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Instruction Manual
Circulator DC30/DL30
including all Baths

Part No. 003-3049
1-1-062-2 01.2002

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Table of Contents

1. Key to Symbols 4

1.1 Symbols used in this manual 4

1.2 Symbols used on the unit 4

1.3 Menu Tree 5

2. Quality Assurance 6

3. Your Contacts at Thermo Haake 6

4. Thermo Haake Test Certificate 7

5. Safety Notes 8

6. Unit Description 10

6.1 Safety features 10

6.2 Applications 11

6.3 Temperature ranges 11

6.4 Unit combinations 12

7. Unpacking / Setting Up 13

7.1 Transportation damage? 13

7.2 Ambient conditions according to DIN EN 61010 . . 13

7.3 Resting time after transportation (only for refrigerated circulators) 13

7.4 Ventilation 13

7.5 Information concerning the CE sign 14

8. Functional and Operating Elements 15

8.1 Temperature control modules DC30/DL30 15

8.2 Bath vessel “W” and integral bath ”P” (example model) 16

8.3 Bath vessel “B3” and integral bath ”P5” 17

8.4 Bath vessel V15 / V26 18

8.5 Bath vessel K15 / K10 / K20 19

9. Assembly 20

9.1 Immersion circulators with bracket mounting 22

9.2 Open-bath circulators with angled mountings 23

9.3 Open-bath circulators with bath bridge and stainless steel or polyacrylic baths 24

9.4 Open-bath cirulators with bath bridge H64 and bath vessel P14 and P21 25

9.5 Open-bath cirulators with bath bridge and bath vessel V15 and V26 26

9.6 Subsequently fitting a circulation set 27

9.7 Subsequently fitting a cooling coil 28

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Table of Contents

9.8 Fitting a lifting platform to the bridge 29
9.9 Open-bath and heating circulators with bath bridge and polyacrylic bath W5P 30
9.10 Open-bath and heating circulators with bath bridge and integral bath P5/U 30
9.11 Open-bath circulators with bath bridge and integral bath P5 31

10. Connecting Hoses 32

10.1 Plastic hoses 33
10.2 Metal hoses 33
10.3 Tap water cooling 34
10.3.1 Connection to cooling (tap) water 34
10.4 External Cooling Devices 34
10.5 Pressure pump 35
10.5.1 Temperature controlling an object in the internal bath 35
10.5.2 Connection of external closed systems . . . 35

11. Filling with Bath Liquid 36

11.1 Recommended bath liquids 36
11.2 Filling with heat transfer liquid 39

12. Draining 40

13. Connecting Up 41

13.1 Connecting to the mains 41
13.1.1 Only for refrigerated baths K15, K10, K20, V15 and V26 41
13.2 Checking the liquid circuit 41
13.3 Changing the mains plug (e.g. for Great Britain) . . 41
13.4 Fuses on the unit 42

14. Operating 43

14.1 Switching on 43
14.2 Heating control lamp 43
14.3 Adjusting the variable set temperature 44
14.4 Adjusting the fixed temperatures F1 to F3 (facultative) 44

15. Excess Temperature Protection 45

15.1 Excess temperature protection dial 45
15.1.1 Setting the excess temperature 46
15.1.2 Testing the cut-off point 46

16. Configuration 47

16.1 Set value S and fixed temperatures F1 to F3 47

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Table of Contents

16.2 Adjusting the correction factors (RTA system) 48
16.3 Displaying the version of the operating software . . 50
16.4 Secured mode 50
16.5 Adjusting the LED display contrast 50
16.6 Resolution of the temperature display 50
16.7 Adjusting temperature limit values 51
16.8 Setting the interface parameters 52
16.9 Baud rate 52
16.10 Parity 52
16.11 Handshake 52

17. Fault Displays 53

17.1 Excess temperature 53
17.2 Low liquid level 53
17.3 Pump or motor overloading 54
17.4 Sensor breakage or short circuit 54
17.5 External fault RS232C 54
17.6 Undefined fault 54
17.7 Fault eliminated? 54

18. Testing the Safety Features 55

18.1 Excess temperature protection 55
18.2 Low liquid level protection 55

19. RS232C Interface 56

19.1 Connecting to a computer 56
19.1.1 PC with an RS232C interface 56
19.2 Interface parameter 57
19.3 Requirements made of external units 58
19.4 Setting the desired set value S, F1–F3 58
19.5 Correction value cS, c1–c3 58
19.6 Commands 59
19.7 Operating status / Error message 61
19.8 Controlling via a BASIC program 62

20. Cooling 63

21. Maintenance 64

21.1 Cleaning the fins of the liquefier 64
21.2 Discarding the unit: 64

22. Disassembly for Servicing 65

23. Technical specifications 66

23.1 Temperature control modules DC30/DL30 to DIN 58966 66
23.2 Fuse values DC30 / DL30 66
23.3 Technical specifications of the refrigerated baths . 67
23.4 Fuse values 67
23.5 Dimensions, material and the permissible temperature ranges of the baths 68

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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.

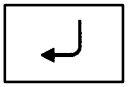
1.2 Symbols used on the unit


Caution: Read the instruction manual!


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


Menu selection

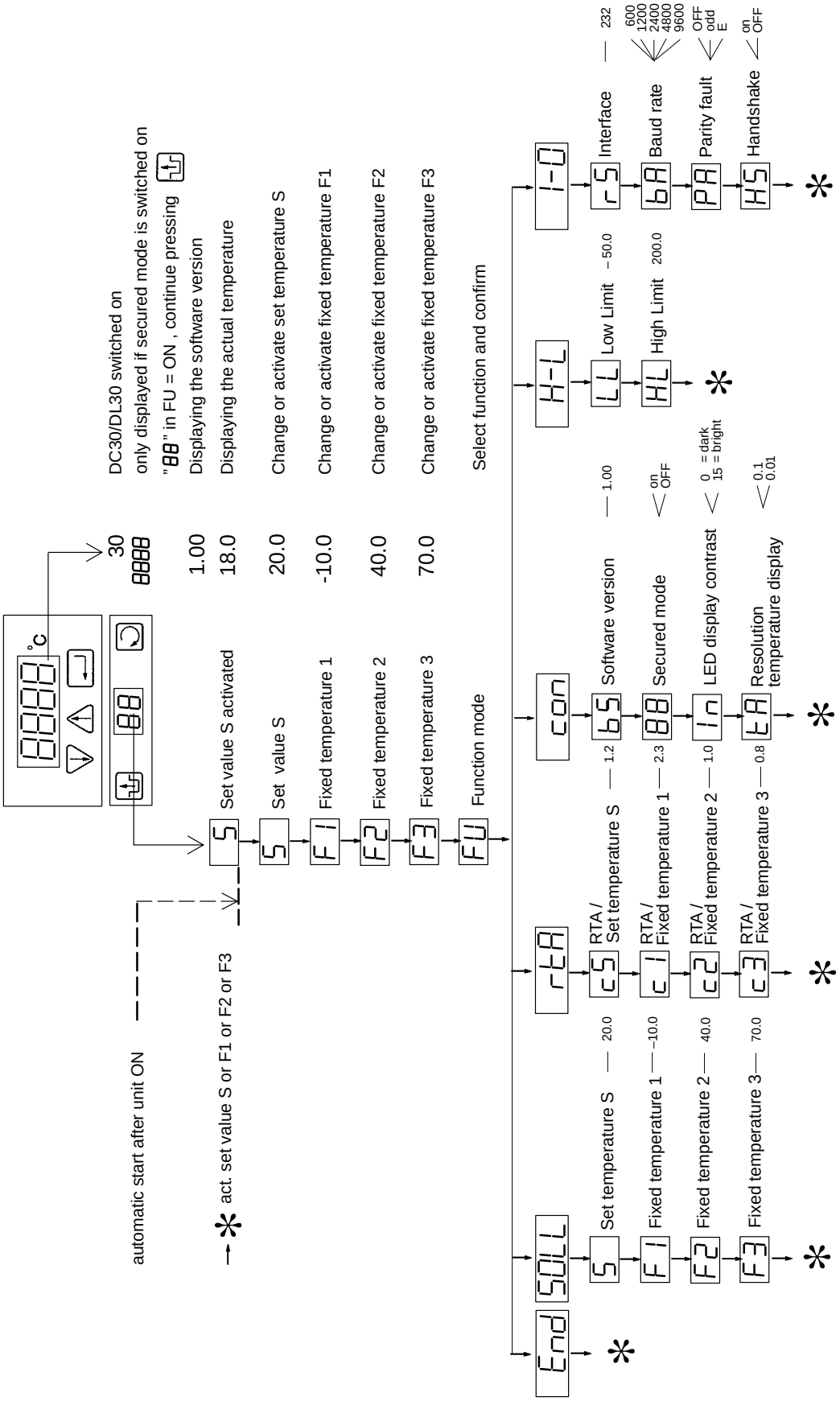

Value alteration (↓) higher / (↑) lower


Enter key


Reset button (for usage after a fault or interruption)

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1.3 Menu Tree



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2. Quality Assurance

Dear customer,
Thermo 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 Thermo Haake

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

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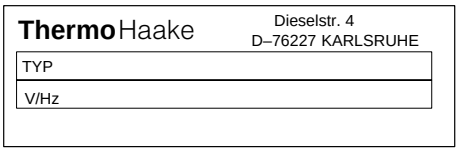
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The following specifications should be given when product enquiries are made:

– **Unit name** printed on the front of the unit,

– **TYP** as specified on the name plate.

– **Version** of the operating software (see chap. 16.3).

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4. Thermo Haake Test Certificate

This is to certify that the tempering device which you have acquired and to which these instructions for operation refer has been tested and equilibrated by Thermo Haake in compliance with the regulations of a certified Quality Assurance System according to DIN ISO 9001.

Testing for constancy of temperature has been carried out in keeping with DIN standard DIN 12876 for laboratory equipment. (follow–up standard to DIN standard 58966).

The measuring equipment used in the testing process is regularly calibrated and can be traced back to the national norms of the Physikalisch Technische Bundesanstalt (PTB) Deutschlands[1] or to other national norms. In those cases where there are no norms and standards on a national level, the testing process is in keeping with currently valid technical rules and regulations, norms and standards.

All required measuring data are listed on this page of the Test Certificate.

Measuring conditions

Ambient temperature:	+ 20°C
Power supply / –frequency:	230V ± 5V / 50 Hz
respectively	115V ± 5V / 60Hz

System parameters

Volume:	8 litre
Liquid:	Water
Rated temperature:	+70°C

Measuring process

Checking constancy of temperature in bath according to DIN 12876, part 2 (follow–up standard to DIN 58966, part 2, paragraph 4.3)

Measuring agent

Type of sensor used for measuring:	Quartz Inexactitude of measurement
according to DIN IEC 751	+/– 0,1 K

Test results

Constancy of temperature (Width of control range):	+/– 0,01 K
Stability of temperature (persistent):	+/– 0,01 K
Accuracy at +70°C:	+/– 0,1 K

The individual test certificate for your thermostat will be provided upon request.

We and our partners shall gladly be at your disposal for a calibration of your thermostat at your premises. Just contact us.

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5. 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.**

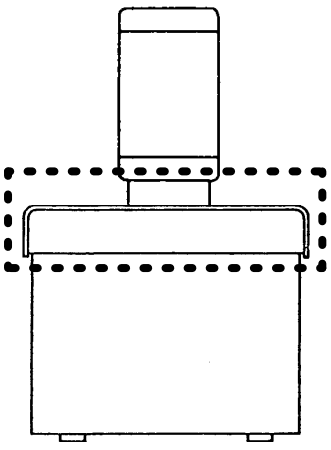
! **Repairs, alterations or modifications must only be carried out by specialist personnel. Consider the manufacturer's instruction manuals.**
Considerable damage can be caused by improper repairs. The Thermo Haake service department is at your disposal for repair work.

! **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.**



! **Many units parts can become hot as a result of normal unit functioning – there is a high risk of burns!**
The overall temperature of the marked zone (see fig.) will become higher than 70°C when the bath temperature exceeds approx. 150°C. Please ensure that adequate contact protection is provided.

! **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!**

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

! **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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6. Unit Description

This device contains safety elements according to category FL making it suitable for unattended continuous operation.

A variably adjustable excess temperature protection and independent low liquid level protection which is preset to the lowest level allow the usage of different heat transfer liquids.

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

6.1 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
Heat transfer liquid is too highly viscous:
⇒ 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 Identification System (FIS) and an acoustic signal indicate 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.**

6.2 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.

6.3 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.

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

Mains cable:

The mains cables used for the temperature control modules DC30 and DL30 are specially designed for usage with heating elements. They can be allowed to come into contact with parts which are heated up to a temperature of **max. 250°C**.

! **Warning for maintenance personnel: Please ensure that the same sort of cable is used in case of replacement!**
(Order no. 082-2409)

6.4 Unit combinations

A complete, ready-to-use circulator always consists of a temperature control module DC30 or DL30, 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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7. Unpacking / Setting Up

7.1 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).

7.2 Ambient conditions according to DIN EN 61010

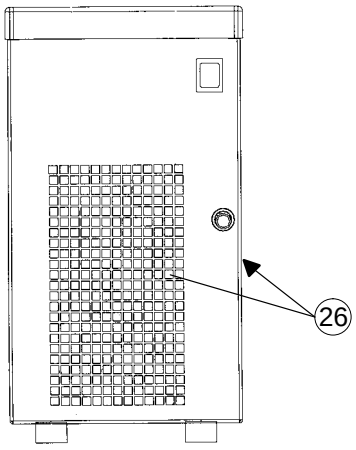
- indoors, max. 2000 meters above sea level,
- ambient temperature 5 ... 40° C,
- relative humidity max. 80%/31°C (→ 50%/40°C)
- excess voltage category II, contamination level 2

7.3 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.



7.4 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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7.5 Information concerning the CE sign

Thermo Haake measuring and control instruments 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.

It was tested according to the strict EMV test requirements of the EN61326-1/A1 (EMV requirements for electrical equipment for measuring technology, conduction technology and laboratory usage). This means it was tested for interference resistance and interference emission according to public low-voltage mains (household and commercial usage).
The following basic standards were applied in detail:

Interference resistance:

EN61000–4–2	electrostatic discharge
EN61000–4–3	electromagnetic fields
EN61000–4–4	fast transients
EN61000–4–5	surge voltages
EN61000–4–6	wire–guided HF–signals
EN61000–4–8	magnetic field of mains frequency
EN61000–4–11	voltage drop/short–time interruption

Interference emission:

CISPR16/class B	wire–guided interference emission
CISPR16/class B	radiated interference emission
EN 61000–3–2	Voltage variations and flickering
EN 61000–3–3	Over-compensation voltage flows

The application in industrial and commercial (public mains) environments is thus possible.
A declaration of conformity is supplied with the ordered unit on request.

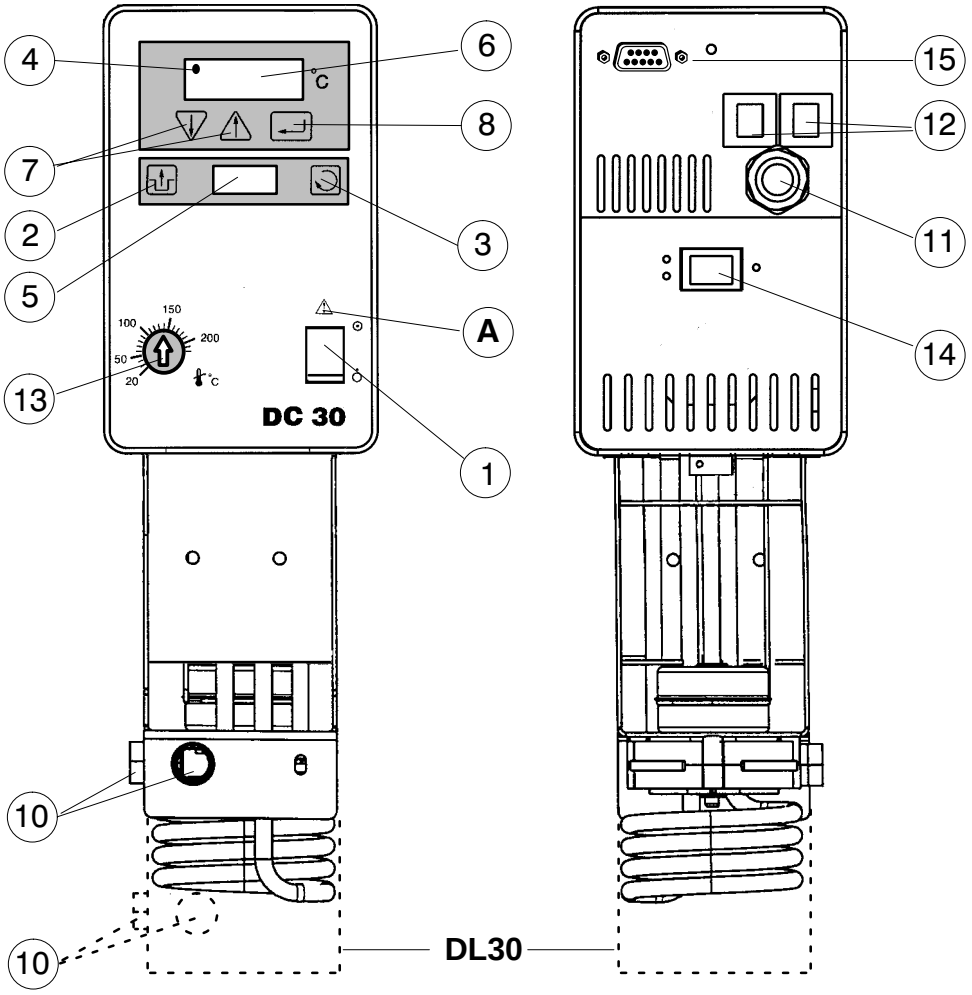
Our strict standards regarding operating quality and the resulting considerable amount of time and money spent on development and testing reflect our commitment to guarantee the high level of quality of our products even under extreme electromagnetic conditions. Practice however also shows that even 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.

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8. Functional and Operating Elements

8.1 Temperature control modules DC30/DL30

(Temperature control modules DL30 with deeper immersion depth)

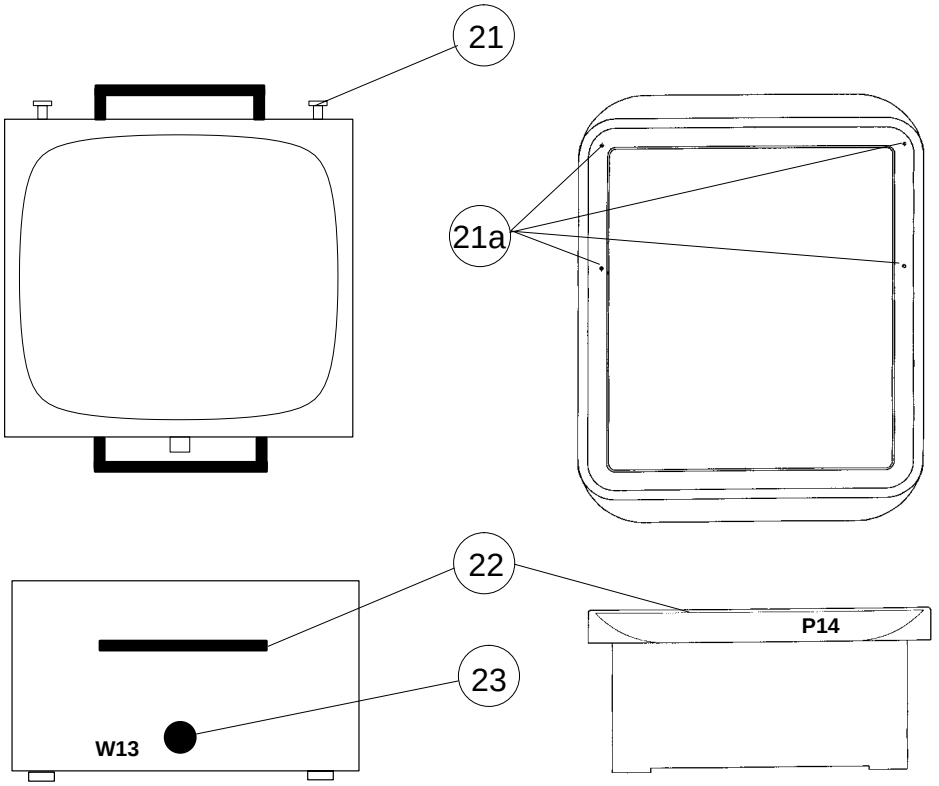


A Symbol: Read the instruction manual!
1 Mains switch
2 Reset button
3 Menu selection key
4 Heating control display
5 Menu position disply
6 Set or actual temperature display
7 Value alteration (↓) higher (↑) lower
8 Enter key
10 Pump outlet (depending on requirements, one of the opening must be closed).
11 Mains cable
12 Fuses (if this fuse is triggered, see chap. 13.4)
13 Excess temperature setting dial
14 Speed reduction switch for TRS system
15 RS232C-interface

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8.2 Bath vessel “W” and integral bath ”P” (example model)

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

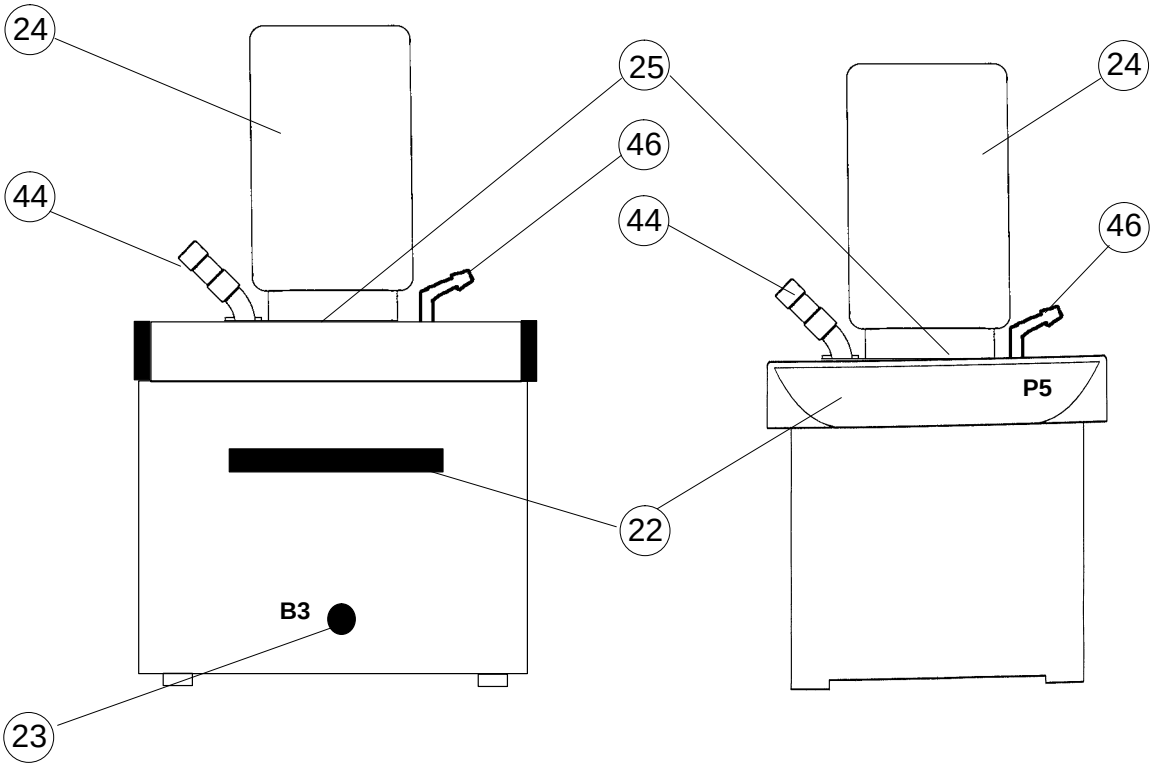


21 Mounting screws for angled holder or bath bridge
21a Tapped holes for attaching the bath bridge
22 Handle
23 Drainage nozzle

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8.3 Bath vessel “B3” and integral bath ”P5”

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

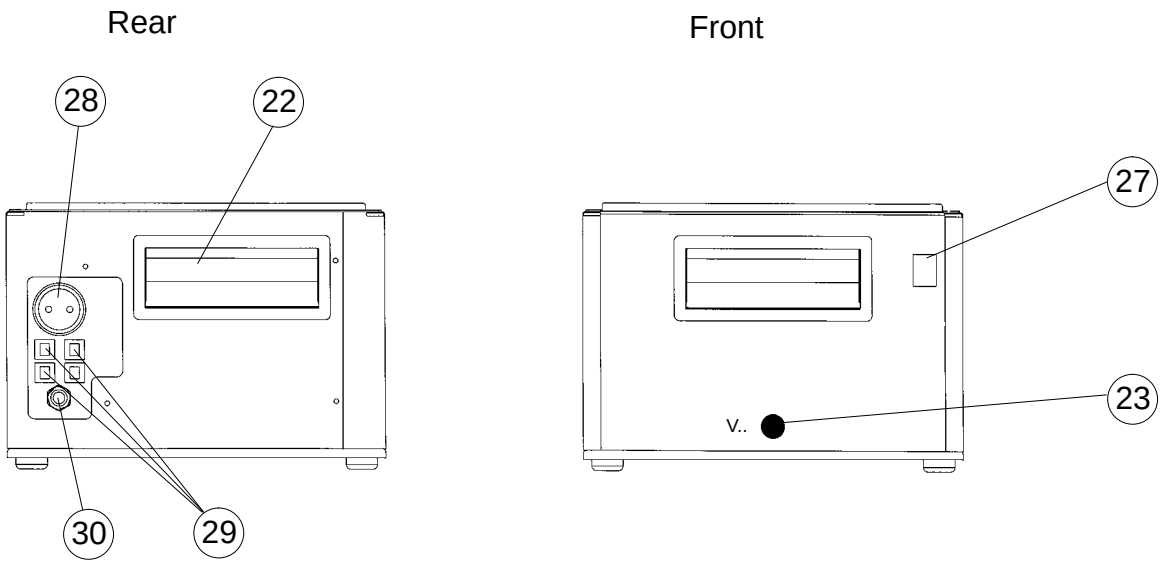


22 Handle
23 Drainage nozzle
24 Temperature control module with intermediate plate
25 Bath opening (with plastic bath covering as a standard feature)
44 Pump connections
(front = to external object)
(rear = return from external object)
46 Connections for tap water cooling
(The flow direction can be chosen 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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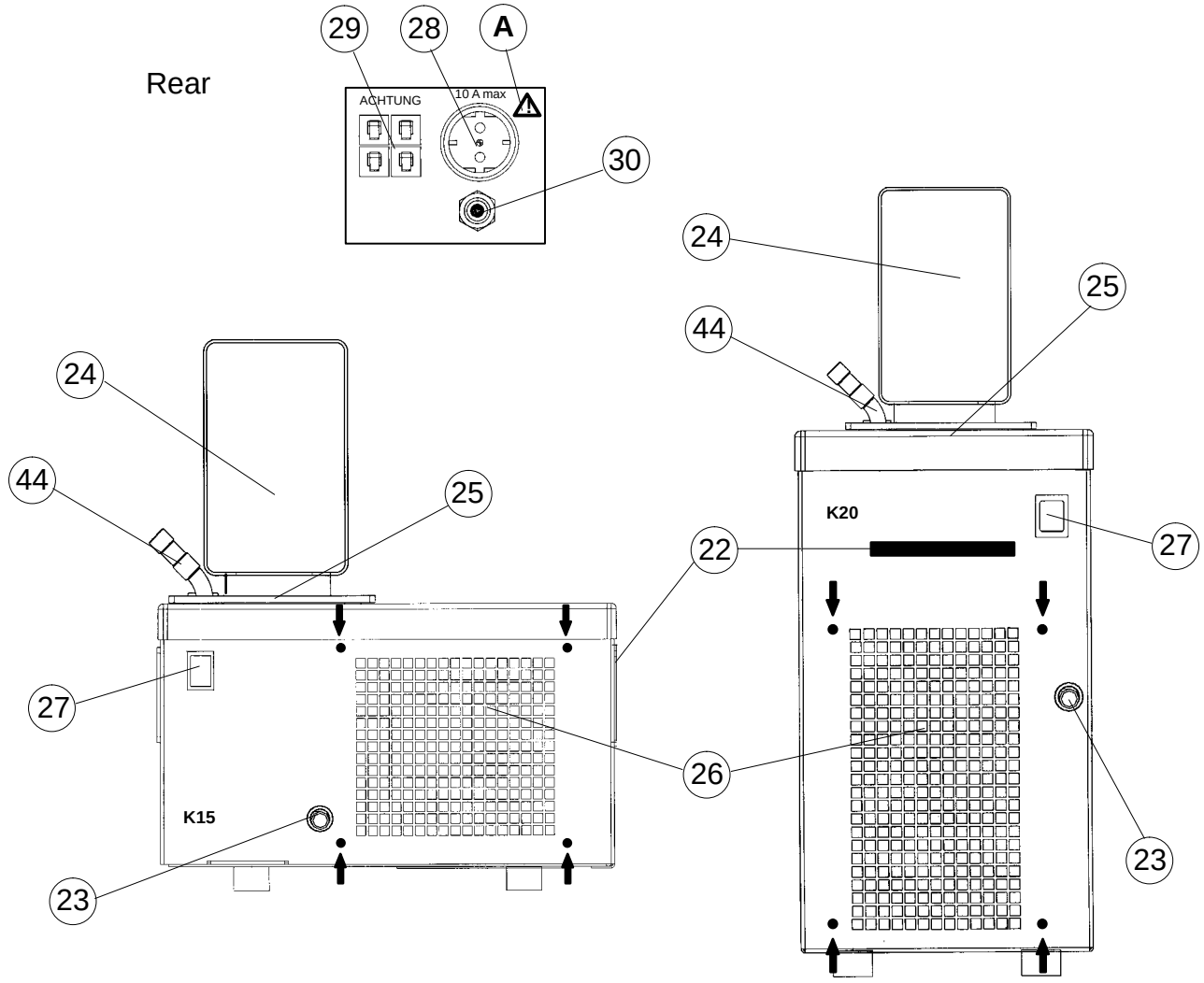
8.4 Bath vessel V15 / V26



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.13.4)
30 Mains cable

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8.5 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.13.4)
30 Mains cable
44 Pump connections
(front = to external object)
(rear = return from external object)

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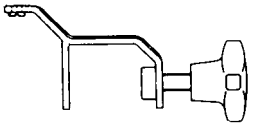
9. Assembly

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:

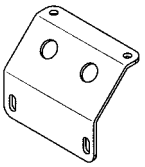
1 screwdriver – size no. 2 (for Phillips screws)

As an **immersion circulator** with bracket mounting



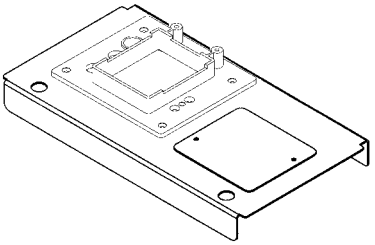
see **page 22**

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



see **page 23**

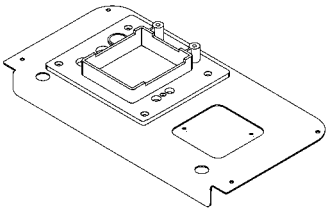
As an **open-bath circulator with bath bridge H62** and bath vessel with **stainless steel W13 – W46** or **polyacrylic bath W12P / W18P**



see **page 24**

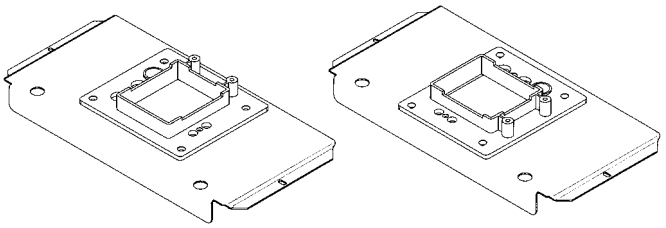
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As an **open-bath circulator with bath bridge H64** and **integral bats P14 / P21**



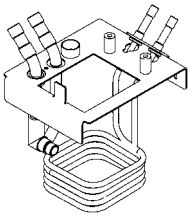
see **page 25**

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



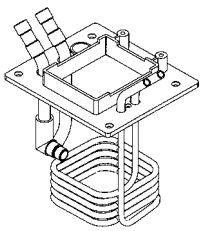
see **page 26**

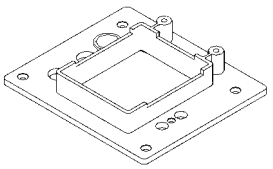
As a combined **open-bath and heating circulator with bath bridge H63** and **polyacrylic bath W5P**



see **page 30**

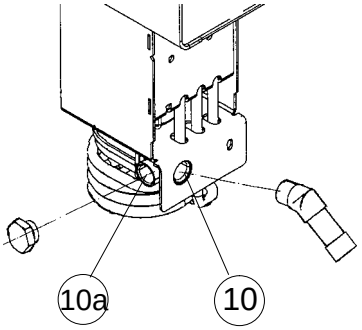
As a combined **open-bath and heating circulator with bath bridge** and **Integral bath P5/U**

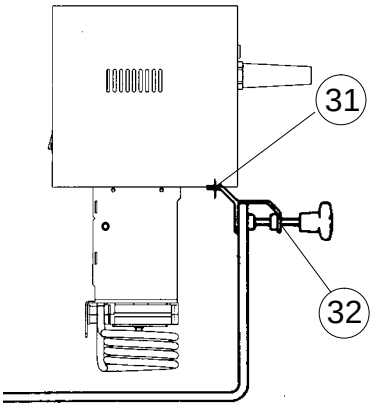


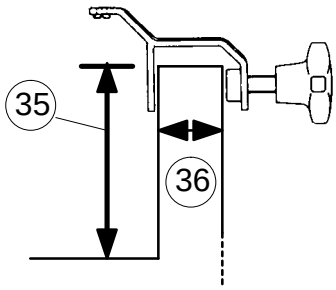


see **page 30/31**

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9.1 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**).

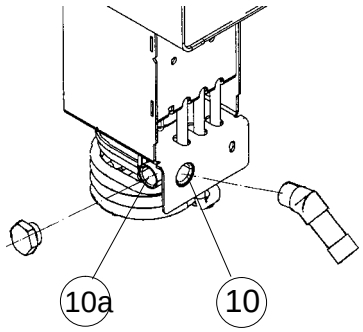
! Polyacrylic and other plastic vessels are instable at higher temperatures, therefore:

- **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 36*** *"Filling".*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.***
Afterwards further ***on page 32.***

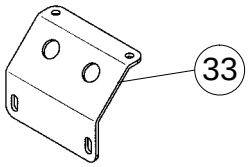
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9.2 Open-bath circulators with angled mountings

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**:

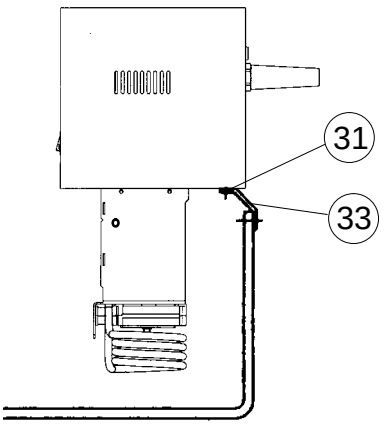


2 Stand the temperature control module upside-down,

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

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

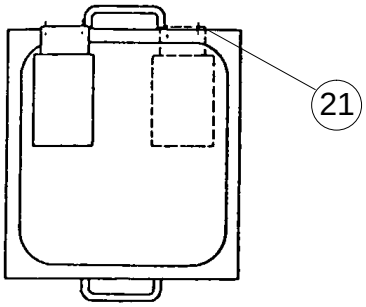
4 Attach bracket mounting using these screws.



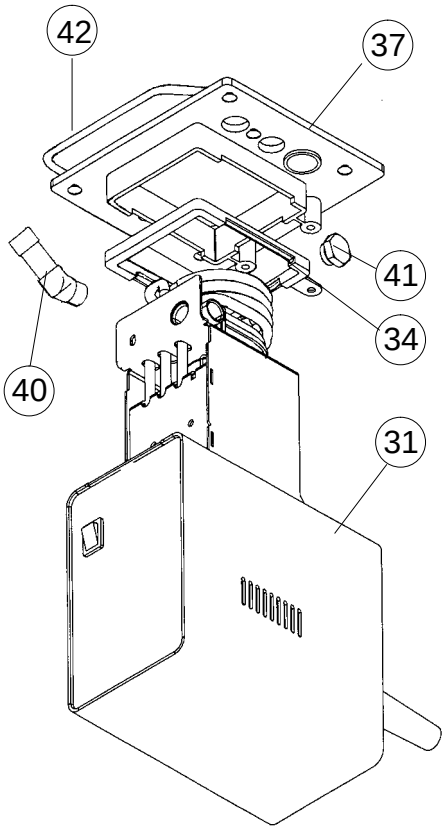
5 Attach the temperature control module to the rear side of the bath using the thumbwheel screws **21.**

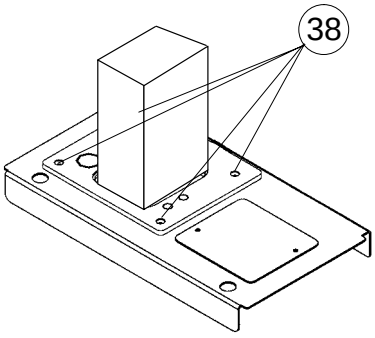
☞ ***Further on page 36*** *"Filling".*

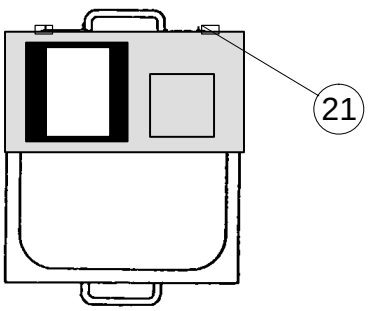
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.*** *Afterwards further* ***on page 32.***



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9.3 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).

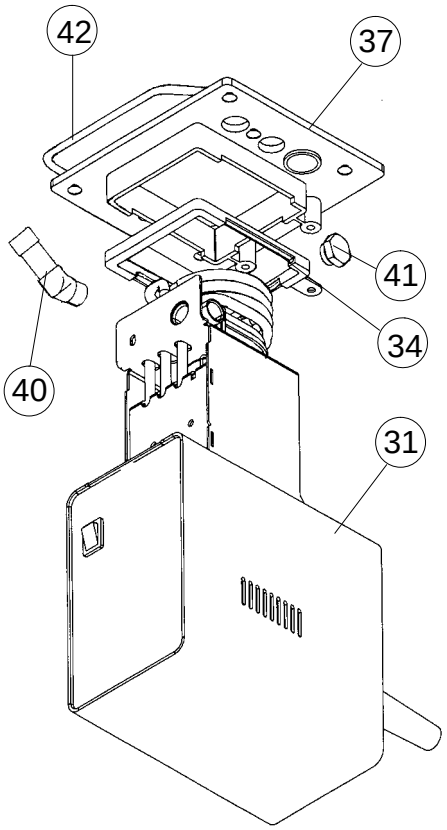
9 Fit the supplied conical bung in the thermometer hole in the bridge.

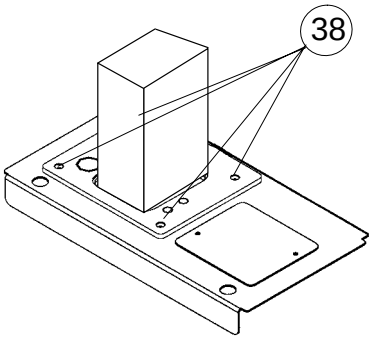
☞ ***Further on page 36*** *“Filling”.*

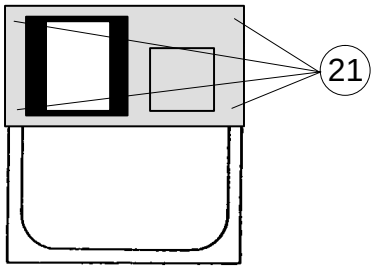
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.*** *Afterwards further* ***on page 32.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 29.***

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9.4 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.**

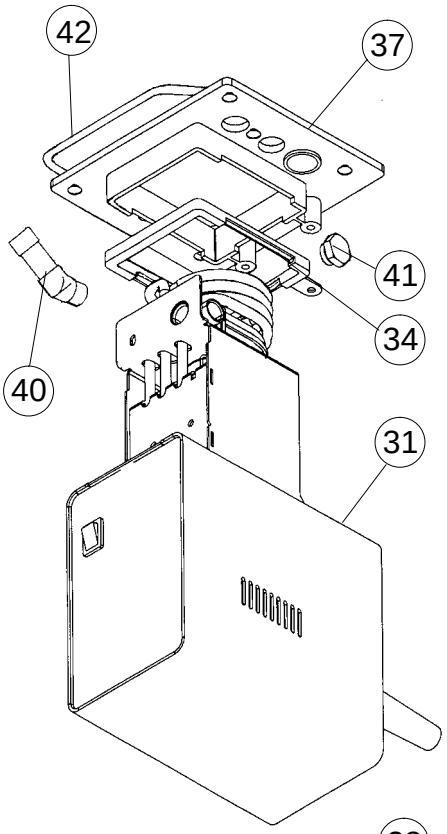
9 Fit the supplied conical bung in the thermometer hole in the bridge.

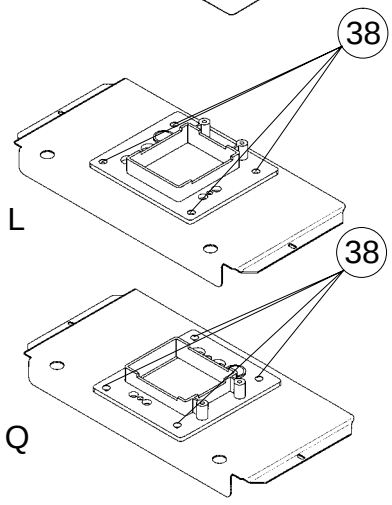
☞ ***Further on page 36*** *“Filling”.*

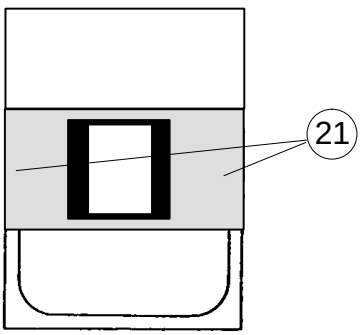
An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.*** *Afterwards further* ***on page 32.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 29.***

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9.5 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**.

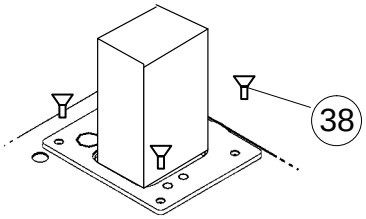
9 Fit the supplied conical bung in the thermometer hole in the bridge.

☞ ***Further on page 36*** *“Filling”.*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.*** *Afterwards further* ***on page 32.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 29.***

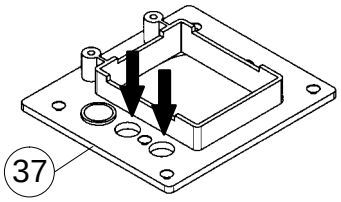
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9.6 Subsequently fitting a circulation set

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

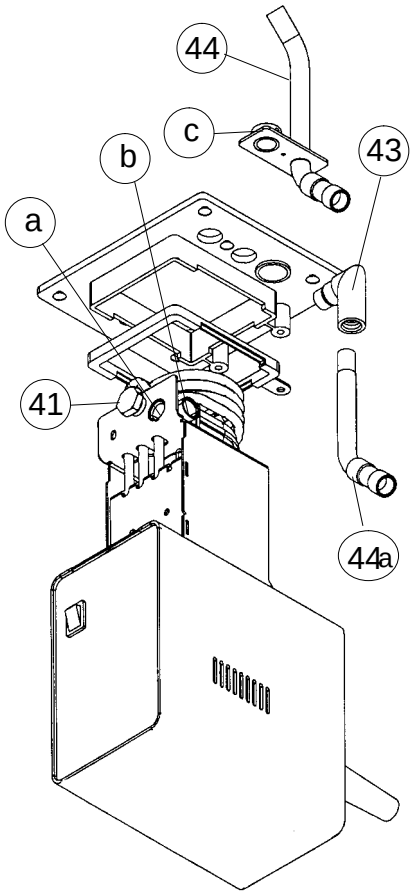
2 Stand the temperature control module upside-down,



! 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 (↓↓).



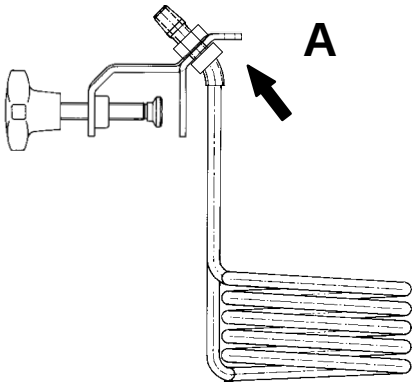
5 Insert hexagon plug screw **41** into **a** and nozzle **43** into pump outlet **b** on the side.

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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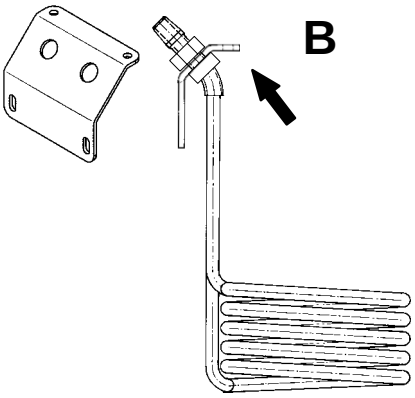
9.7 Subsequently fitting a cooling coil

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

1 Remove the hexagon nuts from the cooling coil.

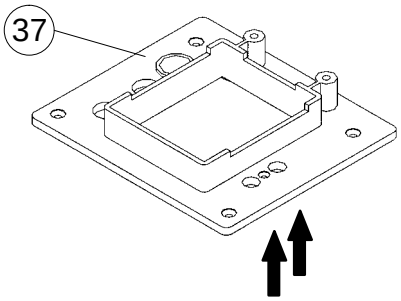
2 Insert cooling coil from below through the bracket or angled mounting as illustrated.

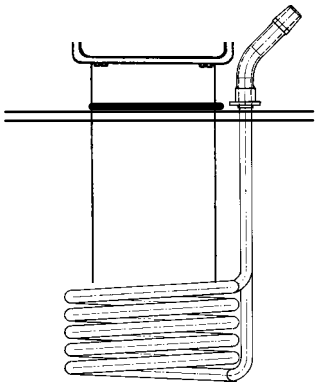
The cooling coil now surrounds the shaft of the temperature control module.



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 22 and 23.





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

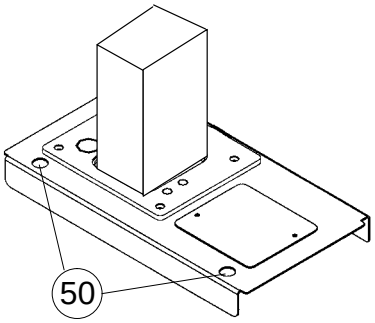
1 Remove the covering plate from the marked openings (↓↓).

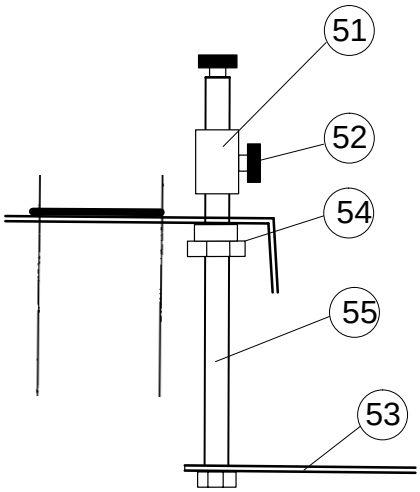
2 Insert cooling coil from below into the plate **37** as illustrated.

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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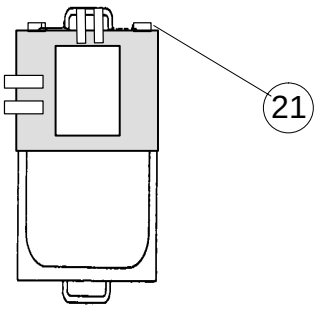
9.8 Fitting a lifting platform to the bridge

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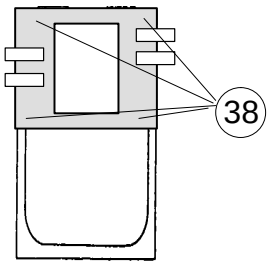
9.9 Open-bath and heating circulators with bath bridge and polyacrylic bath W5P

! 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.



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

! The highest working temperature must be limited to +120°C.

Mounting the bridge onto the bath vessel:

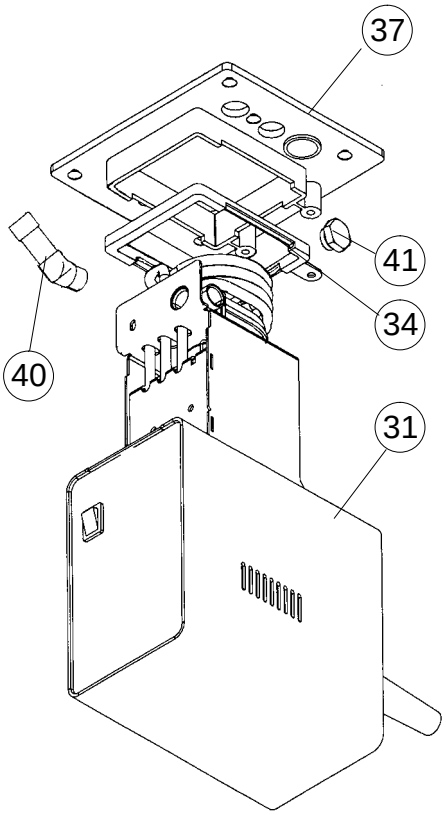
1 Locate the plate with the attached temperature control module on top of the bath vessel and secure it using the four sunken screws **38**.

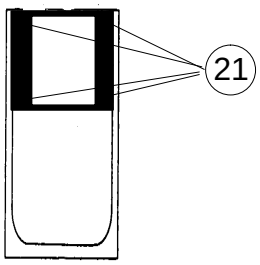
2 Fit the supplied conical bung in the thermometer hole in the bridge.

☞ ***Further on page 36*** *"Filling".*

Further on page 32 *"Connecting Hoses".*

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

! The highest working temperature must be limited to +120°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.

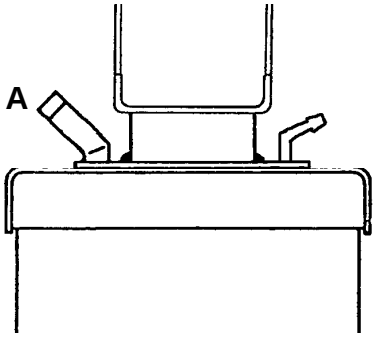
☞ ***Further on page 36*** *“Filling”.*

An explanation on how to mount an optional ***cooling coil*** *can be found* ***on page 28.*** *Afterwards further* ***on page 32.***

An explanation on how to mount an optional ***lifting platform*** *can be found* ***on page 29.***

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10. 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.

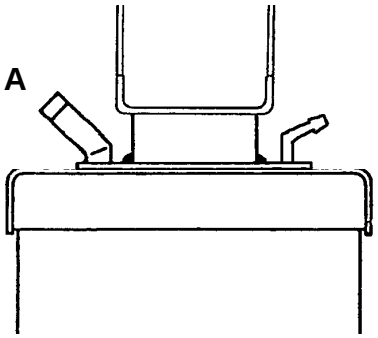
! Hoses must not be folded or bent!
A wide radius should be used if turns have to be made!

! 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



10.1 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.

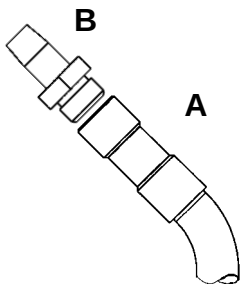
Perbunan hoses have proven their versatility in the temperature range between - 30 to + 100°C.

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

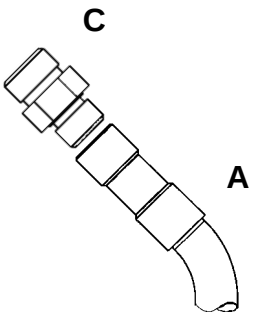
Order no.: 082-0172 for 8 mm i.D. hose
082-0173 for 12 mm i.D. hose

Hoses for other thermal liquids and temperature ranges can also be supplied by Thermo Haake:

Hose material:	Permissible Temperature range:	Remarks:
PVC	10 to 60°C	For water only!
Viton	– 60 to 200°C	
Silicone	– 30 to 220°C	Not for silicone oil! or Synth 60!
Metal	– 50 to 300°C	universally suitable



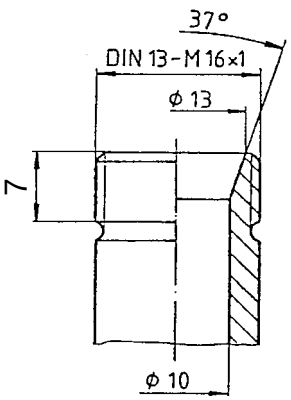
Hoses with 12 mm internal diameter can be pushed directly onto the nozzle **A**. For 8 mm hoses the content of delivery includes 2 hose adapters **B** with R 1/4 screw thread which must be screwed into nozzle **A**.



10.2 Metal hoses

Thermo Haake metal hoses (stainless steel insulated) offer a particularly high degree of safety and are suitable for both low and high temperatures.

The metal hoses are attached to the nozzles **A** using a coupling **C** (order no. 333-0302).

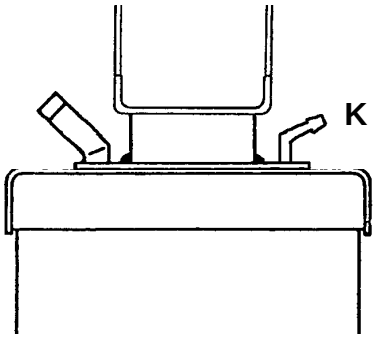


! The hoses must not be extremely bent or subjected to mechanical strain!

These hoses are available in lengths of 0.5, 1.0 and 1.5 meters from Thermo Haake. Couplings for connecting two hoses are also available if other lengths should be required for a particular application.

The smallest opening inside the metal hoses is 10 mm. The metal hoses are provided with coupling nuts (M16 x 1, DIN 12 879, part 2) at either end. The counter piece for attaching them complies to the left hand sketch.

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10.3 Tap water cooling

Only for units without own refrigeration unit!

10.3.1 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.

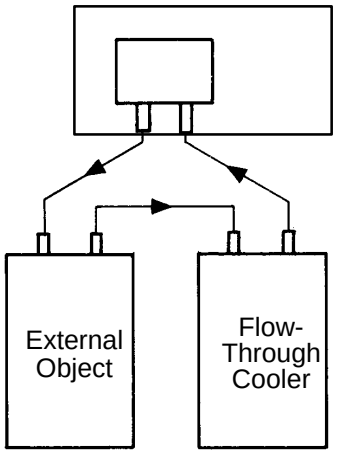
1 Use hoses with 8 mm internal ∅ and connect to the cooling coil **K.** The direction of the flow can be freely selected. It must be taken care that at the outlet side, the water can run out unhindered.

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,

10.4 External Cooling Devices

Heating / Open-bath circulator



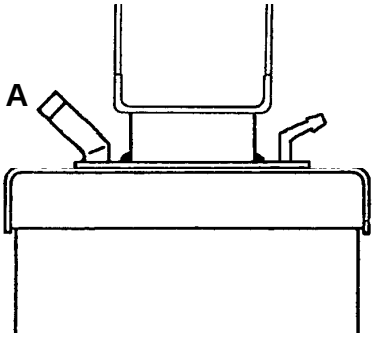
With immersion and flow-through coolers from Thermo Haake, the heat transfer liquid can be cooled down considerably below 0°C and the circulator can be rendered independent of tap water.

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.

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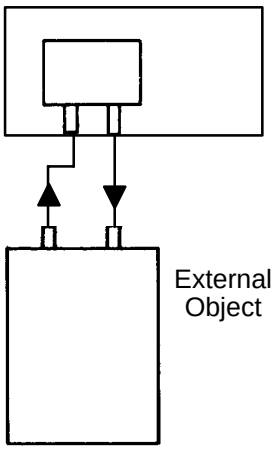
10.5 Pressure pump

10.5.1 Temperature controlling an object in the internal bath

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

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

Heating / Open-bath circulator



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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11. Filling with Bath Liquid

The selection of the proper bath liquid (heat transfer liquid) influences the capacity of a temperature control unit decisively. The technical data with special emphasis on the temperature accuracy was established in accordance with DIN 58 966 (water at 70°C).
The temperature accuracy will decrease the higher viscosity of the heat transfer liquid and the lower its heating capacity is.
It is difficult to arrive at valid statements which can be applied as a general rule as the length of the hoses, the volume and the material of the connected systems have a great influence on this accuracy.

The heating up and the cooling down time of a system to be temperature controlled can be influenced by the bath liquid too. Oil, for instance, cuts this time in half when compared to water.

11.1 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.

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–40 to 200°C

SIL180

…this heat transfer liquid is suitable for covering nearly the entire range with just one liquid especially when used with the cooling units.
Unfortunately *SIL180* has a creeping tendency necessitating the occasional cleaning of the bath cover.

–30 to –10°C

Methanol or Ethanol

Those liquids are usually only used at lower temperatures. Their fire point is at about 10°C. Therefore, they cannot be used in accordance with the standards EN 61010 or DIN 12879.

other temperatures

Thermo Haake offers a range of heat transfer liquids for these temperature control applications.

Synth ... : Synthetic thermal liquid with a medium life span (some months) and little smell annoyance.

SIL ... : Silicone oil with a very long life span (> 1 year) and negligible smell.

Please get in contact with us should you have any questions. We are glad to advise you and can help you to choose a heat transfer liquid suitable for your application
Thermo Haake heat transfer liquids are supplied with an EC Safety Data Sheet.

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

Unsuitable bath liquids are liquids which e.g.

- are very highly viscous (much higher than 30 mPa·s at the respective working temperature)
- have corrosive characteristics or
- tend to cracking

! Important ! **It is absolutely mandatory that the overtemperature cut-off point is set lower than the fire point for the heat transfer liquid selected (see chapter 15.1).**

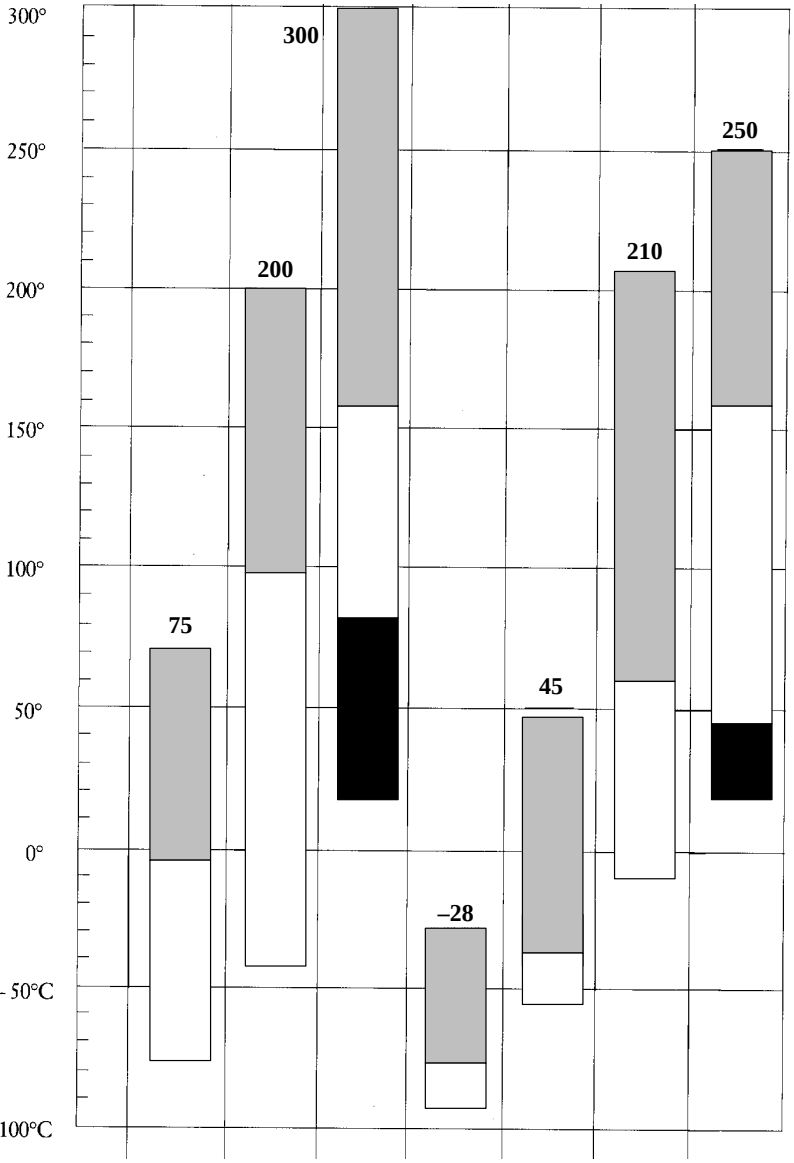
! Important ! **The highest working temperature as defined by the EN 61010 (IEC 1010) must be limited to 25°C below the fire point of the bath liquid.**

! Important ! **Please ensure when selecting the heat transfer liquid that no toxic gases can be generated and bear in mind that inflammable gases can build up over the liquid during usage.**

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Range of Application		Sil 100	Sil 180	Sil 300	Synth 20 *)	Synth 60	Synth 200	Synth 260
Fire point	°C	>100	>225	>325	no sp.	70	>235	275
Flash point	°C	57	170	300	–3	59	227	260
Viscosity	at 20°C [mPas]	3	11	200	<1	2	100	140
Density	at 20°C [kg/dm^3]	0,89	0,93	1,08	0,77	0,76	0,86	1,03
Specific heat capacity	[kJ/kg*K]	1,67	1,51	1,56	no sp.	2,10	1,96	2,00

Temperature range



Colour	trans-parent, colour-less	trans-parent, colour-less	trans-parent, colour-less	trans-parent, colour-less	trans-parent, colour-less	trans-parent, light–brown	trans-parent, yellow
Reacts with	Silicone	Silicone	Silicone	Light–metals Zinc	Rubber Silicone	Copper Light-metals Bronze	Copper Light-metals Bronze
Order-No. 10 l Container	999-0202	999-0204	999-0206	999-0208	999-0210	999-0226	999-0214
5 l Container	999-0201	999-0203	999-0205	999-0207	999-0209	999-0225	999-0213

*) Cannot be exported; use methylcyclohexan as bath liquid.

EC-Safety Data Sheets will be delivered together with each container of liquid.

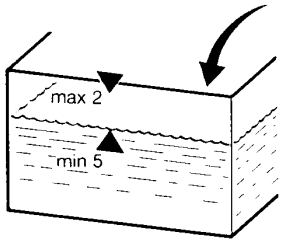
no sp. = no specifications

Heating-up range

operating temperature range

Working temperature range

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11.2 Filling with heat transfer liquid

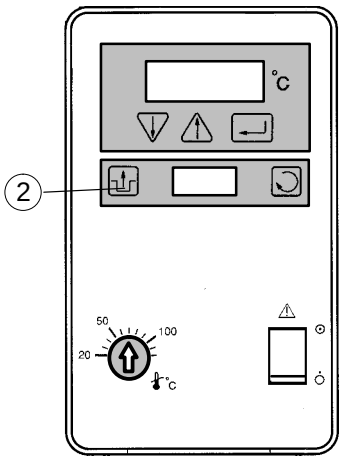
Filling level of the interior bath:
max. up to 2.0 cm below the cover plate,
min. up to 5.0 cm below the cover plate.

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:

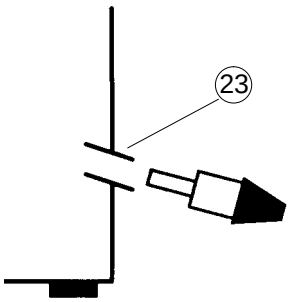
1 Replenish the liquid,

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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12. 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.

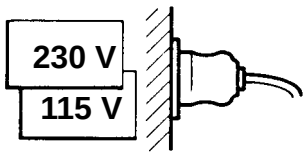
3 Pull out plug (pin) in one quick motion. The liquid will start to run out.

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!

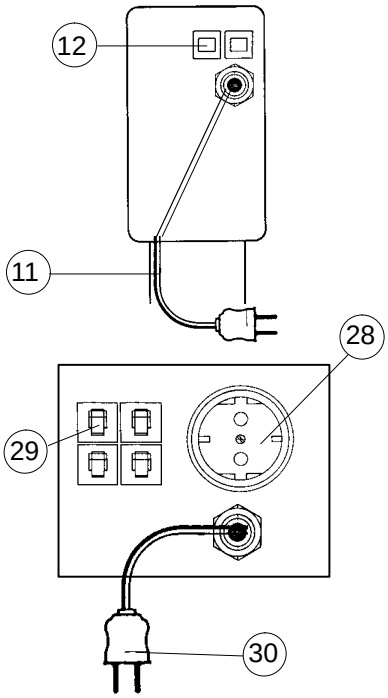
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13. Connecting Up



13.1 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.

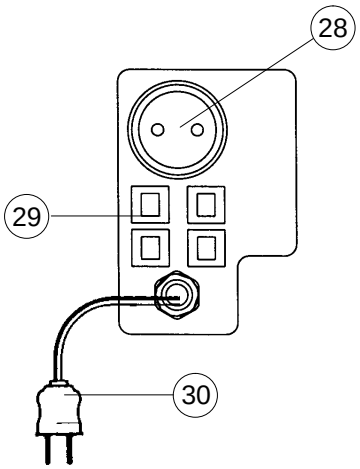


13.1.1 Only for refrigerated baths K15, K10, K20, V15 and V26

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!**



13.2 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 10.5).

13.3 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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13.4 Fuses on the unit

All units are equipped with automatic thermally-triggered fuses.

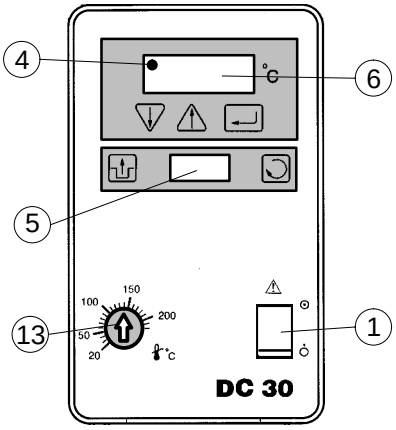
If the fuse **(12/29)** has triggered…

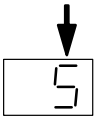
- the fuse does not have to be exchanged – resetting suffices;
- a white marking is visible;
- a certain cooling down time should be allowed (approx. 5 min) before the (dip) switch can be pressed again.

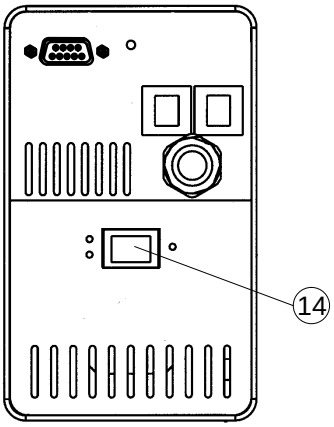
! Do not use tools; do not use force. Both destroy the fuse.

! 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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14. Operating

14.1 Switching on

! Ensure that no forbidden working temperature has been selected, e.g.
max. 150°C for refrigerated baths K15, K20, V15, V26
max. 120°C for integral baths P5, P14, P21
max. 60°C for polyacrylic baths W5P, W12P, W18P

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 14.4).

⇒ 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.

14.2 Heating control lamp

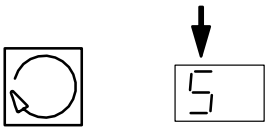
The display **4** lights up when the heating is switched on (set temperature is higher than the actual temperature).

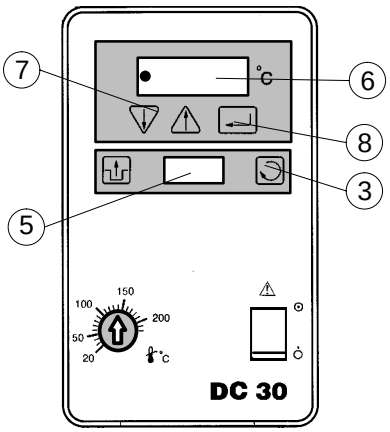
⇒ display **4** lights up constantly during the heating up phase,

⇒ 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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14.3 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.

14.4 Adjusting the fixed temperatures F1 to F3 (facultative)

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



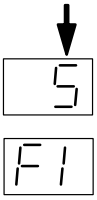
1 Press the menu button **3** :

⇒ 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** .

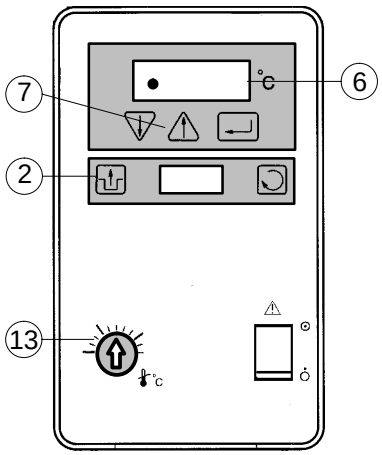
⇒ The selected value is stored as fixed temperature F1, F2 or F3 and activated as currently valid set value.



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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15. Excess Temperature Protection

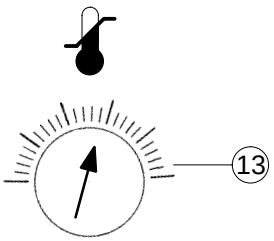
If one of the safety devices is triggered:

- The fault cause is shown in the display **6** (see also chapter 17.).
- An acoustic signal is sounded.
- 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**.

15.1 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.

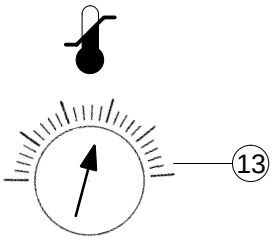
The cut-off temperature is adjusted with the excess temperature setting dial **13**.

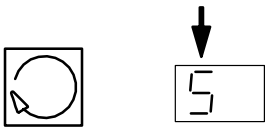
☞ **Proper protection can only be guaranteed if the cut-off point has been correctly set.**

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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15.1.1 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:

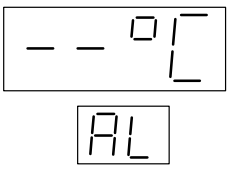
If for instance a bath liquid has a fire point of 60°C the unit should cut off after reaching 35°C at the latest:

1. First set the desired set value "35" 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 (acoustic signal, 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).

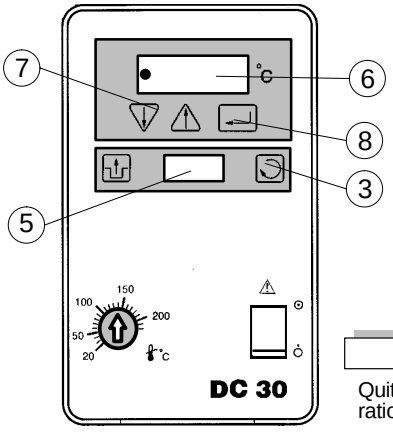
   ⇒ The unit can now be used for temperatures below 35°C. As soon as 35°C is reached, it is securely switched off.

15.1.2 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:

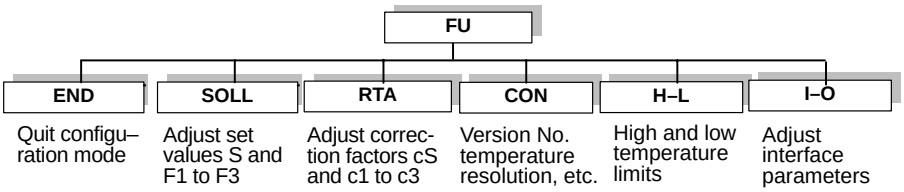


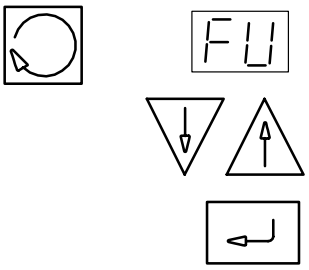
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16. Configuration

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.

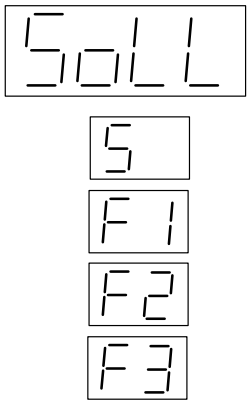
3 Move around through the submenus with the menu button **3** (see chapter "Menu Tree").

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.

16.1 Set value S and fixed temperatures F1 to F3



The adjustment has already been made in chap. 14.3 and 14.4. 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 14.3).

A correcting factor **c** should be associated with each value: S ⇔ cS, F1 ⇔ c1 ... (see chapter 16.2).

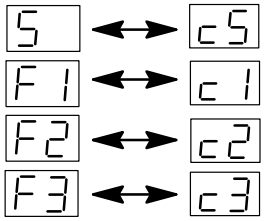
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16.2 Adjusting the correction factors (RTA system)

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).

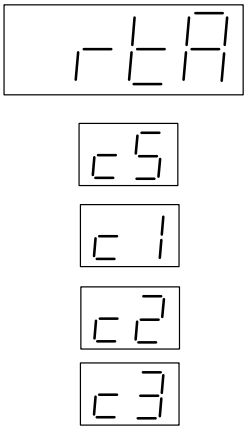


This is how the correcting factor **c** (RTA system) is entered into the circulator. It remains stored in the circulator and is automatically assigned to the corresponding temperature set point.

The same as for the set points in chap. 14.4, four correcting factors can be stored: **cS** , **c1** , **c2** and **c3** , whereby, for example, **c1** is the correcting value associated with **F1** .

The resolution of the correcting 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.

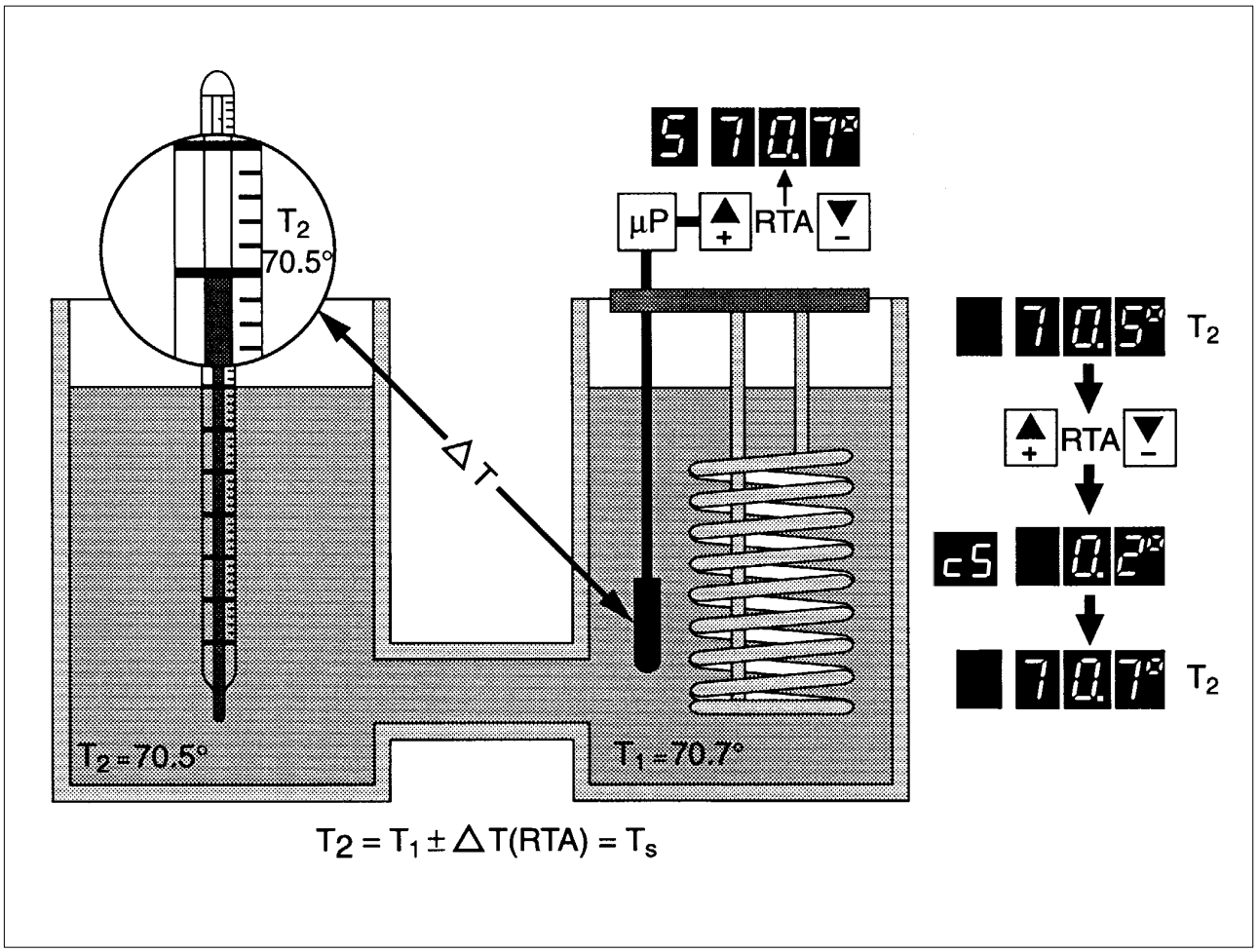
☞ **The new value is not saved until the Enter button has been pressed. The circulator continues to use the old value.**
***Warning:* The correction factor "c" may have to be determined again if the set temperature is altered!**

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 is (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

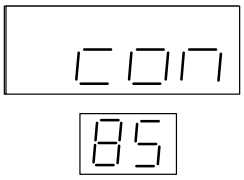
⇒ Deviation, calculated according to $\Delta T = T_{set} - T_{act}$

ΔT = 0.2°C

⇒ Entry of the corrected value ΔT as correction factor “ c5 ” c5 = +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.

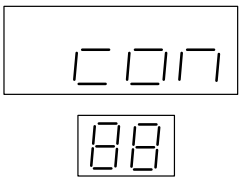
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16.3 Displaying the version of the operating software

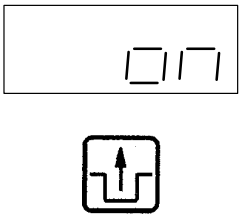
It is often necessary to know the version number of the software for service and other manufacturer inquiries.

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** .

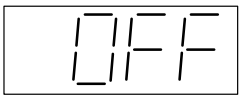


16.4 Secured mode

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.



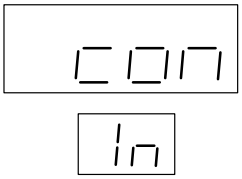
Secured mode: ON
The temperature control module switches to the secured mode in case of a power failure or if it is switched on via the mains switch. Display **6** flashes over all segments 8888 . Switching on again is only possible after the reset button **2** has been pressed. This is due to safety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

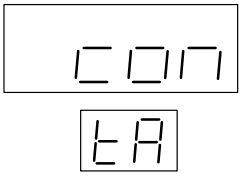
! Please consider any possible resulting risks!

16.5 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.

16.6 Resolution of the temperature display



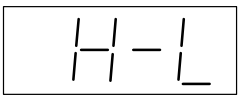
1. Change to **con** in the menu FU and press button **8** to confirm. Switch to **tA** with button **3** .
2. Choose the resolution (0.1 or 0.01 °C) with the buttons **7** and then press the button **8** to confirm (0.01°C resolution is available only in the display range from –9.5 to +99.5 °C).

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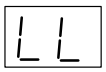
16.7 Adjusting temperature limit values

The setting range of the operating temperature of the circulator can be limited if the application or the fire point of the selected heat transfer liquid 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 keys **7** (the lowest possible temperature is –50°C).

4 Press the enter button **8** .

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

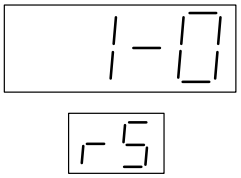
To set the high limit value HL, proceed analogously as described for LL.
HL (High Limit): The highest possible temperature is 200°C.

! Each DC/DL is set to a highest temperature ”H-L” of 150°C in the factory.
The value must not be altered if the compressor cooled units K15, K20 or V are used!
Higher temperatures can damage the compressor cooling circuit and the bath insulation.

! When using the baths P5, P14, P21 it is recommended to adjust the ”H-L” value to max. 120°C and for the baths W5P, W12P, W18P to max. 60°C.

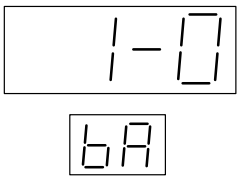
☞ **The new value is not saved until the Enter key has been pressed. The circulator continues to use the old value.**

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16.8 Setting the interface parameters

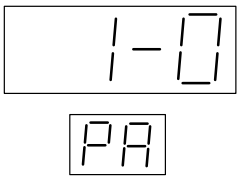
1 Change to **I-O** in the menu FU and press button **8** to confirm. Press button **3** to switch to **rS** . The interface type RS232 appears in the upper display **6** .



16.9 Baud rate

1 Change to **I-O** in the menu FU and press button **8** to confirm. Press button **3** to switch to **bA** .

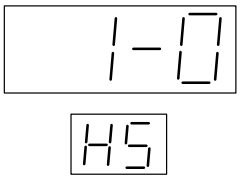
2 Set the desired baud rate with the arrow keys **7** (600 to 9600 baud, 4800 baud recommended) and press button **8** to confirm.



16.10 Parity

1 Change to **I-O** in the menu FU and press button **8** to confirm. Press button **3** to switch to **PA** .

2 Set the desired parity (OFF, odd or E) with the arrow keys **7** and press button **8** to confirm.



16.11 Handshake

1 Change to **I-O** in the menu FU and press button **8** to confirm. Press button **3** to switch to **HS**.

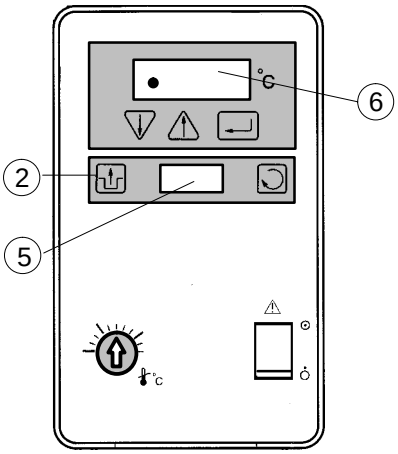
2 Set the desired handshake parameter with the arrow keys **7** (on = with RTS/CTS, OFF = without RTS/CTS) and press button **8** to confirm.

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



3 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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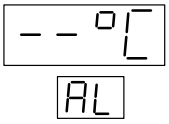
17. Fault Displays

An acoustic signal is sounded and ” XXXX ” is shown on display **6**. ” ” is shown on display **5**.
The heating element and pump are completely switched off.

The following faults are possible:

- - OT	=	Excess temperature
- - - LL	=	Low liquid level
- - PU	=	Pump or motor overloading
- - - E	=	Sensor breakage or short circuit
- - - E	=	External fault RS232C
- - - -	=	Undefined fault

17.1 Excess temperature



The low liquid level protection can be triggered if:

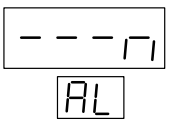
- Excess temperature has been set too closely to the desired working temperature

  ⇒ increase value slightly according to specifications made in chapter 15.1.1.

- the control function is defective

  ⇒ Return unit for servicing.

17.2 Low liquid level



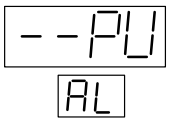
The low liquid level protection can be triggered if:

- there is not enough liquid in the bath

  ⇒ check for leaks, top up if necessary,

  ⇒ fluid has evaporated, top up if necessary.

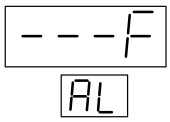
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17.3 Pump or motor overloading

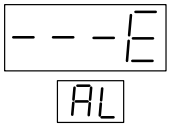
The motor or pump is blocked:

⇒ 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!



17.4 Sensor breakage or short circuit

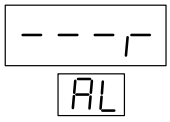
The sensor must be exchanged by qualified service personnel. Please return unit for repairs.



17.5 External fault RS232C

The circulator has been switched to fault status via the interface.

⇒ Check the external system.

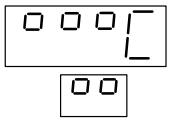


17.6 Undefined fault

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.





17.7 Fault eliminated?

After the fault has been eliminated, the cause of the fault is shown on the display **6** (e.g. 000 E). 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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18. Testing the Safety Features

The safety features for excess temperature protection and low liquid level 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.

18.1 Excess temperature protection

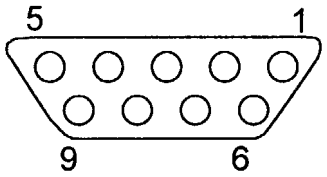
Set a cut-off temperature (see chapter LEERER MERKER) that is lower than the desired set temperature. Switch on the circulator and check if the circulator really does switch itself off at the set cut-off temperature
If not follow the specifications detailed in chapter 15.1.1.

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

18.2 Low liquid level protection

Drain the heat transfer liquid **slowly** during operation (use a drainage tap if necessary) and check if the unit really does switch itself off.
If not the unit must be checked over by qualified service personnel.

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19. RS232C Interface

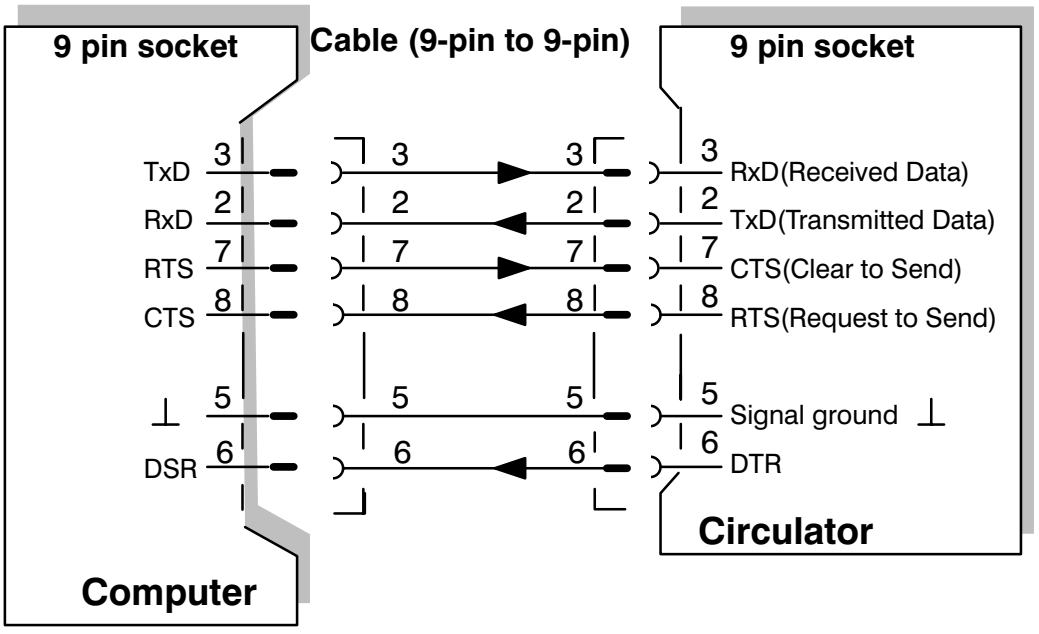
The following circulator functions can be controlled by a computer via the interfaces:

- Setting of the set values ”S, F1–F3” and correction factors ”cS, c1–c3” is possible;
- the actual temperature can be read off;
- the circulator can be reset, started or stopped;
- any fault messages can also be displayed.

19.1 Connecting to a computer

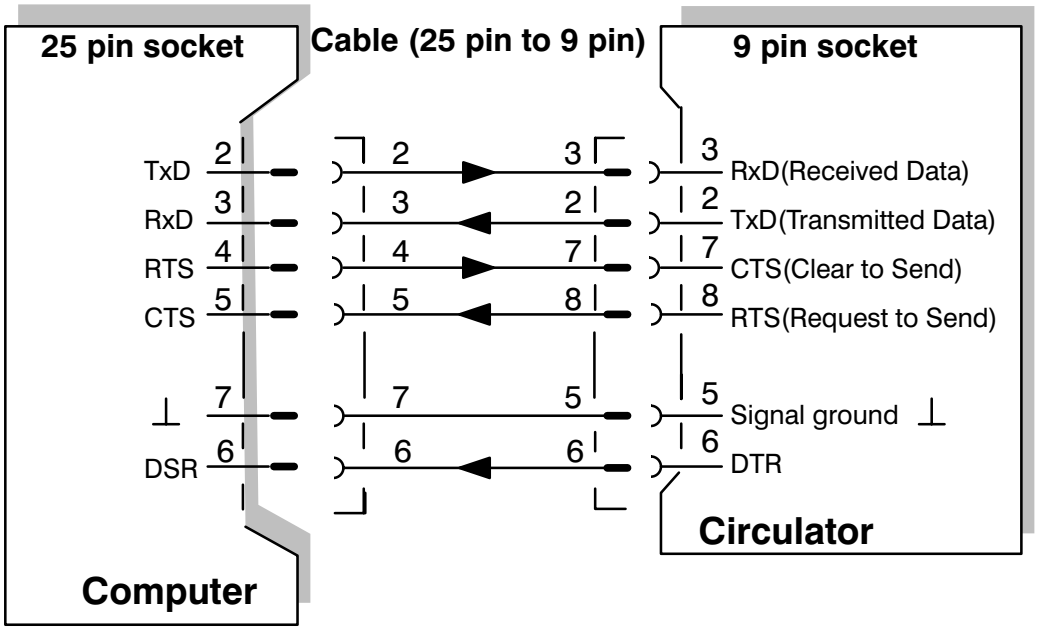
19.1.1 PC with an RS232C interface

The pin assignment required when connecting the circulator to a computer via a **9-pin** socket is as follows:



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The pin assignment required when connecting the circulator to a computer via a **25-pin** socket is as follows:



19.2 Interface parameter

Interface parameters can be set via the circulator as follows:

bA	≙	Baud rate	(600, 1200, 2400, 4800, 9600)
PA	≙	Parity	(OFF= without parity odd = odd E = even)
HS	≙	Handshake	(OFF= without RTS/CTS on = with RTS/CTS)

All these transfer parameters **cannot** be altered via the interface.

Default is 8 (Data) bits.

Maximum baud rate

Recommendation for the maximum baudrate: **4800 bauds**

The communication between the computer and the circulator should not take place at a baud rate higher than 4800. Occasional transfer failures ca occur at a baud rate of 9600.

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19.3 Requirements made of external units

Only units which have been tested according to EN 60950 (=IEC 950) should be connected to the interface of the circulator.

19.4 Setting the desired set value S, F1–F3

If the desired value is set via the computer it is stored permanently, even if the mains supply current is switched off or the RS232C connection is interrupted.

19.5 Correction value cS, c1–c3

If the desired value is set via the computer it is stored permanently, even if the mains supply current is switched off or the RS232C connection is interrupted.

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19.6 Commands

cr : carriage return
<value> : any value with positive or negative sign, comma can be omitted with whole numbers (e.g. 12 = 12.0 = 12.00 = 12.000)

DC30/DL30 command	Alternative command	Answer	
'W ST',cr	'ST',cr	$<cr><lf>	Stop control
'W GO',cr	'GO',cr	$<cr><lf>	Start control
'R V',cr	'V',cr	DC30:1.00-04/97$<cr><lf>	VERSION DC30/DL30
'R VE',cr	'VE',cr	DC30:1.00-04/97$<cr><lf>	
'W RS',cr	'RS',cr	$<cr><lf>	RESET-Command
'R B',cr	'B',cr	BS00101000000$<cr><lf>	read operating status
'R BS',cr	'BS',cr	BS00101000000$<cr><lf>	
'R S',cr	'S',cr	S0+0023.50$<cr><lf>	read active set value (set value S selected)
'R SW',cr	'SW',cr	S1–0012.50$<cr><lf>	read active set value (fixed temp.1 select.)
		S2+0023.50$<cr><lf>	read active set value (fixed temp.2 select.)
		S3–0012.50$<cr><lf>	read active set value (fixed temp.3 select.)
'W SW<Wert>',cr		$<cr><lf>	modify active set value (not stored !)
'R I',cr	'I',cr	T1+0023.50$<cr><lf>	read internal sensor
'R T1',cr	'T1',cr	T1+0023.50$<cr><lf>	
'W AL',cr	'AL',cr	$<cr><lf>	Alarm triggering
'W ER',cr	'ER',cr	$<cr><lf>	unlocking executed
'W EG',cr	'EG',cr	$<cr><lf>	
'W ER',cr	'ER',cr	!<cr><lf>	Alarm source or just unlocked
'W EG',cr	'EG',cr	!<cr><lf>	
'W NS 1',cr	NS 1,cr	$<cr><lf>	1 decimal place at actual temp. display
'W NS 2',cr	NS 2,cr	$<cr><lf>	2 decimal places at actual temp. display
'W L',cr	'L',cr	$<cr><lf>	blocking the ENTER key
'W U',cr	'U',cr	$<cr><lf>	releasing the ENTER key
'R HL',cr	'HL',cr	HL+0150.00$<cr><lf>	read high limit
'R LL',cr	'LL',cr	LL– 0030.00$<cr><lf>	read low limit
'R IS',cr	'IS',cr	IS+00.30$<cr><lf>	read RTA internal cS for set value S
'R I1',cr	'I1',cr	I1+00.30$<cr><lf>	read RTA internal c1 for fixed temp.1
'R I2',cr	'I2',cr	I2+00.30$<cr><lf>	read RTA internal c2 for fixed temp.2
'R I3',cr	'I3',cr	I3+00.30$<cr><lf>	read RTA internal c3 for fixed temp.3

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DC30/DL30 command	Alternative command	Answer	
'W IS <value>',cr		$<cr><lf>	change RTA internal cS for set value S
'W I1 <value>',cr		$<cr><lf>	change RTA internal c1 for fixed temp.1
'W I2 <value>',cr		$<cr><lf>	change RTA internal c2 for fixed temp.2
'W I3 <value>',cr		$<cr><lf>	change RTA internal c3 for fixed temp.3
'R S0',cr	'S0',cr	S0+0020.30$<cr><lf>	read set value S
'R S1',cr	'S1',cr	S1+0070.00$<cr><lf>	read fixed temperature 1
'R S2',cr	'S2',cr	S2–0010.00$<cr><lf>	read fixed temperature 2
'R S3',cr	'S3',cr	S3+0040.00$<cr><lf>	read fixed temperature 3
'W S0 <value>',cr		$<cr><lf>	change set value S with storing
'W S1 <value>',cr		$<cr><lf>	change fixed temperature 1 with storing
'W S2 <value>',cr		$<cr><lf>	change fixed temperature 2 with storing
'W S3 <value>',cr		$<cr><lf>	change fixed temperature 3 with storing
'R GK',cr	GK,cr	GK00$<cr><lf>	read unit type
			00: DC30/DL30
'W ZA 0',cr		$<cr><lf>	switch secured mode ON
'W ZA 1',cr		$<cr><lf>	switch secured mode OFF
'R ZA',cr	'ZA',cr	ZA0$<cr><lf>	read status of secured mode (ON)
'R ZA',cr	'ZA',cr	ZA1$<cr><lf>	read status of secured mode (OFF)

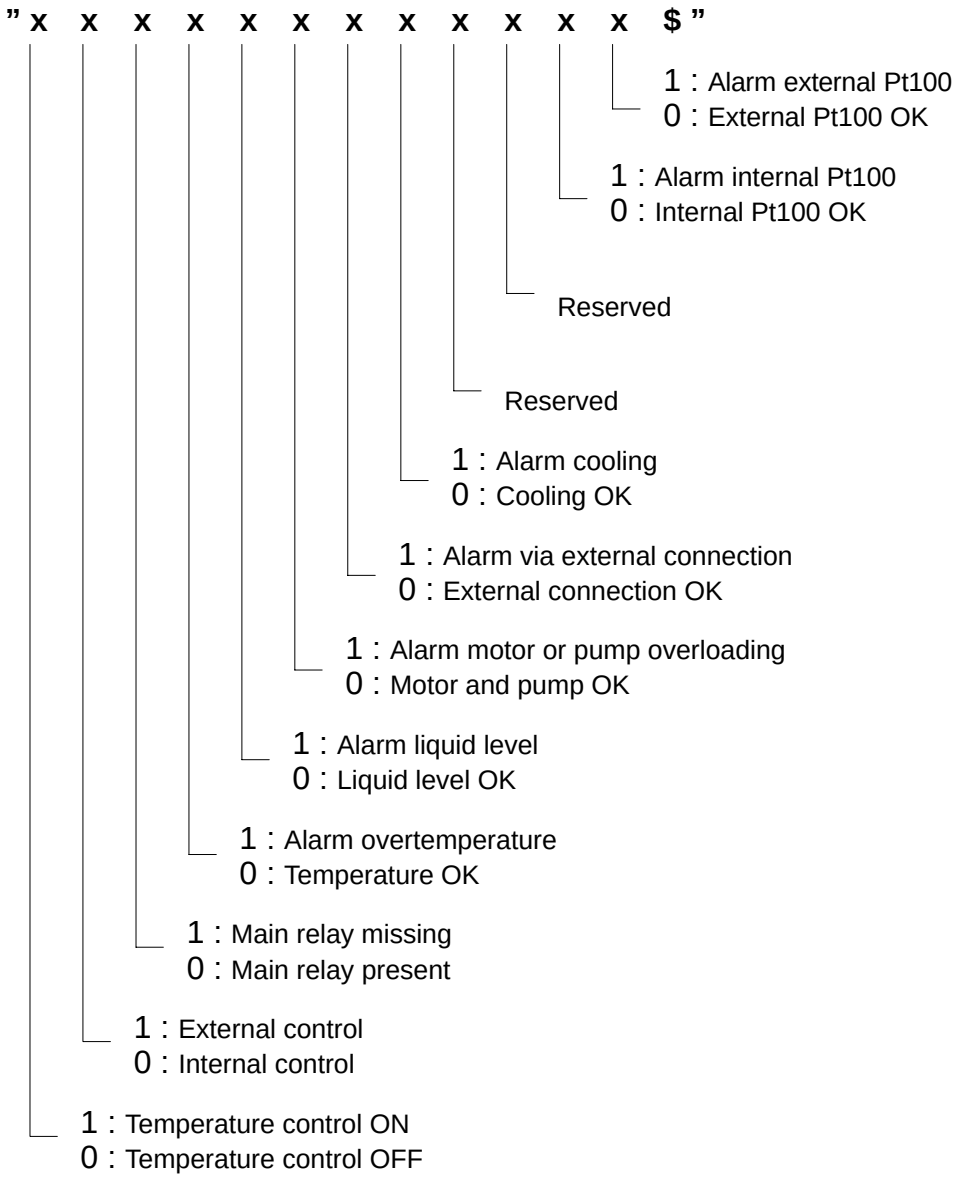
The circulator responds a "!" on incorrect input.

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19.7 Operating status / Error message

R_BS<cr> Call up operating status:

After entering one of these commands, the following twelve ”state flags” are shown:



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19.8 Controlling via a BASIC program

The range of commands stored in the unit can be activated by this simple program:

```
REM     command procedure
REM     enter 1st command
REM     2nd command is passed on to the unit
CLOSE
OPEN   ”COM2:4800,N,8,1,CS0,DS0,CD0” AS #1

loop:
        b$ = ” ”
        INPUT ”command: ”;b$
        if b$ = ”X” then markend
        if b$ = ”x” then markend
repeat command:
        PRINT #1,b$
        PRINT
        PRINT ”return message”
        PRINT ”– – – – – – – –”

GOSUB enter

GOTO loop

markend:
END

enter:
        A$ = ” ”
read loop:
        X = ASC (INPUT$(1,#1))
        IF X = 10 THEN read end
        A$ = A$ + CHR$(X)
        GOTO read loop
read end:
        print a$
        RETURN
```

Note:
Only capital letters are accepted for commands!

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20. Cooling

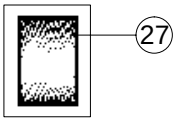
Only for unit combinations with refrigerated bath

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.

☞ **Continuous cooling at set temperatures above approx. 100°C should be avoided!**

This would result an excessively high temperature in the cooling circuit which would then result in the excess temperature protection being triggered and the compressor being switched off. Once the temperature in the compressor circuit were to get back to normal, the unit would then switch back on again.
This situation must be avoided as it results in a cyclical operation of the cooling compressor which in turn reduces the life-span of the unit.



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 150°C) is however permissible.

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21. 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.

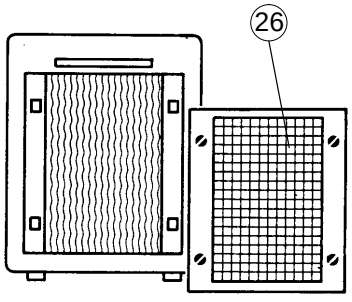
☞ **Do not use scouring powder!**

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!**

21.1 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).

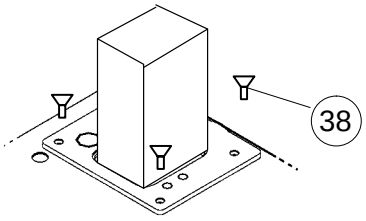
21.2 Discarding the unit:

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.

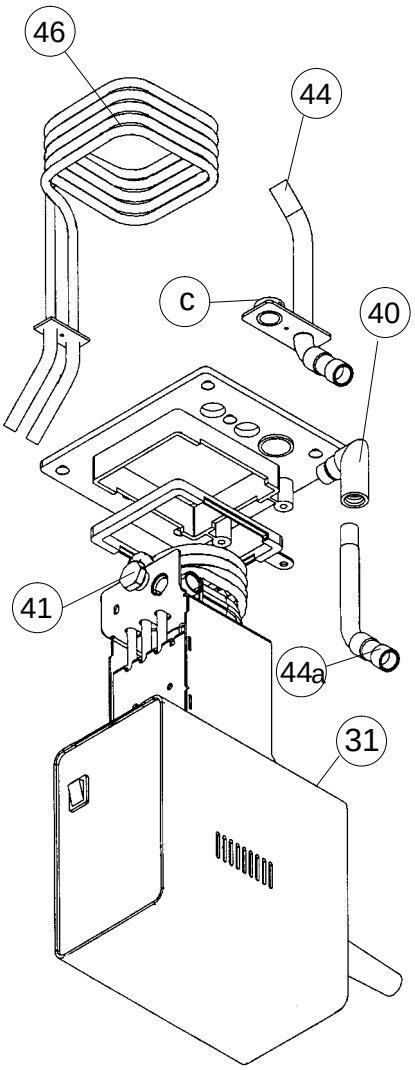
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22. Disassembly for Servicing



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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23. Technical specifications

23.1 Temperature control modules DC30/DL30 to DIN 58966

		DC30	DL30
Operating temperature *)	°C	–50..200	–50..200
Temperature accuracy	+/– K	0.01	0.01
Heater capacity 230V / 115V	W	2000 / 1200	2000 / 1200
Pump pressure max.	mbar	300	300
Circulation capacity (open)	l/min	17	17
Max. flow rate during circulation using 12 mm ø hoses	l/min	12.5	12.5
Immersion depth from..to	mm	85..140	85..190
Voltage	V	230 V±10% or 115 ±10%	230 V±10% or 115 ±10%
Frequency 230V / 115V	Hz	50..60 / 60	50..60 / 60
Total wattage consumption 230V / 115V	VA	2050 / 1250	2050 / 1250
Safety elements according to category		FL	FL
Excess temp. protection		variabel	variabel
Low liquid level protection		fixed	fixed
Motor overload protection		yes	yes
Alarm signalling		opt. + acoust.	opt. + acoust.
FIS-system		yes	yes
Temperature setting		digital	digital
Setting limitation		yes	yes
Temperature display		LED green	LED green
RTA-system		yes	yes
Control type		PID	PID
Control sensor		Pt 100	Pt 100
RS 232 C		yes	yes

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

23.2 Fuse values DC30 / DL30

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

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23.3 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)				

23.4 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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23.5 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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