Inspired by **temperature**

Betriebsanleitung · Operation manual · Manual de instrucciones · Manuel d'utilisation · Manuale de d'uso · 사용 설명서 · Manual de instruções · Инструкция по эксплуатации · Kullanım talimatı · 操作说明书 ·

Unimotive®

This documentation does not contain a device-specific technical appendix.

You can request the full operating instructions from info@huber-online.com. Please give the model designation and serial number of your temperature control unit in your e-mail.

huber

OPERATION MANUAL

Unimotive®

Unimotive®

Pilot ONE®

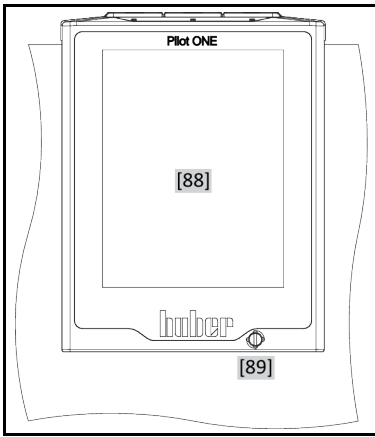
This operation manual is a translation of the original operation manual.

VALID FOR:

Unimotive® 1x
Unimotive® 2x
Unimotive® 3x

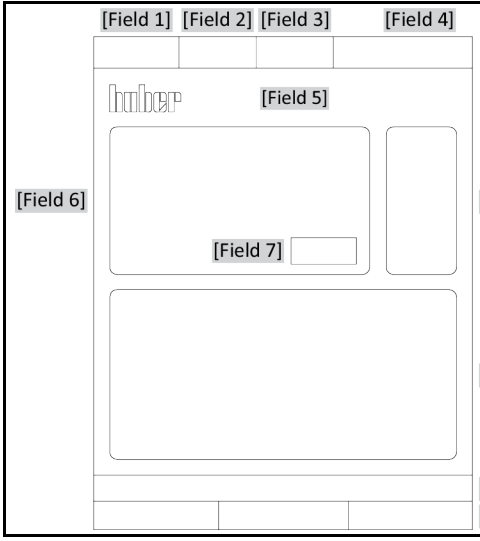
Abbreviations used in model names:
without = air cooled, GL = refrigerant CO_2, w = water cooled, XT = extended temperature range

„Pilot ONE“



[88] Touchscreen
[89] Fixing screw for Pilot ONE

Layout of the “Home” screen



[Field 1] Minimum setpoint
[Field 2] Maximum setpoint
[Field 3] Set over-temperature protection
[Field 4] Status pictogram
[Field 5] Date and time
[Field 6] Process, internal and setpoint value
[Field 7] Button for virtual keyboard
[Field 8] Level and pump status
[Field 9] Process graphic
[Field 10] Status cell
[Field 11] Touchbuttons

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V1.2.0en/13.03.24//17.12

Foreword

Dear customer,

Thank you for choosing a temperature control unit from Peter Huber Kältemaschinenbau SE. You made a good choice. Thank you for your trust.

Please read the operation manual carefully before putting the unit into operation. Strictly follow all notes and safety instructions.

Follow the operation manual with regard to transport, start-up, operation, maintenance, repair, storage and disposal of the temperature control unit.

We fully warrant the temperature control unit for the specified intended operation.

The models listed on page 5 are referred to in this operation manual as temperature control units and Peter Huber Kältemaschinenbau SE as Huber company or Huber. The model listed on page 5 is a temperature control unit from the Unistat series.

1 Introduction

1.1 Identification / symbols in the operation manual

The following identifications and symbols are used in the texts and illustrations.

Overview

Identification / symbol	Description
→	Reference to information / procedure.
»TEXT«	Reference to a chapter in the operation manual. In the digital version, the text is clickable.
>TEXT< [NUMBER]	Reference to the wiring diagram in the annex. The designation and the search digit are specified.
>TEXT< [LETTER]	Reference to a drawing in the same paragraph. The designation and the search digit are specified.
▪	List, first level
–	List, second level

1.2 Information on the EU Declaration of Conformity

CE The equipment complies with the basic health and safety requirements of the European Directives listed below:

- Machinery Directive
- Low Voltage Directive
- EMC Directive

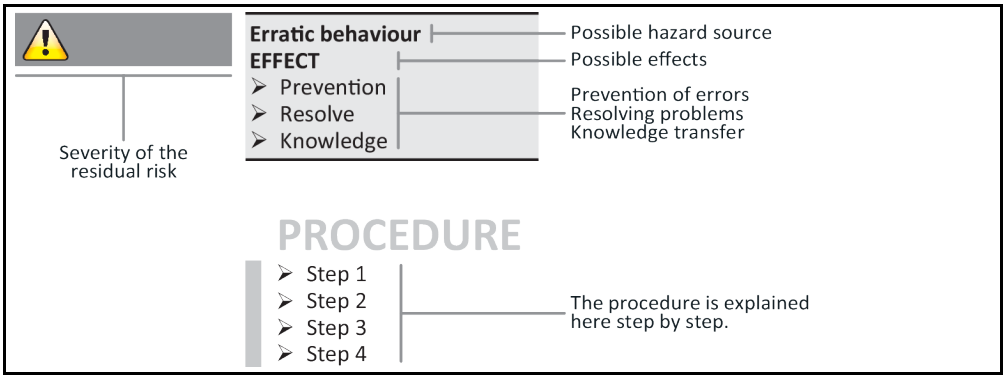
1.3 Safety

1.3.1 Symbols used for Safety Instructions

Safety instructions are marked by the below combinations of pictograms and signal words. The signal word describes the classification of the residual risk when disregarding the operation manual.

DANGER	**Denotes an immediate hazardous situation that will result in death or serious injuries.**
WARNING	**Denotes a general hazardous situation that may result in death or serious injuries.**
CAUTION	**Denotes a hazardous situation that can result in injury.**
NOTE	**Denotes a situation that can result in property material damage.**
INFORMATION	Denotes important notes and usable hints.
	Notes in conjunction with Ex px cabinets.

Safety information and procedure



The safety information in this operation manual is designed to protect the operating company, the operator and the equipment from damage. First inform yourself about any residual risks due to misuse before you start an operation.

1.3.2 Representation of symbols on the temperature control unit

The following pictograms are used as safety identifiers. The table gives an overview of the safety identifiers used here.

Overview

Identifier	Description
Mandatory sign	
	- Observe the instructions
Warning sign	
	- General warning sign - Observe the instructions
	- Warning of electrical voltage
	- Warning of hot surface
	- Warning of flammable substances
Miscellaneous	
	Follow the national and local instructions for the disposal of electrical appliances. → Page 82, section **»Disposal«**

1.3.3 Proper operation

DANGER

Operating the temperature control unit in a potentially explosive area

DEATH THROUGH EXPLOSION

➢ Do NOT install or start up the temperature control unit within an ATEX zone.

WARNING

Improper use

SERIOUS INJURY AND PROPERTY DAMAGE

- Store the operation manual where it is easy to access in close proximity to the temperature control unit.
- Only adequately qualified operators may work with the temperature control unit.
- Operators must be trained before handling the temperature control unit.
- Check that the operators have read and understood the operation manual.
- Define precise responsibilities of the operators.
- Personal protective equipment must be provided to the operators.
- Be sure to follow the responsible body's safety rules to protect life and limb and to limit damages!

NOTE

Modifications to the temperature control unit by third-parties

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- Do not allow third parties to make technical modifications to the temperature control unit.
- The EU declaration of conformity becomes invalid if any modifications are made to the temperature control unit without the approval of Huber.
- Only specialists trained by Huber may carry out modifications, repairs or maintenance work.
- **The following must be observed without fail:**
- Only use the temperature control unit in a fault-free condition!
- Have the start-up and repairs carried out by specialists only!
- Do not ignore, bypass, dismantle or disconnect any safety devices!

The temperature control unit must not be used for any purposes other than temperature control in accordance with the operation manual.

The temperature control unit is made for industrial use. The temperature control unit is used to maintain the temperature of applications, such as glass or metal reactors or other expedient items in laboratories and industry. Flow-through coolers and calibration baths must be used only in combination with Huber temperature control units. Only use thermal fluids suitable for the overall system. The cooling or heating capacity is provided at the pump connections or - where present - in the tempering bath. For the technical specification, refer to the datasheet. → From page 84, Section **»Annex«**. Install, set up and operate the temperature control unit according to the instructions in this operation manual. Any failure to comply with the operation manual is considered as improper operation. The temperature control unit was manufactured according to the state of the art and the recognized safety rules and regulations. Safety devices are installed in your temperature control unit.

1.3.4 Reasonably foreseeable misuse

NOTE

The temperature control unit is operated outside of its specifications

MATERIAL DAMAGE CAUSED BY PREMATURE AGING / MATERIAL FATIGUE OF THE PLATE HEAT EXCHANGER

- Do not **permanently** operate the temperature control unit together with **very dynamic** and **high** temperature changes recurring at **short intervals**.
- The **guarantee will expire** if the temperature control unit is exposed to this type of application.
- Huber offers tried and tested technical solutions for these types of applications.

Without an Ex px cabinet, the temperature control unit / accessory **is NOT** protected against explosion and must **NOT** be installed or put into operation within an ATEX Zone. Only the temperature control unit specified on the rating plate of the Ex px cabinet (model and serial number) is suitable for operation inside the Ex px cabinet. When operating the temperature control unit /accessory in conjunction with an Ex px cabinet, the information in the annex (section ATEX operation) must be observed and followed. This annex is only provided for temperature control units /accessories delivered in conjunction with an Ex px cabinet. If this annex is missing, please immediately contact the Customer Support. → Page 82, section **»Contact data«**.

INFORMATION

The temperature control units Unistat tango (w/wl), Unistat 405(w), Unistat 410(w) und Unistat 705(w) do not have a plate heat exchanger.

Use with medical devices (e.g. in Vitro diagnostic procedure) or for direct foodstuff temperature control is **NOT** permissible.

The temperature control unit must **NOT** be used for any purposes other than temperature control in accordance with the operation manual.

The manufacturer accepts **NO** liability for damage caused by **technical modifications** to the temperature control unit, **improper handling** or use of the temperature control unit if the operation manual is **not observed**.

1.4 Responsible bodies and operators – Obligations and requirements

1.4.1 Obligations of the responsible body

The operation manual is to be stored where it is easy to access in close proximity to the temperature control unit. Only adequately qualified operators (e.g. chemists, CTA, physicists etc.) are permitted to work with the temperature control unit. Operators must be trained before handling the temperature control unit. Check that the operators have read and understood the operation manual. Define precise responsibilities of the operators. Personal protective equipment must be provided to the operators.

- The responsible body must install a condensation water / thermal fluid drip tray below the temperature control unit.
- The use of a drip tray may be prescribed by national legislation for the installation area of the temperature control unit (incl. accessory). The responsible body must check and apply the national regulations applicable for it accordingly.
- The temperature control unit complies with all applicable safety standards.
- Your system, which uses our temperature control unit, must be equally safe.
- The responsible body must design the system to ensure it is safe.
- Huber is not responsible for the safety of your system. The responsible body is responsible for the safety of the system.
- Although the temperature control unit provided by Huber meets all the applicable safety standards, integration into a system may give rise to hazards that are characteristic of the other system's design and beyond the control of Huber.
- It is the responsibility of the system integrator to ensure that the overall system, into which this temperature control unit is integrated, is safe.
- The **>Mains isolator<** [36] (if present) can be locked in the off position to facilitate safe system installation and maintenance of the temperature control unit. It is the responsibility of the responsible body to develop any lock-out/tag-out procedure for the energy source in accordance with local regulations (e.g. CFR 1910.147 for the US).

1.4.1.1 Proper disposal of resources and consumables

Do comply with all national disposal regulations applicable for you. Contact your local waste management company for any questions concerning disposal.

Overview

Material / Aids	Disposal / Cleaning
Packaging material	Keep the packaging material for future use (e.g. transport).
Thermal fluid	Please refer to the safety data sheet of the thermal fluid used for information on its proper disposal. Use the original thermal fluid container when disposing it.
Filling accessories, e.g. beaker	Clean the filling accessories for reuse. Make sure that the materials and cleaning agents used are properly disposed of.
Aids such as towels, cleaning cloths	Tools used to take up spilled thermal fluid must be disposed of in the same fashion as the thermal fluid itself. Tools used for cleaning must be disposed of depending on the cleaning agent used.
Cleaning agents such as stainless steel cleaning agents, sensitive-fabrics detergents	Please refer to the safety data sheet of the cleaning agent used for information on its proper disposal. Use the original containers when disposing of large quantities of cleaning agents.
Consumables such as air filter mats, temperature control hoses	Please refer to the safety data sheet of the consumables used for information on their proper disposal.

1.4.1.2 Temperature control units with refrigerants

1.4.1.2.1 General information

In the following sections we would like to inform you about the refrigerants used. The sections serve to acquaint you as the operating company with some of the necessary responsibilities.

All Huber temperature control units are designed for easy installation at the place of installation.

NO gas detection sensor is installed in this temperature control unit!

Huber offers suitable gas detection sensors and analysis units that can be installed in the building.

The company operating the system is responsible for: The correct installation of the temperature control unit in accordance with the respective national laws and local regulations.

1.4.1.2.1.1 Temperature control unit with natural refrigerants

Temperature control unit with natural refrigerants (NR)

Since 1980, Huber temperature control units with natural refrigerants work with repeatedly proven, safe and highly-sustainable technologies. The temperature control unit has been constructed to the requirements of EU and EFTA countries. The relevant standards and regulations for temperature control units with natural refrigerants contain a number of stipulations, the importance of complying with which is set out below.

Temperature control units with water cooling can be connected to a building's exhaust air system. Temperature control units with air cooling discharge the exhaust air directly from the temperature control unit to the place of installation.

Huber offers suitable gas detection sensors and analysis units that can be installed in the temperature control unit or in the building.

- The cooling circuit is permanently technically tight.
- The temperature control unit is a permanently closed individual compact unit (i.e. a functional unit inside a housing).
- The quantity of the refrigerant is minimized (in "systems with limited filling capacity"). The filling capacity of the refrigerant is specified on the data sheet and on the rating plate.
- The refrigerant circuit must be maintained during the service life of the temperature control unit.

1.4.1.2.2 Obligations of the responsible body

WARNING

Exceedance of the refrigerant limit value per m³ ambient air

DEATH OR SERIOUS INJURY DUE TO EXPLOSION OR SUFFOCATION

- ➢ Observe the amount of refrigerant contained (see data sheet/rating plate of the temperature control unit) and the room size when installing the temperature control unit.
- ➢ National laws and local regulations can demand additional safety measures for the place of installation.
- ➢ The temperature control unit is not approved for operation **in an ATEX zone**.

1.4.1.2.2.1 Example of the place of installation

This section is valid for: Temperature control units with refrigerants

The following enumeration only provides an incomplete overview of possible requirements.

Among others, the following must be observed at the planned place of installation of the temperature control unit with refrigerant:

- Limitation of the refrigerant filling capacity in relation to the room size.
- Installation inside a machinery room.
- Monitoring by means of a gas detection sensor.
- Conditions for outdoor installation.
- All poles are switched off in the event of a fault.

The respective national laws and local regulations must be observed.

1.4.1.2.2.2 Connection >Exhaust air< [105] on the temperature control unit

This section is valid for: Temperature control unit with natural refrigerants (except CO_2 and tabletop units)

The temperature control unit is prepared to enable connection to a building's exhaust air system. To this end, the cover at the **>Exhaust air<** [105] connection must be removed.

Connection of the building's exhaust air system (if necessary):

The building's exhaust air system is connected to the temperature control unit by means of the **>Exhaust air<** [105] connection (DN 100). For the exact position please refer to the wiring diagram. → Section **»Annex«** in the operation manual of the temperature control unit.

PROCEDURE

- ➢ Remove the cover at the **>Exhaust air<** [105] connection. This cover must only be removed when the building's exhaust air system is used!
- ➢ Connect the **>Exhaust air<** [105] connection on the temperature control unit with the building's exhaust air system.

1.4.1.2.2.3 Temperature control units with optional gas detection sensor

This section is valid for: Temperature control unit with natural refrigerants (except CO_2 and table-top units)

A mounting plate onto which the optionally available gas detection sensor can be mounted is integrated in the temperature control unit. The operating company must: Install this gas detection sensor, establish its external electrical connection and check its function.

INFORMATION For more detailed information, please refer to the Huber installation guide and the manufacturer's documentation for the gas detection sensor.

Function:

- The cable entry for the gas detection sensor connection is marked in the wiring diagram.
- The gas detection sensor enables a safety shutdown at 20% of the lower explosive limit. The operating company must install a power disconnect for this purpose.
- Further information on the gas detection sensor:
  - A **24 V DC** external power supply must be available for the gas detection sensor. The alarm output of the gas detection sensor uses a 4 - 20 mA signal. Please refer to the data sheet of the gas detection sensor for the technical information necessary for installation and opera-

tion. The operating company is responsible for this and for the other measures.

– The operating company is responsible for the **calibration of the gas detection sensor** prior to initial operation and the observance of calibration and maintenance intervals according to the manufacturer's operation manual. We recommend to set calibration and maintenance intervals between 6 and 12 months if no information is provided. For increased safety requirements, shorter intervals can be specified. On request we will recommend a specialist company to carry out the calibration and maintenance.

Processing unit for gas detection sensor:

On request, a **separate processing unit is available as an accessory** for the control of the power disconnect relay. The processing unit provides a potential-free switching contact and simultaneously provides the power supply and analysis of the gas detection sensor. Both variants require the operating company to provide the necessary dimensioning and installation. The alarm of the gas detection system can be connected to the operating company's alarm control unit. The operating company is responsible for this and for the other measures.

1.4.1.3 Temperature control units with fluorinated greenhouse gases/refrigerants

F gases regulation (EC) No. 517/2014 of April 16, 2014, on fluorinated greenhouse gases, and repealing Regulation (EC) No. 842/2006.

These regulations deal with all systems that contain fluorinated refrigerants. The substances dealt with in Directive (EC) No. 1005/2009 of the European Parliament and of the Council of 16 September 2009 that deplete the ozone layer are excluded (CFC/HCFC).

The directive regulates the reduction of the emission, utilization, recovery, and destruction of certain fluorinated greenhouse gases. It also regulates the identification and disposal of products and devices that contain these gases. Since July 4, 2007, responsible bodies must check their stationary refrigeration systems for leaks at regular intervals, and have any leaks eliminated immediately.

Directive (EC) No. 303/2008 contains stipulations on the training and certification of companies and personnel that are permitted to execute the specified activities.

Obligations of the responsible bodies:

- Directive (EC) No. 842/2006 already imposed a number of obligations upon responsible bodies regarding certain fluorinated greenhouse gases. The new Ordinance on Fluorinated Greenhouse Gases upholds these to a large extent. Some duties are added while others are designed differently by this new ordinance. Please refer to the text of this ordinance for a complete overview of the individual responsibilities of responsible bodies.
- General obligation to reduce emissions.
- Only certified companies may maintain, repair or decommission refrigeration systems. The responsible bodies must verify that these companies are certified.
- Regular leak tests of stationary refrigeration systems by certified personnel (such as Huber service engineers). The required test interval is based on the refrigerant filling capacity and the type of refrigerant, converted to $CO_2$2 equivalent.
- Responsibility of responsible bodies operating a plant to recover F-gases by certified personnel.
- Obligatory documentation requirement in the refrigeration system's operation manual, specifying type and volume of refrigerant used or recovered. The responsible body must keep the records for at least 5 years after their creation and present it to the responsible authority upon request.
- Temperature control units with natural refrigerants (NR) are exempt from this Directive.
- Please refer to the data sheet or rating plate of your temperature control unit for the quantity and type of refrigerant.
- Additional information about the definition of the inspection interval can be found on our website.

1.4.2 Requirements for operators

Work on the temperature control unit is reserved for appropriately qualified specialists, who have been assigned and trained by the responsible body to do so. Operators must be at least 18 years old. Under 18-year olds may operate the temperature control unit only under the supervision of a qualified specialist. The operator is responsible vis-a-vis third-parties in the work area.

1.4.3 Obligations of the operators

Carefully read the operation manual before operating the temperature control unit. Please observe the safety instructions. When operating the temperature control unit, wear appropriate personal protective equipment (e.g. safety goggles, protective gloves, non-slip shoes).

1.5 General information

1.5.1 Description of workstation

The workstation is located at the control panel in front of the temperature control unit. The workstation is determined by the customer's connected peripheries. Accordingly, it must be designed safe by the responsible body. The workstation design also depends on the applicable requirements of the German occupational health and safety regulations [BetrSichV] and the risk analysis for the workstation.

1.5.2 Safety devices to DIN 12876

The rating of your temperature control unit is stated on the data sheet in the appendix.

Rating of laboratory thermostats and laboratory baths

Classification	Temperature control medium	Technical requirements	Identification [d]
I	Non-combustible [a]	Overheat protection [c]	NFL
II	Combustible [b]	Adjustable overheat protection	FL
III	Combustible [b]	Adjustable overtemperature protection and additional low-level protection	FL

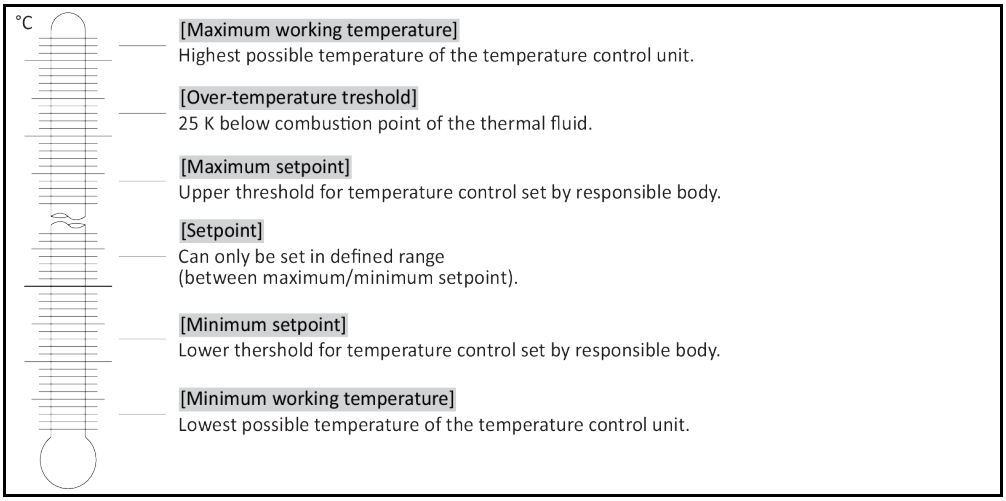
[a] Usually water; other fluids only if non-combustible even within the temperature range of an individual fault.

[b] The temperature control media must have a fire point of ≥ 65 °C.

[c] The overheat protection can, for instance, be realized using a suitable fill level sensor or a suitable temperature limiter.

[d] Optional at the choice of the manufacturer.

Overview of the temperature thresholds



Combined electronic low level and overtemperature protection

This temperature control unit has been equipped with an electronic overtemperature protection and low-level protection. Instead of a mechanical float switch, temperature sensors are employed on the surface of the heating coils. These sensors monitor overtemperature at this potential ignition source, thus ensuring the controller regulates the heating coil temperatures below the critical temperature (fire point of the thermal fluid). An appropriate message is output via the **>Touchscreen<** [88].

There is no longer a need for mechanical tools to set the trigger values of the overtemperature protection. They are replaced by a software engineering tool. The threshold value for the overtemperature protection can be set only if a code, randomly generated by “Pilot ONE”, is entered correctly. As with the mechanical tool, accidental settings are thus prevented.

Low level protection

Low level protection is achieved via a pressure sensor in the fluid circuit. The pump ensures, together with the thermal fluid, the requisite pressure at the pressure sensor. Air in the system (fill level too low, inadequately vented) prevents the pressure from reaching value specified at the pressure sensor. Temperature control and circulation are interrupted.

Overtemperature protection (for temperature control units with heating)

Mechanical tools are no longer required for setting the trip values for the overtemperature protection. A software tool is used instead. The threshold value for the overtemperature protection can be set only if a code randomly generated by “Pilot ONE” beforehand is entered correctly. As with the mechanical tool, accidental settings are thus prevented. The type of overtemperature protection function and of low level protection depends on the temperature control unit.

Process safety

This type of overtemperature operating mode is driven by a desire for further protection of operator and system. Protective devices typically disconnect all poles when reaching the overtemperature protection trigger value. This may result in more heat being fed into the process (e.g. exothermic reaction) than the existing cooling machine is able to cool as the overtemperature protection trigger value is usually set above the controller setpoint. Turning off the temperature control unit eliminates the only possibility to extract heat from the process. The temperature could therefore rise further and system components could be heated up above their rated temperatures, which could e.g. cause danger to life and limb by rupture of the material or phase transitions from liquid to gaseous state. In **Process Safety** mode, the controller recognizes when the trigger value at the overtemperature protection is reached, and then enables the cooling system. This mode requires the compressor to be set to **Permanently ON** ([System Settings] > [Power/ECO Settings] > [Compressor ON/OFF/AUTO] > [Permanently ON]). Even if the temperature continues to rise, the cooling machine will use its maximum cooling capacity to keep any further increase in temperature as low as possible. Strictly note the following: → From page 50, section **»Setting the overtemperature protection«**.

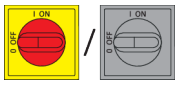
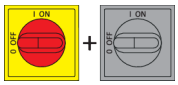
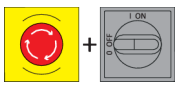
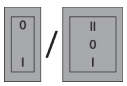
1.5.3 Further protective devices

INFORMATION

Emergency strategy – interrupt the power grid connection!

To determine the type of switch used or the switch combination installed, please refer to the connection sketch. → From page 84, section **»Annex«**.

Overview of switch types

Switch	Designation	Interrupting the power grid connection
	**>Mains isolator<** [36] (red-yellow) or **>Mains isolator<** [36] (grey)	Turn the **>Mains isolator<** [36] to the “0” position.
	**>Mains isolator<** [36] (red-yellow) and additional **>Appliance switch<** [37] (gray):	Turn the **>Mains isolator<** [36] to the “0” position, then the **>Appliance switch<** [37] to the “0” position.
	**>Emergency stop switch<** [70] (red-yellow) and **>Mains isolator<** [36] (gray):	Press the **>Emergency stop switch<** [70], then set the **>Mains isolator<** [36] to the “0” position.
	**>Power switch<** [37]	**Power connection via socket:** Pull the plug, then set the **>Power switch<** [37] to the “0” position. **Connection via hard wiring:** Use the building’s circuit breaker, then set the **>Power switch<** [37] to the “0” position.
–	Without a switch or inside a protective housing	**Power connection via socket:** Pull the plug. **Power connection via hard wiring:** Use the building’s circuit breaker.

1.5.3.1 Power interruption

Following a power outage (or when switching on the temperature control unit), this function can be used to determine how the temperature control unit is supposed to respond. This response can be determined via “Pilot ONE”.

OFF/Standby (Default setting)
After turning the temperature control unit on, thermoregulation is started only after manual input.

ON / Temp. control active
After turning on the temperature control unit, thermoregulation is always started. An INFO appears for a few seconds. This provides for suppressing the automatic start.
Only valid for temperature control units with an emergency stop switch (optional):
After installing the **>Emergency stop switch<** [70], automatic starting of the temperature control process is **not possible** when turning on the temperature control unit.

Power Failure Auto
If temperature control is active during a power outage, the process will automatically continue after the power outage.
Only valid for temperature control units with an emergency stop switch (optional):
After installing the **>Emergency stop switch<** [70], automatic continuation of the temperature control process is **not possible** after a power outage.

1.5.3.2 Alarm functions

An alarm is a system state that signals unfavorable process conditions. The temperature control unit can be programmed so that the plant operator is warned when defined limit values are exceeded.

The response of the temperature control unit to an alarm can be determined. Possible responses are: Switch off temperature control or control temperature to a safe setpoint (2nd setpoint).

1.5.3.3 Warning messages

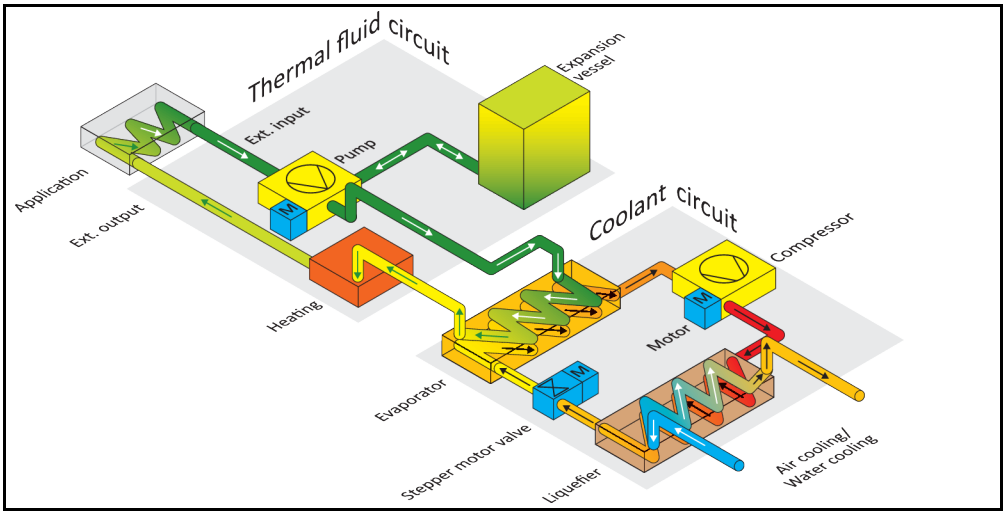
Warning messages contain a message about the irregularity of the temperature control unit. These messages have no further consequences. The plant operator evaluates the relevance of the message and takes action where necessary.

1.5.3.4 Emergency stop switch (optional)

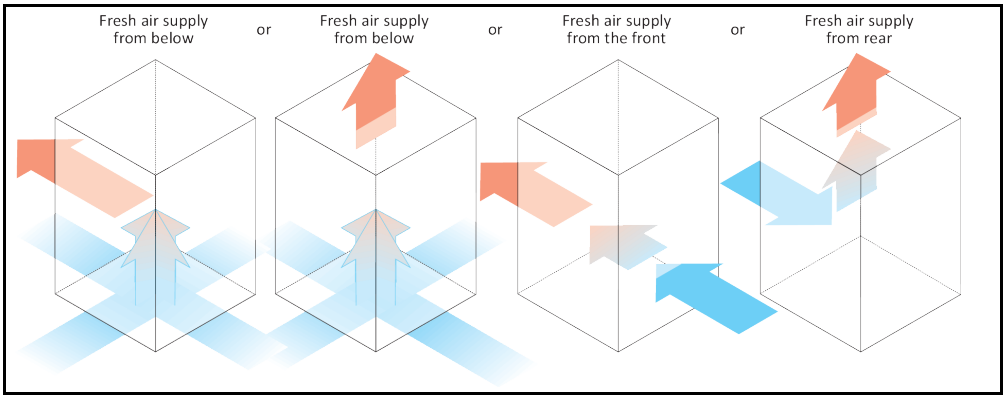
The **>Emergency stop switch<** [70]**immediately** disconnects all poles of the temperature control unit. More detailed information on the **>Emergency stop switch<** [70]: → Page 49, section **»Emergency stop switch (optional): Activate / Deactivate«**.

1.6 Exemplary illustrations of the cooling variants

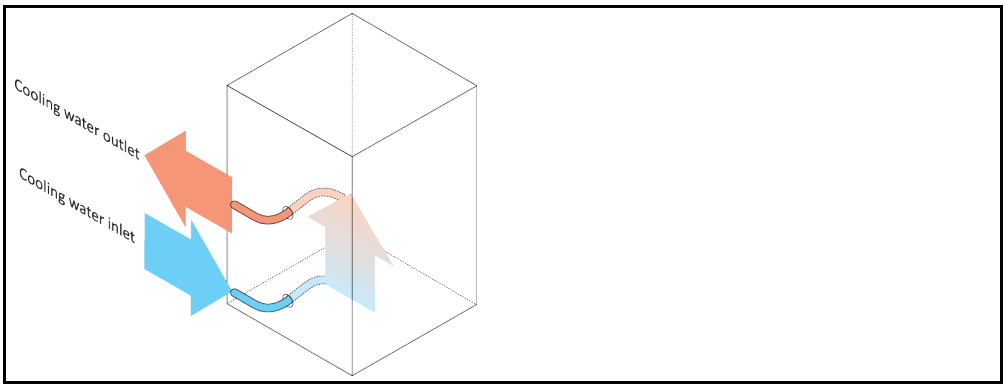
Example: Air and water cooling



Air cooling: Air inlet



Water cooling: Water connection



1.6.1 Consequence of inadequate energy dissipation

Room air/cooling water
Consequences of, for instance, contamination of the liquefier fins, inadequate clearance between temperature control unit to wall/bath wall, room air/cooling water too warm, cooling water differential pressure too low, suction strainer contamination: The refrigerant in the coolant circuit can no longer fully discharge the admitted energy to the room air/cooling water. Thus there is not sufficient liquefied refrigerant available, the condensation temperature and the energy consumption to rise.

Coolant circuit
Consequences of inadequate refrigerant quantity/rising condensation temperature: Not all the cooling capacity from the coolant circuit is available at the evaporator. This means reduced energy transmission from the thermal fluid circuit.

Thermal fluid circuit
Consequence of inadequate energy dissipation from the thermal fluid: The thermal fluid can only dissipate the energy from your application to a limited extent.

Application
Consequences of inadequate energy dissipation from the application: The energy created (exothermic) in the application can no longer be fully dissipated.

Temperature control unit
An electronically-controlled expansion valve is used in the temperature control unit to optimize the power adjustment. The expansion valve always provisions the maximum possible cooling capacity within the permissible ambient temperature range. The temperature control unit switches off when the upper range is reached (maximum permissible ambient temperature).

2 Commissioning

2.1 In-plant transport

WARNING

Temperature control unit is not transported / moved according to the specifications in this operation manual

DEATH OR SERIOUS INJURY DUE TO CRUSHING

- Always transport / move the temperature control unit according to the specifications in this operation manual.
- Wear personal protective equipment during transport.
- Always work with the specified number of persons when moving the temperature control unit on casters (if any).
- If the temperature control unit is equipped with casters and parking brakes: 2 parking brakes are always freely accessible when moving the temperature control unit. Activate the **2 parking brakes** in an emergency! If only **one** parking brake is activated on the casters in an emergency: The temperature control unit is not stopped but rotates around the axis of the caster with the activated parking brake!

NOTE

Temperature control unit transported in a horizontal position

DAMAGE TO THE COMPRESSOR

- Only transport the temperature control unit in an upright position.

NOTE

Filled temperature control unit is transported

MATERIAL DAMAGE DUE TO OVERFLOWING THERMAL FLUID

- Only transport an emptied temperature control unit.

- If available, use the lugs on the top side of the temperature control unit for transportation.
- Use an industrial truck for transport.
- The casters (if present) on the temperature control unit are not suitable for transport. The casters are symmetrically loaded with 25% of the total mass of the temperature control unit.
- Remove the packing material (e.g. the palette) only at the place of installation.
- Protect the temperature control unit from transport damage.
- Do not transport the temperature control unit alone and without aids.
- Check the load bearing capacity of the transportation route and the place of installation.
- The parking brakes must be activated at the rollers (if installed) before the temperature control unit is put into operation.
- For temperature control units with transportation lock, strictly observe the following: → Page 24, Section **»Transportation lock«**.

2.1.1 Lifting and transporting the temperature control unit

2.1.1.1 Temperature control unit without lifting eyes

- Do not lift and transport the temperature control unit alone and without aids.
- Lift and transport the temperature control unit only with an industrial truck.
- The industrial truck must have a lifting force equal to or greater than the weight of the temperature control unit. See the data sheet for the weight of the temperature control unit. → From page 84, section **»Annex«**.

2.1.2 Positioning the temperature control unit

2.1.2.1 Temperature control unit with casters

- Do **not** use the casters for the transportation to the place of installation. → Page 23, section **»Lifting and transporting the temperature control unit«**.
- Use the casters only for positioning at the place of installation.
- Only ever move the temperature control unit on casters if the surface is level, without a gradient, non-slip and stable.
- Do not move the temperature control unit alone.

- **At least 2 persons** are required to move the temperature control unit on casters. **At least 5 persons** are required to move the temperature control unit on the casters if the total weight of the temperature control unit is **over 1.5 tons**.
- The parking brakes must be activated at the casters before the temperature control unit is put into operation.

2.1.2.2 Temperature control unit without casters

- An industrial truck must be used for positioning the temperature control unit.
- Do not move the temperature control unit alone.
- **At least 2 persons** are required to move the temperature control unit.
- The industrial truck must have a lifting force equal to or greater than the weight of the temperature control unit. See the data sheet for the weight of the temperature control unit. → From page 84, Section **»Annex«**.

2.2 Transportation lock

NOTE

Commissioning with active transportation lock

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- ➢ Check the position of the transportation locks.
- ➢ Prior to commissioning of the temperature control unit, bring the transportation locks of the compressor into the operating position.

The temperature control units are listed in the table below are equipped with transportation locks for the compressor. These transportation locks must be unlocked to commissioning the temperature control unit or be reactivated during transport to another place of installation.

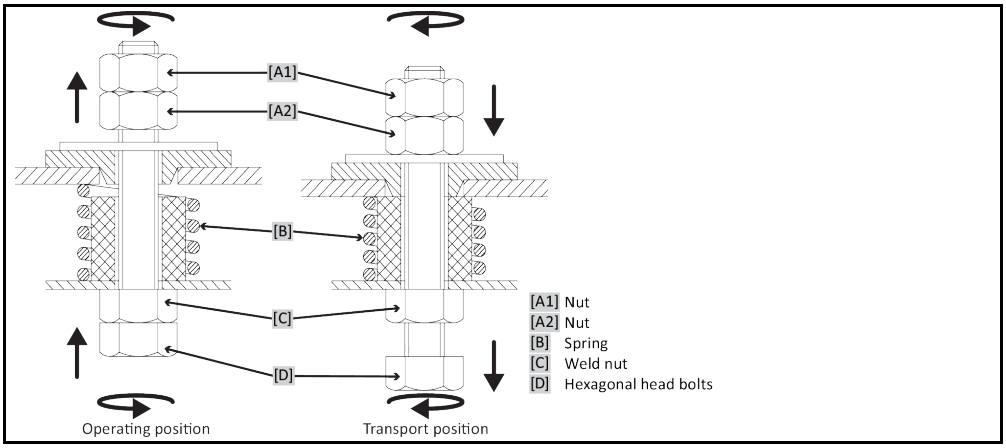
Special or temperature control unit variants may vary from those listed in the table. These temperature control units have a sticker next to the nameplate that indicates the type of transportation lock used.

Overview of transportation locks

Temperature control units	Transportation lock
- Unimotive 0x, 1x, 2x, 3x - All Unistat table-top models - Unistat series: 4xx; 5xx; 7xx; 8xx; 90x; 91xw (water cooling); 1005w; 1015w	without
- Unistat series: 61x; 62x; 63x; 640; 68x; 91x (air cooling); 92x, 93x	Type A
- Unistat series: 645; 650	Type B
- Unistat series: 680w spez	Type B
- Unistat series: 95x	Type A **and** Type B

2.2.1 Transportation lock Type A

Figures showing the transportation lock



INFORMATION

The transportation lock can not be reached in all temperature control units from below ([C] + [D]). On temperature control units with transformer base, part of the paneling must be removed and the transportation lock released or engaged from above ([A1] + [A2]).
The paneling on the temperature control unit must be removed to check the transportation lock.

2.2.1.1 Releasing the transportation lock (operating position)

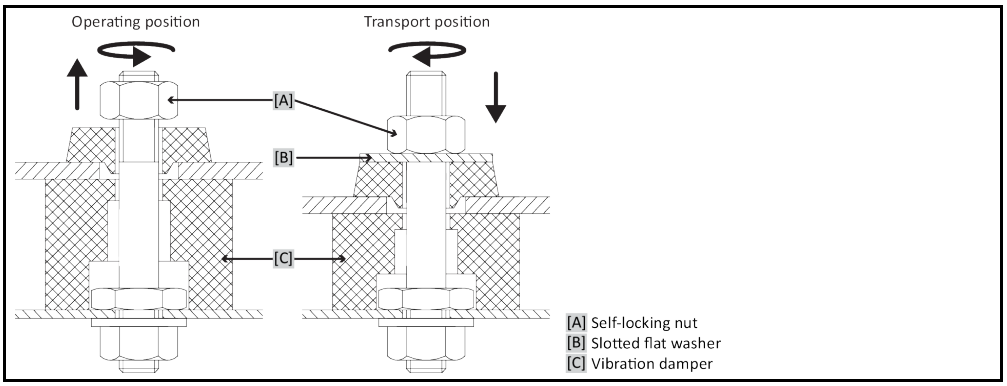
From below: Turn the >Hexagon bolt< [D] at the bottom of the temperature control unit upwards (counter-clockwise) with a socket wrench AF17 and tighten it against the **>weld nut<** [C] (hand-tight).
From above (after removing the panels): Turn the >Nut< [A2] upwards from above with a socket wrench AF17 (counter-clockwise) and tighten against the **>Weld nut<** [C] (hand-tight).

2.2.1.2 Tightening the transportation lock (transport position)

From below: Turn the >Hexagon bolt< [D] at the bottom of the temperature control unit downwards (clockwise) with a socket wrench AF17 and tighten it against the two check nuts (hand-tight).
From above (after removing the panels): Turn the >Nut< [A1] downwards from above with a socket wrench AF17 (clockwise) and tighten the two check nuts (hand-tight).

2.2.2 Transportation lock Type B

Picture of transportation lock Type B



Remove the side panel on the temperature control unit to loosen and tighten the transportation locks.

2.2.2.1 Releasing the transportation lock (operating position)

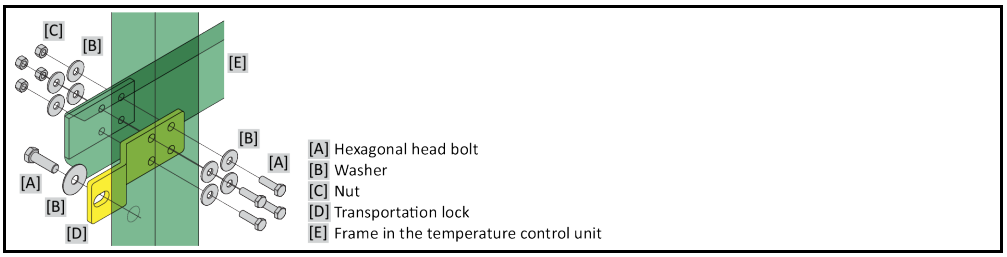
Loosen the **>Self-locking nut<** [A] until the **>Slotted flat washer<** [B] can be removed. Remove the **>Slotted flat washer<** [B].

2.2.2.2 Tightening the transportation lock (transport position)

Insert a **>Slotted flat washer<** [B] under the **>Self-locking nut<** [A]. Tighten the **>Self-locking nut<** [A] until the **>Vibration damper<** [C] is compressed by about 1 to 2 mm.

2.2.3 Transportation lock Type C

Example: Transportation lock **Type C**



Remove the side panel on the temperature control unit to loosen and tighten the transportation locks.

2.2.3.1 Releasing transportation lock Type C

Loosen the **>Hexagonal head bolt<** [A] from the **>Nut<** [C]. Remove the **>Hexagonal head bolt<** [A], **>Washer<** [B], **>Transportation lock<** [D] and **>Nut<** [C] from the temperature control unit. Keep all individual parts for later use.

2.2.3.2 Tightening transportation lock Type C

Mount the **>Hexagonal head bolt<** [A], **>Washer<** [B], **>Transportation lock<** [D], **>Washer<** [B] and **>Nut<** [C] inside the temperature control unit.

2.3 Unpacking

WARNING

Starting up a damaged temperature control unit

DANGER TO LIFE FROM ELECTRIC SHOCK

- Do not operate a damaged temperature control unit.
- Please contact Customer Support. → Page 82, section **»Contact data«**.

PROCEDURE

- Check for damage to the packaging. Damage can indicate material damage to the temperature control unit.
- Check for any transport damage when unpacking the temperature control unit.
- Always contact your forwarding agent regarding the settlement of claims.
- Observe the proper disposal of packaging material. → Page 15, section **»Proper disposal of resources and consumables«**.

2.4 Ambient conditions

CAUTION

Unsuitable ambient conditions / unsuitable installation

SERIOUS INJURY DUE TO CRUSHING

- Comply with all requirements! → Page 26, section **»Ambient conditions«** and → Page 28, section **»Installation conditions«**.

INFORMATION

Make sure there is adequate fresh air available at the site for the circulation pump and the compressors. The warm exhaust air must be able to escape upwards unhindered.

Free-standing models
For the connection data, see the data sheet. → From page 84, section **»Annex«**.

INFORMATION

Only valid for free-standing models:
Depending on the type of maintenance to be carried out on a temperature control unit, a wall clearance of 50 to 200 cm is required on either side. If the temperature control unit has to be moved to carry out the maintenance work: → Page 23, section **»In-plant transport«**.

Additionally valid for free-standing models with **>Electrical cabinet<** [118]:
A wall clearance of 150 to 200 cm is required at the place of installation to open the doors of the electrical cabinet. The doors of the electrical cabinet can only be opened by 90°. For the exact position of the **>Electrical cabinet<** [118], please refer to the wiring diagram. → From page 84, section **»Annex«**.

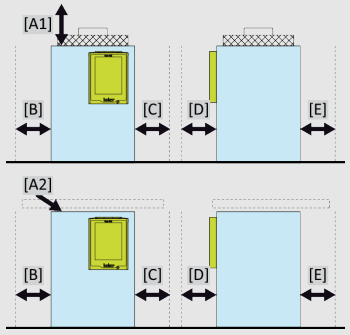
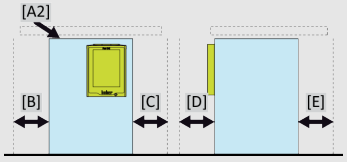
Use of the temperature control unit is permitted only under normal ambient conditions in accordance with the currently valid DIN EN 61010-1.

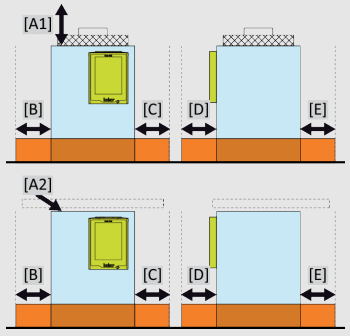
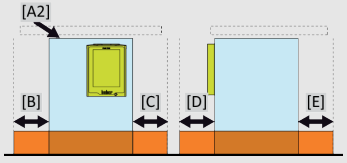
- Use only indoors. The illuminance must be at least 300 lx.
- Installation altitude up to 2,000 meters above sea level.
- Maintain wall and ceiling clearance for adequate air exchange (dissipation of waste heat, supply of fresh air for the temperature control unit and work area). Ensure adequate floor clearance for air-cooled temperature control units. Do not operate this temperature control unit from within the box or with an inadequately dimensioned bath. This inhibits the air exchange.
- Ambient temperature values are provided on the technical data sheet; to ensure trouble-free operation, compliance with the ambient conditions is mandatory.

- Relative humidity max 80% to 32 °C and 40 °C decreasing linearly to 50%.
- Short distance to supply connections.
- The temperature control unit must not be installed so as to hinder or even prevent access to the disconnecting device (to the power supply).
- For the magnitude of the mains voltage fluctuations, refer to the datasheet. → From page 84, section **»Annex«**.
- Transient surges, as would normally occur in the power supply system.
- Installation Class 3
- Applicable degree of soiling: 2.
- Surge category II.

Please note: → Page 21, section **»Exemplary illustrations of the cooling variants«**.

Wall clearances

Side	Clearance in cm	
	Air cooling	Water cooling
		
[A1] Top	Air outlet on top of unit: stand-alone	–
[A2] Top	min. 20	min. 20
[B] Left	min. 20	min. 10
[C] Right	min. 20	min. 10
[D] Front	min. 20	min. 10
[E] Rear	min. 20	min. 20

Side	Clearance in cm (for operation in a bath)	
	Air cooling	Water cooling
		
[A1] Top	Air outlet on top of unit: stand-alone	–
[A2] Top	min. 20	min. 20
[B] Left	min. 20	min. 20
[C] Right	min. 20	min. 20
[D] Front	min. 20	min. 20
[E] Rear	min. 20	min. 20

2.4.1 EMC-specific notes

INFORMATION

Connecting cables in general
Prerequisites for a failure-free operation of the temperature control units incl. their connections with external applications: Installation and wiring must be carried out professionally. Related topics: "Electrical safety" and "EMC-compliant wiring".

Cable lengths
For flexible/fixed cable routing of more than 3 meters, the following must amongst other things be observed:
- Equipotential bonding, grounding (see also technical data sheet "Electromagnetic compatibility EMC")
- Compliance with "external" and/or "internal" lightning/overvoltage protection.
- Design protection measures, professional cable selection (UV resistance, steel pipe protection, etc.)

Attention:
The operating company is responsible for compliance with national/international directives and laws. This also includes the testing of the installation/wiring required by law or standards.

This device is suitable for operation in **"industrial electromagnetic environments"**. It meets the **"immunity requirements"** of the currently applicable **EN61326-1**, which are required for this environment.

It also meets the **"interference emission requirements"** for this environment. It is a **Group 1** and **Class A** device according to the currently applicable **EN55011**.

When operating the temperature control unit in another environment, its electromagnetic compatibility can in rare cases not be ensured.

Group 1 specifies that high frequency (HF) is only used for the function of the device. **Class A** defines the interference emission limits to be observed.

2.5 Installation conditions

WARNING

Temperature control unit is connected to the power supply line
DEATH FROM ELECTRICAL SHOCK BY DAMAGE TO THE POWER CABLE.
➢ Do not put temperature control unit on power cable.

CAUTION

Operating the temperature control unit fitted with casters without brakes activated
CRUSHING OF LIMBS
➢ Activate brakes on the casters.

- Allow the temperature control unit to acclimate for about 2 hours when changing from a cold to a warm environment (or vice versa). Do not turn on the temperature control unit before!
- Install upright, stable and tilt-resistant.
- Use a non-combustible, sealed foundation.
- Keep the environment clean: Prevent slip and trip hazards.
- Wheels, if installed, must be locked after installation!
- Spilled/leaked thermal fluid must be removed immediately. Observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.
- Observe the floor load bearing capacity for large units.
- Observe the ambient conditions.

2.6 Recommended temperature control and cooling water hoses

CAUTION

Use of unsuitable/defective hoses and/or hose connections

INJURIES

- **Thermal fluid**
- Pay attention to the permissible pressure and temperature range when selecting temperature control hoses.
- Use appropriate hoses and/or hose connections.
- Check periodically for leaks and the quality of the hoses and hose connections and take suitable measures (replace) as required.
- Isolate and protect temperature control hoses against contact/mechanical load.
- **Cooling water**
- Reinforced hoses must be used to satisfy tougher safety requirements.
- Shut off the cooling water supply to the temperature control unit even for shorter downtimes (e.g. overnight).

CAUTION

Hot or cold thermal fluid and surfaces

BURNS TO LIMBS

- Avoid direct contact with the thermal fluids or the surfaces.
- Wear your personnel protective equipment (e.g. temperature-resistant safety gloves, safety goggles, safety footwear).

CAUTION

Uncontrolled formation of ice at the connections and hoses of the thermal fluid circuit

SLIP AND TRIP HAZARD

- If the temperature is controlled in the minus range, ice forms at the hoses and connections of the thermal fluid circuit. This occurs by condensing and freezing of atmospheric humidity.
- Check the strength of the ice formation. If too much ice is formed, this increases the risk of the temperature control unit tipping over. Secure the temperature control unit against tipping if this is the case.
- Check the ground below the ice formation for condensation water. Collect the condensation water with a suitable container or thoroughly remove it at regular intervals. You thus prevent the danger of slipping caused by condensation.

To connect applications, use only temperature control hoses that are compatible with the thermal fluid used.

- We recommend you use only temperature-insulated temperature control hoses with your temperature control unit. The responsible body is responsible for the insulation of connection valves.
- We **exclusively** recommend reinforced hoses for connecting to the cooling water supply. Cooling water and insulated temperature control hoses can be found in the Huber catalogue under Accessories.

2.7 Wrench sizes and torques

Observe the proper wrench sizes for the pump connection at the temperature control unit. The following table lists the pump connections and the resulting wrench sizes, as well as the torque values. Always perform a leak test afterwards and re-tighten the connections if required. The values of the maximum torques (see table) must **not** be exceeded. Protect the pump connections against undue twisting by counterholding.

Overview wrench sizes and torques

Connection	Sleeve nut wrench size	Connector wrench size	Recommended torques in Nm	Maximum torques in Nm
M16x1	19	17	30	35
M24x1.5	27	27	47	56
M30x1.5	36	32	79	93
	36	36	79	93
M38x1.5	46	41/46	130	153
M45x1.5	50	50	200	210

Connection	Sleeve nut wrench size	Connector wrench size	Recommended torques in Nm	Maximum torques in Nm
G-thread (flat-sealing)	Adapt the torque to the material of the flat seal used. First hand-tighten the temperature control hose. When using adapter pieces, do not overtighten the G-thread on the pump connection when connecting a temperature control hose. When connecting a temperature control hose to the adapter piece, secure the G-thread against overtightening.			

2.8 Temperature control units with water cooling

WARNING

Open electrical wires below the temperature control unit if the temperature falls below the dew point.

DEATH FROM ELECTRICAL SHOCK BY WATER ENTRY INTO THE ELECTRIC LINES.

- A temperature below the dew point may result in condensation in the temperature control unit and at the cooling water connections. The condensation is caused by high humidity at the cooling water-bearing components. The condensation exists the temperature control unit at the bottom.
- Electrical lines directly below the temperature control unit must be protected against liquid ingress.

CAUTION

Use of unsuitable/defective hoses and/or hose connections

INJURIES

- **Thermal fluid**
- Pay attention to the permissible pressure and temperature range when selecting temperature control hoses.
- Use appropriate hoses and/or hose connections.
- Check periodically for leaks and the quality of the hoses and hose connections and take suitable measures (replace) as required.
- Isolate and protect temperature control hoses against contact/mechanical load.
- **Cooling water**
- Reinforced hoses must be used to satisfy tougher safety requirements.
- Shut off the cooling water supply to the temperature control unit even for shorter downtimes (e.g. overnight).

NOTE

No protection against corrosion

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- The addition of anti-corrosion agents is mandatory if salts (chlorides, bromide) have been added to the water circuit.
- Ensure that the materials used in the cooling water circuit are resistant with respect to the cooling water. For information on materials used see the data sheet. → From page 84, section **»Annex«**.
- Take suitable measures to maintain the warranty conditions.
- For information about water quality, see www.huber-online.com.

NOTE

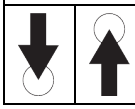
Usage of un-filtered river/sea or ocean water as cooling water

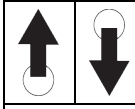
DAMAGE TO THE TEMPERATURE CONTROL UNIT

- Un-filtered river or sea water is not suitable for use as cooling water due to its contaminants.
- Use drinking water or filtered river or sea water for cooling.
- Sea water must not be used for water cooling.
- For information about water quality, see www.huber-online.com.

The following icons can be found near the cooling water connection on the temperature control unit. The table gives an overview of the icons used.

Overview

Icon	Description
	Cooling water connection
	Cooling water inlet

Icon	Description
	Cooling water outlet
	Cooling water drain

Preparing the temperature control unit with water cooling:

INFORMATION

To minimize cooling water consumption, Huber temperature control units with water cooling are equipped with a cooling water regulator. It limits the flow of cooling water to the amount required by the current load situation of the temperature control unit. If only a low cooling capacity is requested, only a small amount of cooling water is consumed. It cannot be ruled out that cooling water flows when the machine is switched off. Shut off the cooling water supply to the temperature control unit even for shorter downtimes (e.g. overnight).

Use of drinking water for water cooling purposes: A backflow from the cooling water line into the drinking water supply must be prevented on the building side. The responsible body must check and apply the national regulations applicable for it accordingly.

In the event of outdoor installation, the responsible body must ensure that the cooling water supply and return lines are laid frost-protected. The cooling water temperature must not fall below 3 °C. At ambient temperatures below 3 °C, the cooling water supply must be heated.

The minimum pressure differential in the cooling water circuit and the recommended cooling water inlet temperature can be found on the data sheet. → From page 84, section **»Annex«**.

Observe the wiring diagram. → From page 84, section **»Annex«**.

PROCEDURE

- Close (if present) the **>Cooling water drain<** [15].
- Connect the **>Cooling water outlet<** [14] to the water return flow. A seal must be used for this.
- Connect the **>Cooling water inlet<** [13] to the water supply. A seal must be used for this.

NOTE

Leaking cooling water connections

DAMAGE BY FLOODING OF ROOMS

- Slowly open the building-side isolating valves of the cooling water supply and return line.
- If water leaks from the cooling water connections: Shut off the cooling water supply and return line immediately.
- Provide leakproof cooling water connections.

- Open the shut-off valves in the water line on the temperature control unit (if present) and on the building side.
- Check the connections for leaks.

2.9 Preparations for operation

2.9.1 Opening/closing valves

Only valid for temperature control units with mechanical draining
If no valves are installed on the temperature control unit, this model is equipped with electrical draining.

Opening and closing valves

INFORMATION

Opening valves:
Open valves by turning them counterclockwise (turn 90° left as far as it will go).
Closing valves:
Close valves by turning them clockwise (turn 90° right as far as it will go).

PROCEDURE

- Check that all valves are closed.
- Close all valves by turning them clockwise (turn 90° right as far as it will go).

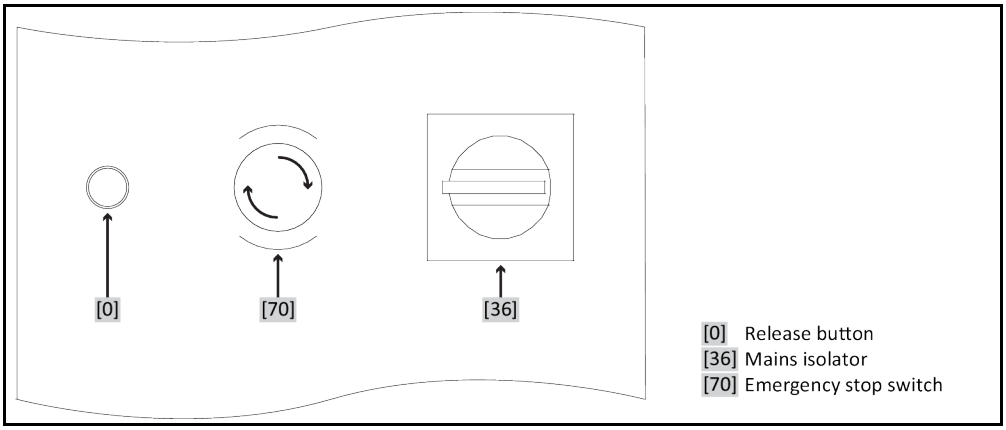
2.9.2 Checking the knurled screws

PROCEDURE

- Check whether the knurled screw on the **>Drain<** [8] has been mounted and tightened.

2.9.3 Emergency stop switch (optional): Check switching status

Exemplary layout of the switches



PROCEDURE

- Check the **>Emergency stop switch<** [70].
  This switch must not be pressed (activated) when taking the temperature control unit into operation.
- If required, release the **>Emergency stop switch<** [70] by turning it clockwise. A built-in spring in the **>Emergency stop switch<** [70] returns it to its original state.

2.9.4 Connecting the functional ground

PROCEDURE

- If required, connect the temperature control unit's **>Functional ground terminal<** [87] to the building's grounding point. Depending on the design, there may be another functional ground terminal on the switch cabinet. Use a ground strap in each case. For the exact positions please refer to the wiring diagram. → From page 84, section **»Annex«**.

2.10 Connecting externally closed application

Observe the wiring diagram. → From page 84, section **»Annex«**.

2.10.1 Connecting an externally closed application

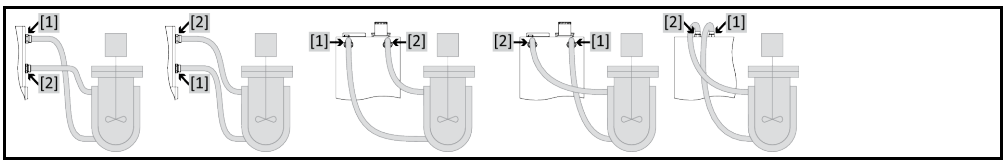
NOTE

Overpressure in the application (e.g. > 0.5 bar (g) with glass apparatus)

MATERIAL DAMAGE TO THE APPLICATION

- Observe the max. system pressure specified in the data sheet of the temperature control unit. → From page 84, Section **»Annex«**.
- Provide an overpressure protective device to prevent damage to the application.
- Do not install valves/quick-release couplings in the feed/discharge lines from the temperature control unit to the application and from the application to the temperature control unit.
- The specified maximum discharge pressure can be briefly exceeded: In case of a sudden shut-off of the system return or an unexpected error occurring.
- **If valves/quick-release couplings are required:**
- Install an overpressure protection device on the application itself (at the feed and discharge lines).
- Install a bypass upstream of the valves/quick-release couplings for the application.
- Matching accessories (e.g. bypasses to reduce pressure) can be found in the Huber catalog.

Example: Connecting an externally closed application



To enable your application to be operated correctly and eliminate air bubbles from the system, you must ensure that the **>Circulation flow<** [1] connection from the temperature control unit is attached to the lower connection point of the application and the **>Circulation return<** [2] into the temperature control unit is attached to the higher connection point of the application. Make sure that on temperature control units without **>Expansion vessel<** [18], the lower connection point of the application is at the same level or slightly higher than the **>Circulation return<** [2] connection.

PROCEDURE

- Remove the screw plugs from the **>Circulation flow<** [1] and **>Circulation return<** [2] connections.
- Then connect your application to the temperature control unit using suitable thermal fluid hoses. Observe the table with the wrench sizes. → Page 29, section **»Wrench sizes and torques«**.
- Check the connections for leaks.

2.11 Connecting to the power supply

INFORMATION

Based on local circumstances, it may be that you need to use an alternative power cable instead of the supplied original power cable. Have the mains cable only installed by a qualified electrician.

2.11.1 Connection using socket with protective earth (PE)

DANGER

Connecting to a power socket without protective earth (PE)

MORTAL DANGER FROM ELECTRIC SHOCK

- Always connect the temperature control unit to safety sockets (PE).

DANGER

Damaged power cable/power cable connection

MORTAL DANGER FROM ELECTRIC SHOCK

- Do not start up the temperature control unit.
- Isolate the temperature control unit from the power supply.
- Have the power supply cable/power supply connection replaced and inspected by an electrician.

NOTE

Incorrect power supply connection

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- Your building's existing power supply voltage and frequency must match the data provided on the rating plate of the temperature control unit.

INFORMATION

In case of uncertainties about an existing protective earth (PE), have the connection inspected by an electrician.

2.11.2 Connection via hard wiring

DANGER

Connection/adjustment to the power supply not carried out by an electrician

MORTAL DANGER FROM ELECTRIC SHOCK

- Have the connection/adjustment to the power supply carried out by an electrician.

DANGER

Damaged power cable/power cable connection

MORTAL DANGER FROM ELECTRIC SHOCK

- Do not start up the temperature control unit.
- Isolate the temperature control unit from the power supply.
- Have the power supply cable/power supply connection replaced and inspected by an electrician.

NOTE

Incorrect power supply connection

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- Your building's existing power supply voltage and frequency must match the data provided on the rating plate of the temperature control unit.

3 Function description

3.1 Function description of the temperature control unit

3.1.1 General functions

Unimotives are **extremely dynamic temperature control units**, designed for **externally closed** applications. → Page 33, section **»Connecting externally closed application«**. Unlike conventional bath and circulation thermostats however, these temperature control units have no **internal bath**.

The tempering bath, which in conventional bath and circulation thermostats also compensates the expansion of the thermal fluids according to their temperature, is replaced by a **temperature-decoupled >Expansion vessel<** [18], which usually maintains the temperature of the thermal fluid in the **>Expansion vessel<** [18] close to room temperature.

Thanks to the **low internal volume** combined with **efficient chilling/heating technology**, you achieve **short cooling/heating rates** compared to conventional bath and circulation thermostats.

Only valid for temperature control units with "XT" in their model designation: The temperature control units are designed for the use of a water-ethylene glycol mixture at temperatures above the normal boiling point. The closed design makes it possible to use a water-ethylene glycol mixture at temperatures at which the thermal fluid normally boils. Despite the closed design, steam can escape from the **>Filling port<** [17] or the **optional additional expansion vessel** in the event of a malfunction.

Temperature control units with "P" in model name: This temperature control unit is particularly suitable for applications requiring high pressure drops.

3.1.2 Other functions

The integrated **speed-controlled pump** enables the **speed** or the **pressure** to be controlled and hence optimally matched to the respective application. On temperature control units with higher pumping and cooling capacities or without speed-controlled pump, this function can be performed by optional accessories.

The **self-optimizing cascade control** delivers **optimal controller results** for regulating levels up and down, both with **setpoint changes** and also with **exothermic reactions**. Temperature control can be either a-periodic or with a slight overshoot (faster).

The **Ethernet, USB device and USB host interfaces supplied as standard with "Pilot ONE"**, as well as the **Pt100, ECS and POKO interfaces at the "Unistat Control ONE"** enable the temperature control units to be seamlessly integrated into numerous automated laboratory systems.

The **removable control panel ("Pilot ONE")** can also be used as a **remote control**. Please contact your dealer or Huber Sales Department if you need an extension cable. → Page 82, section **»Contact data«**.

A **connection jack for Pt100 process controller sensor** enables you to accomplish **external temperature control tasks** with ease.

The temperature control unit is fitted with an **integrated temperature ramp function** and an **internal temperature programmer**. The integrated programmer offers the option of creating and recalling 10 different temperature control programs with a total of 100 program steps.

The temperature control unit has **overtemperature protection to DIN EN 61010-2-010, independent** of the control circuit itself.

Only valid for temperature control units with an emergency stop switch (optional):
By installing an **>Emergency stop switch<** [70], an additional protective device has been installed in the temperature control unit. When the **>Emergency stop switch<** [70] is pressed (activated), all poles of the temperature control unit are **immediately** disconnected.

3.2 Information on the thermal fluids

⚠ CAUTION

Non-compliance with the safety data sheet for the thermal fluid to be used

INJURIES

- Risk of injury to the eyes, skin, respiratory tract.
- The safety data sheet for the thermal fluid to be used must be read prior to using it and its content must be respected.
- Observe the local regulations/work instructions.
- Wear your personal protective equipment (e.g. temperature-resistant safety gloves, safety goggles, safety footwear).
- Danger of slipping because floor and work area are contaminated. Clean the workplace; observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.

NOTE

Non-compliance with the compatibility between the thermal fluid and your temperature control unit

MATERIAL DAMAGE

- Observe the classification of your temperature control unit according to DIN 12876.
- Ensure the following materials are resistant to the thermal fluid: Stainless steel 1.4301 / 1.4401 (V2A), copper, ferrite, carbon and silver solder.
- It is obligatory to use corrosion protection!

NOTE

Mixing different thermofluids in a thermal fluid circuit

PROPERTY DAMAGE

- Do **not** mix different types of thermofluid (such as mineral oil, silicone oil, synthetic oil, water, etc.) in a thermofluid circuit.
- The thermal fluid circuit **must** be rinsed when changing from one type of thermal fluid to another. No residues of the previous type of thermal fluid may remain in the thermal fluid circuit.

INFORMATION

The only approved thermal fluid is a water-ethylene glycol mixture with corrosion protection.
We recommend the ethylene glycols listed in the Huber catalogue in the specified mixing ratio.

Thermal fluid: Water

Designation	Specification
Calcium carbonate per liter	≤ 1.5 mmol/l; corresponds to a water hardness of: ≤ 8.4 °dH (soft)
pH value	between 6.0 and 8.5
Ultrapure water, distillates	Add 0.1 g of sodium carbonate (Na_2CO_3) per liter
Non-approved water	Distilled, deionized, demineralized, chloric, ferruginous, ammoniacal, contaminated or untreated river water or sea water
Thermal fluid: Water without ethylene glycol	
Use	excluded
Thermal fluid: Water-ethylene glycol mixture without corrosion protection	
Use	excluded
Thermal fluid: Water-ethylene glycol mixture with corrosion protection (for example Glysantin®)	
Use	-45 °C to +95 °C (35 to 60 percent by volume of ethylene glycol) "XT" models: -45 °C to +150 °C (60 percent by volume of ethylene glycol)
Thermal fluid composition	Freezing point: ≤ -20 °C and min. 10 K below the permissible minimum temperature. For the permissible temperature range, refer to the datasheet. → From page 84, Section **»Annex«**. Normal boiling point: Min. 10 K above the set max. setpoint limit. The setpoint limits **must** be adjusted to the thermal fluid used. → Page 62, Section **»Setting the setpoint thresholds«**. "XT" models: Set the pressurisation so that the associated boiling point lies sufficiently above the maximum working temperature (15 K).

3.3 To be noted when planning the test

INFORMATION Observe the intended operation. → Page 13, section **»Proper operation«**.

The focus is on your application. Bear in mind that system performance is influenced by heat transfer, temperature, thermal fluid viscosity, volume flow, and flow speed.

- Make sure the electrical connection is adequately dimensioned.
- The installation location of the temperature control unit should be selected so as to ensure adequate fresh air, even with water-cooled chillers.
- The maximum flow pressure of a temperature control unit must be taken into account in case of pressure-sensitive applications, such as glass reactors.
- Cross-section reduction or shut-off in the thermal fluid circuit must be avoided. Take appropriate measures to limit the pressure in the system. Observe the data sheet of the temperature control unit and the glass apparatus. → From page 84, section **»Annex«**.
- Check whether it is necessary to use an external bypass for temperature control units without pressure limitation.
- In order to prevent the risk of overpressure in the system, the thermal fluid must always be adjusted to room temperature before switching off. This will prevent damage to the temperature control unit or the application. Any isolating valves must remain open (pressure equalization).
- The temperature and the dynamics of the process are determined by the flow temperature. A differential temperature (Delta T) forms between flow temperature and process temperature. This differential temperature may have to be limited, because Delta T might exceed limits of the application (glass apparatus) and cause bursting. Adjust the Delta T value to your application.
- Select the thermal fluid to be used in such a way that it not only permits the minimum and maximum working temperature but is also suitable with regard to fire point, boiling point, and viscosity. In addition, the thermal fluid must be compatible with all the materials in your system.
- Avoid bending the temperature control and cooling water hoses (if required). Use suitable angle pieces and lay the hose connections with a large radius. Take the minimum bending radius from the data sheet of the temperature control hoses used.
- The selected hose connections must be able to withstand the thermal fluid, the working temperatures and the admissible maximum pressure.
- Check the hoses at regular intervals for any material fatigue (e.g. cracks, leaks).
- Keep the temperature control hoses as short as possible
  - The inside diameters of the temperature control hoses must correspond at least to the pump connections. Select bigger inside diameters for longer line lengths to compensate for pressure loss in the piping.
  - The viscosity of the thermal fluid determines the pressure drop and influences the temperature control result, especially at low working temperatures.
  - Too small connectors and couplers and valves can generate significant flow resistance. Your application will therefore be slower to reach its design temperature.
- Basically, you should only use the thermal fluid recommended by the manufacturer and only within the usable temperature and pressure range.
- The application should be roughly at the same height of or below the temperature control unit if the temperature control process is close to the boiling temperature of the thermal fluid.
- Fill the temperature control unit slowly, carefully and evenly. Wear the necessary personal protective equipment, such as goggles, heat-proof and chemically resistant gloves, etc.
- The temperature control circuit must be vented after filling and setting all required parameters. This is required to ensure trouble-free operation of the temperature control unit and hence your application.

INFORMATION For water-cooled temperature control units, please take the cooling water temperature necessary for perfect operation and the required differential pressure from the data sheet. → From page 84, section **»Annex«**.

3.4 “Pilot ONE®” controller

The basic version of “Pilot ONE” (Basic) can be upgraded in three stages (“Basic” > “Exclusive” > “Professional” > “Explore”).

3.4.1 Functional overview of “Pilot ONE®”

Overview of the E-grade variants

Temperature control units / E-grade	E-grade Basic	E-grade Exclusive	E-grade Profes-sional
Beer force-aging thermostats	–	X	O
Unistat temperature control units	–	–	X
UniCAL	–	–	X
Other temperature control units	X	O	O
E-grade “Explore” (only for “Unistat” series temperature control units) The E-grade includes E-grade “Professional” functionalities. In addition it includes: – Sensor calibration for return sensor: 5 points – Return temperature display – Display of performance (estimated or calculated from volume flow) – Display mode “Explore” instead of “numerically large” – PB commands correspond to DV-E-grade, except: Temperatures only in 0.01 °C and volume flows only in 0.1 l/min.	–	–	O
E-grade “DV-E-grade” – All interface commands are enabled. – Temperatures in 0.001 °C, volume flows in 0.001 l/min possible (cf. E-grade Explore) **Note:** Only the interface commands are enabled, not the correspond-ing menu items in Pilot ONE!	O	O	O
E-grade “OPC-UA” – OPC-UA interface via Ethernet. This E-grade additionally includes DV-E-grade functionalities.	O	O	O
X = standard equipment, O = optional, – = not possible			

Overview of E-grade functions

Function	E-grade Basic	E-grade Exclusive	E-grade Professi-onal
Temperature control			
Controller parameterization: predefined[1] / TAC[2]	X/–	–/X	–/X
Find parameters: Fast Identification / With Preliminary Test / Estimate Control Parameters	–/–/X	X/X/–	X/X/–
Sensor calibration for control sensor[3]: x -point	2	5	5
Monitoring: Low level and overtemperature[4]	X	X	X
Adjustable alarm thresholds	X	X	X
VPC[5] (Variable Pressure Control)	X	X	X
Ventilation program	X	X	X

[1] TAC function available as a 30 day evaluation version.

[2] True Adaptive Control.

[3] Internal Pt100 and External Pt100.

[4] For temperature control units with integrated overtemperature protection.

[5] For units with variable-speed pump or external bypass.

Function	E-grade Basic	E-grade Exclusive	E-grade Professi-onal
Automated compressor	X	X	X
Setpoint limitation	X	X	X
Program controller: x programs / max x steps	–/–	3/15	10/100
Ramp function: linear / non-linear	–/–	X/–	X/X
Temperature control mode: Internal and process	–	X	X
Adjustable max. heating and cooling capacity	–	X	X
Display & operation			
Temperature display: 5.7" Touchscreen	X	X	X
Display mode: graphically / numerically large / Explore	–/X/–	–/X/–	X/X/–
Display resolution: 0.1 °C / 0.01 °C	X/–	X/X	X/X
Graphic display for temperature curves: Window, full screen and scalable	X	X	X
Calendar, date and time	X	X	X
Language: CZ, DE, EN, ES, FR, IT, JP, KO, PL, PT, RU, TR, ZH	X	X	X
Temperature format switchable: °C, °F and K	X	X	X
Display mode (screen) can be switched by swiping	X	X	X
Favorites menu	X	X	X
User menu (Administrator Level)	–	–	X
2. Setpoint	–	–	X
Connections			
Digital interface RS232	X	X	X
USB interfaces: Host und Device	X	X	X
Ethernet RJ45 interface	X	X	X
Pt100 external sensor connection	–	X	X
External control signal (ECS STANDBY[1])	X	X	X
Programmable potential-free contact (ALARM[2])	X	X	X
AIF (Analog Interface) 0/4–20 mA or 0–10 V[3]	X[4]	X	X
Digital interface RS485[5]	X	X	X
Comfort & other			
Visual / audible alarm signal	X	X	X
Autostart (Power Failure Auto)	X	X	X
Plug & Play technology	X	X	X
Technology glossary	X	X	X
Remote control / data visualization via Spy software	X	X	X
E-grade evaluation versions available (valid for 30 days)	X	X	X

[1] Standard on Unistats, otherwise via optional Com.G@te or POKO/ECS interface.

[2] Standard on Unistats, otherwise via optional Com.G@te or POKO/ECS interface.

[3] Via optional Com.G@te.

[4] Restricted, see entries under “Temperature Control”.

[5] Via optional Com.G@te.

Function	E-grade Basic	E-grade Exclusive	E-grade Professional
Storage/loading temperature control programs onto USB stick	–	X	X
Copying settings	–	–	X
Service data recorders (flight recorder)	X	X	X
PB commands[1]	X	X	X
Communication Watchdog	–	–	X
Process data recording directly to a USB stick: Setpoint, Actual Value Internal and Actual Value Process / Heating Capacity %, Cooling Capacity %, and Pump Pressure / Pump Speed, and VPC Pressure	–/–/–	X/X/–	X/X/X
Calendar start	–	–	X

3.5 Clock/event function

3.5.1 Rechargeable accumulator

"Pilot ONE" is fitted with a clock that continues to run even when the temperature control unit is switched off. The energy required for this purpose is provided by a rechargeable accumulator, which is automatically charged when the temperature control unit is switched on. The accumulator is dimensioned so that the clock can also continue to run for prolonged switch-off intervals (up to several months). If, after extremely prolonged switch-off time, time and date have been deleted, leaving the temperature control unit switched on for a few hours will usually suffice (no temperature control required). During this time, you can reset the time and date.

If after switching the unit off and back on again, the previously set time and date re-appear, it can be safely assumed that the rechargeable accumulator is defective. In this case, please contact Customer Support. → Page 82, section **»Contact data«**.

3.5.2 Programmable event function

The "Calendar Start" offers a programmable event function. This enables you to enter a time at which the event is repeatedly triggered on a daily basis (until the activity in the menu is reset). 2 event types are currently selectable:

3.5.2.1 Event function "Alarm clock event"

Several acoustic signals are used.

3.5.2.2 Event function "Program event"

After selecting **"Program event"** when configuring the event function, you will be prompted for the number of the program to be started. The program will be started automatically when the programmed event time is reached. If the temperature control unit is not active, this will also be started.

3.6 Operation via the touch screen

The entire operation is via the **>Touchscreen<** [88]. These functions can be activated by tapping the displayed text boxes/icons once. This also changes the display.

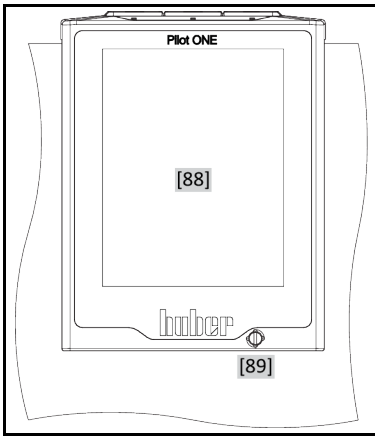
INFORMATION

You can cancel the current dialog or dialog sequence at any time by pressing the "ESC" touch button. When canceling a dialog or dialog sequence, it may be necessary to confirm the cancellation again. When canceling a dialog sequence, settings made earlier in the dialog sequence are discarded. Check your already carried out settings and re-enter as needed.

[1] See Data Communication Manual. Anything controllable via the graphical user interface of the Pilot ONE can be controlled by PB commands.

3.7 Display instruments

Display instruments



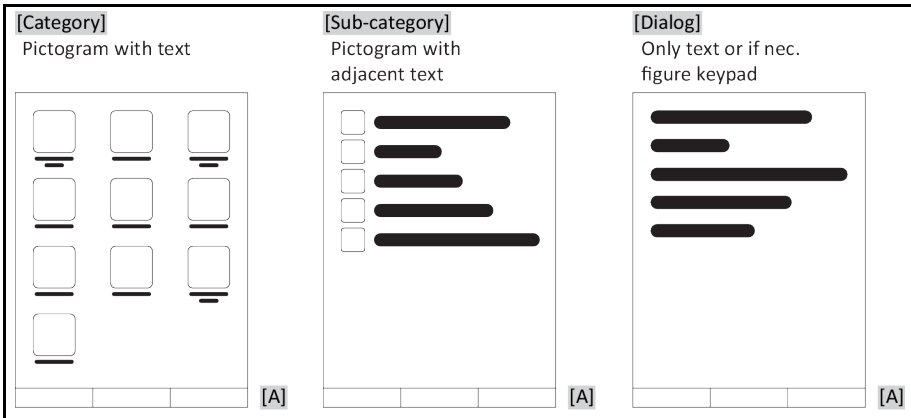
[88] Touchscreen
[89] Fixing screw for Pilot ONE

3.7.1 The touchscreen [88]

The most important display and operating instrument. Shows both standard variables (setpoint, actual value, setpoint thresholds...), and also menu guidance, error information output and operation.

3.8 Control instruments

Example “Control instruments”



[A] Touchbutton

INFORMATION

To exit the “Categories Menu”, sub-categories, menu items, press the “Home” touch button (house) or the arrow. After 2 minutes of inactivity, the category/ sub-category or the Favourites menu is automatically closed and you return to the “Home” screen. Dialogs are **not** canceled/closed after 2 minutes of inactivity.

3.8.1 The touchbuttons

Depending on the situation, the touch buttons can be assigned different functions. For example:

- Select the “Home” screen (house)
- Back (arrow to left)
- Favourites (star)
- Add to favorites (star with a plus sign)
- Select the “Categories menu” (menu)
- Confirm entry
- Start/stop

etc.

3.8.2 The categories

For clarity we have grouped the Operation and Setting of Pilot ONE in various categories. A category is selected by tapping it.

3.8.3 The sub-categories

The sub-categories are parts of a category. This is where you will find the entries that we have grouped together for you in the selected category. Not all the categories also contain sub-categories. Tap on a sub-category to select it.

3.8.4 The dialogs

Tapping on a category or sub-category displays its dialogs. Dialogues may appear e.g. as text, a numeric or a alphanumeric keyboard. Dialogs allow you for example to enter settings or start created temperature control programs. Within a dialog, selection must always be confirmed with the “OK” touch button. When cancelling a dialog with the “ESC” touch button it may be necessary to confirm the cancellation again.

3.9 Function examples

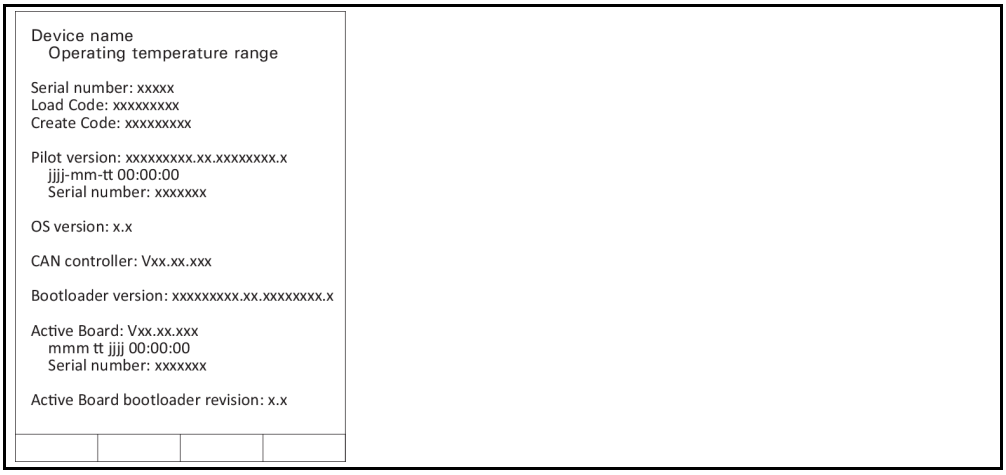
3.9.1 Display of software version

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “System Settings”.
- Tap on the category “System Info”.
- Tap on the sub-category “Software Version”.

The software versions of the electronics will be displayed:

Display of software versions



- Tap either the “ESC” or “OK” touchbutton. You will be returned to the previous screen.
- Tap on the “Home” touchbutton (house) to return to the “Home” screen.

3.9.2 Start & Stop

How to start and stop the temperature control process. Prerequisites: You have entered a setpoint.

PROCEDURE

- Go to the “Home” screen.

Start

- Tap on the “Start” touchbutton.
- Confirm the start of temperature control by tapping on “OK”.
  The correct selection will be displayed graphically and temperature control will start immediately. If tapping on “OK” is not correct, this is displayed graphically for 2 seconds. After this, the display will return to the “Home” screen again. Try to start the temperature control unit again.

Stop

- Tap on the “Stop” touchbutton.
- Confirm the stop of temperature control by tapping on “OK”.
  The correct selection will be displayed graphically and temperature control will stop immediately and the pump with overrun for about 30 seconds. Wait until the pump stops. If tapping on “OK” is not correct, this is displayed graphically for 2 seconds. After this, the display will return to the “Home” screen again. Try to stop the temperature control unit again.

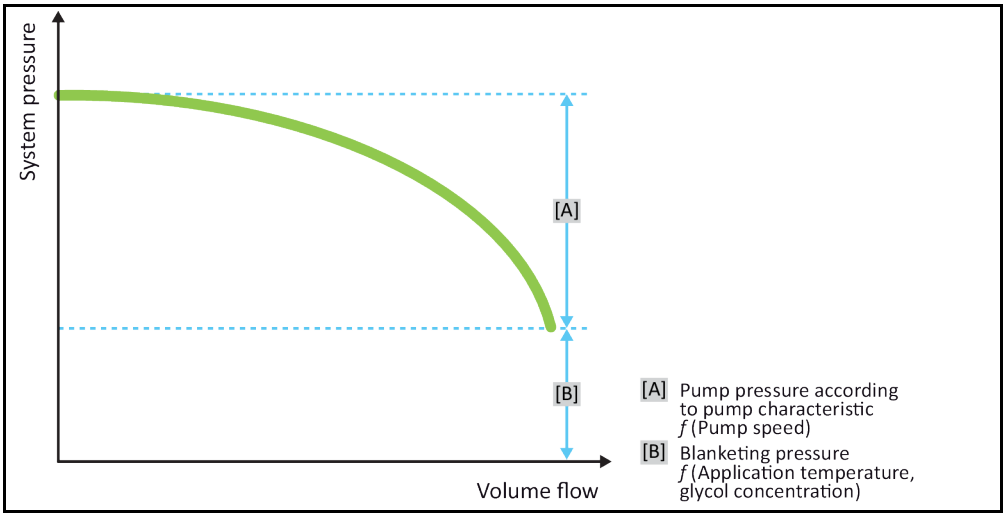
INFORMATION

With the “Stop” touch button, you can also stop Degassing, and Circulation. The requirement for this: The corresponding task is active. In the case of “XT” models, the temperature of the thermal fluid must in addition be controlled to < 95 °C before stopping. If the temperature in the thermal fluid circuit of “XT” models is > 95 °C: A warning is displayed on the touch screen and the activated function is not stopped.

3.9.3 Setting pressurisation

Only valid for temperature control unit with “XT” in the model designation

Exemplary representation of the system pressure



3.9.3.1 Display parameters

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category “Installation”.
- Tap on the category “Pressurisation”.
- Tap on the dialog entry “Display”.
- Tap on “OK” to confirm your selection.
- Tap on “OK” after you have read/checked the parameters.

3.9.3.2 Selecting settings

3.9.3.2.1 Selecting the thermal fluid

Factory settings for models with pressure blanketing

Freezing point water / ethylene glycol	Mixing ratio in percent by volume		1. Setpoint		2. Setpoint		3. Setpoint		Achievable end temperature in °C
	Ethylene glycol	Water	°C	bar abs.	°C	bar abs.	°C	bar abs.	
-50 °C	60.00	40.00	95	1.5	120	2.2	150	4.2	150
-45 °C	55.00	45.00	95	1.5	120	2.4	145	4.2	145
-40 °C	52.50	47.50	95	1.5	120	2.4	145	4.2	145
-35 °C	47.50	52.50	95	1.5	120	2.6	140	4.2	140
-30 °C	45.00	55.00	95	1.5	120	2.6	140	4.2	140
-25 °C	40.00	60.00	95	1.5	120	2.6	140	4.2	140
-20 °C	35.00	65.00	95	1.5	120	2.6	135	4.2	135

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category “Installation”.
- Tap on the category “Select Fluid”.
- Select the thermal fluid used from the list.
- Tap on “OK” to confirm your selection.

3.9.3.2.2 Pressurisation: Load standard profile

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category “Installation”.
- Tap on the category “Pressurisation”.
- Tap on the dialog entry “Temperature/pressure profile”.
- Tap on “OK” to confirm your selection.
- Tap on the dialog entry “Load standard profile”.
- Tap on “OK” to confirm your selection.
- Tap on the required setting in the list.
- Tap on “OK” to confirm your selection.
- Read the message displayed and confirm it by tapping on “OK”.

3.9.3.3 Adjusting settings

3.9.3.3.1 Manually adjusting temperature/pressure characteristic

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category “Installation”.
- Tap on the category “Pressurisation”.
- Tap on the dialog entry “Temperature/pressure profile”.
- Tap on “OK” to confirm your selection.
- Touch the dialog entry “Adjust profile”.
- Tap on “OK” to confirm your selection.
- Tap on the entry to be changed in the list.
- Tap on “OK” to confirm your selection.
- Enter the new temperature using the numeric keypad that appears.
- Tap on “OK” to confirm your entry.
- Enter the new pressure using the numeric keypad that appears.
- Tap on “OK” to confirm your entry.

3.9.3.4 Pressurisation mode

INFORMATION

For the pressurisation, it is possible to select between “Automatic” mode and “Permanently on” mode.
“Automatic” mode: The pressurisation is active when the temperature exceeds the configurated turn-on threshold.
“Permanently on” mode: The pressurisation is always active provided the circulation or a temperature control process are active.

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category “Installation”.
- Tap on the category “Pressurisation”.
- Tap on the dialogue entry “Mode”.
- Tap on “OK” to confirm your selection.
- Select from the dialog entries “Automatic mode” or “Permanently on”.
- Tap on “OK” to confirm your selection.
- **Only valid for “Automatic” mode:** Enter the new setpoint for pressurisation to be switched on using the number keypad that appears. Tap on “OK” to confirm your entry.

3.9.4 Copying the settings to a data carrier

Only valid for E-grade Professional

The current settings of the temperature control unit are saved as a file to a connected USB flash drive. Use this file to restore the settings of a temperature control unit or to copy them to another temperature control unit. The models of the temperature control units used must be identical to copy the settings between temperature control units. You cannot transfer data between different models.

You can also transfer the set value of the overtemperature protection to another temperature control unit. You must **always** verify this value on the respective temperature control unit and adjust it if necessary. Make sure that the value of the overtemperature protection has been adapted to the thermal fluid used.

3.9.4.1 Saving to a USB flash drive

PROCEDURE

- Insert a USB flash drive into the “USB 2.0 interface host”. The USB flash drive must have at least 1 MB of free space.
- Go to the “Categories Menu”.
- Tap on the category “System Settings”.
- Tap on the category “Copy Settings”.
- Tap on the dialog entry “Save to USB flash drive”.
- Confirm your choice by tapping on “OK”. The content of the USB flash drive is displayed. If necessary, select the location (folder) on the USB flash drive.
- Confirm the selection of the memory location by tapping on “OK”.
- Enter a name for the file to be saved. Confirm the entry by tapping on “OK”. Alternatively, you can accept the proposed name by tapping on “OK”.
- Read the message and confirm by tapping on “OK”. The file with the settings was created on the USB flash drive.
- Remove the USB flash drive from the temperature control unit.

3.9.4.2 Loading from a USB flash drive

PROCEDURE

- Insert a USB flash drive with the saved file into the “USB 2.0 interface host”.
- Go to the “Categories Menu”.
- Tap on the category “System Settings”.
- Tap on the category “Copy Settings”.
- Tap on the dialog entry “Load from USB flash drive”.
- Confirm your choice by tapping on “OK”. The content of the USB flash drive is displayed.
- Select the file you want to load.

- Confirm the selection of the file by tapping on “OK”.
- Select the setting group to be loaded from the list. A multiple selection is possible.
- Confirm your choice by tapping on “OK”.
- Read the message on the **>Touchscreen<** [88].
- Switch off the temperature control unit. The settings have been loaded to the temperature control unit.
- Remove the USB flash drive from the temperature control unit.

3.9.5 Restore factory settings

Use this function to reset the temperature control unit to various basic states. This is useful if you want to reverse various settings relatively quickly.

INFORMATION

Restoring the factory settings is **only** possible if the temperature control unit is **not** carrying out a task. If a task is active, do not switch off the temperature control unit until the application allows this. Restoring the factory settings cannot be revoked. Depending on the type of resetting to factory settings performed you may have to enter parameters (process safety, thermal fluid used, cut-out value etc.) again.

“X” = Value is reset, “–” = Value is not reset
(A) = All together; (B) = Device parameters without OT; (C) = Device Parameter; (D) Program Controller; (E) = Menu; (F) = Com.G@te

Description	(A)	(B)	(C)	(D)	(E)	(F)
Acoustics	X	X	X	–	–	–
Display functions Warnings; Messages; Inactive Menu Items; Resolution Temperature	X	X	X	–	–	–
Display modes	X	X	X	–	–	–
AutoStart response	X	X	X	–	–	–
Limitations DeltaT limit; max. heating variable; max. cooling variable; max. permissible current consumption (for 230 V temperature control units)	X	X	X	–	–	–
Com.G@te (only if Com.G@te is connected) Analog interface (configuration input)						
Meaning of AIF input; response on cable break; measurement range setting	X	X	X	–	–	X
Calibration	–	–	–	–	–	X
In case of analog error; current / voltage switching; filter constant	X	X	X	–	–	X
Configuration output AIF output variable; output range setting	X	X	X	–	–	X
Calibration	–	–	–	–	–	X
RS232/RS485 (hardware RS, Baud rate, device address); ECS standby; POKO alarm	X	X	X	–	–	–
Properties (other) Change thermal fluid (thermal fluid, liter indicator, bypass usage); cooling bath / cooling (CC-E only)	X	X	X	–	–	–
Sensor calibration	–	–	–	–	–	–
Automated compressor	X	X	X	–	–	–
Enter program	X	–	–	X	–	–
Pump settings Pump speed setpoint; pump pressure setpoint; control mode	X	X	X	–	–	–
Fluid properties thermal fluid; liter indication; pressure application (only with XT models)	X	X	X	–	–	–

Description	(A)	(B)	(C)	(D)	(E)	(F)
Configuration manual parameters						
Protective function High limit alarm internal; low limit alarm internal; high limit alarm process; low limit alarm process; hydrostatic correction; warning time limit (CC-E only); min. level (for temperature control units with analogue level sensor); max. level (for temperature controllers with analogue level sensor); freeze protection (optional)	X	X	X	–	–	–
Setpoint	X	X	X	–	–	–
Setpoint limitation Min. setpoint; max. setpoint	X	X	X	–	–	–
Language	X	X	X	–	–	–
Temperature format	X	X	X	–	–	–
Temperature control mode	X	X	X	–	–	–
Favorites menu	X	–	–	–	X	–
Pilot ONE Ethernet IP address; subnet mask; remote access	X	X	X	–	–	–
Time unit	X	X	X	–	–	–
2. Setpoint	X	X	X	–	–	–

3.9.5.1 Restore to factory settings without overtemperature protection

PROCEDURE

- Go to the “Categories menu”.
- Tap on the category "System settings".
- Tap on the category “Factory settings”.
- Select from the dialog entries “Device parameters without OT”, “Menu”, “Programmer”, and “Com.G@te”. These entries do **not** reset the overtemperature protection. Tap on the selected dialog entry.
- Tap on the “OK” touch button to confirm your selection.
- Read the message displayed. Tapping on “Yes” restores the factory settings, tapping on “No” cancels the procedure. The message “Restart system!” appears on the **>Touchscreen<** [88].
- Switch off the temperature control unit. The selected parameters have been reset.

3.9.5.2 Restore to factory settings including overtemperature protection

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “System Settings”.
- Tap on the category “Factory Settings”.
- Choose between the dialog entries “Unit Control Data” and “All together”. These entries **also** reset the overtemperature protection. Tap on the required dialog entry.
- Tap on the “OK” touchbutton to confirm your choice.
- Read the message displayed. Tapping on “Yes” restores the factory settings, tapping on “No” cancels the procedure.

INFORMATION

In the following dialog, enter the overtemperature protection suitable to the thermal fluid used. To reset the cut-out values of the overtemperature protection to the factory setting from within the controller of Pilot ONE, enter 35 °C for “Heater” and 45 °C for the expansion vessel (if installed). “Process Safety” is factory set to “Stop” and is automatically reset to “Stop” when restoring the factory settings.

- Enter the temperature unit you want to use with Pilot ONE. The available choices are “Celsius (°C)”, “Kelvin (K)” and “Fahrenheit (°F)”.
- Tap on “OK” to confirm your selection.
- Read the message and confirm by tapping on “OK”.

- Read the safety warning and confirm by tapping on “OK”.
- Read the note and confirm by tapping on “OK”.
- Tap on the temperature unit set by you in the controller (green text).
- Enter the displayed red safety code using the number keypad that appears.
- Enter the value 35 °C for the “Heating OT value” using the number keypad that appears.
- Tap on “OK” to confirm your entry.
- Read the message and confirm by tapping on “OK”.
- Read the safety warning and confirm by tapping on “OK”.
- Tap on the temperature unit set by you in the controller (green text).
- Enter the displayed red safety code using the number keypad that appears.
- Enter the value 45 °C for the “Exp. vessel OT value” using the number keypad that appears.
- Tap on “OK” to confirm your entry. The message “Restart system!” appears on the **>Touchscreen<** [88].
- Switch off the temperature control unit. The temperature control unit is reset.

4 Setup mode

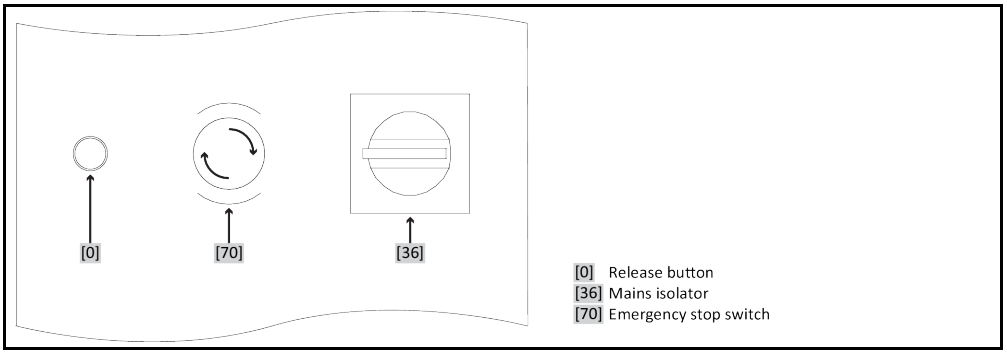
4.1 Setup mode

CAUTION

Moving the temperature control unit during operation
SERIOUS BURNS/FREEZING OF THE HOUSING PARTS/ESCAPING THERMAL FLUID
➢ Do not move temperature control units that are in operation.

4.1.1 Emergency stop switch (optional): Activate / Deactivate

Exemplary layout of the switches



INFORMATION

By activating the **>Emergency stop switch<** [70], all poles of the temperature control unit are disconnected **immediately**.

4.1.1.1 Emergency stop switch (optional): Activate

PROCEDURE

➢ Press the **>Emergency stop switch<** [70].
All poles of the temperature control unit are disconnected **immediately**.

4.1.1.2 Emergency stop switch (optional): Deactivate

PROCEDURE

➢ Turn the **>Mains isolator<** [36] to the “0” position.
➢ Release the **>Emergency stop switch<** [70] by turning it clockwise. A built-in spring in the **>Emergency stop switch<** [70] returns it to its original state.

4.1.2 Turning on the temperature control unit

PROCEDURE

➢ Switch on the temperature control unit using the **>Mains isolator<** [36].

Temperature control units with additional >Appliance switch< [37]**:**
Switch on the Pilot ONE using the **>Appliance switch<** [37].

Temperature control units with emergency stop switch:
The safety relay is tested. The **>Release button<** [0] illuminates if the test is positive. Press the illuminated **>Release button<** [0]. The temperature control unit is started and the illumination in the **>Release button<** [0] is turned off.

A system test is carried out subsequently. With this test, the full functionality of the temperature control unit is checked. All sensors, the all-pole disconnecting power disconnect relay and the power electronics of the main heater and the main heater itself are checked. A message appears on the **>Touchscreen<** [88] in case of an error or if a warning is issued. If in doubt, please contact Customer Support. → Page 82, Section **»Contact data«**.

INFORMATION

The following entries depend on the model and need only be made in case of:
a.) Initial start-up
b.) After resetting to the factory settings

- After switching on the temperature control unit, tap on the required system language. Confirm your selection with “OK”.
- Read the message and confirm the message with “OK”.
- Tap on the power draw you would like to use. Confirm your selection with “OK”.
- Tap on the thermal fluid you would like to use. Confirm your selection with “OK”.
- Read the message and confirm the message with “OK”.
- Enter the overall filling capacity in the thermal fluid circuit by means of the displayed keypad. Confirm your entry with “OK”.
- Set the setpoint limits depending on the thermal fluid used. → Page 36, Section **»Information on the thermal fluids«** and → Page 62, Section **»Setting the setpoint thresholds«**.
- Switch the temperature control unit on and off using the **>Mains isolator<** [36].

  Temperature control units with an emergency stop switch:
  The safety relay is tested. The **>Release button<** [0] illuminates if the test is positive. Press the illuminated **>Release button<** [0]. The temperature control unit is started and the illumination in the **>Release button<** [0] is turned off.

INFORMATION

Temperature control units with emergency stop switch:

Proceed as follows, if the **>Release button<** [0] is not illuminated when turning on the temperature control unit via the **>Mains switch<** [36]:
a.) Check whether the temperature control unit is properly connected to a **functioningpower supply**.
Solution: Properly connect the temperature control unit to a functioning power supply.
b.) Check whether the **>Emergency stop switch<** [70] is activated. → Page 49, Section **»Emergency stop switch (optional): Activate / Deactivate«**.
Solution: Deactivate the **>Emergency stop switch<** [70]. → Page 49, Section **»Emergency stop switch (optional): Deactivate«**.

If the illuminated **>Release button<** [0] does not turn off when pressed and/or the temperature control unit cannot be turned on:
Please contact our Customer Support.

4.1.3 Turning off the temperature control unit

PROCEDURE

- Control the temperature of the thermal fluid to room temperature.
- Stop the temperature control process.
- **Temperature control units with additional >Appliance switch< [37]:**
  Switch off the Pilot ONE using the **>Appliance switch<** [37].

  Switch off the temperature control unit using the **>Mains switch<** [36].

4.1.4 Setting the overtemperature protection

DANGER

The overtemperature protection is not correctly set to the thermal fluid used

MORTAL DANGER FROM FIRE

- The overtemperature protection must be correctly set to the thermal fluid you are using.
- Always observe the safety data sheet of the thermal fluid.
- Different working temperature ranges may apply for open and closed systems.
- Set the cut-out value of the overtemperature protection at least 25 K **below the fire point** of the thermal fluid.

INFORMATION

The usable working temperature range of the thermal fluid may be smaller if the overtemperature protection is correctly set. Due to tolerances, the overtemperature protection can trigger when the temperature is controlled near the upper operating temperature limit.

4.1.4.1 General information on the overtemperature protection

The overtemperature protection is a device in the temperature control unit that works independently of the controller. The software and hardware is designed to test key functions and operating states during a self-test after the power supply has been switched on. If faults are detected, the enabling of the electrical assemblies in the temperature control unit is blocked. During operation, the sensors are tested for short-circuit and interruption.

The bath or flow temperature is monitored to ensure the safety of your system. It is set immediately after you have filled the system with thermal fluid.

Our temperature control units not only offer the possibility to specify the cut-out value of the overtemperature protection but also provide the possibility to specify the shutdown mode of the temperature control unit. In a typical setting the temperature control unit switches off both the temperature control as well as the circulation **(stop according to DIN EN 61010)** after reaching the cut-out value. This monitors a possible defect in the control of the heater. A strong exothermic reaction near the cut-out value can also, under certain circumstances, result in a shutdown of the temperature control unit. In this case, however, a shutdown would be fatal.
Our temperature control units provide the possibility to work with the shutdown mode **Process Safety**. In this mode, temperature control (cooling) and circulation work as always. This is therefore a possibility to respond to exothermic reactions.

INFORMATION

The default shutdown mode of the overtemperature protection is **"Stop according to DIN EN 61010"**. When resetting to factory settings, the overtemperature protection is **reset** to the default shutdown mode "Stop according to DIN EN 61010"!

Upon delivery, the cut-out value of the overtemperature protection is set to 35 °C. An alarm is triggered by the temperature control unit shortly after turning on the power if the temperature of the thermal fluid just filled is higher than the cut-out value set for the overtemperature protection. Set the overtemperature protection to the thermal fluid you are using.

When setting a new cut-out value for the overtemperature protection, you will be prompted to enter a randomly generated and displayed code via the numeric keypad displayed. Only after successful entry will you be able to change the cut-out value.

4.1.4.2 Setting "OT limit: heating"

PROCEDURE

- Go to the "Categories Menu".
- Tap on the category "Safety".
- Tap on the category "Overtemperature".
- Read the safety warning and confirm by tapping on "OK".
- Read the Note and confirm by tapping on "OK".
- Tap on the dialog entry "OT limit: heating".
- Confirm your choice by tapping on "OK".
- Tap on the temperature format set by you in the controller (green text).
- Enter the displayed red safety code using the number keypad that appears.
- Enter the value for the "Heating OT value" using the numeric keypad that appears. This value must be 25 K below the fire point of the thermal fluid you are using.
- Confirm your entry by tapping on "OK".

4.1.4.3 Setting "OT expansion vessel"

PROCEDURE

- Go to the "Categories Menu".
- Tap on the category "Safety".
- Tap on the category "Overtemperature".
- Read the safety warning and confirm by tapping on "OK".
- Read the Note and confirm by tapping on "OK".
- Tap on the dialog entry "OT limit: Expansion vessel".
- Confirm your choice by tapping on "OK".
- Tap on the temperature format set by you in the controller (green text).

- ➢ Enter the displayed red safety code using the numeric keypad that appears.
- ➢ Enter the value for the “Exp. vessel OT value” using the number keypad that appears.
- ➢ Confirm your entry by tapping on “OK”.

4.1.4.4 Setting “Process Safety”

You have two options.

“Stop” in accordance with DIN EN 61010
Once the overtemperature protection cut-out value is reached, the temperature control unit (heating, cooling circuit and circulation pump) switches off (default setting).

“Process Safety”
Once the overtemperature protection cut-out value is reached, the heater switches off and the cooling circuit and circulation pump continue to operate. In case of an emergency (possible exothermic reaction), the full cooling capacity is thus available. Please make sure that the automated compressor is set to **Permanently ON** ([System Settings] > [Power/ECO Settings] > [Compressor ON/OFF/AUTO] > [Permanently ON]).

PROCEDURE

- ➢ Go to the “Categories Menu”.
- ➢ Tap on the category “Safety”.
- ➢ Tap on the category “Process Safety”.
- ➢ Read the safety warning and confirm by tapping on “OK”.
- ➢ Choose between the modes “Stop” and “process safety”.
- ➢ Confirm your choice by tapping on “OK”.

4.1.4.5 Monitoring via “Display OT values”

PROCEDURE

- ➢ Go to the “Categories Menu”.
- ➢ Tap on the category “Safety”.
- ➢ Tap on the category “Display OT values”.
  You will receive an overview of the current measured temperature value of the overtemperature protection sensor, the set cut-out values and the set cut-out mode (Process Safety). Some temperature control units have 2 overtemperature protection sensors, and so 2 values are shown for these temperature control units.
- ➢ Tap on the “OK” touchbutton after you have read/checked the information.

4.1.5 Testing overtemperature protection for functionality

DANGER

Overtemperature protection (OT) does not trip

MORTAL DANGER FROM FIRE

- ➢ Test the response of the device every month and after each change of the thermal fluid in order to assure proper functioning.

NOTE

The steps below are carried out without permanent monitoring of the temperature control unit

DAMAGE TO AND IN THE VICINITY OF THE TEMPERATURE CONTROL UNIT

- ➢ The following actions may only be carried out while constantly monitoring the temperature control unit and the application!

INFORMATION

Run the test only if the temperature of the thermal fluid used is about 20 °C. You must **NOT leave the temperature control unit unattended** during the entire test of the overtemperature protection.

The Pilot ONE controller contains a description for carrying out the overtemperature protection test.

PROCEDURE

- ➢ Go to the “Categories Menu”.
- ➢ Tap on the category “Safety”.

- Tap on the category “OT Test”.
  The description for carrying out the overtemperature protection test is displayed.
- Tap on the “OK” touch button after you have read the information.

4.1.6 Adjusting the Delta T limiter

NOTE

The Delta T limiter has not been adjusted to the used glass apparatus

DAMAGE CAUSED BY GLASS APPARATUS BURSTING

- Adjust the Delta T value to your application.

INFORMATION

The temperature dynamics inside the reactor/process temperature are dictated by the flow temperature. A differential temperature (Delta T) forms between the flow temperature and the temperature inside the reactor. The greater the permitted Delta T, the better the energy transmission and hence the faster the speed reaches the desired setpoint. However, the temperature difference could exceed permissible limits and this could lead to bursting of the application (e.g. glass apparatus). This difference in temperature may have to be restricted depending on the application (glass apparatus).

4.1.6.1 Changing the Delta T limiter

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Protection Options”.
- Tap on the sub-category “Delta T limiter”.
- Set the value of Delta T in line with the glass apparatus.
- Confirm your entry by tapping on the “OK” touchbutton.

4.2 The temperature control circuit

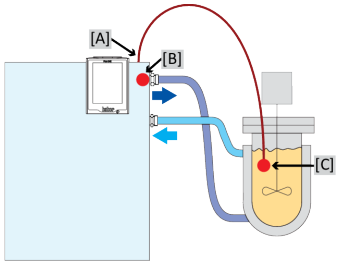
Every temperature control unit with a Pilot ONE control panel has its own PID controller for internal and process temperature control. For many temperature control tasks it is sufficient to use the factory-set control parameter. Our years of experience and current developments in control technology are used in these control parameters.

If a process control system is used, ideally send the specification of the temperature setpoint digitally to the temperature control unit. For this purpose, an Ethernet and USB port is available at the Pilot ONE and a RS232 interface at the temperature control unit. With the optional Com.G@te, an additional RS485 interface is added to your temperature control unit. Optionally you can integrate the temperature control unit in a Profibus environment. → From page 69, section **»Interfaces and software update«**.

INFORMATION

The capacity adjustment of the temperature control unit is optimized so that the specified processes are run through in the fastest possible time. This increases the productivity of the system as a whole and thus saves energy in the long term.

Diagram of temperature control circuit



[A] Pt100 socket for connecting an external process sensor
[B] Internal Pt100 temperature sensor (internal temperature)
[C] External Pt100 temperature sensor (process temperature)

4.2.1 Select temperature control: Internal or process

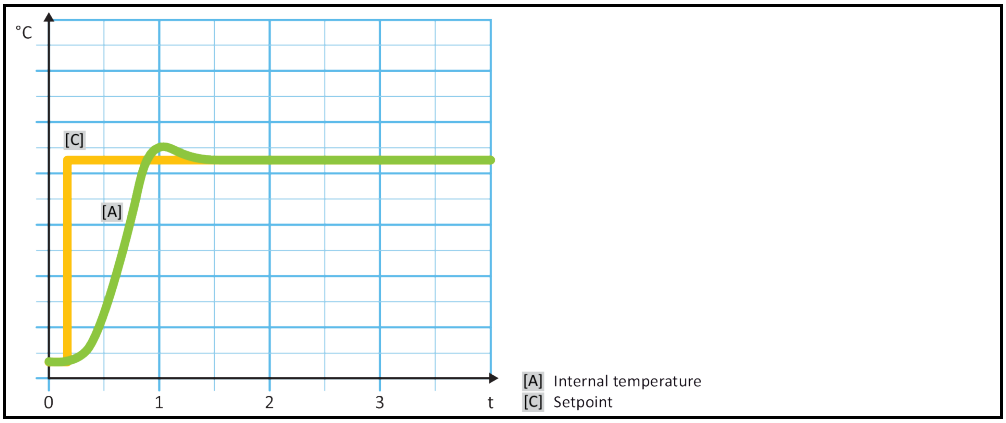
PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “Process/Internal”.
- Choose between the entries “Internal” and “Process (Cascade)”.
- Confirm your choice by tapping on “OK”.

4.2.2 Temperature control to internal temperature

With internal temperature control, a control circuit is used to control the temperature at the internal Pt100 temperature sensor. This Pt100 temperature sensor is built into the device and is located close to thermal fluid outlet (forward flow) or in the bath tank.

Representation of an optimum internal temperature control



4.2.3 Temperature control to process temperature

Certain temperature control tasks require that the temperature is recorded elsewhere for best results than described. Setting the temperature to process temperature makes alternatives available. When setting the temperature to process temperature, an additionally connected external Pt100 temperature sensor is used in conjunction with a master controller (cascade controller). The internal sensor at the supply line is integrated with the slave controller. This temperature control method is used e. g. for the thermostatic control of jacket vessels. The setpoint setting is valid for the process controller. It in turn calculates a target value for the internal controller to optimally adjust the process setpoint.

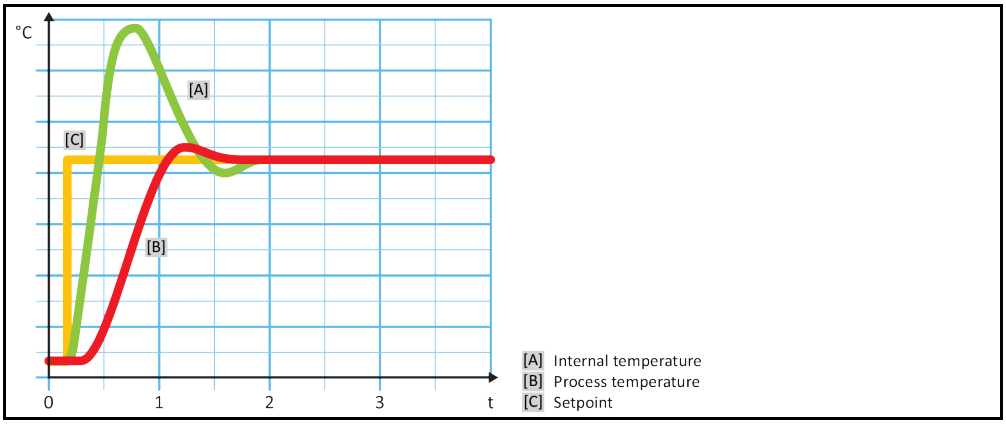
NOTE

Incorrect installation of the process sensor (Pt100)

MATERIAL DAMAGE CAUSED BY FAULTY TEMPERATURE CONTROL

- Disruption of measured value recording due to static build-up.
- The process sensor (Pt100) must have a screened supply cable.
- If the sensor tube is metallic, take care to avoid ground loops.
- The connection cable should not be unnecessarily long.
- Make sure that the process sensor is properly attached at the measurement point and that there is good thermal coupling
- The sensor itself must have good insulation from the screen or the protective grounding (R > 20 MΩ).

Representation of an optimum process temperature control



4.2.4 Delta T limiter

The Delta T limiter is a part of the temperature control which protects the system or the process. The Delta T limiter is given a limit value. The Delta T limiter then reacts when the limit value is reached during heating or cooling.

The temperature control mode “Process (Cascade)” evaluates the temperature difference between the flow temperature and the process temperature. The default setting of the limit value is 100 K. If the limit value and the temperature sensor are set properly, the load limits, e.g. from a glass apparatus, are not exceeded. As the limit value is approached, the cooling or heating capacity is adjusted. The DeltaT limiter is **not** a safety device.

4.2.5 Monitoring the Pt100 temperature sensors

The Pt100 temperature sensors are constantly monitored for their electrical status. If the status “Sensor faulty” occurs during temperature control, the temperature control process is stopped immediately and a device message is displayed. This applies for all temperature sensors connected within the temperature control unit.

4.2.6 Optimum control parameters for optimum temperature control

If the adjustment of the temperature does not correspond to the quality of the illustrations shown above, you can adjust the control parameters. With Huber temperature control units, there are various ways of finding the optimum control parameters. Depending on the facilities of the temperature control unit, you can choose the following processes:

- Use ex-factory parameters (standard)
- Estimate Control Parameters (only useful for bath thermostats with E-grade Basic and internal control)
- Fast Identification (from E-grade Exclusive)
- With Preliminary Test (from E-grade Exclusive)

4.2.7 Sub-category: “Select auto/expert mode”.

NOTE

Use of the “Expert mode” without a thorough knowledge of I&C technology.

MATERIAL DAMAGE TO THE APPLICATION

➢ Only use this mode if you have a thorough knowledge of I&C technology.

Here you can select whether the control parameters are set in the “Automatic mode” or in the “Expert mode”. To enter settings in “Expert mode” requires in-depth knowledge of process measuring and control technology. Incorrect or insufficient settings can severely impair the function of the temperature control unit.

INFORMATION

In “Expert mode”, “Configuration auto” is deactivated and only “Configuration manual” is possible.

This is how to change mode:

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Select auto/expert”.
- Choose between the dialog entries “Automatic mode” and “Expert mode”.
- Confirm your choice by tapping on “OK”.

4.2.8 Sub-category: “Configuration auto”

INFORMATION You can only select this menu entry if “Automatic mode” is set.

4.2.8.1 Sub-category: “Find parameters”

4.2.8.1.1 Dialog entry: “Fast Identification”

Considering the small effort, the “Fast Identification” function of the controlled system provides you with very quick and reliable adapted control parameters. These control parameters achieve a fast and very accurate tuning performance. The more complex but also more precise identification “With Preliminary Test” is only very rarely required.

INFORMATION Do not make any changes to the temperature control unit and to the application (temperature control unit / external application) after your system has been started. Changes include e.g. filling / draining process chamber, changing the mixer speed, change of position of Pt100 process control sensor etc.

PROCEDURE

- Before setting the control parameters, make sure that the temperature control unit has reached the set setpoint and has been controlling the temperature at this setpoint for a few minutes. Do not stop the temperature control.
- Do not make any changes to the temperature control unit and the application during parameter determination.
- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Find parameters”.
- Tap on the dialog entry “Fast Identification”.
- Confirm your choice by tapping on “OK”.
- Read the message displayed and confirm it by tapping on “OK”.
- Select the thermal fluid used from the list.
- Confirm your choice by tapping on “OK”.
- Choose between the dialog entries “Internal” and “Process (Cascade)”.
- Confirm your choice by tapping on “OK”.
- Enter a new setpoint using the number keypad that appears. This should be at least 10 K away from the current setpoint.
- Confirm your entry by tapping on “OK”. Setting of the control parameters using “Fast Identification” starts and after a while a message appears on the display.
- Read the message displayed and confirm it by tapping on “OK”.

4.2.8.1.2 Dialog entry: “With Preliminary Test”

In some complex applications, the “Fast Identification” of the control circuit may not yet lead to optimum control. This can happen, in particular, if the hydraulic build-up cannot be adjusted to the necessary circulation volumes. → Page 37, section **»To be noted when planning the test«**.

A further optimization of control behavior can be achieved if you select the control parameterization “With Preliminary Test”. With this, the control parameters within the set limits of the minimum and maximum setpoint are determined. Temperature control is then also carried out to the setpoint limits in some circumstances.

INFORMATION

Before starting the automatic controller parameterization, verify the correct setting of the minimum and maximum setpoint. A limitation to the actually used operating temperaturerange is advantageous. Do not make any changes to the temperature control unit and to the application (temperature control unit / external application) after your system has been started. Changes include e.g. filling / draining process chamber, changing the mixerspeed, change of position of Pt100 process sensor etc.

Since the working temperature range can sometimes be very large, finding the parameters takes correspondingly longer in this mode. The control defines up to three temperature setpoints and automatically processes them one after another. One of these is below room temperature, one roughly at room temperature and one above room temperature, if the setpoint limits allow this.

PROCEDURE

- Before setting the control parameters, make sure that the temperature control unit has reached the set setpoint and has been controlling the temperature at this setpoint for a few minutes. Do not stop the temperature control.
- Do not make any changes to the temperature control unit and the application during parameter determination.
- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Find parameters”.
- Tap on the dialog entry “With Preliminary Test”.
- Confirm your choice by tapping on “OK”.
- Read the message displayed and confirm it by tapping on “OK”.
- Select the thermal fluid used from the list.
- Confirm your choice by tapping on “OK”.
- Choose between the dialog entries “Internal” and “Process (Cascade)”.
- Confirm your choice by tapping on “OK”. Setting the control parameters using “With Preliminary Test” starts and a message appears on the touchscreen after a while.
- Read the message displayed and confirm it by tapping on “OK”.

4.2.8.1.3 Dialog entry: “Estimate Control Parameters”

Even with the simple temperature control units, we offer a further advantage in comparison with comparable bath thermostats available on the market. You can modify an existing control parameter by entering the thermal fluid used and the quantity of thermal fluid. This version is available with bath thermostats without connected external application.

INFORMATION

All the necessary technical data for the thermal fluids listed for Pilot ONE are stored in the controller. If the thermal fluid that you use is not shown in the list, choose the most similar thermal fluid with regard to temperature range and viscosity. → Page 36, section **»Information on the thermal fluids«**.

PROCEDURE

- Before setting the control parameters, make sure that the temperature control unit has reached the set setpoint and has been controlling the temperature at this setpoint for a few minutes. Do not stop the temperature control.
- Do not make any changes to the temperature control unit and the application during parameter determination.
- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Find parameters”.
- Tap on the dialog entry “Estimate Control Parameters”.
- Confirm your choice by tapping on “OK”.
- Read the message and confirm it by tapping on “Yes”. The current control parameters will be overwritten.
- Select the thermal fluid used from the list.
- Confirm your choice by tapping on “OK”.

- Read the message displayed and confirm it by tapping on “OK”.
- Enter the filling volume using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Tap twice on the “Arrow” touchbutton to return to the category “Temperature Control”.
- Tap on the category “Process/Internal”.
- Choose between the dialog entries “Internal” and “Process (Cascade)”.
- Tap on “OK” to confirm your choice.

4.2.8.2 Sub-category: “Control Dynamics”

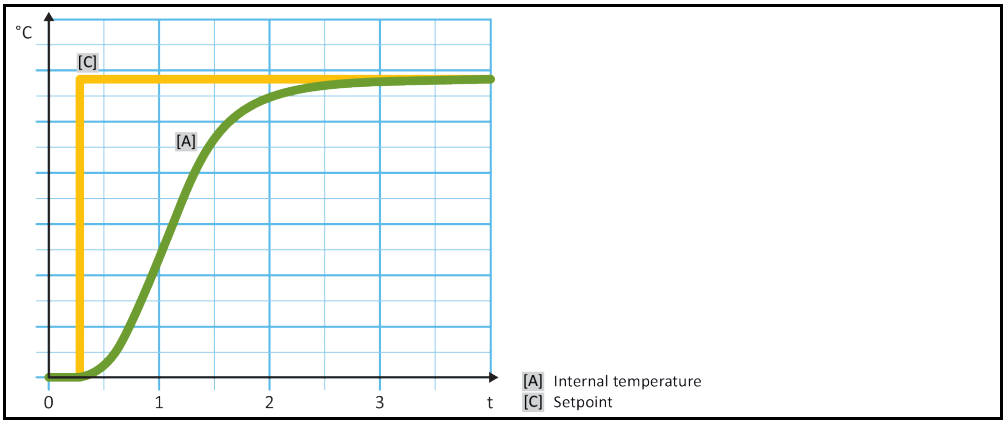
You can choose between a faster tuning performance with a possible and accepted small temperature overshoot and a tuning performance without temperature overshoot. The default setting is **“Fast, small overshoot”**.

The overshoot always refers to the leading temperature. If, for example, you have activated the process temperature control, this will be the leading temperature. Contrary to this, the bath or flow temperature must always be ahead of the process temperature. To achieve the best possible transmission of energy the largest possible temperature difference between bath and flow temperature and the process temperature is required. Note the illustration **“Representation of an optimum process temperature control”**. → From page 54, section **»Temperature control to process temperature«**. This can only ever be done with the largest possible volume flow of thermal fluid. In the setting **“Fast, small overshoot”**, the combination of high thermal fluid flow rate and the superbly designed control electronics hardly ever results in an overshoot, while reaching the setpoint as quickly as possible. Contrary to the mode **“Faster, small overshoot”** there is the setting **“Without overshoot”.** The target temperature is approached more cautiously and thus aperiodically. It takes longer to adjust to the selected setpoint. The statement “without overshoot” is only valid with little external disturbance influence. Please note the specifications. → Page 37, section **»To be noted when planning the test«**.

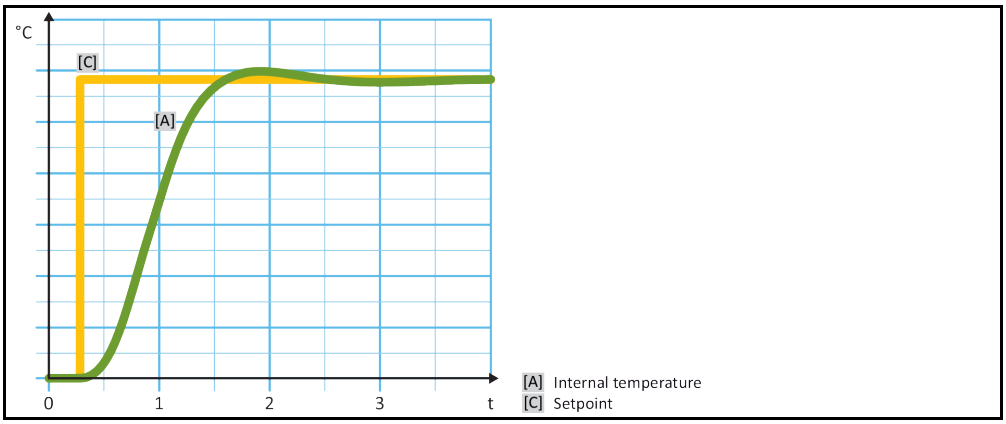
INFORMATION

The adjustment behavior can be selected at any time without reactivating the “Find control parameters”.

Internal, aperiodic temperature control



Internal, dynamic temperature control with possible overshooting of the temperature



PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Control Dynamics”.
- Choose between the dialog entries “Fast, small overshoot” and “Without overshoot”.
- Confirm your choice by tapping on “OK”.

4.2.8.3 Sub-category: “Fluid Properties”

4.2.8.3.1 Sub-category “Select Fluid”

Under this entry, you can select the thermal fluid used from a list.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Fluid Properties”.
- Tap on the sub-category “Select Fluid”.
- Select the thermal fluid used from the list.
- Confirm your choice by tapping on “OK”.

4.2.8.3.2 Sub-category: “Bath/Circulation Volume”

Under this entry, you can enter the filling volume of the thermal fluid in your bath/circuit.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Fluid Properties”.
- Tap on the sub-category “Bath/Circulation Volume”.
- Read the message and confirm it by tapping on “OK”.
- Enter the filling volume using the number keypad that appears.
- Confirm your entry by tapping on “OK”.

4.2.8.3.3 Sub-category: “Show Fluid”

This entry provides you with an overview of the settings entered.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Fluid Properties”.
- Tap on the sub-category “Show Fluid”.
- Tap on “OK” after you have read/checked the entries.

4.2.8.4 Sub-category: “Display parameters”

Here you can display the set parameters in “Automatic mode”.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.

- Tap on the sub-category “Configuration auto”.
- Tap on the sub-category “Display parameters”.
- Tap on “OK” after you have read/checked the parameters.

4.2.9 Sub-category: “Configuration manual”

NOTE

Use of the “Expert mode” without a thorough knowledge of I&C technology.

MATERIAL DAMAGE TO THE APPLICATION

- Only use this mode if you have a thorough knowledge of I&C technology.

INFORMATION

In “Expert mode”, “Configuration auto” is deactivated only “Configuration manual” is possible.

To enter settings in “Expert mode” requires in-depth knowledge of process measuring and control technology. Incorrect or insufficient settings can severely impair the function of the temperature control unit.

4.2.9.1 Sub-category: “Change parameters”

In this menu you manually configure the control parameters. If only the internal temperature is used as a target value, the control parameters are entered only under “Internal”. If the process temperature is used as the target value, also the internal controller can be used, for example, when reaching the set point limit or in case of a Delta T limit. Consequently, parameter sets must be entered under all three items (“Internal”, “Jacket” and “Process”) when using the process temperature as a target value.

4.2.9.1.1 Sub-category: “Internal”

Enter the new values for “KP”, “Tn” and “Tv” here one after the other.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration manual”.
- Tap on the sub-category “Change parameters”.
- Tap on the sub-category “Internal”.
- Enter the new “KP” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Enter the new “Tn” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Enter the new “Tv” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.

4.2.9.1.2 Sub-category: “Jacket”

Enter the new value for “KP” here.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration manual”.
- Tap on the sub-category “Change parameters”.
- Tap on the sub-category “Jacket”.
- Enter the new “KP” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Read the message and confirm it by tapping on “OK”.

4.2.9.1.3 Sub-category: “Process”

Enter the new values for “KP”, “Tn” and “Tv” here one after the other.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration manual”.
- Tap on the sub-category “Change parameters”.
- Tap on the sub-category “Process”.
- Enter the new “KP” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Enter the new “Tn” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.
- Enter the new “Tv” value using the number keypad that appears.
- Confirm your entry by tapping on “OK”.

4.2.9.2 Sub-category: “Display parameters”

In this function, the set manual parameters are displayed.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration manual”.
- Tap on the sub-category “Display parameters”.
- Tap on “OK” after you have read/checked the parameters.

4.2.9.3 Sub-category: “Control structure”

With this function, you have two different control structures available.

“Huber PID controller”: Default setting

“Classic PID controller”: This setting is exclusively used by Huber service engineers for service purposes.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Configuration manual”.
- Tap on the sub-category “control structure”.
- Choose between the dialogue entries “Huber PID controller” and “Classic PID controller”.
- Confirm your choice by tapping on “OK”.

4.2.10 Sub-category: “Reset parameters”

With this function, you can reset the control parameters to the factory setting.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Reset parameters”.
- Read the message and confirm it by tapping on “Yes”. The control parameters are reset/deleted. **The temperature control unit can only be operated again after a complete restart.**
- To do so, switch the temperature control unit off and back on again. The parameters have been reset.

4.2.11 Sub-category: “Display parameters”

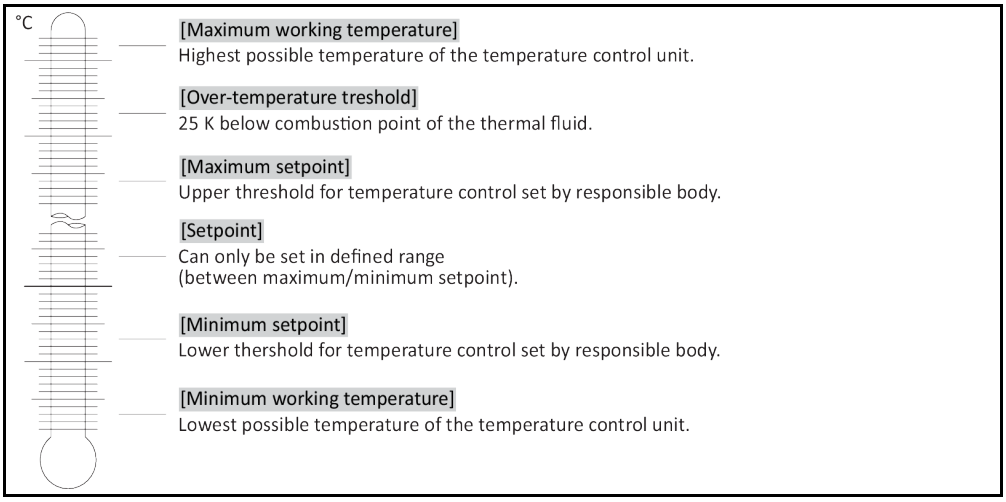
In this function, the set parameters are displayed. Depending on the previous setting, these will be the “Automatic control parameters” or the “Manual control parameters”.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Temperature Control”.
- Tap on the category “TAC/Manual”.
- Tap on the sub-category “Display parameters”.
- Tap on “OK” after you have read/checked the parameters.

4.2.12 Setting the setpoint thresholds

Overview of the temperature thresholds



The limits for the minimum and maximum setpoint serve the safety of your system. They **must** be set for the application range of the thermal fluid before starting the first temperature control and when changing the thermal fluid. The maximum setpoint limit limits the setpoint setting for the bath or flow temperature. The minimum setpoint limit protects against high viscosity or freezing at low temperatures. The adjustable setpoint is then only available in the temperature range between the minimum and maximum setpoint limit.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Protection Options”.
- Tap on the category “Setpoint Limits”.
- Tap on the sub-category “Minimum Setpoint”.
- Enter the new value, using the numeric keypad that appears.
- Confirm your entry by tapping on “OK”.
- In the display that follows, confirm your entry again by tapping on “OK”.
  The correct selection will be displayed graphically and the “Min. setpoint” will be changed promptly. If tapping on “OK” is not correct, it will be displayed graphically for 2 seconds. The display will then return to the category “Setpoint Limits”. Try changing the “Min. Setpoint” again.
- Tap on the sub-category “Maximum Setpoint”.
- Enter the new value, using the numeric keypad that appears.
- Confirm your entry by tapping on “OK”.
- In the display that follows, confirm your entry again by tapping on “OK”.
  The correct selection will be displayed graphically and the “Max. Setpoint” will be changed promptly. If tapping on “OK” is not correct, it will be displayed graphically for 2 seconds. The display will then return to the category “Setpoint Limits”. Try changing the “Max. Setpoint” again.

INFORMATION

Check the set values for the minimum and maximum setpoint at any system change, especially when changing the thermal fluid.

4.2.13 Setting the setpoint

PROCEDURE

- Go to the “Home” screen.
- Tap on the keypad symbol next to “$T_{Setpoint}$”.
- Enter a new setpoint using the number keypad that appears.
  The following must apply:
  [Minimum setpoint limit] ≤ [Setpoint] ≤ [Maximum setpoint limit].
  If these conditions are not met, a message will appear on the **>Touchscreen<** [88] and the entry will be ignored. In this case, delete the value just entered either with the “Arrow” key or with the “Clear” key. Enter the setpoint again.
- Tap on “OK” to confirm your entry.
- In the display that follows, confirm your entry again by tapping on “OK”.
  The correct selection will be displayed graphically and the setpoint will be changed immediately. If tapping on “OK” is not correct, it will be displayed graphically for 2 seconds. The display will return to the “Home” screen. Try changing the setpoint again.

4.3 Filling, venting and draining

Observe the wiring diagram. → From page 84, section **»Annex«**.

CAUTION

Extremely hot / cold surfaces, connections and thermal fluids

BURNS/FREEZING OF LIMBS

- Surfaces, connections and tempered thermal fluids can be extremely hot or cold depending on the operating mode.
- Avoid direct contact with surfaces, connections and thermal fluids!
- Wear your personnel protective equipment (e.g. temperature-resistant safety gloves, safety goggles).

CAUTION

Steam escapes from the open >Filling port< [17] in the event of a malfunction

SEVERE BURNS

- Do not start the temperature control unit in normal mode with open **>Filling port<** [17].
- Following setup mode, the **>Filler port<** [17] must be closed with the appropriate **>Locking device expansion vessel<** [22]. In the event of a malfunction, this reduces the escape of hot steam and/or thermal fluid.

NOTE

During an active circulation, the thermal fluid circuit is shut off by shut-off valves

MATERIAL DAMAGE TO THE CIRCULATING PUMPS INSTALLED IN THE TEMPERATURE CONTROL UNIT

- Do not close the thermal fluid circuit during an active circulation by means of shut-off valves.
- Warm the thermal fluid to room temperature before stopping the circulation.

4.3.1 Externally closed application

4.3.1.1 Filling and venting externally closed application

CAUTION

Non-compliance with the safety data sheet for the thermal fluid to be used

INJURIES

- Risk of injury to the eyes, skin, respiratory tract.
- The safety data sheet for the thermal fluid to be used must be read prior to using it and its content must be respected.
- Observe the local regulations/work instructions.
- Wear your personal protective equipment (e.g. temperature-resistant safety gloves, safety goggles, safety footwear).
- Danger of slipping because floor and work area are contaminated. Clean the workplace; observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.

NOTE

Semi-automatic venting

DAMAGE TO THE TEMPERATURE CONTROL UNIT

- An elevated tolerance time for the pressure drop can damage the pump if the thermal fluid level in the system is also too low.
- Constantly observe the thermal fluid level in the **>Sight glass<** [23] or on the **>Touchscreen<** [88]. Fill up the thermal fluid during the venting phase so the thermal fluid level in the **>Expansion vessel<** [18] does not fall below the minimum mark.

INFORMATION

Calculate whether the capacity of the **>Expansion vessel<** [18] can absorb the expansion volume during operation. Assume the following volumes for this calculation: [Minimum filling capacity of the temperature control unit] + [Volume of the **>Additional expansion vessel<** [19] (optional)] + [Volume of the temperature control hoses] + [Jacket volume of your application] + [10% / 100 K].

INFORMATION

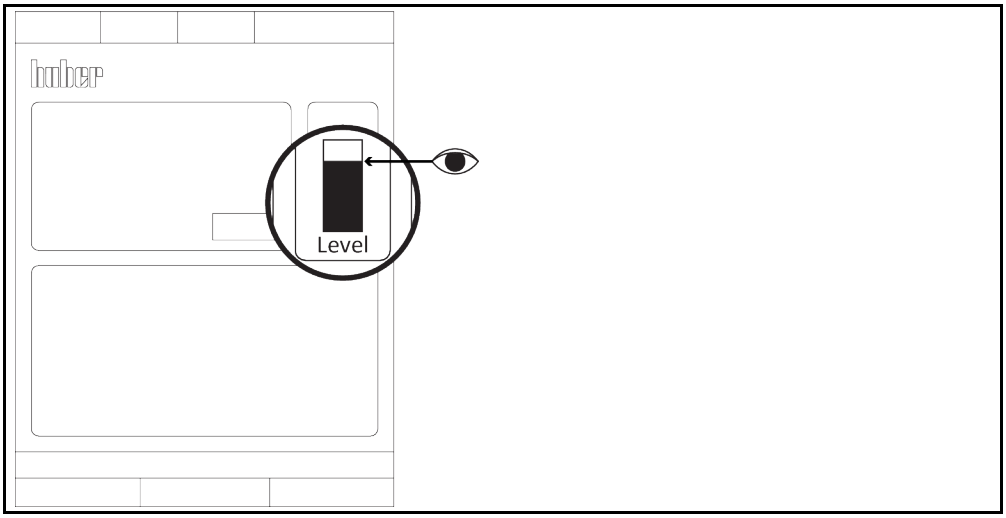
If, with externally closed applications (reactors), the fluid level in the fill level display remains the same when the pump is running and when the pump has stopped, the application has been vented.

INFORMATION

Venting must be performed especially during commissioning and after a change of thermal fluid. This is the only way to ensure trouble-free operation.

Note that the volume expansion of the thermal fluid depends on the working temperature range you wish to work in. At the “lowest” working temperature, the level must not drop below the **minimum** mark of the **>Sight glass<** [23] or on the **>Touchscreen<** [88], and at the “highest” working temperature there must be no overflow from the **>Expansion vessel<** [18]. In case of overfilling, drain the excess amount of thermal fluid. → Page 65, Section **»Draining externally closed applications«**. Check if the thermal fluid can be reused. Follow the instructions for the proper disposal of thermal fluid. → Page 15, Section **»Proper disposal of resources and consumables«**.

Thermal fluid level on the **>Touchscreen<** [88]



- Please observe any measures that may be required during filling, e.g. grounding the container, the funnel and other aids.
- Fill from the lowest possible height.

PROCEDURE

- Open the **>Pump filling valve<** [122] (model-dependent) by turning it counter-clockwise (turn 90° left as far as it will go). This will accelerate the filling process.
- Carefully pour suitable thermal fluid into the **>Filling port<** [17] using the filling accessories (funnel and/or beaker). The thermal fluid flows from the **>Expansion vessel<** [18] into the temperature control unit and via the hose connections to the external application. The fill level is displayed in the **>Sight glass<** [23] or on the **>Touchscreen<** [88]. Follow the instructions for the proper disposal when cleaning filling accessories. → Page 15, Section **»Proper disposal of resources and consumables«**.

- Before starting the venting process, fill the **>Expansion vessel<** [18] from 50 to 70 %. The thermal fluid flows via the **>Expansion vessel<** [18] into the temperature control unit.
- Wait until the level in the **>Sight glass<** [23] or on the **>Touchscreen<** [88] no longer drops. Refill the **>Expansion vessel<** [18] from 50 to 70 %.
- Go to the “Categories menu”.
- Tap on the category “Temperature control”.
- Tap on the category “Start/Stop”.
- Tap on the dialog entry “Start venting”.
- Tap on “OK” to confirm your selection.
- Confirm the preset time interval by tapping on “OK”. Alternatively, use the numeric keypad that appears to enter an individual time interval. Tap on “OK” to confirm your entry. Venting will start. Venting stops if the level in the **>Sight glass<** [23] or on the **>Touchscreen<** [88] drops too much. Refill thermal fluid (fill level 50 to 70%) and restart venting. Depending on the temperature control unit and the connected application, this process must be repeated several times. The venting process can only be restarted after the time interval has elapsed if a time interval indicated in the **>Status line<** [Field 10] runs backwards.
- Stop venting. To do this, go to the category “Temperature control”.
- Tap on the category “Start/Stop”.
- Tap on the dialog entry “Stop venting”.
- Tap on “OK” to confirm your selection. Venting is stopped and the pump continues to run for approx. 30 seconds. Wait until the pump stops.
- Close the **>Pump filling valve<** [122] (model-dependent) by turning it clockwise (turn 90° right as far as it will go).
- Close the **>Expansion vessel cap<** [22] by hand.

4.3.1.2 Draining externally closed applications

CAUTION

Hot or very cold thermal fluid

SEVERE BURNS/FROSTBITE OF LIMBS

- Before draining, ensure that the thermal fluid has room temperature (20 °C).
- If, at this temperature, the thermal fluid is too viscous to be drained: Control the temperature of the thermal fluid for a few minutes until the viscosity will allow drainage. Never control the temperature of the thermal fluid when the drain is open.
- Danger of burns when draining thermal fluids at temperatures above 20 °C.
- Wear your Personal Protective Equipment for draining.
- Only drain using suitable drainage hose and collecting container. These must be compatible with the thermal fluid and its temperature.

INFORMATION

Not all temperature control units are equipped with the same combination of connections/drains. Skip the step in the procedure if the connection / drain is not available on your temperature control unit.

4.3.1.2.1 Emptying the thermal fluid circuit

PROCEDURE

- Remove the knurled screw at the **>Drain<** [8].
- Connect a suitable drain hose to the **>Drain<** [8].
- Remove the knurled screw at the **>Expansion vessel drain<** [9].
- Connect a suitable drain hose to the **>Expansion vessel drain<** [9].
- Stick both ends of the hoses into suitable containers (e.g. original canister, which is compatible with the thermal fluid).
- **Only valid for temperature control units with the function “Drain” or Draining “Thermal fluid”:** To completely drain the thermal fluid circuit, the function „Draining“ or Draining „Thermal fluid“ must be activated. If the dialog entry „Draining“ or Draining „Thermal fluid“ is not available, the following instruction must be skipped. For water-cooled temperature control units, the function “Draining” also opens the control valve in the cooling water circuit, depending on the model. This can cause the cooling water consumption to increase during draining. This does not apply to temperature control units with the function Draining “Cooling water”.
  - Tap in succession “Category menu”, “Temperature control”, “Start/stop”.
  - Tap on the dialog entry: “Drain” or subsequently on Draining “Thermal fluid”.
  - Confirm your choice by tapping on “OK”.
  - Read the message and confirm by tapping on “OK”.
  - Do **not** confirm the subsequent message by touching “OK”.
- Open the **>Drain valve thermal fluid<** [3] by turning it counterclockwise.

- Open the **>Drain valve<** [4] by turning it counterclockwise.
- Open the **>Expansion vessel drain valve<** [5] by turning it counterclockwise.
- Wait until the thermal fluid has drained from the external application via the pump chamber and the draining hoses into the containers.
- Have another suitable container (e.g. a tub) ready to catch the thermal fluid from the **>Residues drain<** [10].
- Remove the knurled screw from the **>Residues drain<** [10]. The remaining thermal fluid will flow from the temperature control unit into the container as soon as you have opened the knurled screw.
- Open the **>Drain valve water separator<** [76] by turning it counterclockwise.
- **Only valid for temperature control units with the function "Drain" or Draining "Thermal fluid":** Read the message on the **>Touchscreen<** [88] and confirm it with "OK". With that, the temperature control unit has been drained. For water-cooled temperature control units, this function also closes the control valve in the cooling water circuit, depending on the model.
- Drain the external application. The description for the draining process can be found in the documents you received with the application.

4.3.1.2.2 Dismantling/mounting the application

PROCEDURE

Continuation of the procedure »Emptying the thermal fluid circuit«

- Disconnect the external application from the connection **>Circulation flow<** [1].
- Disconnect the external application from the connection **>Circulation return<** [2]. Leave the temperature control unit open for a while to allow it to dry out (without seal cap and with open drains).
- Connect the external application with the connection **>Circulation flow<** [1].
- Connect the external application with the connection **>Circulation return<** [2].

4.3.1.2.3 Closing the valves

PROCEDURE

Continuation of the procedure »Dismantling/mounting the application«

- Close the **>Drain valve water separator<** [76] by turning it clockwise.
- Fit the knurled screw to the **>Residues drain<** [10].
- Close the **>Drain valve thermal fluid<** [3] by turning it clockwise.
- Close the **>Drain valve<** [4] by turning it clockwise.
- Close the **>Expansion vessel drain valve<** [5] by turning it clockwise.
- Remove the drain hose from the **>Expansion vessel drain<** [9].
- Install the knurled screw at the **>Expansion vessel drain<** [9].
- Remove the drain hose from the **>Drain<** [8].
- Install the knurled screw at the **>Drain<** [8].
- Remove the containers used to collect the thermal fluid. Check if the thermal fluid can be reused. Follow the instructions for the proper disposal. → Page 15, Section **»Proper disposal of resources and consumables«**.

5 Normal operation

5.1 Automatic operation

CAUTION

Extremely hot / cold surfaces, connections and thermal fluids

BURNS/FREEZING OF LIMBS

- Surfaces, connections and tempered thermal fluids can be extremely hot or cold depending on the operating mode.
- Avoid direct contact with surfaces, connections and thermal fluids!
- Wear your personnel protective equipment (e.g. temperature-resistant safety gloves, safety goggles).

CAUTION

Steam escapes from the open >Filling port< [17] in the event of a malfunction

SEVERE BURNS

- Do not start the temperature control unit in normal mode with open **>Filling port<** [17].
- Following setup mode, the **>Filler port<** [17] must be closed with the appropriate **>Locking device expansion vessel<** [22]. In the event of a malfunction, this reduces the escape of hot steam and/or thermal fluid.

NOTE

During an active circulation, the thermal fluid circuit is shut off by shut-off valves

MATERIAL DAMAGE TO THE CIRCULATING PUMPS INSTALLED IN THE TEMPERATURE CONTROL UNIT

- Do not close the thermal fluid circuit during an active circulation by means of shut-off valves.
- Warm the thermal fluid to room temperature before stopping the circulation.

5.1.1 Temperature control

5.1.1.1 Starting the temperature control process

The temperature control process can be started after filling and complete venting.

PROCEDURE

- Go to the “Home” screen.
- Tap on the “Start” touchbutton.
- Confirm the start of temperature control by tapping on “OK”.
  The correct selection will be displayed graphically and temperature control will start immediately. If tapping on “OK” is not correct, this is displayed graphically for 2 seconds. After this, the display will return to the “Home” screen again. Try to start the temperature control unit again.

5.1.1.2 Ending the temperature control process

NOTE

When the temperature control unit is switched off, the thermal fluid temperature is higher/lower than room temperature

DAMAGE TO THE TEMPERATURE CONTROL UNIT AND THE GLASS APPARATUS/APPLICATION

- Bring the thermal fluid up to room temperature using the temperature control unit.
- Do not close the shut-off valves in the thermal fluid circuit.

INFORMATION

On “XT” models, the temperature of the thermal fluid must be controlled to < 95 °C before stopping. If the temperature in the thermal fluid circuit is > 95 °C: A warning is displayed. The temperature control is not stopped.

The temperature control can be ended at any time, the pump continues to run for approx. 30 seconds. The compressor is switched off after the stepper motor valve has reached a defined position to control the cold output.

PROCEDURE

- Go to the “Home” screen.
- Tap on the “Stop” touchbutton.
- Confirm the stop of temperature control by tapping on “OK”.
  The correct selection will be displayed graphically and temperature control will stop immediately

and the pump with overrun for about 30 seconds. Wait until the pump stops. If tapping on “OK” is not correct, this is displayed graphically for 2 seconds. After this, the display will return to the “Home” screen again. Try to stop the temperature control unit again.

INFORMATION

The compressor is not switched off until the stepper motor valve has reached a defined position. The status line [Field 10] displays the relevant information.

5.1.2 Temperature control via a created temperature control program

INFORMATION

Only valid for “XT” models: When creating a temperature control program, attention must be paid that the temperature of the thermal fluid is controlled to below 95 °C by the end of the program. This is the basic prerequisite for starting the temperature control program.

5.1.2.1 Starting the temperature control program

A temperature control program can be started after filling and complete venting.

PROCEDURE

- Go to the “Categories Menu”.
- Tap on the category “Programmer/Ramp”.
- Tap on the category “Start/stop Program”.
- Tap on the dialog entry of the temperature control program to be started.
- Confirm your choice by tapping on “OK”.
- Read the message and confirm it. You temperature control unit will start the temperature control program and the temperature control programmed in it will start.
- Read the Note and confirm by tapping on “OK”.

5.1.2.2 Ending/cancelling the temperature control program

NOTE

When the temperature control unit is switched off, the thermal fluid temperature is higher/lower than room temperature

DAMAGE TO THE TEMPERATURE CONTROL UNIT AND THE GLASS APPARATUS/APPLICATION

- Bring the thermal fluid up to room temperature using the temperature control unit.
- Do not close the shut-off valves in the thermal fluid circuit.

INFORMATION

On “XT” models, the temperature of the thermal fluid must be controlled to < 95 °C before stopping. If the temperature in the thermal fluid circuit is > 95 °C: A warning is displayed. The temperature control is not stopped.

You can either end the temperature control automatically using the parameters predefined in the temperature control program or end/interrupt the temperature control at any time manually. The temperature control is switched off immediately after, the pump continues to run for approx. 30 seconds. The compressor is switched off after the stepper motor valve has reached a defined position to control the cold output.

Manual ending/cancelling

PROCEDURE

- Go to the “Home” screen.
- Tap on the “Stop” touchbutton.
- Confirm the stop of temperature control by tapping on “OK”.
  The correct selection will be displayed graphically and temperature control will stop immediately and the pump with overrun for about 30 seconds. Wait until the pump stops. If tapping on “OK” is not correct, this is displayed graphically for 2 seconds. After this, the display will return to the “Home” screen again. Try to stop the temperature control unit again.

INFORMATION

The compressor is not switched off until the stepper motor valve has reached a defined position. The status line [Field 10] displays the relevant information.

6 Interfaces and software update

NOTE

Connecting to the interfaces at the temperature control unit during operation

DAMAGE TO THE INTERFACES

- When devices in operation are connected with interfaces of the temperature control unit, interfaces may get damaged.
- Before connecting, ensure the temperature control unit and the device to be connected are turned off.

NOTE

The specifications of the interface used are not being met.

PROPERTY DAMAGE

- Only connect components that meet the specifications of the interface used.

NOTE

The Pilot ONE controller is not operated behind a firewall

PROPERTY DAMAGE

- Operate the controller Pilot ONE exclusively behind a firewall, if the local subnet is connected to the Internet or another risk-prone network.
- The best available technology is to be applied in order to provide sufficient security for the LAN!

INFORMATION

The interfaces used must meet the specifications of the generally accepted standards. For the exact position of the interfaces, please refer to the wiring diagram. → From page 84, section **»Annex«**.

INFORMATION

Settings on the Pilot ONE: In the category “Interfaces” you can change the settings of each function such as POKO, analog interface and RS232/RS485.

INFORMATION

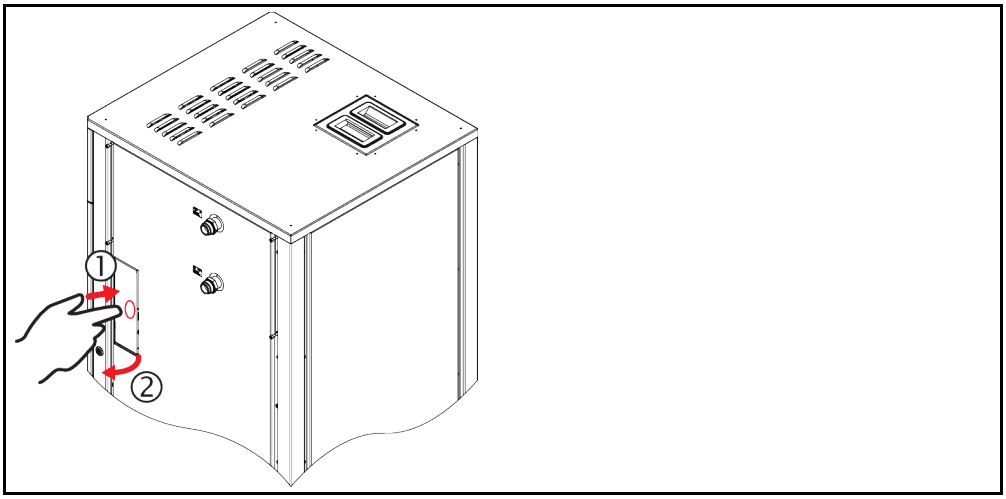
The use of PB commands is described in our manual “Data communication”. You can download this manual at www.huber-online.com.

INFORMATION

Information on the interfaces can be found in our manual “Interfaces”. You can download this manual at www.huber-online.com.

6.1 Swinging open the interface box [133]

Swinging open the **>Interface box<** [133] (exemplary illustration)



PROCEDURE

- Press on the **>Interface box<** [133]. This causes the **>Interface box<** [133] to spring open a little.
- Swing open the **>Interface box<** [133].

6.2 Installing the Com.G@te® [46] (optional)

INFORMATION

The **>Com.G@te<** [46] is available in two versions (external and internal). For the external **>Com.G@te<** [46], you can obtain the required connection cable, a wall mounting bracket or a bracket for direct mounting on the housing from our accessory program. The connection cable for the internal **>Com.G@te<** [46] is marked in the wiring diagram and numbered. This numbering is directly affixed to the connection cable that is pre-assembled in the control cabinet.

The **>Com.G@te<** [46] must only be connected/replaced when the temperature control unit is switched off.

PROCEDURE

- Switch off the temperature control unit.
- **External>Com.G@te<** [46]**:**
  - Place the **>Com.G@te<** [46] into the optional bracket.
  - Connect the **>Com.G@te<** [46] via the connection cable with the **>Service interface<** [50] on the temperature control unit.
- **Internal>Com.G@te<** [46]**:**
  - Open the control cabinet.
  - Remove the lid of the temperature control unit from the assembly opening.
  - Install the **>Com.G@te<** [46] into the temperature control unit
  - Connect the **>Com.G@te<** [46] with the connection cable in the control cabinet.
  - Close the control cabinet.
- Switch on the temperature control unit. The **>Com.G@te<** [46] is automatically recognized and is ready for operation.

6.3 Firmware update

The "Pilot ONE Flasher" software to update the firmware is available under www.huber-online.com. The installation package contains instructions for the firmware update.

7 Service/maintenance

7.1 Messages from the temperature control unit

Messages output by the temperature control unit can be divided into various classes.

Follow the instructions displayed on the **>Touchscreen<** [88]. Once a message has been acknowledged, a symbol is output on the **>Touchscreen<** [88]. Tapping the symbol takes you to an overview of all messages in chronological order.

Displayed symbol:

7.2 Replacing the “Pilot ONE®”

DANGER

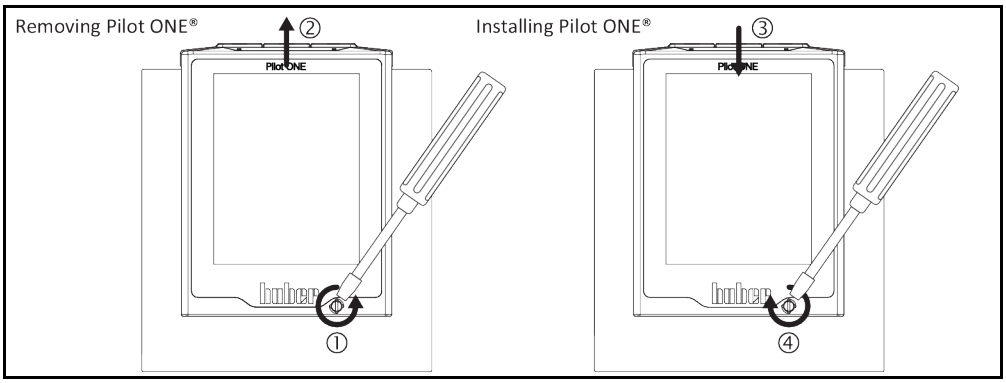
Replacing the electronics while the temperature control unit is operating

MORTAL DANGER FROM FIRE

- Stop an ongoing temperature control process.
- Turn off the temperature control unit.
- Also disconnect the temperature control unit from the power supply.

In case of fault, you can replace the “Pilot ONE” yourself. If you have questions or difficulties, please contact your dealer, your local office or our Customer Support.

Replacing the “Pilot ONE”



PROCEDURE

- Turn off the temperature control unit.
- Disconnect the temperature control unit from the power supply.
- Release the **>Fixing screw for Pilot ONE<** [89] at the front of the housing.
- Carefully pull the “Pilot ONE” away upwards.
- Carefully insert the replacement “Pilot ONE”.
- Close the **>Fixing screw for Pilot ONE<** [89] at the front of the housing.
- Connect the temperature control unit to the power supply.
- Turn on the temperature control unit.

7.3 Maintenance

DANGER

Cleaning/maintenance while the temperature control unit is operating

MORTAL DANGER FROM ELECTRIC SHOCK

- Stop an ongoing temperature control process.
- Turn off the temperature control unit.
- Also disconnect the temperature control unit from the power supply.

NOTE

Performing maintenance work not described in these operation manual

MATERIAL DAMAGE ON THE TEMPERATURE CONTROL UNIT

- Please contact Huber for maintenance work that is not described in these operation manual.
- Maintenance work not described in these operation manual is reserved for qualified specialists trained by Huber.
- Safety-relevant components may only be replaced by equivalent ones. The specified safety values for the respective component must be observed.

7.3.1 Function check and visual inspection

Control intervals

Cooling*	Description	Maintenance interval	Comment	Person responsible
A/W	Visually inspect hoses and hose connections	Prior to switching on the temperature control unit	Exchange leaking hoses and hose connections prior to switching on the temperature control unit. → Page 73, Section **»Replacing temperature control or coolant hoses«**.	Operating company and / or operators
A/W	Inspection in accordance with the F-Gas Directive	In accordance with the F-Gas Directive	→ Page 18, Section **»Temperature control units with fluorinated greenhouse gases/refrigerants«**	Operating company
A/W	Check the power cable	Prior to switching on the temperature control unit or on relocation	Do not start the temperature control unit if the power supply cable is damaged.	Qualified electrician (BGV A3)
A	Clean the perforated sheet	As required	Clean the perforated sheet of the temperature control unit with a damp cloth	Operating company
A/W	Thermal fluid inspection	As required	–	Operating company and / or operators
A	Check the liquefier fins	As required, after 3 months at the latest	→ Page 73, Section **»Cleaning the liquefier fins«**	Operating company and / or operators
W	Check the hat-type strainer (dirt trap)	As required, after 3 months at the latest	→ Page 74, Section **»Cleaning the hat-type strainer/dirt trap«**	Operating company and / or operators
A/W	Overtemperature protection (OT) - functional check	Every month or after changing the thermal fluid	→ Page 52, Section **»Testing overtemperature protection for functionality«**	Operating company and / or operators
A/W	Emergency stop switch (optional): Function test	Every 6 months or after a change of location	→ Page 75, Section **»Emergency stop switch (optional): Function test«**	Operating company and / or operators
A/W	Check the temperature control unit for damage and stability	Every 12 months or after a change of location	–	Operating company and / or operators
W	Check the cooling water quality	Every 12 months	Descale the cooling water circuit as required. Documentation on water quality is available at: www.huber-online.com	Operating company and / or operators
A/W	Exchange safety-relevant electric and electromechanical components	20 years	Have the exchange only carried out by certified personnel (such as Huber service engineers). Please contact Customer Support. → Page 82, Section **»Contact data«**	Operating company

*A = Air cooling; W = Water cooling; U = Applicable only for Unistats

7.3.2 Replacing temperature control or coolant hoses

Replace defective temperature control and/or coolant hoses **before** turning on the temperature control unit.

7.3.2.1 Replacing temperature control hoses

PROCEDURE

- Drain the temperature control unit. → Page 65, section **»Draining externally closed applications«**.
- Replace defective temperature control hoses. Observe the proper disposal. → Page 15, section **»Proper disposal of resources and consumables«**.
- Reconnect your external application. → Page 33, section **»Connecting externally closed application«**.
- Fill the temperature control unit with thermal fluid. → Page 63, section **»Filling and venting externally closed application«**.
- Vent the temperature control unit. → Page 63, section **»Filling and venting externally closed application«**.
- Restart the temperature control unit in normal mode.

7.3.2.2 Replacing coolant hoses

PROCEDURE

- Drain the cooling water. → Page 80, section **»Draining the cooling water«**.
- Replace the defective coolant hoses. Follow the instructions for the proper disposal. → Page 15, section **»Proper disposal of resources and consumables«**.
- Reconnect the temperature control unit to the building's cooling water supply. → Page 30, section **»Temperature control units with water cooling«**.
- Restart the temperature control unit in normal mode.

7.3.3 Cleaning the liquefier fins

Valid for air-cooled temperature control units only

⚠ CAUTION

Manual cleaning

RISK OF BEING CUT ON THE LIQUEFIER FINS

- Wear suitable cut-resistant gloves for cleaning work.
- Depending on the ambient conditions, use cleaning equipment such as vacuum cleaners and/or a hand brush/brush. Follow the local regulations when cleaning. Do not clean the liquefier fins in a clean room with items like a brush and do not use a vacuum cleaner without an extra-fine particle filter.

NOTE

Cleaning using pointed or sharp-edged tools

DAMAGE TO THE LIQUEFIER FINS

- Clean the liquefier fins using suitable cleaning appliances.

INFORMATION

Make sure there is adequate ventilation (removal of waste heat, fresh air supply) for the temperature control unit, in case of **air cooling, maintain wall clearance**. → Page 21, section **»Exemplary illustrations of the cooling variants«** and → Page 26, section **»Ambient conditions«**.
The liquefier fins must be cleaned (dust) from time to time as only then will the temperature control unit perform at its maximum cooling capacity.

Identify the position of the ventilation grille, usually located on the front. With some temperature control units, the ventilation grilles on the side wall, rear or on the underside (table units) of the temperature control unit.

PROCEDURE

Ventilation grille on the front/rear or on a side wall

- Turn off the temperature control unit.
- Disconnect the temperature control unit from the power supply.

- Remove the ventilation grille to create unhindered access to the liquefier fins.
- Clean the liquefier fins using suitable cleaning appliances. Observe the local regulations and ambient conditions when selecting cleaning appliances.
- Make sure the liquefier fins are not damaged or deformed as this will impair the air flow.
- Re-mount the ventilation grille after cleaning work.
- Connect the temperature control unit to the power supply.
- Turn on the temperature control unit.

7.3.4 Cleaning the hat-type strainer/dirt trap

Valid for water-cooled temperature control units only

NOTE

Building's isolating valves are not closed

DAMAGE BY FLOODING OF ROOMS

- Close the building-side isolating valves of the cooling water supply and return line.

INFORMATION

Depending on the water quality, regular checking and cleaning of the strainer at the **>Cooling water inlet<** [13] is necessary.
Carry out the steps "Draining the cooling water circuit", "Dismantling the cooling water inlet", "Cleaning the hat-type strainer/dirt trap" and "Installing the cooling water inlet" in succession.

INFORMATION

We would be pleased to also offer you training for the Service. Contact our Customer Support → page 82, section **»Contact data«**.

7.3.4.1 Draining the cooling circuit

PROCEDURE

Only valid for temperature control units without the function "Drain":.

- Switch off the temperature control unit.
- Disconnect the temperature control unit from the power supply.
- Close the building-side isolating valves of the cooling water supply and return line.
- Place a collecting container below the cooling water supply [13], [14] and [15] (if present)
- Open the **>Cooling water drain<** [15] (if present). If the temperature control unit is not equipped with a **>Cooling water drain<** [15]: Open the **>Cooling water inlet<** [13]. The cooling water will begin to drain out. Allow the cooling water to fully drain.
- Open the **>Cooling water outlet<** [14]. The cooling water will begin to drain out. Allow the cooling water to fully drain.
- Remove the collecting containers below the cooling water supply [13], [14] and [15] (if present) after draining. Properly dispose of the contents of the collecting containers. → Page 15, section **»Proper disposal of resources and consumables«**.

PROCEDURE

Only valid for temperature control units with the function "Drain" or Drain „Cooling water"
To fully drain the cooling water circuit, you must activate the function „Drain" or "Drain cooling water" to open the control valve in the cooling water circuit. This causes the cooling water from the temperature control unit to be removed as well.

- Close the building-side isolating valves of the cooling water supply and return line.
- Place a collecting container below the cooling water supply [13], [14] and [15] (if present)
- Open the **>Cooling water drain<** [15] (if present). If the temperature control unit is not equipped with a **>Cooling water drain<** [15]: Open the **>Cooling water inlet<** [13]. The cooling water will begin to drain out. Allow the cooling water to fully drain.
- Open the **>Cooling water outlet<** [14]. The cooling water will begin to drain out. Allow the cooling water to fully drain.
- Tap on "Category menu", "Temperature control", "Start/stop" in sequence.
- Tap on the dialog entry "Drain" and then "Drain cooling water".
- Touch "OK" to confirm your selection.
- Read the message and confirm by tapping on "OK".
- Wait until the remaining thermal fluid has flown from the thermal control unit.
- Read the message and confirm by tapping on "OK".

- Remove the collecting containers below the cooling water supply [13], [14] and [15] (if present) after draining. Properly dispose of the contents of the collecting containers. → Page 15, section **»Proper disposal of resources and consumables«**.
- Switch off the temperature control unit.
- Disconnect the temperature control unit from the power supply.

7.3.4.2 Dismantling the cooling water supply

PROCEDURE

- Disconnect the **>Cooling water inlet<** [13] from the building's cooling water supply.
- Disconnect the **>Cooling water outlet<** [14] from the building's cooling water return line.
- Close the **>Cooling water drain<** [15] (if present).

7.3.4.3 Cleaning the hat-type strainer/dirt trap

- Remove the paneling around the cooling water supply [13], [14] and [15] (if present). Located immediately behind the **>Cooling water inlet<** [13] is the dirt trap.
- Carefully detach the cover (hexagonal).
- Remove the metal strainer located below.
- Clean the metal strainer under running water.
- Re-insert the metal strainer after cleaning work.
- Carefully fasten the cover (hexagonal).
- Mount the paneling around the cooling water supply [13], [14] and [15] (if present).

7.3.4.4 Installing the cooling water supply

- Connect the **>Cooling water inlet<** [13] to the building's cooling water supply.
- Connect the **>Cooling water outlet<** [14] to the building's cooling water return line.
- Check the connections for leaks.
- Open the building-side isolating valves of the cooling water supply and return line.

7.3.5 Emergency stop switch (optional): Function test

INFORMATION

Important: Perform the function test only when the temperature control unit is **not** controlling the temperature. All poles of the temperature control unit are switched off **immediately** during a function test!

Immediately take the temperature control unit out of use if the function test doesn't turn off the temperature control unit. Please contact Customer Support, if this is the case. → Page 82, section **»Contact data«**.

PROCEDURE

- Press the **>Emergency stop switch<** [70].
  All poles of the temperature control unit are disconnected **immediately**.
- Restart the temperature control unit in normal mode after a successful function test. → Page 49, section **»Turning on the temperature control unit«**.

7.4 Thermal fluid inspection, replacement and circuit cleaning

Observe the wiring diagram. → From page 84, section **»Annex«**.

⚠ CAUTION

Extremely hot / cold surfaces, connections and thermal fluids

BURNS/FREEZING OF LIMBS

- Surfaces, connections and tempered thermal fluids can be extremely hot or cold depending on the operating mode.
- Avoid direct contact with surfaces, connections and thermal fluids!
- Wear your personnel protective equipment (e.g. temperature-resistant safety gloves, safety goggles).

NOTE

During an active circulation, the thermal fluid circuit is shut off by shut-off valves

MATERIAL DAMAGE TO THE CIRCULATING PUMPS INSTALLED IN THE TEMPERATURE CONTROL UNIT

- Do not close the thermal fluid circuit during an active circulation by means of shut-off valves.
- Warm the thermal fluid to room temperature before stopping the circulation.

7.4.1 Thermal fluid inspection

CAUTION

Thermal fluid is not inspected on a regular basis

BURNS DUE TO REDUCED BOILING POINT

- Regularly check your thermal fluid whether it meets the specifications in the safety data sheet.

NOTE

Thermal fluid is not inspected on a regular basis

DAMAGE TO THE HEAT EXCHANGER AND/OR ELECTROMECHANICAL PARTS.

- Regularly check your thermal fluid whether it meets the specifications in the safety data sheet.

INFORMATION

Oxidation
Oxidation ages the thermal fluid and changes its characteristics (e.g. reduces its boiling point). When controlling high temperatures, a reduced boiling point may cause very hot thermal fluid to overflow at the **>Expansion vessel<** [18]. This may cause serious burns of the limbs.
Hygroscopy
When continuously controlling the temperature to below room temperature, hygroscopy causes water to accumulate in the thermal fluid in the course of time. Such a liquid mixture causes the evaporator to burst when the temperature is controlled in the minus range. This is caused by the water in the liquid mixture, which forms ice crystals on the evaporator. When controlling the temperature in the high range with such a liquid mixture, the boiling point is reduced. When controlling high temperatures, a reduced boiling point may cause very hot thermal fluid to overflow at the **>Expansion vessel<** [18]. This may cause serious burns of the limbs.

7.4.2 Thermal fluid replacement

NOTE

Mixing different thermofluids in a thermal fluid circuit

PROPERTY DAMAGE

- Do **not** mix different types of thermofluid (such as mineral oil, silicone oil, synthetic oil, water, etc.) in a thermofluid circuit.
- The thermal fluid circuit **must** be rinsed when changing from one type of thermal fluid to another. No residues of the previous type of thermal fluid may remain in the thermal fluid circuit.

Please note when changing the thermal fluid: → Page 63, Section **»Filling, venting and draining«**.

7.4.3 Rinsing the thermal fluid circuit

DANGER

Setpoint and overtemperature protection are not adjusted to the thermofluid

MORTAL DANGER FROM FIRE

- The cut-out value of the overtemperature protection **must** be adapted to the thermofluid. Set the cut-out value of the overtemperature protection 25 K below the fire point of the thermofluid.
- The setpoint set during rinsing **must** be adjusted to the thermofluid used.

CAUTION

Non-compliance with the safety data sheet for the thermal fluid to be used

INJURIES

- Risk of injury to the eyes, skin, respiratory tract.
- The safety data sheet for the thermal fluid to be used must be read prior to using it and its content must be respected.
- Observe the local regulations/work instructions.
- Wear your personal protective equipment (e.g. temperature-resistant safety gloves, safety goggles, safety footwear).
- Danger of slipping because floor and work area are contaminated. Clean the workplace; observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.

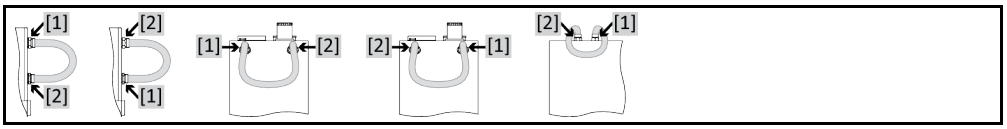
NOTE

Mixing different thermofluids in a thermal fluid circuit

PROPERTY DAMAGE

- Do **not** mix different types of thermofluid (such as mineral oil, silicone oil, synthetic oil, water, etc.) in a thermofluid circuit.
- The thermal fluid circuit **must** be rinsed when changing from one type of thermal fluid to another. No residues of the previous type of thermal fluid may remain in the thermal fluid circuit.

Example: Connecting a short circuit hose



The inner components of the temperature control unit must be dried out Need to avoid boiling retardation during future uses (e.g. use of a silicone oil at temperatures above about 100 °C).

INFORMATION

Not all temperature control units are equipped with the same combination of connections/drains. Skip the step in the procedure if the connection / drain is not available on your temperature control unit.

PROCEDURE

- Drain the temperature control unit. → Page 65, section **»Draining externally closed applications«**.

INFORMATION

Residual thermal fluid can remain in the pump chamber and the internal lines after draining. Leave the temperature control unit with open valves for a while.

- Leave the drain hose mounted to the **>Drain<** [8].
- Leave the drain hose mounted to the **>Expansion vessel drain<** [9].
- Check the fill level in the collecting container at the other end of the drain hose. Follow the instructions for the proper disposal of thermal fluid. → Page 15, Section **»Proper disposal of resources and consumables«**.

INFORMATION

Perform the following steps without attaching a bypass hose, if the application used by you (externally closed) is also dirty. In this case, reconnect your externally closed application to the temperature control unit. → Page 66, Section **»Dismantling/mounting the application«**. This rinses the temperature control unit and your application at the same time.

- Connect the **>Circulation flow<** [1] with the **>Circulation return<** [2] at the temperature control unit using a bypass hose.
- Close all the valves. → Page 66, Section **»Closing the valves«**
- **Fill** the system (minimum fill level) with the thermal fluid you wish to use. → Page 63, Section **»Filling and venting externally closed application«**.
- **Vent** the system. → Page 63, Section **»Filling and venting externally closed application«**.
- Adjust the **setpoint** and the cut-out value of the **overtemperature protection** and the **setpoint limits** to the thermal fluid used. → Page 63, Section **»Setting the setpoint«**, → Page 50, Section **»Setting the overtemperature protection«** and → Page 62, Section **»Setting the setpoint thresholds«**.
- Go to the “Categories menu”.
- Tap on the category “Temperature control”.
- Tap on the category “Start/Stop”.
- Tap on the dialog entry “Start temperature control”.
- Tap on “OK” to confirm your selection. The length of rinsing depends on the level of soiling.
- Tap on the category “Start/Stop”.
- Tap on the dialog entry “Stop temperature control”.
- Tap on “OK” to confirm your selection. The temperature control process is stopped.
- **Drain** the temperature control unit. → Page 65, Section **»Draining externally closed applications«**.
- Connect the **>Circulation flow<** [1] with the **>Circulation return<** [2] at the temperature control unit again using a bypass hose.
- Repeat the steps “Filling”, “Venting”, “Start/Stop temperature control” and “Draining” until the drained thermal fluid remains clear.
- Remove the bypass hose after completely draining the temperature control unit.

INFORMATION Leave an application connected, if you have simultaneously rinsed a used application (externally closed).

- Leave the drains and the drain valves open for a while to allow the thermal fluid remaining in the temperature control unit to evaporate.
- Close all valves and remove the drain hoses. → Page 66, Section **»Closing the valves«**.
- Reconnect your application. → Page 66, Section **»Dismantling/mounting the application«**.
- Fill the temperature control unit with thermal fluid. → Page 63, Section **»Filling and venting externally closed application«**.
- Vent the temperature control unit. → Page 63, Section **»Filling and venting externally closed application«**.
- Restart the temperature control unit in normal mode.

7.5 Cleaning the surfaces

CAUTION

Extremely hot / cold surfaces, connections and thermal fluids

BURNS/FREEZING OF LIMBS

- Surfaces, connections and tempered thermal fluids can be extremely hot or cold depending on the operating mode.
- Avoid direct contact with surfaces, connections and thermal fluids!
- Wear your personnel protective equipment (e.g. temperature-resistant safety gloves, safety goggles).

NOTE

Exposed plug contacts

DAMAGE CAUSED BY FLUID INGRESS

- Protect unused plug contacts with the protective caps supplied.
- Clean surfaces only with a damp cloth.

A standard stainless steel cleaning agent is suitable for cleaning the stainless steel surfaces. Carefully clean painted surfaces (damp only) using a solution of sensitive-fabrics detergent. Observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.

7.6 Plug contacts

NOTE

Exposed plug contacts

DAMAGE CAUSED BY FLUID INGRESS

- Protect unused plug contacts with the protective caps supplied.
- Clean surfaces only with a damp cloth.

Protective caps are supplied for all plug contacts. Make sure that any plug contacts not required are protective with the caps.

7.7 Decontamination/repairs

CAUTION

Returning a not decontaminated temperature control unit for repair

PHYSICAL INJURY AND PROPERTY DAMAGE CAUSED BY HAZARDOUS MATERIALS IN OR ON THE TEMPERATURE CONTROL UNIT

- Carry out appropriate decontamination.
- The decontamination process depends on the type and quantity of the materials used.
- Consult the relevant safety data sheet.
- You will find a prepared return receipt at www.huber-online.com.

As the responsible body you are responsible for carrying out decontamination **before** third-party personnel come into contact with the temperature control unit / accessory. Decontamination must be carried out **before** the temperature control unit / accessory is returned for repair or inspection. Attach a clearly visible written notice stating that the temperature control unit / accessory has been decontaminated.

To simplify the process, we have prepared a form for you. This is available for download at www.huber-online.com.

8 Shutting down

8.1 Safety instructions and basic principles

DANGER

Connection/adjustment to the power supply not carried out by an electrician and/or connection to a power socket without protective earth (PE)

MORTAL DANGER FROM ELECTRIC SHOCK

- Have the connection/adjustment to the power supply carried out by an electrician.
- Always connect the temperature control unit to safety sockets (PE).

DANGER

Damaged power cable/power cable connection

MORTAL DANGER FROM ELECTRIC SHOCK

- Do not start up the temperature control unit.
- Isolate the temperature control unit from the power supply.
- Have the power supply cable/power supply connection replaced and inspected by an electrician.

WARNING

Risk of tipping due to unstable temperature control unit

SERIOUS INJURY AND PROPERTY DAMAGE

- Avoid risk of tipping due to unstable temperature control unit.

CAUTION

Non-compliance with the safety data sheet for the thermal fluid to be used

INJURIES

- Risk of injury to the eyes, skin, respiratory tract.
- The safety data sheet for the thermal fluid to be used must be read prior to using it and its content must be respected.
- Observe the local regulations/work instructions.
- Wear your personal protective equipment (e.g. temperature-resistant safety gloves, safety goggles, safety footwear).
- Danger of slipping because floor and work area are contaminated. Clean the workplace; observe the proper disposal of thermal fluid and aids. → Page 15, section **»Proper disposal of resources and consumables«**.

CAUTION

Hot or very cold thermal fluid

SEVERE BURNS/FROSTBITE OF LIMBS

- Before draining, ensure that the thermal fluid has room temperature (20 °C).
- If, at this temperature, the thermal fluid is too viscous to be drained: Control the temperature of the thermal fluid for a few minutes until the viscosity will allow drainage. Never control the temperature of the thermal fluid when the drain is open.
- Danger of burns when draining thermal fluids at temperatures above 20 °C.
- Wear your Personal Protective Equipment for draining.
- Only drain using suitable drainage hose and collecting container. These must be compatible with the thermal fluid and its temperature.

INFORMATION

All safety instructions are important and must be followed accordingly during working operations!

8.2 Switch-off

PROCEDURE

Our temperature control units are equipped with various functions. Depending on the function, the switch-off procedure on shutting down differs.
Without “Draining” function: Steps d.) and e.)
With “Draining” function: Steps: a.), b.), d.) and e.)
With the functions Draining “Thermal fluid” and “Cooling water”: Steps a.), c.), d.) and e.).

- **a.)** Drain the thermal fluid circuit with the function Draining “Thermal fluid”. → From page 63, Section **»Filling, venting and draining«**
- **b.)** Do **not** confirm the last message by tapping on “OK”. Thus, the control valve in the cooling water circuit remains open. This is the prerequisite to be able to completely drain the cooling water circuit.

- **c.)** Drain the cooling water circuit with the function Draining “Cooling water”.→ From page 80, Section **»Draining the cooling water«**
- **d.)** Switch off the temperature control unit.
- **e.)** Disconnect the temperature control unit from the power supply connection.

8.3 Draining the temperature control unit

PROCEDURE

- Drain the temperature control unit. → From page 63, section **»Filling, venting and draining«**.

8.4 Draining the cooling water

INFORMATION This section must be observed when using water-cooled temperature control units.

8.4.1 Draining process

CAUTION

Pressurized cooling water connections

RISK OF INJURY

- Wear your personnel protective equipment (e.g. safety goggles).
- Carefully open the cooling water connection. Open slowly (1-2 signal edges) and drain the cooling water slowly.

NOTE

Building-side isolating valves are not closed

DAMAGE BY FLOODING OF ROOMS

- Close the building-side isolating valves of the cooling water supply and return line.
- Place a collecting container below the cooling water supply [13], [14] and [15] (if installed).

PROCEDURE

- Proceed as described to drain the cooling water circuit.
  → From page 74, section **»Draining the cooling circuit«**.
  → From page 75, section **»Dismantling the cooling water supply«**.

8.5 Uninstalling an external application

PROCEDURE

- Disconnect the external application from the temperature control unit.

8.6 Opening/closing valves

PROCEDURE

- Close the valves. → From page 31, Section **»Opening/closing valves«**.

8.7 Mounting the knurled screws

PROCEDURE

- Check whether the knurled screws on the drains have been mounted and hand-tightened.

8.8 Transportation lock

NOTE

Not checking the position of the transportation locks prior to transport

DAMAGE TO THE TEMPERATURE CONTROL UNIT

➢ Prior to packaging and transport of the temperature control unit, bring the transportation locks of the compressor into the transport position.

When tightening the transportation locks, please observe: → Page 24, section **»Transportation lock«**.

8.9 Packing

Always use the original packaging! → Page 26, section **»Unpacking«**.

8.10 Shipping

NOTE

Temperature control unit transported in a horizontal position

DAMAGE TO THE COMPRESSOR

➢ Only transport the temperature control unit in an upright position.

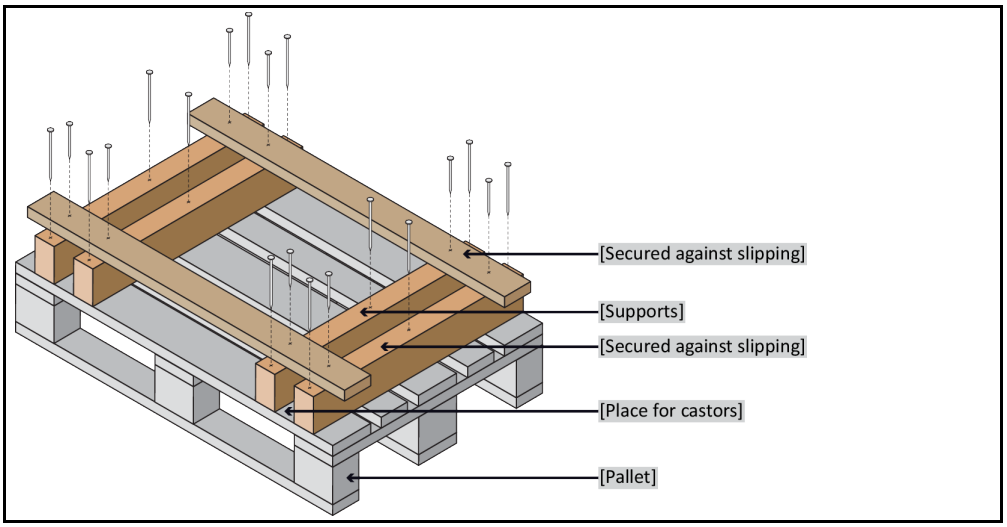
NOTE

Temperature control unit transported incorrectly

PROPERTY DAMAGE

➢ Do not transport by truck on the castors or feet.
➢ Comply all requirements in this section to avoid damage to the temperature control unit.

Pallet with squared timber for free-standing units



Transport using the lugs, if fitted, on the top of the temperature control unit. Do not transport the temperature control unit alone and without aids.

- Always use the original packaging for transportation.
- Indicate the upright transport position with arrows on the packaging.
- Always transport the temperature control unit upright on a pallet!
- Protect attachments from damage during transportation!
- During transport, place the temperature control unit on squared timber to protect the casters/feet.
- Secure with tensioning belts/lashing straps that are suitable for the weight.
- Additionally secure (depending on model) with plastic film, cardboard and straps.

For temperature control units with transportation lock, strictly observe: → Page 24, section **»Transportation lock«**.

8.11 Disposal

The operating company must observe the national and local regulations for the proper disposal.

CAUTION

Uncontrolled or incorrect opening of the coolant circuit

RISK OF INJURY AND ENVIRONMENTAL DAMAGE

- Work on the coolant circuit and disposal of the refrigerant must be carried out by approved refrigeration/air-conditioning system contractors.
- Please strictly observe: → Page 18, section **»Temperature control units with fluorinated greenhouse gases/refrigerants«**.

NOTE

Improper disposal

ENVIRONMENTAL DAMAGE

- Spilled/leaked thermal fluid must be discarded immediately and correctly. → Page 15, section **»Proper disposal of resources and consumables«**.
- To avoid environmental damage, have "disused" temperature control units disposed of exclusively by approved waste management companies (e.g. refrigeration and air conditioning companies).
- Please strictly observe: → Page 18, section **»Temperature control units with fluorinated greenhouse gases/refrigerants«**.

Huber temperature control units and Huber accessories are made of high quality, recyclable materials. For example: Stainless steel 1.4301 / 1.4401 (V2A), copper, nickel, FKM, Perbunan, NBR, ceramic, carbon, Al-Oxid, red brass, brass, nickel-plated brass and silver solder. Proper recycling of the temperature control unit and accessories can actively help reduce CO_2 emissions in the production of these materials. Follow the laws and regulations of your jurisdiction when disposing material.

8.12 Contact data

INFORMATION

Contact your supplier or local specialist retailer **prior** to returning the temperature control unit. The contact data can be found on our homepage www.huber-online.com under the heading „Contact". Please keep the serial number of the temperature control unit ready. The serial number can be found on the nameplate of the temperature control unit.

8.12.1 Telephone number: Customer Support

If your country is not mentioned in the list below: The responsible service partner can be found on our homepage www.huber-online.com under the heading „Contact".

- Huber Deutschland: +49 781 9603 244
- Huber China: +86 (20) 89001381
- Huber India: +91 80 2364 7966
- Huber Ireland: +44 1773 82 3369
- Huber Italia: +39 0331 181493
- Huber Swiss: +41 (0) 41 854 10 10
- Huber UK: +44 1773 82 3369
- Huber USA: +1 800 726 4877 | +1 919 674 4266

8.12.2 Telephone number: Sales

Telephone: +49-781-9603-123

8.12.3 Email address: Customer Support

Email: support@huber-online.com

8.13 Clearance certificate

This certificate must be enclosed with the temperature control unit. → Page 78, section **»Decontamination/repairs«**.

9 Annex

Inspired by **temperature** designed for you

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