The World of Thermoregulation

huber

Ministat 125, 230, 240 - efficient thermal regulation

Operating Instructions

ministat 125
ministat 230
ministat 240

Peter Huber Kältemaschinenbau GmbH
Werner-von-Siemens-Strasse 1 · D-77656 Offenburg / Germany
Tel. +49-781-96030 · Fax +49-781-57211
E-Mail: info@huber-online.com · Internet: www.huber-online.com

Version 2.1/05

huber
Peter Huber
Kältemaschinenbau
GmbH

EC Declaration of Conformity

We declare that the design and model of the thermostat described in the following and the version put into circulation by complies with all the relevant and applicable safety and health requirements laid down in the corresponding EC directive.
If the thermostat is modified without the modification being agreed upon by the manufacturer, this declaration will become void.

Model	Comp. Control Thermostat Ministat 125	Order no. 740.000X
	Comp. Control Thermostat Ministat 230	Order no. 741.000X
Identification	Comp. Control Thermostat Ministat 240	Order no. 742.000X
	Series 03/04	

EC Directives

EC Low Voltage Directive 73/23/EEC
93/68/EEC amendment
EC Electromagnetic Compatibility Directive 89/336/EEC
92/31/EEC, 93/68/EEC,98/13/EEC amendment

Harmonized Standards

EN 61010-1
EN 61010-2-010
EN 61326

National Standards and Technical Specifications

DIN 12876-1
DIN 12876-2
DIN 12876-3

Manufacturer:

Peter Huber Kältemaschinenbau GmbH
Werner-von-Siemens-Straße 1, D-77656 Offenburg

01.11.2003, CEO Daniel Huber

Symbols

Safety
Warning! A potentially hazardous situation. Identifies hazards sufficient to cause death or severe injuries if the safety instructions are disregarded.
Caution! A potentially hazardous situation. Identifies hazards sufficient to cause light injuries if the safety instructions are disregarded.

Definitions from our Huber Glossary and fundamental technical knowledge.

Stepwise instructions for operating the device and the controller.

Entries at the Polystat cc controller.

Device messages.

Practice.

Service
This is where you get help: the Huber Hotline.

EXTRA
Additional information.

Preface

Dear Customer,

Congratulations! Units and devices manufactured by Peter Huber Kältemaschinenbau GmbH are always a good choice. Thank you very much for your trust.
To meet your demands as a user, we have revolutionized the user interface of our thermostats and implemented a uniform method of operating almost the entire HUBER product range. Many devices, ranging from small immersion thermostats to large Unichillers are operated via a single controller generation: Polystat Control.
The controller for Ministats 125, 230 and 240 **Ministat Control** was created in the course of this further development. It offers all the functions and convenience of the Polystat Control and can be operated just as easily, which brings us back to the concept of uniform operation.

On the type label on the rear of your device you will find important information such as:

ministat 240	-40°... +200°C	SNr.: 55655/03
[Device name]	[Temp.range]	[Serial number]

Free choice in operation:
All the Ministats can be operated with three different controller versions:
Ministat Control cc1, the simple one
Ministat Control cc2, the convenient one
Ministat Control cc3, the one with dialog capabilities

You controller version is identified by the label above the display.
For details on your type of controller, please refer to Chapter 2.2

Please consider only those instructions in the present documentation that apply to your device type and controller version.

Content

1. Safety

1.1. Intended Use

General Safety Instructions

The thermostat is designed for industrial applications.
The thermostat is used for direct and indirect thermoregulation, i.e. for heating or cooling external substances through suitable thermal fluids.
It must be operated strictly in compliance with the operating instructions.
The thermostat must not be modified by the plant operator or any operating personnel.
The thermostat must not be used for purposes other than thermoregulation in compliance with the operating instructions.Unintended use or use not in compliance with the operating instructions may lead to severe personal injury or property damage.

Your device has been designed and constructed according to the state of the art and in compliance with the generally accepted safety rules. Nonetheless, your device may constitute an imminent or unexpected hazard. For this reason, your device has been equipped with safety devices. Deactivating these safety devices bears high risks and invalidates the warranty.

Use the device only if it is in good order and condition.
Shut down the device immediately in the case of malfunctions or failures.
Only qualified personnel is permitted to perform repairs.
Do not bypass, bridge, dismount or deactivate any safety devices.

The manufacturer assumes no liability for damage due to technical modifications, improper handling or use of the device disregarding the operating instructions.
The manufacturer assumes no liability for damage due to technical modifications, improper handling or use of the device disregarding the operating instructions.

Warning! Risk of injuries!

While operating at high temperatures, the bath lid and the housing could become very hot.
Only touch the housing and the lid by the grips otherwise there is a *risk of burns*!

Never lift the bath's lid during operation at high temperature:
- Risk of *scald /burn* through thermal fluid overflow.
Depending on the type of thermal fluid used:
- Risk of *caustic vapours* causing injuries to the respiratory tract and/or skin!
(For further information about the chosen thermal fluid please read the material safety data sheet delivered with it.)

This warning is only applicable for units with this warning sign.

Important: transport damage!
When unpacking the device, inspect it for transport damage.
Please revert to the haulage contractor or shipping agent for settlement of claims.
Commission a damaged device only after the damage has been repaired or you have ascertained the full effects of damage and the insurance agent/haulage contractor/shipping agent has given their permission.

1. Safety

1.2. Intended Use

General Safety Instructions

Duties of the Plant Operator:

- The operating instructions must be kept readily available in the immediate vicinity of the thermostat.
- Only sufficiently qualified operating personnel are permitted to use the thermostat.
- The operating personnel must be trained in handling and using the thermostat.
- Verify that operating personnel have read and understood the operating instructions.
- Precisely define the fields of responsibility of the operating personnel.
- Provide protective clothing for the operating personnel.

Requirements to be Met by the Operating Personnel

- Only personnel assigned and trained by the plant operator may handle and operate the thermostat.
- The minimum age for operating personnel is 16 years. Within the workspace, the device operator is responsible for third parties.
- The device operator must be sufficiently qualified

Duties of the Operatorating Personnel:

- The operating personnel must read the operating instructions thoroughly before handling or using the thermostat.
- The operating personnel must heed all the safety instructions.
- The operating personnel must wear protective clothing when handling or using the thermostat.

Workspace

The workspace is defined to be at the control panel in front of the thermostat. The workspace is further defined by the peripheral equipment connected by the customer. The customer is responsible for taking suitable safety measures.

Safety Devices

- Over-temperature protection device
- Low liquid level protection
- Mains failure automatic
- Alarm functions

Emergency Plan – Switch off the Power Supply!

Hazardous emission of fluid/vapor from the thermostat or connected pipes/ hoses (very hot, very cold, hazardous chemical compositions) and or fire/ explosion/implosion:

- Strictly heed the safety instructions of the plant operator relating to the risk of injury and danger to life as well as to the limitation of damage.
- Observe the instructions included in the safety data sheet of the respective thermal fluid!

2

Device Description

2. Device Description

2.1. Structure

Compatible Control Thermostat ministat 125
Compatible Control Thermostat ministat 230
Compatible Control Thermostat ministat 240

Working temperature range of the ministat 125: -25...150°C.
Working temperature range of the ministat 230: -33...200°C.
Working temperature range of the ministat 240: -40...200°C.

1 Detachable, exchangeable Ministat Control

2 Bath lid

3 Draining connection

View of RH front side

ministat 125

View of rear side

		NAMUR designation
6	Return	
7*	RS232/485	SERIAL
8*	ECS (External control signal)	STANDBY
9*	AIF (Analog Interface)	REG + E-PROG
10*	POKO (Potenzialfreier Kontakt)	ALARM
11	Flow	

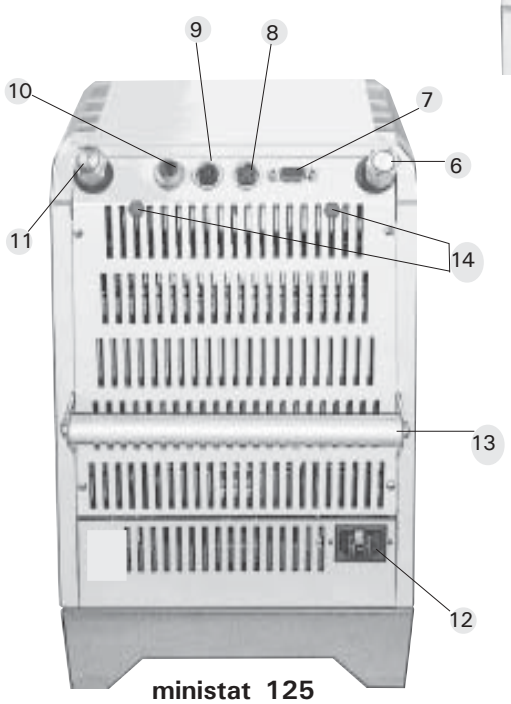
12 Power supply connection

13 Handle

14 Attachment screw (for the Ministat Control)

*Only available with an optionally fitted ComBox or a CC3-Controller

ministat 230, 240



ministat 125

Please note:

The **return/flow** of the ministate 230 and 240 are in **opposite position** (compared to the ministat 125)

The flow direction of the thermofluid is emborssed on the casing.

2. Device Description

2.2. Controller

Ministat Control cc1
Ministat Control cc2
Ministat Control cc3

Display, control panel

R1 Digital status display

R2 Prompt for a temperature set-point, input confirmation (data transfer)

R3 Call of the user menu for convenient handling

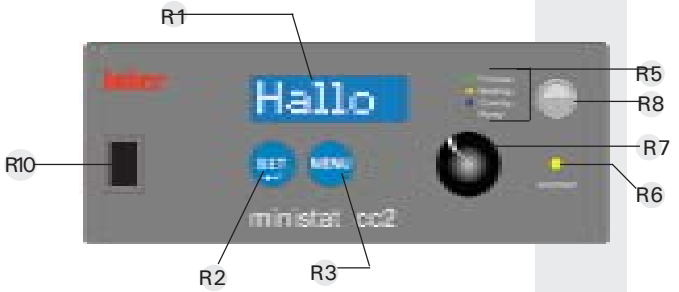
R4 On/Off key to start/stop thermoregulation

R5 Activity indicator LEDs

R6 over-temperature protection device

R7 Encoder/ rotate:
Entry of Program numbers, step numbers, parameters (e.g. temperature set-point)

Encoder/ press:
Input confirmation (data transfer)



Connec-tions

R8 Pt100 sensor socket

R9 RS 232/485 interface

R10 Power switch

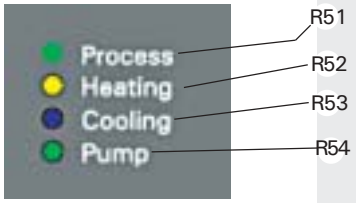
Activity indicator LEDs

R51 Process temperature control active (green LED), only with cc2 and cc3:
Temperature is measured by a process sensor located at the point of control , e.g. in a reactor.

R52 Heating active (yellow LED)

R53 Cooling /compressor active (blue LED)

R54 Pump active (greene LED):
Thermal fluid is beeing pumped through the connected application, e.g. around the reactor jacket.



3

Commissioning

3. Commissioning

3.1. Safety Instructions and Principles

Preparatory Measures for Commissioning

Plan the thermoregulation target and procedure.
Determine the device configuration and system structure.
Select an appropriate thermal fluid.
Selection criteria for thermal fluids: Temperature range of the thermostat, application restrictions building safety regulations, your projected working temperature, viscosity, flash point.Position the thermostat and external devices on a stable and even surface. Ensure that the surface can safely hold the weight of the thermostat and

Positioning

Caution! Potential risk of injury and material damage:
Keep the device upright during transport.
Place the device in an upright and stable position and make sure that it cannot tilt over.
Keep the vicinity of the device clean: Prevent slip and tilting hazards.
Lock the wheels of floor-mounted devices once you have positioned them as desired!

Useful note: Place appropriately large collecting trays under the thermostat and the application.

Location

The operation on the unit is only allowed in a normal surrounding according to DIN EN 61010-1:2001:

- Only indoor use.
- To be used in a hight up to 2000m.
- Place the device on a firm, level, non flammable and non-slip surface.
- Place the device at a distance to walls and the ceiling that permits sufficient air circulation (heat dissipation, supply of fresh air for the thermostat and the workspace). A water-cooled unit requires a minimum distance of10 cm and an air-cooled unit needs a minimum of 20 cm.
- Ambient temperature min. 5°C to max. 32 °C.
- Maximum relative humidity 80% for temperatures to 32°C.
- Keep power and waterlines as short as possible.
- The device should not be placed such that the access to the isolator is obstructed.
- Line voltage changes should not exceed ±10% of the mains voltage.
- Transient overvoltages, as they typically occur in the supply network.
- applicable degree of pollution: 2.
- Overvoltage class II.
- Safety class system: IP20

The workspace of the thermostat must comply with local workplace safety regulations (ArbStättV 20. März 1975 zuletzt geändert BGBl. I 1996)

Please Note:
All the safety instructions are vital and must be considered during the operation of the unit in compliance with the operating instructions.

3. Commissioning

3.1. Principles, Media and Safety Instructions

The operating instructions include additional safety instructions. These are identified through a triangle with an exclamation mark. Thoroughly read and heed the instructions Non-observance may involve considerable consequences such as device damage, physical damage or personal injury with fatal consequences.

Workspace
The workspace is defined to be at the control panel in front of the thermostat. The workspace is further defined by the peripheral equipment connected by the customer. The customer is responsible for taking suitable safety measures.

Safety Devices

^ Overtemperature protection
^ Low liquid level protection
^ Mains failure automatic
^ Alarm functions

Hazardous emission of fluid/vapor from the thermostat or connected pipes/ hoses (very hot, very cold, hazardous chemical compositions) and or fire/ explosion/implosion:
Strictly heed the safety instructions of the plant operator relating to the risk of injury and danger to life as well as to the limitation of damage.
Observe the instructions included in the safety data sheet of the respective thermofluid!

Classification according to DIN12876:

DIN 12876

Classification	Thermoregulation fluid	Technical Specifications	Identification[d]
I	non-combustible[a]	Overheating protection[c]	NFL
II	combustible[b]	Adjustable overheating protection	FL
III	combustible[b]	Adjustable overheating protection Additional low-level protection	FL

a Generally water, other fluids only if they are not combustible in the temperature range of an individual fault.
b The thermoregulation fluids must have a combustion point of > 65 °C, i.e. when using ethyl alcohol, only supervised operation is possible.
c The overheating protection can be achieved e.g. through an appropriate fill level sensor or appropriate temperature control devices.
d Optional according to the selection of the manufacturer

Your thermostat is classified as FL / III

Please Note: All the safety instructions are vital and must thus be considered on the job in compliance with the present operating instructions..

3. Commissioning

3.1. Principles, Media and Safety Instructions

Thermal fluid

Not suitable for use as a medical device (e.g. in vitro diagnostic procedures).

Requirements for thermofluids classified as FL:
EN 61010-1: Max. permissible working temperature
25 °C below the flash point!

Maximum viscosity at the lowest working temperature: 50 mm^2/s!

Maximum density of the thermofluid: 1 kg/dm^3.
Possible thermoregulation range within the range of the plannedminimum and maximum working temperature.

Do not use thermofluids with any of the additives ether, ester, strong mineral acids, oxidizing acids or amines. Do not use demineralized water, mineral water, sea water or CaCl brines$_2$

Compatibility with the materials used for the thermostat (stainless steel 1.4301 (V2A) and with all the materials used in the system connected to the thermostat.

For a selection of thermofluids including technical data, please refer to the topical Huber catalog.

Hazards during thermo-regulation

Caution! Potential risk of injury and material damage during thermoregulation:
In the course of operation of the thermostat, extreme changes in temperature and pressure and the specific characteristics of the thermal fluids used may constitute hazards.

Please Note:

All the safety instructions are vital and must be considered on the job in compliance with the present operating instructions.

3. Commissioning

3.1. Safety Instructions and Principles

Hazards through emission of fluids

Caution! Potential risk of injury and material damage:
The floor will be slippery when fluids have been spilt!
Thermal fluids with a low flash point constitute a fire hazard!
Hazard of scalding/burning when touching exposed or defective connections that are hot.

Prevent overflow of the bath.
Prevent leaking fluid-conveying pipes/tubes and connections.
Always remove any liquids spilt on the floor immediately.
Always clean contaminated devices immediately.
Place an appropriately large collecting tray under your external application.

Hazards through emission of gases

Caution! Potential risk of injury and material damage:

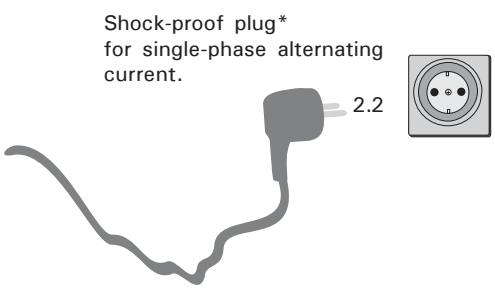
Risk of causticization of your respiratory tracts and skin through vapors!
Prevent leaks on closed external devices.
Ensure good aeration and ventilation in the vicinity of the thermostat.
Choose thermal fluids for thermoregulation that are not detrimental to health.

Current connection

2.1 Check the fuse, power and voltage ratings according to the data sheet (attached) and the type plate (on the rear side of the device)

2.2 Connect the power plug to the power outlet.

* Figure applies in the country of manufacture (Germany) only.



Please Note:

All the safety instructions are vital and must be considered on the job in compliance with the present operating instructions.

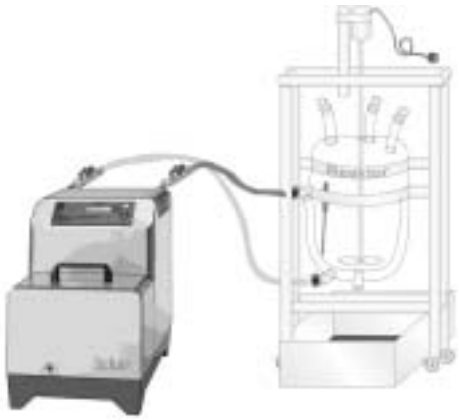
3. Commissioning

3.2. Preparing the thermostat for use

Preparation Thermo-regulation

If you wish to thermoregulate in a bath , please take the following into consideration:
Seal the pump manifolds with blind plugs and cap nuts (M16x1 / SW19). While doing so, counter using SW17 at the pump manifold.

If you wish to thermoregulate an externall application, please take the following into consideration:
Remove the blind plugs and cap nuts at the pump manifolds.
Replace them with suitable hose connections to your external application.



ministat 240

Please consider that the return/flow of the ministat 125 are in opposite position!

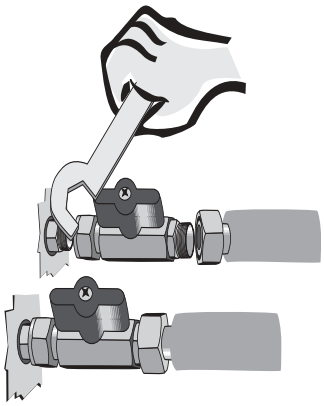
For more information, please refer to Chapter 4 „Thermoregulation via Controller“.

Alternative

Hazard!

If hoses have to be connected via shut-off valves:
Only close when performing work on the reactor, otherwise allways keep open!

Remember that thermal fluid expands and contracts with changes in temperature. Sealing the external application will expose the application to these forces!



Verify the following:

Make sure that all connections are correct and that there are no leaks!

3. Commissioning

3.3. Filling Thermofluid

Overtemperature protection

Require ments

Prepare the thermostat for thermoregulation and take safety measures as described below.

Setting the overtemperature protection device.

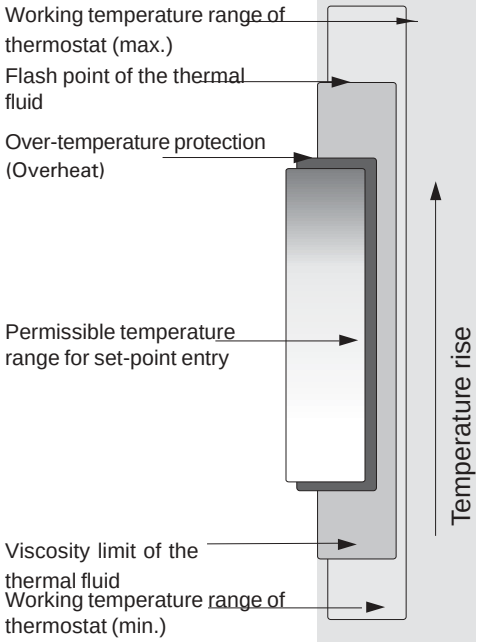
Requirements:

A suitable thermal fluid has been selected for the process requirements.

The flash point of the thermal fluid is known.

Procedure:

The over-temperature protection is set to at least 25 °C below the flash point of the thermofluid.



Caution!

The overtemperature protection is an especially important safety device of your thermostat. It should always be operable and be tested periodically!

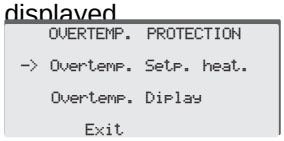
(Refer to 41-1)

Setting the over-temperature protection

2 For the ministats 125, 230, 240 the overtemperature protection is set electronically.

It is independent of the controller.

Use a suitable tool (screw driver or the like) to press the button in the center of the over-temperature protection device. The overtemperature menu will be displayed.



Overtemperature Setpoint Heating: overtemperature value (adjustable on the Ministat Control 22-1).

Overtemperature Display: the actuell overtemperature value is displayed.

For detailed information on the range of accessories incl. technical data and price quotations, please refer to the Huber catalog or contact your Huber agent.

3. Commissioning

3.3. Filling with Thermofluid

Bath thermostats

Filling the bath

L2 Lift the bath cover
Fill in thermofluid.

Please note the optimum fill level:
The evaporator coil must be fully covered with thermal fluid.

Close the bath cover

Please note that the medium needs to cool to room temperature before you *replenish* thermofluid!

L2

Caution! Potential risk of injury and material damage!

In the case of high temperatures, the bath cover and housing cover become very hot.
Please touch the device and the cover at the grips only. **Scalding hazard**!

Never, under any circumstances, lift the cover of the bath during operation at high temperatures:

Scalding / burning hazard due to overflow of the thermofluid.
Risk of causticization of your respiratory tracts and skin through vapors!

Important!
For information on thermofluids, refer to 3.1! For a selection of thermofluids includingtechnical data, please refer to the Huber catalog.

3. Commissioning

3.4. Major Presettings

Language

Deutsch

When delivered the controller displays will be in German.
Other options can be selected in the „Language“ menu (refer to 4.3.2):
English, Francais

Set-point

The thermostat controls the temperature to the predefined setpoint.
Use the SET key and the encoder to select an other setpoint.

Minimum set-point

Maximum set-point

The setting can be changed in the „Alarm Config.“ menu (refer to 4.4.1):
Any temperature value within the performance parameters of the thermostat (refer to the Data Sheet, Appendix or type plate.) and the safety limits (refer to 3.1!).

Notes to the temperature limits:

- Select limits no greater than necessary
- Consider the properties of the thermal fluid (flash point and viscosity)
- Consider the manufacturers recommendations of your application.

The programs for operating the thermostat are described in Chapter 4 of the Operating Instructions.

4

Thermoregulation via controllers

4. Thermoregulation via controller

4.1. Safety Instructions and Principles

Checks to be Performed:
Test Arrangement

Compare the device configuration, the system structure and the selected thermofluid to the thermoregulation target.
Verify the stability of the thermostat and external devices.
Make sure there are no leaking connections.
Make sure the shut-off valves for thermofluid and cooling water (if applicable) have been opened.
Check the connection to the power supply.

Caution! Potential risk of injury and material damage:
Slip hazard! The floor and the workspace may be slippery when fluids have been spilt!
Tilt hazard! Make sure the thermostat and external devices are in a stable position.
Shock hazard! Make sure the connection to the power supply is undamaged and in perfect working order.
Scalding and burning hazard! Always be aware of extreme temperatures.
Causticization hazard! Risk of causticization of your eyes, your skin and your respiratory tracts through hazardous vapors (depends on the thermofluid used).

Safety Measures

Setting the overtemperature protection:
(Applies to Polystats and Compatible Control Thermostats):
When: Immediately after filling the system with thermofluid!
Recommendation:
Periodically test the function of the overtemperature protection by entering a higher setpoint, e.g. as follows:
Set the overtemperature protection to 30 °C.
Enter the maximum setpoint of 40 °C (since the overtemperature protection is independent of the controller, you can enter this excessive value without problems).
Enter the new setpoint of 33 °C (former setpoint 20 °C); the heating will heat to 33 °C, then the thermoregulation process will be stopped automatically with the error message: „Temp"
The error message will be displayed until the error has been remedied.
Remedy the error. Set the overtemperature protection to a temperature above 40 °C.Switch the thermostat off and then on again.

Entering the minimum and maximum setpoints:
In combination with the working temperature range limits, the minimum and maximum setpoints provide additional safety for the thermoregulation process. This means, accidental entry of a setpoint that is too low or too high will be rejected.

Low liquid level protection:
Monitor the liquid level during operation.
Applies to bath thermostats (Polystats and Compatible Control Thermostats):
Fill level to approx. 60 – 80 % of the bath height;
for chillers: fill level to approx. 60 – 80 % on the level indicator.
Thermofluid level too low: Risk of the thermostat pump running dry. The controller will report an error and stop the thermoregulation process.
Thermofluid level too high: Overflow, soiling, slip and causticization hazard!

Change of fluid:
Rinsing fluid and thermofluids come into contact with stainless steel (V2A), Viton and Perbunan and must be compatible with these materials.

Room ventilation:
Sufficient aeration and venting in the vicinity of the thermostat minimizes the risk of overheating and the accumulation of harmful gases and vapors.

Please Note: All the safety instructions are vital and must thus be considered on the job in compliance with the present operating instructions.

4. Thermoregulation via Controller

4.1. Safety Instructions and Principles

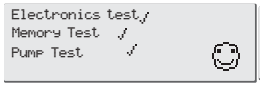
Principles of displays and entries

Salutation
Flash displays on the controller

Manufacturer

Salutation

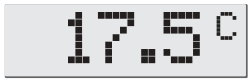
System test

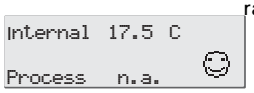


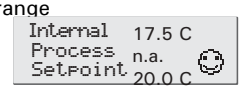
Name of thermostat, software version

Name of thermostat, working temperature range

Status display

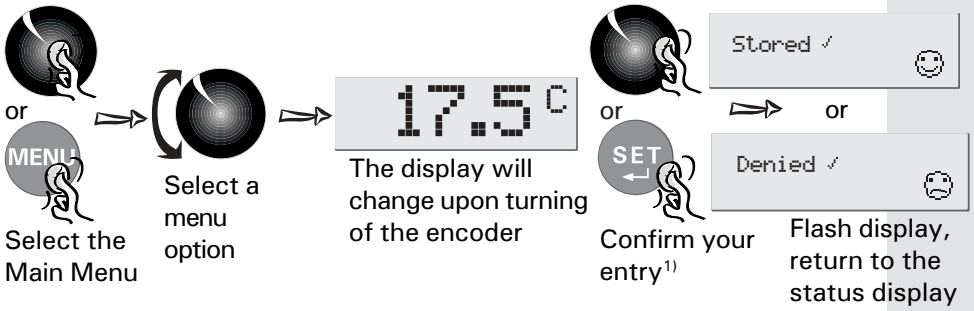






The status display depends on the preset display mode (refer to 61-2).

Operating the controller



[1)] If you fail to confirm your entry within 4 minutes, your selection will not be saved. The program returns to the status display.
To exit the menu instantaneously at any point, use the **Break function***: Press the SET and MENU keys simultaneously. Your selection will not be saved.

Messages

During operation, ad-hoc messages may be displayed on the controller. They provide information on irregularities and hazards in the thermostat. In the case of imminent danger, the controller will display a message and stop the thermoregulation process/switch off the thermostat at the same time.

On/Off

**Press the On/Off key to start/stop the thermoregulation process (thermoregulation combined with circulation).
For Ministat Control CC1 and CC2 during status display:
Turning the encoder displays the „Temperierung Ein/Aus“ (Thermoregulation On/Off) menu
Alternative:
****MasterClear function:**Pressing the MENU and TEMP keys simultaneously stops a thermoregulation program in progress or switches off the analog interface or switches from the digital interface remote mode to local mode.

Note: To learn more about the menu and the individual menu options, please also read sections 4.2 to 4.9 of the present operating instructions.

*applies to Ministat Control CC2 and CC3 only
**applies to Ministat Control CC3 only

4. Thermoregulation via Controller

4.2. Main Menu

Contents

The main menu provides menu options and submenu options including all the settings and selections required to operate the thermostat. (Refer to 42-1!)

[1] This menu option is not available for Ministat Control cc1.

[2] This menu option is not available for Ministat Control cc2.

Selection

MENU

Main Menu

Page	MAIN MENU:
43-1	I⇾ 2nd Setpoint [1), 2)]
47-2	Alarm Clear
47-2	Alarm Config.
47-5,6	Analog-Interface [1), 2)]
47-1	Display
47-7	Digit. Interface [1), 2)]
43-1	Venting
47-4	Machine Options
43-7	Max. Heat Power
46-1	Calibration Proc.
43-7	Compressor Auto
47-1	Mains Failure Auto
46-2	Offset Calibration
44-2	PI-Parameters
45-2_5	Edit Program [1)]
45-6	Program Start/Stop [1)]
45-1	Start Ramp [1)]
47-8	Acoustic Alarm
47-3	Software version
43-2	Setpoint Limits
44-1	Language
44-1	Temperature Scale
441	Control Mode [1), 2)]
43-1	Circulation
47-8	Select Usermenu
47-8	Config Usermenu
441	Factory Default
47-1	Time Scale
	Exit

Submenus

I⇾ ALARM CONFIGURATION:
- I⇾ Alarm Mode
- Lower Alarm Limit
- Upper Alarm Limit
- Level Alarm Delay
- Exit

I⇾ Display
- I⇾ Display modes
- optimise display
- Options
- Exit

I⇾ Digit. Interface :
- I⇾ Hardware RS
- Baud rate
- Protocol
- slave address
- Exit

I⇾ 2-P.CALIBR.:
- I⇾ Edit TCal1
- Edit TCal2
- Control to TCal1
- Control to TCal2
- Exit

I⇾ OFFSET CALIBRATION:
- I⇾ internal sensor
- process sensor
- Exit

I⇾ INITIALISE:
- I⇾ Unit Data
- User menus
- Programmer
- All together
- Exit

4. Thermoregulation via Controller

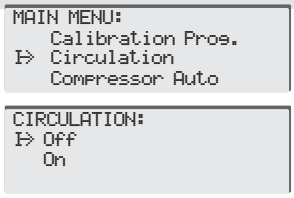
4.3. Utilities

1. Circulation
2. Venting
3. 2. Setpoint (for **Ministat Control cc3** only)

All the factory defaults can be customized in the menu.

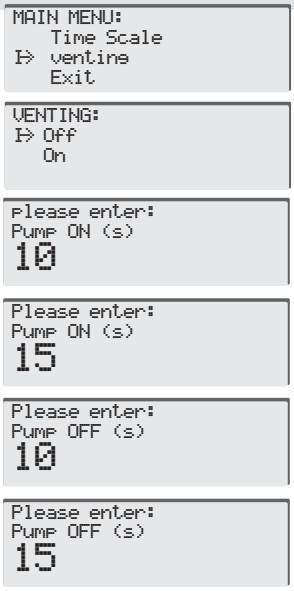
All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Circulation



„Circulation“ option
„Off“
No pump operation (related to the thermoregulation process) or stop of the alternating pump operation.
„On“
Start of the alternating pump operation (without thermoregulation) e.g. to enhance the filling procedure.

Venting



„Venting“ option:
Can be selected only with thermoregulation switched off.
Using the venting option, the pump can be operated in intervals in alternating mode, e.g. for enhanced venting of external applications.

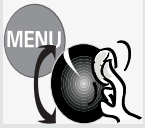
„On“
The default settings for the time intervals for pump operation/pause may have to be edited (take into consideration the viscosity of the thermofluid and the system dimensions) and – at the same time – start of the alternating pump operation in intervals.

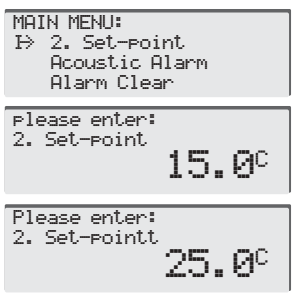
„Off“ Stop the alternating pump operation in intervals.
(Refer to 3.4!)

Caution! Potential risk of injury and material damage!

Please take into consideration the capacity and fill level of the thermostat and the connected systems as well as the viscosity and expansion characteristics of the thermofluid used.
Please prevent overflow of the fluid. Refer to 3.4!

2. Setpoint





„2nd Setpoint“ option *(exclusively available for Ministat controllers cc3)*
Entry of the 2nd setpoint. This setpoint is enabled only if an error occurs in the analog control. Refer to „Analog Interface“!
When entering the 2nd setpoint, the same applies as to the „standard“ setpoint: the characteristics of the thermofluid, the thermoregulation objective and the safety measures must always be taken into consideration.

4. Thermoregulation via Controller

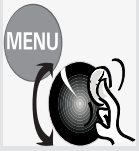
4.3. Limiting the Thermoregulation Range

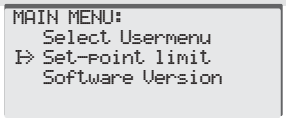
4. Setpoint Limits

All the factory defaults can be customized in the menu.

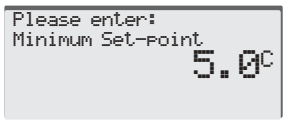
All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Setpoint Limit

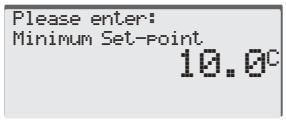




„Setpoint Limits“ option:
Enter the desired minimum setpoint and confirm your entry (e.g. 10.0 °C).

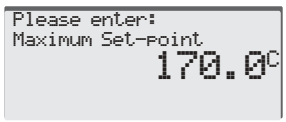


The minimum setpoint is a safety limit for thermoregulation. Where:
The lowest permissible temperature value > = minimum setpoint (3.1, 4.1).
It is not possible to enter a setpoint lower than the minimum setpoint.



Enter the desired maximum setpoint and confirm your entry (e.g. 170.0 °C).

The maximum setpoint is a safety limit for thermoregulation. Where:
The highest permissible temperature value < = maximum setpoint (3.1, 4.1).
It is not possible to enter a setpoint higher than the maximum setpoint.
The maximum setpoint should not be set to a value lower than 5-8 degrees below the value set for the overtemperature protection. In this way, the controller can tolerate a minimum ballistic effect of the attained temperature when thermoregulating to the maximum setpoint.



Warning
The overtemperature protection is an especially important safety device of your thermostat. It should always be operable and thus be tested **periodically**!
If the actual value exceeds the set overtemperature limit, an alarm is triggered and the thermostat will cut-out the thermoregulation process.
This process can be restarted only after the cause of the alarm has been eliminated and the alarm message acknowledged.
Refer to 3.1 Principles and Safety Instructions!

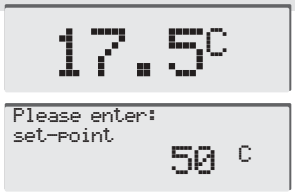
4. Thermoregulation via Controller

4.3. Enter a Setpoint - Start

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Entry of Setpoint



Press the SET key.
The setpoint will be shown on the status display.
Enter the new setpoint by turning the encoder (e.g. to 50 °C).
Confirm your entry by pressing the encoder or the SET key.

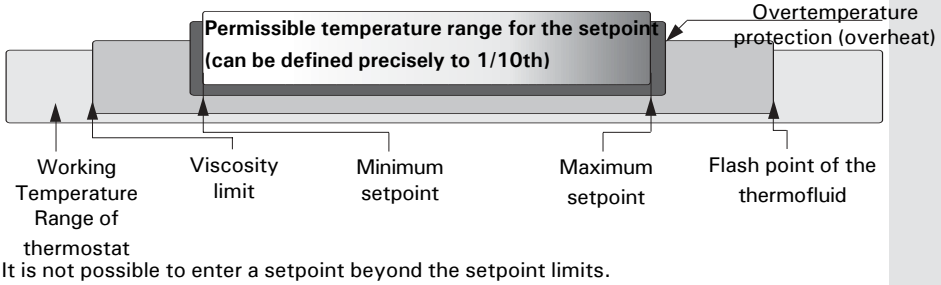
Start thermoregulation only after all the prerequisites have been met (refer to 3 Commissioning), especially:

Suitable location (3.1)
Correct connections (3.2)
Ambient temperature max. 30 °C (3.1)
Correct setting of the overtemperature protection (4.1)
Correct setting of the setpoint limits (4.4)

Ministat cc1 and cc2 controllers:
Start the thermoregulation process by turning the encoder.

Ministat cc3 controller:
The thermoregulation process to the new setpoint is started by pressing the TEMP key.

To stop the thermoregulation process: Refer to page 43-4!



It is not possible to enter a setpoint beyond the setpoint limits.

Caution!
The overheating point and the setpoint must be 25 degrees below the flash point of the thermofluid and the setpoint must be above the temperature at which the thermofluid attains a viscosity higher than 50 mm^2/s.
(3.1.!)
Note: Gas venting (Prog. 55) and decalcify.

4. Thermoregulation via Controller

4.3. Terminating the Thermoregulation Process

Abort

Ministat Control cc1/cc2: The thermoregulation process can be aborted at any time by pressing the power switch. You can also turn the encoder until the „Thermoregulation“ menu is displayed, in which you can select „Off“ or „On“.

Ministat Control cc3: The thermoregulation process can be aborted at any time by pressing the On/Off key on the controller.

When you press the On/ Off key or the power switch to stop the thermoregulation process, all the LEDs will go out.

Actuate the power switch of the thermostat to interrupt the power supply.

Caution!
Do not stop the thermoregulation process by pulling the power plug. When the controller is switched back on, various device messages may be displayed and faults may occur.

4. Thermoregulation via Controller

4.4. Editing Default Settings

1. Restoring the factory default
2. Selecting a language for the controller display
3. Temperature scale
4. Control mode – internal/ external

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). For this purpose, proceed as described below. (Also refer to „Salutation“ 4.1).

Factory Default


```
MAIN MENU:
   Config User
I->Factory default
```

„Factory Default“ option

```
INITIALISE:
I⇨ Unit Data
   Programmer
   User menus
   All together
   Exit
```

Submenu selection:
„Unit Data“: Important if you replaced device components or accessories.

„Programmer“
Deletion of all the thermoregulation programs

```
 INITIALISE:
   User menus
I⇨ All together
   Exit
```

„User menus“
Restores the „User menu“ factory default.
„All together“
Restores all the factory defaults.
Caution! All the thermoregulation programs incl. ramps entered by the customer will be deleted!
„Exit“ option:
The factory defaults will not be restored.

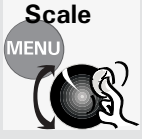
Language


```
MAIN MENU:
   Set-point limits
I⇨ Language
   Temperature Scale
```

```
Language:
I⇨ Deutsch
   English
   Francais
```

For selecting the language that is to be

Temperature Scale




```
MAIN MENU:
   Language
I⇨ Temperature Scale
```

```
Temperature Scale:
I⇨ Celsius
   Fahrenheit
   Kelvin
```

For selecting the temperature unit for display

Control Mode


```
MAIN MENU:
   Temperature Scale:
I⇨ Control mode
```

```
Control mode:
I⇨Internal
   Process (Cascade)
```

Not available for Ministat Control cc1!

For definitions of internal and external thermoregulation, please refer to the Huber Glossary, keyword Control Mode – Internal, Process

4. Thermoregulation via Controller

4.4. Editing Default Settings

5. PI-Parameters

PI-Parameters

Factory Default:
The P-parameter (proportional parameter) and the I-parameter (integral parameter) influence the thermoregulation behavior of your thermostat. The factory default of the P-parameter is 5,000, that of the I-parameter is 1,000.
The factory default is well suited for a large number of applications.

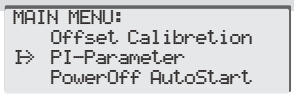
New settings:
The PI-parameters can be edited as desired.
Value range of the P-parameter: 50 ... 30,000
Value range of the I-parameter: 0 ... 30,000

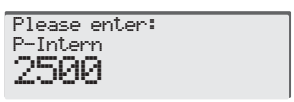
Test your thermoregulation process for optimum settings by entering new value pairs for the thermoregulation mode (internal or process

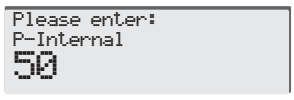
Test Part 1	External thermoregulation Temperature change by 20 °C after each setting up to U* (ballistic effect)
P - portion I - portion	50 1000 2000 3000 ... 10.000 ...up to Ü*e.g. 12.000
Test Part 2	External thermoregulation Temperature change by 20 °C after each setting up to O**
P - Portion I - Portion	12.000 12.000 12.000 12.000 1.000 2.000 5.000 ... up to O** e.g. 15.000

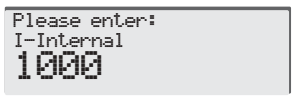
* U: Ballistic effect: At the thermoregulation target, the actual value oscillates about the setpoint.
**O: Optimum ratio between the accuracy of the controller and your desired speed.
Rule: Fast thermoregulation due to a high P and a low I-parameter results in a high ballistic effect.

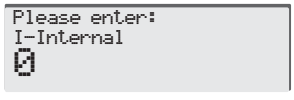
PI-Test











Thermoregulation:
1. Heating by 20 °C with P/I = 50/0, then cooling by 20 °C
2. Heating by 20 °C with P/I = 1000/0, then cooling by 20 °C
3. Continue as described for Test Part 1 (table above) until all the relevant P-parameters have been tested.
4. Heating by 20 °C with P/I = 12,000/1,000, then cooling by 20 °C
5. Heating by 20 °C with P/I = 12,000/2,000, then cooling by 20 °C
6. Continue as described for Test Part 1 (table above) until all the relevant I-parameters have been tested.

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

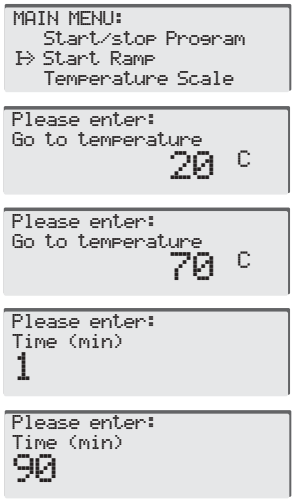
1. Start Ramp (for **Ministat Control cc2/cc3** only)

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Start Ramp

If you want to change the working temperature slowly and smoothly instead of suddenly, you should implement the setpoint change via a ramp.



„Start Ramp“ option:

Enter the desired final temperature of the ramp (ramp setpoint), e.g. 70 °C.

Enter the time (in minutes) the thermoregulation to the ramp setpoint should take, e.g. 90 minutes.

Starting the ramp:
The ramp will automatically be started once you have confirmed the time parameter.

Completion of the ramp:
Once the ramp setpoint has been reached (e.g. after 90 minutes), the thermostat will keep the new actual temperature constantly on the new value (e.g. 70 °C

Interrupting the ramp:
The ramp can be interrupted in the course of the process by entering a new setpoint (SET/encoder).

Caution!
The setpoint must be 25 degrees below the flash point of the thermofluid and above the temperature, at which the thermofluid attains a viscosity higher than 50 mm^2/s. (3.1.!)

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

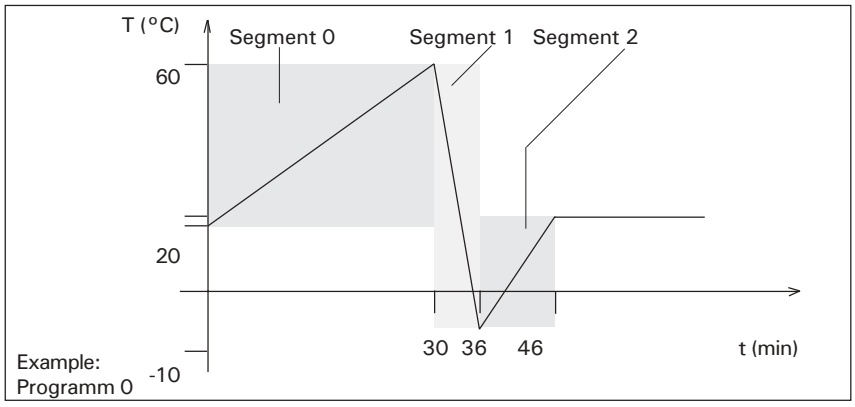
2. Edit Program
(Exclusively for **Ministat Control cc2/ cc3**)

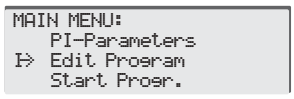
All the factory defaults can be customized in the menu. All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Edit Program

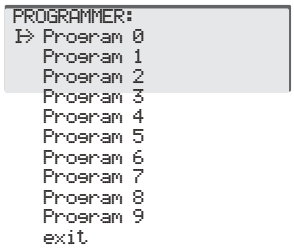
Creation of a separate thermoregulation program
Ministat cc2 controller: 1 thermoregulation program for editing (can always be overwritten) with as many as 5 segments.
Mionistat cc3 controller: 10 thermoregulation programs for selecting and editing (can always be overwritten). A total of 50 segments are available.
One segment can maximally span a period of 54 hours.
Programming is done in steps according to the „Edit Program“ menu item.

Planning (Example):
A fluid in an external bath is to be heated and cooled in 3 steps. The heating process is to be temperature-stable and the cooling process time-stable. For the time it takes to cool the bath, an agitator is to be controlled via the potential-free contact.
At the end of the program, the thermostat is to maintain the bath





„Edit Program“ option



Options in the „Programmer“ (PR) submenu: 10 Programs
„Program 1“ option
Upon initial commissioning, all the programs will still be „empty“, i.e. they have not been assigned any segments. In the course of the application, these programs may be completely filled with segments.
For further programs, you may edit existing ones.

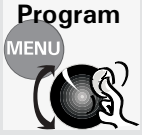
Caution!
The setpoint must be 25 degrees below the flash point of the thermofluid and above the temperature at which the thermofluid attains a viscosity higher than 50 mm^2/s. (4.1.!)

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

3. Edit Program (exclusively for **Ministat Control cc2/ cc3**)

Edit Program




```
FUNCTIONS PR:
   Attach Segment
I> insert Segment
   modify Segment
   Delete Segment
   show Segment
   Delete Program
   Exit
```

Submenu selection:
„Programmer“ (PR)/ „Program 0“/
„Functions PR“:
„Program 1“ options
„Attach Segment“ (for the 1st segment, this corresponds to „Insert Segment“). The parameters for the 1st segment are defined in the following.
(Refer to the example of program 0 on page 45-2!)

```
PROGRAM NO.1:
I> Set point SegEnd
   Segment period
   Modify Segment
   Control mode
   Options
   Save & exit
   Exit
```

```
Please enter:
Set point SegEnde
          0.0 C
```

```
Please enter:
Set point SegEnde
         60.0 C
```

„Setpoint SegEnd“ option: entry of the setpoint for the 1st segment of the 1st program, e.g. 60 °C.

```
PROGRAM NO.1:
   Set point SegEnd
I> Segment period
   Modify Segment
   Control mode
   Options
   Save & exit
   Exit
```

```
Please enter:
Segment period (s)
1
```

```
Please enter:
Segment period (s)
1800
```

„Segment period“ option: entry of the time period for the 1st segment of the 1st program, e.g. 1800 seconds.

```
PROGRAM NO.1:
   Set point SegEnd
   Segment period
I> Control mode
   Options
   Save & exit
   Exit
```

```
CONTROL MODE:
I> Internal
   Process (cascade)
```

```
CONTROL MODE:
   Internal
I> Process (cascade)
```

„Control Mode“ option: example: selection of external thermoregulation.

```
PROGRAMM NO.1:
   Set point SegEnd
   Segment period
   Modify Segment
   Control mode
I> Options
   Save & exit
   Exit
```

```
OPTIONs PR:
   Pot.free Contact
   Analog Output
I> End condition
   Stability
   exit
```

```
AT SEGMENT-END:
   stop regulation
I> continue loop
```

„Options“ menu option: Selection of the „End condition“ for the 1st segment of the 1st program, e.g. „Continue“, i.e. the temperature value of the segment end is maintained. („Stop Regulation“ = thermoregulation to the former setpoint at the end of the segment)

```
OPTIONs PR:
   Pot.free Contact
   Analog Output
   End condition
-> Stability
   exit
```

```
STABILITY:
I> Time-stable
   Temperature-stable
```

„Stability“ option, e.g. „Time-Stable“ for the 1st Segment of the 1st program.

Time-Stable: The segment period entered has priority for the segment end.

Temperature-Stable: The „Setpoint SegEnd“ has priority for the end of the segment.

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

4. Edit Program

(Exclusively for **Ministat Control cc2/ cc3**)

All the factory defaults can be customized in the menu.
All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).
Select „Exit“ to return to the superordinate level

Edit Program


```
OPTIONs PR:
   Pot.free Contact
   Analoe Outeut
   End condition
   Stability
 I⊕exit
```

Select „Exit“ to return to the superordinate level „Program 1“.

```
PROGRAM NO.1:
   Set eoint SesEnd
   Sesment eeriod
    Control mode
   Oetions
I⊕ Save & exit
   Exit
```

„Save & Exit“ option: Saving of all the data for the 1st segment in the 1st program. The 1st program has thus been created.
If you exit the „Program 1“ level without „Save & Exit“, all the data entered for this segment up to now that have not yet been saved will be discarded.
After „Save & Exit“ the program will return to the superordinate level „Functions PR“.

```
FUNKTIONS PR:
   Delete Sesment
I⊕ show Sesment
   Delete Program
   Exit
```

```
Proe:0        Ses:0
Temp:60       Contr:Cas
Time:1800     Stab:Time
Poco:0        AnO:0
```

„Functions PR“ option, „Show segment“ option: this is where you can check your entries. Press the MENU key to exit the display.
The program will return to „Functions PR“, where you select „Attach Segment“ as shown in the example. The entries now correspond to those for segment 1 taking the values from our example. In this segment, you must additionally select the potential-free contact for controlling the agitator in segment 2.

```
FUNKTIONS PR:
I⊕ Attach Sesment
  insert Sesment
  modify Sesment
```

```
Please enter:
Set eoint SesEnd
          60.0
```

```
Please enter:
Set eoint SesEnd
         -10.0 C
```

```
PROGRAM NO.1:
   Set eoint SesEnd
I⊕ Sesment eeriod
   Control mode
```

```
Please enter:
Sesment eeriod (s)
1800
```

```
Please enter:
Sesment eeriod (s)
360
```

```
PROGRAM NO.1:
   Set eoint SesEnd
   Sesmentdauer
I⊕ Temeeriermodus
```

```
CONTROL MODE:
I⊕ Internal
   Process (Cascade)
```

```
CONTROL MODE:
   Internal
I⊕ Process (Cascade)
```

Potential-free contact

```
PROGRAM NO.1:
   Sollwert SesEnde
   Sesmentdauer
I⊕ Temeeriermodus
```

```
OPTIONS PR:
I⊕ Pot.free contact
   Analoe outeut
   End condition
```

```
POCO ACTIVE:
   No
I⊕ Yes
```

```
OPTIONS PR:
   Analoe outeut
I⊕ End condition
   Stability
```

```
AT SEGMENT-END:
I⊕ Stoe reoulation
   Continue loee
   Reeeat
```

```
OPTIONS PR:
   End condition
→ Stability
   exit
```

```
STABILITY:
   time-stable
I⊕ Temeerature-stable
```

```
OPTIONS PR:
  End condition
   Stability
→ exit
```

```
PROGRAMM NO.1:
   Oetions
I⊕ save sesment
  exit
```

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

5. Edit Program
(Exclusively for **Ministat Control cc2**/ **cc3**)

All the factory defaults can be customized in the menu.
All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).
Select „Exit“ to return to the superordinate level.

Edit Program

„Functions PR“ option, „Show segment“ option: this is where you can check your entries. Press the MENU key to exit the display.
The program will return to „Functions PR“, where you select „Attach Segment“ as shown in the example. The entries now correspond to those for segment 1 taking the values from our example. In this segment, you must additionally select the potential-free contact for controlling the agitator in segment 2.

FUNKTIONS PR: I⇒ Attach Seament Insert Seament Modify Seament	Please enter: Set point SesEnd -10.0	Please enter: Set point SesEnd 20.0 C
PROGRAMM NO.1: Set point SesEnd I⇒ Seament Temperiermodus	Please enter: Period Seam. (s) 360	Please enter: Period Seam. (s) 600
PROGRAMM NO.1: Set point SesEnd Period Seam. I⇒ Control mode	CONTROL MODE: I⇒ Internal Process (Cascade)	CONTROL MODE: Internal I⇒Process (Cascade)
	OPTIONS PR: Analoa output I⇒ End condition Stability	AT SEGMENT-END: Stop reaulation I⇒ Continue loop
	OPTIONS PR: End condition → Stability exit	STABILITY: Time stable I⇒ Temperature stable
	OPTIONS PR: End condition Stability → Exit	PROGRAMM NO.1: Options I⇒ save & exit Exit

You have now created a thermoregulation program with 3 segments according to our example.

Caution!
Before activating the program, make sure you are using a suitable thermofluid!
The setpoint must be 25 °C below the flash point of the thermofluid and above the temperature at which the thermofluid attains a viscosity higher than 50 mm²/s. (3.1.!)

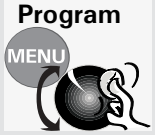
Please Note:
You cannot create thermoregulation programs with the Ministat controller cc1.
You can create one thermoregulation program with the Ministat controller cc2.
You can create 10 thermoregulation programs with the Ministat controller cc3.

4. Thermoregulation via Controller

4.5. Convenient Thermoregulation – Programs

6. Start Program (Exclusively for **Ministat Control cc2/ cc3**)

Start/Stop Program




```
MAIN MENU:
   Software Version
I> Start/Stop Program
   Start Ramp
```

„Start/Stop Program“ option

If ***no*** program has been started:
Submenu selection:
„Program 1“ example Ministat cc3:
10 programs / 50 segments
(However one program cannot contain more than 40 segments)

```
PROGRAMMER:
I> Program 1
   Program 2
   Program 3
   Program 4
   Program 5
   Program 6
   Program 7
   Program 8
   Program 9
   Program 10
   Exit
```

Ministat Control cc2: 1 program / 5 segments

```
SERVICE-PROGRAM:
   Program Pause
   Program Continue
   Go To Segment No.
   Program stop
   Exit
```

If a program has ***already*** been started:
Submenu selection:
„Program Pause“
„Program Continue“
„Go To Segment No.“
„Program Stop“
„Exit“

```
Progr.:1      Segm.:1
Internal         21.2
Process          17.5
Setpoint         17.6
```

Program 1 will be started.

„Internal“:
development of the internal actual value

„Process“:
development of the external actual value

„Setpoint“:
Calculated actual setpoint.

Aborting the thermoregulation program
With Ministat controller cc2: Power switch or new menu (using„Program Stop“).
With Ministat controller cc3:
Break function (press the MENU and On/ Off keys simultaneously).
Alternative: Power switch or new menu.

Standard end of the thermoregulation process once the thermoregulation program has been completely executed, according to:
- programmed segment end (the temperature of the last segment setpoint is maintained (Continue) or thermoregulation to the last setpoint entered outside the program) or repeating of Temp. Program.
- Stability: Time-Stable (i.e. after the programmed segment period has elapsed) or Temperature-Stable (i.e. after the segment setpoint has been attained).

```
60.0 °C
```

Once the program has been completely executed, the status display will be shown.

Caution!
Before activating the program, make sure you are using a suitable thermofluid!
The setpoint must be 25 °C below the flash point of the thermofluid and above the temperature at which the thermofluid attains a viscosity higher than 50 mm^2/s. (4.1.!)

4. Thermoregulation via Controller

4.6. Calibration

1. Calibration Program

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Calibration Prog.


```
MAIN MENU:
   Analog Interface
I> Calibration proc.
   Circulation
```

„Calibration Prog.“ option
Is used exclusively to calibrate the internal sensor.
Use a calibrated reference thermometer as a second temperature sensor for calibration.

```
2-P.CALIBR. INTERNAL:
I> Edit T-Cal1/2
   Control to T-Cal1
   Control to T-Cal2
   exit
```

```
Please enter:
Set-point TCal1
              6 °C
```

Submenu selection: „Edit TCal1/2“

```
Please enter:
Set-point TCal1
             10 °C
```

Entry of the 1st of two calibration temperatures, e.g. change from 6°C to 10 °C.

```
2-P.calibration:
   Edit TCal1
I> Edit TCal2
   Control to T-Cal1
   Control to T-Cal2
   exit
```

```
Please enter:
set-point TCal2
            100 °C
```

Entry of the 2nd of two calibration temperatures, e.g. change from 100°C to 40 °C.

```
Please enter:
set-point TCal2
             40 °C
```

Submenu selection: „Control to TCal1“

```
2-P.calibration:
   Edit TCal1
   Edit TCal2
I> Control to T-Cal1
   Control to T-Cal2
   exit
```

Start thermoregulating until the 1st calibration temperature has been reached. If your reference thermometer indicates the set temperature reliably, compare the value to the actual value display of the Ministat controller. Deviations can be corrected using the encoder.
Submenu selection: „Control to TCal2“
Proceed as described for TCal1.
Exit the menu once you have completed the calibration procedure.

```
2-P.calibration:
   Edit TCal1
   Edit TCal2
   Control to T-Cal1
I> Control to T-Cal2
   Exit
```

The two-point calibration includes all the values between T1 and T2. With offset calibration, on the other hand, the entire temperature level is shifted by one value on a linear level.

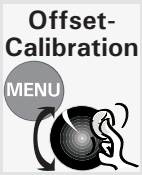
4. Thermoregulation via Controller

4.6. Calibration

2. Offset calibration

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).




```
MAIN MENU:
   Max. Heat Power
I> Offset Calibration
   PI-Parameters
```

```
OFFSET CALIBRATION:
I> Internal sensor
   Process sensor
   Exit
```

„Offset Calibration“ option
Suitable for calibrating all the sensors used.
Use a calibrated reference thermometer as a second temperature sensor for calibration in the area of the sensor to be calibrated. Compare the actual controller temperature displayed to the reference thermometer reading.

```
Please enter:
Internal sensor
              0.0°C
```

Any deviation can be corrected via the options provided in the „Internal Sensor“ submenu by entering the difference with the versed sign.

```
Please enter:
Internal sensor
             -1.5°C
```

Example:
Controller display (Internal Sensor) 10 °C, reference thermometer reading 8.5 °C, difference = 1.5 K.
Calibrate by entering „-1.5“. The output level of the controller display will decrease by 1.5 K. The controller display will now correspond to the reference thermometer reading.

```
OFFSET CALIBRATION:
   Internal sensor
I> Process sensor
   exit
```

Submenu selection: „Process Sensor“
Calibrate the process sensor (e.g. in an external bath)
Proceed as described for the „Internal Sensor“.

Also all other sensors can be calibrated the same way.

Offset calibration shifts the entire temperature level by one value on a linear level.
Two-point calibration, on the other hand, includes all the values between T1 and T2.

4. Thermoregulation via Controller

4.7. Editing Further Settings

1. Display
2. Time scale
3. Mains failure auto

Display


```
MAIN MENU:
   Digit. Interface
I> Display
   Edit Program
```

```
DISPLAY:
I>Display mode
   optimise display
   display
   Exit
```

```
DISPLAY MODES:
 Standard
I> Double
   Double1+Setp.
   Service1
   Service2
   exit
```

```
DISPLAY:
   Display modes
-> optimise display
   Exit
```

```
Please Enter:
Optimise display
```

„Display“ option

Selection in the „Display Modes“ submenu:
„Standard“:
Single-line status display, the actual value of the controller temperature (according to the control mode (internal or process temperature) is displayed in maximum font size.
„Double“:
Double-line status display, the actual values of the internal temperature and the (external) process temperature are displayed in medium font size.
„Double + Setp“:
Three-line status display, the actual values of the internal temperature and the process temperature as well as the setpoint are displayed in small font size.
„Service2“:
Four-line status display, the actual values of the internal temperature and the process temperature (external) as well as of the additional temperature sensors 1 and 2 are displayed in small font size.

Selection in the „Display Angle“ submenu:
Selection of a value to change the display angle by turning the encoder.

Time Scale


```
MAIN MENU:
   Temperature Scale
I> Time Scale
   Venting
```

```
TIME SCALE:
   Seconds
I> Minutes
```

„Time scale“: option
Select the unit on which the timing of the thermoregulation programs is to be based.

Mains Failure Auto

```
MAIN MENU:
  PI-Parameters
I> PowerOff AutoStart
  Select Usermenu
```

```
POWEROFF AUTOSTART.:
I>Off
  On
```

„Mains Failure Auto“ option
„Off“ After mains failure, manual input is required to continue the thermoregulation process.
„On“ After mains failure, the thermoregulation process is continued automatically. The setpoint programmed last will be used for thermoregulation.

Refer to 4.1 Safety Instructions!

4. Thermoregulation via Controller

4.7. Editing Further Settings

4. Alarm Configuration
5. Alarm Clear

The alarm concept plans two types of alarms:“hard“ alarms always lead to a „malfunction“ and can only be eliminated by switching off the power supply. „Soft“ alarms lead either to a „malfunction“ or are generated as a warning.
The soft alarms lead to malfunctionwhen the stop mode is selected in the configuration menu (factory default). Otherwise, a warning will be displayed (in the run mode).The user can delete a warning in the menu alarm config.\ alarm clear. A warning can be overwritten by a „hard“ alarm anytime.
The authorization for „soft“ alarms consists of the fact that the customer can at least operate temporarily on the device when small errors occured. The error condition should be repaired in appropriate time.

A list of soft alarms is to be found in chapter 6.4.

Alarm Configuration


```
MAIN MENU:
   Alarm clear
I> Alarm config.
   Analog Interface
```

Selection of the „Alarm config“ menu.

```
ALARM CONFIG.:
I> Alarm mode
   Lower Alarm Limit
   Upper Alarm Limit
   Level alarm delay
   Exit
```

Selection in the „Alarm mode“ submenu:
Run mode: ref. to „Alarm clear“!
Stop mode: ref. to „Alarm clear“!

```
ALARM MODE:
   Run Mode
->Stop Mode
```

Submenu Selection:
„Lower Alarm Limit“ / „Upper Alarm Limit“
The lower and upper alarm limits define the temperatures that trigger an alarm and stop the thermoregulation process, depending on the Alarm Mode settings. Refer to 4.1 Safety Instructions!

```
Please enter:
Upper Alarm Limit
          40.0°C
```

„Level Alarm Delay“
The level alarm delay is defined by entering the delay time in seconds.
The minimum filling level is supervised.
A brief falling under lower level is tolerable.

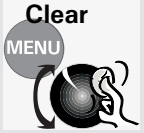
```
Please enter:
Level alarm delay
40
```

```
MAIN MENU:
   Acoustic Alarm
I> Alarm clear
   Alarm config.
```

„Alarm Clear“ option
Acknowledge the alarm.

In the case of software-monitored alarm messages, the thermoregulation process is continued.
The alarm message will persist until the cause auf the alarm has been eliminated and the alarm message has been acknowledged.

Alarm Clear




```
ALARM-STOP MODE:
   Please switch unit
   off and on
```

„Alarm stop Mode“ preselection
„Stop Mode“:
The thermoregulation process will be stopped.
Once the cause of the alarm has been eliminated and the alarm message has been acknowledged, it can be restarted manually.
„Alarm Mode“ preselection
„Run Mode“:
After the cause auf the alarm has been eliminated: „Restart“: The thermoregulation process is continued. the message disapears.
„Continue“: The thermoregulation process will continue. The message is not displayed anymore.

```
ALARM CLEAR:
I> Restart
   Continue
```

4. Thermoregulation via Controller

4.7. Editing Further Settings

6. Compressor Automatic
7. Maximum Heating Power
8. Software Version

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Compressor Auto


```
MAIN MENU:
   Circulation
I> Compressor Auto
   Config. Usermenu
```

```
COMPRESSOR AUTO:
I> Automatic
   Always on
   Always off
```

Selection of the compressor starting mode

„Automatic“
The compressor will start automatically depending on the topical demand. The chiller will work on demand only.
Benefit: Saving of energy.
Drawback: Heating time (idle time) in the case of a sudden demand.

„Always On“
The compressor remains switched on, continuous chiller operation.

„Always Off“
The compressor remains switched of, the chiller is not in operation.

Heating Capacity


```
MAIN MENU:
   Machine Features
I> Max. Heat Power
   Offset Calibration
```

```
Please enter:
Max. heat power (%)
100
```

„Max. Heat Power“ option

Enter the desired maximum heating power in percent.
This is required for devices equipped with a heater and a compressor (chiller).
The heating power must be reduced to enable simultaneous operation of heater and compressor with a view to the fusing of the device.

Software version


```
MAIN MENU:
   Set-Point limits
I> Software version
   Start/Stop Program
```

```
SOFTWARE:
Series No.: 0
Version    04.00s
Date  19.02.03. 15.41
```

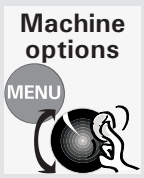
„Software Version“ option

For example:
04.00s vom 19.02.2003, 15.41 PM.

4. Thermoregulation via Controllers

4.7. Editing **Further Settings**

9. Machine Options



Machine Features:
Various settings are possible depending on the equipment of the device. These can be selected in the submenu displayed. Only those options actually installed in the device are displayed.

```
MENu OPTION:

I⊳ Pump Speed
```

Here, the nominal speed can be set for devices equipped with variable-speed

```
MENu OPTION:

I⊳ Reserverd
```

Without significance

```
MENu OPTION:

I⊳ Exit
```

Settings are not changed, exit menu.

```
Main menu:
   Language
I⊳ Machine Options
   Max. Heat Power
```

„Machine Options“ menu option

```
MENu OPTION:

I⊳ Ext. Control Signal
```

Various external control signal (ECS) functions can be triggered for devices with external control signal. For this reason, a submenu is displayed here for selecting the functions when the external control signal is enabled.

```
MENu OPTION:

I⊳ Ext. Control Signal
   -Off-
```

„Off“ External control input is not assigned any function

```
MENu OPTION:

I⊳ Ext. Control Signal
   -Standby-
```

„Standby“ When the external control signal is enabled, thermoregulation is switched on and remains active until the external control input is disabled.

```
MENu OPTION:

I⊳ Ext. Control Signal
   -Act. 2nd Setpoint-
```

„Act. 2nd setpoint“: activate the 2nd setpoint. The active-on principle is beeing used.
therefore applies to this protective function:
it is thermoregulated on the „normal“ setpoint value, as long as the ECS is active. The 2nd setpoint is effective when the dry contact at ECS opens and stays effective when the ECs is reactivated.

```
MENu OPTION:

I⊳ Ext. Control Signal
   -Exit-
```

„Exit menu“: Settings are not changed, exit menu.

4. Thermoregulation via Controller

4.7. Editing Further Settings

10. Analog Interface – Parameter Input
Applies to all thermostats with the **Ministat Control cc3** !

All the factory defaults can be customized in the menu. All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Anlog Interface


```
MAIN MENU:
   Alarm mode
I> Analog Interface
   Display
```

```
ANALOG INTERFACE:
I> Temp. T1 (Zero)
   Temp. T2 (Span)
   Conf. Input
   Conf. Output
   Exit
```

```
Please enter:
Temp. 1 (zero)
              5.0°C
```

```
ANALOG INTERFACE:
   Temp. T1 (zero)
I> Temp. T2 (Span)
   Conf. Input
   Conf. Output
   Exit
```

```
Please enter:
Temp. 2 (Span)
             35.0°C
```

```
ANALOG INTERFACE:
   Temp. T1 (Zero)
   Temp. T2 (Span)
I> Conf. Input
   Conf. Output
   Exit
```

```
ANALOG INPUT:
  AIF-Input Off
  AIF -> Set-point
  I>  Adjust
   Exit
```

```
ANALOG INPUT:
I> AD-value at T1
   AD-value at T2
   On error Analog
   Exit
```

```
ANALOG INPUT:
   AD-Value at T1
   AD-Value at T2
I> On error Analog
   Exit
```

```
ANALOG INPUT:
   AD-Value at T1
   AD-Value at T2
I> On error Analog
   Exit
```

„Analog Interface“ (AIF) option: The thermoregulation process is controlled via an analog signal (currents from 4 to 20 mA), the strength of which represents the setpoint. The temperature range can be set by the user. The difference between *Zero* and *Span* must be at least 10 K but must not exceed 320 K.

Submenu selection: „Temp. T1 (Zero)“

Default „Temp.1“: Lower limit of the temperature range

Submenu selection: „Temp. T2 (Span)“

Default „Temp.2“: Upper limit of the temperature range

Submenu selection: „Param. Input“

Default: Parameter input disabled/enabled or configuration.

Submenu selection: „Configuration“

Default: Measured value of the analog-digital converter at T1/T2: „AN. CURR OK?- Yes“ if the analog device (provided by the customer) is synchronized with the Huber controller.
„AN. CURR OK?- No“ if the analog device (provided by the customer) must be resynchronized with the Huber controller. Automatic return to the menu.

Selection in the „If Error at Analog“ submenu:
Response to errors: Cut-out or enabling of the 2nd setpoint (ref. to 6.4.)

When the AIF is enabled, the input current determines the setpoint. If a setpoint is entered via the CC3 keyboard in this period, this setpoint will be enabled only after the AIF has been disabled. The definition of the setpoint via the AIF can be aborted with the MasterClear function. The setpoint defined prior to enabling the AIF will then be used for thermoregulation.
Caution! The Electronic may be destroyed if currents exceeding 20 mA are used and/or if the polarity is confused!

4. Thermoregulation via Controller

4.7. Editing Further Settings

11. Analog Interface – Parameter Output
Applies to all thermostats with the **Ministat Control cc3**!

All the factory defaults can be customized in the menu. All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Anlog Interface


```
MAIN MENU:
   Alarm mode
I> Analog Interface
   Display
```

```
ANALOG INTERFACE:
   Temp. T1 (Zero)
   Temp. T2 (Span)
   Conf. Input
I>Conf. Output
   Exit
```

```
ANALOG OUTPUT:
I>Output value
   Current at T1
   Current at T2
   Exit
```

```
SOURCE ANALOG OUT:
   No output
   Internal temp.
   External temp.
   Programmer
I> Manual value
   Exit
```

Select „Analog Interface“ (AIF): The thermoregulation process is controlled via an analog signal (currents from 4 to 20 mA), the strength of which represents the setpoint. The temperature range can be set by the user. The difference between *Zero* and *Span* must be at least 10 K but must not exceed 320 K.

Submenu selection: „Output Value“ Definition of the measuring point for temperature output values.

„No Output“ Constant output of 4 mA as a power supply, e.g. for an external thermometer.

„Internal Temp.“: Measurement using an internal sensor in the thermostat. In the case of a bath thermometer, the sensor is inside the bath.

„External Temp.“: Measurement with an external sensor, e.g. in an external bath.

„Programmer“: In a thermoregulation program, each segment can be assigned an output current, e.g. for adapting the speed of an external pump to individual program segments.

```
ANALOG OUTPUT:
   Quelle fuer Ausgang
I> Output value
   Current at T1
   Current at T2
```

„Manual Value“ Any percentage from 0 %...100 % analog to 4...20 mA with encoder.

```
Please enter:
DAC-Output at T1
591
```

Submenu selection: „Current at T1“ Presetting of a converter output value for T1 (Zero): The encoder is used to set a value that results in the desired current value for T1, e.g. 4 mA at the analog setpoint encoder.

```
ANALOG OUTPUT:
   Output value
   Current at T1
I> Current at T2
   Exit
```

```
Please enter:
DAC-Output at T2
4104
```

Submenu selection: „Current at T2“

Presetting of a converter output value for

Caution! The electronic may be destroyed if currents exceeding 20 mA are used and/or if the polarity is confused!

4. Thermoregulation via Controller

4.7. Editing Further Settings

12. Digital Interface
Applies to all thermostats with the **Ministat Control cc3**!

All the factory defaults can be customized in the menu. All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Digital Interface


```
MAIN MENU:
   Control Mode
I> Digit.Interface
   Display
```

„Digit. Interface“ option
The controller is equipped with a bidirectional RS232 interface and an RS485 interface. These digital interfaces enable remote control via a PC (Remote mode).

```
DIGIT. INTERFACE.:
I> Hardware RS
   Baud rate
   Slave address
   exit
```

Submenu selection: „Hardware RS“
Preselection of the RS232 (for 1 PC) or RS485 (for up to 32 PCs) interface.

```
HARDWARE RS:
I> RS 232
   RS 485
```

Submenu selection: „Baud rate“

```
DIG. SCHNITTST.:
   Hardware RS
I> Baud rate
   Slave address
   Exit
```

Preselection of the data transfer rate between the thermostat and the connected PC. You can select one of five baud rates.

```
BAUD RATE:
   1200 Baud
   2400 Baud
   4800 Baud
I> 9600 Baud
   19200 Baud
```

Factory default: 9,600 Baud

```
DIGIT. INTERFACE:
   Hardware RS
   Baud rate
I> Slave address
   exit
```

Submenu selection: „Slave address“

```
Please enter:
Slave address
1
```

The Huber thermostat is assigned an „address“, i.e. an assignment across the entire device system of the user. Selection range: 0 to 99.

If the analog input is enabled as the setpoint source in the menu, then this setpoint has a higher priority than the setpoint sent to the controller via the digital interface.

Keyboard entries are not possible in remote mode. There is only one exception: the MasterClear function (press the MENU and TEMP keys simultaneously). In this case, the program exits the remote mode and the controller can be operated via the keyboard again. At the same time, the controller setpoint active prior to selecting „RS232“ or „RS485“ will be reactivated (auxiliary setpoint).

4. Thermoregulation via Controller

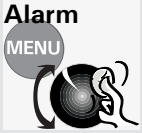
4.7. Editing Further Settings

13. Acoustic Alarm
14. Select Usermenu
15. Configure Usermenu

All the factory defaults can be customized in the menu.

All the factory defaults can be restored via the „Factory Default“ option (with the thermoregulation function switched off). (Also refer to „Salutation“ 4.1).

Acoustic Alarm




```
MAIN MENU:
   2nd Stpoint
I> Aucoustic alarm
   Alarm Clear
```

```
AUCOUSTIC ALARM
I> OFF
   ON
```

„Acoustic Alarm“ option
„Off“ Alarm signals and error messages without acoustic alarm.
„On“ Alarm signals and error messages with acoustic alarm.

Select Usermenu


```
MAIN MENU:
   PowerOff AutoStart
I> select user menu
   Setpoint Limit
```

```
USER MENU:
I> Administrator
   User menu 1
   User menu 2
   User menu 3
   User menu 4
   User menu 5
   User menu 6
   User menu 7
   Exit
```

„Select Usermenu“ option:

Only the administrator can select this submenu after entering the correct password.

Config Usermenu


```
MAIN MENU:
   Compressor Auto
I> Confis. User menu
   Control Mode
```

```
Please enter:
User menu
1
```

The „Config Usermenu“ option is visible to the administrator only (default see above „Select Usermenu“).
For this reason, only the administrator can select this submenu after entering the correct password.
Via the „Config. Usermenu“ option you define the menu options that are to be visible in the Main Menu, i.e. the factory default is customized.

The administrator password is forwarded to the user separately (on request).

5

Shut Down

5. Shut Down

5.1. Safety Instructions and Principles

Caution! Potential risk of injury and material damage:

Slip hazard! The floor and the workspace may be slippery when fluids have been spilt!
Tilt hazard! Make sure the thermostat and external devices are in a stable position.
Shock hazard! Make sure the connection to the power supply is undamaged and in perfect working order.
Scalding and burning hazard! Always be aware of extreme temperatures. **Causticization hazard!** Risk of causticization of your eyes, your skin and your respiratory tracts through hazardous vapors (depends on the thermofluid used).

Electrical connections	Make sure that the power connections are in good condition. Plugs, sockets and cables must be in good order and of the correct rating. Avoid contact with fluids. When replacing fuses, always use fuses with the correct ratings (refer to 5.3.!)
Cleaning	Clean and service the thermostat periodically (refer to 5.3!). Keep the vicinity of the thermostat clean! Always clean contaminated areas immediately.
Transport	Keep thermostats upright during transport. Transport thermostats on clean, level and non-slip surfaces only. Keep all the thermostat connectors/fittings closed. Close the valves for fluids! Protect plug-type connections using the caps provided for this purpose.

Please Note:

All the safety instructions are vital and must be considered during use in compliance with the present operating instructions!

5. Shut Down

5.2. Draining, Deactivating and Dismantling

Requirements

Keep at hand a collecting vessel, a suitable drain tube, a screwdriver, compressed air and a cleaning cloth.

Terminate the thermoregulation process via menu selection or by pressing the On/Off key (R4 with cc3). (The final temperature should be as close as possible to the ambient temperature. Highly viscous thermofluids may need to be above ambient temperature).

Draining Thermo-fluid

Requirements:
Caution: Risk of burns! Before draining it, allow the thermofluid to cool or warm to almost room temperature. Set the temperature to a value slightly above room temperature for highly viscous media.
Read the safety data sheet of the thermofluid in advance by all means; wear gloves, if required.

Avoid contamination in the vicinity of the thermostat through spilt or splashed thermofluid and through escaping hazardous vapors.
Use appropriate drain tubes and collecting vessels.

Draining:
Stop thermoregulation, switch off the thermostat at the power switch.
If the workspace in front of the thermostat is readily accessible, the device can be pulled directly to the edge of the workbench, and the thermofluid can flow freely into a collecting tank placed below the table, once the drain plug has been removed.

Otherwise, it can be drained via a suitable hose.
Put one end of the drain hose into the collecting tank.
Cautiously loosen the drain plug at the drain manifold. At the same time, have the end of the drain hose at hand.
Screw the drain plug completely out of the thread but still push it against the drain manifold. Remove the drain plug and at the same time slide on the hose.
The more rapidly and smoothly this is done, the less thermofluid is spilt.
Complete draining can be supported in the end by lifting the device and slightly tilting it.

Switching off

Disconnect the power plug.

Cleaning surfaces

Cover unused electrical connectors using the protective caps supplied.

Clean the stainless-steel surfaces using steel cleaning spray (Huber catalogue number 6283).

Carefully clean painted surfaces using a mild detergent.

Note: The drained thermofluid must be disposed of in compliance with the instructions of the fluid manufacturer.The drained cooling water can be disposed of through the standard sewage.

5. Shutdown

5.3. Maintenance and Service

Requirements

Keep at hand a collecting vessel, a suitable drain tube, a screwdriver, compressed air and a cleaning cloth.

The thermoregulation process is terminated via menu selection or by pressing the On/Off key (R4 with cc3). (The final temperature should be as close as possible to the ambient temperature, with highly viscous thermofluids slightly above the ambient temperature).

Replacing Fuses

In the case of a failure of the automatic cut-out, determine the cause of the failure and eliminate it.
Then replace the fuse.

Cleaning the Surfaces

Cover unused slide-on receptacles using the protective caps supplied for this purpose.

Clean the stainless-steel surfaces using commercial steel cleaning spray.

Carefully clean painted surfaces using brine made from a mild detergent.

Replacing the Controller

Caution! Disconnect the power plug bevor replacing the controller!!

If a defect comes up, you can replace the Ministat Control yourself. (When replacing the controller, please heed the safety instructions in the controller instruction manual.)
On the rear of the thermostat, there are two attachment screws. After you have loosened the two screws in the threads, apply uniform pressure to the screws to easily slide the slide-in module out to the front.

Caution! The bath cover must be closed!!

Urgent plea:
Maintain the warranty claim and the cost-efficient replacement price by not performing any repairs by yourself.

Caution!
The easiest and most effective method of preventing accidents and guaranteeing trouble-free operation:
Keep the vicinity of the thermostat clean!
Always clean contaminated areas immediately.
Service the equipment periodically!

5. Shutdown

5.3. Maintenance and Service

Maintenance of the Ministats

- The liquefier is on the bottom of the ministat housing.
  The cooling air is sucked in from below through the liquefier.
  Avoid light particles in the air suction area on the bottom ofthe device.
- The liquefier should be cleaned from time to time.
  For this purpose, remove the power cable from the ministat, completely drain the bath and tilt the housing to the rear by 90°.
  You can clean the liquefier using a brush or vacuum cleaner. Please do not use any sharp or pointed objects for this purpose.
- The ministat should be returned to its horizontal original position immediately after the cleaning procedure.

Disposal

- To prevent damage to the environment, dispose of „veteran“ thermostats through certified expert companies only.

Service Hotline

Hotline Germany:	**+49 - 781 - 9603 - 244**
Hotline Service Center USA:	**+1 - 740 - 373 - 6809**
Hotline Service Center NL:	**+31 - 485 - 542 - 811**

Caution!

The easiest and most effective method of preventing accidents and guaranteeing trouble-free operation!
Keep the vicinity of the thermostat clean!
Always clean contaminated areas immediately.
Service the equipment periodically!

6

Appendix

6. Appendix

6.1. Presettings

Programs for changing the factory default settings

Standard Parameter Set - Factory Default

4.7.2.	Alarm Configuration – Upper Alarm Limit	155 °C Ministat125
4.7.2.	Alarm Configuration – Upper Alarm Limit	205 °C Ministat230
4.7.2.	Alarm Configuration – Upper Alarm Limit	205 °C Ministat240
4.7.2.	Alarm Configuration – Lower Alarm Limit	-30 °C Ministat125
4.7.2.	Alarm Configuration – Lower Alarm Limit	-38 °C Ministat230
4.7.2.	Alarm Configuration – Lower Alarm Limit	-45 °C Ministat240
4.7.2.	Alarm Configuration – Level Alarm Delay	4 s
4.7.2.	Alarm Mode	Stop Mode
4.7.5-6	Analog Interface – Temp. T1	5 °C
4.7.5-6	Analog Interface – Temp. T2	35 °C
4.7.5-6	Analog Interface – Parameter Input	disabled
4.7.5-6	Analog Interface–Parameter Output /Source Analog Out	Internal Temp.
4.7.5-6	Analog Interface – Current at T	DAC 269
4.7.5-6	Analog Interface – Current at T2	DAC 4104
4.7.1.	Display – Display Modes	Standard
4.7.1.	Display – Display Angle	100
4.7.7.	Digital Interface – Hardware RS	RS 232
4.7.7.	Digital Interface – Baud Rate	9600
4.7.7.	Digital Interface – Slave Address	1
4.3.1.	Venting	Off / 10 s
4.3.7.	Max. Heat Power	100 %
4.6.1.	Calibration Prog. – TCal 1	0 °C
4.6.1.	Calibration Prog. – TCal 2	100 °C
4.3.7.	Compressor Auto	Automatic
4.7.1.	Mains Failure Auto	Off
4.6.2.	Offset Calibration – Internal Sensor	0 °C
4.4.2.	PI-Parameters – P-Internal	2500 Ministat125
4.4.2.	PI-Parameters – P-Internal	1125 Ministat230
4.4.2.	PI-Parameters – P-Internal	1125 Ministat240
4.4.2.	PI-Parameters – I-Internal	1000
4.5.2-5	Edit Program	0
4.7.8.	Acoustic Alarm	On
4.3.2.	Setpoint	20 °C
4.3.2.	Setpoint Limits – Minimum Setpoint	5 °C
4.3.2.	Setpoint Limits – Maximum Setpoint	35 °C
4.4.1.	Language	Deutsch
4.4.1.	Temperature Scale	°C
4.4.1.	Control Mode	Internal
4.3.1.	Circulation	Off
4.7.8.	Usermenu	Administrator
4.7.1.	Time Scale	Minutes
4.3.2	2nd Setpoint	5 °C

EXTRA

All the factory defaults can be restored via the „Factory Default" option (refer to 42-1).

6. Appendix

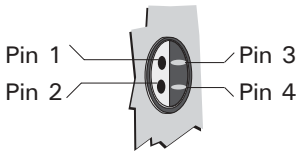
6.2. Interface Specification, Data

Please adhere to the following general principles:

- Always switch off all associated devices before connecting any cables.
- Only low voltages may be applied to the interfaces of the Huber devices.
- Always use an process sensor with a shielded cable. Otherwise the sensor may be electro-statically charged. The charge on the sensor could damage the measuring circuit when the sensor is connected.
- Before connection of plug-type connectors, ensure that they are in good and proper condition.
- Never try to make an electrical connection using force.

Pt100 external

Pin 1: I+
Pin 2: U+
Pin 3: U--
Pin 4: I- (four-conductor technology)
Refer to 2.1, 2.2 and 3.5!

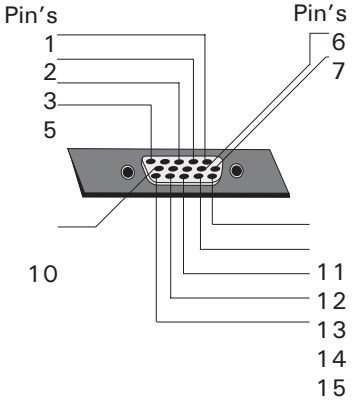


RS232/ RS485

Poko dry contact (Potential-free contact)

Pin 1: Terminating resistor 120 Ù, RS4851
Pin 2: Data input RS232 (RXD)
Pin 3: Data output RS232 (TXD)
Pin 4: Reserved, please do not use!

Pin 5: Earth (DGND)
Pin 6: Potential-free contact (Poko) max. 1 A / 24 V DC
Pin 7: Terminating resistor 120 Ù, RS485
Pin 8: Reserved, do not use!
Pin 9: Reserved, do not use!
Pin 10: Potential-free contact (Poko)
Pin 11: A (RS485)
Pin 12: Analog output for AIF
Pin 13: Analog earth (AGND for AIF)
Pin 14: Analog input for AIF
Pin 15: B (RS485)



Refer to 2.1, 2.2 and 3.5!

Data Communication

Various protocols are available for complex parameterization to customize a Huber device to an automated application.
Examples: Point-to-Point commands for direct operation with a PC; LAI instruction set for RS485 bus systems.
For more detailed information, please refer to: **Data Communication Manual**

ComBox According to the Namur Standard

6.3. Signal Interface

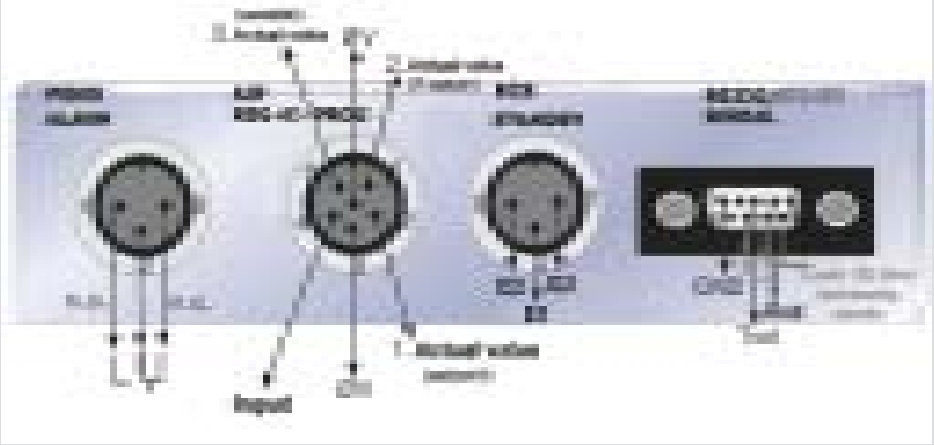
General Safety Principles

Warning: Never apply mains voltage to the plug connections of the ComBox! **Danger to life!**

The CC-3 controllers are equipped with a 15-pin multi-function connector for connection to process control equipment. For all Huber devices produced after August 2003 and equipped with a CAN connector, we offer an optional ComBox with an enhanced scope of functions.
The signal interface communicates with the CC controllers via the internal CAN bus, independent of whether the device is operated with a CC-1, 2 or 3 controller.

Generally, the signal interface offers the following functions:
Signal connectors are designed according to the NAMUR recommendations.(There is no possibility of confusing them)

BU1: Digital interface with commands suggested according to NAMUR (RS232/ RS485).
BU2: Release signal ECS can be implemented with the potential-free contact.The pins 1 and 3 are bridged out.
BU3: Analog interface with one input (definition of the setpoint) and max. 3 output channels.
St4: POKO (dry contact) breaks contact and makes contact elements lead through.



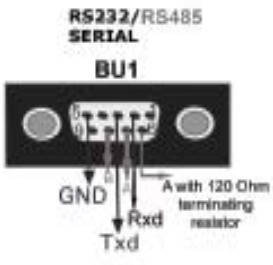
St4 BU3 BU2 BU1

Please note: if the ComBox is operated with a cc3-controller, signal moduls which exist twice will be blocked on the controller.
This is applicable for the digital interface, the analog interface and the ECS.

ComBox According to the Namur Standard

6.3. Electrical Connection Options

RS232/RS485, ECS external control signal (standby)



RS232/ RS485 Serial Interface

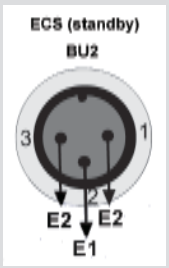
A PC for remote control of the controller electronics can be connected to this socket.
Before connecting the cable, check and adapt the settings (if required) in the „Digital Interface“ menu.

RS232 circuit:

Pin 2	RxD	Receive Data
Pin 3	TxD	Transmit Data
Pin 5	GND	Signal GND

RS485 circuit:

Pin 6	A with 120 Ω terminating resistor
Pin 7	A
Pin 8	B



ECS input (standby)
(external control signal)

Pin	Signal
1,3	E2
2	E1

ECS is electronically active when E1 and E2 are linked through a dry contact.

The ECS' fonctionality is determined via the menu „machine options“. Please refer to chapter 4.3..

ECS factory default: ECS off.

ComBox According to the Namur Standard

6.3. Electrical Connection Options

AIF Analog Interface

Analog Signals

The analog interface of the ComBox is normaly programmed via the menu „analog Interface“.

The ComBox features 3 analog channels. They are occupied as follows:

1. (1st) actual value: Allways the output of the actual setpoint.

2. (2nd) actual value: Allways the output of the process temperature.

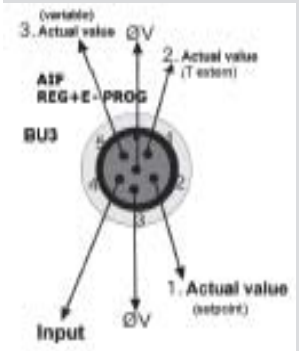
3. (3rd) actual value: The behaviour of this output is programmable (via the controller menu Analog Interface\ Analog Out).

Safety Instructions for the ComBox: Never apply mains voltage to the plug connections of the signal interface! Danger to life!

ComBox According to the Namur Standard

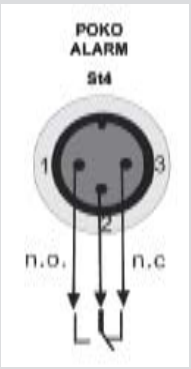
6.3. Signal Interface

Analog Interface (AIF/REG + E-PROG) and POKO (dry contact)



Programmer input/temperature recorder outputs
AIF/REG + E + PROG

Pin		Signal
1 Current output	2nd actual value	0...20 mA
2 Current output	1st actual value	0...20 mA
3 Gnd for output		0V
4 Analog input		0...20 mA
5 Current output	3rd actual value	0...20 mA
6 Gnd for Analog input		0V



POKO (dry contact) (for external alarm evaluation)

This connection is designed in the form of a potential-free change-over contact. Pin 2 and Pin 3 are connected in steady state.

Switching current max. 1A at 24V DC

Use shielded cables only!

The POKO (dry contact) shows the status of the thermostat through the position of the switch. If the normally open contact (n.o.) is closed, the unit will be in working order. In case of disturbance, the n.o. will be open.

Safety Instructions for the ComBox

Warning: Never apply mains voltage to the plug connections of the signal interface! Danger to life!

ComBox According to the Namur Standard

6.3. Digital Interface with Additional NAMUR Commands

RS232-, Command syntax, Namur commands

RS232 Commands

The ComBox features a digital RS232 interface.
According to the NAMUR recommendation (NE28), some commands are set up. The following character notation conditions apply if you use these Namur commands:

1 Start bit
8 character bits
1 Stop bit.
No parity

The transfer rate is set in the „Digtal Interface“ menu of the controller.

Data flow controller: Commands are not buffered, a new command may be sent as soon as the response to the topical query has been received. If a response it not to be expected, a break of 500 ms must be made.

Access mode: Master (computer/ PLC) slave (thermostat) procedure. The slave can only be active on request of the master. Guaranteed response time: within 500 ms.

More notes on the command syntax

- Commands and parameters must be separated with a blank
- Parameters are submitted with a floating point number or an integer
- The full stop is the decimal separator in a floating point number (Code 46).
- Following the comma, 2 characters are permissible in OUT commands.
- A following physical unit is ignored.
- A positive sign can be omitted.
- Exponent parameters are not permitted.

Namur Commands

IN_PV_00	Query Tintern temperature (jacket)
IN_PV_02	Query Textern temperature (reactor inside temperature)
IN_SP_00	Query current thermoregulation setpoint
IN_SP_05	Query current analog setpoint
OUT_SP_00	Define xxx.xx setpoint
START	Activate thermoregulation
STOP	Deactivate thermoregulation
STATUS	Query device status

STATUS	**Monadic**
-1	Alarm
Manual Stop 0	OK / standby / manual stop
Manual Stop 1	OK Temp. or bleed
Remote Stop 2	Remote control of active temp. off
Remote Start 3	Current temp. with remote control

Safety Instructions for the ComBox

Warning: Never apply mains voltage to the plug connections of the signal interface! Danger to life!

ComBox According to the Namur

6.3. Digital Interface with Additional NAMUR Commands

Command Sequence

Example

Command Sequence

Example of a Possible Thermoregulation Task:

Note: the notation \r\n means that CR LF is used as the terminating character of the command. The characters exchanged via the interface are enclosed in „".

Master	Slave	Comment
„START\r\n"		Start thermoregulation
„OUT_SP_00 21.20\r\n"		Set setpoint to 21.2 °C
„IN_PV_00\r\n"		Setpoint queried Request Tintern (internal temperature)
	„20.5\r\n"	Slave sends the temperatures
„IN_PV_02\r\n"		Request Textern (external temperature)
	„20.5\r\n"	Slave sends the temperatures
„STOP\r\n"		Switch off thermoregulation

Note:

If the controller doesn't answer, a break of 0.5 s must be maintained.

Safety Instructions for the ComBox

Warning: Never apply mains voltage to the plug connections of the signal interface! Danger to life!

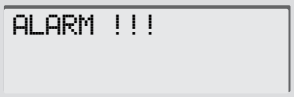
6. Appendix

6.4. Device Messages

„Device messages“ are codes that inform the user or service technician of „occurrences“ and the current status of internal components and systems at the time of the „occurrence“.
The controller display’s device messages automatically
Device messages can be a warning or a fault.
All alarm messages shut down the thermoregulation process.
Factory default settings determine that all device messages are accompanied by an acoustic alarm. (This can be disabled via the „Acoustic Alarm“ option.)

All alarm messages will persist until the cause of the alarm has been rectified.
All alarm messages must be acknowledged via the „Alarm Mode“ option.
Once the alarm has been acknowledged and the cause of the alarm has been rectified, the alarm message will disappear.

Once the cause of the alarm has been rectified, the thermostat will function as programmed.



The display shows the alarm message in the form of a „flash“ display.

In intervals of 2 seconds, the display alternates with the status display.
„Alarm !!!“ is displayed in the upper line of the alarm message.
The cause of the alarm is displayed in the bottom line of the alarm message.

To acknowledge the alarm message:
Select the „Alarm Mode“ option. Display in Stop Mode (refer to 4.3.9) Follow the displayed prompts.

Display in Stop Mode (refer to 4.3.9)
Select „Restart“ or „Continue“.

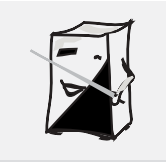
The following applies to all automatic messages that are identified by the „Practice“ icon:
Please check the external conditions of your thermostat and your controller inputs according to the operating instructions and your process arrangement.
If required, re-program the condition.
If the message persists after you have repeated this action, please contact our Service Hotline.

The following applies to all spontaneous messages that are identified by the „Hotline“ icon:
Please switch off the thermostat and call our Service Hotline

Hotline Germany:	**(+49)781 – 9603 – 244**
Hotline Service Center USA:	**(+1)740 – 373 – 6809**
Hotline Service Center NL:	**(+31)- 485 – 542 - 811**

6. Appendix

6.4. Device Messages



Description of the message.
Behavior of the thermostat.
Your response.

Hardware error

```
device not
initialized
```

Cause
During the self diagnostics carried out by the machine after a controller has been replaced a new controller is detected by the operating system. This error just means that the system does not recognize the new controller.
Effect
The circulation and thermoregulation process cannot be started.
Remedy
Please select the „Unit Data“ option in the „Factory Default“ menu.
This eliminates the error.

Hardware error

```
ALARM  !!!

HARDWARE ERROR  !!
```

Cause
During the self diagnostics carried out by the machine after a controller has been replaced a new controller is detected by the operating system. This error just means that the system does not recognize the new controller.
Effect
The circulation and thermoregulation process cannot be started.
Please call our customer service!

Device ID error

```
ALARM  !!!
Device ID error  !!
```

Cause
During the self diagnostics carried out by the machine after switch-on an error is detected in the hardware or software. This could happen after a controller replacement.
Effect
The circulation and thermoregulation process cannot be started.
Remedy
Please call our customer service!

Over-temperature

```
ALARM  !!!

OVERTEMPERATURE  !!
```

Cause
The temperature of the thermal fluid exceeds the temperature limit of the over-temperature protection device.
Effect
The circulation and thermoregulation process is stopped.
Remedy
Please check your set-point or your thermoregulation program as well as the setting of the over-temperature protection device and compare it to the safety requirements of your process and the application limits of your thermofluid.
Correct your inputs or the setting of the over-temperature protection (refer to 3.1, 3.4, 4.1, 4.4.1 and 4.7).
Restart the thermoregulation process according to the alarm mode.

Over-temperature

```
ALARM  !!!

ALARM TEMPERATURE  !!
```

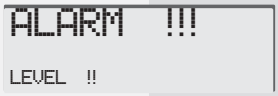
Cause
In Alarm Run Mode only (refer to 4.3.8.): The thermal fluid's temperature exceeds the „upper alarm limit“ or has dropped below the „lower alarm limit“.
The circulation and thermoregulation process is stopped.
Remedy
Please check your set-point or your thermoregulation program as well as the setting of the over-temperature protection device and compare it to the safety requirements of your process and the application limits of your thermofluid.
Correct your inputs or the setting of the alarm limits (refer to 3.1, 3.4, 4.1, 4.3.8 and 4.7).
Restart the thermoregulation process according to the alarm mode.

6. Appendix

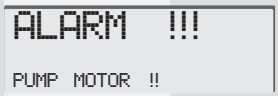
6.4. Device Messages

Description of the message.
Behavior of the thermostat.
Your response.

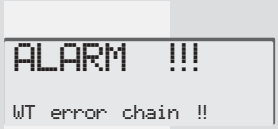
Level



Cause
The level has dropped below minimum allowed thermofluid level or the circulation pressure of the pump is too low.
Result
The circulation and thermoregulation process is stopped.
Remedy
Please check the thermofluid filling level and if necessary, replenish the thermofluid, (refer to 3.4).
Restart the thermoregulation process.
If the alarm message persists, please check for visible causes of extraordinarily high fluid losses through loose or defective connections, defective tubing, fluid contamination etc. and rectify.If the alarm persists despite your remedial action, please call our customer service!



Cause
The circulation pump is overloaded and the pump motor has overheated.
Result
The circulation and thermoregulation process is stopped.
Remedy
Make sure that the thermofluid in use is suitable for the temperature range over which the thermostat is used.
The viscosity of the thermofluid must not exceed 50 mm^2/s.
If required, change the thermal fluid.
Once you are sure that the correct thermal fluid is in use or replaced the thermal fluid with one that is suitable, allow the pump motor to cool and re-start.
If the alarm message persists and you are using a suitable thermal fluid, please call our customer service!

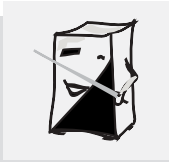


Cause
A general fault has been detected with the motor windings or an incorrectly rotating 3-phase supply has been detected.
(A trained electrician must swap any two phases in the mains plug to change the direction of rotation of the 3-phase supply)
Effect
The circulation and thermoregulation process is stopped.
Remedy
Make sure that the thermofluid in use is suitable for the temperature range over which the thermostat is used.
The viscosity of the thermofluid must not exceed 50 mm^2/s.
If required, change the thermal fluid.
Check the condition of all circuit breakers and re-set as necessary.
Once you are sure that the correct thermal fluid is in use or replaced the thermal fluid with one that is suitable, allow the pump motor to cool and re-start.

If the alarm message persists and you are using a suitable thermal fluid, please call our customer service.

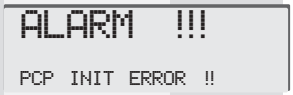
6. Appendix

6.4. Device Messages



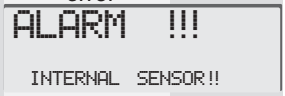
Description of the message.
Behavior of the thermostat.

Hardware error



Cause
During the self diagnostics carried out by the machine a hardware or software error has been detected. Thiscan sometimes happen after fitting a new controller.
Effect
The circulation and thermoregulation process cannot be started.
Remedy
Please contact our customer service!

Hardware error



Cause
An internal temperature sensor is not connected or is defective.
Effect
The circulation and thermoregulation process cannot be started.
Please call our customer service!

Device ID Error

Cause
External Pt100 sensor is not connected or defective.
Effect
The circulation and thermoregulation process cannot be started.
Remedy
Please check the connection of your process Pt100 sensor including the connecting cable and the sensor itself. If the sensor is defective, replace it with a new one.

Appendix

Huber Glossary

AIF – Analog Interface The analog interface is used to transfer constantly changing values, mostly temperatures, in the form of a signal current (generally 4 to 20 mA). Refer to „External Control"! Refer to 4.3!

Alarm Limit The defined absolute temperature for the thermofluid or product depending on the control mode.When the temperature exceeds or drops below the defined value, the thermostat will respond as defined in the alarm mode.

Alarm Mode
The response of the thermostat when the temperatureerature has exceeded or dropped below the defined alarm limits.

Ambient Temperature Range
This is the temperature range permissible in the area surrounding the device for the device to function properly.
For all devices by HUBER, this is the temperature range from 5 to 30 °C. The cooling performance quoted is always based on an ambient temperature of 20 °C.

Automatic Mains Failure Control (Mains Failure Auto)
Determines the response of the thermostat in the case of a power failure.
The corresponding settings are made in the main menu of the controller.
Default setting:
Mains Failure Auto is disabled.Once the supply of power has been restored, manual intervention is required to continue the thermoregulation process.
Alternative setting:
Mains Failure Auto is enabled.Once the supply of power has been restored, thermoregulation is automatically continued.
Refer to 4.3!

Automatic Cooling Capacity Control
A method for saving energy and resources.The microprocessor control determines whether the required cooling capacity can be reduced according to the operating temperature.The adaptation is performed continuously and – apart form saving energy – it also protects the compressor, decreases heat dissipation into the environment and reduces the consumption of cooling water.
Refer to Compressor Auto, 4.3!

Automatic Compressor Control (Compressor Auto)
Supports an energy-saving method for cooling thermostats in specific thermoregulation situations.A control logic in the microprocessor helps decide whether the chiller is needed at all or whether it can be switched off.
Refer to 4.2.! Refer to Automatic Cooling Capacity Control!

Actual Temperature
The temperature at the measuring point at the time of display.The measuring point is either in the thermostat, in the thermofluid (factory default: internal thermoregulation) or external to the thermostat, e.g. in the core of a reactor (external thermoregulation).

Bath, Closed
Double-wall, closed „shell" with inflow and outflow connections.
Indirect thermoregulation of the customers' products in the „core".Designed in metal or glass.Refer to „Reactor", refer to 3.3!

Bath Opening
This is the active surface available for direct thermoregulation, generally across the entire usable depth.

Bath Thermostat
A bath thermostat is a thermostat equipped with a circulation pump (force pump in Polystats) and a bath tank for holding the object to be thermoregulated.The circulation pump is primarily used for mixing the bath fluid, if required, however, it can also pump the fluid through a closed external circuit, e.g. when flow water coolers for cooling heating thermostats are connected.

Bath Thermostat/Circulator
Thermostats with a bath opening large enough to accommodate objects for direct thermoregulation in the bath, including a circulation pump (force or suction pump with Compatible Control thermostats) for closed (force pump) or open external (suction pump) circuits.

Bath Volume (also referred to as fill volume)
The volume of the thermofluid inside the bath, required for the intended operation of the thermostat, excluding the thermofluid volume in external fluid circuits.
Especially in closed external applications, the expansion tank must be dimensioned with care since the circulator must additionally handle the expansion of the fluid in the external circuit.

Baud Rate
The data transfer rate for serial communication (mandatory setting).
Refer to:4.2 Digital Interface!

Bath Tank
An open tank that holds the thermofluid (fluid for thermoregulation).

Appendix

Huber Glossary

Calibration Thermostat (CAL)
A bath thermostat with an especially high degree of temperature stability and especially uniform temperature distribution across the bath fluid.

Calibration
Verification of the measured values displayed and – if required – recording of the values by which the displayed values deviate from the actual temperatures measured.Refer to Offset Calibration!

Cascade Control
Refer to Process Control!

Characteristic Temperature
This term denotes the operating temperature of a heating thermostat attained in stationary status with the heating switched off and the pump in operation.It depends on the motor capacity of the pump installed, the bath fluid used (viscosity, density) and the thermostat insulation, e.g. on whether the bath cover is used or not.

Compressor
A compressor is a machine for compressing gases and vapors.

Condenser
Apparatus in chillers for condensing refrigerant vapors (liquefier).

Cooler (Special Feature of the Unistat Tango)
This type of cooler is a heat exchanger through which water flows during the cooling process. This cooling water leads off just enough heat from the superheated refrigerant to prevent condensation.
The cooling water may flow only while the compressor is in operation, otherwise the cooling unit will not work!
It is important that only a tiny runnel of cooling water is routed through the cooler.

Cooling Capacity
Heat abstraction from the thermofluid via heat exchangers, using either ambient air or cooling water.
Refer to HT-Cooler!

Cooling/Heating Thermostat
A thermostat with a working temperature ranging from below to above the ambient temperature that is capable of abstracting heat from and transferring heat to the thermofluid.

Cooling Thermostat
A thermostat, the working temperature range of which is generally below the ambient temperature and that preferably abstracts heat from the thermofluid.HUBER cooling thermostats are actually cooling/heating thermostats since their working temperature ranges from below to above the ambient temperature and they are capable of abstracting heat from or transferring heat to the thermofluid.

Cooling Water
Water routed through the thermostat via a system of pipes for cooling the chiller.It should contain only minimized amounts of lime and corrosive substances that limit the life cycle of the system.

Cooling Circulators (IC, UC)
These are cooling thermostats designed in the form of circulators.Due to their special design (desktop, tower, without a readily accessible bath), their cooling performance and pumping capacities, they constitute a separate device group.

Circulation Pump
The circulation pump is used to circulate the thermofluid in a closed circuit.

Circulator (Unistat)
A circulator is a thermostat, in which the thermofluid is routed through an open or closed external circuit.Unistats feature a thermically decoupled, active surface (expansion tank). In this case, however, the surface temperature differs from the operating temperature. Unistats are not equipped with a bath.

Circulation (operating mode)
Circulation means that the thermofluid circuit is driven by the circulation pump.The heater and/or cooling unit are switched off.
Refer to 4.6!“Circulation“!

Controller
In a long tradition at Huber’s, „controller“ refers to an exchangeable electronics unit, including the required control and thermoregulation software.Refer to 2.3!

Control Mode – Internal, Process (Cascade)
Internal thermoregulation:The temperature measured inside the thermostat (flow temperature) is used as the controlled variable for thermoregulation.**Process (Cascade)**:With the aid of an external Pt100 sensor, a measuring point outside the thermostat in an external application, e.g. in a reactor, is used for controlling the thermoregulation process.
Refer to:4.4!

Appendix

Huber Glossary

Default Parameters
Refer to Factory Default!

Delivery Pressure
The overpressure of the circulation pump of a thermostat directly at the pressure connecting piece, measured using water.On charts, the delivery pressure is expressed as a function of the flow rate.

Delivery Suction
The suction of the circulation pump (force/ suction pump or duplex pump) directly at the pressure connecting piece, measured using water.On charts, the delivery suction is expressed as a function of the flow rate.

Digital Interface
The digital interface is used to transfer data in the form of bits and bytes.

DW-Therm
DW-Therm is a thermofluid (fluid for thermoregulation) developed especially for Unistats (Huber thermostats with a closed thermofluid circuit) with an extremely large temperature range (-90°C... + 200°C).

Effective Heating Capacity
Heat flow delivered to the thermofluid (fluid for thermoregulation) by heat sources.

Extended Working Temperature Range
This is the working temperature range extended to lower temperature levels achieved through the use of a manufacturer-defined cooling coil with cooling water.

External Control
The thermostat is not controlled through the controller but rather through external equipment. The external interface (multifunction socket) on the Polystat controller is used for this purpose.
Refer to:2.3, 4.3!

Factory Default
The manufacturer has set the thermostat parameters such that the temperature range constitutes only a minimum potential hazard and that the easiest and most probable thermoregulation process can be performed. Factory defaults ensure safe commissioning by the customer and can be changed using the respective programs according to the requirements of the customer
All the factory defaults can be restored with Program 52 with the thermoregulation function switched off.
Refer to 4.2 Restart!

Fill Volume
Refer to Bath Volume!

FL
Refer to Safety Classification!

Flash Point
The term flash point denotes the temperature to which a fluid in an open bath must be heated until the vapor/air mixture at the surface inflames when a flame is held near and keeps on burning once the flame is pulled away again.
Refer to:3.1.EN 61010-1EN 61010-1

Flash Display
Controller display shown for seconds only to provide information on a variable intermediate program status or the status of the thermostat.

Flow Cooler (DC)
Flow coolers are „uncontrolled" coolers without circulation pump that are interposed in an external circuit, thus expanding the functionality of a heating thermostat to that of a heating/ cooling thermostat.On the one hand, they substitute water cooling, on the other hand they are used to achieve lower temperatures.

Flow Rate
The volume of fluid delivered by the circulation pump per time unit, measured using water.In charts, the flow rate is expressed as a function of the delivery pressure (backpressure).

Flow Temperature
Denotes the temperature measured directly at the point the thermofluid exits the circulator.

Force Pump
The force pump is used for circulating the thermofluid in a closed external circuit and for mixing the fluid inside the bath.

Force/Suction Pump
This pump features a pressure and a suction stage driven by a common motor.The pressure stage forces the thermofluid from the thermostat into the circuit, the suction stage draws the fluid back into the thermostat.A force/suction pump can be used in a closed circuit.Benefit:In the external circuit, the pressure drops from positive values (pressure) to negative values (vacuum) and is almost zero in the consumer.This facilitates thermoregulation even of pressure-sensitive glass vessels.In addition, an open external circuit (bath tank) can also be connected using a force/suction pump.A level constant ensures a constant fluid level in the bath tank.

Appendix

Huber Glossary

Gas Venting
A special thermoregulation regime common to all Unistats with the objective of perpetuating thermoregulation despite the evaporation of part of the thermofluid and removing elements with a low boiling point from the circulating fluid.

Heat Exchanger
Refer to Thermofluid!

Heating Capacity
The maximum installed electrical power of the heating element.The heating capacity depends on the voltage of the thermostat. It is continuously controlled and reduced when the temperature approaches the programmed setpoint.

Heating Thermostat
A thermostat, the working temperature range of which is primarily above the ambient temperature and that preferably transfers heat to the thermofluid.

High-Pressure Cut-Out
Protective switch installed in Unistats and Unichillers. Shuts down the thermoregulation process if the pressure on the compressor side gets too high.
Applies to Unistats:Once the Unistat is ready for operation again, the high-pressure cut-out must be pressed to continue the thermoregulation process.
Applies to Unichillers:Once the Unichiller is ready for operation again, the high-pressure cut-out is automatically reset to continue the thermoregulation process.(The high-pressure cut-out in Unichillers is not readily accessible.)

High-Temperature Cooler (with Unistats):
A high-temperature cooler is a heat exchanger that cools a thermofluid from a high temperature to ambient temperature using air or water.It is installed on the upstream side of chillers in Unistats, thus reducing the load on and power consumption of the chiller.

High Temperature Stage (HT) (with Unistats):
The ***high temperature stage*** is the top temperature stage in multi-stage chillers in Unistats.Sie dient der It is used for decreasing the temperature (to approx. −60 °C) and thus prepares ***the low temperature stage*** (NT) in dual-stage chillers (to approx. −90 °C) and the medium temperature stage (MT) (to approx. −90 °C) in triple-stage chillers.
The medium temperature stage, in turn, prepares the low temperature stage (currently to approx. −120°C) in triple-stage chillers.

Housing Volume
The volume resulting from the outer dimensions of the thermostat.

Immersion Cooler (TC)
A cooling unit with a flexible tube and a cooling coil (evaporator) for immersing in baths.

Immersion Thermostat (Polystats cc)
This is a thermostat that is combined with a bath tank that forms an independent unit. Immersion thermostats are equipped with a screw clamp for fastening to the walls of any desired bath tank. Using a bath bridge, they can also be mounted permanently on the top of a bath or on a tripod.

Industrial Thermostats (IC-Hx)
Industrial thermostats are cooling circulators (intelligent chillers) with a heater installed ex works.High cooling, heating and pumping capacities and small fluid volumes provide for fast cooling and heating rates.They are ideal for thermoregulation in process engineering and in narrow temperature ranges (-20..120 °C).

Interface, Analog (AIF)
This interface is used for entering the temperature setpoint or for the output of the actual temperature as an analog value in the form of a signal current (4 – 20 mA).Refer to: 4.3 Main Menu, Analog Interface!

Interface, Digital
This interface is used for digital data exchange between connected devices via the data communication line.Primarily, the temperature setpoint and the actual temperature are transmitted.Refer to:RS232 Interface and RS485 Interface!
Refer to:4.3 Main Menu, Digital Interface!

Low Temperature Stage (NT)
Refer to High Temperature Stage!

Medium Temperature Stage (MT)
Refer to High Temperature Stage!

Net Refrigerating Capacity
The effective capacity the cooling thermostat or chiller provides for the application.The frictional heat generated by the circulation pump and the heat entering due to insufficient insulation has already been taken into consideration.The cooling capacity data correspond to those of the net cooling capacity.

NFL
Refer to Safety Classification!

Appendix

Huber Glossary

Offset Calibration
Single-point correction of a temperature sensor at a specific temperature.

Operating Temperature Range
This is the temperature range that is limited by the permissible minimum and maximum operating temperature.
The operating temperature is the temperature to which the thermostat is permitted to heat/cool the respective thermofluid.

Overheat Point
Refer to Overtemperature Protection!

Overheating
The positive difference between the condensation temperature and the topical gas temperature of the thermofluid in the refrigeration process.(Does not refer to overheating of the thermostat!)

Overtemperature Protection
Each thermostat with a heater is equipped with overtemperature protection.The overtemperature protection operates completely independently of the controller, i.e. it cannot be influenced through the controller.If at least one temperature sensor reports that a temperature limit has been exceeded, the thermoregulation process is stopped at once.
In the course of the thermoregulation process, the sensors are tested for short-circuit and failure.The overtemperature protection is equipped with an independent protective device.This prevents very reliably that the OK status is set while there actually is a failure.The user sets the upper temperature limit (overheating point) at the thermostat to ensure operating safety considering the respective thermofluid used.For unattended operation, the overheating point must be selected at least at 25 °C below the flash point of the respective thermofluid.
Refer to:4.1.!

Physical Mass
The physical mass describes the P/I parameters (P = proportional, I = integral) of the thermostat.
Refer to 4.3!

PLC (Programmable Logic Controller)
A device frequently used in industrial environments to control operations and processes.

POKO Potential-Free Contact
The POKO is a change-over contact led through the POKO relay in the controller.The potential-free contact is designed for an ohm resistive load up to 30 V and a maximum of 0.1 A.
The following applies due to the working current principle:The OK status is linked to the flow of current through the winding of the POKO relay.The POKO relay is actuated by the controller.

Presettings ex Works, Factory Default
Refer to Factory Default!

Process Control (often referred to as cascade control)
Thermoregulation of a connected application.A temperature sensor (Pt100) that forms part of this application is connected with the thermostat.The actual temperature of the external process is sensed and the operating temperature of the thermostat is permanently calculated and adapted.Depending on the operating temperature, losses through insulation and exothermic reactions, the operating temperature at the consumer may deviate considerably from the setpoint and the actual temperature of the application.
Caution!
Observe the safety-relevant limits of the respective thermofluid!
Refer to: 3.1!

Process Temperature (core temperature)
The process temperature is the temperature measured in the core of a connected external application (in the case of external thermoregulation), e.g. in the core of a reactor.Refer to Reactor, Control Mode!
Refer to 2.3!

Program (Thermostat Control)
The controller provides programs for the user to operate the thermostat, to monitor and control statuses and processes, i.e. to perform the thermoregulation process.

Program (Thermoregulation)

Refer to Thermoregulation Program!

Appendix

Huber Glossary

Protocols
Protocols are used in digital data exchange.The term protocol in this context refers to a series of rules drawn up to facilitate uniform coding and decoding of the bits and bytes in the data exchange between the thermostats and a **PC, PCS** (process control system) or the like. For the time being, three protocols are available, two of which have been implemented in all the product families.
PPP – point-to-point protocol
LAI protocol – for communication on the bus
The third protocol is currently only available for UNISTATS on demand:
Modbus protocol (Modbus RTU by Gould)

Ramp
A desired change in temperature within a given time period.A ramp is a simple and frequently used programming of a temperature pattern.
A ramp is defined through the increase in temperature and the thermoregulation period.Once the ramp has been entered, the thermoregulation process thus programmed will start automatically and does not require any accompanying inputs.
The ramp can be defined through different combinations and sequences of the setpoint, time period and slope parameters.
Where:Time period = slope x setpoint
Refer to 4.3!

Reactor
A cylindrical double-wall tank permitting the flow of thermofluid through the space between the two walls (jacket).The temperature of the thermofluid is transferred to the hollow space inside (core) via the inner wall.The user fills his/her reagents into this core with separate inlets and outlets.The reagents are then indirectly thermoregulated via the inside reactor wall.

Refrigerant
Refrigerant is used in the circuit of the refrigerating unit. It abstracts heat from the thermofluid when the compressed gas expands and evaporates in the evaporator.Since 1992 HUBER has been using exclusively refrigerants free of CFC and since 1994 even refrigerants free of HCFC (e.g. R22) that do not harm the ozone layer, i.e. with an ODP (Ozone Depletion Potential) = 0 and minimized GWP (Global Warming Potential, e.g. greenhouse effect).

Refrigerating Capacity
Heat flow led off from the thermofluid by a cooling thermostat.

Remote Control Panel
An external device permitting operation of the Huber Thermostat (possibly to a limited extent).

RS232 Interface
Digital controller interface for digital data exchange between connected devices via the data communication line.RS232 is a serial interface for establishing a point-to-point connection.This means, only two parties, e.g. a thermostat and a PC, can communicate via the interface at a time.
Refer to:4.3. Main Menu, Digital Interface!

RS 485 Interface
Digital controller interface for digital data exchange between connected devices via the data communication line.
As many as 32 parties can be connected to the RS 485 interface.Each party connected to this bus system is assigned a separate address.
Refer to:4.3 Main Menu, Digital Interface!

Safety Classificatio
In thermostats, either flammable (FL) or non-flammable (NFL) thermofluids (fluids for thermoregulation) may be used.The respective safety requirements have been laid down in DIN EN 61010-2-010.Accordingly, the safety classes NFL and FL have been defined:
NFL (non-flammable) thermostats with integrated overheating protection exclusively for non-flammable fluids.
Thermostats classified as FL (flammable) with adjustable overtemperature protection and low liquid level protection for flammable fluids (all the thermostats by HUBER).Refer to: 3.1. Thermofluid!

Segment
A segment is a section of a thermoregulation program that creates part of the temperature graph.
Refer to Thermoregulation Program!

Setpoint
The temperature to be attained at the point of measurement.
Maximum Setpoint
The highest permissible temperature to be attained at the point of measurement.
Minimum Setpoint
The lowest permissible temperature to be attained at the point of measurement.
Refer to Control Mode! Refer to 4.4!

Self Test
Test procedure in the thermostat after power on.It ensures the operability of safety-relevant thermostat components.
(Except for overtemperature protection!)

Appendix

Huber Glossary

Slave Address
Identification number the user assigns to a device to be able to allocate data to a device during data transfer via a bus protocol.
Refer to RS485 Interface!

Standards
Safety requirements for electrical laboratory equipment, and especially for thermostats, have been laid down in European Standards EN 61010-1 and EN 61010-2-010.These standards replace DIN 12879 (among others).The terms and characteristic data are defined in DIN 12876-1 and DIN 12876-2.

Status Display
Display on the UniCop that provides information on the topical program sequence or the topical status of the thermostat.

Temperature – internal, external
Refer to Control Mode, Flow Temperature!

Temperature Stability
This term denotes half the difference in temperature between the highest and lowest temperature measured in a thermostat within 30 minutes of attaining a stable value at a specific setpoint.
This value is determined at a temperature of 70 °C (with water) for a heating thermostat and at – 10 °C (with ethanol) for a cooling thermostat.
Also refer to DIN 12876!

Temperature-Stable
Refer to Thermoregulation, Temperature-Stable!

Tempmove
Possibility of selecting the input variable for a temperature.

Thermofluid (fluid for thermoregulation)
Heat transfer fluid. Transfers energy from the thermostat to the application or vice versa.Siehe 3.1.!Refer to 3.1!

Thermoregulation Fluid
Refer to Thermofluid!

Thermoregulation
The active manipulation of the temperature of a substance to the desired level by way of heating and/or cooling

Thermoregulation, Temperature-Stable!
Thermoregulation will proceed until the defined setpoint has been attained (if required, the desired thermoregulation period will be exceeded).**Thermoregulation, Time-Stable**
Thermoregulation will proceed according to the time targets entered (independent of the actual temperature value attained).

Thermoregulation Program
Arrangement of segments to create a reproducible temperature graph.
A thermoregulation program is made up of a program header and segments.
The program header is independent of the number of active segments and the length of the program.
The program header defines the beginning and sequence of the thermoregulation program (TP) through the following parameters:
Start temperature of segment n, start ramp slope (K/min),
thermoregulation priority: temperature-stable or time stable, program end.
A segment is defined through the following parameters:
Start temperature of segment n (= end temperature of segment n-1)
Segment period n
Refer to:4.4!

Transparent Bath
A bath thermostat with transparent walls permitting direct monitoring of the object to be thermoregulated (Polystat models A5 – A18).

Appendix

Huber Glossary

Usable Depth
The term usable depth denotes the depth of fluid available in the bath thermostat for direct thermoregulation.

Venting
A special circulation regime with the objective of driving out air trapped in closed thermofluid circuits.

Viscosity
Also referred to as „internal friction“. The characteristic of a fluid or gaseous substance that causes frictional tension at deformation in addition to the thermodynamic pressure, which counteracts the displacement of fluid or gaseous particles relative to each other.
This means, the viscosity of a substance increases with decreasing temperature, the available cooling capacity decreases with decreasing temperature.
The viscosity of thermofluids (fluids for thermoregulation) used in HUBER thermostats should not exceed 50 mm^2/s.

Watchdog
A safety device in the electronic control, similar to the principle of the dead-man switch in an engineThe functionality of the system is monitored through the input signals.

Warning
Device messages pointing to irregularities in the operation of the thermostat that do not cause a shut-down of the thermoregulation process. Programs 10, 11.

Working Temperature Range
The working temperature range is defined with reference to an ambient temperature of 20 °C. It denotes the temperature range the thermostat attains by itself without the aid of any auxiliary means*, utilizing electric power only.
Due to the heat transferred by the pump motor and the insulation, the working temperature range of heating thermostats starts above the ambient temperature and ends at the upper limit of the operating temperature.
In the case of cooling/heating thermostats, the working temperature ranges from the lower limit of the operating temperature to the upper limit of the operating temperature. This temperature is permissible in continuous operation with the use of a chiller.
The working temperature range of cooling thermostats starts at the lower limit of the operating temperature and ends at ambient temperature.*Auxiliary means are additional heating elements, coolers, heat exchangers or fans.