Operation manual

LAUDA Universa MAX und Universa PRO

Immersion thermostats, heating thermostats and cooling thermostats

MAX: U 8 M, U 12 M, U 16 M, U 20 M, U 40 M, U 845 M, U 855 M, U 890 M, U 1245 M, U 1645 M, U 2040 M, U 4230 M.
PRO: U 4 P, U 8 P, U 16 P, U 40 P, U 6 TP, U 15 TP, U 20 TP, U 420 P, U 630 P, U 635 P, U 845 P, U 855 P, U 890 P, U 1245 P, U 1635 P, U 1645 P

V1R128

Read this manual prior to performing any task!

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1 Safety

1.1 General information

Operating instructions

IMPORTANT
READ CAREFULLY BEFORE USE KEEP FOR FUTURE REFERENCE

- Read these operating instructions carefully before use.
- Persons operating the appliance must have read and understood the operating instructions.
- Follow all warnings and safety instructions on the appliance and in the operating instructions.
- Always keep the operating instructions within easy reach near the appliance.
- The operating instructions are part of the device. Never pass the appliance on to third parties without the operating instructions.
- The appliance may only be operated as intended in accordance with the instructions in this operating manual. Any other operating mode is considered
  not as intended. The manufacturer assumes no warranty or guarantee for improper use.

Safe condition

The "safe state" in "functional safety" is generally understood as follows:

- This is an operating state of a system in which the risk to persons, the environment or systems is minimized.

The temperature control unit switches to the "Safe state":

- at excess temperature,
- at lower level
- or when an error or errors occur.

Table 1: The "Safe state" is defined as:

Device	Heating off	Pump off	Optical signal	Acoustic signal
Universa PRO	✓	✓	✓	✓
Universa MAX	✓	✓	✓	✓

1.2 Intended use

The appliances may only be operated as intended under the conditions specified in these operating instructions. Any other mode of operation is considered improper use. The operator is responsible for ensuring that the appliance is used as intended.

Intended use

This appliance may only be used for tempering flammable and non-flammable tempering liquids.

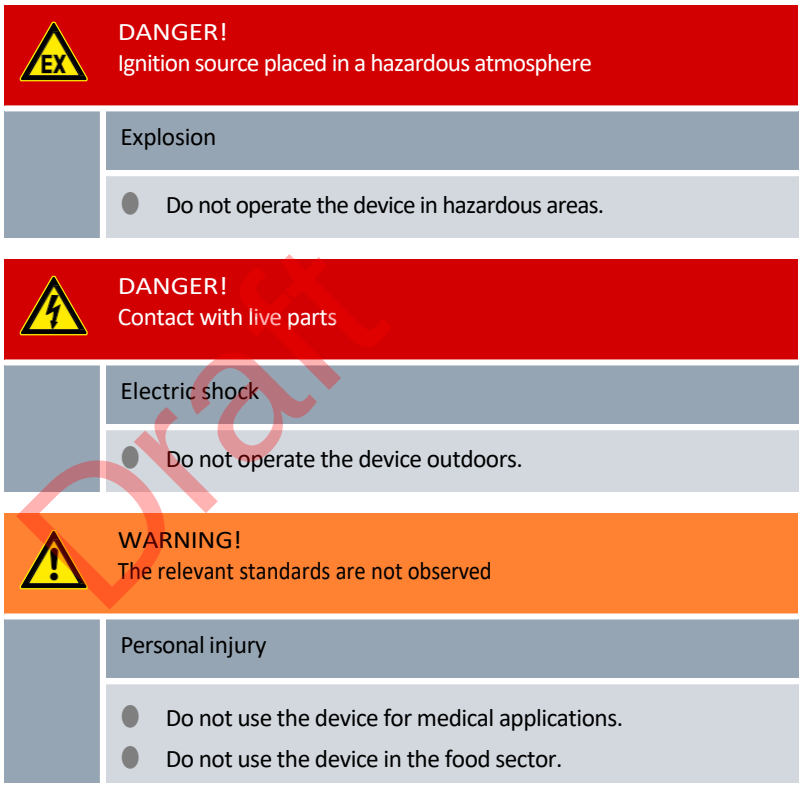
The device may only be used in the following areas:

- Production, quality assurance, research and development in an industrial environment

A heating thermostat is used for heating temperature control liquids in a bath tank and for heating and conveying temperature control liquids in an external circuit. The heating thermostat can be operated with a cooling coil. In this case, the heating thermostat can also be used to cool tempering liquids.

A cooling/heating thermostat is used to control the temperature of temperature control liquids in a bath tank and to control the temperature and convey temperature control liquids in an external circuit.

Reasonably foreseeable misuse



The following uses, among others, are considered reasonably foreseeable misuse:

- Operating the device without tempering liquid
- Operating the device with an unsuitable temperature control fluid
- Operation of the pump and control unit without heating or cooling base or suspension device
- Incorrect setting of the overtemperature cut-off point Tmax
- Setting a pump stage that is too high
- Medical applications
- in potentially explosive atmospheres
- for tempering food
- with a glass reactor without overpressure protection

- Outdoor installation
- Operation with external load (with PRO device variant)
- Operation with no external consumer when using a pure pressure pump (with MAX device variant)
- Operation with defective, unsuitable or non-standard mains connection cables
- Operation with defective or unsuitable hoses
- Operation with pump and control unit placed upside down on the bath

The residual risks are described in the warnings and safety instructions in the operating instructions.

1.3 Obligations of the operator

Observe the national regulations for operating the system in the respective country in which the system is installed.

In particular, the application of statutory regulations on operational safety must be observed.

1.4 Prohibition of modifications to the device

Any technical modification of the device by the user is prohibited. Any damage resulting from unauthorized modification is not covered by customer service or the product warranty. Service work may only be performed by the LAUDA Service department or a service partner authorized by LAUDA.

1.5 Observe additional operating instructions

Accessories

The appliance can be equipped with additional accessories, for example interface modules, solenoid valves, standard rails, etc. When installing and using accessories, the relevant operating instructions for the accessories must be read and observed

1.6 Software versions

These operating instructions are valid for the device from these software versions.

Software	valid from version
Control system (U_R)	1.00
Protection system (U_S)	1.00
Cooling system (U_T)	2.00
External Pt100 module (E_E)	1.48
Analog IO module (P_A)	3.54

1.7 Materials and substances

All parts of the appliance that come into contact with the temperature control fluid are made of high-quality materials adapted to the operating temperature. High-quality stainless steels and temperature-resistant, high-quality plastics are used.

1.8 Natural refrigerants

The appliances are filled with natural refrigerant.

The refrigeration units are permanently closed systems with less than 0.15 kg refrigerant of safety group A3. The natural refrigerants have increased flammability. Due to the low filling weight and the permanently closed design, no special requirements apply to the installation conditions.
A classification of the area of application, depending on the installation location and the requirements for the use of the premises, only takes place from a filling weight of more than 0.15 kg.

The designation and filling quantity of the refrigerant are indicated on the type label. plate and in Chapter 11.7 "Refrigerant and charge" on page 147.

1.9 Requirements for temperature control fluids

The appliance is designed for flammable and non-flammable temperature control fluids in accordance with class III as per DIN 12876-1.

- Temperature control liquids are used for temperature control.
- Temperature control fluids from LAUDA are recommended. LAUDA tempering liquids are manufactured by LAUDA DR. R. WOBSER GMBH & CO. KG tested and approved temperature control fluids.
- The safety data sheet for the temperature control fluid lists possible hazards and corresponding safety measures when handling the fluid. of the fluid is specified. The safety data sheet for the temperature control fluid must therefore be consulted for the intended use of the appliance.
- The temperature control fluids each cover a specific temperature range. Select a temperature control fluid with a tempera- range according to the temperature range of your application.
- If you want to use your own temperature control fluids, you must check that the fluids are suitable for the materials and materials used. are suitable.
  The temperature control fluid must be equipped with corrosion protection. You must test the further suitability of the temperature control fluid by carrying out a test run in the desired temperature range. During test operation, you must also check the low level protection.
- Do not use any tempering liquid above the flash point.
- Do not use any tempering fluid above 25 K below the firing point.
- Do not use any tempering fluid above 100 K below the ignition temperature.
- Do not use any temperature control fluid that is radioactive, toxic or environmentally hazardous.

- Do not use ethanol or methanol, as their flash point is below the normal ambient temperature.
- Do not use deionized water as a temperature control fluid.
- Use temperature control fluids that have a kinematic viscosity of less than 100 mm^2/s during operation.
- Use tempering fluid with a density in the range of 0.75 to 1.8 g/cm^3.
- Only use temperature control fluids that are approved for heat transfer systems.

1.10 Requirements for hoses

Use hoses with a

- Temperature resistance,
- Pressure resistance and
- Media resistance according to your application.

Recommended hoses can be found in the "Hoses" chapter.

1.11 Ambient and operating conditions

The device may only be used in the following areas:

- Production, quality control, research and development in an industrial environment
- For indoor use only
- Use up to an altitude of 2,000 m above sea level
- Ambient temperature from 5 °C to 40 °C
- Maximum relative humidity 80 % at temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C.
- Fluctuations in the mains voltage:
  - Mains connection 200 - 240 V: up to± 10 % of the rated voltage
  - Mains connection 100 - 125 V: up to +5 % / -10 % of the nominal voltage
- Overvoltage category II
- Temporary overvoltages that occur in the mains power supply
- Pollution degree 2

1.12 Time limits

Service life - All devices are designed for continuous operation. Service life - The device is designed for 20,000 operating hours.

placed.

Maintenance intervals -↳ Chapter 7.2 "Maintenance intervals" on page 121

1.13 Warranty conditions

LAUDA grants a standard warranty of one year.

1.14 Copyright

This operating manual was written in German, checked and approved. If the content of other language editions deviates from the German edition, the information in the German edition shall take precedence. If you notice any discrepancies in the content, please contact LAUDA Service, see

Chapter 1.15 "Contact LAUDA" on page 12.

Company and product names mentioned in the operating manual are usually registered trademarks of the respective companies and are therefore subject to brand and patent protection. Some of the images used may also show accessories that are not included in the delivery.

1.15 Contact LAUDA

Contact the LAUDA Service department in the following cases:

- Troubleshooting
- Technical questions
- Ordering accessories and spare parts

Please contact our sales department for questions relating to your specific application.

Contact information LAUDA

Service

Phone: +49 (0)9343 503-350

Email: service@lauda.de

1.16 Protective devices of the appliance

Below-grade protection

The bottom level protection is a protective device to prevent damage to the appliance and ignition of flammable temperature control fluid by the radiators.

- PRO
  If the fill level falls below the minimum, an alarm is triggered. All safety-relevant components of the appliance are switched off.
- MAX:
  If the fill level falls below the minimum, a warning is issued first. If the level drops further, an alarm is triggered. All safety-relevant components of the appliance are switched off.

Overtemperature protection

The overtemperature protection is a protective device to prevent flammable temperature control fluid from igniting due to excessively high temperatures. If the set maximum temperature (Tmax) is exceeded, all safety-relevant components of the appliance are switched off to prevent a fire hazard. In addition, an alarm signal provides information about activated overtemperature protection. The temperature at which the protective device (Tmax) triggers must be set depending on the temperature control fluid used.

1.17 Structure of warnings

Warning signs	Type of danger
	Warning - dangerous electrical voltage.
	Warning - explosive atmosphere.
	Warning - explosive substances.
	Warning - flammable substances.
	Warning - hot surface.
	Warning - slip hazard.
	Warning - danger zone.

Signal word	Meaning
DANGER!	This combination of symbol and signal word indicates an imminently dangerous situation that will result in death or serious injury if it is not avoided.
WARNING!	This combination of symbol and signal word indicates a potentially dangerous situation that can result in death or serious injury if it is not avoided.
CAUTION!	This combination of symbol and signal word indicates a possible dangerous situation that can result in minor injury if it is not avoided.
NOTICE!	This combination of symbol and signal word indicates a potentially dangerous situation that can result in material and environmental damage if it is not avoided.

1.18 Personnel qualification

Certified specialist
Specialist who is certified and authorized to perform specific work.

Operating personnel
Operating personnel are personnel who have been instructed by qualified personnel on how to use the device as intended in line with the information in the operating manual.

Specialized personnel
Certain activities on the device must be performed by specialized personnel. Specialized personnel are people whose professional education, knowledge, and experience as well as knowledge of relevant standards qualify them to assess the function and risks associated with the device and its use.

1.19 Personal protective equipment

Protective gloves
Protective gloves must be worn for certain tasks. The protective gloves must comply with standard DIN EN ISO 374-1. The protective gloves must be chemically resistant.

Protective work clothing
Protective clothing must be worn for certain tasks. This protective clothing must meet the legal requirements for personal protective equipment. Protective clothing with long sleeves must be worn. Additionally safety shoes are required.

Safety glasses
Safety glasses must be worn for certain tasks. The safety glasses must comply with the standard DIN EN 166. The glasses must be tightly closed and equipped with side plates.

1.20 Warning symbols

Sticker on devices with NRTL certification, attached to the right-hand side of the device.

This equipment is intended for use in industrial occupancies as defined in the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15.
DANGER RISK Of Fire Or Explosion. FLAMMABLE REFRIGERANT Used. To Be Repaired Only By Trained Service Personnel. Do Not Use Mechanical Devices To Defrost REFRIGERATING EQUIPMENT. Do Not Puncture REFRIGERANT Tubing.
CAUTION RISK Of Fire Or Explosion. FLAMMABLE REFRIGERANT Used. Consult Repair Manual / Owner's Guide Before Attempting To Install Or Service This Equipment. All Safety Precautions Must be Followed. Dispose Of Properly In Accordance With Federal Or Local Regulations.

Cet équipement est destiné à être utilisé dans des établissements industriels tels que définis dans la norme de sécurité pour les systèmes de réfrigération, ANSI/ASHRAE 15.
DANGER RISQUE D'Incendie Ou D'Explosion. RÉFRIGÉRANT INFLAMMABLE Utilisé. À Réparer Uniquement Par Un Personnel De Service Formé. Ne Pas Utiliser D'Appareils Mécaniques Pour Dégivrer L'Équipement De Réfrigération. Ne Pas Percer La Tuyau De Réfrigérant.
ATTENTION RISQUE D'Incendie Ou D'Explosion. RÉFRIGÉRANT INFLAMMABLE Utilisé. Consulter Le Manuel De Réparation / Guide Du Propriétaire Avant De Tenter De Réparer Ce Produit. Toutes Les Précautions De Sécurité Doivent Être Suivies. Éliminer Correctement Conformément Aux Réglementations Fédérales Ou Locales.

Fig. 1

2 Unpacking

Personnel: ■ Operating personnel

WARNING!
Leaks in the cooling circuit due to transport damage

	Fire
	● If you notice any damage to the transport packaging, store the device either in a well-ventilated place with no sources of ignition or outdoors. Contact LAUDA Service.

■ Wear protective gloves when unpacking.

The following instruction is relevant for heating thermostats:

■ Reach under the appliance to lift and carry it. The following instructions are relevant for cooling thermostats:

■ To lift and carry, reach into the front and rear grip recesses.

1. Unpack the device.
2. Check the appliance for completeness and any transport damage immediately after delivery.

Universa MAX Table 2 accessories as standard: Universa MAX thermostat

Designation	Device type	Quantity
Pump connection M16 x 1; with sealing plug (HKN 065) and union nut (HKM 032)	U 8 M, U 12 M, U 16 M, U 20 M, U 40 M	1
Cooling coil cpl. M16 x 1; with screw cap (EZV 146)	U 8 M, U 12 M, U 16 M, U 20 M, U 40 M	1
Bath cover	U 8 M, U 12 M, U 16 M, U 20 M	1
Bath cover, two-part	U 40 M	2
Olive connection set for M16x1; outer diameter olive 13.5 mm	All devices	1
Warning sticker "Flammable substances"	All devices	1
Operating instructions	All devices	1

Table 3: Universa MAX cooling thermostat

Designation	Device type	Quantity
Pump connection M16 x 1; with sealing plug (HKN 065) and union nut (HKM 032)	All devices	1
Bath cover	All devices	1

Designation	Device type	Quantity
Warning sticker "Flammable substances"	All devices	1
Operating instructions	All devices	1

Universa PRO Table 4 accessories as

standard: Universa PRO thermostat

Designation	Device type	Quantity
Cooling coil cpl. M16 x 1; with screw cap (EZV 146)	U 4 P, U 8 P, U 16 P, U 40 P U 6 TP, U 15 TP, U 20 TP	1
Warning sticker "Hot surface"	All devices	1
Operating instructions	All devices	1

Table 5: Universa PRO cooling thermostat

Designation	Device type	Quantity
Pump connection M16 x 1; with sealing plug (HKN 065) and union nut (HKM 032)	All devices	1
Bath cover	All devices	1
Warning sticker "Hot surface"	All devices	1
Operating instructions	All devices	1

3 Device description

3.1 Structure

3.1.1 Structure of the MAX pump and control unit

Front page

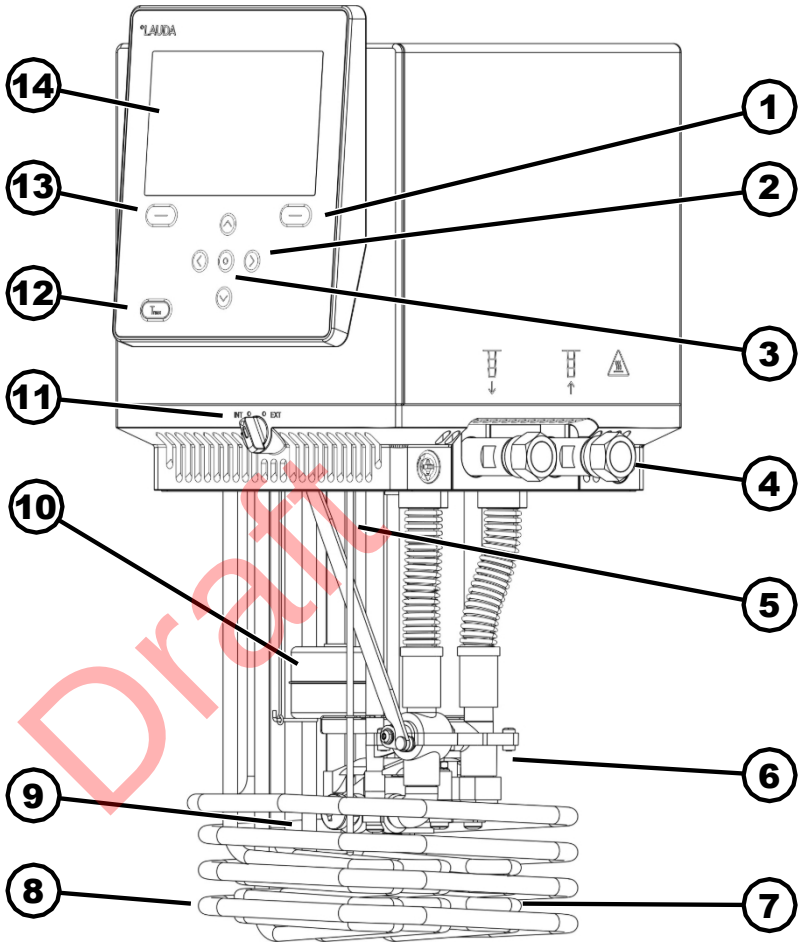


Fig. 2: Universa MAX pump and control unit

1 Soft key right
2 Arrow key (right, left, up and down)
3 Enter key
4 Pump connection (flow on the left and return on the right), connection for application
5 Temperature sensor (Pt1000)
6 Pump chamber with impeller
7 Radiators
8 Cooling coil for heating thermostats
9 Pump output for internal bath circulation
10 Float for level detection
11 Changeover switch for the internal and external pump output (INT / EXT)
12 Tmax button
13 Soft key left
14 Display

Rear MAX, 200 - 240 volts

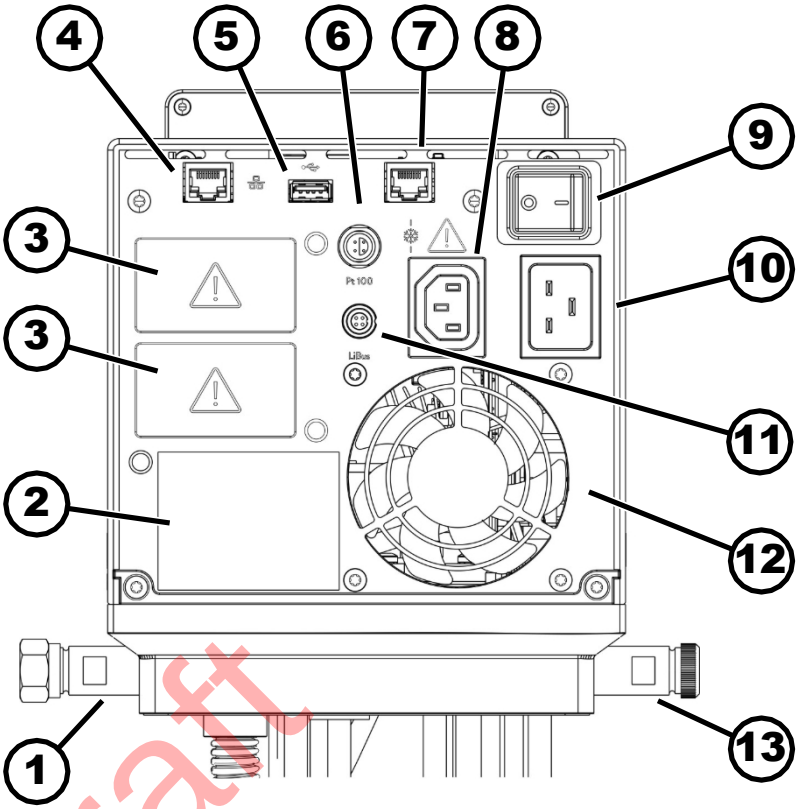


Fig. 3: Universa MAX pump and control unit, rear view

1 Pump nozzle
2 Type plate pump and control unit
3 Module slot (approx. 51 mm x 27 mm) for interface modules for expansion
4 Ethernet interface (RJ45 socket)
5 USB interface for software update
6 Lemo socket in size 1S for external Pt100 temperature sensor
7 Connection socket (RJ45 socket) for control cable of the refrigeration base unit
8 IEC socket for power supply from the pump and control unit to the lower refrigeration section
⚠ *Only LAUDA Universa refrigeration base units may be connected here! The current must not exceed 10 amperes.*
9 Mains switch (with circuit breaker)
10 Mains connection via power socket
11 LiBus interface
12 Fan
13 Cooling coil connection piece (for heating circulators)

Rear MAX, 100 - 125 Volt

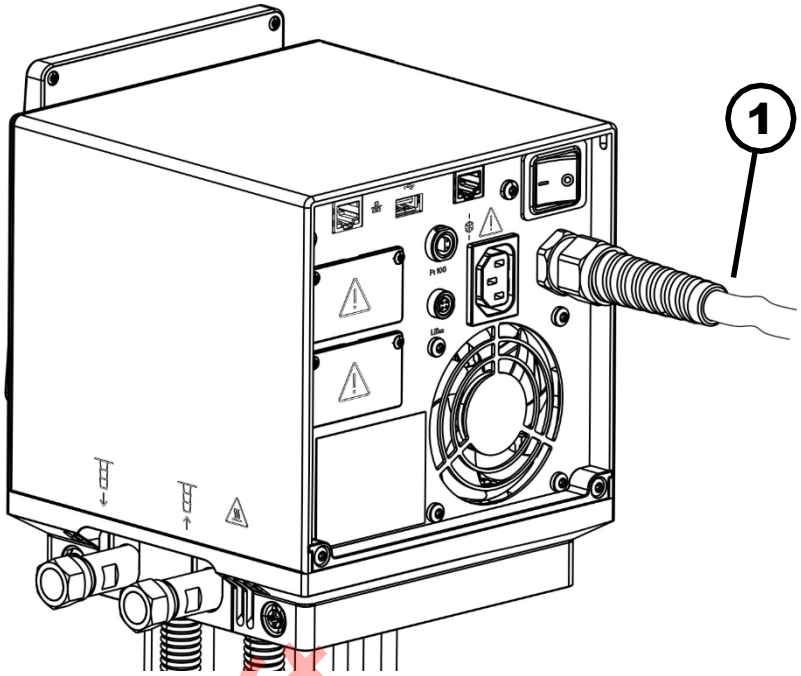


Fig. 4: Universa MAX pump and control unit, rear view

1 Mains cable, permanently installed

3.1.2 Structure of MAX thermostat

Front page

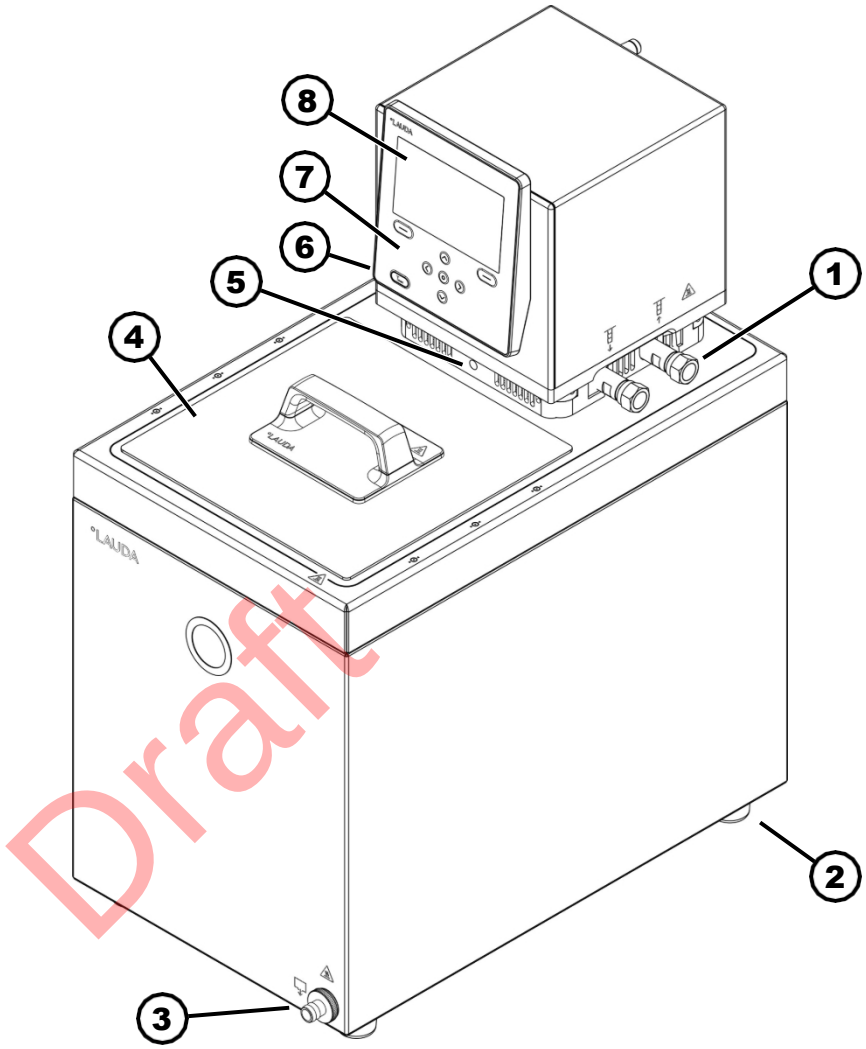


Fig. 5: MAX thermostat, front view

1 Pump connection for external application (flow on the left and return on the right), standard for MAX thermostats
2 Four feet
3 Drain nozzle with drain tap
4 Bath cover, standard for MAX thermostats
5 Changeover switch for splitting the internal and external pump flow
6 Cooling coil connection piece (concealed), for heating thermostats as standard
7 Control panel
8 Display

Back

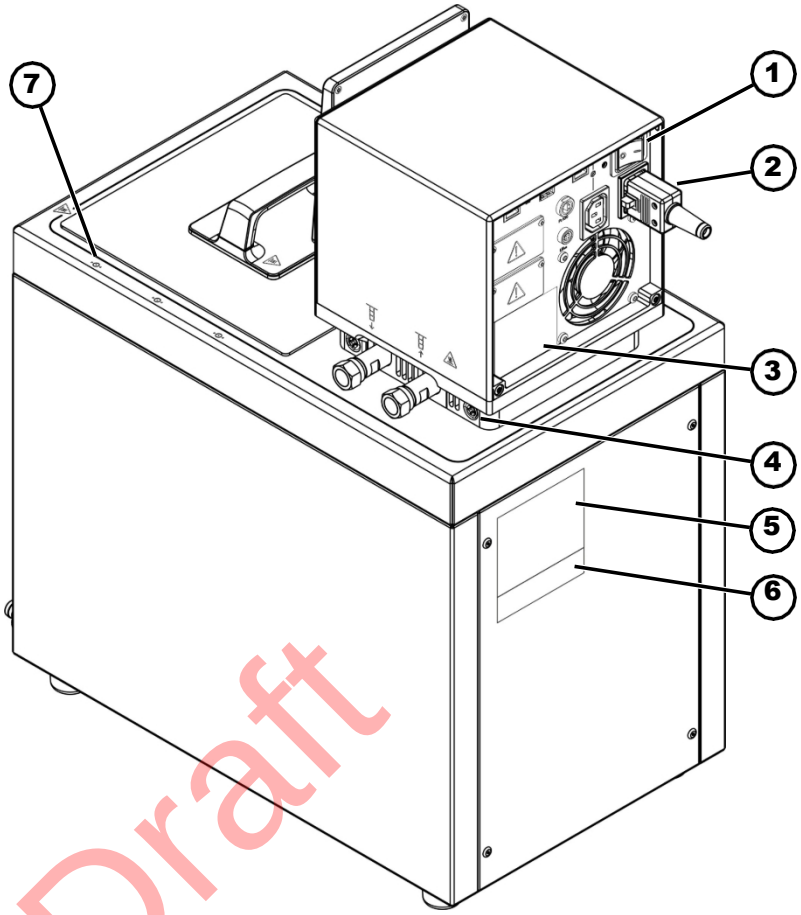


Fig. 6: MAX thermostat, rear view

1 Mains switch (circuit breaker)
2 Mains connection cable
3 Type plate pump and control unit
4 Locking the pump and control unit on the bath bridge
5 Type plate heating base
6 Complete system type plate
7 Marking for drilling into the edge of the bath

3.1.3 Structure of MAX cooling thermostat

Front page

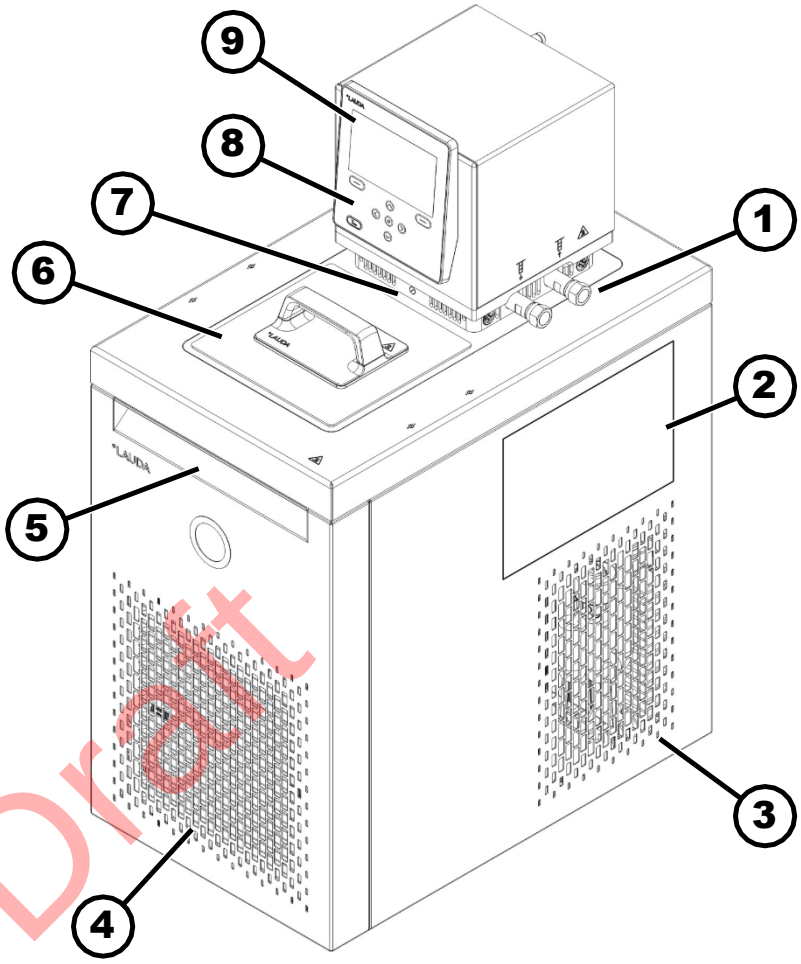


Fig. 7: MAX cooling thermostat, front view

1 Connection for application (flow on the left and return on the right)
2 Sticker on devices with NRTL certification
3 Rear castors, front feet; four castors for U 2040 M and U 4230 M
4 Front panel (removable), including drainage spout with drain cock
5 Front grip recess
6 Bath cover
7 Changeover switch for splitting the external and internal pump flow
8 Control panel
9 Display

Back

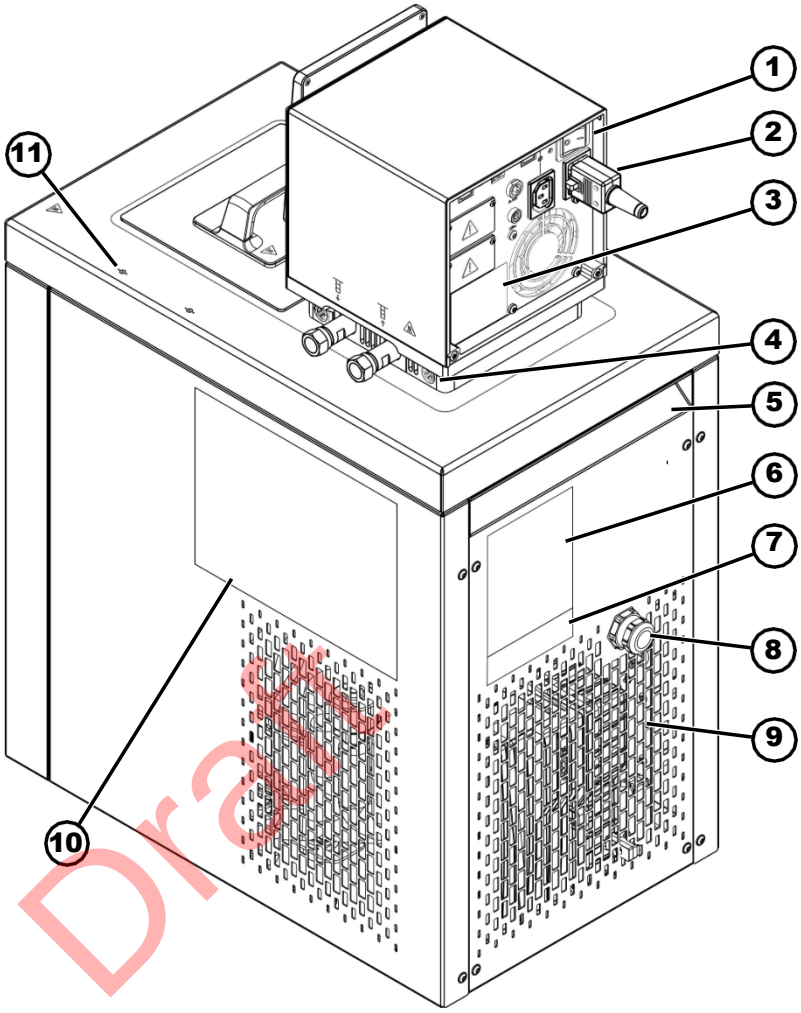


Fig. 8: MAX cooling thermostat, rear view

1 Mains switch (with circuit breaker)
2 Mains connection cable
3 Type plate pump and control unit
4 Locking the pump and control unit on the bath bridge
5 Rear grip recess
6 Refrigeration base type plate
7 Complete system type plate
8 Cable for the control and power supply of the refrigeration base unit
9 Ventilation grille
10 Sticker on devices with NRTL certification
11 Marking for drilling into the edge of the bath

3.1.4 Structure of the PRO pump and control unit

Front page

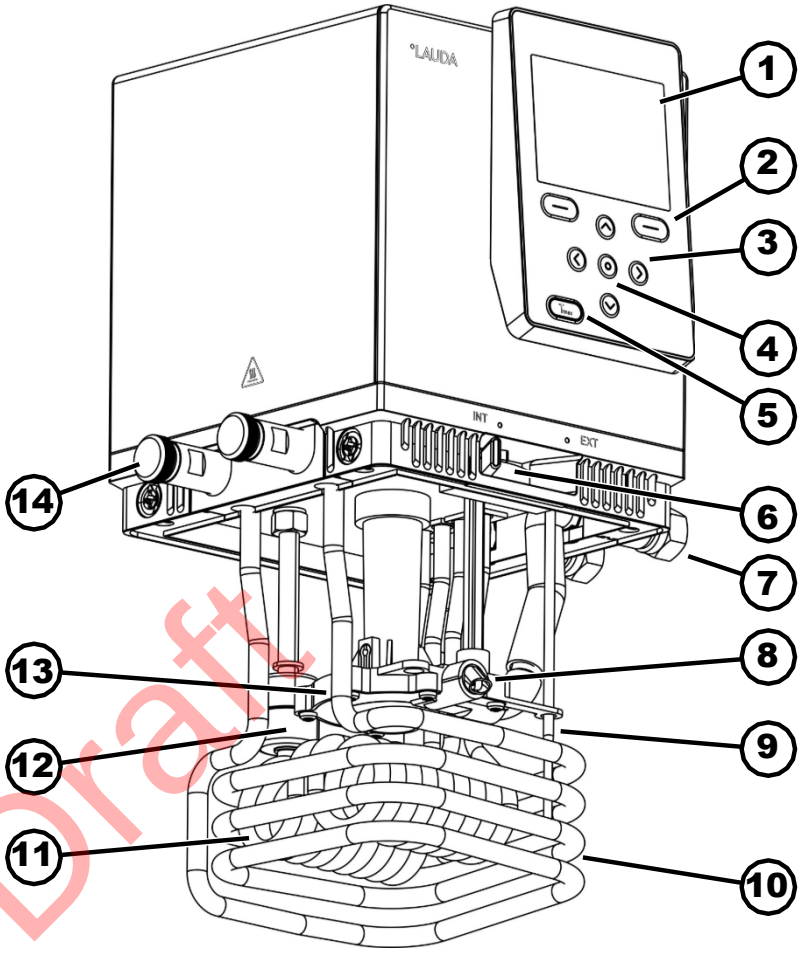


Fig. 9: Universa PRO pump and control unit, front view

1 Display
2 Soft key right and left
3 Arrow key (right, left, up and down)
4 Enter key
5 Tmax button
6 Changeover switch for the internal and external pump output (INT / EXT)
7 Connection for application (pump connection); accessories for PRO heating thermostats and immersion thermostats
8 Pump output for internal bath circulation
9 Temperature sensor (Pt1000)
10 Cooling coil for heating circulators; accessories for immersion circulators
11 Radiators
12 Float for level detection
13 Pump chamber with impeller
14 Cooling coil connectors for heating thermostats; accessories for immersion thermostats

Back PRO, 200 - 240 Volt

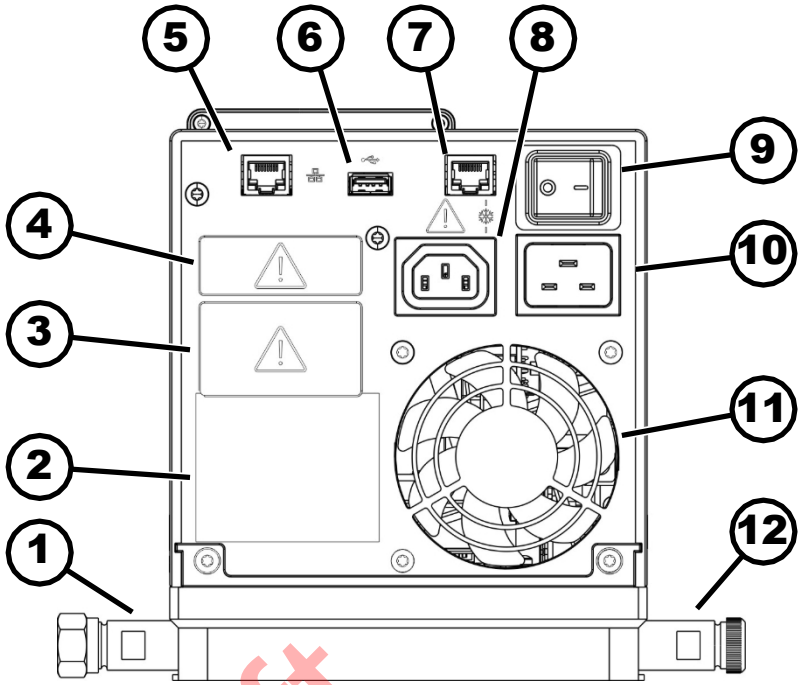


Fig. 10: Universa PRO pump and control unit, rear view

1 Pump connection pieces; accessories for PRO thermostats and immersion thermostats
2 Type plate pump and control unit
3 Module slot (approx. 51 mm x 27 mm) shown with optional interface module
4 Module slot (approx. 51 mm x 17 mm) shown with optional interface module
5 Ethernet interface (RJ45 socket)
6 USB interface for software update
7 Connection socket (RJ45 socket) for control cable of the refrigeration base unit
8 IEC socket for power supply from the pump and control unit to the lower refrigeration section
⚠ *Only LAUDA Universa refrigeration base units may be connected here! The current must not exceed 10 amperes.*
9 Mains switch (circuit breaker)
10 Mains connection
11 Fan
12 Cooling coil supports for heating thermostats; accessories for immersion thermostats.

Back PRO, 100 - 125 Volt

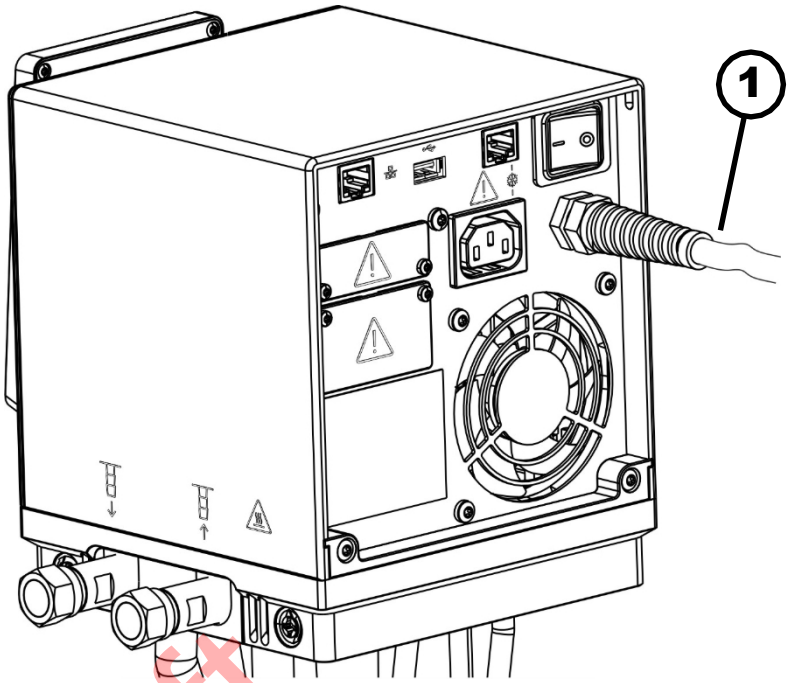


Fig. 11: Universa PRO pump and control unit, rear view

1 Mains cable, permanently installed

3.1.5 Structure of PRO thermostat

Front page

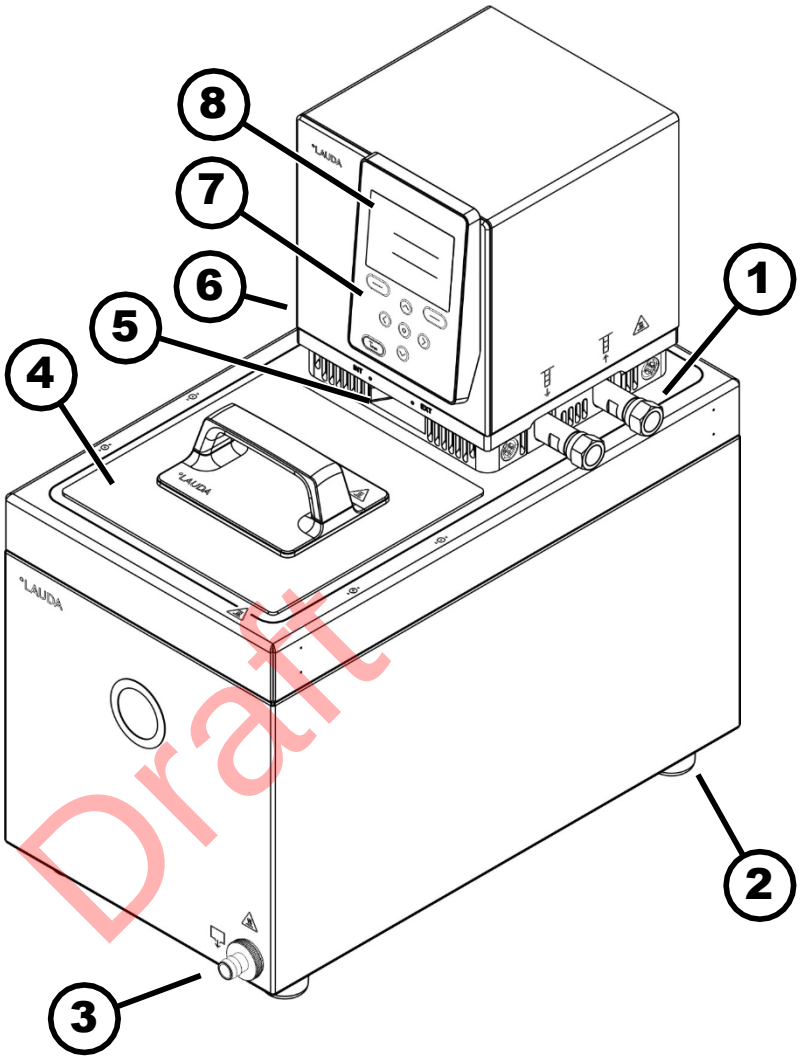


Fig. 12: Heating thermostat PRO front view

1 Connection for application (flow on the left and return on the right); accessories for heating thermostats
2 Four feet
3 Drain nozzle with drain tap
4 Bath cover, accessories for thermostats
5 Changeover switch for splitting the internal and external pump flow
6 Cooling coil connection piece (concealed), for heating thermostats
7 Control panel
8 Display

3.2 Control elements

3.2.1 Buttons on the control panel

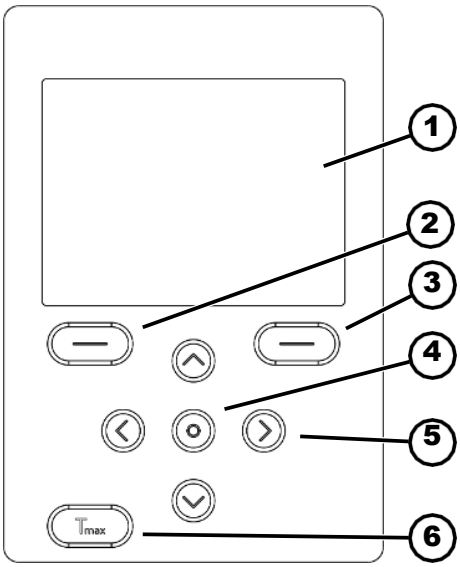


Fig. 13: Control panel buttons (using PRO as an example)

1 Display
2 Soft key left
3 Soft key right
4 Enter key
5 Arrow key
6 Tmax button

The control panel buttons can be used to control functions in the device display.

- The functions shown on the display for these buttons can be selected using the softkeys.
- A selection in the display can be confirmed with the enter key.
- The up, down, right and left arrow keys can be used to navigate the display.
- The Tmax button can be used to display and edit the overtemperature switch-off point.

The buttons on the control panel can be locked to prevent accidental misuse.

The display shows the basic window.

Activate key lock

1. Press and hold the [Enter] key.
2. Press and hold the [Down] arrow button.
   ▶ The button lock is activated after 5 seconds.
   Only the left soft key [Display] retains its function.

Deactivate

1. Press and hold the [Enter] key.
2. Press and hold the [Up] arrow button.
   ▶ The key lock is deactivated after 5 seconds.

3.2.2 Mains switch

The device has a power switch. The device is switched off with the [0] position and switched on with the [1] position.

The rocker switch is also designed as a fuse switch.
If the current is too high, the rocker switch triggers and disconnects the appliance from the mains supply. The appliance can be used again by switching the rocker switch to position [1]. *If the rocker switch trips again, contact LAUDA Service*

Chapter 1.15 "Contact LAUDA" on page 12.

3.2.3 Changeover switch for pump flow rate

The changeover switch for the pump flow can be set to the following positions by moving it to the right and left:

- The [EXT] position causes the largest flow rate in the external circuit. This position is required for operation as a circulation thermostat.
  tigated.
- In position [INT], the external flow rate is throttled to a minimum and the outlet for the internal bath circulation is completely closed.
  oPened.

With a position between [INT] and [EXT], the flow rate is divided between internal and external circulation.

3.3 Functional elements

3.3.1 Standard and additional interfaces

In the following sections you will find a general overview of the standard interfaces of the device, as well as additional optional interface modules.

The devices connected to the extra-low voltage inputs and extra-low voltage outputs must be safely isolated from dangerous voltages in accordance with DIN EN 61140, for example by double or reinforced insulation in accordance with DIN EN 60730-1 or DIN 60950-1.

Further information on the installation and use of these interface modules can be found in the separate operating instructions for the interface modules. The respective operating instructions must be consulted for the intended use.

Standard interfaces

The USB interface is not designed for connecting a device (laptop, smartphone), only for USB memory sticks.

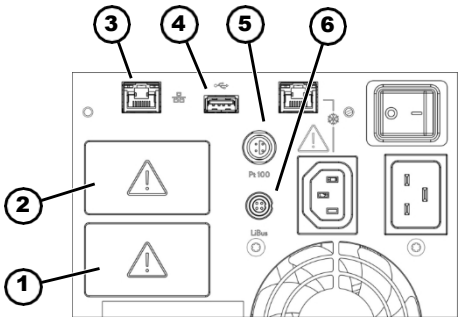


Fig. 14: Interfaces on the MAX pump and control unit

1 Module shaft (approx. 51 mm x 27 mm)
2 Module shaft (approx. 51 mm x 27 mm)
3 Ethernet interface
4 USB interface for software update
5 Pt100 interface (Lemo socket in size 1S)
6 LiBus interface

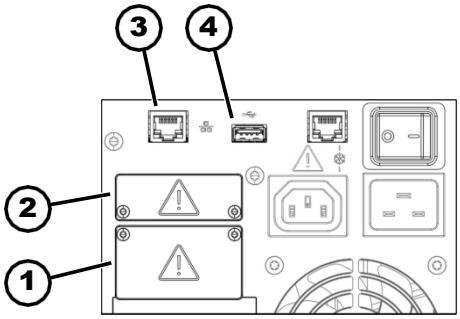


Fig. 15: Interfaces on the PRO pump and control unit

1 Module shaft (approx. 51 mm x 27 mm)
2 Module shaft (approx. 51 mm x 17 mm)
3 Ethernet interface
4 USB interface for software update

- The Ethernet interface enables connection to a control station or a PC. The interface offers the user the
  Possibility to monitor and control its temperature control processes by means of LAUDA interface kit (process interface).
- The USB interface Host (type A) enables the connection of a USB stick. This interface can be used for importing and exporting data.
  port and software update (no process interface).
- An external Pt100 temperature sensor can be connected to the Pt100 interface (MAX only) (Lemo socket in size 1S).
- The LiBus interface (MAX only) enables the connection of LAUDA accessories. Various solenoid valves (cooling fluids
  valve, automatic refill unit, shut-off unit) or the LiBus module box can be connected. The abbreviation "LiBus" stands for "LAUDA internal BUS" and refers to the CAN-based field bus system used in LAUDA devices.

Additional interfaces

The device can be equipped with additional interface modules. The availability of the interfaces depends on the software version; you may need to update your device.

- The analog module (order no. LRZ 912) has 2 inputs and 2 outputs on a 6-pin round socket. The inputs and outputs are
  can be set independently of each other as a 0– 20 mA, 4– 20 mA or 0– 10 V interface. A voltage of 20 V is fed out of the socket to supply an external sensor with evaluation electronics.
- The Pt100 / LiBus module (order no. LRZ 925)
- The RS 232/485 Advanced module (order no. LRZ 926) is designed as a 9-pin D-subminiature socket. Through optocoupler galva-
  separated. The RS 232 interface can be connected directly to the PC with a 1:1 contact cable.
- The NAMUR Advanced contact module (order no. LRZ 927) is designed as a plug connector in accordance with NAMUR NE28. This contact module
  is identical to LRZ 928, but with only 1 output and 1 input on 2 sockets. The coupling socket (order no. EQD 047) and the coupling plug (order no. EQS 048) are 3-pin.
- The Advanced contact module (order no. LRZ 928) is designed as a 15-pin D-subminiature socket. With 3 relay contact outputs
  (changeover contact, maximum 30 V / 0.2 A) and 3 binary inputs for control via external potential-free contacts.
- Profibus module Advanced (order no. LRZ 929) is designed as a 9-pin D-Sub miniature socket. Profibus is a bus system with high sig-
  nal transfer rate and for connecting up to 256 devices.
- EtherCAT module Advanced (order no. LRZ 931) with M8 sockets. EtherCAT is an Ethernet-based fieldbus with master/slave radio communication.
  tionality.
- Profinet module Advanced (order no. LRZ 932) with RJ45 socket. Profinet is an industrial Ethernet-based communication protocol,
  which enables fast and reliable data transmission between automation components in industrial networks.

- CAN module Advanced (order no. LRZ 933) with 9-pin D-submiature socket. CAN is a robust, serial bus system for the communication
  The new system is used for networking control devices in industrial applications and offers a high level of transmission reliability and resistance to interference.
- OPC UA module Advanced (order no. LRZ 934) with 8-pin RJ45 socket. The OPC UA server enables secure and standardized communication between the
  communication and simple integration of the LAUDA temperature control unit into higher-level systems such as MES or SCADA.
- Modbus TCP/IP module Advanced (order no. LRZ 935) with 8-pin RJ45 socket. Modbus enables an established and efficient network connection.
  communication and uncomplicated integration of the LAUDA temperature control unit into existing automation systems.
- external LiBus module box (order no. LCZ 9727) with 2 additional module slots. The number of LiBus interfaces can be selected via the LiBus-
  module box (LCZ 9727) can be enlarged. This allows additional modules to be connected. For example, a solenoid valve for cooling water control or a return flow safety device can be connected.

Further information on connecting and using these interfaces can be found in the operating instructions for the respective LAUDA interface module.

3.3.2 Hydraulic circuit

Hydraulic circuit

The hydraulic circuit refers to the circuit in which the temperature control fluid is located.

The circuit essentially consists of the following components:

- Bath boiler with temperature control fluid, with integrated cooling (for cooling thermostats)
- Pump
  - The pump is used to circulate the temperature control fluid in the bath tank. This creates a homogeneous temperature distribution.
  - The pump can be set to 8 pump stages for MAX or 6 pump stages for PRO in order to optimize the bath circulation.
    The aim is to be able to optimize the flow rate, the delivery pressure, the noise development and the mechanical heat input.
  - With an external setting, the pump delivers the temperature control fluid to the external application via the pump nozzles.
- Heater for heating the tempering liquid
- Cooling coil for cooling the temperature control fluid (only for heating circulators; optional accessory for immersion circulators).
- Hoses to the external application and back (optional accessory).

Cooling coil in the bathroom

- A cooling source, for example the fresh water supply, is connected to the cooling coil connections.
- The bath temperature of the thermostat can be lowered (without external application) to approx. 5 °C above the temperature of the cooling water.
- With the coolant valve A001657 (with LiBus control), which is available as an accessory, the cooling water supply is only controlled as required.
  oiled. This saves cooling water and heating energy and improves temperature consistency.

3.3.3 Refrigeration unit

The cooling unit contains natural refrigerant, which is flammable.

The cooling unit consists of the following components, among others:

- Compressor
  A variable-speed reciprocating compressor is used in the compressor, which is controlled according to demand. The compressor is switched on automatically during operation, but can also be switched on manually via the operating menu. In the event of safety-related faults, the compressor is switched off automatically.
- Vaporizer
  Heat is extracted from the internal bath using a stainless steel coil evaporator.
- SmartCool System
  A special form of proportional cooling. This cooling is implemented using variable-speed refrigeration compressors in conjunction with expansion valves controlled by stepper motors or variable-speed refrigeration compressors in conjunction with capillary injection. The refrigeration machine is speed-controlled and only switched on as required.
  This results in enormous energy savings compared to conventional cooling with counter-heating.
- SelfCheck Assistant
  Before and during operation, the system is checked, in particular the switch-off paths of the heating as well as the sensors and actuators.
  Not only alarms or error messages are shown on the display. Attention is also drawn to maintenance tasks, such as cleaning the condenser.

3.3.4 Bath edge ventilation

The air flowing from the pump and control unit is directed over the edge of the bath and reduces the temperature there when the bath is cold or heated. excessive cooling or heating of the edge of the bath. Depending on the operating status, this reduces ice formation and condensation on the edge of the bath.

The fan in the pump and control unit runs continuously. The basic minimum speed is so low that the noise of the fan is barely perceptible. Depending on the operating status, the following criteria influence the fan speed. The criterion that requires the highest fan speed specifies the actual fan speed.

- Heating capacity:
  - Increasing the fan speed from 50 % heat output
- Bath temperature:
  - Linear increase in fan speed at a bath temperature below 10 °C
  - Full fan speed at a bath temperature below -10 °C
  - Pump capacity, depending on:
    - Set pump stage
  - Viscosity of the tempering liquid

3.4 Type plates and serial numbers

The bath thermostats in the LAUDA Universa range are designed for modular installation. The heating and cooling thermostats consist of a pump and control unit as well as a base unit, which can be flexibly combined.

Both the pump and control unit and the lower parts of the appliance are with their own type plates. The type plates contain important identification data and further information.

Nameplate of the pump and control unit

The pump and control unit is a separate assembly that can be mounted on a lower part of the appliance. Each pump and control unit has its own type plate, on which the following information is given. Certain details depend on the installed equipment.

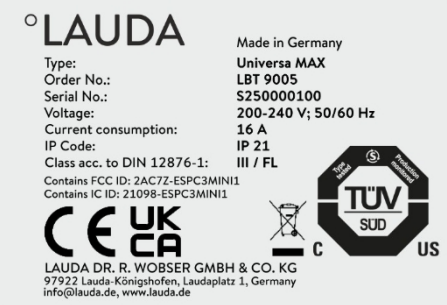


Fig. 16: Nameplate of a pump and control unit

Table 6: For a pump and control unit:

Specification	Description
Type:	Type designation of the pump and control unit
Order No.:	Order number of the pump and control unit
Serial No.:	■ serial number of the pump and control unit: ● from the letter S, ● from the year of manufacture (displayed with two ZiRs), ● from a 7-digit ZiRer.
Voltage:	Permissible mains voltage and mains frequency of the pump and control unit
Current consumption:	Current consumption of the pump and control unit (maximum value including connected refrigeration subsections)
IP code:	Protection class through housing according to EN 60529
Class acc. to DIN 12876-1	Classification according to DIN 12876-1
For devices with a built-in WLAN interface: Contains FCC ID: Contains IC ID:	 Identifier for the approval of wireless devices for sale in the USA. Identifier for the approval of wireless devices for sale in Canada.

Type plate, lower part of appliance

The lower part of the heating or cooling thermostat is a separate assembly and has its own type plate on which the following information is given. Certain information depends on the installed equipment.

Fig. 17: Nameplate of a heating base unit

Table 7: For a heat thermostat:

Specification	Description
Type:	Type designation of the heating base
Order No.:	Order number of the heating base
Serial No.:	■ serial number of the heating base: ● from the letter S, ● from the year of manufacture (displayed with two ZiRs), ● from a 7-digit ZiRer.

Fig. 18: Type plate of a refrigeration base unit

Table 8: For a cooling thermostat:

Specification	Description
Type:	Type designation of the refrigeration base
Order No.:	Order number of the cooling base
Serial No.:	■ Serial number of the refrigeration base: ● from the letter S, ● from the year of manufacture (displayed with two ZiRs), ● from a 7-digit ZiRer.
Refrigerant I:	Refrigerant used in the refrigeration circuit 1 of the appliance.
Filling charge I:	Charge weight of the refrigerant in the refrigeration circuit 1.
PS high pressure I:	Maximum permissible operating pressure on the high-pressure side of the refrigerant circuit 1 (sealing, condensation).
PS low pressure I:	Maximum permissible operating pressure on the low-pressure side of refrigeration circuit 1 (expansion, evaporation).
Refrigerant II:	Refrigerant used in the refrigeration circuit 2 of the appliance.
Filling charge II:	Charge weight of the refrigerant in the refrigeration circuit 2.
PS high pressure II:	Maximum permissible operating pressure on the high-pressure side of the refrigeration circuit 2 (sealing, condensation)
PS low pressure II:	Maximum permissible operating pressure on the low-pressure side of refrigeration circuit 2 (expansion, evaporation)
Voltage:	Permissible mains voltage and mains frequency of the refrigeration base unit
Current consumption:	Power consumption of the cooling base

Specification	Description
IP code:	Protection class through housing according to EN 60529
Refrigeration equipment with flammable refrigerant	Note: Refrigeration unit with flammable refrigerant

Mains connection for cooling thermostats

Before you want to connect an appliance to the mains, you must check the mains voltage and frequency against the rating plate on the pump and control unit and the rating plate on the cooling unit.
If the permissible mains voltage range is specified differently on the pump and control unit and the refrigeration base, the overlapping range applies. The mains voltage and the mains frequency must be within this range.

Serial number complete system

A LAUDA Universa heating or cooling thermostat is a complete system consisting of a pump and control unit and a base unit. This complete system is given its own serial number ex works, which is indicated on an additional label on the lower part of the device. This serial number makes it possible to identify the complete system.

Fig. 19: Type plate of a cooling thermostat

Table 9: For a complete system

Specification	Description
Type:	Type designation of the heating or cooling thermostat
Order No.:	Order number of the heating or cooling thermostat
Serial No.:	■ serial number of the heating or cooling thermostat: ● from the letter S, ● from the year of manufacture (displayed with two ZiRs), ● from a 7-digit ZiRer.

The serial numbers can also be viewed in the Device status

→ Device information→ Serial numbers can be viewed.

4 Before starting up

4.1 Install device

Each refrigeration circuit of the Universa refrigerated circulators contains less than 150 g of flammable refrigerant.

- According to standard EN 378-1, no special requirements apply to permanently closed refrigeration systems below this filling quantity limit to the installation site, the room volume and the access area.

DANGER!
Contact with voltage conductors due to faulty power supply cable

Electric shock

- Always use standard power supply cables such as the one supplied.
- Check the supplied power supply cable for damage prior to use.

DANGER!
The appliance coupler detaches from the built-in plug

Electric shock

- Insert the appliance plug until the lock engages.

DANGER!
Contact with live parts

Electric shock

- Disconnect the device from the mains power supply before installing modules.

WARNING!
Distribution box / multiple socket is unsuitable

Fire

- Only connect the device directly to the socket on the installation side.
- Do not use distribution boxes or multiple sockets.

WARNING!
Danger of the device rolling away or overturning

Impact, crushing

- Do not tilt the device!
- Position the device on an even, non-slip surface with a sufficient load carrying capacity!
- Actuate the caster brake when setting up the device!
- Do not place heavy parts on the device!

WARNING!
Overpressure hazard due to high ambient temperature

Injury, leakage of refrigerant, fire

- Observe the permissible ambient temperature and storage temperature.

The following warning is relevant for Universa PRO:

WARNING!
Pump unit and control unit is mounted crookedly on transparent bath

Fire

- Ensure that the pump unit and control unit are fixed correctly and horizontally on the transparent bath.

WARNING!
Leakage of tempering liquid

Scalding, frostbite

- Do not store any liquids or objects above the appliance.

WARNING!
Escaping heat transfer liquid

Scalding, cold burns

- The temperature resistance of the hoses must be suitable for the application temperature range.
- Use hoses with a greater compressive strength than the maximum possible pump pressure. For liquids with a density above 1 kg/dm^3, the pump pressure must be converted according to the density.
- Use pressure-resistant external applications or safety valves in the hydraulic circuit.
- When laying the hoses for the application, make sure that the hoses cannot be kinked or crushed.
- Always secure the hoses with suitable hose safety devices.

WARNING!
Contact with hot or cold hoses

Hot and cold burns

- Use insulated hoses for temperatures below 0 °C and above 70 °C.

WARNING!
Hot tempering fluid in the bath

Fire

- Applications with non-flow-through areas are not permitted.
  - There is a possibility that gas cushions may form during operation, which could release hot tempering liquid.
    back into the bath boiler.
  - You can check this by reducing the pump output by one or two stages. The level in the
    Do not allow the bath tank to rise.
- Ventilate the installation site. Hazardous vapors may be produced.

The following warning is not valid for Universa MAX:

WARNING!
Risk of heat transfer liquid escaping during operation due to open application

Scalding, cold burns

- Always use hydraulically sealed applications.

The following warning is relevant for Universa MAX:

WARNING!
Overflow of temperature control fluid during operation with oRener application

Scalding, frostbite

- Only use a hydraulically operated application in conjunction with a pressure/suction pump and the Accessories Level constants in the bathroom.

WARNING!
Bursting of the external application due to excessive pressure

Scalding, frostbite

- In the case of deeper, pressure-sensitive external applications, please also note the additional pressure resulting from
  the height difference between the application and the device.
- For pressure-sensitive applications (e.g. glass fittings) with a maximum permissible operating pressure below
  the maximum pressure of the pump (see chapter Technical data), the hoses of the application must be laid in such a way that kinking or crushing is not possible.
- A separate safety valve must be installed in the flow to protect against incorrect operation.
- Adjust the pump pressure by changing the pump stage.

WARNING!
Use of unsuitable heat transfer liquid

Fire, mutation, poisoning, environmental hazard, equipment damage

- Heat transfer liquids from LAUDA are recommended.
- If you wish to use your own heat transfer liquids, you must check that the fluids are suitable for the materials used. The heat transfer liquid must be provided with corrosion protection. You must also test the suitability of the liquid by performing a test run within the desired temperature range. During the test run, you must also check the low-level protection.
- Select a heat transfer liquid with a temperature range suitable for the application.
- Do not use any heat transfer fluid above the flash point.
- Do not use any heat transfer fluid more than 25 K below the flash point.
- Do not use any heat transfer fluid more than 100 K below the ignition temperature.
- Do not use any heat transfer fluid that is radioactive, toxic or environmentally hazardous.
- Do not use ethanol or methanol because their flash point is below normal ambient temperature.
- Do not use deionized water as a heat transfer liquid.
- Only use heat transfer liquids that are approved for heat transfer systems.
- Use heat transfer fluids with a kinematic viscosity of less than 100 mm^2/s during operation.
- Use heat transfer fluids with a density in the range of 0.75 to 1.8 g/cm^3.

The following warning is relevant for Universa MAX:

CAUTION!
Leakage of tempering liquid at standstill when an oRen application is connected

Slipping or falling

- If the level of the liquid in the application and in the thermostat are not the same, use
  You also need the accessory shut-off unit A001753. The shut-off unit prevents the liquid in the higher vessel from flowing into the lower vessel when the thermostat is switched off.

The following warning is relevant for Universa MAX, in the version with ball bearing pump:

NOTICE!
Use of unsuitable temperature control fluid with ball-bearing pump

Device damage

- Only use temperature control fluids based on mineral oil or silicone oil.
- Do not use water-based temperature control fluids: water, water-monoethylene glycol mixture,
  Aqua 90, Kryo 30.

Personnel: ■ Specialized personnel

Protective equipment: ■ Protective work clothing

■ Safety glasses

■ Protective gloves

Connecting an external application

1. Please note the following:

   ■ When connecting the hoses:

   ● When tightening the union nut on the pump nozzle, use a second open-end wrench to hold the pump nozzle in place.
   blunt against it!

   ● Secure the hoses with hose clamps on the hose nozzles.

   ■ Set the changeover switch for the pump flow rate to *External*.

   ■ Use the shortest possible hoses with the largest possible diameter.
   If the diameter of the hose is too small, there will be a temperature drop between the temperature control unit and the external application due to insufficient flow rate. In this case, increase the pump stage accordingly.

   ■ If the temperature control unit is to be controlled externally, a temperature sensor must be connected to the external application.

   ■ If the application is positioned higher than the temperature control unit, the following can happen:

   ● When the pump is at a standstill, air can enter the external liquid circuit.

   ● Despite the closed circuit, this can lead to liquid from the application entering the temperature control unit.
   fliedt.

   ● As a result, there is a risk of the liquid in the temperature control unit overflowing.

2. If the temperature control unit is disconnected from the external application, the temperature control unit must be

   ■ the pump nozzles are sealed with plugs or

   ■ the flow connection and the return connection on the temperature control unit are connected by a hose (short-circuit hose)
   and

   ■ the changeover switch for the pump flow must be set to *Internal.*

Remove external application

4.2 Installing the interface module

The interface module is connected to an internal LiBus ribbon cable and inserted into a free module slot. The number and arrangement of the module slots vary depending on the device. The module slots are protected by a cover that is screwed onto the housing or attached to the slot opening.

DANGER!
Contact with live parts during installation

Electric shock

- Disconnect the device before installing modules.
- Only skilled personnel are permitted to install/replace interface modules.

The description of module installation applies in principle to all LAUDA temperature control units; the example diagrams here show the installation of a LiBus module in a temperature control unit from the Variocool range.

Please note that an interface module with a large cover may only be installed in a high module slot. After installation, the cover must completely cover the opening of the module slot.

To fasten the interface module, use the screws supplied with the interface modules as accessories (ISO14583-A2/70-TX10-M3X6) and a suitable screwdriver.

Observe the following sequence during installation:

1. Switch off the temperature control unit and disconnect the mains plug.
2. If necessary, loosen the screws on the cover of the required module slot. If the cover is attached, you can lift it off with a slotted screwdriver.

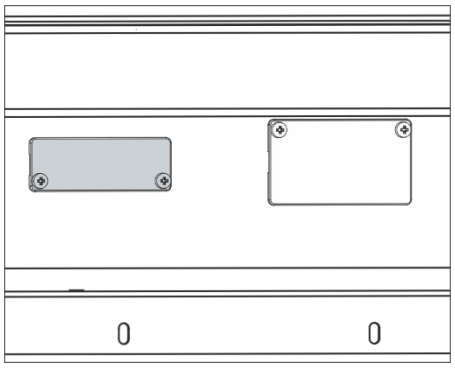


Fig. 20: Dismantling the cover (schematic diagram)

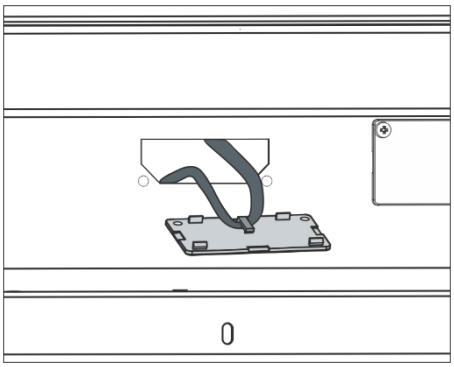


Fig. 21: Detaching the LiBus ribbon cable (schematic diagram)

3. Remove the cover from the module slot.

   ▶ The module slot is open. The LiBus ribbon cable is attached to the inside of the cover and is easily accessible.

4. Detach the LiBus ribbon cable from the cover.

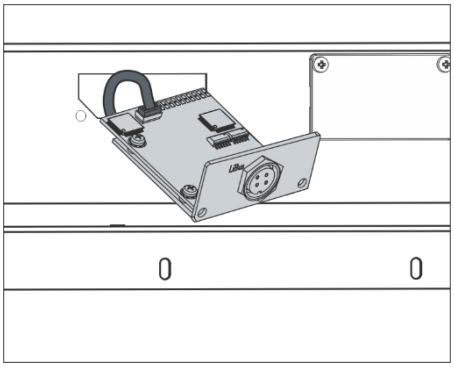


Fig. 22: Connecting the interface module (schematic diagram)

5. Connect the red plug of the LiBus ribbon cable to the red socket on the circuit board of the interface module. The plug and socket are reverse polarity protected: Ensure that the nose of the plug points towards the recess in the socket.

   ▶ The interface module is correctly connected to the temperature control unit.

6. Slide the LiBus ribbon cable and the interface module into the module slot.

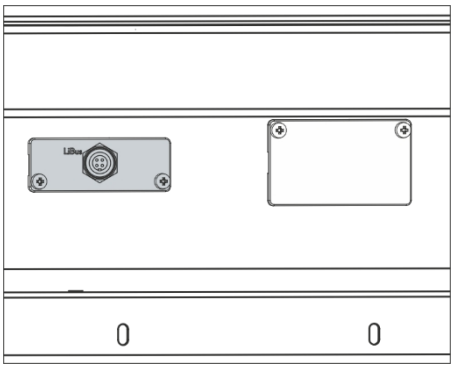


Fig. 23: Fastening the cover (schematic diagram)

7. Screw the cover to the housing using 2 M3 x 10 screws.

   ▶ The new interface of the temperature control unit is ready for operation.

4.3 Hoses

Approved elastomer hoses

Hose type	Clear width Ø in mm	Outer diameter in mm	Temperature range of the hose in °C	Field of application	Order number
EPDM hose, non-insulated	9	13	10 - 90	for all LAUDA temperature control fluids, except mineral oils	RKJ 111
EPDM hose, non-insulated	12	16	10 - 90	for all LAUDA temperature control fluids, except mineral oils	RKJ 112
EPDM hose, insulated	12	35	-35 - 90	for all LAUDA temperature control fluids, except mineral oils	LZS 021
Silicone hose, not insulated	11	15	10 - 100	Water, water-glycol mixture	RKJ 059
Silicone hose, insulated	11	33	-60 - 100	Water, water-glycol mixture	LZS 007

Released metal hoses

The following approved metal hoses are made of stainless steel with union nuts M16 x 1. The clear width is 10 mm.

Hose type	Length in cm	Temperature range of the hose in °C	Field of application	Order number
MC 50	50	10 - 400	with single insulation, for all LAUDA temperature control fluids	LZM 040
MC 100	100	10 - 400	with single insulation, for all LAUDA temperature control fluids	LZM 041
MC 150	150	10 - 400	with single insulation, for all LAUDA temperature control fluids	LZM 042
MC 200	200	10 - 400	with single insulation, for all LAUDA temperature control fluids	LZM 043
Pump short circuit	18	10 - 400	with single insulation, for all LAUDA temperature control fluids	LZM 044
MK 50	50	-90 - 150	with foam insulation for the refrigeration sector, for all LAUDA temperature control fluids	LZM 052
MK 100	100	-90 - 150	with foam insulation for the refrigeration sector, for all LAUDA temperature control fluids	LZM 053
MK 150	150	-90 - 150	with foam insulation for the refrigeration sector, for all LAUDA temperature control fluids	LZM 054

Hose type	Length in cm	Temperature range of the hose in °C	Field of application	Order number
MK 200	200	-90 - 150	with foam insulation for the refrigeration sector, for all LAUDA temperature control fluids	LZM 055
Pump short circuit	18	-90 - 150	with foam insulation for the refrigeration sector, for all LAUDA temperature control fluids	LZM 045

4.4 LAUDA heat transfer liquids

Please note:

- At the lower limit of the temperature control fluid's temperature range, the increasing viscosity can lead to a deterioration in temperature stability. properties. Therefore, only use this temperature range fully if necessary.
- Never use contaminated temperature control fluids. Contamination of the pump chamber can cause the pump to block. and thus lead to the device being switched off.
- Observe the safety data sheet for the temperature control fluid. If required, you can request the safety data sheets at any time.

Table 10: Released tempering liquids

Designation	Chemical name	Working temperature range in °C	Viscosity (kin) in mm²/s (at 20 °C)	Viscosity (kin) in mm²/s at temperature	Flash point in °C
Kryo 95	Silicone oil	-95 - 60	1,6	20 at -80 °C	64
Kryo 60	Silicone oil	-60 - 60	3,34	25 at -60 °C	62
Kryo 51	Silicone oil	-50 - 120	5,6	34 at -50 °C	120
Kryo 30	Water-monoethy-lene glycol mixture	-30 - 90	4	50 at -25 °C	---
Kryo 20	Silicone oil	-20 - 170	11,4	27 at -20 °C	>170
Kryo 10	Water-propylene glycol mixture	-10 - 90	4,3	14 at -10 °C	---
Aqua 90	Decalcified water	5 - 90	1	---	---
Ultra 301①	Mineral oil	40 - 230	76,5	35.4 at 40 °C	245
Therm 250	Silicone oil	50 - 250	158	25 at 70 °C	>300
Therm 180	Silicone oil	0 - 180	23	33.3 at 0 °C	>250
Therm 160	Polyalkylene glycol and additives	60 - 160	141	28 at 60 °C	>260

①Recommendation: Overlay with StickstoR from 150 °C

Table 11: Order numbers for temperature control fluids

Designation	Container size Order number			
	5 L	10 L	20 L	200 L
Kryo 95	LZB 130	LZB 230	LZB 330	---
Kryo 60	LZB 102	LZB 202	LZB 302	LZB 802
Kryo 51	LZB 121	LZB 221	LZB 321	---
Kryo 30	LZB 109	LZB 209	LZB 309	LZB 809
Kryo 20	LZB 116	LZB 216	LZB 316	---
Kryo 10	LZB 132	LZB 232	LZB 332	----
Aqua 90	LZB 120	LZB 220	LZB 320	---
Ultra 301	LZB 153	LZB 253	LZB 353	---
Therm 250	LZB 122	LZB 222	LZB 322	---
Therm 180	LZB 114	LZB 214	LZB 314	---
Therm 160	LZB 106	LZB 206	LZB 306	---

- When using Kryo 30 and Kryo 10:
  The water content decreases during prolonged work at higher temperatures and the mixture becomes flammable (flash point 119 °C). Check the mixing ratio, for example using a sealing spindle.
- When using Aqua 90:
  Evaporation losses occur at higher temperatures. In this case, use a bath lid.
- Never use silicone oil on silicone hoses.
- When using mineral oils:
  Do not use in conjunction with EPDM hose.

Temperature control fluid
Water

- The proportion of alkaline earth ions in the water must be between 0.71 mmol/L and 1.42 mmol/L (corresponds to 4.0 °dH and 8.0 °dH). Harder
  Water leads to limescale deposits in the appliance.
- The pH value of the water must be between 6.0 and 8.5.
- Distilled, deionized and demineralized water are unsuitable due to their reactivity. Ultrapure water and distillates are
  after adding 0.1 g soda (Na_2CO_3, sodium carbonate) per liter of water is suitable as a tempering liquid.
- Seawater is unsuitable due to its corrosive properties.
- Chlorine in the water must be avoided at all costs. Do not add chlorine to the water. Chlorine is found, for example, in cleaning agents and disinfectants.
- The water must be free of impurities. Unsuitable are ferrous water due to rust formation, untreated river water
  due to algae formation.
- The addition of ammonia is not permitted.

5 Commissioning

5.1 Establish power supply

DANGER!
Transport damage

Electric shock

- Closely inspect the device for transport damage prior to starting up.
- Never operate a device that has sustained transport damage!

DANGER!
Contact with voltage conductors due to faulty power supply cable

Electric shock

- The power supply cable must not come into contact with hoses containing heat transfer liquid or other hot parts.

DANGER!
Condensation (after transportation)

Electric shock

- Do not operate the appliance for at least 24 hours after transportation. This allows
  allows temperature equalization at the installation site.

NOTICE!
Use of impermissible mains voltage or mains frequency

Device damage

- Compare the type plate with the available mains voltage and mains frequency.

Note on the mains connection for cooling thermostats:

- Before you want to connect an appliance to the mains, you must check the mains voltage and frequency against the rating plate on the appliance.
  pump and control unit and with the type plate on the lower refrigeration section.
  If the mains voltage range is specified differently on the pump and control unit and refrigeration base, the overlapping range applies. The mains voltage and the mains frequency must be within this range.

Note for electrical installation on the building side:

- The appliances must be protected on the installation side by a circuit breaker with a maximum rated current of 16 amps
  may.
  - Exception: For appliances with a UK plug, the rated current is limited to a maximum of 13 amps.
- The maximum power consumption of the appliance can be found on the rating plate of the pump and control unit.

Please note:

- The mains plug of the appliance is the primary disconnecting component. The mains switch (circuit breaker) on the appliance only has a safety function. tion.
  - The mains plug must be easily recognizable.
  - The mains plug must be easily accessible.
  - It must be easy to remove the mains plug from the socket.
- Only use standard mains connection cables such as the mains connection cable supplied.
- Connect the appliance to a socket outlet with a protective earth conductor (PE).

5.2 Indications on the display and basic navigation

5.2.1 Basic window, navigation and softkeys

After switching on the device and making the settings, the last active view is displayed. The basic view appears by default as long as no messages are active and the initial setup has been completed.

Fig. 24: Basic window with status bar, temperature displays and softkey bar

1 Status bar
2 Pump stage
3 Level in the bath boiler (only with Universa MAX)
4 Heating and cooling percentage (only for cooling thermostats)
5 Alarm symbol (red) and warning symbol (yellow)
6 Cloud connectivity symbol
7 WLAN connectivity symbol (for devices with WLAN)
8 Current time
9 Temperature displays (the temperature is regulated to the temperature that is displayed in large format)
10 Softkey bar

The softkeys are special buttons that can be pressed at any time, but can assume different functions depending on the context. The respective function is shown in the display.

By pressing the DISPLAY soft key, you can switch through the various windows one after the other:

- Basic window
- Basic window with status bar
- Graphic window
- Alarm messages
- Warning messages

A window with alarm messages or warning messages is only displayed if such messages have actually been triggered. Please note:

- These windows do not appear while you have opened another menu.
- To see the messages, you must actively switch through the windows.

No alarm or warning messages are displayed in the graphics window of the Universa PRO temperature control unit.

5.2.2 Graphic window

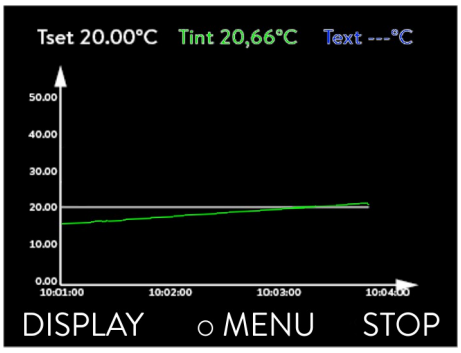


Fig. 25: Graphics window

The display offers you the option of displaying temperature curves graphically.

You can access the graphics window via the [Display] softkey in the basic window of the display.

- T_{set} indicates the set target temperature (gray).
- T_{int} indicates the internal temperature (green) of the temperature control fluid in the appliance.
- T_{ext} indicates the external temperature (dark blue) of the temperature control fluid in the application.
- The graphic can be scrolled in any direction using the arrow keys.

Customize graphics window

1. Press the enter key to access the menu.
2. *Select* the menu item→ *Graphic*.
   ▶ The Graphics submenu opens.

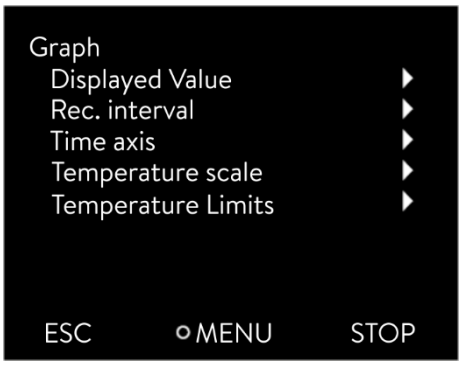


Fig. 26: Graphics menu

You can customize the graphics window to your needs in this submenu.

- [Display measured values]: T_{set}, T_{int}, T_{ext} and T_{ext2}.
  Here you specify which temperatures are to be displayed in the graph.
- [Recording interval]: 2 s (maximum 50 min), 10 s (maximum 4 h), 30 s (maximum 12 h), 1 min (maximum 24 h) or 2 min (maximum 48 h).
  Here you specify the interval at which a new temperature reading is to be recorded.
- [Time range]: auto, 9 min, 45 min, 2 h15 min, 4 h30 min , 9 h, 24 h or 48 h.
  Here you define which time range is displayed within the visible graph window (corresponds to the scaling of the x-axis).

- [Temperature scaling]: automatic or manual.
  Here you specify which temperature range is displayed within the visible graphic window.
  - [Automatic]: The size of the visible graphic area automatically adapts to the changing temperature curves.
  - If the setting is selected automatically, the following menu item (Temperature limits) is not visible.
- [Temperature limits]: T-scale Min and T-scale Max.
  Here you can manually define which time range is displayed within the visible graphic window.

5.3 Switching on the device for the first time

WARNING!
Device start carried out via a remote control unit

Burning, slipping, environmental hazard

- Only switch the device on at the mains switch when the application is fully connected hydraulically and all measures for safe commissioning have been taken.

You can change the following settings menu language , time zone and temperature unit at any time via the menu
→ Settings→ Change basic settings.

You switch the device on

Fig. 27: Start screen

1. Switch the device on using the power switch. You will hear a signal tone and the start screen will appear briefly.

   ▶ The menu for selecting the language is displayed.

Fig. 28: Menu language

2. Use the up and down arrow buttons to select the desired [Menu language].

   Confirm your selection with the Enter key (checkmark set) and then continue with the [>>] softkey.

   ▶ The menu for selecting the time zone is displayed.

3. Use the up and down arrow buttons to select the desired [Time zone].

   Confirm your selection with the Enter key and then continue with the [>>] softkey.

   ▶ The menu for selecting the temperature unit is displayed.

4. Use the up and down arrow buttons to select the desired [Temperature unit].

   Confirm your selection with the Enter key (checkmark set) and then continue with the [>>] softkey.

   ▶ The menu for selecting the temperature control fluid is displayed.

5. Use the up and down arrow buttons to select the [Temperature control fluid].

   Confirm your selection with the Enter key (checkmark set) and then continue with the [>>] softkey.

   ▶ The menu for selecting the bath base is displayed.

6. Use the up and down arrow buttons to select the [Bath base].

   Confirm your selection with the Enter key (checkmark set) and then continue with the [>>] softkey.

   ▶ The settings after switching on for the first time are completed and the basic window is displayed.

5.4 Basic settings for commissioning

You must always make basic settings on the device if the following applies:

- Switching on for the first time
- with every commissioning
- after every change of tempering fluid.

You may only fill the appliance once you have made the settings in the following chapters.

5.4.1 Sequence and limitation of entries

The following diagram shows the specified sequence of entries that are required for security reasons.

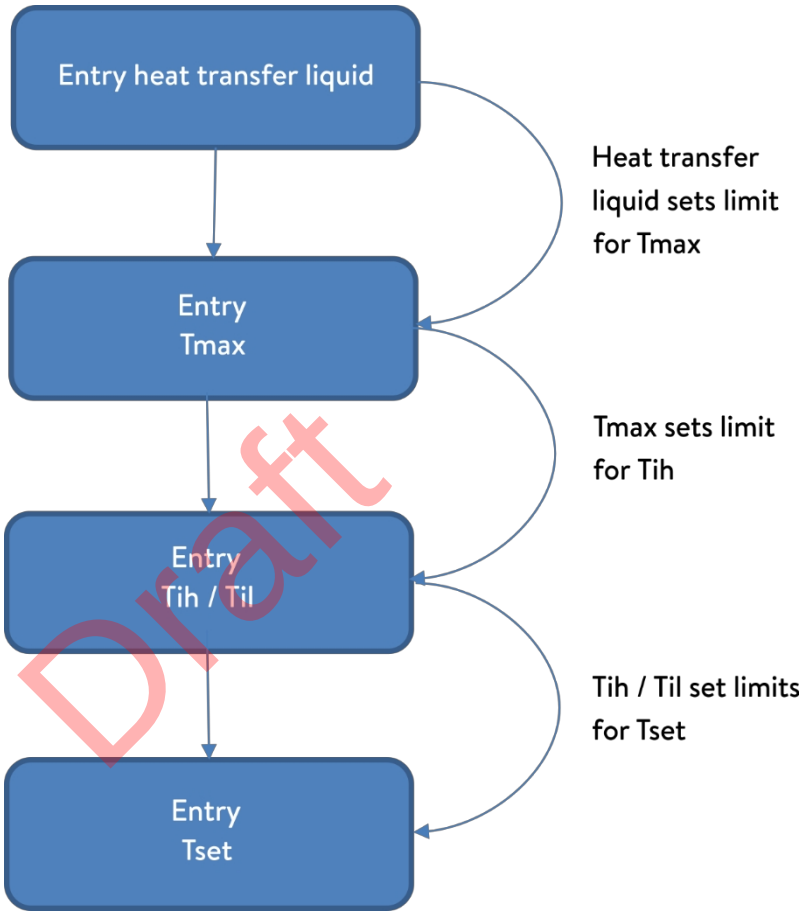


Fig. 29: Sequence of entries

5.4.2 Adjusting the tempering liquid

Set the temperature control fluid used in the device menu. This process loads the properties entered in the software into the device's control unit.

The properties of the tempering liquid are

- Flash point
- Permissible Tmax
- Minimum temperature
- Maximum temperature
- Viscosity (optional)
- Density (optional)
- Specific heat capacity (optional)

In the [Reset hours] menu item, you can reset the operating time of the temperature control fluid to 0.

Personnel: ■ Operating personnel

1. Press the Enter button to access the menu.
2. Select the menu items→ *Tempering*→ *Fluid*→ *Select fluid* from.
   ▶ A list with the approved temperature control fluids for the appliance is displayed.
3. Select a tempering liquid by scrolling.

   Press the [ESC] *button to return to the basic window without making any changes.*
4. Confirm your selection by pressing [OK].
   ▶ The selection is marked with a tick.
5. In the menu item→ *Display fluid properties*, you can display the properties of the temperature control fluid.

   Set Tmax immediately

   Once you have selected the temperature control fluid, immediately set the overtemperature cut-off point $T_{(max)}$.
   ↳ Chapter 5.4.3 "overtemperature cut-off point (Tmax)Setting the " on page 55.

5.4.3 Setting the overtemperature cut-off point (Tmax)

The warning is relevant for:

■ Appliances with transparent baths

CAUTION!
Operating error

Burning, appliance damage

● When setting Tmax, take into account the maximum temperature range of 100 °C for transparent baths. but.

Personnel: ■ Specialized personnel

The appliance's overtemperature protection device may trigger an overtemperature alarm at temperatures as low as 5 °C below the set T_{max} *value.*

This is because the integrated safety system works with a separate temperature sensor, which may deviate slightly downwards from the value shown on the display.

Therefore, set T_{max} *high enough to ensure trouble-free operation.*

The value of T_{max} can only be changed manually.

The permissible range (maximum value and minimum value) for setting the value of T_{max} is set automatically as soon as the temperature control fluid has been selected in the device menu.

1. Press and hold the T_{max} button.
   ▶ The value T_{max} is shown on the display.
2. Press the enter key [O].
   ▶ The input window (Fig. 30) is displayed. The cursor under the T_{max} value flashes.
3. Use the arrow buttons to change the value.

   If you release the T_{max} button, the process is canceled and T_{max} has not been changed.
4. Confirm the new value with the enter key [O].
5. Check whether the flashing value is correct.
6. Confirm the new value by pressing the [ADJ.] softkey.
   ▶ The new value is active.
7. Release the T_{max} button.

Fig. 30: Enter new Tmax

5.4.4 Set temperature limit values

There are two temperature limits:

Tih - upper limit value (Temperature internal high) Til

- lower limit value (Temperature internal low)

This function is used to set the temperature limit values Tih and Til. The temperature limit values restrict the temperature setpoint. If the internal actual temperature is outside the temperature limit values, a warning is issued and the heating is switched off. The temperature limit values should reflect the limits of your application. In addition, a tolerance of 2 K should be added to the lower and upper temperature limit values to compensate for overshoots in the control, especially for external controls. When setting the temperature limit values, the working temperature range of the temperature control fluid must also be taken into account.

The adjustable range of the two limit values depends on the temperature control fluid used, the set overtemperature cut-off point (Tmax), the pump and control unit used and the lower part of the bath used.

1. Press [Enter] to access the menu.
2. Select the menu items→ *Temperature control*→ *Temperature limit values* → *Lower limit value (Til)* or→ *Upper limit value (Tih)* from.
   ▶ The input window is displayed. The cursor under the value flashes. The upper and lower limit values are displayed.

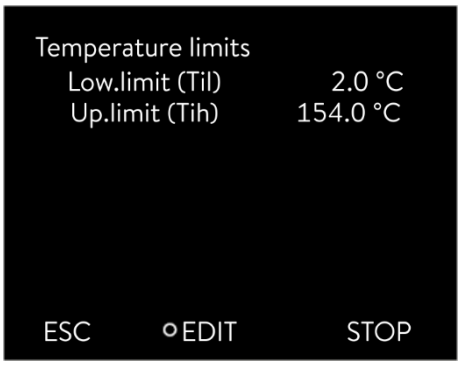


Fig. 31: Set temperature limit values

3. Use the arrow buttons to change the value.

> *Press the* [ESC] *button to return to the higher-level menu without making any changes.*

4. Press the enter key [OK].

▶ The value is adopted.

5.4.5 Setting the set temperature

Personnel: ■ Operating personnel

1. Press [Enter] to access the menu.
2. Select the menu items→ *Temperature control*→ *Set temperature.*

   ▶ The input window is displayed. The cursor flashes under the value. The target temperature can be set within the displayed limit values. values are set.
3. Adjust the set temperature accordingly and confirm with the enter button.

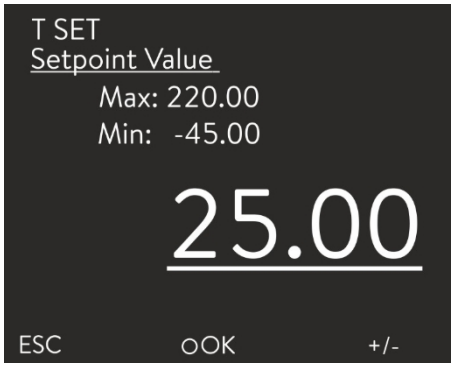


Fig. 32: Setting the set temperature

You can change the sign using the [+/-] soft key.

Press the ESC soft key to return to the previous display without making any changes.

5.5 Fill device

LAUDA accepts no liability for damage caused by the use of an unsuitable heat transfer fluid. Approved heat transfer fluids Chapter 4.4 "LAUDA heat transfer fluids" on page 47.
Depending on the software version, it may not be possible to set a freely adjustable temperature.
ier liquid is available. In this case, select the LAUDA temperature control fluid whose physical properties are closest to those of your fluid. Be sure to observe the instructions for setting the overtemperature cut-off point Tmax.

DANGER!
Spraying of tempering liquid

Electric shock

- Do not spray any tempering liquid.

WARNING!
Overheating of the heat transfer liquid

Fire

- In the device menu, select the LAUDA heat transfer liquid used in the device.
- If you use your own heat transfer liquid, you must enter the correct liquid parameters in the device menu.
- Set the overtemperature switch-oR point Tmax, but not above the
  - flash point of the heat transfer liquid,
  - fire point of the heat transfer liquid minus 25 K,
  - ignition temperature of the heat transfer liquid minus 100 K and
  - permissible temperature range of the heat transfer liquid.

WARNING!
Splashing heat transfer liquid

Eye damage

- Always wear suitable safety glasses when working on the device.

This applies to MAX:

CAUTION!
Overflow of heat transfer liquid

Slipping or falling over

- Do not overfill the device.
  Please note the level display and keep in mind that the heat transfer liquid will increase in volume when heated (for the total volume with application and hoses).

This applies to PRO:

CAUTION!
Overflow of tempering liquid

Slipping or falling

- Do not overfill the appliance.
  Note the volume expansion of the temper-
  ier liquid when heated (for the total volume with application and hoses).

CAUTION!
Leakage of tempering liquid

Slipping or falling

- Drain cock must be closed.
- Ensure that all hydraulic connections are tight.

The temperature control fluids expand when heated (approx. 10 % per 100 °C). If an external consumer is connected, the total expansion occurs in the bath of the thermostat.

Bathroom thermostat

1. Close the drain valve. To do this, turn it clockwise.
2. Carefully pour the tempering liquid into the bath.

The recommended filling height of the bath thermostat is between 30 and 100 mm below the top edge of the bath.

Only with Universa MAX:
The overlevel reaction is triggered at a fill level of 25 mm below the top edge of the bath. The overlevel reaction is freely adjustable.
The *low level warning* triggers at around 110 mm and the *low level alarm* triggers at around 120 mm below the top edge of the bath.

5.6 Basic settings menu

Personnel: ■ Operating personnel

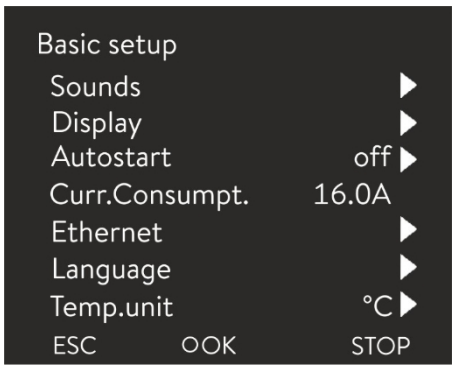


Fig. 33: Basic settings menu Set

1. Press the Enter key to open the menu.
2. Select the menu items→ *Setup*→ *Basic setup*.

The basic settings are described on the following pages.

the brightness of the display

The display brightness can be set manually.

Fig. 34: Adjusting brightness Displayed

1. In the Basic setup menu select the menu item *Display→ Brightness*.
   ▶ A list containing the settings opens.
2. The following options are available in the window:
   - You can select the brightness manually with entries [Level 1 - 6]. The brightness intensifies from [Level 1].

   ▶ The new setting is valid with immediate eRect.

temperatures in the display

In the [Displayed T-ext2] menu you can select via which interface a second external temperature value is read into your device. The newly selected temperature value is displayed in the home window and in the graphic window.

1. In the Basic setup menu select the menu item→ *Display→ Displayed T-ext2*.
   ▶ A list containing the settings opens.
2. Select the external temperature with the arrow keys, which you would also like to be displayed.
   ▶ The measuring channels are displayed which are installed in the device.
3. Press the Enter key to confirm your selection.
   ▶ The new setting is active.

Adjusting the volume of the sounds

The device indicates alarms, warnings and errors both visually and acoustically.

In the menu, you can adjust the volume of the sounds for:

- Alarm
- Warning
- Error

The volume settings are:

- loud
- medium

- low
- oR

Fig. 35: Adjusting volume

1. In the Basic setup menu select the menu item→ *Sounds*.
   ▶ A list containing the sounds opens.
2. Select the sound that you wish to change using the arrow keys.
3. Press the Enter key to confirm your selection.
   ▶ A list containing the volume settings opens.
4. Select a volume setting using the arrow keys.
5. Press the Enter key to confirm your selection.
   ▶ The new setting is active.

Selecting the menu language

The menu languages English, German, French, Spanish, and Italian are avail- able for the device display.

Fig. 36: Select language Select

1. In the [Basic setup] menu select the menu item→ *Language*.
   ▶ A list containing the languages opens.
2. Select your language using the arrow keys.
3. Press the Enter key to confirm your selection.
   ▶ The new setting is valid with immediate eRect.

temperature unit

In the [Temp. unit] menu you can select in which unit the temperature value is displayed. In general, this setting is valid for all windows in the display.

1. In the [Basic setup] menu select the menu item→ *Temp. unit*.
   ▶ A list of the options opens.
2. Select one of the following options:
   - With [°C] all temperatures are displayed in *°Celsius* .
   - With [°F] all temperatures are displayed in *°Fahrenheit* .
3. Press the Enter key to confirm your selection.
   ▶ The new setting is valid with immediate eRect.

Set clock

Only change the time and date after you have set the time zone. Otherwise, the local time may shift due to the changed time zone oRset when you change the time zone.

The set time zone is used to convert between UTC (Universal Time Coordinated) and local time. The internal real-time clock in the temperature control unit runs according to UTC.

Obtaining the time/date via NTP from the network only works if you have set your time zone correctly. The IP address of the NTP server must be communicated to the LAUDA temperature control unit using DHCP (option 42).

If DHCP is switched off and the IP address is permanently configured, automatic time tracking is not possible. (➝ *Interfaces*➝ *LAN*➝ *LAN settings*➝ *DHCP client*)

Personnel: ■ Operating personnel

Set time format

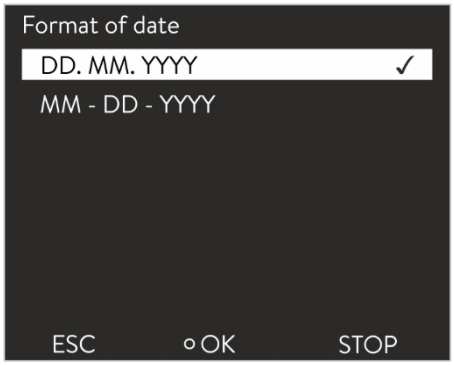


Fig. 37: Select option

You can display the date in two different formats.

- ■ Setting [DD.MM.YYYY] means day, month and year are displayed in this order (European).
- ■ Setting [MM - DD - YYYY] means month, day and year are displayed in this order (US English).

1. Press the Enter button to access the menu.
2. Select the menu items➝ *Settings*➝ *Basic settings* ➝ *Clock*➝ *Date format* off.
   ▶ The list with the settings opens.
3. You have the following options in the window:
   - ■ Format [DD.MM.YYYY]
   - ■ Format [MM - DD - YYYY]

   ▶ The new setting is active immediately.

Use timer

A timer can be set in the temperature control unit to switch the temperature control unit on or off at a specific time.

CAUTION!
Automatic device start with the timer

Scalding, cold burns, injury

- ● Before using the timer, ensure that all preparatory measures for intended use have been implemented!

The temperature control unit is not completely switched off in standby mode. The temperature control unit may start unintentionally due to a previously activated timer!

Call up the timer menu

1. Press the enter key to access the menu.
2. In the Basic settings menu, select the menu item ➝ *Settings*➝ *Basic setting*➝ *Clock*➝ *Timer* off.
   ▶ A *weekly schedule* is displayed.
3. Use the left and right arrow keys to jump to the various columns. Press the enter key to edit. Use the upper and lower arrow keys to change the values. *Select* the desired option *no* or *yes*. The set values are accepted without the enter key.

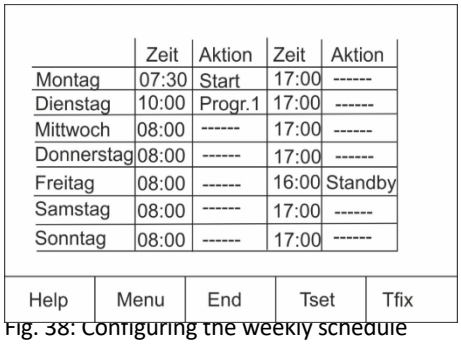


Fig. 38: Configuring the weekly schedule

Configure *weekly schedul*

- In the table with the weekdays Monday to Sunday, you can specify the specific times at which the temperature control unit should switch itself off.
  should be switched on or off. Two actions can be carried out per day.
- For example, the appliance can always be switched on at 7 a.m. on Mondays. However, the appliance must be prepared in such a way that a safe
  operation from standby is possible. Recovery begins after 7 days.

5.7 Operating settings

5.7.1 Settings for overlevel safety function

Set overlevel

Various reactions can be set in the device menu as to how the level detection reacts to an excess level in the bath tank.

1. Press the enter key to access the menu.
2. Select the menu item→ *Settings*→ *Operating settings* → *overlevel reaction*.
   ▶ The submenu opens.

Depending on the structure, temperature control fluid or operating conditions, one of the following reactions may be appropriate:

Table 12: Overlevel reaction

Setting in the menu	Meaning	Reaction of the device and application recommendation
No warning	no message is issued	Only select if there are no special safety requirements. For example, when operating with water.
Warning	A warning is shown in the display	Continuous acoustic and visual warning that only ends when the level has dropped sufficiently. This is the factory setting.
Warning + heating off	A warning is shown on the display and the heating switches off	■ Continuous acoustic and visual warning ■ Automatic switch-off of the heating ■ These measures remain active until the level has fallen sufficiently. Recommended for non-flammable temperature control fluid and temperatures above 100 °C.
Alarm	An alarm message is shown on the display	■ Automatic switch-off of pump and heating ■ Recommended for: ● external application or with ● Use of flammable temperature control fluid

5.7.2 Setting for lower part

Selecting the lower part of the device

The lower part of the device, with which the pump and control unit is operated as a heating or cooling thermostat, must be adjusted if changes are made to the system configuration.

1. Press the enter key to access the menu.
2. Select the menu item→ *Settings*→ *Operating settings*
   → *Lower part* made of.
   ▶ A list for selecting the lower part of the device opens.
3. Select the lower part of the appliance according to the type specification on the rating plate of the lower part of the appliance.
4. Confirm the new value with the [OK] button.
   ▶ The new setting is active.

Incorrect configuration

If the configuration is incorrect, messages are displayed in the warning message display view.

5.7.3 Setting for warning level Level

Set warning level Level

This section is relevant for:

- Universa MAX devices

A warning is issued before a low level alarm is triggered when the fill level falls below the minimum. You can set the warning level for low level in the level range 1 to 3. Depending on the design, requirements, temperature control fluid or operating conditions, different warning levels may be appropriate.

1. Press the enter key to access the menu.
2. Select the menu item→ *Settings*→ *Operating settings*
   → *Warning level*.
   ▶ The input window opens.
3. Change the value using the arrow buttons
4. Confirm the new value with the [OK] button.
   ▶ The new setting is active.

5.7.4 Limit current consumption

Limit current consumption

The installation-side fuse protection must at least correspond to the maximum current consumption of the appliance (see rating plate). If the mains fuse protection is lower, you must reduce the maximum current consumption of the appliance. This will reduce the heating output accordingly. When setting the current consumption, take into account whether other consumers may be connected to the same circuit as your appliance.

Fig. 39: Determine current consumption

Personnel: ■ Specialized personnel

1. In the [Settings] menu, select the menu items

   → *Operating settings*→ *Max. Power consumption* off.

   ▶ An input window for a numerical value opens. The cursor under the numerical value flashes. The upper and lower input area are displayed.

2. Use the arrow buttons to change the value.

   Press the [ESC] *button to return to* the [Basic settings] *menu without making any changes.*

3. Confirm the new value with the [OK] button.

   ▶ The new value is active.

Reducing the maximum power consumption of the appliance reduces the heating output and may therefore influence the control properties.

5.7.5 Autostart

Automatic start after power interruption

After a power interruption and restoration of the power supply, the appliance does not resume operation (factory setting). You can set the appliance so that it automatically resumes operation after the power supply is restored.

Fig. 40: Set autostart

1. In the [Settings] menu, select the menu items

   → *Operating settings*→ *Autostart* off.

   ▶ The list with the settings opens.

2. Select one of the following options:

   ■ With [off], the device is switched to standby mode after a mains interruption and restoration of the power supply. by.

   ■ With [on], the appliance continues to run automatically after a mains interruption and the power supply is restored.

   The automatic operation of the appliance may lead to unattended operation.

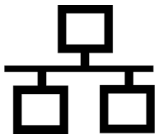
3. Confirm your selection with the Enter key.

   ▶ The new setting is active.

5.8 Configuring the network interface

Technical data of the Ethernet interface

Data	Value	Unit
Ethernet - Standard	10/100	MBit



PC control

- The *PC control* menu item is used to access the device.
  for a PC or a control station. This function
  switch on if control or monitoring of the temperature control unit via an external control station is required.

To be able to operate the temperature control unit and the control station together in a local network (LAN), the Ethernet interface must first be configured.

The Ethernet interface can be configured in two ways:

Obtain LAN settings automatically	– The prerequisite for this is that a DHCP server is available in the local network (LAN). For a direct connection, the control station must support the Auto-IP method.
Specify LAN settings manually	– Manual configuration must be carried out if no DHCP server is available, the Auto-IP procedure is not supported or you want to use the Ethernet interface with fixed IP addresses.

Obtain network settings automatically (DHCP client on)

Personnel: ■ Specialized personnel

1. Switch on the temperature control unit.
2. Press [Enter] to access the menu.
3. (a) Select this menu item to configure the LAN interface:
   → *Interfaces*→ *Networks*→ *LAN*→ *LAN settings*→ *DHCP client*.

   (b) Select this menu item to configure the WLAN interface:
   → *Interfaces*→ *Networks*→ *WLAN*→ *WLAN settings*
   → *DHCP client*.
   ▶ The display shows the options [off] and [on].
4. Select the [On] option and confirm with [OK].
   ▶ A check mark is set. The DHCP client is active. The configuration of the Ethernet interface is automatically deactivated.
   led.
5. In the [PC control] menu, select the [On] entry.
   ▶ A check mark is set. The control for the control station is activated.
6. If required, assign the port number in the [PC control] menu.

Specify network settings manually (DHCP client off)

1. Switch on the temperature control unit.
2. Press [Enter] to access the menu.

3. (a) Select this menu item to configure the LAN interface:
→ *Interfaces*→ *Network*→ *LAN*→ *LAN settings*→ *DHCP client*.

   (b) Select this menu item to configure the WLAN interface:
→ *Interfaces*→ *Network*→ *WLAN*→ *WLAN settings*
→ *DHCP client*.

   ▶ The display shows the options [off] and [on].

4. Select the [off] option and confirm with the enter key.

   ▶ A check mark is set. The entry has been accepted.

5. Use the left arrow button to go back one menu level.

6. Scroll down to the numerical values in the [Local IP address] menu item and press the Enter key.

   ▶ The *Local IP address* menu opens.

7. Byte 1 is highlighted. Press the right arrow button.

   ▶ The input window opens. The area in which the numerical values can be entered is displayed.

8. Enter the numerical value for byte 1. Confirm the value with the [OK] button.

   The numerical values are entered byte by byte. From top to bottom, from byte 1 to byte 4, for example 120.0.0.13 (byte1.byte2.byte3.byte4).

   Press [ESC] to cancel the entry.

9. Enter the numerical values for byte 2, byte 3 and byte 4.

10. Once you have entered the numerical values, press the left arrow button.

    ▶ You are back in the *LAN settings* menu.

11. Scroll to the numerical values from the [Subnet mask] menu item and press the Enter key.

    ▶ The *Subnet mask* menu opens.

12. Enter the numerical values as described in points 7 to 9.

13. Once you have entered the numerical values, press the left arrow button.

    ▶ You are back in the *LAN settings* menu.

14. If required, also enter the numerical values for [Gateway] and [DNS server].

15. Once you have entered the numerical values, press the left arrow button.

    ▶ The numerical values entered for [Local address], [Subnet mask], [Gateway] and [DNS server] are displayed.

16. Press the soft key [ANW.] to accept the entered numerical values.

17. Go back one menu level with the left cursor key and select the *PC control* menu item and confirm the entry.

18. Confirm the [PC control] entry again.

19. Select the [on] option and confirm the entry.

    ▶ The control system for the control station is activated.

No settings are applied if you leave the LAN settings menu without first pressing the [APPL.] *button.*

If you set the [DHCP Client] *from* [off] *to* [on]*, all numerical values are reset to 0. 0. 0. 0.*

Once you have set up an Ethernet connection between the control station and the temperature control unit, it takes 1 to 2 minutes for the connection to be established.

Checking the LAN network and the process interface

1. On a PC with a Microsoft Windows operating system, start the Windows command processor by entering `cmd.exe` .↵

   ▶ The input window opens.

2. You have two options for checking:

   - You enter the ping command together with the IP address.

     `ping XXX.XXX.XXX.XXX`↵

     XXX.XXX.XXX.XXX" must contain the IP address that was entered when configuring the Ethernet interface.

     Or

   - Enter the ping command together with the serial number of the temperature control unit (possible from software control system 1.36).

     `ping serial number`↵

   ▶ If the Ethernet interface is correctly configured and connected, four responses are received within a very short time from of the interface. See Fig. 41.

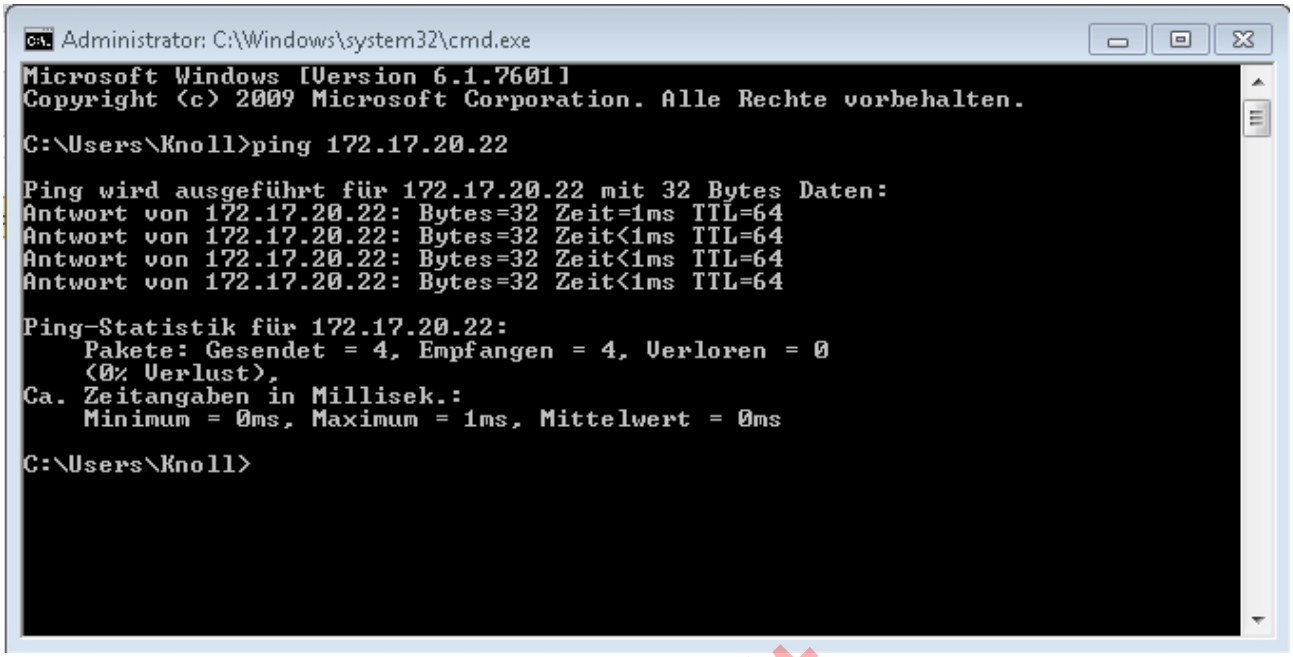


Fig. 41: Example for entering the ping command

Check with RealTerm

The connection of the process interface to a PC can also be easily checked with programs available as freeware (e.g. RealTerm or PuTTY).

1. On a PC with a Microsoft Windows operating system, start the "HyperTerminal" program or the "Terminal program".

   ▶ The input window opens.

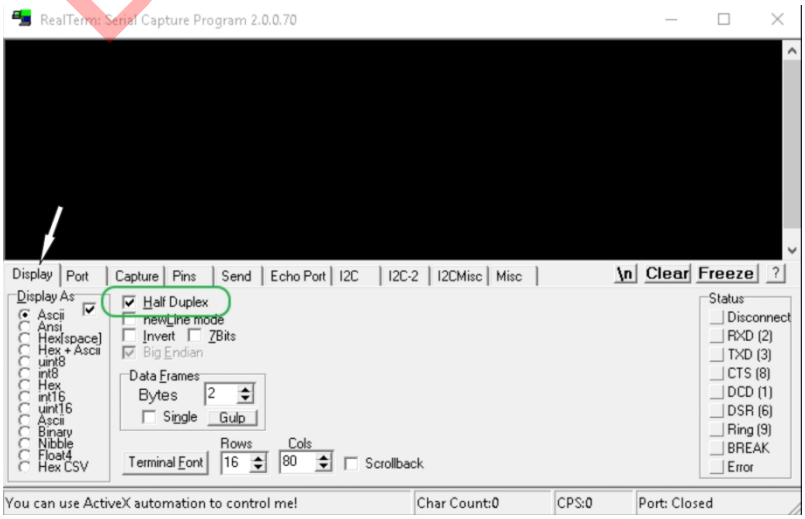


Fig. 42: "RealTerm" program

2. In the *Display* tab, check the *Half Duplex* box.

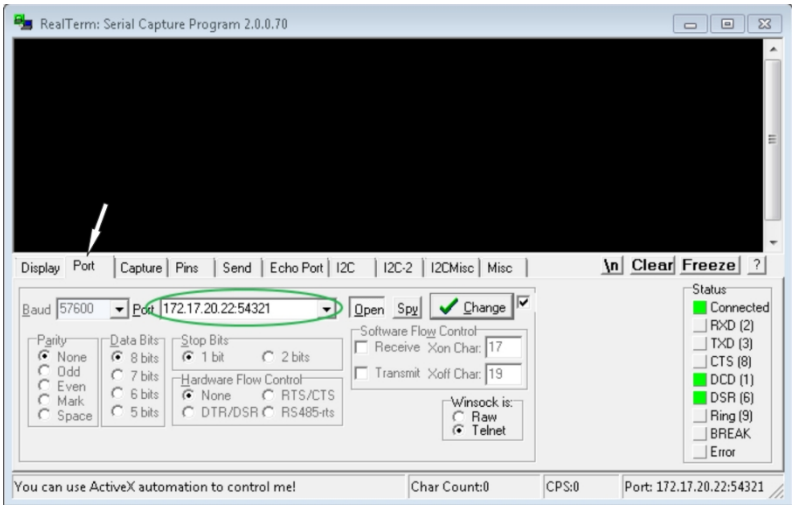


Fig. 43: Input in the Port field

3. In the *Port* tab, enter the configured IP address and port number of the temperature control unit's Ethernet interface. The IP address and port number must be separated by a colon.

   Instead of the IP address, you can enter the serial number of the temperature control unit.

4. Then press the [Open] button.

5. Open the *Send* tab.

   ▶ So far the program has been configured, now the actual test begins.

6. Place a checkmark next to *+CR* and *+LF*.

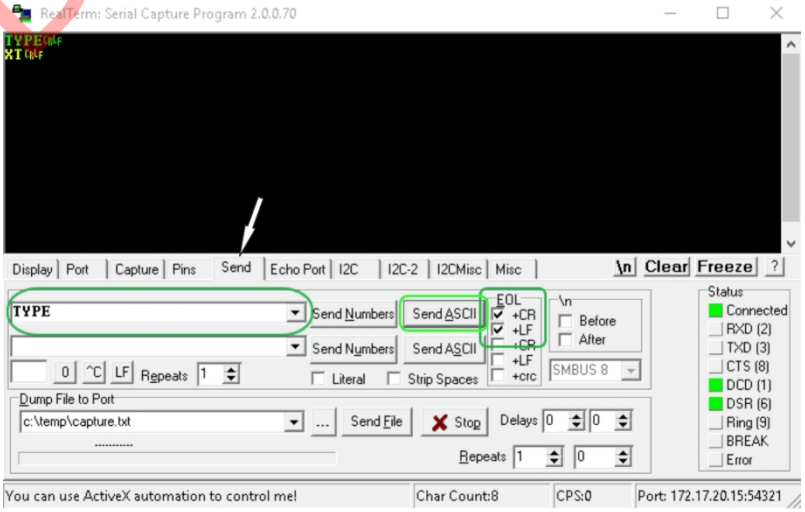


Fig. 44: Inputs for the test

7. A command must be sent to the temperature control unit to test the communication. For example `TYPE`. Type in the command and press [Send ASCII].

   ▶ If the connection works, the command is acknowledged by the temperature control unit.

To test the communication, a read command must be sent to the temperature control unit↪ Chapter 6.12.2 "Read commands" on page 113.

5.9 Connection to a wireless network (WLAN)

The WLAN menu and the WLAN icon are only visible if the temperature control device supports the WLAN function.

The Wi-Fi icon is located in the status bar on the main screen. The icon flashes when WLAN is set to on but there is no connection.
It lights up continuously when there is a connection to an access point. It is not visible if the device does not support a WLAN function or WLAN is set to off.

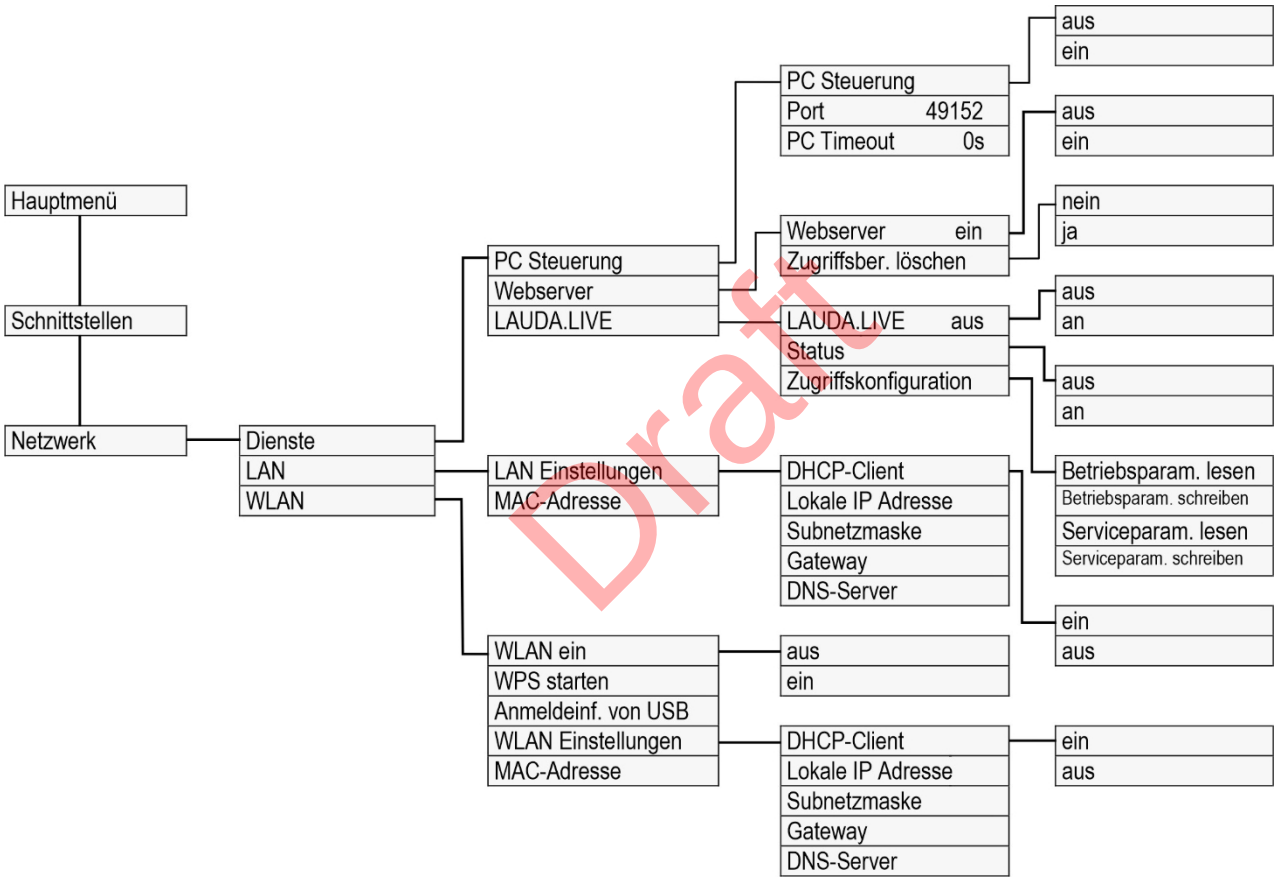


Fig. 45: WLAN interface menu

The LAUDA Universa thermostats support connection to a wireless network in some countries. Once the connection is established, you can operate the device very easily, for example with wireless devices such as tablets and smartphones.

WLAN-enabled devices can currently only be purchased in the following regions:

- European Union
- United Kingdom

- Switzerland
- USA
- Canada
- India

You can obtain an updated list by downloading the operating instructions from the LAUDA website. The version available for download there always contains the current list of countries for which WLAN-capable device variants are available. WLAN-capable devices may only be operated in the countries listed above. Device variants without an integrated WLAN function are available for countries that do not currently have WLAN approval.
If necessary, contact your sales partner for further information.

The device can only establish contact with wireless networks in the 2.4 GHz band in accordance with IEEE 802.11 b/g/n. The device supports WPA encryption to protect the transmission, WPA2 and WPA3. During connection au@on, the device assumes the encryption method and the connection parameters of your access point.

Please note that you may have to switch on the device's network services (e.g. the integrated web server) individually and independently of the WLAN configuration in order to be able to operate the device via it.

Connecting to a wireless network

You can register the device to a wireless network using various registration mechanisms. Select the method that is compatible with your existing infrastructure.

- WPS procedure (Wi-Fi Protected Setup)
- WPA-PSK (Wi-Fi Protected Access with static network key)

Connection with WPS method

To establish the connection using the WPS method, your access point must support WPS.

To establish the connection, proceed as follows:

1. Start the WPS connection on your access point by pressing the WPS button.
2. Start the WPS connection on your LAUDA device by selecting the menu→ *Interfaces*→ *Network*→ *WLAN*→ *Start WPS*.
3. Wait up to 2 minutes for the connection to be established.
4. Check on the main screen whether the WLAN icon is displayed continuously. Then the connection to an access point is established. A flashing WLAN icon indicates the connection attempt.

Connection with static key (WPA-PSK)

Authentication with a static network key is the most widely used method. The device is integrated into an existing network by announcing the shared network key. The login information, the WLAN name and the WLAN password, for your network are transferred to the device via USB stick.

Proceed as follows:

1. Download the text file with the name pskCfg.txt (UTF8 format) from the LAUDA homepage. https://www.lauda.de/de/ services/download-center/filter/installation-instructions/Universa
2. Open the file with the Windows text editor. Enter the name of your WLAN under `SSID`. Enter the password under `Password`.
3. Save the file to a USB stick and insert it into your LAUDA temperature control unit.
4. Select menu→ *Interfaces*→ *Network*→ *WLAN*
   → Read *login information* from *USB* from.
5. Wait up to 2 minutes for the connection to be established.
6. Check on the main screen whether the WLAN icon is displayed continuously. Then the connection to an access point is established. A flashing WLAN icon indicates the connection attempt.

Disconnecting from a wireless network

1. To disconnect from the network, set→ *Interfaces*→ *Network*→ *WLAN*→ *WLAN* to off in the menu.
   ▶ The WLAN icon is no longer displayed.

The connection parameters entered remain saved in the device.

SAR limits

This device with the built-in WLAN module complies with the SAR limits for a controlled environment. The usual distance to the device is 20 cm or more and must not be exceeded permanently.

5.10 Restoring the factory settings

Reset control system

With Universa thermostats, the values of the control parameters are defined according to the device subsections. If a subsection is changed, the control parameters are automatically reset to the factory settings.

If you want to restore the temperature control unit to its factory settings, carry out these menu items.

In the [Control system] menu, you can reset your specific settings to the factory settings.

- Reset everything
- Control parameters only
- Other parameters

Fig. 46: Factory setting menu

Other parameters include:

- The temperature control fluid is set to "undefined".
- Locking the operating buttons is deactivated.
- The temperature unit is set to *°C*.
- The volume of the signal tone is *set* to *loud*.
- The brightness of the display is set *to level 5.*

Fig. 47: Factory setting

Reset in the [Reset all] menu:

- Regulation
  - Controlled variable (internal Pt)
  - Control parameters (Xp, Tn, Tv,...)
- Temperature limits (Tih and Til)
- Basic setting
  - Display
  - Signal tone
  - Language
  - Temperature unit
  - Clock
  - Power consumption
  - Warning level
  - Cooling water circuit
  - Autostart: On
- Calibration (temperature sensor)
- Graphic display
- Basic window
- Operating mode (operation)

Personnel: ■ Operating personnel

Navigate to the Factory settings menu

1. Press the enter key to access the menu.
2. Select the menu items→ *Settings*→ *Factory settings.*
3. Select a menu item.
4. Select one of the following options:
   - Press [no] to return to the higher-level menu without making any changes.
   - Press [yes] to reset to factory settings if you confirm this with the enter button.

   ▶ The selected menu item is reset to the factory setting.

Values of the factory setting

Table 13: Control system

Parameters	Factory setting
Internal control parameters	Device-specific
External control parameters	Device-specific
Device configuration	Device-specific
Maximum temperature	Device-specific
Minimum temperature	Device-specific
Pump stage	Device-specific
Display brightness	5
Warning level lower level (with Universa MAX)	1
Display Text2	from
Programmer optimization	from
Dynamic heating limitation	off / 100 %
Heat output limitation	off / 100 %
Limitation of cooling capacity	off / 100 %
Standby	a
Autostart	from
Signal volume	maximum
Set temperature	20 °C
Maximum current consumption Mains	16 Ampere
Fluid	Undefined
Language	Undefined
Controlled variable	internal
Correction size limitation	500 K
Target value set	from
Setpoint offset temperature	0 K
Graph Recording interval	2 seconds
Graph Axis scaling	automatically
Graph parameters to be displayed	Tset / Tint / Text
Program repetition	1
Delete program	all

Table 14: Cooling system

Parameters	Factory setting
Automatic cooling system	automatically
Control value limitation cooling	100 %

Table 15: Network

Parameters	Factory setting
Web server	from
LAUDA.LIVE ■ Read operating parameters ■ Write operating parameters ■ Read service parameters ■ Write service parameters	off off off off from
DHCP	from
PC control	from
Port number	49152

6 Operation

6.1 Safety instructions for operation

All work on the device

CAUTION!
Hazard due to inaccessible mains switch

Scalding, frostbite

- Ensure that the mains plug is always easily accessible. The mains plug must be quickly removed from the socket can be drawn.

DANGER!
Immersion thermostat falls into the bathroom

Electric shock

- Only operate immersion circulators on circuits with a residual current device (RCD).
- Make sure that the holder of the hanging unit is securely connected to the bath.
- Only use bath tubs that are sufficiently stable to hold the immersion circulator and are suitable for the are suitable for the intended operating temperatures.

DANGER!
When operating as an immersion circulator, deposits can form on the circuit boards

Electric shock

- If possible, use a closed cover for the bath if vapors are present above the temperature control liquid. arise. The ingress of vapors into the pump and control unit must be avoided.

DANGER!
Vapors form deposits on circuit boards if the pump unit and control unit are placed upside down on the bath.

Electric shock

- If possible, use a closed cover for the bath if vapors are present above the temperature control liquid. arise. The ingress of vapors into the pump and control unit must be avoided.

DANGER!
Mains connection cable is exposed to high temperatures if the pump unit and control unit are placed on the bath in a twisted position. Contact with live cables.

Electric shock

- Immersion of the mains connection cable in the temperature control fluid and contact of the mains connection cable with hot surfaces (> 70 °C) must be avoided under all circumstances.

WARNING!
Unauthorized control

Scalding, frostbite, fire

- Only operate the process interface in a protected intranet (firewall).

WARNING!
Splashing heat transfer liquid

Eye damage

- Always wear suitable safety glasses when working on the device.

WARNING!
Unauthorized changes to safety-relevant settings

Fire

- Operation by operating personnel only.

WARNING!
Overheating of the tempering liquid

Fire

Set the overtemperature switch-off point Tmax,

- not above the flash point of the tempering liquid,
- does not exceed the focal point of the tempering liquid minus 25 K and
- not above the ignition temperature of the tempering liquid minus 100 K.

WARNING!
Overheating above the flash point of the temperature control fluid due to exposed heater

Fire

- The thermostat may only be operated on a horizontal surface.

WARNING!
Overheating above the flash point of the temperature control fluid

Ignition and spread of fire

- Check the low level detection when changing the temperature control fluid, but at the latest in accordance with the maintenance instructions.
  interval.

WARNING!
Overheating above the temperature control liquid's focal point -25 K

Ignition and spread of fire

- Do not use temperature control fluids with a focal point below 65 °C.

WARNING!
Mechanical damage to the refrigerant circuit

Combustion, fire

- Do not use mechanical tools for rapid de-icing.

WARNING!
Bursting of the refrigeration circuit due to overpressure

Combustion, fire

- Ensure that all ventilation grilles of the fan on the temperature control unit are not blocked. This includes the front air inlet of the refrigeration base and the air outlets.

WARNING!
Leakage in the refrigerant circuit

Combustion, fire

- Do not use corrosive temperature control fluids.

WARNING!
Use of flammable temperature control fluids

Fire

- Ventilation openings on the appliance must not be blocked.
- Do not smoke. No flame.
- Do not use any electrical parts that can generate sparks when you are near the temperature control unit.
  device and the application.
- If possible, use a bath lid.
- For the operator's responsible body: affix the warning symbol W021 "Warning of flammable substances" clearly visible on the device (Sticker included in the accessories).

WARNING!
Boiling heat transfer liquid overflows from the bath

Chemical and heat burns

- Never replenish hot heat transfer liquid with other fluids.

WARNING!
Boiling distortion and thermal decomposition due to liquid residues

Burns, scalding

- Remove all liquid residues when changing the temperature control fluid from temperature control fluids containing water or other low boilers to thermal oils, also from hoses and consumers. Otherwise there is a risk of burning due to boiling delay!
- To do this, also remove the dummy caps from the pump outputs and pump inputs. Set the internal/
  Set the external changeover switch to the middle position and blow out the pump nozzles with compressed air. To do this, also remove any liquid residue behind the drain cock by draining the liquid and checking that no liquid residue is visible.

WARNING!
Gas displaces atmospheric oxygen

Danger of asphyxia

- Only use the inert gas overlay in areas with good aeration.

WARNING!
Operating error, technical defect

Fire

- Pull out the mains plug for safe disconnection from the mains.

WARNING!
Pump stage selected too high for small bath

Burns, frostbite

- When setting the pump stage, ensure that the temperature control fluid does not overflow from the bath.

CAUTION!
Object falls into the bath, tempering liquid is splashed

Scalding, frostbite

- Do not place any objects on the pump and control unit.

CAUTION!
Competing settings due to simultaneous operation on the device and via LAUDA.LIVE

Scalding, cold burns

- If the user allows cloud access for write commands, conflicting settings may occur (cloud, operator terminal).

CAUTION!
Leakage of temperature control fluid through unsealed pump connections

Scalding, frostbite

- Fit sealing plugs or a short-circuit hose to the pump connections if there is no external power supply.
  application is connected.

CAUTION!
Contact with hot / cold surfaces

Burns, frostbite

- Do not touch any parts marked with the "Hot surface" warning symbol.

CAUTION!
Restriction of operation or setup

Ergonomic impairment

- Position the LAUDA thermostat on a table, pedestal or floor so that you can see all the controls.
  (bath, connections, interfaces, display, keyboard) can be operated optimally.
- Appliances with 4 castors are only suitable for use on the floor to prevent them from falling from an elevated position.
  level.

CAUTION!
Contact with vapors of the tempering liquid

Breathing difficulties

- Use a trigger.
- If possible, use a bath lid.

CAUTION!
Operation of the cooling coil on a central cooling water system; heath steam/outflow of boiling cooling water

Scalding

- When operating on a central cooling water system, you may use the cooling coil up to a bath temperature of 95 °C
  use.

CAUTION!
Operation of the cooling coil with drinking water; superheated steam/hot water vapor at bath temperatures above 95 °C

Scalding

- Attach the free hose end of the cooling coil to the outlet.
- When operating with drinking water, you may use the cooling coil up to a bath temperature of 155 °C.

CAUTION!
Condensate drips from the lid into the hot tempering liquid

Scalding

- Open the lid by lifting one edge first so that any condensation can drain off to the side can. Observe whether boiling distortions occur.
- Only open the lid completely when no boiling distortion can be detected.

NOTICE!
Water damage due to use of the cooling coil

Damage to the equipment

- To prevent water damage caused by a leak in the cooling water system, use a water leak detector with water shut-off.

The following note is relevant for:

- Operation of a Universa PRO or MAX pump and control unit with the U 830, U 1225, U 1625 refrigeration base units.

NOTICE!
Operating error

Device damage

- Take the maximum temperature range of the appliance type into account when setting Tmax. The maximum Temperature range can be found in the technical data for these refrigerated bases.

6.2 Menu structure

Menu structure for MAX and PRO

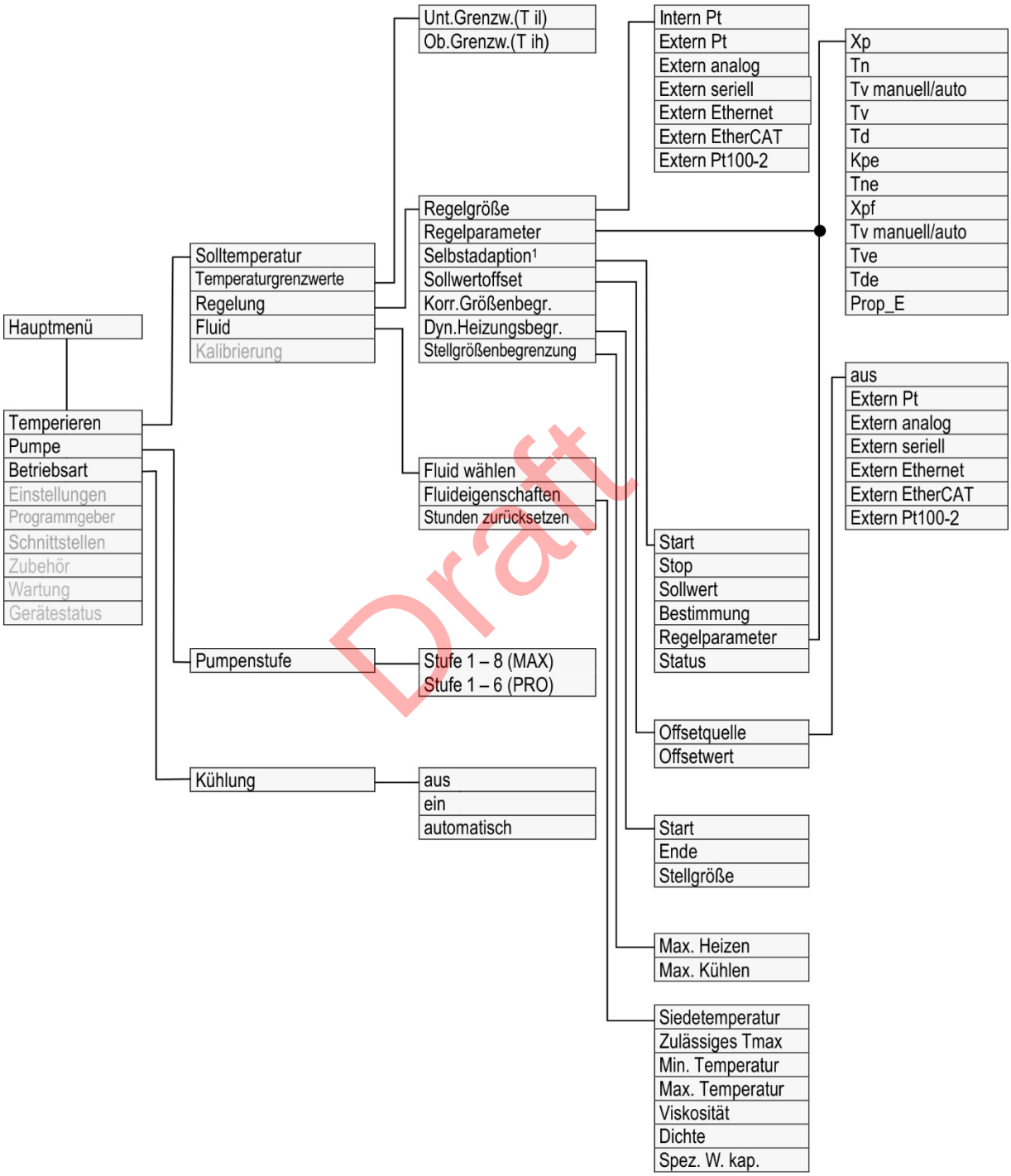


Fig. 48: Menu structure part 1, MAX and PRO

[1]Only available with Universa MAX

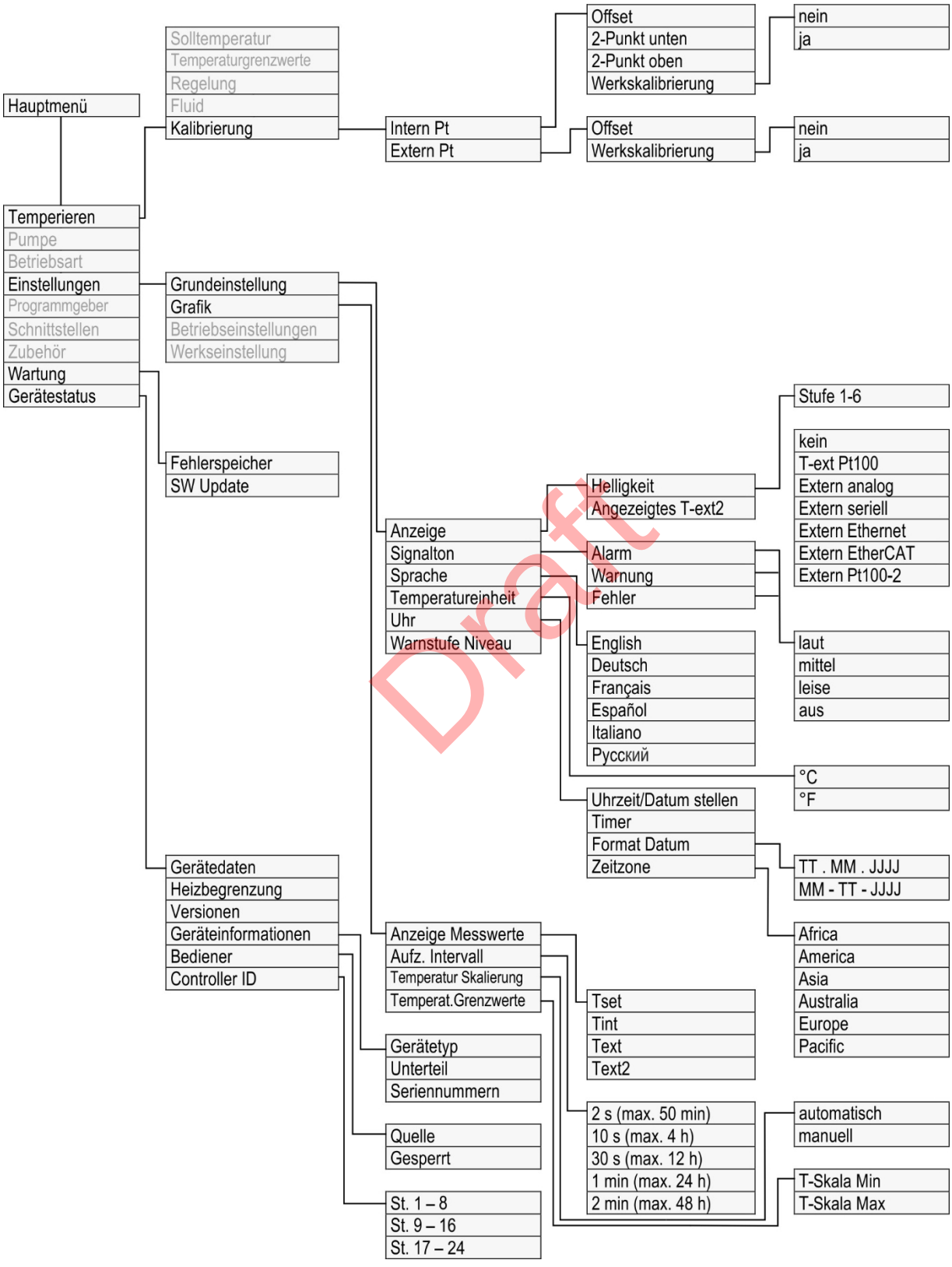


Fig. 49: Menu structure part 2, MAX and PRO

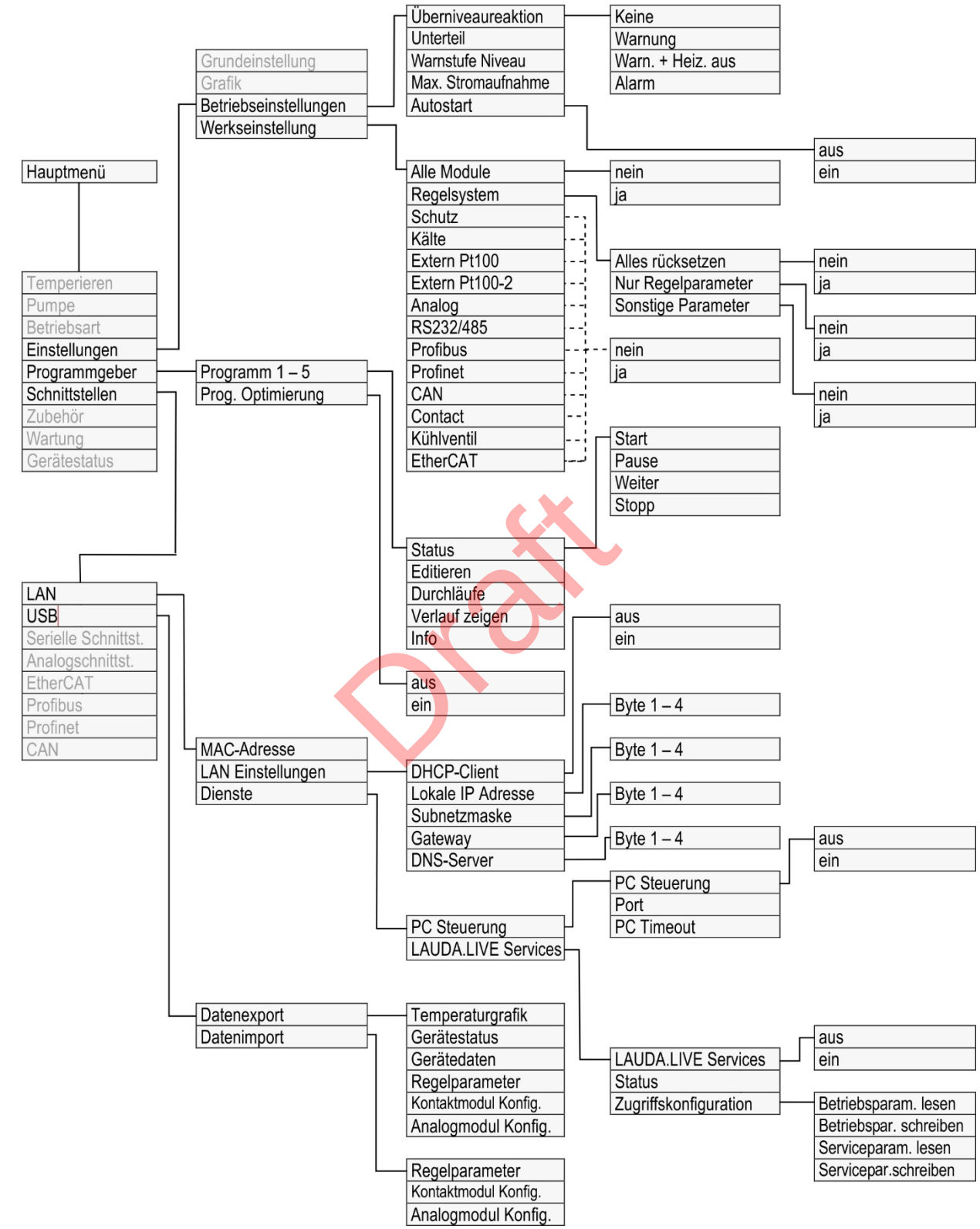


Fig. 50: Menu structure part 3, MAX and PRO

Menu structure Interfaces

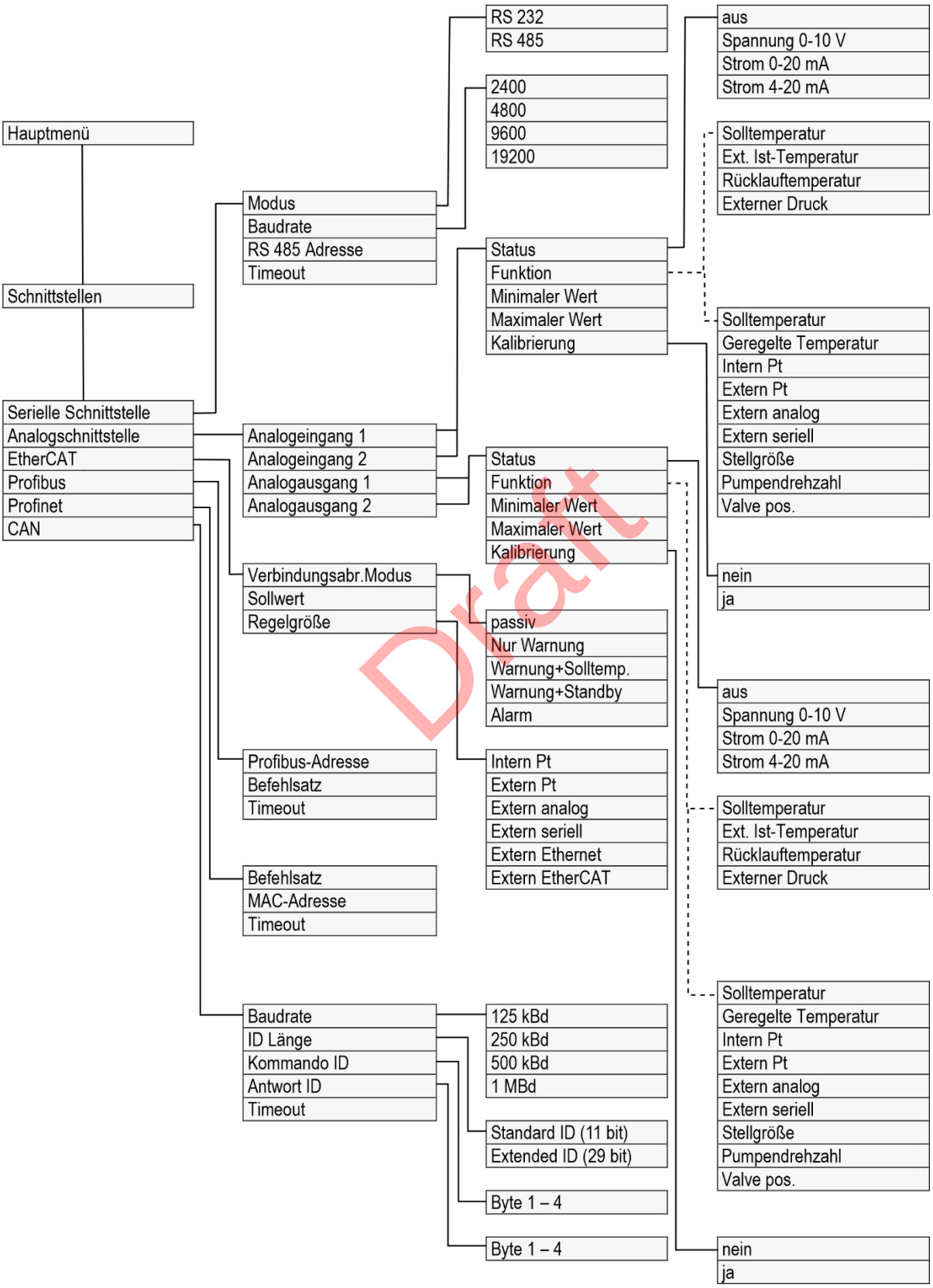


Fig. 51: Menu structure part 4, MAX and PRO

Accessories menu structure

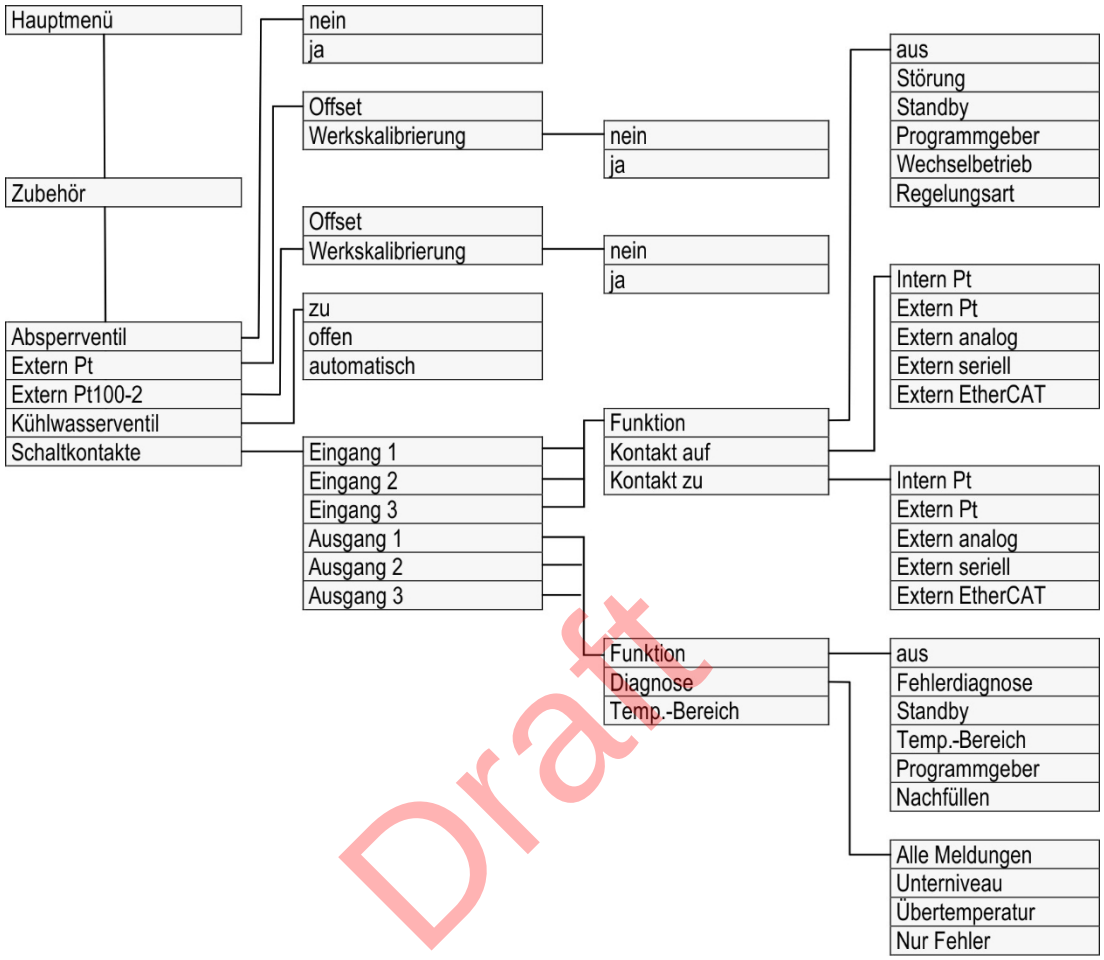


Fig. 52: Menu structure part 5, MAX and PRO

6.3 Tempering menu

Fig. 53: Main menu

In the [Tempering] menu, you can make the following settings or open submenus:

- Set temperature
  Use this function to set the target temperature for your application
  Chapter 5.4.5 "Setting the target temperature" on page 58.
- Temperature limits
  Use this function to set the temperature limit values Tih and Til
  Chapter 5.4.4 "Setting temperature limit values " on page 56.
- Regulation
  In the [Control] sub-menu, you can select all the functions required for temperature control.
  Set the relevant parametersChapter 6.4.2 " control menuCalling up the " on page parameter 93.
- Fluid
  You can select the temperature control fluid in the [Fluid] submenu, with which your temperature control unit is operatedChapter 5.4.2 'temperature control Setting the fluid' on page 54.
  The fluid properties can be viewed.
- Calibration
  In the [Calibration] submenu, you can enter an ORset or a 2-point calibration on the internal control sensor and, if activated on the external control sensorChapter 6.8 "Calibrating the temperature sensor" on page 107.

6.4 Control menu

The control parameters are factory-set for the operation of the bath thermostat optimized and stored with water as the temperature control fluid and internal control.

- Depending on the application, adjustments to the configuration may be necessary from case to case. This applies in particular to external Applications.
- The heat capacity and viscosity of the temperature control fluid also influence the control behavior.

Only change the control parameters if you have sufficient knowledge of control technology.

6.4.1 Control basics

Definition

A brief explanation of terms

Actuating signal	– Initial value of the controller to compensate for the diRerence between the actual value and target value (control deviation).
PID controller	– The PID controller operates with extreme speed and precision and consists of a P, I and D-component.
Proportional range Xp	– The proportional range Xp indicates the temperature range within which the proportional component (P-component) of the controller represents 0 - 100 % of the maximum actuating signal. If the preset Xp is 10 K and the control deviation is 2 K, for example, the P-component is 20 % of the actuating signal. If the control deviation is 10 K or more, the P-component is 100 % of the actuating signal.
Adjustment time Tn	– The adjustment time is crucial for the I-component of the actuating signal. It specifies the interval at which an existing control deviation is integrated. The higher the Tn, the slower the control deviation is integrated and the more sluggish the control becomes. A small Tn makes the control more dynamic and eventually results in vibrations.
Hold-back time Tv	– The D-component of the actuating signal is formed from the hold-back time Tv. It influences the speed with which the actual value approaches the target value and counter-acts the P-component and I-component. The greater the preset hold-back time Tv, the more intensively the output signal is attenuated. Rule of thumb: Tv= Tn x 0.75.
Attenuation time Td	– Attenuation time of the D-component. Rule of thumb: Td = Tv x 0.15.
Correction limitation	– Represents the maximum permitted deviation between the temperature at the external consuming unit and the temperature at the outlet.

Optimizing the hydraulic system

One important prerequisite for an acceptable control quality is a well designed hydraulic system. The best possible connection must therefore be established between the temperature control application and the constant temperature equipment.

- Use short hoses with a large cross section to reduce the flow resistance. More heat transfer liquid can circulate in a short time, resulting in a shorter circulation time.
- Select the thinnest possible heat transfer liquid with the highest possible heating capacity. Ranking descending according to heat capacity: Water, water/monoethylene glycol mixture, oils, Fluorinert .™
- Select the highest possible pump level.
- For external applications, set the flow rate through the external consuming unit as high as possible.
- With bath thermostats, make sure that the circulation in the bath is adequate.

ERects of viscosity on the heat transfer liquid

A control that is stable at low temperatures will usually be stable at high temperatures. Conversely, if a system is just about stable at high temperatures, it will most probably be unstable at lower temperatures, i.e. vibrate.

The viscosity of the heat transfer liquid changes drastically with the temperature. At low temperatures, liquids are more viscous. The control quality is therefore generally poorer at low temperatures. For this reason, the control setting should be towards the lower end of the temperature range.

Example

If the temperature range of an application is -20 το 80 °C, for example, a control setting of -10 το 20 °C is most suitable.

Influence of control parameters on the control behavior

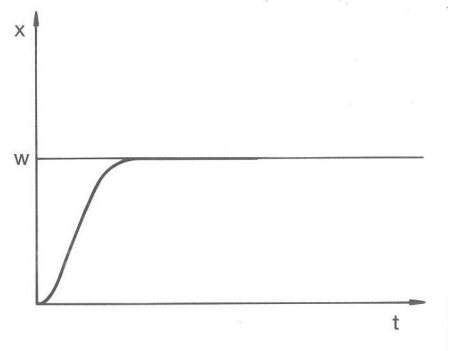
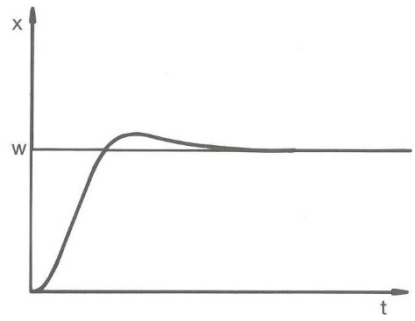
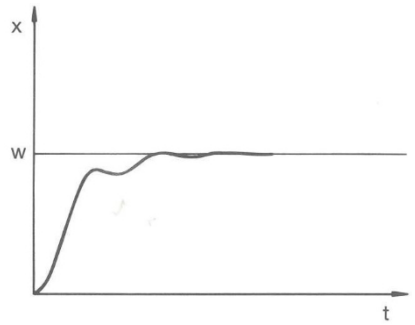


Fig. 54: Ideal setting



If the Xp parameter selected is too large, the actual value will reach the proportional range early and the P-component will be less than 100 % of the actuating signal. It takes longer to reach the target value and as a result, the simultaneously integrated I-component has more time to establish its actuating signal component. Once the target value is reached, the excessive addition of the I-component causes the value to overshoot the target value. If proportional range Xp is reduced, the P-component remains at 100 % for longer. Consequently, the actual value approaches the target value more quickly and the I-component has less time to integrate the system deviation. The overshoot is reduced.

Fig. 55: Control parameter Xp too large



If the proportional range selected is too small, the P-component of the actuating signal remains at 100 % for a long time. This value decreases even faster within the proportional range, i.e. the actuating signal decreases rapidly and the progress of the actual value towards the target value comes almost to a complete stop. The I-component, which only becomes eRective now, causes the actual value to move slowly towards the target value.

Fig. 56: Control parameter Xp too small

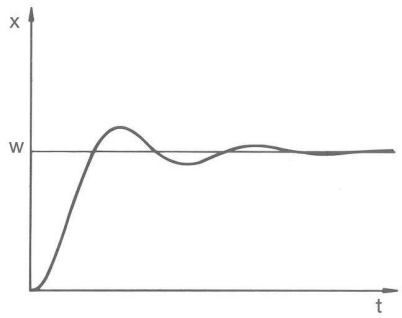


Fig. 57: Control parameters Tn and Tv too small

In the case shown here, the preset I-component is too large (parameter Tn too small, Tn must be increased). The I-component integrates the control deviation until it becomes 0. If integration proceeds too rapidly, the actuating signal, i.e. the output signal of the controller, is too large. As a result, the actual value fluctuates (fading) around the target value. The hold-back time (parameter Tv) should be adapted using the formula: Tv = Tn x 0.75.

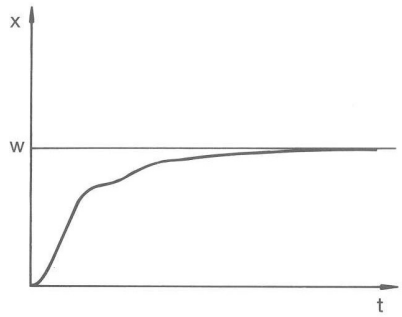


Fig. 58: Control parameters Tn and Tv too large

The actual value increases relatively sharply towards the specified target value. The proportional area settings seem to be correct. If the control deviation becomes smaller, the actual value approaches the target value much more slowly. The integration component (I-component) must compensate for the drastic reduction of the proportional component (P-component). In this case, the I-component is integrated too slowly. The parameter Tn, which specifies the integration interval, must therefore be reduced. The hold-back time (parameter Tv) should be adapted using the formula: Tv= Tn x 0.75.

6.4.2 Call up the Control parameters menu

1. Press the enter key to access the menu.
2. Select the menu item→ *Temperature control*→ *Control* → *control parameters*.
   ▶ The submenu opens.

6.4.3 Overview of internal control parameters

The internal control compares the setpoint temperature $T_{set}$with the bath temperature $T_{int}$and calculates the actuating variable, i.e. the amount of heating or cooling.

Designation	Parameter	Unit
Proportional range	Xp	K
Reset time	Tn	s
Retention time	Tv	s
Damping time	Td	s

If Tv manual/auto is set to auto, Tv and Td cannot be changed. In this case, they are derived from Tn using fixed factors.

The following parameters can also influence the internal control:

- Temperature limit values: Til and TihChapter 5.4.4 "temperature limit Setting values " on page 56
- Control value limitation: Heating output and cooling outputChapter 6.4.9 "Limiting heating and cooling (control value limitation)" on page 99
- Maximum power consumption of the device reduced
- Pump stage too small

6.4.4 Overview of external control parameters

- External control consists of a master controller (external controller) and a slave controller (internal controller). The temperature of the application to be temperature controlled is also required. In general this is determined with an external "Pt100 sensor".
- The master controller compares the set temperature with the external temperature (application temperature) and, from these temperatures, calculates the set temperature (set_internal) for the slave controller (internal controller).
- The slave controller compares the set temperature (set_internal) with the outflow temperature and calculates the actuating signal, i.e. the measurement used for heating or cooling.

Table 16: The following control parameters can be adapted on the master controller (external controller):

Characteristics	Designation	Unit
Kpe	Amplification factor	–
Tne	Adjustment time	s
Tve	Hold-back time	s
Tde	Attenuation time	s
Prop_E	Proportional range	K

Table 17: The following control parameters can be adapted on the slave controller (internal controller):

Characteristics	Designation	Unit
Xpf	Proportional range	K

If Tv manual/auto is set to auto , Tv and Tde cannot be modified. In this case, they are derived with fixed factors of Tne.

The temperature limits Tih and Til also have an effect on the control.

Correction limitation

If a temperature jump is specified via set temperature T_{set}, the control may set an outflow temperature which is considerably higher (e.g. 50 K, possible with enamel reactors) than the temperature T_{ext} required in the external application. Therefore, there is a correction limitation that specifies the max- imum permitted deviation between the temperature at the pump connection pressure side T_{int} and the temperature at the external application T_{ext}.

1. Press the [Enter key] to open the menu.
2. Select the menu items→ *Setup*→ *Control*→ *Correction limit...*
   ▶ An entry window opens for the numerical value.
3. Enter the value.
4. Confirm the new value with the [Enter key].
   ▶ The new value has been accepted.

6.4.5 Activate external control, deactivate internal control

If the device is to regulate to the internal control variable or an external control variable, you must set this. The old controlled variable is then automatically deactivated. Only one controlled variable can be selected.

A standard interface marked Pt100 is installed on the rear of the MAX pump and control unit. An optional Pt100 / LiBus interface module can be retrofitted to the PRO control head for this purpose. This is where you connect a Pt100 temperature sensor to record the actual temperature in the external application. The standard display for the external measured temperature T_{ext} is always the set external control variable. If a different actual temperature is to be shown in the display, this must be set explicitly.

If external control is activated, the temperature control unit regulates to the external temperature value T_{ext} and not to the bath temperature $T_{(int)}$ (bath thermostat).

List of possible control variables

- [Internal Pt]
- [External Pt]
  The corresponding interface must be available from here.
- [External analog]
- [External serial]
  - This includes the RS232/485, Profibus, ProfiHet and CAN interface modules.
- [External Ethernet]
- [External EtherCAT]
- [External Pt100-2]

Activate external control

1. Connect a Pt100 temperature sensor to the temperature control unit at the Pt100 interface or the interface cable to the desired interface.
2. Hang the Pt100 temperature sensor in the temperature control fluid of the external application and attach it carefully. In the case of external control via one of the above interfaces, ensure that a specification is made via the external controller.
3. Press the enter key to access the menu.
4. Select the menu item→ *Temperature control*→ *Control*→ *Control variable* from.
   ▶ Depending on the interfaces installed, the display shows the selectable control variables.
5. Use the arrow buttons to select the desired control variable.
   ▶ The new setting is marked with a tick.
6. Press the [ESC] softkey to return to the basic window.

You can also feed in your actual temperature via the Ethernet interface or another interface module.

Activate internal control

To reactivate the internal control, go to the submenu [Controlled variable] *to* select *the* [Internal Pt] *option.*

6.4.6 Change control parameters

Personnel: ■ Specialized personnel

Press the [ESC] *softkey to return to the previous display without making any changes.*

Fig. 59: Change control parameters

1. Press the enter key to access the menu.
2. Select the menu items→ *Temperature control*→ *Control*
   → *control parameters*.
   ▶ If an external control variable is active, the external control parameters are shown on the display.
   If the controlled variable is active internally, the internal control parameters are shown on the display.
3. Scroll to a control parameter and select it with the Enter button.
   ▶ An input window opens. You can now change the numerical value. The values displayed for *Max:* and *Min:* indicate The limits for entering values.
4. Confirm the new value with the [OK] button.
   ▶ The new value is active.

Release control parameters for editing

- With *Tv manual/auto*, you can specify whether the control parameters *Tv* and *Td* or *Tve* , *Tde* and *Prop_E* manually or automatically.
  can be set automatically. If the automatic setting is active, these control parameters are displayed with a lock and cannot be changed.
  To be able to set these control parameters manually, change the control parameter *Tv manual/auto* to manual setting.

6.4.7 Setting the setpoint offset

It is possible to apply an ORset value to the temperature measured by an external temperature sensor and then process it as a setpoint value. The setpoint for the bath temperature can therefore be set, for example, 15 K below the temperature of a reactor measured by the external temperature sensor.

Navigate to the settings

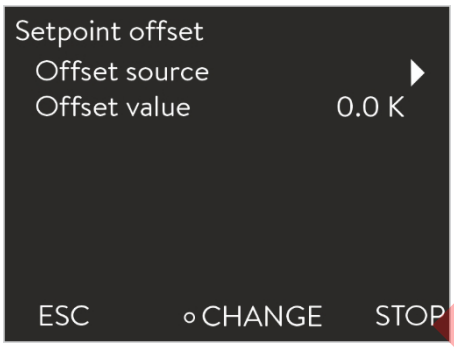


Fig. 60: Enter setpointORset

value of the ORset

1. Press the Enter button to access the menu.
2. Select the menu item→ *Temperature control*→ *Control*
   → *Target value set* from.
   ▶ The options are shown in the display.
3. Select one of the following options:
   - With [ORset source] you can specify the source for which the ORset is to be measured.
   - With [ORsetvalue] you can enter the value for the setpointoRset.

1. Select [ORsetvalue] in the SetpointoRset menu.
   ▶ An input window is displayed. The ORset value can be entered within the displayed limit values.
2. Enter the setpoint oRset.
3. Confirm with [Enter].
4. The software returns to the previous Setpoint set menu.

Activate ORset source

You can use the options in the [ORset source] menu to activate or deactivate the entered value of the setpoint toRset for a corresponding source. With [external Pt100], for example, you can activate the setpoint toRset for the external temperature sensor.

1. Select the [ORset source] button in the SetpointoRset menu.
2. Select one of the following options:
   - Press [off] to deactivate the ORset source.
     Activate an ORset source from the other options:
   - [External Pt]
   - [External analog]
   - [External serial]
   - [External Ethernet] and so on.
3. Confirm with [Enter].
4. Press the [ESC] softkey to return to the basic window.

6.4.8 Dynamic heat limiter

With the dynamic heat limiter, you limit the heating output of the device. At low flow rates at the heaters, there is a risk that the heat transfer liquid will overheat locally. This can lead to premature aging, oil cracking with silicone oils (depolymerization) or boiling.

Example

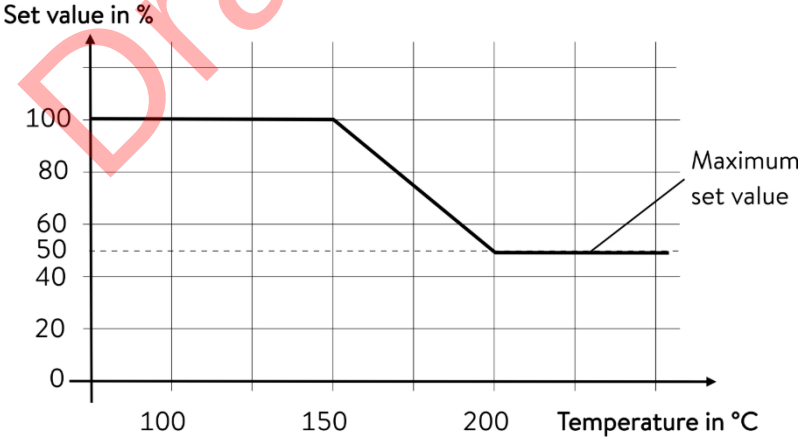


Fig. 61: Dynamic heat limiter

Start	150 °C
End	200 °C
Actuating signal	50 %

Personnel: ■ Operating personnel

1. Press the Enter key to open the menu.
2. Select the menu items→ *Temperature control*→ *Control*→ *Dynamic heat limiter*.
   ▶ The submenu opens.
3. Enter your values and press the Enter key to confirm.

Menu items	Description
Start	You use the values for Start and End to specify a temperature range in which the power of the heater is linearly limited to the entered value of the actuating signal. The heater works at reduced power above the entered end temperature ([End]). The heater works at full power below the entered start temperature ([Start]).
End	
Actuating signal	You enter the value for limitation of the heating output in percent here.

▶ The dynamic heat limiter is active.

6.4.9 Heating and cooling limitation (control value limitation)

You can limit the maximum heating output or the maximum cooling output (for a cooling thermostat) with the control value limitation. The setting is made as a percentage of the maximum value.

Activating the heating output control value limit prevents the surface temperature on the radiator from becoming too high. Excessively high radiator temperatures can cause damage to the temperature control fluid and appliance.

1. Press the Enter button to access the menu.
2. Select the menu item→ *Temperature control*→ *Control*
   → *Output limitation* off.
   ▶ The options are shown in the display.
3. Select [Max. heating] and confirm with [OK].
   ▶ An input window is displayed. The control value limit can be adjusted within the displayed limit values.
4. Adjust the value accordingly.
5. Use the [OK] button to return to the previous display with the new setting.
   ▶ The new setting is active.

6.5 Pump menu

Setting the pump stage

With the Universa PRO thermostats, the pump can be set to 6 levels and can be set in 8 stages for the Universa MAX thermostats. Each pump stage is assigned a speed. This speed is maintained regardless of the viscosity and density of the temperature control fluid as long as the pump motor is operating within its load limit.

Otherwise, the speed is automatically reduced. In this way, even highly viscous liquids and liquids with a high density are circulated as well as possible. The pump stage influences the bath circulation, the flow rate, the delivery pressure, the mechanical heat input and the noise level.

For a small bath thermostat without an external consumer, a low pump stage is recommended. With the MAX device variant pump stages 1 to 3, with the PRO device variant pump stages 1 to 2. When used as a circulation thermostat, a higher output stage is advisable in order to keep the temperature difference between the bath and the external consumer as low as possible.

1. Press the Enter button to access the menu.
2. Select the menu item→ *Pump*→ *Pump stage.*
   ▶ The submenu opens.

The selected pump stage is immediately active. It does not need to be confirmed separately.

6.6 Operating mode

6.6.1 Cooling

The cooling unit of the appliances is operated in the default setting [automatic]. Depending on the temperature and operating status, the cooling unit is automatically switched on or off (recommended operating mode). You can switch the cooling unit on permanently or off permanently manually via the menu. In the case of sensitive control processes, control fluctuations can be prevented by automatically switching the cooling unit on or off.
With [Cooling off], only temperatures above room temperature can be reached. [Cooling on] may lead to increased energy consumption due to a permanently running cooling unit.

1. Press the enter key to access the menu.
2. *Select* the menu items→ *Operating mode*→ *Cooling*.
3. Select one of the following options:
   - With the [automatic] setting, the cooling unit is switched on and off automatically as required.
   - With [off], the cooling unit remains switched off.
   - With [on], the cooling unit cools permanently.
4. Confirm your selection by pressing [OK].

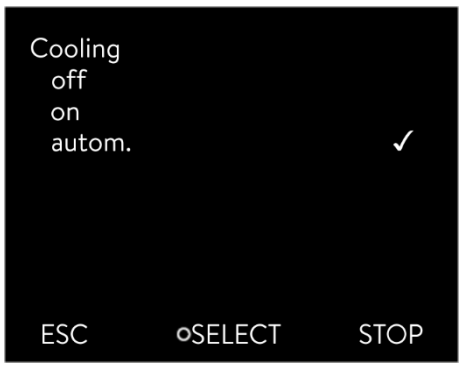


Fig. 62: Configure cooling

6.7 Programmer

6.7.1 Basics

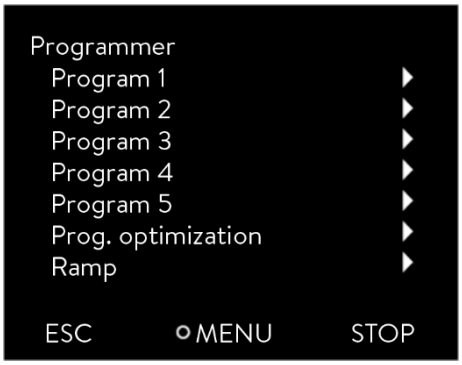


Fig. 63: Programmer

The programmer allows you to run and save a temperature-time program. A program consists of several temperature-time segments. In a segment, information on the end temperature of the segment, the time duration, the temperature tolerance, the pump stage and the switch position (off/on) of the contact module is defined. Ramps, temperature jumps or temperature holding phases are possible.

The programmer of the temperature control unit has 5 programs.
These 5 programs share a total of 150 segments.

A program occupies at least 1 segment.
A maximum of 146 segments can be saved in one program.

- Ramp
  A ramp is described by the specified duration, from the start to the end of the segment, and by the target temperature, i.e. the temperature at the end of the segment.
- Temperature jump
  Without a time setting (time is 0), the final temperature is reached as quickly as possible.
- Temperature holding phase
  No temperature change (the temperature at the start and end of a segment is the same).
- Pump stage 0
  The pump stage [---] (means pump is off) can be selected within a segment. This ends the program when this segment is reached, although further segments in this program will follow. The thermostat is set to "Stand-by" status. When the program is started, a message appears indicating that the program ends at this segment with pump stage 0.
- Program optimization
  In practice, activating the program optimization leads to very good control behaviour. With programs that contain both ramps and other segment types, the actual temperature curve matches the set temperature curve more closely than with programs without optimization. Overshoots are minimized. An increased undershoot at the end of the ramp can only occur with very unfavorable control parameters. In this case, deactivate the optimization.
  A *tolerance that is* too tight worsens the control result. If possible, work without a tolerance.
- Stand-by
  If the appliance is set to standby while a program is running, the running program is automatically paused.

1. Press the enter key to access the menu.
2. Select the menu item→ *Programmer*→ *Program X*.
   ▶ The submenu in the selected program opens.

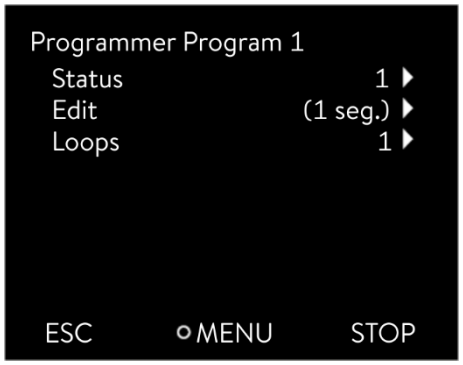


Fig. 64: Program 1

3. You have the following options:

- [Status]
  - To start the program, select the [Start] option.
  - Once the program has started, it can be paused via [Pause].
  - A paused program can be continued via [Continue].
  - To end the program, select the [Stop] option.
- [Edit]
- [Runs]
  - Enter the number of repetitions of the selected program here.

4. *Select* the menu item→ *Edit*.

▶ The program is shown on the display. You can now edit it.

You can stop the programmer with the [STOP] softkey. After pressing the [START] softkey, the programmer continues to run in the previously selected mode (pause or active mode).

The programmer can be controlled or changed via the timer.

Possible settings

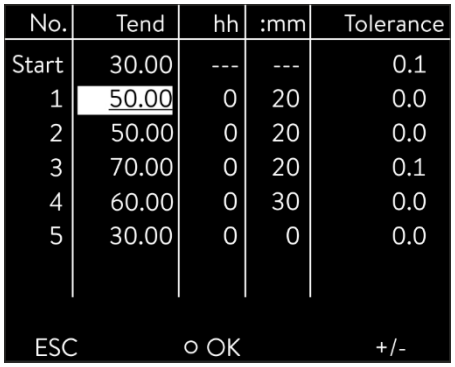


Fig. 65: In the program editor

Setting	Description
No.	Segment number of the program
Tend	Final temperature to be reached
hh	Time in hours (hh) in which the specified temperature should be reached
:mm	Time in minutes (:mm) in which the specified temperature should be reached
Tolerance	Tolerance defines how exactly the temperature should be reached before the next segment is processed. 0.0 means that no tolerance is observed. This means that the program moves to the next temperature after the specified time, even if the initial temperature has not yet been reached.
Pump	The segment is processed with the entered pump stage.
S1, S2, S3	The switching status (off or on) of a contact module (if installed) can be entered here. Contact modules are available as accessories.

Examples of the functions of a contact module (see operating instructions for the interface module)

- Functions of the inputs
  - Set fault
  - Set stand-by
  - Control programmer
  - Control alternating operation (2 different setpoint temperatures)
  - Control internal or external regulation
- Functions of the outputs
  - signal various error states
  - Stand-by signaling
  - Specify position in relation to a temperature window (inside or outside)
  - Specify programmer status
  - Signalize refilling

Edit program example

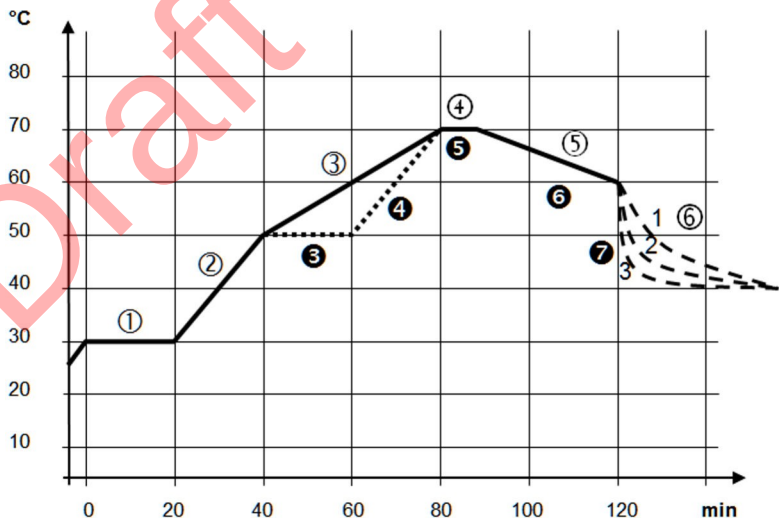


Fig. 66: Program sequence (before and after), example

The graphic shows an example of the reprogramming of a target temperature curve.

The cooling time in the diagram varies depending on the appliance type, load and so on. In example segment number 2, 50 °C should be reached within 20 minutes.

The original values of the following table "before" are shown with a solid line, the edited course of the further table
"after" with dashed line.

Start segment

Each program begins with the *Start* segment. It determines the temperature at which segment *1* should continue the program. The temperature of the *Start* segment is approached as quickly as possible. No time can be specified in the *Start* segment. Without the *Start* segment, segment *1* would be different at the start of the program depending on the temperature of the temperature control fluid.

Table 18: Program example before (values of the solid line in Fig. Program sequence)

No.	Tend	hh	:mm	Tolerance	Pump	S1	S2	S3
Start	30,00	---	---	0,0	---	from	from	from
1	30,00	0	20	0,1	2	from	from	from
2	50,00	0	20	0,0	3	from	from	from
3	70,00	0	40	0,0	4	from	from	from
4	70,00	0	10	0,1	2	from	from	from
5	60,00	0	30	0,0	2	from	from	from
6	40,00	0	0	0,0	2	from	from	from

A new segment with the number 3 has been entered in the edited table (table below). In addition, the time and the pump stage for the segment with the number 4 have been changed. The tolerance and pump stage have been adjusted for segment number 5.

Table 19: Program example after (values of the dashed line in Fig. Program sequence)

No.	Tend	hh	:mm	Tolerance	Pump	S1	S2	S3
Start	30,00	---	---	0,0	---	from	from	from
1	30,00	0	20	0,1	2	from	from	from
2	50,00	0	20	0,0	2	from	from	from
3	50,00	0	20	0,1	3	from	from	from
4	70,00	0	20	0,0	4	from	from	from
5	70,00	0	10	0,8	2	from	from	from
6	60,00	0	30	0,0	2	from	from	from
7	30,00	0	0	0,0	2	from	from	from

Toleranc
e

Observe the following notes and compare Fig. 67:

- The Tolerance field, for example, allows you to precisely maintain the dwell time at a certain temperature.
- Only when the flow temperature reaches the tolerance band (1) is the following segment processed so that, for example, the ramp of the second segment is only started with a delay at 2.

- However, a tolerance band that is too narrow can also cause undesirable delays. In extreme cases, it is possible that the program cannot be continued. The tolerance band should not be too narrow, especially with external control. A larger tolerance was entered in segment 5 so that the desired time of 10 minutes is maintained even with transient processes (3).
- Only flat (slow) ramps should be programmed with a tolerance band if necessary. Steep ramps that are close to the maximum possible heating rates or cooling rates of the appliance may be significantly delayed (4) if the tolerance band is too narrow (here in segment 2).

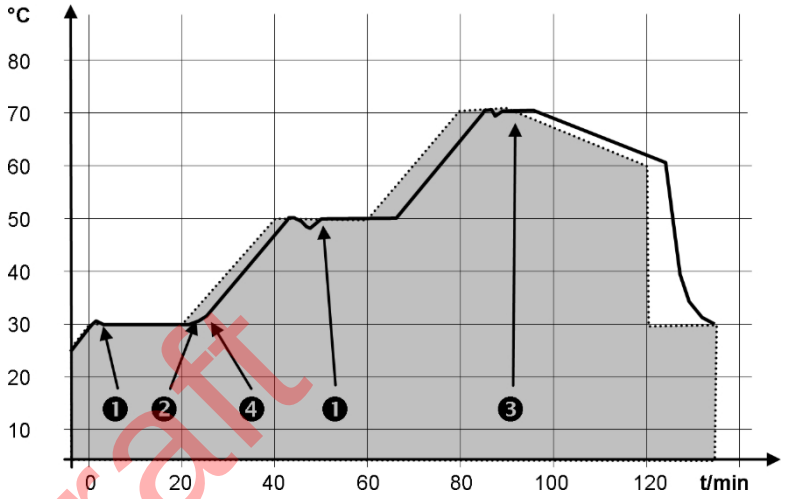


Fig. 67: Program sequence set temperature and actual temperature

The above graph of the edited curve illustrates the possible lag between the actual temperature (solid line) and the setpoint temperature of the programmer (gray background).

6.7.2 Set and process program

Please note:

- If a segment time> 999:59 h is included, this time must be distributed over several successive segments.

Start processing

No.	Tend	hh	:mm	Tolerance
Start	30.00	---	---	0.1
1	50.00	0	20	0.0
2	50.00	0	20	0.0
3	70.00	0	20	0.1
4	60.00	0	30	0.0
5	30.00	0	0	0.0

ESC ○ OK +/-

Fig. 68: Editing a program

1. Select the *Edit* menu item for the selected program.
   ▶ You can edit the program.

Editing a program

Please note:

- If in the *hh* and *:mm* field the value "0" is entered, the temperature T_{end} will be started as quickly as possible.
- Changes to the pump level are entered in the respective segment (= program line).
- The default value of the contact module is *off* .

You have the following options in the selected program:

- By pressing the right arrow key 5 times you can display the columns Pump, S1, S2 and S3 of the program.
- Use the left arrow key to display the columns Tend, hh, :mm and Tolerance again.
- With the [up] and [down] arrow keys, you can navigate to the segments (lines) of a program.
- With the [OK] you select a value for editing.
- Use the [right] and [left] arrow keys to select individual digits of the value.
- With the [up] and [down] arrow keys, you can increase or reduce the selected digit.
- With the [ESC] softkey, you can deselect a selected value again.
- With the [OK] key, you confirm your change.
- You exit the program with the [ESC] softkey. The entered values are saved.

Add new segment

1. Navigate to the segment under which the new segment should be added.
2. In this segment, navigate to the column with the *No.*
3. Press the [NEW] key.
   ▶ A new segment is created.

No.	Tend	hh	mm	Tolerance
Start	30,00	---	---	0,1
1	50,00	0	20	0,0
2	50,00	0	20	0,0
3	70,00	0	20	0,1
4	60,00	0	30	0,0
5	30,00	0	0	0,0
ESC		○ NEW		DELETE

Fig. 69: Select program segment Delete segment

1. Navigate to the segment that you want to delete.
2. In this segment, navigate to the column with the *No.*
3. Press the *DELETE* softkey.
   ▶ The segment is deleted.

Editing a program currently running

Please note:

- No segments can be added or deleted in a currently running program.
- In the running program, changes of the existing temperature values and segment durations are possible. The segment is continued as if the change had been eRective since the beginning of the segment.
- If the new segment time is shorter than the elapsed segment time, the program jumps to the next segment.

1. Select the *Edit* menu item for the running program.
   ▶ You can edit the segments.

6.8 Calibration of the temperature sensor

A calibrated reference thermometer that corresponds to the desired degree of accuracy is required. Otherwise, you should not change the calibration of your temperature control unit.

If you determine a constant temperature deviation of T_{int} or T_{ext} from the reference thermometer when checking the temperature in the steady state, the deviation can be equalized using the *Calibration* menu item.

In the *Offset* (1-point adjustment) menu item, the characteristic curve of the temperature sensor is shifted in parallel by the entered value.

In the *2-point calibration* (2-point adjustment) menu item, the characteristic curve of the temperature sensor is shifted and the gradient of the characteristic curve is also changed.

It is possible to change the temperature values T_{int} and T_{ext} within a range of ± 3 K.

ORset

- For internal bath applications, the reference thermometer must be hung in the bath as specified in the calibration certificate.
- For external use, the reference thermometer must be inserted into the flow for the application in accordance with the specifications in the calibration certificate.
  be built. The installation position of the reference thermometer should be as close as possible to the application.
- To measure the temperature, wait until the system is in a steady state.

1. Press [Enter] to access the menu.
2. Select the menu items→ *Tempering*→ *Calibration*→ *Internal Pt*
   or→ *External Pt*→ *Offset*.
   ▶ The input window opens.
3. Enter the temperature value read from the reference thermometer in the input window.
4. Confirm the new value with the [OK] button.
   ▶ The new value is adopted.

2-point calibration

- For internal bath applications, the reference thermometer must be hung in the bath as specified in the calibration certificate.
- For external use, the reference thermometer must be installed in accordance with the specifications in the calibration certificate. The position of the
  reference thermometer in the pressure side, between the connecting piece of the temperature control circuit on the pressure side and the application, should be selected as close as possible to the application.
- The lower and upper temperature measurements must be at least 40 K apart.
- To measure the temperature, wait until the system is in a steady state.

1. Set a low setpoint T_{set}on the device.
2. Wait until the setpoint and the temperature of the tempering liquid have approached each other.
3. Press [Enter] to access the menu.
4. Select the menu items→ *Tempering*→ *Calibration*→ *Internal Pt*

   or→ *External Pt*→ *2-point* at *the bottom.*
   ▶ The input window opens.
5. Enter the temperature value read from the reference thermometer in the input window.
6. Confirm the new value with the [OK] button.
   ▶ The lower value is adopted.
7. Set a high setpoint T_{set}on the device.
8. Wait until the setpoint and the temperature of the tempering liquid have approached each other.
9. In the [Calibration] menu, select the *2-point* menu item *at the top*.
   ▶ The input window opens.
10. Enter the temperature value read from the reference thermometer in the input window.
11. Confirm the new value with the [OK] button.
    ▶ The upper value is accepted. The 2-point calibration is complete.

Restoring the factory calibration

If you want to restore the factory calibration, select this menu item.

1. Press [Enter] to access the menu.
2. Select menu items→ *Tempering*→ *Calibration*→ *Internal Pt*

   or→ *External Pt*→ *Factory calibration* off.
3. Select the [yes] option.
4. Confirm your selection by pressing [OK].
   ▶ The calibration performed by the customer is deleted and the calibration set at the factory is active again.

6.9 Maintenance menu

1. Press the enter key to access the menu.
2. Select the menu item→ *Maintenance.*
   ▶ The submenu opens.

These menu items are available:

- Fault memory and
- SW Update
  - In the SW Update menu, you can install new software versions for the device and the interface modules.

To analyze the errors, the devices have an error memory in which up to 48 warning messages, error messages and alarm messages are stored.

- *No.* means consecutive numbering, listed chronologically according to the occurrence of errors.
- The module causing the message is displayed under *Source*.
- *Code* shows the encrypted alarm, warning or error description.
- The exact time of the error is displayed with the *date* and *time*.
- The last column in the list is the *detail code* .

6.10 Display device status

In the Device status menu with its submenus, you can display a lot of information and data about the device. No settings are possible in the entire Device status menu.

1. Press the enter key to access the menu.
2. Select the menu item→ *Device status.*
   ▶ The submenu opens.

These menu items are available:

- Device data,
  - Temperatures, current values, speeds, etc.
- Heating limitation,
  - Current consumption, dynamic heating limitation, upper limit values (Tih), manipulated variable limitation, etc.
- Versions,
  - Hardware and software. The versions of connected interface modules are also displayed.
- Device information,
  - Device type, device base, serial numbers.
- Operator and
- Controller ID.

6.11 Operating the device via the interface

The following operating units and interfaces are considered:

- Pump and control unit
- Control station/PC
  - connected to the temperature control unit via Ethernet interface or another optional interface ("Additional interfaces" on page 31).
- Analog interface (optional accessory)
- Contact interface (optional accessory)

> *Allow access to the device via the network*
>
> *To enable digital access to the device from outside, this must first be set in the device software.*

Allow access to the device

1. Press [Enter] to access the menu.
2. Select the menu items→ *Interfaces*→ *LAN/WLAN* → *Services*→ *PC control*.
   ▶ The display shows the options [off] and [on].
3. Select the option [on] and confirm with the enter key.
   ▶ A check mark is set. The entry has been accepted.

Functional scope of the operating units

- The full range of functions is available without restriction via the pump and control unit.
- The control station is limited by the functionality of the interface and its protocol (command set).
- Limitations of the analog interface and contact interface are their functionality and protocol.

Operator and viewer

Applies equally to pump and control unit and control station

- Operator, maximum once, has write and read rights
  - All setting options are available to the operator, both read and write, provided that the functional scope of the Control unit included.
- Viewer, multiple possible, has read-only rights
  - All menus are accessible to the viewer, but no settings can be made to change the function of the device, can be made. Exceptions are entries that are necessary to log in as an operator.

On delivery, the pump and control unit has operator rights.

An operator is logged in and another operating unit requests the operator rights ("Requesting operator rights" on page 112). After requesting operator rights, the first operator becomes the Viewer.

If an operator is downgraded to viewer, a pop-up window appears with a corresponding message.

Control center monitoring

When delivered, the connection to the control station is actively monitored. If no command is sent to the device via Ethernet for more than 15 seconds an interruption in communication is detected. Each new command resets the timeout. If there is an interruption to the control station, the temperature control unit triggers alarm 22Table 43 "Temperature control unit alarms" on page 129.
The timeout can be set from one to 99 seconds. To do this, use the [OUT_SP_08_XX] command via the interface.
For the Ethernet interface, the function can also be activated via the
→ *Interfaces*→ *LAN/WLAN*→ *Services*→ *PC control*→ *PC timeout*
to take place. This must be set before the start of communication.
If monitoring of the control station is active, the operator's right-hand side is located exclusively at the control station.
Operation of the temperature control unit is therefore blocked. The local control panel of the pump and control unit can obtain the operating rights when requested by the user. If a timeout occurs during monitoring, the operating rights are automatically transferred to the temperature control unit. To deactivate monitoring of the connection, a timeout value of 0 must be set. The temperature control unit can be operated from the control station/PC or on the temperature control unit itself. The operator rights can be obtained alternately. In this case, communication is not monitored and a connection failure is not detected.

Each time the control station sends a write command, it obtains the operating right, provided this is not blocked by another control panel. If the control station sends write commands very often, this can make operation more difficult for another control panel.

Cold start

After switching the device off and on again, the pump and control unit will return to the previous login level. The same applies to the web server.

An exception is the situation where the operating unit that last requested the user rights is not connected. In this case, the operator rights automatically revert to the pump and control unit when it is switched on.

Status display

If an operating unit has viewer rights, a lock symbol is displayed instead of the right softkey or the start/stop button:

- In the pump and control unit, the right-hand softkey with the Start/Stop assignment is replaced by the assignment with the lock symbol.
- When operating with a control station, it is the responsibility of the user (customer) to have the status displayed.

Requesting user rights

Fig. 70: Operation on the device locked

User rights are requested by selecting the lock symbol:

- Press the right softkey on the pump and control unit. A pop-up window appears with the query Yes/No.

Locked operator rights

Description

Each operating unit with operator rights can block (lock) the operator rights of other operating units/control stations. In this case, no other operating unit/control station can obtain the operator right and therefore remains a viewer.

Blocking operator rights at the control station

If monitoring of the control station is activated, the operator rights to the control station are locked/exclusive.
No operating units can obtain operator rights. A message appears when an attempt is made to obtain operator rights.
If there is an interruption to the control station, the temperature control unit is switched off and on again, an alarm occurs or the control station monitoring is deactivated. The exclusive right is withdrawn from the control station.

6.12 Read commands and write commands of the interface

6.12.1 Protocol of the interface

Note the following instructions:

- The command from the computer must be made with a CR, CRLF, or LFCR.
- The response from the thermostatic circulator is always made with a CRLF.
- After each command sent to the thermostat, it is necessary to wait for the reply before sending another command. This ensures that the sequencing of inquiries and answers is clear.

CR= Carriage Return (Hex: 0D); LF= Line Feed (Hex: 0A)

Table 20: Example with set point transfer of 30.5 °C to the thermostatic circulator

Computer	Temperature control device
"OUT_SP_00_30.5 "CRLF	➔
➔	"OK "CRLF

6.12.2 Read commands

The interface module recognizes the following read commands, which you can use to query the operating data of the temperature control unit.

Table 21: Temperature

ID	Function	Unit, resolution	Command
2	Setpoint temperature	[°C]	IN_SP_00
3	Bath temperature (flow temperature)	[°C], 0.01 °C	IN_PV_00
4	Bath temperature (flow temperature)	[°C], 0.001 °C	IN_PV_10
5	Controlled temperature (internal / external Pt / external analog / external serial)	[°C]	IN_PV_01
7	External temperature $T_{(E)}$ (Pt)	[°C]	IN_PV_03
8	External temperature $T_{(E)}$ (analog input)	[°C]	IN_PV_04
14	External temperature $T_{(E)}$ (Pt)	[°C], 0.001 °C	IN_PV_13
25	Switch-off point overtemperature T_Max	[°C]	IN_SP_03
27	Flow temperature limitation TiH (upper limit value)	[°C]	IN_SP_04
29	Flow temperature limitation TiL (lower limit value)	[°C]	IN_SP_05
158	Command value master controller with external control	[°C]	IN_PV_11

Table 22: Pump

ID	Function	Unit	Command
18	Pump power level	[-]	IN_SP_01

Table 23: Fill level

ID	Function	Unit	Command
9	Bath level (fill level)	[-]	IN_PV_05

Table 24: Control value

ID	Function	Unit, resolution	Command
11	Controller manipulated variable in resolution per thousand — negative value→ Device cools — positive value→ Device heats	[‰]	IN_PV_06
13	Controller manipulated variable in watts — negative value→ Device cools — positive value→ Device heats	[W]	IN_PV_08

Table 25: Cold

ID	Function	Unit	Command
24	Cooling mode: 0= off / 1= on / 2= automatic	[-]	IN_SP_02

Table 26: Security

ID	Function	Unit	Command
35	Timeout communication via interface (1 - 99 seconds; 0= OR)	[s]	IN_SP_08
202	Status of the exclusive user rights for the interface (1 = active / 0= inactive)	[-]	IN_MODE_09

Table 27: Control parameters

ID	Function	Unit	Command
39	Control parameter Xp	[-]	IN_PAR_00
41	Control parameter Tn (181= OR)	[s]	IN_PAR_01
43	Control parameter Tv	[s]	IN_PAR_02
45	Control parameter Td	[s]	IN_PAR_03
47	Control parameter KpE	[-]	IN_PAR_04
49	Control parameter TnE	[s]	IN_PAR_05
51	Control parameter TvE	[s]	IN_PAR_06
53	Control parameter TdE	[s]	IN_PAR_07
55	Correction size limitation	[K]	IN_PAR_09
57	Control parameter XpF	[-]	IN_PAR_10
61	Control parameter Prop_E	[K]	IN_PAR_15

Table 28: Regulation

ID	Function	Unit	Command
59	Target value set	[K]	IN_PAR_14
67	Control to controlled variable X: 0= internal / 1= external Pt / 2= external analog / 3= external serial / 5= external Ethernet / 6= external EtherCAT / 7= external Pt 2 / 8 = external OPC UA / 9 = external Modbus TCP	[-]	IN_MODE_01
69	ORset source X for setpoint: 0= normal / 1= external Pt / 2= external analog / 3= external serial / 5= external Ethernet / 6= external EtherCAT / 7= external Pt 2 / 8 = external OPC UA / 9 = external Modbus TCP	[-]	IN_MODE_04

Table 29: Rights

ID	Function	Unit	Command
63	Status of the buttons on the control panel: 0= free / 1= locked	[-]	IN_MODE_00

Table 30: Status

ID	Function	Unit	Command
75	Standby status: 0= Device is switched on / 1= Device is switched off	[-]	IN_MODE_02
107	Device line / device series: 0= Proline, 1= XT, 2= Kryomat, 3= ECO, 5= VC, 6 = PRO, 7 = INT, 8 = UNI.	[-]	TYPE
130	Device status: 0= OK / -1= Fault	[-]	STATUS
131	Fault diagnosis Bits 0= inactive, 1= active; ■ Bit 0= Collective error, ■ Bit 1= Collective alarm, ■ Bit 2= Collective warning, ■ Bit 3= Overtemperature, ■ Bit 4= Lower level, ■ Bit 5= Overlevel	[-]	STAT
161	Serial number, alphanumeric (10 characters)	[-]	SERIAL_NO

Table 31: Programmer

ID	Function	Unit	Command
77	Program to which further commands refer	[-]	RMP_IN_04
85	Programmer segment	[-]	RMP_IN_00_[Seg No.]
88	Current segment number	[-]	RMP_IN_01
90	Set number of program sequences	[-]	RMP_IN_02
92	Current program run	[-]	RMP_IN_03
94	Currently running program (0= no running program)	[-]	RMP_IN_05

Table 32: Contact input / output

ID	Function	Unit	Command
96	Contact input 1: 0 = open / 1 = closed	[-]	IN_DI_01
98	Contact input 2: 0= open / 1= closed	[-]	IN_DI_02
100	Contact input 3: 0= open / 1= closed	[-]	IN_DI_03
102	Contact output 1: 0= open / 1= closed	[-]	IN_DO_01

ID	Function	Unit	Command
104	Contact output 2: 0= open / 1= closed	[-]	IN_DO_02
106	Contact output 3: 0= open / 1= closed	[-]	IN_DO_03

Table 33: SW version

ID	Function	Unit	Command
108	Control system	[-]	VERSION_R
109	Protection system	[-]	VERSION_S
111	Cooling system (only for appliances with active cooling)	[-]	VERSION_T
112	Analog interface module (interface module must be present)	[-]	VERSION_A
114	Interface module RS 232/485 or Profibus / Profinet/CAH (interface module must be available)	[-]	VERSION_V
116	EtherCAT interface module (interface module must be present)	[-]	VERSION_Z
117	Contact interface module (interface module must be present)	[-]	VERSION_D
118	Solenoid valve for cooling water (solenoid valve must be present)	[-]	VERSION_M_0
119	Solenoid valve automatic refill (solenoid valve must be present)	[-]	VERSION_M_1
120	Solenoid valve level stabilizer (solenoid valve must be present)	[-]	VERSION_M_2
121	Solenoid valve, shut-off valve 1 (solenoid valve must be present)	[-]	VERSION_M_3
122	Solenoid valve, shut-off valve 2 (solenoid valve must be present)	[-]	VERSION_M_4
128	External Pt interface 0 (external temperature module must be present)	[-]	VERSION_E
129	External Pt interface 1 (second external temperature module must be present)	[-]	VERSION_E_1

6.12.3 Write commands

The interface module recognizes the following write commands, which you can use to transfer values to the temperature control unit.

Table 34: Temperature

ID	Function	Unit	Command
1	Setpoint temperature	[°C]	OUT_SP_00_XXX.XX
15	Actual value external temperature (via interface)	[°C]	OUT_PV_05_XXX.XX
26	Flow temperature limitation TiH (upper limit value)	[°C]	OUT_SP_04_XXX.XX
28	Flow temperature limitation TiL (lower limit value)	[°C]	OUT_SP_05_XXX.XX

Table 35: Pump

ID	Function	Unit	Command
17	Pump power level 1 - 6 (PRO) or 1 - 8 (MAX)	[-]	OUT_SP_01_XX

Table 36: Cold

ID	Function	Unit	Command
23	Cooling mode: 0= off / 1= on / 2= automatic	[-]	OUT_SP_02_X

Table 37: Security

ID	Function	Unit	Command
34	Timeout communication via interface (1 - 99 seconds; 0 = OR)	[s]	OUT_SP_08_XXX
201	Deactivate/activate the exclusive operating rights for interface 1= Get exclusive rights. 0 = Give up exclusive rights	[-]	OUT_MODE_09_X

Table 38: Control parameters

ID	Function	Unit	Command
38	Control parameter Xp	[-]	OUT_PAR_00_XX.X
40	Control parameter Tn (5 - 180 s; 181= OR)	[s]	OUT_PAR_01_XXX
42	Control parameter Tv	[s]	OUT_PAR_02_XXX
44	Control parameter Td	[s]	OUT_PAR_03_XX.X
46	Control parameter KpE	[-]	OUT_PAR_04_XX.XX
48	Control parameter TnE (0 - 9000 s; 9001= OR)	[s]	OUT_PAR_05_XXXX
50	Control parameter TvE (5= OR)	[s]	OUT_PAR_06_XXXX

ID	Function	Unit	Command
52	Control parameter TdE	[s]	OUT_PAR_07_XXXX.X
54	Correction size limitation	[K]	OUT_PAR_09_XXX.X
56	Control parameter XpF	[-]	OUT_PAR_10_XX.X
60	Control parameter Prop_E	[K]	OUT_PAR_15_XXX

Table 39: Regulation

ID	Function	Unit	Command
58	Setpoint set	[K]	OUT_PAR_14_XXX.X
66	Control on controlled variable X: 0= internal / 1= external Pt / 2= external analog / 3 = external serial / 5 = external Ethernet / 6 = external EtherCAT / 7 = external Pt 2 / 8 = external OPC UA / 9 = external Modbus TCP	[-]	OUT_MODE_01_X
68	ORset source X for setpoint: 0= normal / 1= external Pt / 2= external analog / 3 = external serial / 5 = external Ethernet / 6 = external EtherCAT / 7 = external Pt 2 / 8 = external OPC UA / 9 = external Modbus TCP	[-]	OUT_MODE_04_X
Note (ID 66 and 68): With the value X= 3, the commands ID 66 and ID 68 can only be executed on some temperature control units if an external temperature specification has been received beforehand (via the command ID 15).			

Table 40: Rights

ID	Function	Unit	Command
62	Keys on the control panel (corresponds to "KEY"): 0= enable / 1 = disable	[-]	OUT_MODE_00_X

Table 41: Status

ID	Function	Unit	Command
74	Switch device on / off (stand-by): 0= switch on / 1 = switch off	[-]	START / STOP

Table 42: Programmer

ID	Function	Unit	Command
78	Start programmer	[-]	RMP_START
79	Pause programmer	[-]	RMP_PAUSE
80	Continue programmer (after pause)	[-]	RMP_CONT
81	Exit programmer	[-]	RMP_STOP
83	Delete program (all segments)	[-]	RMP_RESET

ID	Function	Unit	Command
84	Programmer segment	[-]	RMP_OUT_00_[Temp.]_[Zeit]_[Tol]_[Pumpstep]
89	Set number of program sequences XXX = 1 - 250; 0 = infinite	[-]	RMP_OUT_02

6.13 Importing and exporting data

Data records and programs can be exported from the temperature control unit to a USB stick so that they can then be imported into another temperature control unit. The exported file is marked with a tick.

All exported files are saved on the USB stick in the directory *CommandFiles* and its subdirectories. You can export the

following data to the USB stick:

- [Temperature graph]
- [Device status]
- [Device data]
- [Control parameters]
  - The currently set temperature control parameters (Tn / Xp / Kpe / ...) are exported to the USB stick here.
- [Contact module config.]
- [Analog module config.]

You can import the following data to a temperature control unit:

- [Control parameters]
- [Contact module config.]
- [Analog module config.]

7 Maintenance

7.1 Safety instructions Maintenance

DANGER!
Contact with live or moving parts

Electric shock

- Before starting any service or repair work, switch off the device and pull out the mains plug.
- Only skilled personnel are permitted to perform service and repair work.

DANGER!
Penetration of moisture/cleaning agent into the device

Electric shock

- Use a slightly damp cloth for cleaning.

WARNING!
Incorrect handling

Burning, fire, equipment damage

- Do not damage the refrigeration circuit.
- Do not use aggressive cleaning agents to clean the pump and control unit.
- Do not use cleaning agents containing chlorine for the bath boiler and the evaporator.
- Do not use sharp or pointed objects to clean the vaporizer.

WARNING!
Mechanical damage to the refrigerant circuit

Combustion, fire

- Do not damage the refrigeration circuit.
- Use suitable materials / tools to clean the condenser (e.g. soft brush),
  suction or compressed air).
  To do this, remove the removable cover plate on the front of the appliance.

WARNING!
Failure of the overtemperature protection or the low level protection is not detected

Burns, scalding, fire

- Carry out regular checks of the Tmax function and the low level protection.
- Carry out the checks according to the maintenance interval.

WARNING!
Undetected failure of the safety function

Fire

- The appliance must be switched off briefly after one month of uninterrupted operation at the latest.

CAUTION!
Contact with hot / cold appliance parts, accessories and tempering fluid

Burns, scalding, frostbite

- Bring appliance parts, accessories and temperature control fluid to room temperature before touching them.

7.2 Maintenance intervals

Interval	Maintenance work
before switching on the device	Check the mains connection cable for damage
monthly at the latest	Carry out a self-test by switching the device off and on again at the mains switch.
as required, monthly at the latest	Check (visually) the external hoses, hose clamps and screw connections for leaks and damage.
after changing the temperature control fluid, at least once a month	Checking the overtemperature protection
when filling for the first time after each transport, after changing the temperature control fluid, at least once a month	Checking the sub-level protection
as required, at the latest quarterly	Cleaning the air-cooled condenser
Quarterly (depending on water hardness and operating time, a shorter interval should be selected)	Descaling the cooling coil
as required, at the latest every six months	Checking the temperature control fluid for suitability for use
as required, at the latest annually	Check the external condition of the appliance for damage and stability.

Interval	Maintenance work
yearly	Checking the cooling water quality
twenty years old	Replacement of safety-relevant electrical and electromechanical components by LAUDA Service. This includes the circuit breaker and the power circuit board.

7.3 Cleaning the air-cooled condenser

WARNING!
Mechanical damage to the refrigerant circuit

Combustion, fire

- Do not damage the refrigeration circuit.
- Use suitable materials / tools to clean the condenser (e.g. soft brush),
  suction or compressed air).
  To do this, remove the removable cover plate on the front of the appliance.

Removing the front panel

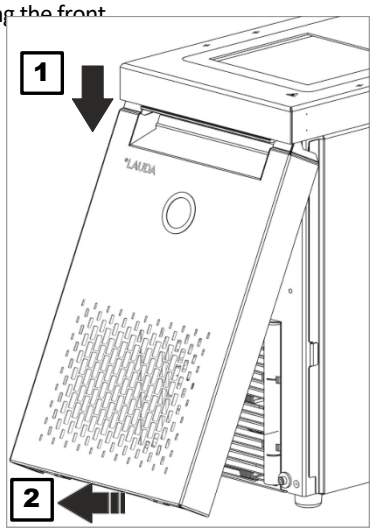


Fig. 71: Removing the front panel

1. Hold the front panel by the sides and slide it downwards (1).

   The front panel is held in place on the underside of the chassis by two magnets.

2. Tilt the lower end of the front panel towards you, as shown in the picture (2).
3. Slide the front panel further down at the top end and pull the front panel towards you.

Inserting the front panel

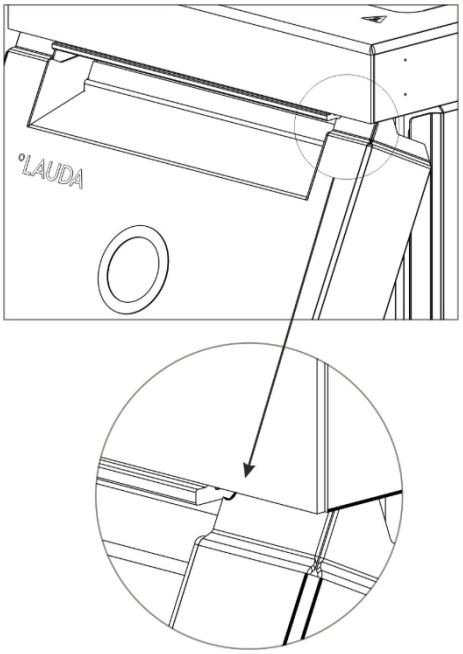


Fig. 72: Radii on the front panel

1. Hold the front panel by the sides, tilt the top edge towards the appliance and slide the edge under the edge of the bath.
2. Only push the front panel up far enough so that the radii are still visible Fig. 72.
3. Press the lower end of the front panel to the lower edge of the chassis.
4. Slide the front panel vertically upwards, further under the edge of the bath.
   ▶ The small tabs at the bottom of the front panel slide into the chassis.
5. To check, try pulling the lower end of the front panel towards you. The front panel must be firmly in place.
   ▶ You have inserted the front panel correctly.

7.4 Check tempering liquid

WARNING!
Contact with hot/cold heat transfer liquid

Scalding, cold burns

- Bring the heat transfer liquid to room temperature for analysis.

This warning is only valid for flammable tempering liquids:

WARNING!
Heat transfer liquid wear (degradation, aging, (oxidation))

Fire

- The serviceability of the heat transfer liquid must be checked if necessary (e.g. if the operating mode is changed) but at every prescribed maintenance interval at the latest. Continued use of the heat transfer liquid is only permitted following successful testing.

This warning is only valid for non-flammable temperature control fluids:

NOTICE!
Wear, contamination, dilution of the heat transfer liquid

Device damage

- The serviceability of the heat transfer liquid must be checked if necessary (e.g. if the operating mode is changed) but at every prescribed maintenance interval at the latest. Continued use of the heat transfer liquid is only permitted if the check indicates this.

Wear of the tempering liquid

- *Temperature control fluid is subject to wear, such as cracking or ageing (oxidation).*
- *If necessary, the temperature control fluid must be changed (e.g. when changing the operating mode), but at least every six months,*
  for suitability for use.
- *Further use of the temperature control fluid is only permitted with corresponding test results.*

Protective equipment:
- Safety glasses
- Protective gloves
- Protective work clothing

When testing the temperature control fluid, these points should be considered where applicable:

Flash point

1. Impairment of the flash point, for example due to ageing and oxidation, impurities and thermal stress.

Viscosity

2. Medium becomes more viscous through resinification, for example through oxidation.

Water content

3. Boiling delay due to water content in the thermal oil.

   Interruptions in the flow of the temperature control fluid due to boiling of low boilers and non-homogeneous fluid.

   For water-monoethylene glycol mixtures: The water content decreases during longer work at higher temperatures and the mixture becomes flammable.

Boiling point

4. Lowered boiling point due to cracking (splitting of C-C chains in hydrocarbons).

Turbidity

5. Increase in deposits, suspended solids and particles, for example due to thermal reactions and oxidation.

Color

6. Medium becomes darker or even black, for example due to oxidation.

Odor

7. Smells rancid, burnt, for example.

application

8. General deterioration in thermal performance. Reduction

   in the achievable temperature stability.

7.5 Checking the sub-level protection device

WARNING!
Contact with hot or cold heat transfer liquid

Scalding, cold burns

- Bring the heat transfer liquid to room temperature before draining.

If the level of the temperature control fluid falls below a certain threshold value, the appliance switches to a safe state: Components such as heating elements, pump and cooling unit are de-energized. The *low level* alarm is triggered.

1. Fill the appliance with suitable temperature control fluid.
2. Switch the appliance on. Set the target temperature to room temperature.
3. Attach a hose to the drain nozzle.
4. Open the drain cock and lower the level of the temperature control fluid.
   ▶ If the fill level drops lower, the appliance switches to a safe state,
   ▶ The *low level* alarm is triggered.
5. *The window with the low level alarm message normally appears automatically, unless the menu is currently open.*
   To display the window with the alarm message, press the [Display] *softkey. Depending on the previously selected view, you may have to press the* [Display] *softkey several times.*
6. Close the drain cock.
7. Top up the bath with tempering liquid.
   ▶ You have now eliminated the cause of the alarm.
8. Acknowledge the alarm with the enter button [O].
   ▶ The alarm message is deleted, the device is in standby mode.
9. Switch the appliance to temperature control mode by pressing the [START] softkey.

If the temperature control fluid level does not drop within five seconds and the appliance switches to a safe state (heating elements, pump and cooling unit are de-energized, "low level" alarm), take the appliance out of operation and contact LAUDA Service.

7.6 Check overtemperature protection device

WARNING!
Failure of the overtemperature protection or the low level protection is not detected

Burns, scalding, fire

- Carry out regular checks of the Tmax function and the low level protection.
- Carry out the checks according to the maintenance interval.

If the temperature of the temperature control fluid rises above a certain threshold value, the set maximum temperature T_{max}, the appliance switches to a safe state: Components such as heating elements, pump and cooling unit are de-energized.

The appliance's overtemperature protection device may trigger an overtemperature alarm at temperatures as low as 5 °C below the set T_{max} value.

This is because the integrated safety system works with a separate temperature sensor, which may deviate slightly downwards from the value shown on the display.

Therefore, set T_{max} high enough to ensure trouble-free operation.

The check is carried out by temporarily setting the maximum temperature (Tmax) to a value below the current bath temperature. The appliance must then switch to a safe state: Components such as heating elements, pump and cooling unit are de-energized. The *overtemperature* alarm is triggered.
The test can only be carried out at a bath temperature above 10 °C.

1. Set the set temperature value T_{set} to a value above the room temperature, for example 50 °C. Wait until the bath temperature has almost reached the set temperature.
2. Press and hold the T_{max} button.
   ▶ The value T_{max} is shown on the display.
3. Press the enter key [O].
   ▶ The input window is displayed. The cursor under the T_{max} value flashes.
4. Use the arrow buttons to set a T_{max} value that is at least 5 °C below the current temperature of the liquid.
5. Confirm the new value with the enter key [O].
6. Check whether the flashing value is correct.

7. Confirm the new value with the [ANW] softkey and release the T_{max}key.

   ▶ The new value is active.

8. The device switches to a safe state:

   ▶ Components such as heating elements, pump and cooling unit are de-energized.

   ▶ The *overtemperature* alarm is triggered.

9. *The window with the overtemperature alarm message normally appears automatically, unless the menu is currently open.*
   To display the window with the alarm message anyway, press the [Display] *softkey. Depending on the previously selected view, you may have to press the* [Display] *softkey several times.*

10. Set the T_{max}value again using the current temperature of the liquid.

    ▶ You have now eliminated the cause of the alarm.

11. Acknowledge the alarm with the enter button [O].

    ▶ The alarm message is deleted, the device is in standby mode.

12. Switch the appliance to temperature control mode by pressing the [START] softkey.

    ▶ Components such as heating elements, pump and cooling unit are actively switched.

If the above actions do not lead to a switchover to the safe state (heating elements, pump and cooling unit de-energized, overtemperature alarm), take the appliance out of operation and contact LAUDA Service.

8 Faults

Troubleshooting and repair

DANGER!
Contact with live or moving parts

Electric shock

- Before starting any service or repair work, switch off the device and pull out the mains plug.
- Only skilled personnel are permitted to perform service and repair work.

DANGER!
Incorrect handling

Explosion, burns, fire

- Only certified specialists who are trained to handle flammable refrigerants are authorized to perform repair and disposal work.
- In order to avoid the risk of possible ignition due to incorrect maintenance or the installation of incorrect parts, only specialists certified by the manufacturer are authorized to carry out maintenance.
- Any components and parts must be replaced with identical parts.

8.1 Alarms, errors and warnings

The appliances' SelfCheck assistant monitors various appliance parameters and issues alarms, warnings or errors in borderline cases. Any alarms, error messages and warnings triggered on the device are displayed on the control panel as a code with a fault description.

Procedure for alarms

Alarms are safety-relevant. The appliance components, such as the pump, switch off. The appliance emits a signal tone. After eliminating the cause of the fault, you can acknowledge alarms by pressing the enter button.

You can find a list of alarms in Chapter 8.2 "Alarms" on page 129.

Procedure for warnings

Warnings are not relevant to safety. The appliance continues to run. The appliance emits a continuous tone for a short time. Warnings are not issued periodically.
Warnings can be acknowledged manually if their cause has been rectified. If the cause disappears on its own, the warning disappears automatically after 2 minutes.

Procedure for errors

If an error occurs, the device emits a signal tone.

In the event of a fault, switch the appliance off at the mains switch. If the error occurs again after switching the device on, make a note of the error code and the corresponding description and contact LAUDA Service. Contact details can be found atChapter 1.15 "Contact LAUDA" on page 12.

In the menu structure under *Fault memory*, the faults are displayed with a corresponding description and a fault code in the form of a consecutive number.

8.2 Alarms

Alarms are shown on all displays in use.

Table 43: Temperature control unit alarms

Alarm code	Output	Description	User action
1	Pump lower level	Low level detected by pump, pump speed too high	Refill tempering fluid
2	Lower level	Lower level detected by float	Refill tempering fluid
3	Overtemperature	Excess temperature (bath temperature/flow temperature > Tmax)	Allow the appliance to cool down to T< Tmax; adjust Tmax if necessary
4	Pump is blocked	Pump standstill	Switch off device, check viscosity
9	T ext Pt100	No actual value from the Pt100 module	Check temperature sensor
10	T ext analog	No actual value from the analog interface	Check temperature sensor
11	T ext serial	No actual value from the serial interface	Check serial connection
12	Analog input 1	Analog module: Current interface 1, interruption.	Check connection
13	Analog input 2	Analog module: Current interface 2, interruption.	Check connection
14	Overlevel	Overlevel detected by float	Empty excess tempering fluid from the appliance; caution: risk of burns
15	Digital input	Interference signal at the input of the contact module	(customer application)
16	Refill	Tempering liquid level is too low	Refill tempering fluid
20	T ext Ethernet	No actual value from the Ethernet interface	Check serial connection check whether the control station specifies the actual temperature via the Ethernet interface

Alarm code	Issue	Description	User action
22	Disconnection	A.) Connection to the control station (PC control) is interrupted B.) Set timeout of the control station monitoring exceeded (interface function "ID34 Safety")	A.) Check cable connection B.) Check interface communication, adjust timeout if necessary
23	T ext EtherCAT	No actual value from the EtherCAT interface	Check serial connection

9 Decommissioning

9.1 Changing/draining heat transfer liquid

WARNING!
Contact with hot or cold heat transfer liquid

Scalding, cold burns

- Bring the heat transfer liquid to room temperature before draining.

WARNING!
Splashing heat transfer liquid

Eye damage

- Always wear suitable safety glasses when working on the device.

Observe the regulations for the disposal of used heat transfer liquid.

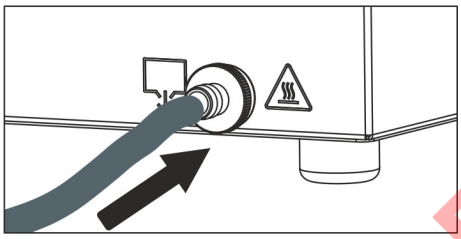


Fig. 73: Attaching hose

1. Allow the device and heat transfer liquid to cool or warm up to room temperature.
2. Turn oR the device and pull out the mains plug.
3. Attach a hose to the drain nozzle.
4. Place the hose in a suitable container to collect the heat transfer liquid.

   It may be necessary to drain the device several times if the filling volume is high.

5. Open the drain tap by turning it counterclockwise.

   Drain the bath, external consuming unit, accessories and hoses completely.

6. If necessary, clean or flush out the device (with new heat transfer liquid, for example).

After changing to a different heat transfer liquid, you may have to set new values for the temperature limit, overtemperature switch-off point and/or the controller output limit.

10 Disposal

10.1 Dispose of refrigerant

DANGER!
Uncontrolled leaking of refrigerant

Explosion, burns, fire

- Never dispose of a cooling circuit that is still pressurized.
- Only certified specialists who are trained in the handling of flammable refrigerants are permitted to perform disposal work.

Personnel: ■ Certified specialist

The type and filling weight of the refrigerant are indicated on the type plate.

1. Only have repairs and disposal carried out by a certified refrigeration technician.

10.2 Device disposal

The following applies for EU member states: The device must be disposed of according to Directive 2012/19/EU (WEEE Waste of Electrical and Electronic Equipment).

10.3 Disposing of packaging

The following applies for EU member states: Disposal of the packaging must proceed according to regulation 94/62/EC.

11 Technical data

11.1 General technical data

Table 44: Universa PRO display

Specification	Value	Unit
Display	TFT color display	---
Display size	3,5 70 x 53	Inch mm
Display resolution	320 x 240	Pixel
Display resolution	0,01	°C
Setting resolution	0,01	°C

Table 45: Display Universa MAX

Specification	Value	Unit
Display	TFT color display	---
Display size	5 108 x 65	Inch mm
Display resolution	800 x 480	Pixel
Display resolution	0,01	°C
Setting resolution	0,01	°C

Table 46: Device data

Specification	Value	Unit
Installation and use	indoors	---
Use up to a maximum height above sea level	2.000	m
IP code according to EN 60529	IP 21	---
Overvoltage category	II	---
Protection class for electrical equipment DIN EN 61 140 (VDE 0140-1)	1	---
Classification according to DIN 12 876-1		
- Class designation	III	---
- Labeling	FL (suitable for flammable and non-flammable liquids) opportunities)	---
Temperature constancy Heating thermostat[1]	±0,01	K
Constant temperature Refrigerated thermostat[1]		
- PRO device variant	±0,02	K
- MAX device variant	±0,01	K
Humidity	Maximum relative humidity 80 % at temperatures up to 31 °C, decreasing linearly up to 50 % relative humidity at 40 °C	%
Degree of soiling according to EN 60664-1 / VDE 0110-1	Pollution degree 2 only non-conductive pollution, although temporary pollution caused by condensation is possible. conductivity is expected	---
Ambient temperature at		
- Bath temperature up to a maximum of 250 °C	5 - 40	°C
- Bath temperature up to a maximum of 300 °C	5 - 35	°C
Storage temperature	5 - 40	°C
Transport temperature	-20 - 43	°C
Mains voltage tolerance range (thermostats)	for mains connection 200 - 240 V: up to± 10 % of the rated voltage for mains connection 100 - 125 V: up to +5 % / -10 % of the nominal voltage	---
With WLAN module installed:		
- RF output power (theoretical maximum value)	19,96	dBm EIRP
- Frequency range	2,400-2,4835	GHz

[1]- Temperature constancy determined according to standard DIN 12876-2

Table 47: Tolerance range of mains voltages for cooling thermostats

Device variant	Device type Refrigeration thermostat	Voltage [V]	Tolerance range	Amperage [A]	Frequenc y [Hz]
MAX	U 845 M	100 - 125	+5 % / -10 %	16	50 / 60
MAX	U 845 M	200 - 240	±10 %	16	50 / 60
MAX	U 855 M	100 - 125	+5 % / -10 %	16	50 / 60
MAX	U 855 M	200 - 240	±10 %	16	50 / 60
MAX	U 890 M	200 - 240	±10 %	16	50 / 60
MAX	U 1645 M	100 - 125	+5 % / -10 %	16	50 / 60
MAX	U 1645 M	200 - 240	±10 %	16	50 / 60
MAX	U 2040 M	100 - 125	+5 % / -10 %	16	50 / 60
MAX	U 2040 M	200 - 240	±10 %	16	50 / 60
MAX	U 4230 M	100 - 125	+5 % / -10 %	16	50 / 60
MAX	U 4230 M	200 - 240	±10 %	16	50 / 60
PRO	U 420 P	100	±10 %	12	50 / 60
PRO	U 420 P	110 - 125	+5 % / -10 %	12	60
PRO	U 420 P	220 - 240	±10 %	12	50 / 60
PRO	U 630 P	100	±10 %	12	50 / 60
PRO	U 630 P	110 - 125	+5 % / -10 %	12	60
PRO	U 630 P	220 - 240	±10 %	12	50 / 60
PRO	U 635 P	100 - 125	+5 % / -10 %	12	50 / 60
PRO	U 635 P	220 - 240	±10 %	12	50 / 60
PRO	U 1635 P	100 - 125	+5 % / -10 %	12	50 / 60
PRO	U 1635 P	220 - 240	±10 %	12	50 / 60
PRO	U 1245 P	100 - 125	+5 % / -10 %	12	50 / 60
PRO	U 1245 P	200 - 240	±10 %	12	50 / 60

Table 48: Mains voltages and current consumption of the cooling thermostats

Device type	Voltage / Frequency	Power consumption
U 420	220 - 240 V; 50/60 Hz	1,5 A
U 420	110 - 127 V; 60 Hz	3,2 A
U 630	220 - 240 V; 50/60 Hz	1,9 A
U 630	110 - 127 V; 60 Hz	4,2 A
U 635	220 - 240 V; 50/60 Hz	1,9 A
U 635	100 - 127 V; 50/60 Hz	5,6 A
U 830	110 - 127 V; 60 Hz	4,2 A
U 845	100 - 240 V; 50/60 Hz	7,4 A
U 855	100 - 240 V; 50/60 Hz	8,7 A
U 890	200 - 240 V; 50/60 Hz	8,6 A
U 1225	110 - 127 V; 60 Hz	4,2 A
U 1245	100 - 240 V; 50/60 Hz	7,4 A
U 1625	110 - 127 V; 60 Hz	4,2 A
U 1635	220 - 240 V; 50/60 Hz	1,9 A
U 1635	100 - 127 V; 50/60 Hz	5,6 A
U 1645	100 - 240 V; 50/60 Hz	8,7 A
U 2040	100 - 240 V; 50/60 Hz	7,4 A
U 4230	100 - 240 V; 50/60 Hz	7,4 A

11.2 Bathroom thermostats

Table 49: Immersion circulator PRO

	Unit	PRO
Working temperature range	°C	30 - 200
Operating temperature range	°C	30 - 200
Extended operating temperature range[1]	°C	20 - 200
Device dimensions (W x D)	mm	195 x 234
Appliance height (H)	mm	333
Effective depth	mm	140
Sound pressure level[2]	dB(A)	49
Weight	kg	4,1
Distance to the surroundings		
- Front	mm	200
- Rear	mm	200
- Right	mm	200
- Links	mm	200

Table 50: Universa PRO heating bath thermostats

	Unit	U 4 P	U 8 P	U 16 P	U 40 P
Working temperature range	°C	30 - 200	40 - 200	40 - 200	40 - 200
Extended working temperature range[1]	°C	20 - 200	20 - 200	20 - 200	20 - 200
Device dimensions (W x D)	mm	190 x 330	230 x 400	280 x 550	380 x 850
Appliance height (H)	mm	436	476	476	478
Bathroom opening (W x D)	mm	130 x 100	150 x 150	200 x 300	300 x 600
Bath depth (H)	mm	160	200	200	200
Effective depth	mm	140	180	180	180
Bath top height	mm	240	280	280	282
Filling volume					
- minimal	L	3,0	5,8	11,5	27,5
- maximum	L	5,0	8,5	17,0	41
Drain connection Outer diameter	mm	∅12	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	49	49	49	49
Weight	kg	10,5	15	19	28

	Unit	U 4 P	U 8 P	U 16 P	U 40 P
Cooling coil connection	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Distance to the surroundings	mm	200	200	200	200

Table 51: Universa MAX heating bath thermostats

	Unit	U 8 M	U 12 M	U 16 M	U 20 M	U 40 M
Working temperature range	°C	70 - 300	70 - 300	70 - 300	65 - 300	65 - 300
Extended working temperature range[1]	°C	20 - 300	20 - 300	20 - 300	20 - 300	20 - 300
Device dimensions (W x D)	mm	230 x 400	280 x 450	280 x 550	280 x 450	380 x 850
Appliance height (H)	mm	497	497	497	617	499
Bathroom opening (W x D)	mm	150 x 150	200 x 200	200 x 300	200 x 200	300 x 600
Bath depth (H)	mm	200	200	200	320	200
Effective depth	mm	180	180	180	300	180
Bath top height	mm	280	280	280	400	282
Filling volume						
- minimal	L	5,8	8,5	11,5	9,5	29
- maximum	L	8,5	13,0	17,0	22,0	42
Connection thread (external) for application, flow/return	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Discharge connection Outer diameter	mm	∅12	∅12	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	53	53	53	53	53
Weight	kg	14,5	18	20	22,5	29
Cooling coil connection	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Distance to the surroundings	mm	200	200	200	200	200

[1]- with forced cooling by means of a cooling coil

[2]- Sound pressure level determined in accordance with standard EN 11201 for operating position in front of the appliance at a distance of 1 meter

Device variants with ball bearing pump

*The appliance types U 8 M, U 12 M, U 16 M and U 40 M are also available with a ball bearing pump. The technical data is identical to the information in the table*Table 51 "Heat and cooling capacity". Universa MAX bath thermostats" on page 138.

11.3 Refrigerated bath thermostats

Table 52: Universa PRO cooling bath thermostats

	Unit	U 420 P	U 630 P	U 635 P	U 845 P
ACC range[1]	°C	-20 - 200	-30 - 200	-35 - 200	-45 - 200
Device dimensions (W x D)	mm	210 x 410	215 x 460	290 x 480	310 x 490
Appliance height (H)	mm	616	616	646	736
Bathroom opening (W x D)	mm	130 x 100	130 x 150	130 x 150	150 x 150
Bath depth (H)	mm	160	160	160	200
Effective depth	mm	140	140	140	180
Bath top height	mm	420	420	450	540
Filling volume - minimal - maximum	 L L	 1,8 4	 3,2 5,7	 3,2 5,7	 5,0 8,0
Connection thread (external) for application, flow/return	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Drain connection Outer diameter	mm	∅12	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	50	50	52	56
Weight	kg	25	26	33	43
Distance to the surroundings	mm	200	200	200	200

	Unit	U 855 P	U 1245 P	U 1635 P
ACC range[1]	°C	-50 - 200	-45 - 200	-35 - 200
Device dimensions (W x D)	mm	310 x 490	310 x 510	310 x 610
Appliance height (H)	mm	736	736	736
Bathroom opening (W x D)	mm	150 x 150	200 x 200	200 x 300
Bath depth (H)	mm	200	200	200
Effective depth	mm	180	180	180
Bath top height	mm	540	540	540
Filling volume - minimal - maximum	 L L	 5,0 8,0	 8,5 13,0	 11,0 16,5
Connection thread (external) for application, flow/return	mm	M16 x 1	M16 x 1	M16 x 1
Drain connection Outer diameter	mm	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	60	56	52

	Unit	U 855 P	U 1245 P	U 1635 P
Weight	kg	43	43	38
Distance to the surroundings	mm	200	200	200

Table 53: Refrigerated bath thermostats Universa MAX

	Unit	U 845 M	U 855 M	U 890 M	U 1245 M
ACC range[1]	°C	-45 - 200	-55 - 200	-90 - 200	-45 - 200
Device dimensions (W x D)	mm	310 x 490	310 x 490	525 x 615	310 x 510
Appliance height (H)	mm	757	757	787	757
Bathroom opening (W x D)	mm	150 x 150	150 x 150	150 x 150	200 x 200
Bath depth (H)	mm	200	200	200	200
Effective depth	mm	180	180	180	180
Bath top height	mm	540	540	570	540
Filling volume - minimal - maximum	 L L	 5,0 8,0	 5,0 8,0	 5,0 8,0	 8,5 13,0
Connection thread (external) for application, flow/return	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Drain connection Outer diameter	mm	∅12	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	58	60	56	58
Weight	kg	44	44	76	44
Distance to the surroundings	mm	200	200	200	200

	Unit	U 1645 M	U 2040 M	U 4230 M
ACC range[1]	°C	-45 - 200	-40 - 200	-30 - 200
Device dimensions (W x D)	mm	310 x 610	350 x 540	450 x 690
Appliance height (H)	mm	757	927	927
Bathroom opening (W x D)	mm	200 x 300	200 x 200	300 x 350
Bath depth (H)	mm	200	320	320
Effective depth	mm	180	300	300
Bath top height	mm	540	710	710
Filling volume - minimal - maximum	 L L	 10,5 16,5	 9,0 21,0	 19,0 47,0
Connection thread (external) for application, flow/return	mm	M16 x 1	M16 x 1	M16 x 1

	Unit	U 1645 M	U 2040 M	U 4230 M
Drain connection Outer diameter	mm	∅12	∅12	∅12
Sound pressure level[2]	dB(A)	60	55	55
Weight	kg	48	55	66
Distance to the surroundings	mm	200	200	200

[1]- The ACC range (Active Cooling Control), in accordance with DIN 12876, is the working temperature range when operating with an active cooling unit.

[2]- Sound pressure level determined in accordance with standard EN 11201 for operating position in front of the appliance at a distance of 1 meter

Device variants with ball bearing pump

The appliance types U 845 M, U 855 M, U 890 M, U 1245 M and U 1645 M are also available with ball bearings. Pump. The technical data is identical to the information in of the table Table 53 "Refrigerated bath thermostats Universa MAX" on page 140.

11.4 Hydraulic data

Table 54: Universa PRO

Specification		PRO	U 4 P, U 8 P, U 16 P, U 40 P	U 420 P, U 630 P, U 635 P, U 845 P, U 855 P, U 1245 P, U 1635 P
Pump type	---	Vario pump	Vario pump	Vario pump
Pump stages	Quantity	6	6	6
Pump data 50/60 Hz - Maximum delivery pressure - Maximum flow rate	 bar L/min	 0,55 22	 0,55 22	 0,55 22
Connection thread (external) flow/return	mm	---	---	M16 x 1
Discharge connection Outer diameter	mm	---	∅12	∅12

Table 55: Universa MAX

Specification	Unit	U 8 M, U 12 M, U 16 M, U 40 M	U 845 M, U 855 M, U 890 M, U 1245 M, U 1645 M
Pump type	---	Varioflex pump	Varioflex pump
Pump stages	Quantity	8	8
Pump data 50/60 Hz - Maximum delivery pressure	 bar	 0,7	 0,7

Specification	Unit	U 8 M, U 12 M, U 16 M, U 40 M	U 845 M, U 855 M, U 890 M, U 1245 M, U 1645 M
- Maximum conveying suction	bar	0,4	0,4
- Maximum flow rate (pressure)	L/min	25	25
- Maximum flow rate (suction)	L/min	23	23
Connection thread (external) flow/return	mm	M16 x 1	M16 x 1
Discharge connection Outer diameter	mm	∅12	∅12

Table 56: Universa MAX

Specification		U 20 M	U 2040 M, U 4230 M
Pump type	---	Vario pump	Vario pump
Pump stages	Quantity	8	8
Pump data 50/60 Hz			
- Maximum delivery pressure	bar	1,1	1,1
- Maximum flow rate	L/min	32	32

Table 57: Universa MAX with ball bearing pump

Specification	Unit	U 8 M, U 12 M, U 16 M, U 40 M	U 845 M, U 855 M, U 890 M, U 1245 M, U 1645 M
Pump type	---	Varioflex pump	Varioflex pump
Pump stages	Quantity	8	8
Pump data 50/60 Hz			
- Maximum delivery pressure	bar	0,7	0,7
- Maximum conveying suction	bar	0,4	0,4
- Maximum flow rate (pressure)	L/min	25	25
- Maximum flow rate (suction)	L/min	23	23
Connection thread (external) flow/return	mm	M16 x 1	M16 x 1
Drain connection Outer diameter	mm	∅12	∅12

Data is also valid for pump with ball bearing

11.5 Power consumption and heat output

Table 58: Immersion thermostat PRO

Mains connection	Current consumption in A	Maximum heating output in kW for lower / upper mains voltage
200 - 240 V; 50/60 Hz	12	1,9 / 2,8
100 - 125 V; 50/60 Hz	12	1,1 / 1,5

Table 59: PRO heating thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Mains connection	Current consumption in A	U 4 P	U 8 P	U 16 P	U 40 P
200 - 240 V; 50/60 Hz	12	1,9 / 2,8	1,9 / 2,8	1,9 / 2,8	1,9 / 2,8
100 - 125 V; 50/60 Hz	12	1,1 / 1,5	1,1 / 1,5	1,1 / 1,5	1,1 / 1,5

Table 60: PRO cooling thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Mains connection	Current consumption in A	U 420 P	U 630 P	U 635 P	U 1635 P
220 - 240 V; 50/60 Hz	12	2,3 / 2,8	2,3 / 2,8	2,3 / 2,8	2,3 / 2,8
110 - 125 V; 60 Hz	12	1,3 / 1,5	1,3 / 1,5	---	---
100 - 125 V; 50/60 Hz	12	---	---	1,1 / 1,5	1,1 / 1,5

		Maximum heating output in kW for lower / upper mains voltage		
Mains connection	Current consumption in A	U 845 P	U 855 P	U 1245 P
200 - 240 V; 50/60 Hz	12	1,9 / 2,8	1,9 / 2,8	1,9 / 2,8
100 - 125 V; 50/60 Hz	12	1,1 / 1,5	1,1 / 1,5	1,1 / 1,5

Table 61: MAX heating thermostats

		Maximum heating output in kW for lower / upper mains voltage				
Mains connection	Maximum current consumption in A	U 8 M	U 12 M	U 16 M	U 20 M	U 40 M
200 - 240 V; 50/60 Hz	16	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7
100 - 125 V; 50/60 Hz	16	1,4 / 2,0	1,4 / 2,0	1,4 / 2,0	1,4 / 2,0	1,4 / 2,0

Table 62: MAX cooling thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Mains connection	Maximum current consumption in A	U 845 M	U 855 M	U 890 M	U 1245 M
200 - 240 V; 50/60 Hz	16	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7
100 - 125 V; 50/60 Hz	16	1,4 / 2,0	1,4 / 2,0	---	1,4 / 2,0

		Maximum heating output in kW for lower / upper mains voltage		
Mains connection	Maximum current consumption in A	U 1645 M	U 2040 M	U 4230 M
200 - 240 V; 50/60 Hz	16	2,8 / 3,7	2,8 / 3,7	2,8 / 3,7
100 - 125 V; 50/60 Hz	16	1,4 / 2,0	1,4 / 2,0	1,4 / 2,0

11.6 Cooling capacity

The cooling capacity is measured at a specific temperature of the tempering liquid. The ambient temperature for the measurement is 20 °C. Ethanol is used as the temperature control fluid up to 20 °C; thermal oil is used at temperatures above 20 °C.

Cooling thermostats PRO

Table 63: 1-stage cooling unit 50/60 Hz

	Unit	U 420 P	U 630 P	U 635 P	U 1635 P	Pump stage
Cooling capacity with						
200 °C	W	200	240	500	500	6
100 °C	W	200	160	500	500	6
20 °C	W	200	300	500	500	6

	Unit	U 420 P	U 630 P	U 635 P	U 1635 P	Pump stage
10 °C	W	190	290	500	470	6
0 °C	W	180	250	470	430	6
-10 °C	W	140	190	300	370	6
-20 °C	W	70	120	170	150	3
-30 °C	W	---	20	60	50	3
-35 °C	W	---	---	20	20	3

Table 64: 1-stage cooling unit 50/60 Hz

	Unit	U 845 P	U 855 P	U 1245 P	Pump stage
Cooling capacity with 200 °C	W	800	1600	800	6
100 °C	W	800	1600	800	6
20 °C	W	800	1600	800	6
10 °C	W	730	1450	770	6
0 °C	W	700	1250	730	6
-10 °C	W	590	880	600	6
-20 °C	W	440	620	450	3
-30 °C	W	260	380	260	3
-40 °C	W	120	180	120	3
-45 °C	W	50	---	50	3
-50 °C	W	---	50	---	3
-55 °C	W	---	20	---	3

Cooling thermostats MAX

Table 65: 1-stage cooling unit 50/60 Hz

	Unit	U 845 M	U 855 M	U 1245 M	Pump stage
Cooling capacity with 200 °C	W	800	1600	800	8
100 °C	W	800	1600	800	8
20 °C	W	800	1600	800	8
10 °C	W	730	1450	770	8
0 °C	W	700	1250	730	8
-10 °C	W	590	880	600	8
-20 °C	W	440	620	450	4

	Unit	U 845 M	U 855 M	U 1245 M	Pump stage
-30 °C	W	260	380	260	4
-40 °C	W	120	180	120	4
-45 °C	W	50	---	50	4
-50 °C	W	---	50	---	4
-55 °C	W	---	20	---	4

Table 66: 1-stage cooling unit 50/60 Hz

	Unit	U 1645 M	U 2040 M	U 4230 M	Pump stage
Cooling capacity with 200 °C	W	1600	800	800	8
100 °C	W	1600	800	800	8
20 °C	W	1600	800	800	8
10 °C	W	1450	740	740	8
0 °C	W	1200	710	700	8
-10 °C	W	860	600	590	8
-20 °C	W	580	450	430	4
-30 °C	W	350	260	180	4
-40 °C	W	150	100	---	4
-45 °C	W	70	---	---	4

Table 67: 2-stage cooling unit 50/60 Hz

	Unit	U 890 M	Pump stage
Cooling capacity with 200 °C	W	800	8
100 °C	W	800	8
20 °C	W	800	8
10 °C	W	780	8
0 °C	W	740	8
-10 °C	W	720	8
-20 °C	W	720	4
-30 °C	W	680	4
-40 °C	W	640	4
-50 °C	W	600	4
-60 °C	W	460	4
-70 °C	W	280	4
-80 °C	W	120	4
-90 °C	W	20	4

11.7 Refrigerant and filling quantity

Cooling thermostats

Table 68: PRO single-stage refrigeration unit

	Unit	U 420 P	U 630 P	U 635 P	U 845 P
Natural refrigerant	---	R-600a	R-600a	R-290	R-290
Maximum filling weight	kg	0,03	0,03	0,052	0,08
$GWP_{(100a)}$*	---	3	3	3	3

	Unit	U 855 P	U 1245 P	U 1635 P
natural refrigerant	---	R-1270	R-290	R-290
Maximum filling weight	kg	0,075	0,08	0,052
$GWP_{(100a)}$*	---	3	3	3

Cooling thermostats

Table 69: MAX single-stage cooling unit

	Unit	U 845 M	U 855 M	U 1245 M
Natural refrigerant	---	R-290	R-1270	R-290
Maximum filling weight	kg	0,08	0,075	0,08
$GWP_{(100a)}$*	---	3	3	3

	Unit	U 1645 M	U 2040 M	U 4230 M
natural refrigerant	---	R-1270	R-290	R-290
Maximum filling weight	kg	0,075	0,08	0,08
$GWP_{(100a)}$*	---	3	3	3

Table 70: Two-stage cooling unit MAX

	Unit	U 890 M
Natural refrigerant (1st stage)	---	R-1270
Maximum filling weight (1st stage)	kg	0,06
$GWP_{(100a)}$*	---	3
Natural refrigerant (2nd stage)	---	R-170
Maximum filling weight (2nd stage)	kg	0,035
$GWP_{(100a)}$*	---	6

Global Warming Potential (GWP), CO_2comparison= 1.0

** Time frame 100 years - according to IPCC IV*

11.8 Heating curve

Heating curves measured with thermal oil as temperature control fluid and closed bath lid.

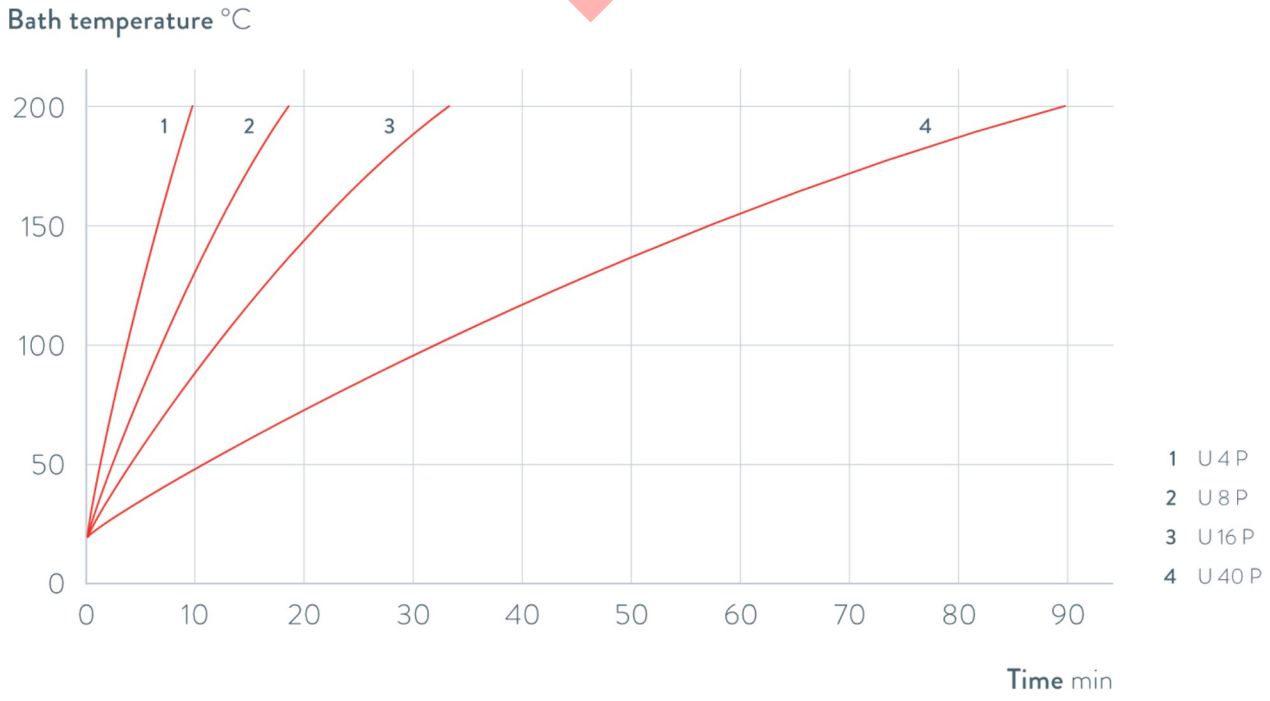


Fig. 74: Heating curves for Universa PRO thermostats

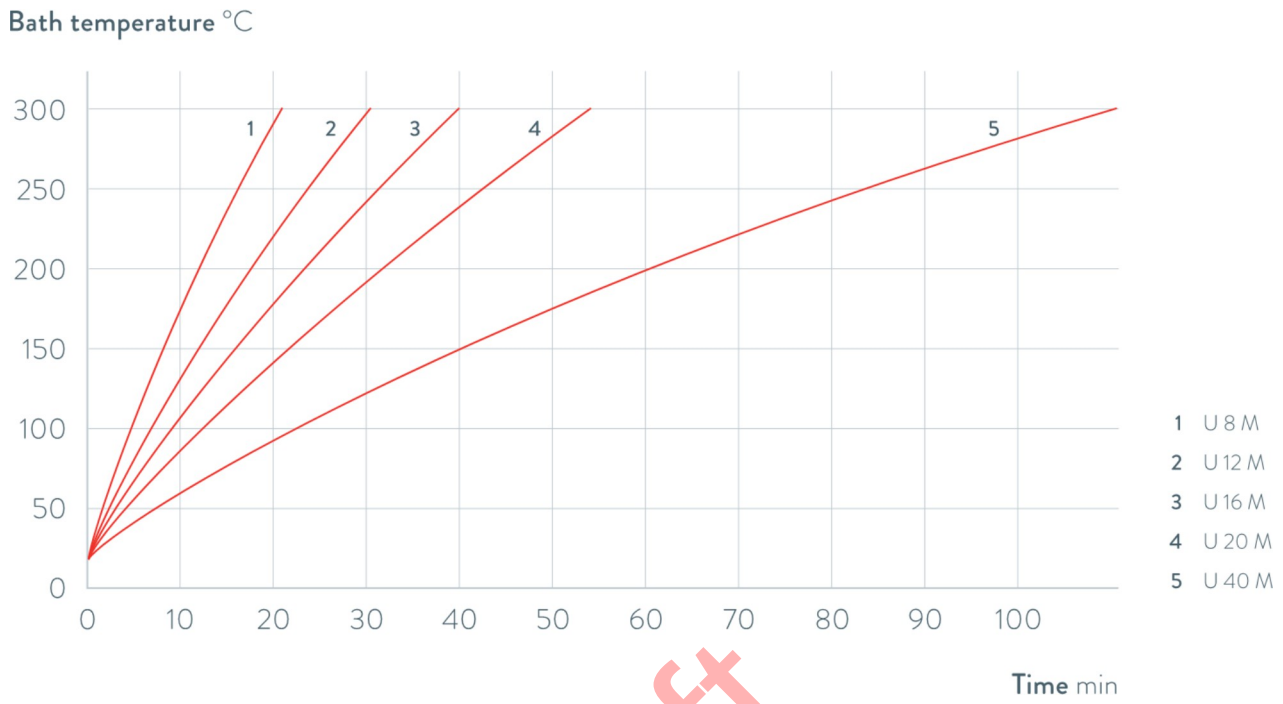


Fig. 75: Heating curves for Universa MAX heating thermostats

11.9 Cooling curve

Cooling curves measured with ethanol as tempering liquid and closed bath lid.

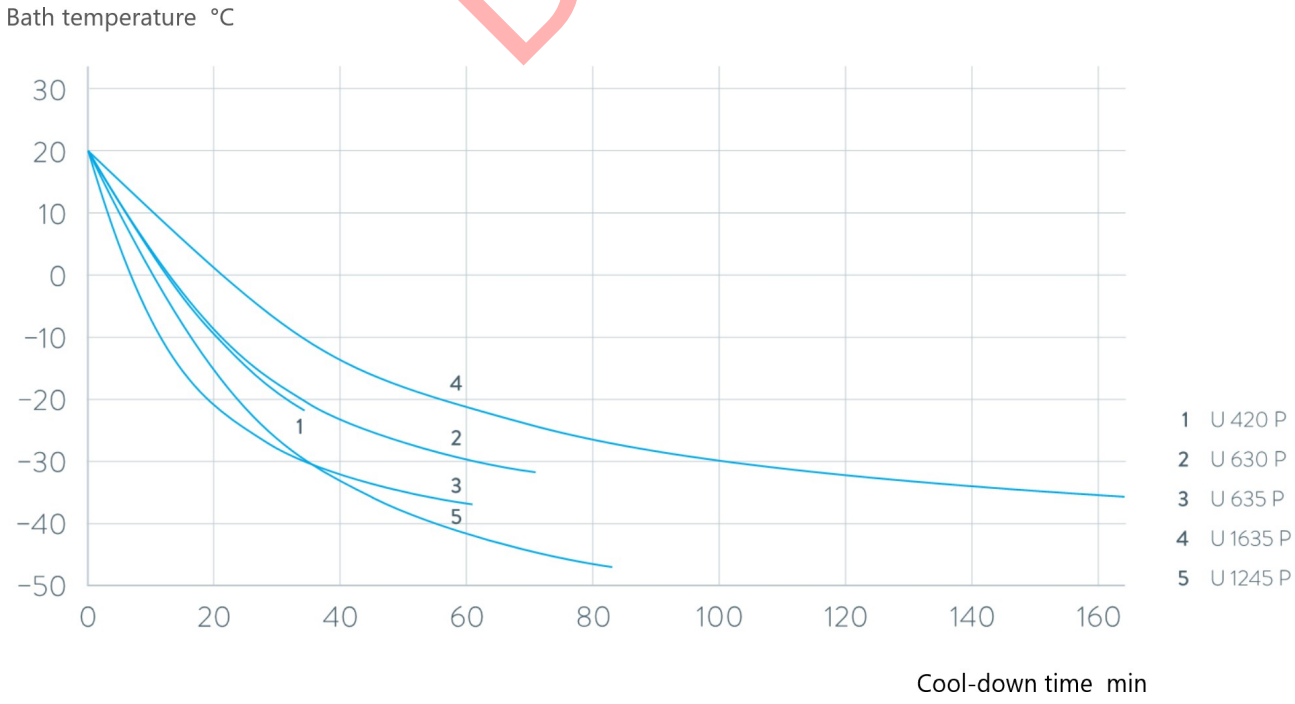


Fig. 76: Cooling curves for Universa PRO cooling thermostats

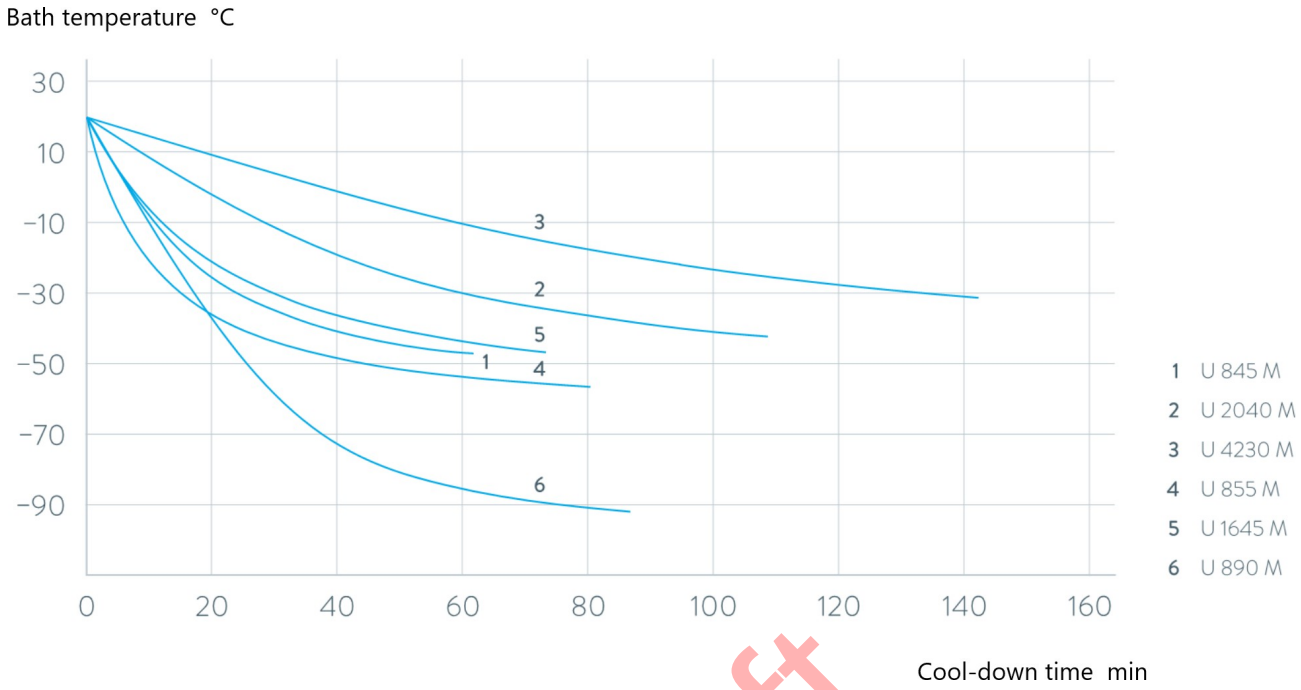


Fig. 77: Cooling curves for Universa MAX cooling thermostats

11.10 Pump characteristic curve

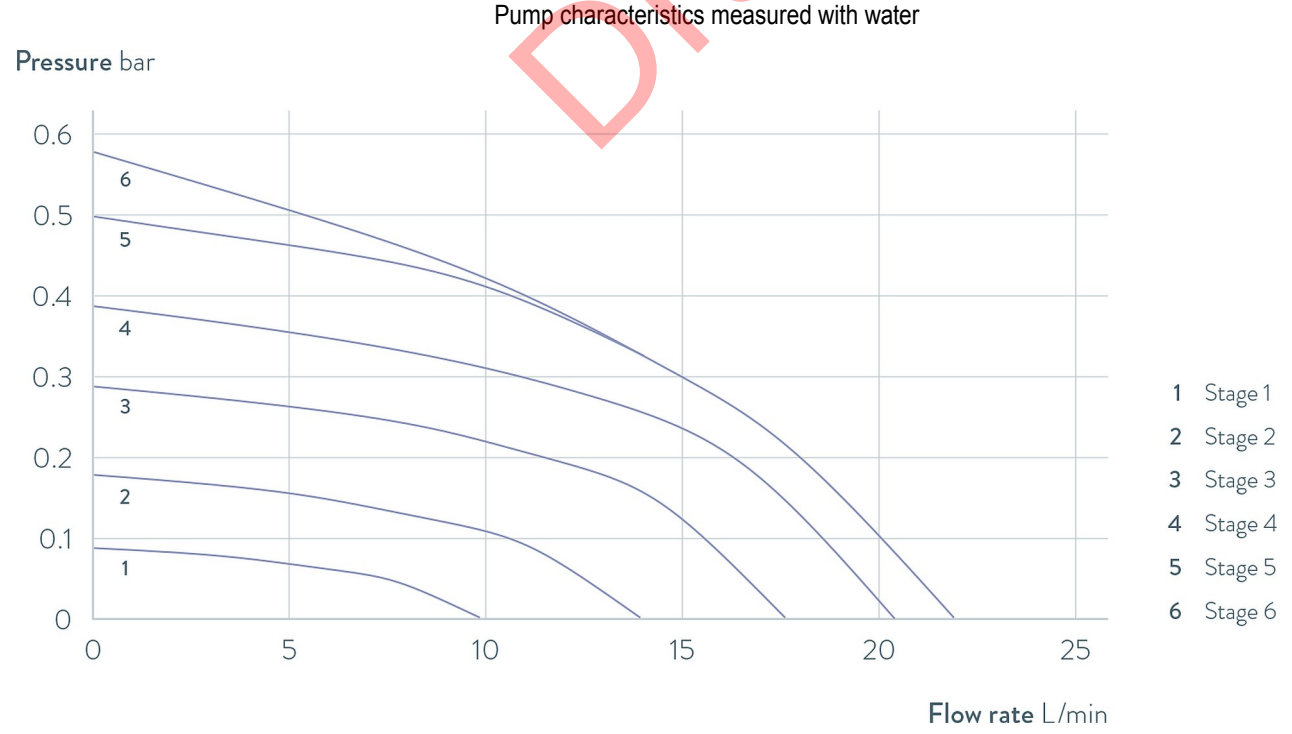


Fig. 78: Pump characteristic Universa PRO

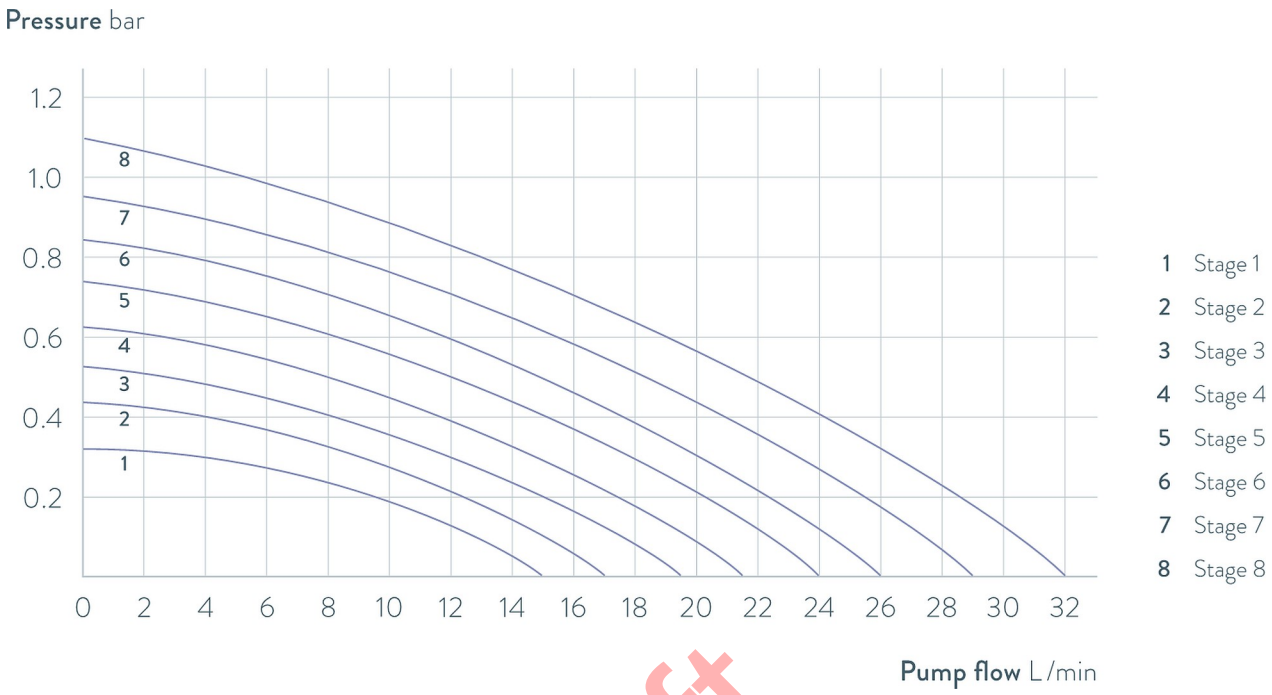


Fig. 79: Pump characteristic Universa MAX with pressure pump (vario pump) for a bath depth of 320 mm

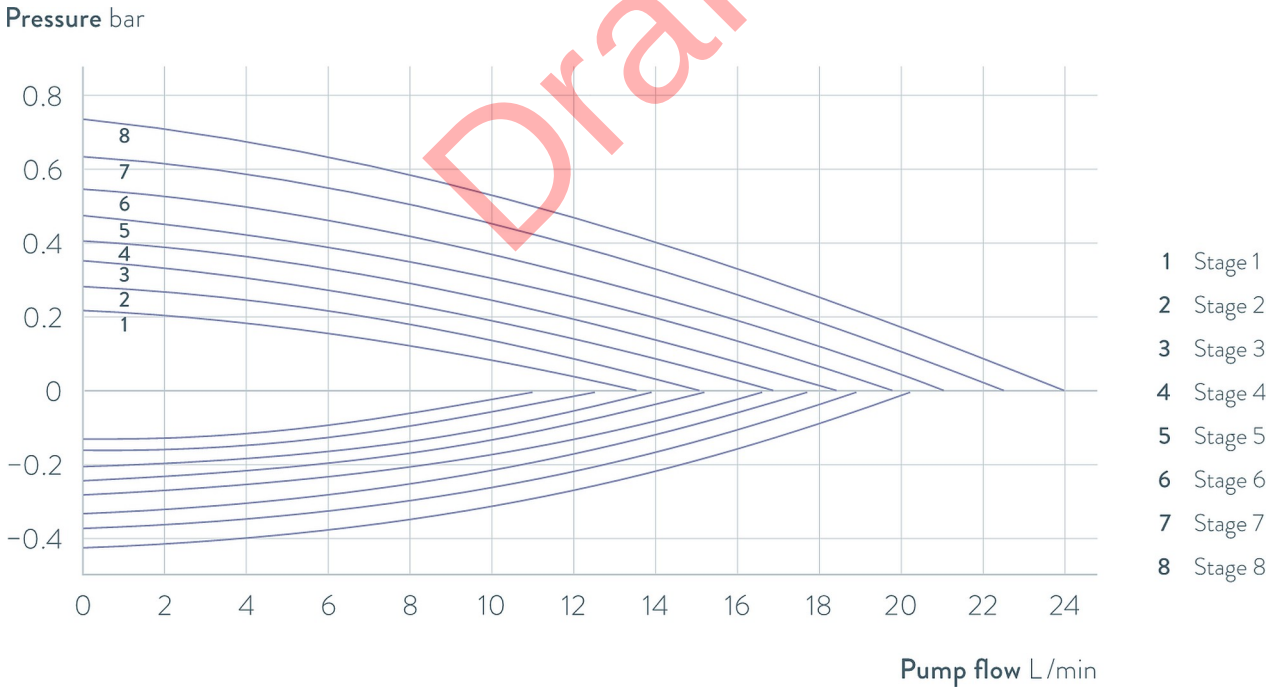


Fig. 80: Pump characteristic Universa MAX with pressure-suction pump (Varioflex pump)

12 Accessories

Interface modules

The following electrical accessories are available for Universa devices. The interfaces may only be operable from a certain software version. We recommend clarifying this before installation.

Table 71: Interface modules for the 51 mm x 27 mm module slot

Accessories for Universa MAX and PRO	Feature	Order number
Analog interface module	2 inputs and 2 outputs on 6-pin round socket	LRZ 912
LiBus module		LRZ 920
external Pt100 / LiBus interface module	Large aperture	LRZ 925
RS 232/485 interface module Advanced	D-subminiature socket 9-pin	LRZ 926
Advanced contact interface module with one input and one output	1 x input / 1 x output	LRZ 927
Advanced contact interface module with three inputs and three outputs	D-subminiature socket 15-pin, 3 x input / 3 x output	LRZ 928
Profibus interface module Advanced	D-subminiature socket 9-pin	LRZ 929
EtherCAT interface module Advanced, M8 socket connection	2 x M8	LRZ 931
Profinet interface module Advanced	RJ45 socket	LRZ 932
CAN interface module Advanced	D-subminiature socket 9-pin	LRZ 933
OPC UA interface module Advanced	RJ45 socket	LRZ 934
Modbus TCP interface module Advanced	RJ45 socket	LRZ 935

Table 72: Interface modules for the 51 mm x 17 mm module slot

Accessories for Universa PRO	Feature	Order number
external Pt100 / LiBus interface module	Small aperture	LRZ 918

Table 73: Racks and hanging basket for bath boilers

Accessories for Universa MAX and PRO	Feature	suitable for device	Order number
Test tube rack in z-shape	with 36 openings, Diameter 17 mm	U 8, U 830, U 845, U 855, U 890	A001652
	with 49 openings, Diameter 13 mm	U 8, U 830, U 845, U 855, U 890	A001653
	with 64 openings, Diameter 17 mm	U 12, U 1225, U 1245, U 20, U 2040	A001654
	with 100 openings, Diameter 13 mm	U 12, U 1225, U 1245, U 20, U 2040	A001655

Accessories for Universa MAX and PRO	Feature	suitable for device	Order number
Suspension frame	for test tubes, D= 16 mm outside	U 8, U 830, U 845, U 855, U 890, U 630, U 635	A001664
	for test tubes, D= 30 mm outside	U 8, U 830, U 845, U 855, U 890, U 630, U 635	A001665
	for 72 Eppendorf tubes	U 4, U 420	UE 028
Stainless steel suspension frame RN 18/4	for 11 lenses, D= 14-18 mm, 110 mm ET①	U 4, U 420	UE 035
Hanging basket	140x140x195 mm	U 8, U 830, U 845, U 855, U 890	LCZ 0658
Hanging basket	180x190x195 mm	U12, U1225, U 1245	LCZ 0694
Rotunda, rotatable and height-adjustable	Diameter 198 mm, holes with a diameter of 6.5 mm, 10 mm and 12 mm, divided into twelve sections.	U 20, U 2040	A001764

(①) ET= Immersion depth

Bath cover with feed-throughs or openings

Table 74: Bath cover for Universa thermostats

Designation	suitable for device	Bath oiling in mm x mm	Quantity	Order number
Bath cover with grommets	U 8, U 830, U 845, U 855, U 890	150 x 150	1	A001658
Bath cover with grommets	U 12, U 1225, U 1245	200 x 200	1	A001659
Bath cover with ring inserts: 4 openings	U 8, U 830, U 845, U 855, U 890	150 x 150	1	A001744
Bath cover with ring inserts: 5 openings	U 12, U 1225, U 1245	200 x 200	1	A001745

Bath cover

Table 75: Bath cover for Universa heated bases

Designation	Device type	Bath oiling in mm x mm	Quantity	Order number
Bath cover	U 8	150 x 150	1	A001661
	U 12 and U 20	200 x 200	1	A001662

Designation	Device type	Bath oiling in mm x mm	Quantity	Order number
	U 16	200 x 300	1	A001663
Bath cover, two-part	U 40	300 x 600	2	A001794

Table 76: Bath cover for Universa refrigerated base units

Designation	Device type	Bath oiling in mm x mm	Quantity	Order number
Bath cover	U 845, U 855, U 890	150 x 150	1	A001661
	U 1245	200 x 200	1	A001662
	U 1645, U 2040	200 x 300	1	A001663
	U 4230	300 x 350	1	A001750

Table 77: Bath cover for Universa PRO thermostats

Designation	suitable for device	Bath oiling in mm x mm	Quantity	Order number
Bath cover	U 4	130 x 100	1	A001748
	U 8	150 x 150	1	A001661
	U 12	200 x 200	1	A001662
	U 16	200 x 300	1	A001663
Bath cover, two-part	U 40	300 x 600	2	A001794

Table 78: Screw-on bath cover for Universa PRO heating and cooling thermostats

Designation	suitable for device	Bath oiling in mm x mm	Quantity	Order number
Screw-on bath lid	U 4, U 420	130 x 100	1	A001761

Table 79: Hydraulic components

Designation	suitable for device	Feature	Order number
Pump connection set	Universa PRO	with M16 x 1 stainless steel connections	A001737
Cooling coil set	Universa PRO	with M16 x 1 stainless steel connections	A001740
Adapter	all	M16 x 1 I② to NPT 1/2" A③	HKA 221
Adapter	all	Adapter M16 x 1 I to NPT 1/4" A	HKA 107
Angle adapter	all	M16 x 1 A to M16x1 I with union nut	HKA 063
Adapter	all	M16 x 1 I to G3/8" A	HKA 058

Designation	suitable for device	Feature	Order number
	all	M16 x 1 I to G1/2" A	HKA 060
	all	M16 x 1 to M14 x 1.5	HKA 068
	all	M16 x 1 I to G1/4" A	HKA 144
	all	M16 x 1 A on ball bushing, D= 27 mm	HKA 149
	all	M16 x 1 I to G1/2" A	HKA 150
Extension	all	Length 70 mm	HKA 190
Union nut	all	M16 x 1	HKM 032
Hose nozzle with elbow	all	13.5 mm to M16 x 1 I	HKA 073
Hose nozzle	all	11 mm for M16 x 1	HKO 025
	all	13.5 mm for M16 x 1	HKO 026
	all	8 mm for M16 x 1	HKO 061
Quick coupling set	all	Suitable for M16 x 1 connection thread	A001656

(②) I= Internal thread
(③) A= External thread

Table 80: Mounting parts, brackets

Designation	suitable for device	Feature	Order number
Standard rail Stainless steel 25 mm x 10 mm	U 8, U 420	Length: 394 mm	A001666
	U 12, U 20, U 630	Length: 444 mm	A001667
	U 635, U 830	Length: 440 mm	A001668
	U 845, U 855, U 1225, U 1245	Length: 484 mm	A001669
	U 16, U 2040	Length: 534 mm	A001670
	U 1625, U 1635, U 1645, U 890, U 4230	Length: 604 mm	A001671
	U 40	Length: 844 mm	A001672
Standard rail claw for pipes	A001666 to A001672	Mounting hole: M10	A001720
Lid holder	A001666 to A001672	Suitable for standard rails	A001721
Roller base	U 4, U 8, U 12, U 16, U 420, U 630, U 635, U 830, U 845, U 855, U 1225, U 1245, U 1625, U 1635, U 1645	adjustable	A001746

Table 81: Connector plug

Accessories	Feature	Item number
Module box	for connecting up to two additional interface modules	LCZ 9727
External temperature sensor with plug and shielded connection cable		ETP 059
Coupling plug, 6-pin for analog inputs/outputs		EQS 057
Connector D-Sub 9-pin		EQM 042
RS 232 cable for PC	(length: 2 m)	EKS 037
RS 232 cable for PC	(length: 5 m)	EKS 057
3-pin coupling plug for contact input		EQS 048
3-pin coupling socket for contact output		EQD 047

Table 82: Valve units

Accessories	Feature	Item number
Coolant valve with LiBus control	for M16x1 connection thread	A001657
Shut-off unit / non-return valve with LiBus control		A001753

13 Declarations of conformity

13.1 Heating devices

EC DECLARATION OF CONFORMITY

Manufacturer: LAUDA DR. R. WOBSER GMBH & CO. KG
Laudaplatz 1, 97922 Lauda-Königshofen, Germany

We hereby declare under our sole responsibility that the machines described below

Product line Universa **Serial number** from S250000001

Types: U 4 P (U 4 + PRO), U 8 P (U 8 + PRO), U 12 P (U 12 + PRO), U 16 P (U 16 + PRO),
U 20 P (U 20 + PRO), U 40 P (U 40 + PRO),
U 6 TP (U 6T + PRO), U 15 TP (U 15T + PRO), U 20 TP (U 20T + PRO),
U 8 M (U 8 + MAX), U 12 M (U 12 + MAX), U 16 M (U 16 + MAX), U 20 M (U 20 + MAX),
U 40 M (U 40 + MAX),
PRO

comply with all relevant provisions of the EC Directives listed below due to their design and type of construction in the version brought on the market by us:

Radio Equipment Directive	2014/53/EU (only for devices with radio certification markings on the rating plate of the pump and control unit)
Machinery Regulation	(EU) 2023/1230 (valid from 20.01. 2027)
Machinery Directive	2006/42/EU (valid until 19.01.2027)
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU in conjunction with (EU) 2015/863

The protection objectives of the Machinery Regulation (or Directive) with regard to electrical safety are complied with in accordance with Annex III (or Annex I) paragraph 1.5.1 with conformity to the Low Voltage Directive 2014/35/EU.

The machine or the associated product is subject to the conformity assessment procedure the basis of an internal production control (Module A according to (EU) 2023/1230).

Applied standards (date of publication in the Official Journal of the European Union is given in brackets if applicable):

- EN ISO 12100:2010 (exp.08.04.2011)
- EN ISO 13849-1:2023 (exp. 15.05.2024)
- EN 61010-1:2010/A1:2019/AC:2019-04 (exp. 30.11.2020)
- EN IEC 61326-1: 2021
- EN 61326-3-1:2017
- EN IEC 61010-2-010:2020 (exp. 22.06.2021)

Q5WA-QA13-059-EN-01

°FAHRENHEIT. °CELSIUS. °LAUDA.

Only for devices with radio certification markings on the rating plate of the pump and control unit:

- EN IEC 62311:2020
- ETSI EN 300 328 V2.2.2 (2019-07) (exp. 06.02.2020)
- ETSI EN 301 489-1 V2.2.3 (2019-11)
- ETSI EN 301 489-17 V3.2.4 (2020-09)

Authorized representative for the compilation of technical documentation:
Dr. Jürgen Dirscherl, Head of Research & Development

Signed in the name of: LAUDA DR. R. WOBSER GMBH & CO. KG

Lauda-Königshofen, 02.04.2025

A. Dinger

Dr. Alexander Dinger,
Head of Quality and Environmental Management

Q5WA-QA13-059-EN-01

°FAHRENHEIT. °CELSIUS. °LAUDA.

13.2 Cooling devices

EC DECLARATION OF CONFORMITY

Manufacturer: LAUDA DR. R. WOBSER GMBH & CO. KG
Laudaplatz 1, 97922 Lauda-Königshofen, Germany

We hereby declare under our sole responsibility that the machines described below

Product Line Universa **Serial number** from S250000001

Types: U 420 P (U 420 + PRO), U 630 P (U 630 + PRO), U 635 P (U 635 + PRO),
U 830 P (U 830 + PRO), U 845 P (U 845 + PRO), U 855 P (U 855 + PRO),
U 890 P (U 890 + PRO), U 1225 P (U 1225 + PRO), U 1245 P (U 1245 + PRO),
U 1625 P (U 1625 + PRO), U 1635 P (U 1635 + PRO), U 1645 P (U 1645 + PRO),
U 845 M (U 845 + MAX), U 855 M (U 855 + MAX), U 890 M (U 890 + MAX),
U 1245 M (U 1245 + MAX), U 1645 M (U 1645 + MAX), U 2040 M (U 2040 + MAX),
U 4230 M (U 4230 + MAX)

comply with all relevant provisions of the EC Directives listed below due to their design and type of construction in the version brought on the market by us:

Radio Equipment Directive	2014/53/EU (only for devices with radio certification markings on the rating plate of the pump and control unit)
Machinery Regulation	(EU) 2023/1230 (valid from 20.01.2027)
Machinery Directive	2006/42/EU (valid until 19.01.2027)
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU in conjunction with (EU) 2015/863

The equipment is not covered by the Pressure Equipment Directive 2014/68/EU, as the maximum classification of the equipment is Category 1 and it is covered by the Machinery Directive.

The protection objectives of the Machinery Regulation (or Directive) with regard to electrical safety are complied with in accordance with Annex III (or Annex I) paragraph 1.5.1 with conformity to the Low Voltage Directive 2014/35/EU.

The machine or the associated product is subject to the conformity assessment procedure the basis of an internal production control (Module A according to (EU) 2023/1230).

Applied standards (date of publication in the Official Journal of the European Union is given in brackets if applicable):

- EN ISO 12100:2010 (exp. 08.04.2011)
- EN ISO 13849-1:2023 (exp. 15.05.2024)
- EN 61010-1:2010/A1:2019/AC:2019-04 (exp. 30.11.2020)

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- EN IEC 61326-1:2021
- EN 61326-3-1:2017
- EN IEC 61010-2-010:2020 (exp. 22.06.2021)
- EN IEC 61010-2-011:2021 /A11:2021 (exp. 10.05.2022)
- EN 378-2:2016 (exp. 09.06.2017)

Only for devices with radio certification markings on the rating plate of the pump and control unit:

- EN IEC 62311:2020
- ETSI EN 300 328 V2.2.2 (2019-07) (exp. 06.02.2020)
- ETSI EN 301 489-1 V2.2.3 (2019-11)
- ETSI EN 301 489-17 V3.2.4 (2020-09)

Authorized representative for the compilation of technical documentation:
Dr. Jürgen Dirscherl, Head of Research & Development

Signed in the name of: LAUDA DR. R. WOBSER GMBH & CO. KG

Lauda-Königshofen, 02.04.2025

A. Dinger

Dr. Alexander Dinger
Head of Quality and Environmental Management

Q5WA-QA13-058-EN-01

°FAHRENHEIT. °CELSIUS. °LAUDA.

14 FCC Compliance Statements

SUPPLIER'S DECLARATION OF CONFORMITY

47 CFR § 2.1077 Compliance Information

Unique Identifier

Universa MAX
Universa PRO

Responsible Party – U.S. Contact Information

LAUDA-Brinkmann, LP
9 East Stow Road, Suite C
Marlton, NJ 08053

Phone: (856) 764-7300 ext 113
www.lauda-brinkmann.com

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

15 Product Returns and Clearance Declaration

Product Returns

Would you like to return a LAUDA product you have purchased to LAUDA? For the return of goods, e.g. for repair or due to a complaint, you will need the approval of LAUDA in the form of a *Return Material Authorization (RMA)* or *processing number*. You can obtain the RMA number from our customer service department at *+49 (0) 9343 503 350* or by email service@lauda.de.

Return address

LAUDA DR. R. WOBSER GMBH & CO. KG

Laudaplatz 1

97922 Lauda-Königshofen

Deutschland/Germany

Clearly label your shipment with the RMA number. Please also enclose this fully completed declaration.

RMA number	Product serial number
Customer/operator	Contact name
Contact email	Contact telephone
Zip code	Place
Street & house number	
Additional explanations	

Clearance Declaration

The customer/operator hereby confirms that the product returned under the above-mentioned RMA number has been carefully emptied and cleaned, that any connections have been sealed to the farthest possible extent, and that there are no explosive, flammable, environmentally hazardous, biohazardous, toxic, radioactive or other hazardous substances in or on the product.

Place, date	Name in block letters	Signature

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Manufacturer:
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