side),

Mounting the plate:

3 Place the seal **34** onto plate **37** and slide the plate over the shaft.

4 Insert the screws **31** through the plate **37** and screw tight.

5 Screw angled nozzle **40** onto pump outlet and hexagon plug screw **41** onto pump outlet on the side.

Mounting the bridge onto the bath vessel:

6 Place the seal **42** under the plate **37**.

7 Locate the plate with the attached temperature control module on top of the bath vessel and secure using the four sunken screws **38**.

8 Attach the bridge to the bath vessel with the thumbwheel screws **21** (bridge overlaps; only tighten screws lightly).

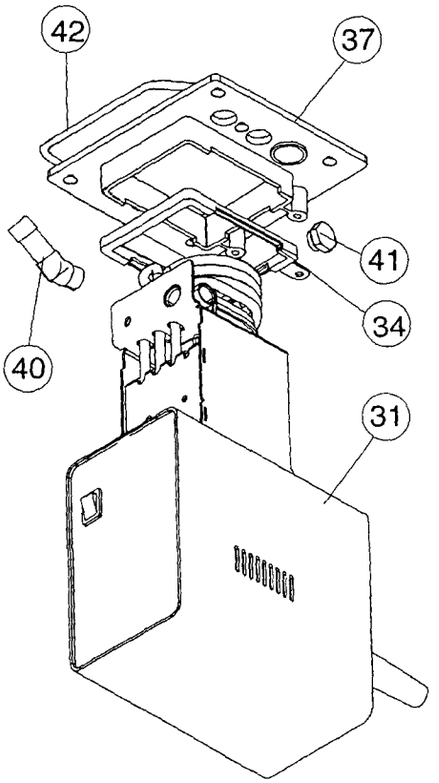
9 Fit the supplied conical bung in the thermometer hole in the bridge.

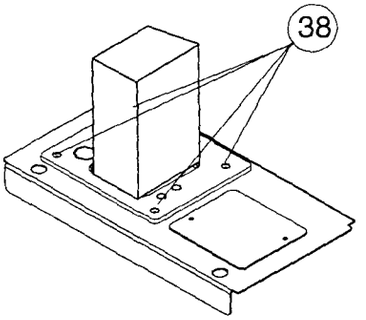
☞ ***Further on page 33*** *"Filling".*

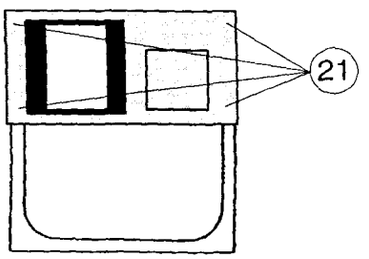
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.*** *Afterwards further* ***on page 30.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 27.***

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8.4 Open-bath cirulators with bath bridge H64 and bath vessel P14 and P21

Preparation:

1. Stand the temperature control module upside-down,

! **Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.**

2. Unscrew and remove pair of screws **31** and hexagon plug screw **41** (pump outlet on the side),

Mounting the plate:

3. Place the seal **34** onto plate **37** and slide the plate over the shaft.
4. Insert the screws **31** through the plate **37** and screw tight.
5. Screw angled nozzle **40** onto pump outlet and hexagon plug screw **41** onto pump outlet on the side.

Mounting the bridge onto the bath vessel:

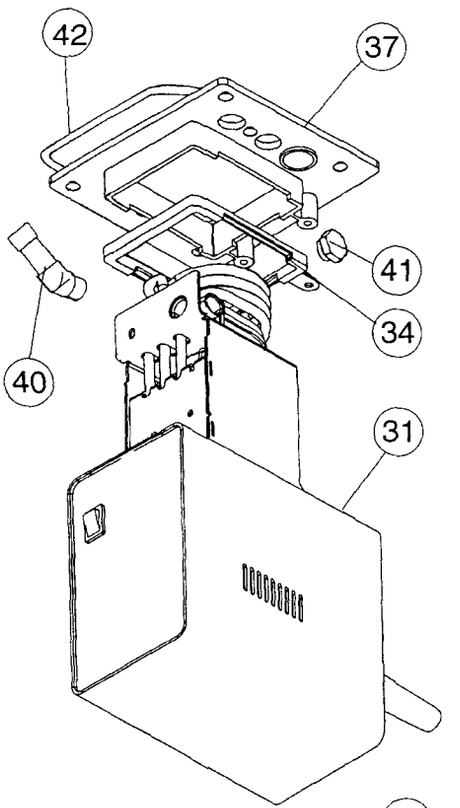
6. Place the seal **42** under the plate **37**.
7. Locate the plate with the attached temperature control module on top of the bath vessel and secure using the four sunken screws **38**.
8. Attach the bridge to the bath vessel with the four sunken screws **21.**
9. Fit the supplied conical bung in the thermometer hole in the bridge.

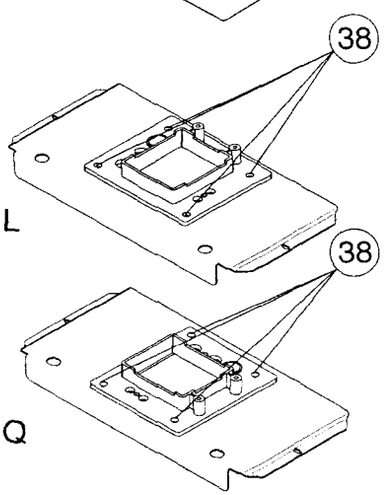
☞ ***Further on page 33*** *"Filling".*

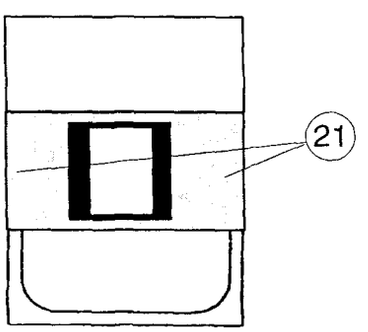
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.*** *Afterwards further* ***on page 30.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 27.***

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8.5 Open-bath cirulators with bath bridge and bath vessel V15 and V26

Preparation:

1 Stand the temperature control module upside-down,

! **Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.**

2 Unscrew and remove pair of screws **31** and hexagon plug screw **41** (pump outlet on the side),

Mounting the plate:

3 Place the seal **34** onto plate **37** and slide the plate over the shaft.

4 Insert the screws **31** through the plate **37** and screw tight.

5 Screw angled nozzle **40** onto pump outlet and hexagon plug screw **41** onto pump outlet on the side.

Mounting the bridge onto the bath vessel:

6 Place the seal **42** under the plate **37**.

7 Locate the plate with the attached temperature control module on the bath bridge L (standard version) or Q (special version) and secure using the four sunken screws **38**.

8 Attach the bridge to the bath vessel with the thumbwheel screws **21**.

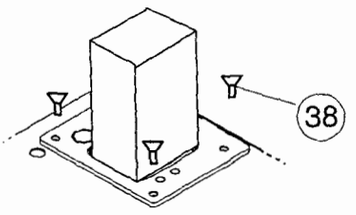
9 Fit the supplied conical bung in the thermometer hole in the bridge.

☞ ***Further on page 33*** *"Filling".*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.*** *Afterwards further* ***on page 30.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 27.***

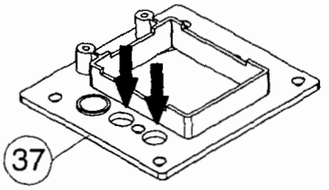
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8.6 Subsequently fitting a circulation set

1 Remove the temperature control module with plate from the bath bridge (unscrew the four sunken screws **38**).

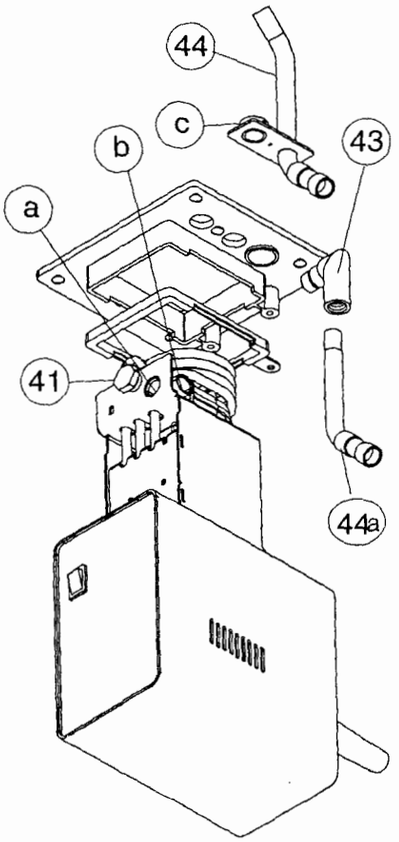
2 Stand the temperature control module upside-down,



! Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.

3 Unscrew angled nozzle **40** from pump outlet and hexagon plug screw **41** from pump outlet on the side,

4 Remove the covering plate from the marked openings (↓↓).



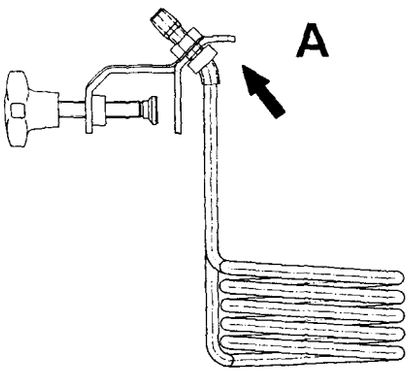
5 Insert hexagon plug screw **41** into **a** and nozzle **43** into pump outlet **b** on the side.

6 From below insert circulation set **44** into the plate (↓↓) and fix with sunken screw.

7 Insert tube **44a** through plate and circulation set into nozzle **43** and fix it with setscrew **c** (the required allen key is supplied).

Mount the temperature control module with plate to the bath bridge.

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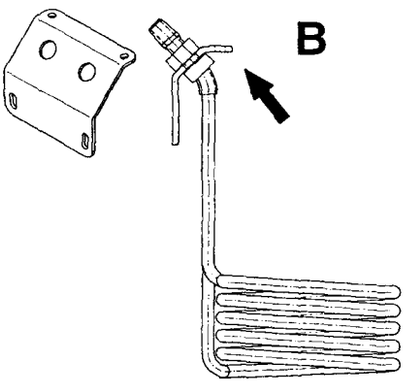


8.7 Subsequently fitting a cooling coil

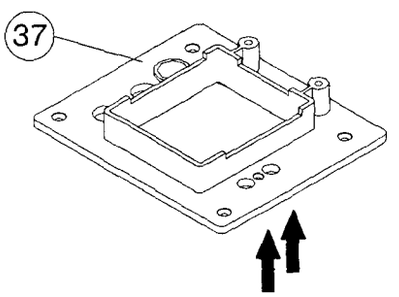
Open-bath circulators with bracket mounting **A** or angled mounting **B**

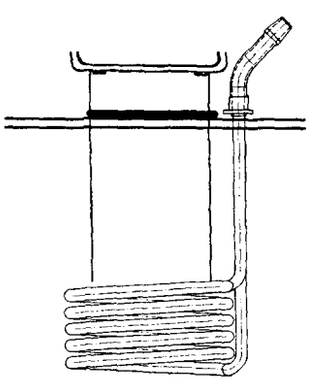
1. Remove the hexagon nuts from the cooling coil.
2. Insert cooling coil from below through the bracket or angled mounting as illustrated.

   The cooling coil now surrounds the shaft of the temperature control module.



3. Adjust the cooling coil (it should be equally spaced away from the shaft on all sides) and screw tight using hexagon nuts.
4. Attach the cooling coil with the bracket or angled mounting to the unit according to the instructions on pages 20 and 21.





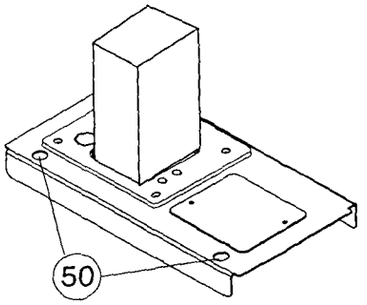
Open-bath circulators with a plate on a bath bridge:

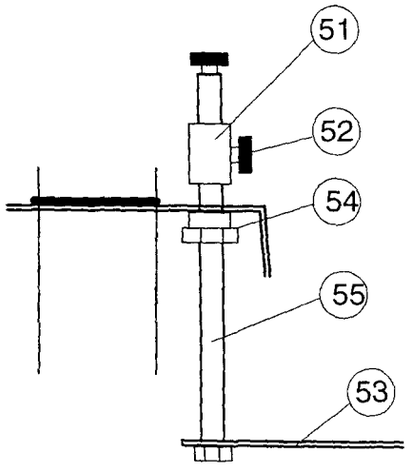
1. Remove the covering plate from the marked openings (↓↓).
2. Insert cooling coil from below into the plate **37** as illustrated.

   The cooling coil now surrounds the shaft of the temperature control module.

3. Adjust the cooling coil (it should be equally spaced away from the shaft on all sides) and screw tight using using the screw which previously held the covering plate

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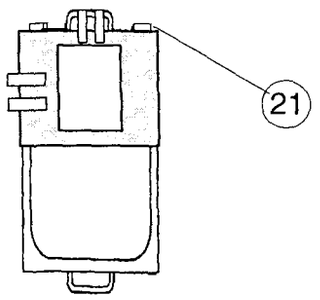
8.8 Fitting a lifting platform to the bridge

For fitting a lifting platform it is not necessary to remove the bath bridge with the fixed temperature control module.

1. Remove the closure pieces **50**.
2. Unscrew nuts **54** from sleeves **51**,
3. Insert sleeves **51** from above into the bath bridge and fix with nut **54** from below using a wrench,
4. Locate lifting platform **53** in the bath vessel.
5. From above insert handles **55** through the sleeves. Screw the handles to the nuts of the lifting platform.

The height adjustment of the lifting platform is carried out via the thumbwheel screws **52**.

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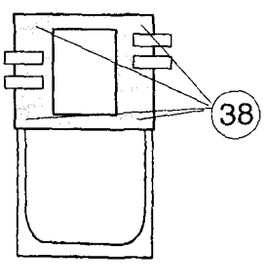
8.9 Open-bath and heating circulators with bath bridge and polyacrylic bath W5P

! The highest working temperature must be limited to +60°C.

Mounting the bridge onto the bath vessel:

[6] Attach the bridge to the bath vessel with the thumb-wheel screws **21** (bridge overlaps; only tighten screws lightly).

[7] Fit the supplied conical bungs in the thermometer holes in the bridge.



8.10 Open-bath and heating circulators with bath bridge and integral bath P5/U

! The highest working temperature must be limited to +100°C.

Mounting the bridge onto the bath vessel:

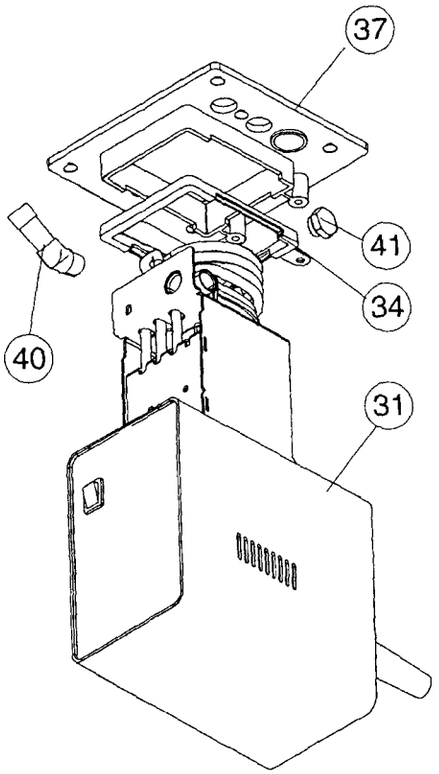
[1] Locate the plate with the attached temperature control module on top of the bath vessel and secure it using the four sunken screws **38**.

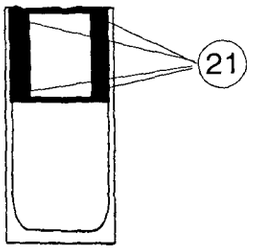
[2] Fit the supplied conical bung in the thermometer hole in the bridge.

☞ ***Further on page 33*** *"Filling".*

Further on page 30 *"Connecting Hoses".*

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8.11 Open-bath circulators with bath bridge and integral bath P5

! The highest working temperature must be limited to +100°C.

Preparation:

1 Stand the temperature control module upside-down,

! Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.

2 Unscrew and remove pair of screws **31** and hexagon plug screw **41** (pump outlet on the side),

Mounting the plate:

3 Place the seal **34** onto plate **37** and slide the plate over the shaft.

4 Insert the screws **31** through the plate **37** and screw tight.

5 Screw angled nozzle **40** onto pump outlet and hexagon plug screw **41** onto pump outlet on the side.

Mounting the bridge onto the bath vessel:

6 Locate the plate **37** with the attached temperature control module on top of the bath vessel, .and secure using the four sunken screws **21**.

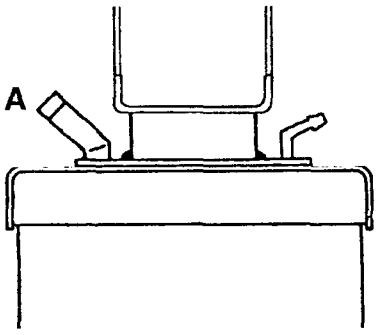
7 Fit the supplied conical bung in the thermometer hole in the bridge.

☞ ***Further on page 33*** *"Filling".*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 26.*** *Afterwards further* ***on page 30.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 27.***

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9. Connecting Hoses

Pump nozzle **A**:

front: outlet to external object (pressure side)
rear: return flow from external object

Hoses are normally used to connect the pump with an external vessel. If objects are to be temperature controlled in the internal bath only, connect the pump nozzles **A** with a short hose with a min. length of 50 cm in order to achieve a better temperature constancy.

General recommendations concerning the max. allowable length of hoses cannot be given. It all depends largely on the size, form and material of the external vessel to be temperature controlled. It should be understood that the length of a hose and its diameter combined with the circulating capacity have a large effect on the temperature control effectiveness. Whenever possible, the decision should be made in favor of the wider hose diameter and the vessel to be temperature controlled should be placed as close as possible to the circulator.

! High operating temperatures will lead to high temperatures on the hose surface, this is even more so at the metal nozzles. In this case: DO NOT TOUCH!

! The required hose material is dependent on the heat transfer liquid used.

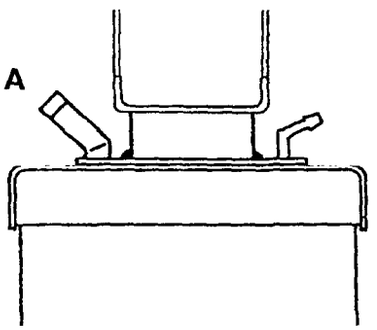
! Hoses must not be folded or bent!
A wide radius should be used if turns have to be made!

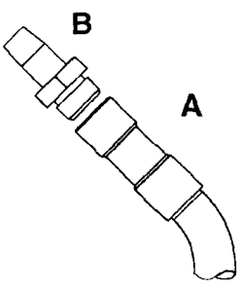
! Hoses may become brittle after prolonged use or they may get very soft. They should, therefore, be checked regularly and exchanged if necessary!

! Secure all hose connections using hose clamps!

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Connecting Hoses





9.1 Plastic hoses

It must be ensured that the hoses selected are fully suitable for the particular application, i.e. that they will not split, crack or become disengaged from their nozzles.

Perbunan hoses have proved to be satisfactory for your HAAKE circulator.

These hoses are available as running meter goods with internal diameters of 8 or 12 mm.

Order no.:	082-0172 for 8 mm i.D. hose
	082-0173 for 12 mm i.D. hose

Hoses made of other materials are also available from HAAKE.

Hoses with 12 mm internal diameter can be pushed directly onto the nozzle **A**. For 8 mm hoses the content of delivery includes 2 hose adapters **B** with R 1/4 screw thread which must be screwed into nozzle **A**.

9.2 Tap water cooling

Only for units without own refrigeration unit!

9.2.1 Connection to cooling (tap) water

Using the cooling coil a lowest operating temperature approx. 3°C above the given cooling water temperature can be achieved.

[1] Use hoses with 8 mm internal ∅ and connect to the cooling coil **K.** The direction of the flow can be freely selected. It must be taken care that at the outlet side, the water can run out unhindered.

Pressure fluctuations of the public water net may hamper the temperature constancy. For proper results the water pressure should be stable or measures should be taken to keep it stable.
The min. pressure should not be below 1 bar.

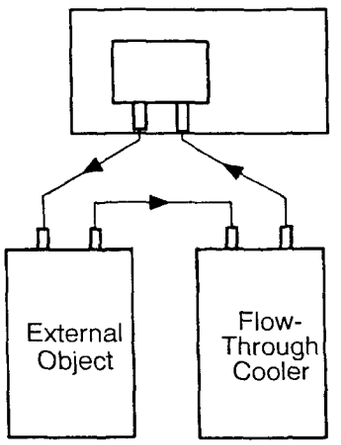
[2] The amount of flow should be set to a min. value. At first the full flow should be used so that the unit can reach its operating temperature. Then, the amount of flow should be reduced using the water cock or a hose clamp. The actual temperature will rise above the set temperature if the water flow is insufficient. If so increase the water flow.

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Connecting Hoses

9.3 External Cooling Devices

Heating / Open-bath circulator

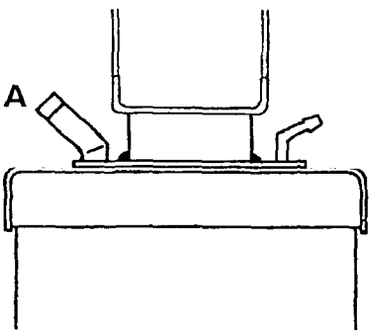


With immersion and flow-through coolers from HAAKE, the heat transfer liquid can be cooled down considerably below 0°C and the circulator can be rendered independent of tap water.

A flow-through cooler should be used for the circulator and bath B3. The flow-through cooler is hooked up into the return flow line of the external vessel and from there to the circulator (see Fig.).

Immersion coolers have proven themselves especially suitable for open-bath circulators with angled brackets or the bath bridge H62.
The fitting opening is already provided in the bath bridge H62.

The assembly and application are described in the instruction manual of the cooler in detail.

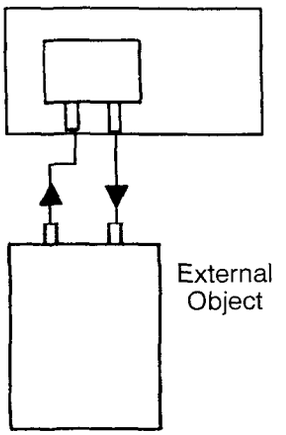


9.4 Pressure pump

9.4.1 Temperature controlling an object in the internal bath

Connect pressure and return nozzle **A** with a short hose.

Heating / Open-bath circulator



9.4.2 Connection of external <u>closed</u> systems

E.g. instruments with a pressure-tight temperature jacket or coil or a heat exchanger.

Hose connection:
From the pressure port (at the front) to the external object and then back to the return port (at the rear).

If it cannot be avoided that the external object is situated higher than the circulator, the heat transfer will only not flow back on the condition that the system is completely tight and leak-free. To be on the safe side it may be considered necessary to fit stop cocks to the inlet and outlet hoses.

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10. Filling with Bath Liquid

10.1 Recommended bath liquids

5 to 95°C *Distilled Water*

- Normal tap water leads to calcareous deposits necessitating frequent unit decalcification.

! **Calcium tends to deposit itself on the heating element. The heating capacity is reduced and service life shortened!**

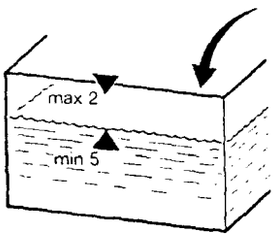
- Water, of course, can be employed up to 95°C, however above 80°C water vaporization reaches a level which necessitates the liquid to be constantly replenished.

-30 to 80°C *Water with Antifreeze*

In applications below 5°C the water has to be mixed with an antifreeze. In doing so, the amount of antifreeze added should cover a temperature range 5°C lower (but max. -30°C) than the operating temperature of the particular application. This will prevent the water from gelling (freezing) in the area of the evaporating coil the surface area of which is much colder than the working temperature. An excess of antifreeze deteriorates the temperature accuracy due to its high viscosity.

! Important ! **Thermo Haake takes no responsibility for damages caused by the selection of an unsuitable bath liquid.**

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10.2 Filling with heat transfer liquid

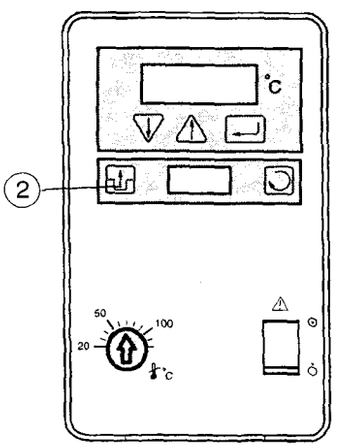
Filling level of the interior bath:
max. up to 2.0 cm below the cover plate,
min. up to 5.0 cm below the cover plate.

When working with water or water with antifreeze:
or with oil below ambient temperature:
the filling level should be 2 cm below the deck plate.

When working with oil above 80°C:
Keep level somewhat lower. Oil expands when being heated. Rule of thumb: 10% volume increase per 100°C heat increase.

External systems included within the circulating circuit have to be filled with the same heat transfer liquid in order to avoid too much liquid being drawn from the internal bath.

☞ The bath level should be checked when the preset temperature has been reached!

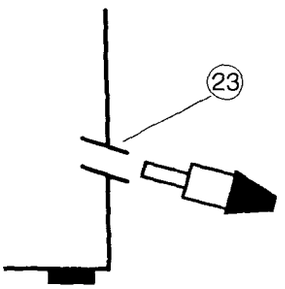


Quite often closed external systems cannot be prefilled as suggested. In this case the internal bath of the unit has to be filled to the max. level. After starting the unit, the pump will feed the necessary liquid to the external system. Should the demand be higher than the volume difference between high and low, the low liquid level sensor will be activated and the pump switched off.

In this case:

1. Replenish the liquid,
2. Reset the unit:
   Depress the key **2** (at the front).
   ⇒ The unit starts up again
3. Repeat this action if necessary.

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11. Draining

The temp. control unit is drained at the nozzle **23**.

1 Place a suitable vessel underneath nozzle.

☞ Bear in mind that the liquid will run out in a slight arc.

2 Turn plug slowly until it becomes disengaged from the thread. A pin will prevent the liquid from running out right away.

3 Pull out plug (pin) in one quick motion. The liquid will start to run out.

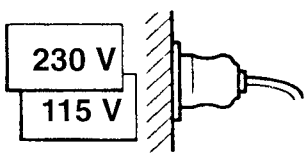
4 Possible residues can be drained by tilting the circulator slightly.

! Hot heat transfer liquid should not be drained! When certain conditions make draining necessary, please act safety conscious: Wear protective clothing and protective gloves!

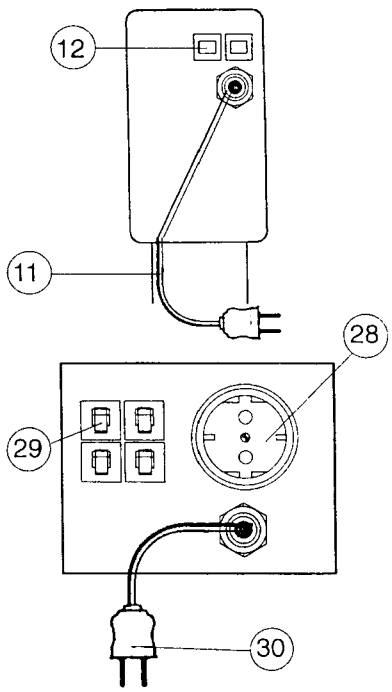
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12. Connecting Up

12.1 Connecting to the mains



Only attach this unit to mains sockets with a grounded earth. Compare the local mains voltage with the specifications written on the name plate. Voltage deviations of +/- 10% are permissible. The socket must be rated as suitable for the total power consumption of the unit.

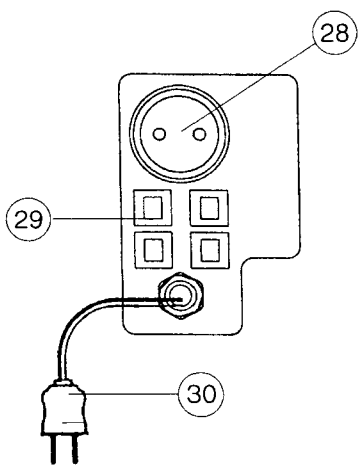


12.1.1 Only for refrigerated baths K15, K10, K20, V15 and V26

1. Insert the mains plug **11** of the temperature control module into the socket **28** at the rear of the refrigerated bath.
2. Connect the refrigerated bath's mains plug **30** to a grounded mains socket.

! Socket 28 is live as soon as this connection has been made whether the refrigerated bath has been switched on at the mains switch or not!

12.2 Checking the liquid circuit



Before switching on, check again to make sure that the pressure and suction ports are connected with each other – or alternatively if an external object is to be temperature controlled, that the hoses are connected correctly and secured (see chapter 9.4).

12.3 Changing the mains plug (e.g. for Great Britain)

! This should only be carried out by qualified specialist personnel!

The mains cable wires have the following colors:

Brown	=	**Live**
Blue	=	**Neutral**
Green/Yellow	=	**Earth**

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12.4 Fuses on the unit

All units are equipped with automatic thermally-triggered fuses.

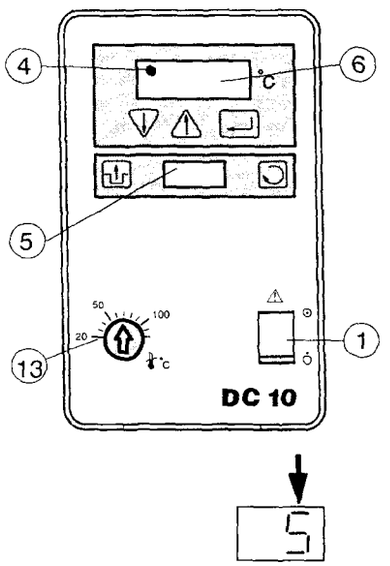
If the fuse **(12/29)** has triggered...

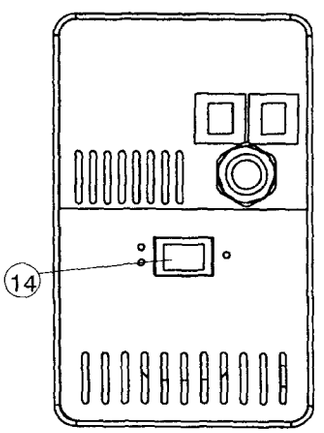
- the fuse does not have to be exchanged – resetting suffices;
- a white marking is visible;
- a certain cooling down time should be allowed (approx. 5 min) before the (dip) switch can be pressed again.

! **Do not use tools; do not use force. Both destroy the fuse.**

! **If the fuse should be triggered again after resetting, the unit probably has a defect. In this case the unit should be sent in for servicing.**

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13. Operating

13.1 Switching on

1 Set the excess temperature protection clearly above the desired operating temperature using the dial **13**.

2 Switch the circulator on at the mains switch **1**.

This causes:

⇒ Display **6** briefly shows the device identification and thereafter the version number of the operating system software, e.g. "0.11", and after that the **actual temperature** at the location of the control sensor is displayed.

⇒ The display **5** shows which one of the four adjustable set values is currently activated (set temperature **"S"** or one of the fixed temperatures " **F1"**, " **F2"** ," **F2"** (see chapter 13.4).

⇒ The pump motor runs - the bath liquid is circulated.

⇒ The rotation speed of the pump motor can be changed with the switch **14**.

°° full speed ° reduced speed

A separate cooling device (if available) is switched on via it's own mains switch **27**. The compressor starts with a slight jerk. Only activate cooling device if cooling is actually required.

13.2 Heating control lamp

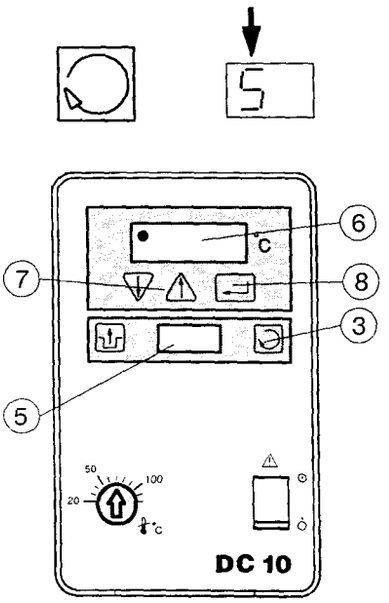
The display **4** lights up when the heating is switched on (set temperature is higher than the actual temperature).

⇒ display **4** lights up constantly during the heating up phase,

⇒ display **4** flashes on and off during the control phase.

The display **4** does not light up if the heating is not activated (set temperature is lower than the actual temperature).

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13.3 Adjusting the variable set temperature

1 Press the menu button **3**:

⇒ A left-justified "**S**" appears in the small display **5** (for **s**et temperature adjustment).

2 Increase (↑) or decrease (↓) the value shown in the display **6** with the buttons **7** . The first degree of temperature change is thereby passed slowly and thereafter the rate of temperature change in the display is five times faster.

3 Press the enter button **8**.

⇒ The selected value is stored as new set temperature and activated.

The new value is not saved until the Enter button has been pressed. The circulator continues to use the old set value.

The display **6** automatically switches back to actual temperature display after a short time.

13.4 Adjusting the fixed temperatures F1 to F3 (facultative)

This device permits permanent storage of three fixed temperatures which can be activated when required.



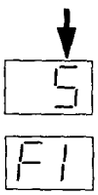
1 Press the menu button **3** :

⇒ The small display **5** shows **F1** (for **f**ixed temperature **1**), **F2** or **F3** .

2 Press the buttons **7** to increase (↑) or decrease (↓) the value shown in the display **6** .

3 Press the enter button **8** .

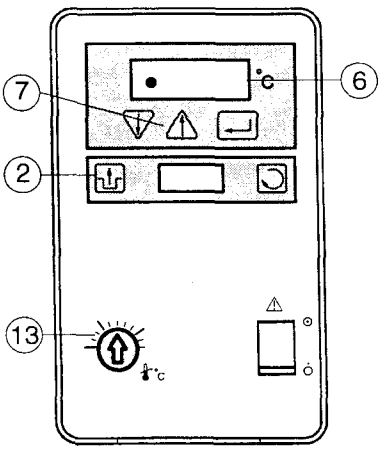
⇒ The selected value is stored as fixed temperature F1, F2 or F3 and activated as currently valid set value.



The display **6** automatically switches back to actual temperature display after a short time. At the same time the small display **5** shows whether the temperature set point S, F1, F2 or F3 is currently active.

To activate another set value, press the menu button **3** until the designator of the desired set point (e.g. "**S**") is shown in the display **5**. Then press the button **8** to confirm without changing the value.

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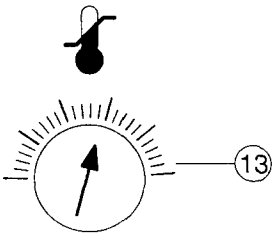
14. Excess Temperature Protection

If one of the safety devices is triggered:

- The fault cause is shown in the display **6** (see also chapter 16.).
- all voltage conducting unit components (the heating element and pump motor) are switched off immediately i.e. the safety circuit transfers the unit to a stable, safe condition.

☞ **The fault cause must be identified and remedied.**

After the fault has been eliminated the unit can be started again by pressing the Reset key **2**.



14.1 Excess temperature protection dial

It offers protection against dangers caused by an uncontrolled heating up of the heat transfer liquid above the desired set temperature.

The cut-off temperature is adjusted with the excess temperature setting dial **13**.

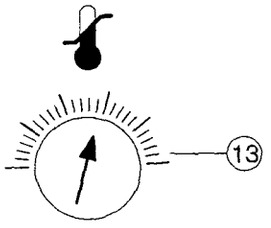
☞ **Proper protection can only be guaranteed if the cut-off point has been correctly set.**

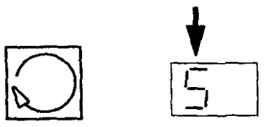
There are two main aims for correct setting:

- **Safety (primary importance):**
  Protection against ignition of the heat transfer liquid. The cut-off point must be set at least 25°C **below** the fire point of the bath liquid used.
- **Protection of the object to be temperature controlled (secondary importance):**
  Additional protection, e.g. of a biological sample. The cut-off point should be set as close as possible to the desired temperature value.

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Excess Temperature Protection





14.1.1 Setting the excess temperature

The cut-off point is set with the excess temperature dial **13** with a rough scale of temperature values arranged around it. This scale, of course, can only serve as an approximate setting means for this cut-off point. However, the cut-off point can be determined to act exactly if the following procedure is adhered to:

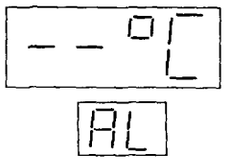
If for instance a bath liquid has a fire point of 60°C the unit should cut off after reaching 35°C at the latest:

1. First set the desired set value "5" using keys **7** (↑) or (↓) to exactly 35°C.
2. After the circulator has reached this temperature, turn the excess temperature dial **13** backwards very slowly (to the left) until the unit cuts off (fault message on display **6**).
3. Reset the unit via the Reset key **2** after the heat transfer liquid has cooled down somewhat.
4. Then set the set temperature to the actual temperature (< 35°C).

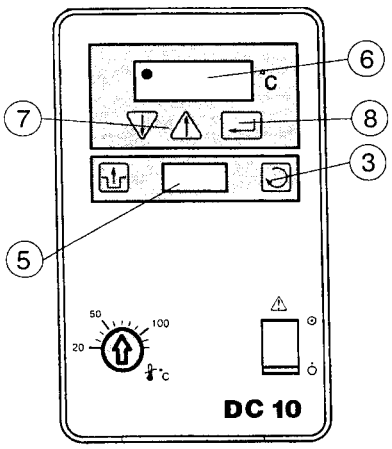
   ⇒ The unit can now be used for temperatures below 35°C. As soon as 35°C is reached, it is securely switched off.

14.1.2 Testing the cut-off point

Set the set temperature to a higher value than 35°C, set the unit to heat up and watch the digital display or thermometer. The value indicated when the alarm goes off is the real cut-off temperature. The reaching of the cut-off point is indicated at the display by the following message:

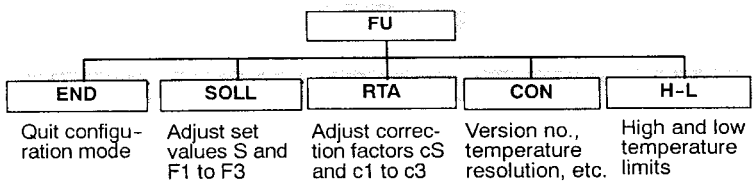


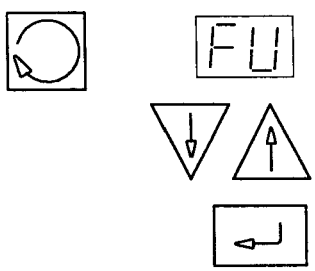
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15. Configuration

The device is completely ready for operation after defining the desired set temperature and adjusting the overtemperature protection. It is furthermore possible to adjust or call-up several functions in the function mode **"FU"**.





1 Switch to function mode by pressing the menu button **3** several times (until display **5** shows **FU**).

2 Switch to the desired function SOLL, RTA, CON or H-L with the arrow buttons **7**. Press the enter button **8** to confirm the selection made.

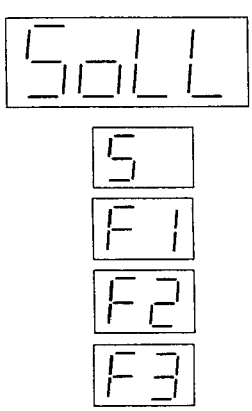
3 Move around through the submenus with the menu button **3** (see chapter "Menu Tree").

4 A further press of the menu button **3** quits function mode and returns to display of the actual temperature.

Display **6** always returns automatically to actual temperature display after a short time.

END is provided to skip function mode without making any settings.

15.1 Set value S and fixed temperatures F1 to F3



The adjustment has already been made in chap. 13.3 and 13.4. In the function mode it is also possible to adjust and change these set values *without activating them.*

1 Press the arrow buttons **7** in the menu FU to change to the SOLL function. Press the enter button **8** to confirm this selection.

2 Press the menu button **3** to move through the submenus S, F1 to F3 (the procedure for making adjustments is the same as in chapter 13.3).

A correcting factor **c** should be associated with each value: S ⇔ cS, F1 ⇔ c1 ... (see chapter 15.2).

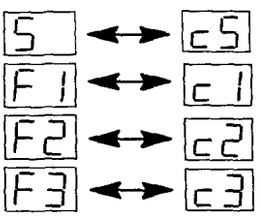
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15.2 Adjusting the correction factors (RTA system)

Display **6** shows the actual temperature at the control sensor.

This temperature does not correspond directly to the temperature in the circulator's bath and even less to the temperature in the external connected system.

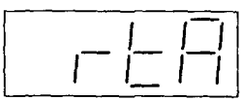
The temperature difference is determined by measuring the actual current temperature using a suitable measuring device (calibrated or gauged thermometer).

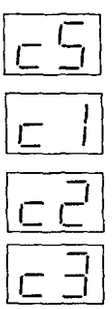


This is how the correction factor **c** (RTA system) is entered into the circulator. It remains stored in the circulator and is automatically assigned to the corresponding set temperature.

The same as for the set values in chap. 13.4, four correction factors can be stored: **cS** , **c1** , **c2** and **c3** , whereby, for example, **c1** is the correction value associated with **F1**.

The resolution of the correction factor according to the RTA system is 0.01°C and the possible range of variation is ±9.9°C.





Entry (see also the example on the next page):

1. Switch to the RTA function with the arrow buttons **7** in the menu FU. Press the enter button **8** to confirm this selection.
2. Press the menu button **3**:

⇒ The small display **5** shows **cS** (correction factor for working with the set temperature **S**).

3. Set the determined temperature difference on the display **6** with the buttons **7**.
4. Press the enter button **8**.

⇒ This confirms the value as new correction factor **cS**.

Proceed analogously as described for cS to adjust the correction factors c1 to c3 for the set values F1 to F3.

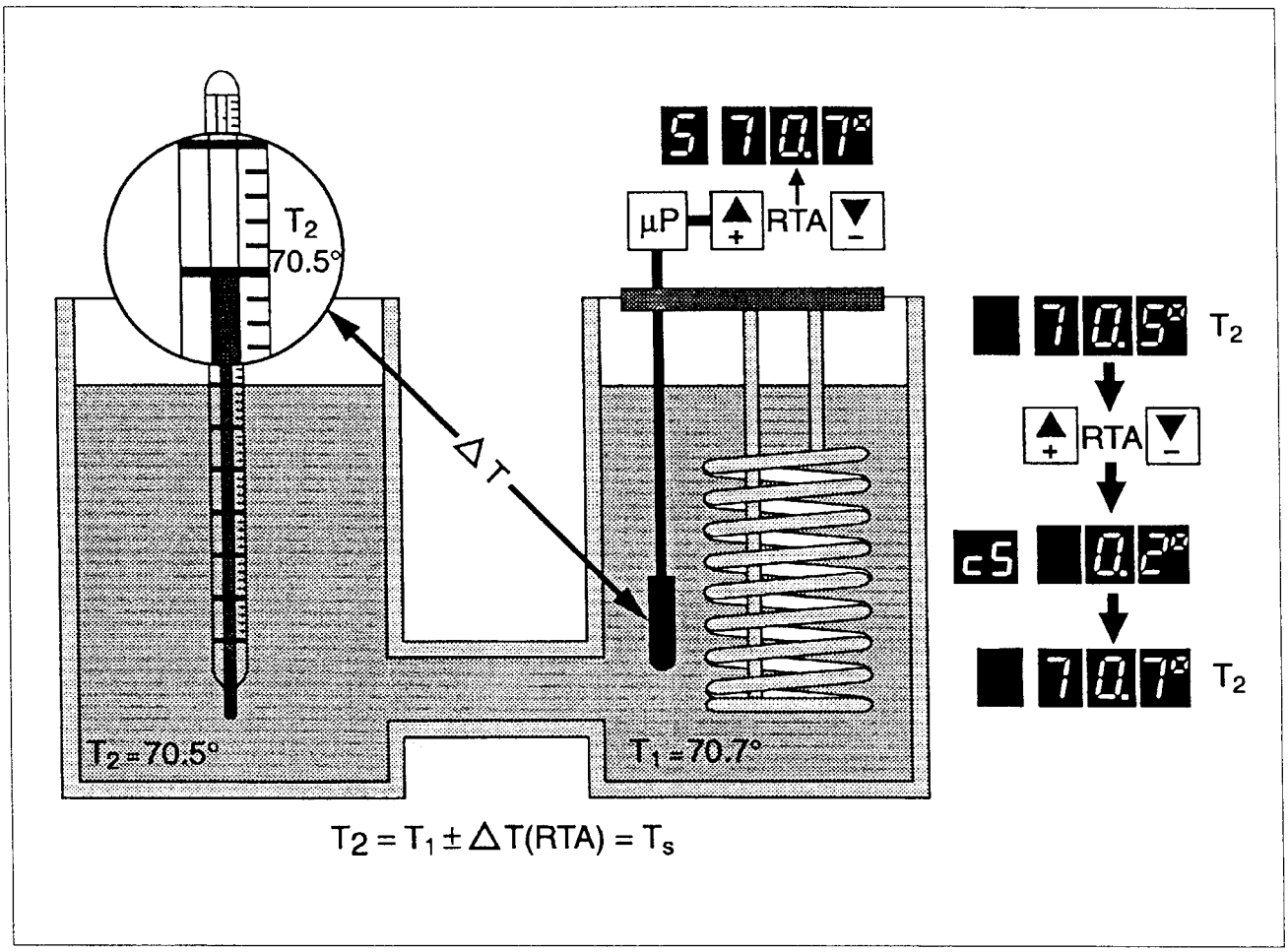
☞ **The new value is not saved until the Enter button has been pressed. The circulator continues to use the old value.**
***Warning:* The correction factor "c" may have to be determined again if the set temperature is altered!**

The display **6** automatically switches back to actual temperature display after a short time.

After the Enter button **8** has been depressed, the correction value (like the set value) remains stored even in case of a power failure.

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Example:



Set value programmed at the circulator	T_{set} =	70.7°C
Actual temperature in bath / system	T_{act} =	70.5°C
⇒ Deviation, calculated according to $\Delta T = T_{set} - T_{act}$	ΔT =	0.2°C
⇒ Entry of the corrected value ΔT as correction factor "c 5 "	c 5 =	+0.2°C

The temperature control is thus internally altered so that the desired 70.7°C is also attained in the external system. The temperature displayed at the circulator and that of the external system now correspond with each other.

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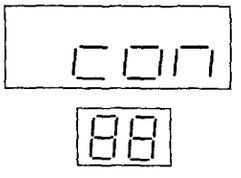
Configuration



15.3 Displaying the version of the operating software

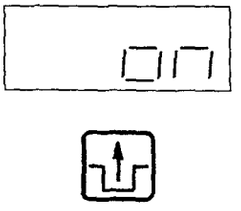
It is often necessary to know the version number of the software for service and other manufacturer inquiries.

1. Change to **con** in the menu FU and press button **8** to confirm. Press button **3** to switch to **BS**. The version number appears in the upper display **6**.



15.4 Secured mode

1. Change to **con** in the menu FU and press button **8** to confirm. Press button **3** to switch to **88**.
2. Switch security mode ON or OFF with the arrow buttons **7** and press button **8** to confirm.

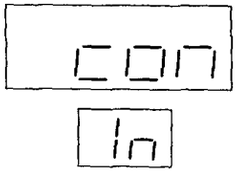


Secured mode: ON
The temperature control module switches to the secured mode in case of a power failure or if it is switched on via the mains switch. Display **6** flashes over all segments 8888. Switching on again is only possible after the reset button **2** has been pressed. This is due to safety reasons.
The unit reacts in the same way if is switched on via a mains switch in the laboratory.



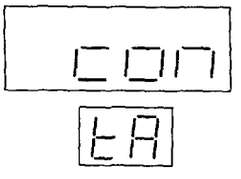
Secured mode: OFF
After a power failure or if it is switched on via the mains switch the temperature control module will switch on and start heating corresponding to the stored values and the last temperature used.

! Please consider any possible resulting risks!



15.5 Adjusting the LED display contrast

1. Change to **con** in the menu FU and press button **8** to confirm. Switch to **In** with button 3.
2. Press the arrow buttons **7** to change the display contrast (0 to 15) and then press button **8** to confirm the setting.



15.6 Resolution of the temperature display

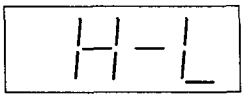
1. Change to **con** in the menu FU and press button **8** to confirm. Switch to **tA** with button **3**.
2. Choose the resolution (0.1 or 0.01 °C) with the buttons **7** and then press the button **8** to confirm (0.01°C resolution is available only in the display range from –9.5 to +99.5 °C).

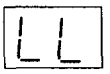
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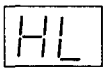
15.7 Adjusting temperature limit values

The setting range of the operating temperature of the circulator can be limited if the application requires this.

! This is not a safety element but merely an aid to help avoid user faults when operating the unit. The excess temperature protection must be set separately.







1 Change to the function H–L with the arrow buttons **7** in the menu FU. Then press the enter button **8** to confirm the selection.

2 Press the menu button **3** :

⇒ The small display **5** shows **LL** (Low Limit temperature value).

3 Set the desired limit value with the arrow buttons **7** (the lowest possible temperature is –30°C).

4 Press the enter button **8** .

⇒ The chosen value is stored as low limit value **LL** .

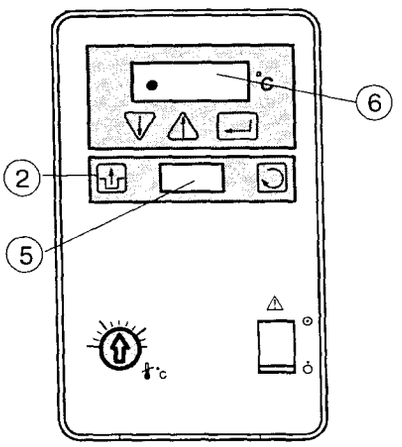
To set the high limit value HL, proceed analogously as described for LL.
HL (High Limit): The highest possible temperature is 100°C.

☞ **The new value is not saved until the Enter key has been pressed. The circulator continues to use the old value.**



5 Press the menu button **3** again to quit function mode and return to display of the actual temperature.
Or just wait until the displays **5** and **6** automatically return to actual temperature display mode after a short delay.

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16. Fault Displays

Display **6** shows the fault message " XXXX ".
"AL" is shown on display **5**.
The heating element and pump are completely switched off.

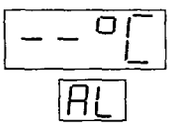
The following faults are possible:

- - OL = Excess temperature

- - PU = Pump or motor overloading

- - - S = Sensor breakage or short circuit

- - - r = Undefined fault



16.1 Excess temperature

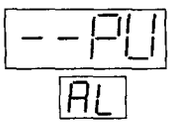
The low liquid level protection can be triggered if:

- Excess temperature has been set too closely to the desired working temperature

  ⇒ increase value slightly according to specifications made in chapter 14.1.1.

- the control function is defective

  ⇒ Return unit for servicing.



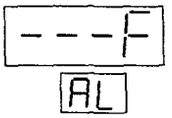
16.2 Pump or motor overloading

The motor or pump is blocked:

⇒ It can take 10 min or longer, until the motor temperature has sunk far enough so that the unit can be switched on again by pressing the reset key **2**. If the circulator switches off again after a short time, return the unit for servicing!

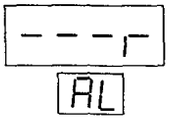
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Fault Displays



16.3 Sensor breakage or short circuit

The sensor must be exchanged by qualified service personnel. Please return unit for repairs.

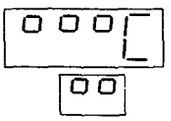


16.4 Undefined fault

This can be caused by fault which only occurs for a short period of time, i.e. with a fluctuating bath level when the filling level is very close to minimum.

Before returning the unit, top up with heat transfer liquid. This fault can often be remedied in this way!

In all other cases this unit must be checked by qualified service personnel.





16.5 Fault eliminated?

After the fault has been eliminated, the cause of the fault is shown on the display **6** (e.g. 000 L). The preceding three zeros mean that the fault has been eliminated

The reset key **2** must be pressed in order to start up the unit again.

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17. Testing the Safety Features

The safety feature for excess temperature protection must be checked at regular intervals. The level of regularity of checking depends on the unit's designated application and the heat transfer liquid used (inflammable or non-inflammable). Practical experience has shown that between 6 to 12 times a year is sufficient.

17.1 Excess temperature protection

Set a cut-off temperature (see chapter 14.1) that is lower than the desired set temperature. Switch on the circulator and check if the circulator really does switch itself off at the set cut-off temperature
If not follow the specifications detailed in chapter 14.1.1.

It may be deemed necessary to have the unit checked over by qualified service personnel.

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18. Cooling

Only for unit combinations with refrigerated bath

The refrigerated bath is used mainly for enabling lower than ambient or tap water temperatures in circulators or for cooling a heated bath down to a low temperature level very quickly.

The working temperature range is shown in the technical specifications.

1 In this case switch the refrigerated bath off at the mains switch **27**.

Switching the cooling compressor on for quick cooling down purposes (even at working temperatures of 100°C) is however permissible.

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19. Maintenance

The stainless steel surfaces of the bath vessel and of the housing may after some time show spots and become tarnished. Normal stainless steel cleaners as they are used in the kitchen can be used. The bath vessel and built-in components should occasionally (at least every time the bath liquid is changed) be cleaned using a household cleaner. Vinegar-based cleaners have proved to be suitable used according to the manufacturers recommendations.

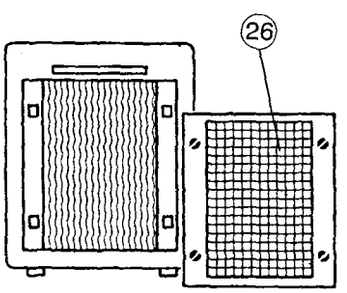
☞ **Do not use scouring powder!**

The inside of the bath vessel must be kept clean in order to ensure a long service life. Substances containing acidic or alkaline substances and metal shavings should be removed quickly as they could harm the surfaces causing corrosion. If corrosion (e.g. small rust marks) should occur in spite of this, cleaning with stainless steel caustic agents has proved to be suitable. These substances should be applied according to the manufacturers recommendations.

☞ **For cleaning the integral baths you must not use any substances which contain solvents!**

19.1 Cleaning the fins of the liquefier

In order to maintain the cooling capacity of the unit, cleaning has to be done two to four times per year, depending on the grade of soiling.



! **Switch off the unit and pull out the mains plug.**

Only for V15 and V26 bath:

1. Clean the fins with compressed air.
   For extreme soiling remove the cooling compressor casing (only specialist personnel).

Only for K15 and K20:

1. Loosen ventilation grid **26**: Rotate the mounting screws 90° in any direction and remove grid.
2. Clean fins with brush or similar tool.
3. Replace grid and push screws back in (do not rotate screws).

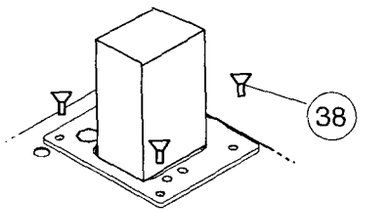
19.2 Discarding the unit:

One day the life span of your cooling unit will end.
Therefore:

! **This unit contains ozone-friendly coolant R134a. The unit may however only be discarded by authorized personnel.**

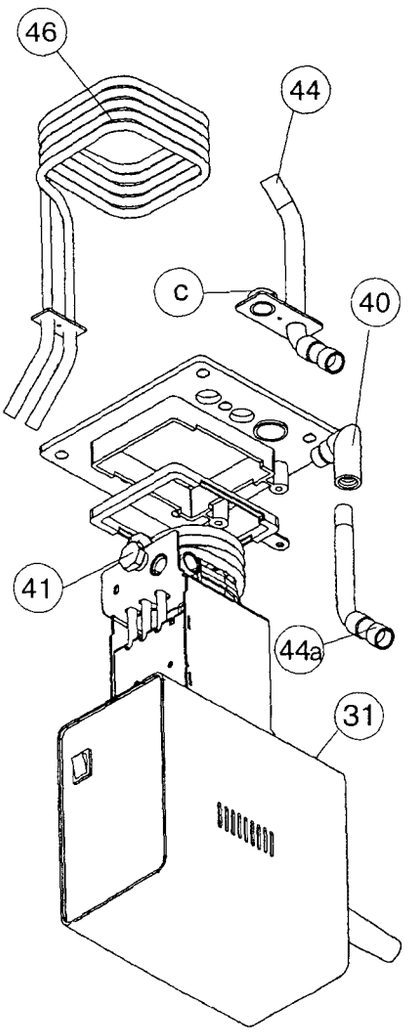
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20. Disassembly for Servicing



1 Remove the temperature control module from the bath bridge/cooling bath (unscrew the four sunken screws **38**).

2 Stand the temperature control module upside-down,



! Dry unit first if necessary, in order to avoid exposing the electronics to water penetration.

Circulation set

3 Loosen the setscrew **c** of the circulation set **44**,

4 Remove the tube **44a**,

5 Loosen the screw of the circulation set **44** and remove the set upwards.

6 Unscrew and remove hexagon plug screw **41** and nozzle **40**.

7 Unscrew and remove pair of screws **31**,

8 Take off plate with seal and cooling coil upwards.

Cooling coil

9 Unscrew and remove the screw of the cooling coil **46**.

10 Take off the cooling coil upwards.

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21. Technical specifications

21.1 Technical specifications of the temperature control module DC10 according to DIN 58966

Operating temperature *)	°C	-30..100
Temperature accuracy	+/- K	0.02
Heater capacity 230V / 115V	W	2000 / 1200
Pump pressure max.	mbar	300
Circulation capacity (open)	l/min	17
Max. flow rate during circulation using 12 mm ø hoses	l/min	12.5
Immersion depth from..to	mm	85..140
Voltage	V	230 ±10% or 115 ±10%
Frequency 230V / 115V	Hz	50..60 / 60
Total wattage consumption 230V / 115V	VA	2050 / 1250
Safety elements according to category		NFL
Excess temp. protection		variable
Motor overload protection		yes
Alarm signalling		optical
FIS-system		yes
Temperature setting		digital
Setting limitation		yes
Temperature display		LED green
RTA-system		yes
Control type		PID
Control sensor		digital IC

* The working temperature range is dependant on the cooling selected.

21.2 Fuse values

Mains voltage	Fuse(s) at the rear panel
230 V	2x10 A
115 V	1x15 A
100 V	1x15 A

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21.3 Technical specifications of the refrigerated baths

		K10	K15	K20	V15	V26
Voltage	V	230 ± 10 % 115 ± 10 %	230 ± 10 % or 115 ± 10 % or 100 ± 10 %			
Frequency	Hz	50 (230 V) 60 (230 V) 60 (115 V)	50 (230 V) 60 (230 V) 60 (115 V) 50–60 (100 V)		50 (230 V) 60 (230 V) 60 (115 V) 50–60 (100 V)	
Total wattage consumption	VA	2300 (230 V) 1600 (115 V)	2600 (230 V) 1600 (115 V) 1600 (110 V)		2550 (230 V) 1500 (115 V) 1500 (110 V)	
Additional connections		Mains socket for temperature control module N_{max} = 2100 VA(230 V) N_{max} = 1300 VA(115 V) N_{max} = 1300 VA(100 V)				

21.4 Fuse values

Unit type	Mains voltage	Fuse(s) at the rear panel
K10	230 V	2x10 A/2x5 A
	115 V	1x12 A/1x6 A
K15	230 V	2x10 A/2x5 A
	115 V	1x12 A/1x6 A
	100 V	1x12 A/1x6 A
K20	230 V	2x10 A/2x5 A
	115 V	1x12 A/1x6 A
	100 V	1x12 A/1x6 A
V15	230 V	2x10 A/2x5 A
	115 V	1x12 A/1x6 A
	100 V	1x12 A/1x6 A
V26	230 V	2x10 A/2x5 A
	115 V	1x12 A/1x6 A
	100 V	1x12 A/1x6 A

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21.5 Dimensions, material and the permissible temperature ranges of the baths

Bath	Material	Tempera-ture (°C)	Bath opening (mm) w. holder	w. bridge	Bath depth (mm)	Volume (l) from..to	Dimensions (WxDxH) [1] (mm)
W5P	P	0..60	-	120 x 240	150	4..6	170 x 400 x 340
W12P	P	0..60	-	300 x 165	150	9..12	310 x 335 x 340
W18P	P	0..60	-	300 x 340	150	15..19	310 x 510 x 340
W13	S	..200	300 x 325	300 x 175	150	7..12	335 x 360 x 350
W15	S	..200	300 x 325	300 x 175	200	10..15	335 x 360 x 400
W19	S	..200	300 x 500	300 x 350	150	12..19	335 x 535 x 350
W26	S	..200	300 x 500	300 x 350	200	20..26	335 x 535 x 400
W45	S	..200	-	300 x 500	300	37..42	360 x 540 x 510
W46	S	..200	-	300 x 700	200	26..44	360 x 910 x 410
P5	I	0..100	-	130 x 175	160	5	160 x 330 x 360
P14	I	0..100	-	300 x 190	160	14	330 x 380 x 360
P21	I	0..100	-	300 x 380	160	21	330 x 570 x 360
B3	S	..200	-	130 x 100	150	3	200 x 300 x 375
B5	S	..250	-	140 x 150	150	4.5	210 x 360 x 380
B7	S	..300	-	130 x 100	200	7	230 x 360 x 440
B12	S	..300	-	220 x 140	200	12	320 x 380 x 440
V15	S	-5..150	300 x 325	300 x 175	200	10..15	340 x 540 x 400
V26	S	-10..150	300 x 500	300 x 350	200	20..16	360 x 750 x 400
K10	S	-10..150	-	130 x 100	150	3	195 x 355 x 570
K15	S	-28..150	-	130 x 100	150	4.5	385 x 465 x 415
K20	S	-28..150	-	130 x 100	150	4.5	230 x 460 x 590

P = Polyacryl, S = Stainless steel

I = Integral bath vessel made of PPO (modified)

[1] Approx. height including temperature control module

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