°LAUDA

Operation manual

LAUDA Universa MAX and Universa PRO

Immersion thermostats, high and low temperature 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

V1R132

Read this manual prior to performing any task!

Manufacturer:
LAUDA DR. R. WOBSER GMBH & CO. KG
Laudaplatz 1
97922 Lauda-Königshofen
Germany
Telephone: +49 (0)9343 503-0
E-mail: info@lauda.de
Internet: https://www.lauda.de

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1 Safety

1.1 General Information

Operating manual

IMPORTANT
READ CAREFULLY BEFORE USE
KEEP FOR FUTURE REFERENCE

- Read this operating manual carefully before use.
- All personnel must have read and understood the operating instructions before operating the device.
- Follow all the warnings and safety instructions on the device and in the operating manual.
- Always keep the operating manual within easy reach near the device.
- This operating manual is part of the device. Never pass the device on to third parties without the operating manual.
- The device must always be operated as intended according to the instructions in this operating manual. Any other use is considered to be unintended use. The manufacturer assumes no liability or guarantee for improper use.

Safe state

In terms of "functional safety", a "safe state" is generally understood to mean the following:

- It is the operating state of a system in which the risk to people, the environment or equipment is minimal.

The constant temperature equipment switches to the "safe state":

- in the event of overtemperature,
- if the liquid falls below the specified minimum level
- or if one or more errors occur.

Table 1: The "safe state" is indicated by the following:

Device	Heating off	Pump off	Visual signal	Acoustic signal
Universa PRO	✔	✔	✔	✔
Universa MAX	✔	✔	✔	✔

1.2 Intended use

The devices can only be operated as intended under the conditions specified in this operating manual. Any other use is considered improper. It is the operator's responsibility to ensure that the devices are used properly.

Intended use

This device may only be used for controlling the temperature of flammable and non-flammable heat transfer liquids.

The device may only be used in the following areas:

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

A high temperature thermostat is used for heating heat transfer liquids in a bath vessel and for heating and circulating heat transfer liquids in an external circuit. The high temperature thermostat can be operated with a cooling coil. In this case, the high temperature thermostat can also be used to cool heat transfer liquids.

A low and high temperature thermostat is used for controlling the temperature of heat transfer liquids in a bath vessel, and for controlling the temperature and circulating heat transfer liquids in an external circuit.

Reasonably foreseeable improper use

DANGER!
Ignition source placed in a hazardous atmosphere

Explosion

- Do not operate the device in hazardous areas.

DANGER!
Contact with live parts

Electric shock

- Do not operate the device outdoors.

WARNING!
The relevant standards are not observed

Personal injury

- Do not use the device for medical applications.
- Do not use the device in the food sector.

The following are considered cases of reasonably foreseeable misuse:

- Operating the device without heat transfer liquid
- Operating the device with an unsuitable heat transfer liquid
- Operating the pump and control unit without a stainless steel or cold bath or a suspension device
- Incorrectly setting the overtemperature switch-off point Tmax
- Setting a pump level that is too high
- Medical applications
- Use in hazardous areas
- Use for controlling the temperature of foodstuffs
- Operation with a glass reactor without gage pressure protection
- Outdoor installation
- Operation with an open external consumer (PRO device variant)
- Operation with an open external consumer in combination with a dedicated pressure pump (MAX device variant)
- Operation with power cables that are faulty, unsuitable or do not conform to standards

- Operation with faulty or unsuitable hoses
- Operation with the pump and control unit placed on the bath in a twisted position

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

1.3 Obligations of the operator

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

In particular, the application of statutory regulations concerning 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 Observing additional operating instructions

Accessories

The device can be equipped with additional accessories, such as interface modules, solenoid valves, standard rails, etc. Before installing and using accessories, always read and observe the operating manual accompanying the relevant accessory

1.6 Software versions

This operating manual is valid for devices with the following software versions or higher.

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

1.7 Materials

All parts of the device that come into contact with heat transfer liquid are manufactured from high-quality materials adapted to withstand the operating temperature. High-quality stainless steels and high-quality, temperature-resistant plastics are used.

1.8 Natural refrigerant

The devices are filled with natural refrigerant.

The cooling units are permanently sealed systems, containing less than 0.15 kg of refrigerant from safety group A3. The natural refrigerants are highly flammable. Due to the low filling weight and sealed design, there are no special installation requirements.
The application area is only classified from a filling weight of over 0.15 kg depending on the installation location and the requirements for using the space.

The refrigerant designation and charge are specified on the type plate and in the ↳ Chapter 11.7 “Refrigerant and filling charge” on page 145.

1.9 Heat transfer liquid requirements

The device is designed for flammable and non-flammable heat transfer liquids according to class III as per DIN 12876-1.

- Heat transfer liquids are used to control the temperature.
- Heat transfer liquids from LAUDA are recommended. LAUDA heat transfer liquids are transfer liquids that have been tested and approved by LAUDA DR. R. WOBSER GMBH & CO. KG.
- The safety data sheet of the heat transfer liquid specifies potential hazards and the corresponding safety measures required for handling the liquid. The safety data sheet of the heat transfer liquid must therefore be observed to ensure proper use of the device.
- The heat transfer liquids are suitable for a specific temperature range. Select a heat transfer liquid with a temperature range suitable for the application.
- If you wish to use your own heat transfer liquids, you must check that the liquids are suitable for the materials used.
  The heat transfer liquid must be provided with corrosion protection.
  You must also test the suitability of the heat transfer liquid by performing a test run within the desired temperature range. During the test run, you must also check the low-level protection.
- Do not use heat transfer liquids above the flash point.
- Do not use any heat transfer fluid above 25 K below the firing point.
- Do not use any heat transfer fluid above 100 K below the ignition temperature.
- Do not use any heat transfer liquids that are 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 heat transfer liquid.
- Use heat transfer liquids with a kinematic viscosity of less than 100 mm^2/s during operation.
- Use heat transfer liquid with a density in the range of 0.75 to 1.8 g/cm^3.
- Only use heat transfer liquids that are approved for heat transfer systems.

1.10 Hose requirements

The

- temperature,
- pressure and
- media resistance of the hoses must be suitable for the respective application.

Refer to the "Hoses" chapter for information on recommended hoses.

1.11 Environmental and operating conditions

The device may only be used in the following areas:

- Production, quality assurance, research and development in an industrial environment
- Only used inside buildings
- Use up to a height 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, linearly decreasing until 50% relative humidity at 40°C.
- Mains voltage fluctuations:
  - Power supply 200 – 240 V: up to ±10%
  - Power supply 100 – 125 V: up to +5% / -10% of the nominal voltage
- Overvoltage category II
- Sporadic electric surges 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.
Maintenance intervals	- Chapter 7.2 “Maintenance intervals” on page 119

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 Safety features on the device

Low-level protection

The low-level protection is a safety feature that prevents damage to the device and prevents the heaters from igniting flammable heat transfer liquid.

- PRO
  If the fill level falls below the minimum, an alarm is triggered. All safety components on the device are switched off as a result.
- MAX:
  If the liquid falls below the minimum fill level, a warning is issued to start with. If the fill level continues to fall, an alarm is triggered. All safety components on the device are switched off as a result.

Overtemperature protection

The overtemperature protection is a safety feature that prevents flammable heat transfer liquid from igniting due to high temperatures. If the preset maximum temperature (Tmax) is exceeded, all safety-related components on the device are switched off to prevent the risk of fire. An alarm signal also indicates that the overtemperature protection has been activated. The temperature at which the safety device (Tmax) is activated must be set in line with the heat transfer liquid 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 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

Stickers on devices with NRTL certification, affixed on the right 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'Equipement 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 to heat thermostats:

■ Place your hands under the device to lift and carry it.

The following instruction is relevant to low temperature thermostats:

■ Use the front and rear handles to lift and carry the unit.

1. Unpack the device.
2. Check that the device is complete and free of transport damage immediately after delivery.

Universa MAX standard accessories

Table 2: Universa MAX high temperature thermostat

Designation	Device type	Quantity
Pump connector M16 x 1; with stopper (HKN 065) and union nut (HKM 032)	U 8 M, U 12 M, U 16 M, U 20 M, U 40 M	1
Complete cooling coil 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-piece	U 40 M	2
Nipple connection set for M16x1; Nipple outer diameter 13.5 mm	All devices	1
"Flammable substance" warning sticker	All devices	1
Operating manual	All devices	1

Table 3: Universa MAX low temperature thermostat

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

Designation	Device type	Quantity
"Flammable substance" warning sticker	All devices	1
Operating manual	All devices	1

Universa PRO standard accessories

Table 4: Universa PRO high temperature thermostat

Designation	Device type	Quantity
Complete cooling coil 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
"Hot surface" warning sticker	All devices	1
Operating manual	All devices	1

Table 5: Universa PRO low temperature thermostat

Designation	Device type	Quantity
Pump connector M16 x 1; with stopper (HKN 065) and union nut (HKM 032)	All devices	1
Bath cover	All devices	1
"Hot surface" warning sticker	All devices	1
Operating manual	All devices	1

3 Device description

3.1 Structure

3.1.1 Structure of MAX pump and control unit

Front

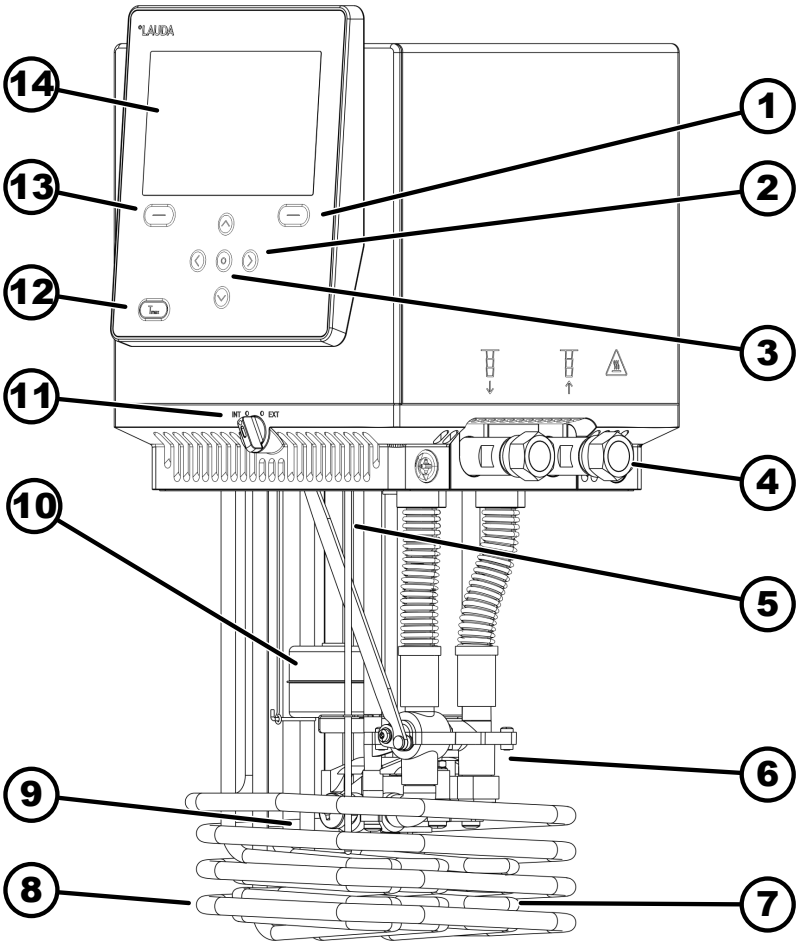


Fig. 2: Universa MAX pump and control unit

1 Right softkey
2 Arrow buttons (right, left, up and down)
3 Enter key
4 Pump connector (inlet on left and outlet on right), connection for application
5 Temperature probe (Pt1000)
6 Pump housing with impeller
7 Heater
8 Cooling coil for high temperature thermostats
9 Pump outlet for internal bath circulation
10 Float for level indication
11 Changeover switch for the internal and external pump outlet (INT / EXT)
12 Tmax button
13 Left softkey
14 Display

Rear of MAX, 200 – 240 volt

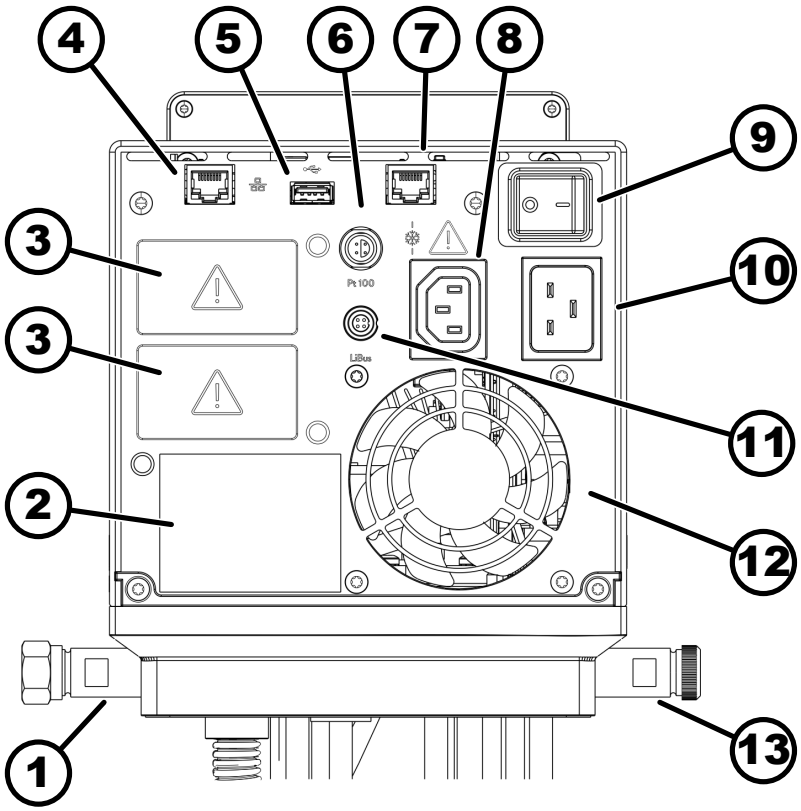


Fig. 3: Universa MAX pump and control unit, rear view

1 Pump connector
2 Pump and control unit type plate
3 Module slot (approx. 51 mm x 27 mm) for extending interface modules
4 Ethernet interface (RJ45 socket)
5 USB interface for software updates
6 Lemo socket, size 1S for external Pt100 temperature probe
7 Connection socket (RJ45 socket) for cold bath control cable
8 Cold appliances socket for pump and control unit power supply for cold bath
⚠ *Connecting assemblies other than LAUDA Universa cold baths is not permitted! The maximum current must not exceed 10 amperes.*
9 Mains switch (with circuit breaker)
10 Power supply via cold appliances connector
11 LiBus interface
12 Ventilator fan
13 Cooling coil connectors (for high temperature thermostats)

Rear of MAX, 100 – 125 volt

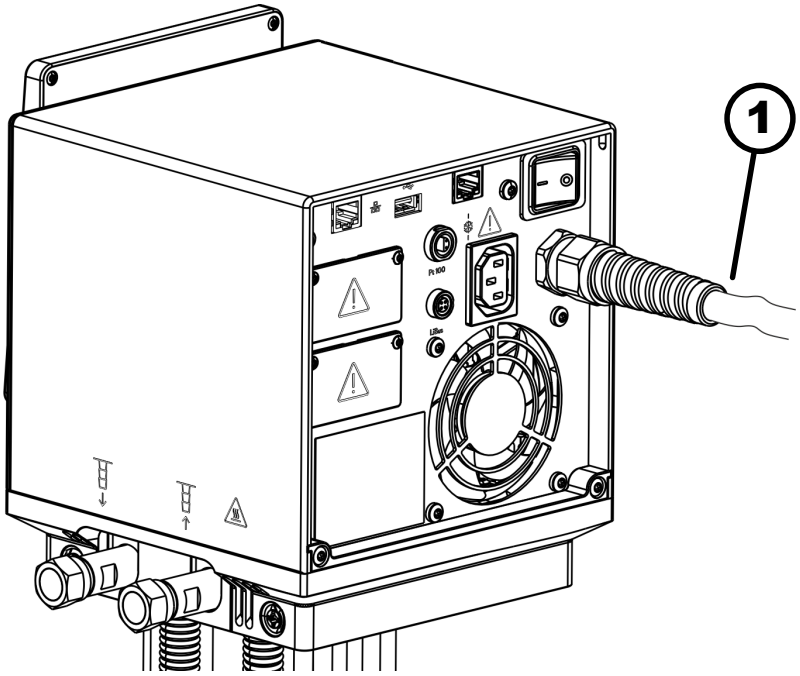


Fig. 4: Universa MAX pump and control unit, rear view

1 Power cord, not interchangeable

3.1.2 Structure of MAX high temperature thermostat

Front

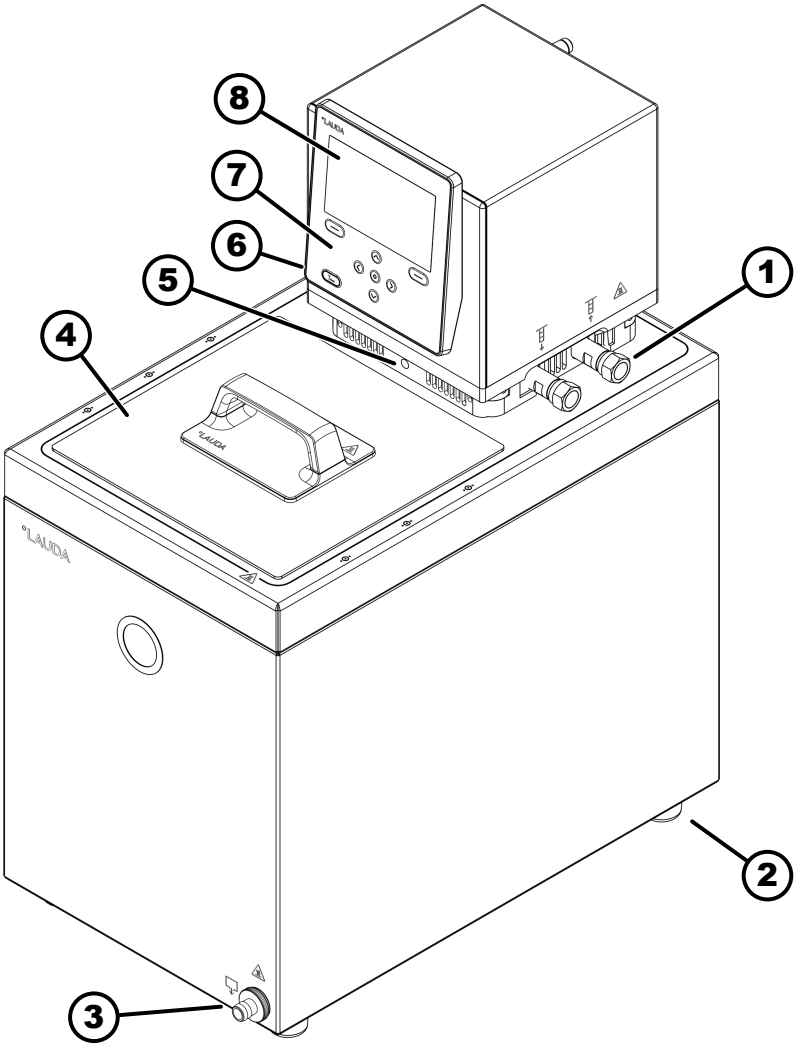


Fig. 5: MAX high temperature thermostat, front view

1 Pump connector for external application (inlet on left and outlet on right), standard for MAX high temperature thermostats
2 Four feet
3 Drain nozzle with drain tap
4 Bath cover, standard for MAX high temperature thermostats
5 Changeover switch for dividing the internal and external pump flow rate
6 Standard cooling coil connector (obscured) for high temperature thermostats
7 Control panel
8 Display

Back

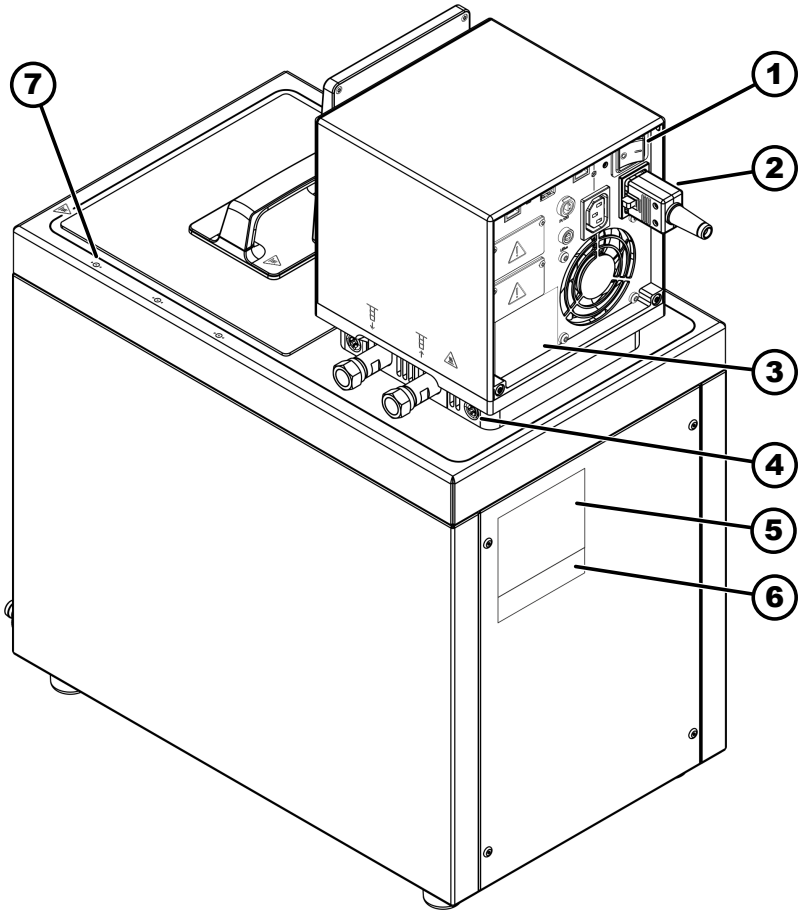


Fig. 6: MAX high temperature thermostat, rear view

1 Mains switch (circuit breaker)
2 Power supply line
3 Pump and control unit type plate
4 Pump and control unit lock on the bath bridge
5 Stainless steel bath type plate
6 Complete system type plate
7 Marking for hole in bath edge

3.1.3 Structure of MAX low temperature thermostat

Front

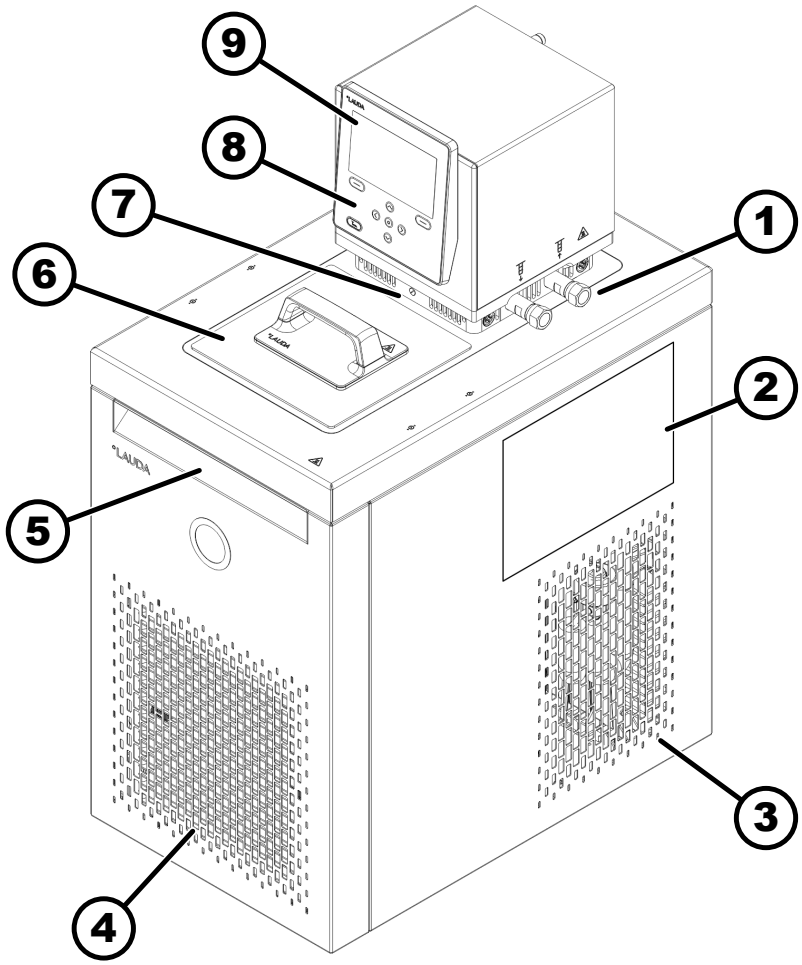


Fig. 7: MAX low temperature thermostat, front view

1 Connection for application (inlet on left and outlet on right)
2 Stickers on devices with NRTL certification
3 Castors at rear, feet at front; four castors for U 2040 M and U 4230 M
4 Front panel (detachable), underneath a drain nozzle with drain tap
5 Front recessed grip
6 Bath cover
7 Changeover switch for dividing the external and internal pump flow
8 Control panel
9 Display

Back

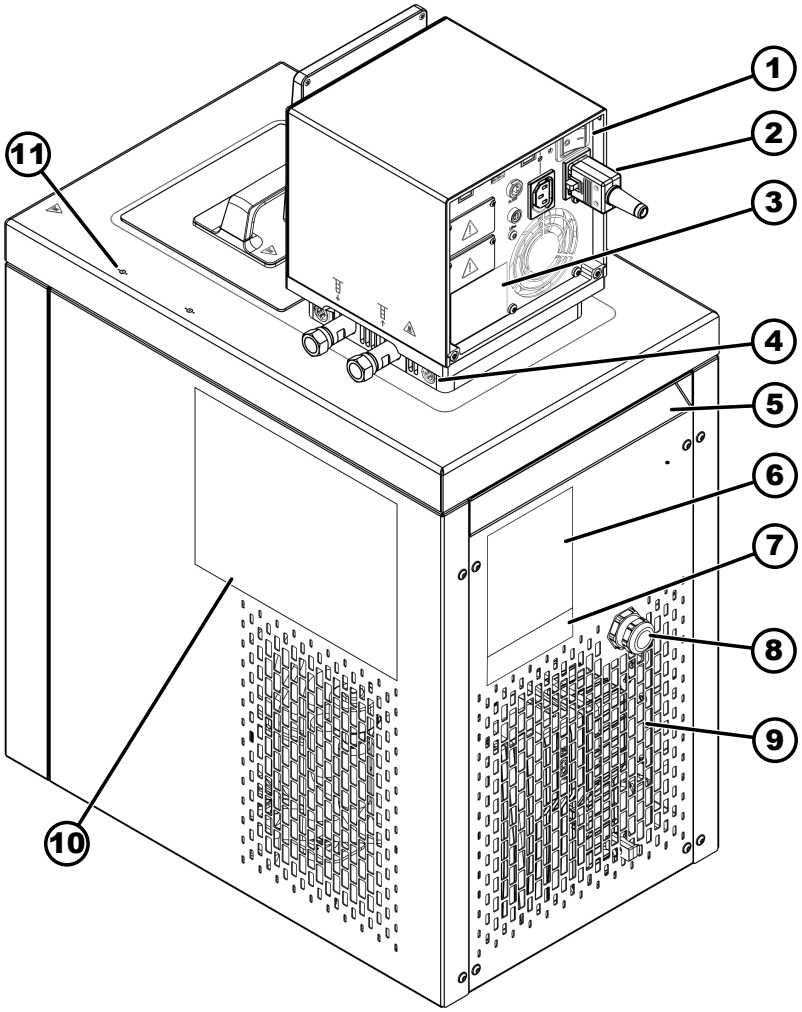


Fig. 8: MAX low temperature thermostat, rear view

1 Mains switch (with circuit breaker)
2 Power supply line
3 Pump and control unit type plate
4 Pump and control unit lock on the bath bridge
5 Rear recessed grip
6 Cold bath type plate
7 Complete system type plate
8 Cable for the cold bath control and power supply
9 Ventilation grid
10 Stickers on devices with NRTL certification
11 Marking for hole in bath edge

3.1.4 Structure of PRO pump and control unit

Front

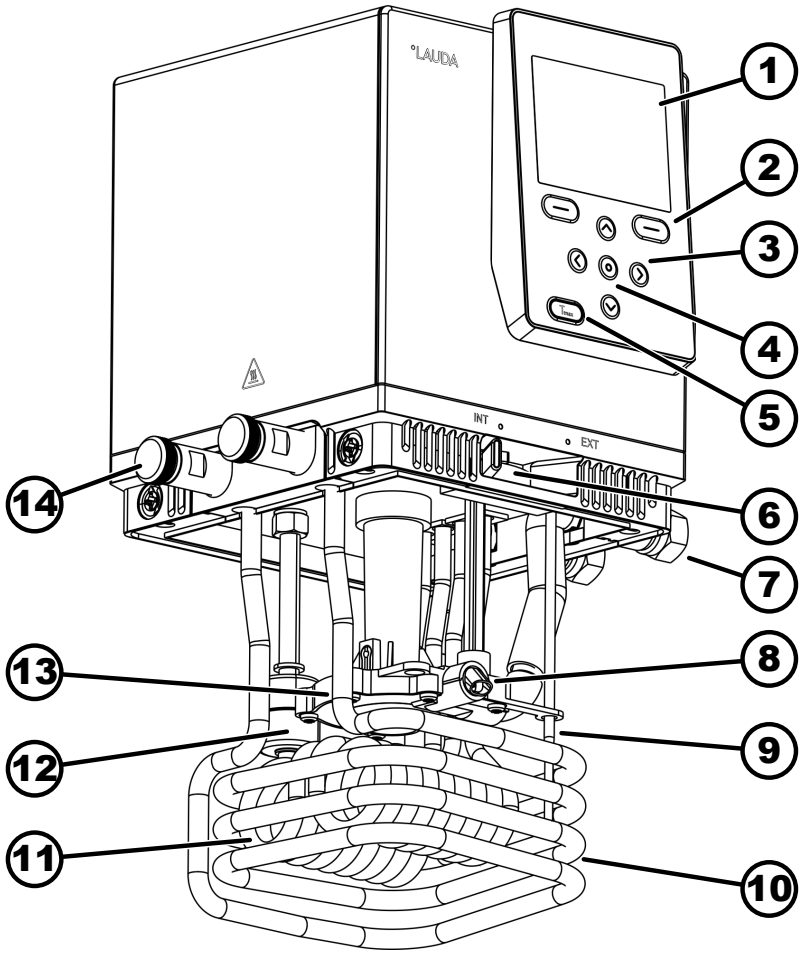


Fig. 9: Universa PRO pump and control unit, front view

1 Display
2 Right and left softkeys
3 Arrow buttons (right, left, up and down)
4 Enter key
5 Tmax button
6 Changeover switch for the internal and external pump outlet (INT / EXT)
7 Connection for application (pump connector); accessories for PRO high temperature thermostats and immersion thermostats
8 Pump outlet for internal bath circulation
9 Temperature probe (Pt1000)
10 Cooling coil for high temperature thermostats; accessories for immersion thermostats
11 Heater
12 Float for level indication
13 Pump housing with impeller
14 Cooling coil nozzle for high temperature thermostats; accessories for immersion thermostats

Rear of PRO, 200 – 240 volt

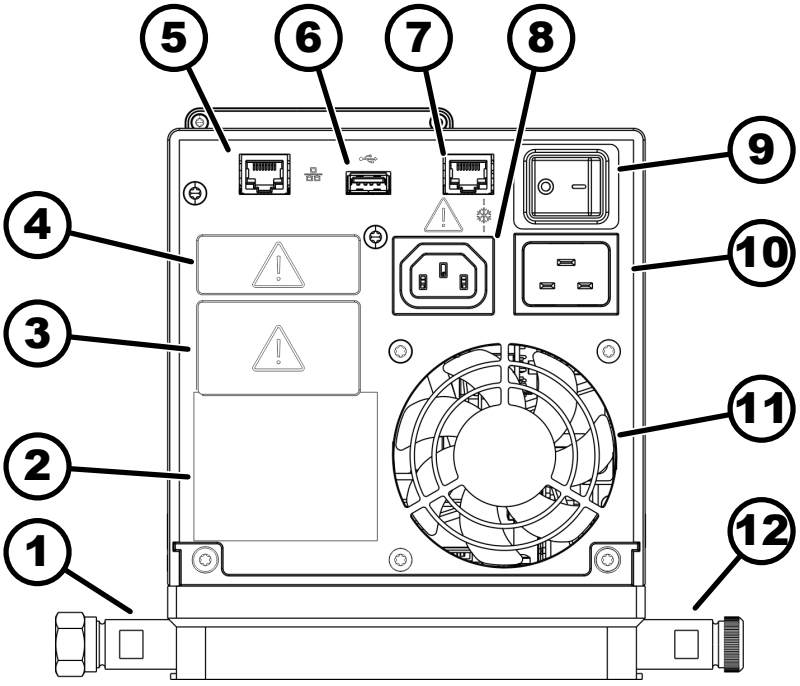


Fig. 10: Universa PRO pump and control unit, rear view

1 Pump connector; accessories for PRO high temperature thermostats and immersion thermostats
2 Pump and control unit type plate
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 updates
7 Connection socket (RJ45 socket) for cold bath control cable
8 Cold appliances socket for power supply of pump and control unit for cold bath
⚠ *Connecting assemblies other than LAUDA Universa cold baths is not permitted! The maximum current must not exceed 10 amperes.*
9 Mains switch (circuit breaker)
10 Power supply
11 Ventilator fan
12 Cooling coil nozzle for high temperature thermostats; accessories for immersion thermostats.

Rear of PRO, 100 – 125 volt

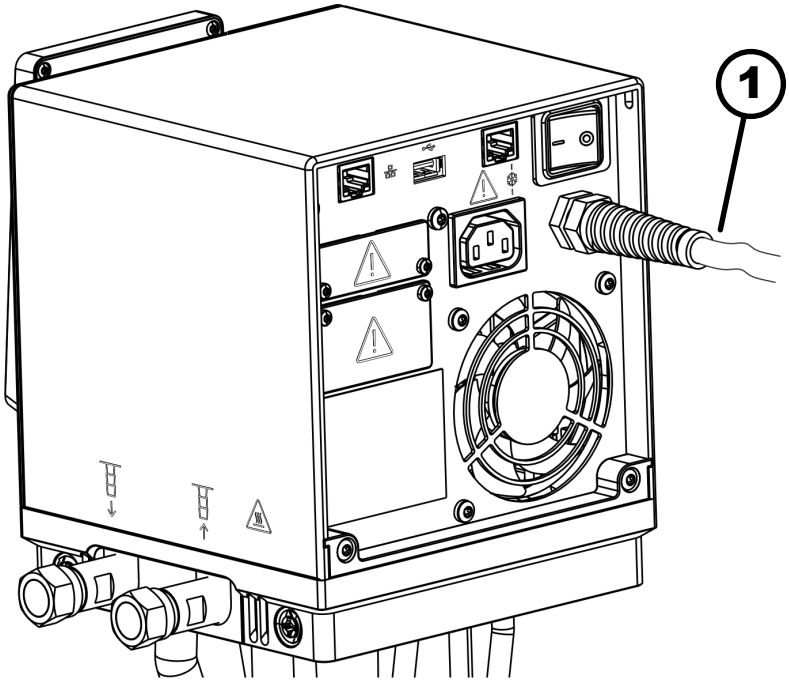


Fig. 11: Universa PRO pump and control unit, rear view

1 Power cord, not interchangeable

3.1.5 Structure of PRO high temperature thermostat

Front

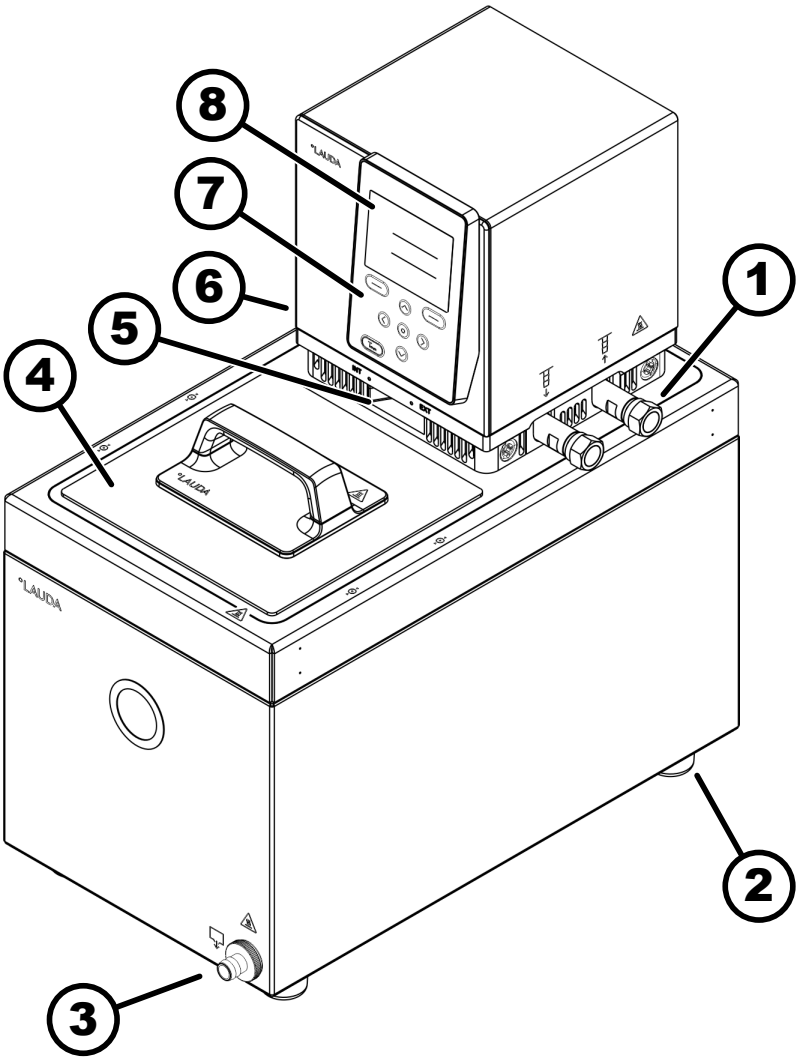


Fig. 12: PRO high temperature thermostat, front view

1 Connection for application (inlet on left and outlet on right); accessories for high temperature thermostats
2 Four feet
3 Drain nozzle with drain tap
4 Bath cover, accessories for high temperature thermostats
5 Changeover switch for dividing the internal and external pump flow
6 Cooling coil connector (obscured) for high temperature thermostats
7 Control panel
8 Display

3.2 Operating elements

3.2.1 Buttons on the control panel

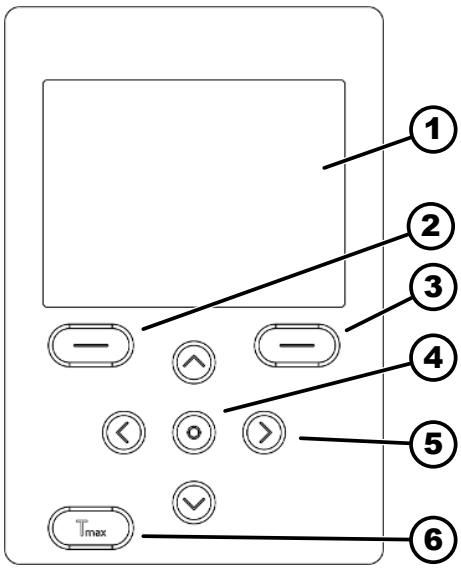


Fig. 13: Control panel buttons (using the PRO as an example)

1 Display
2 Left softkey
3 Right softkey
4 Enter key
5 Arrow button
6 Tmax button

Functions on the device display can be controlled using the control panel buttons.

- The softkeys can be used to select the functions indicated on the display for these keys.
- The Enter button can be used to confirm a selection in the display.
- The Up, Down, Right and Left arrow buttons can be used to navigate on the display.
- The Tmax button can be used to display and edit the overtemperature switch-off point.

Key lock

The keys on the control panel can be locked to prevent inadvertent operating errors.

Activating

The display shows the home window.

1. Press and hold down the [input button].
2. Press and hold down the [Down] arrow button.
   ▶ After five seconds, the key lock is activated.

   Only the left [Display] softkey continues working.

Deactivating

1. Press and hold down the [input button].
2. Press and hold down the [Up] arrow button.
   ▶ After five seconds, the key lock is deactivated.

3.2.2 Mains switch

The device is fitted with a mains switch. Position [0] switches the device off, position [1] switches it on.

The rocker switch is also designed as a safety switch. If the current is too high, the rocker switch trips and disconnects the device from the mains supply. The device can be used again by switching the rocker switch to position [1]. If the rocker switch trips again, contact the LAUDA Service department ↳ Chapter 1.15 “Contact LAUDA” on page 12.

3.2.3 Changeover switch for pump flow

The pump flow changeover switch can be moved right and left to the following positions:

- The [EXT] position increases the flow rate in the external circuit to maximum. This position is required for operation as a circulation thermostat.
- In the [INT] position, the external flow rate is restricted to a minimum and the outlet for internal bath circulation is opened completely.

In the 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

The following sections contain a general overview of all standard interfaces on the device as well as additional optional interface modules.

Equipment connected to the low-voltage inputs and outputs must be safely insulated against dangerous contact voltages as per DIN EN 61140, for example, using double or reinforced insulation as per DIN EN 60730-1 or DIN 60950-1.

Refer to the separate operating manual accompanying the interface modules for further information on installing and operating these interface modules. The respective operating manual must be observed in order to use the module as intended.

Standard interfaces

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

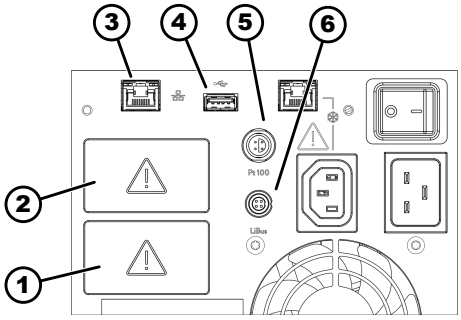


Fig. 14: Interfaces on the MAX pump and control unit

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

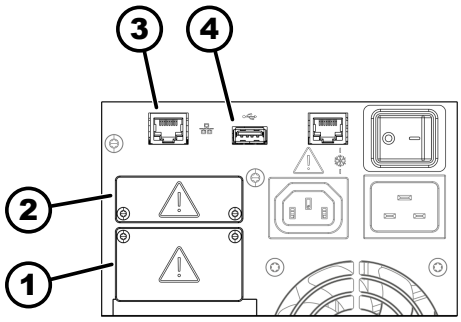


Fig. 15: Interfaces on the PRO pump and control unit

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

- The **Ethernet interface** allows connection to a control station or PC. The interface offers the user the opportunity to control and monitor their temperature control processes via a LAUDA interface command set (process interface).
- The (type A) **USB interface host** enables connection of a USB stick. This interface can be used for data import, data export and software updates (not a process interface).
- An external Pt100 temperature probe can be connected to the **Pt100 interface** (MAX only) (Lemo socket, size 1S).
- The **LiBus interface** (MAX only) allows the connection of LAUDA accessories. Different solenoid valves (cooling valve, automatic filling device, shut down valve) or the LiBus module box can be connected. The abbreviation "LiBus" stands for "LAUDA internal BUS" and refers to the CAN-based fieldbus system used in LAUDA equipment.

Additional interfaces

Additional interface modules can be fitted to the device. The availability of the interfaces depends on the software version and you may need to update your device.

- The **analog module** (order no. LRZ 912) has a 6-pin round socket with two inputs and two outputs. The inputs and outputs can be configured as a 0 – 20 mA, 4 – 20 mA or 0 – 10 V interface independently of one another. A voltage of 20 V applied to the socket supplies power to an external sensor with an electronic evaluation unit.
- The **Pt100 / LiBus module** (order no. LRZ 925)
- The **RS 232/485 module Advanced** (order no. LRZ 926) is available in a 9-pin D-SUB miniature socket design and is galvanically isolated by an optocoupler. The RS 232 interface can be connected directly to the PC using a 1:1 contacted cable.
- The **contact module NAMUR Advanced** (order no. LRZ 927) is available in a plug connector design according to NAMUR NE28. This contact module is identical to LRZ 928 but only has 2 sockets, each with 1 output and 1 input. The coupling socket (order no. EQD 047) and the coupling connector (order no. EQS 048) have a 3-pin design.
- The **contact module Advanced** (order no. LRZ 928) is available in a 15-pin D-SUB miniature socket design. The module has three relay contact outputs (changeover contacts, maximum 30 V / 0.2 A) and three binary inputs for control via external floating contacts.
- **Profibus module Advanced** (order no. LRZ 929) is available in a 9-pin D-SUB miniature socket design. Profibus is a bus system with a high signal transmission rate for connecting up to 256 devices.
- **EtherCAT module Advanced** (order no. LRZ 931) with M8 sockets. EtherCAT is an Ethernet-based field bus with master/slave functionality.
- **Profinet module Advanced** (order no. LRZ 932), with RJ45 socket. Profinet is an industrial Ethernet-based communication protocol that enables fast, reliable data transmission between automation components in industrial networks.
- **CAN module Advanced** (order no. LRZ 933) with 9-pin D-Subminiature socket. CAN is a robust, serial bus system for networking control units in industrial applications that offers a high degree 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, standardized communication as well as easy integration of LAUDA constant temperature equipment into higher-level systems such as MES or SCADA.
- **Modbus TCP/IP module Advanced** (order no. LRZ 935) with 8-pin RJ45 socket. Modbus allows established, efficient network communication as well as simple integration of LAUDA constant temperature equipment into existing automation systems.
- External **LiBus module box** (order no. LCZ 9727) with two additional module bays. The number of LiBus interfaces can be increased using the LiBus module box (LCZ 9727). Additional modules such as a solenoid valve for regulating the cooling water or a reverse flow protection can subsequently be connected.

Refer to the operating manual accompanying the relevant LAUDA interface module for further information on connecting and using these interfaces.

3.3.2 Hydraulic circuit

Hydraulic circuit

The hydraulic circuit refers to the circuit containing the heat transfer liquid.

The circuit essentially consists of the following components:

- **Bath vessel** containing heat transfer liquid with integral cooling (for low temperature thermostats)
- **Pump**
  - The pump circulates the heat transfer liquid inside the bath vessel, and achieves a homogeneous temperature distribution.
  - The pump on the MAX has 8 pump levels and the pump on the PRO has 6 pump levels that can be used to optimize bath circulation, output, discharge pressure, noise emissions and mechanical heat input.
  - For external applications, the pump delivers the heat transfer liquid into the external application via the pump connectors.
- **Heater** for heating the heat transfer liquid
- **Cooling coil** for cooling the heat transfer liquid (only for high temperature thermostats; optional accessory for immersion thermostats).
- **Hoses** to external **application** and back (optional accessory).

Cooling coil in the bath

- A cooling source such as a fresh water supply is connected to the cooling coil connection sockets.
- The bath temperature of the thermostat can be decreased to approximately 5 °C above the temperature of the cooling water (without an external application).
- The A001657 cooling valve (with LiBus triggering), available as an accessory, only opens the cooling water supply when required, which saves cooling water and heating energy while improving temperature stability.

3.3.3 Cooling unit

The cooling unit contains natural refrigerant, which is flammable.

The cooling unit consists of the following main components:

- Compressor
  The compressor incorporates a variable-speed piston compressor that is activated according to requirements. During operation, the compressor switches on automatically but can also be activated manually via the control menu. If safety-related faults occur, the compressor is switched off automatically.
- Evaporator
  A stainless steel tube coil evaporator extracts the heat from the internal bath.
- SmartCool system
  A special form of proportional cooling. This type of cooling is achieved by combining variable-speed refrigeration compressors with expansion valves controlled by step motors, or combining variable-speed refrigeration compressors with capillary injection. The refrigerating machine is speed-controlled and only switched on when needed.
  This saves a huge amount of energy compared to conventional cooling with reheating.
- SelfCheck assistant
  The system is checked (in particular the modes for switching off the heating) together with the sensors and actuators before and during operation. It is not only alarms or error messages that are shown on the display. Notification of maintenance tasks such as condenser cleaning are also displayed.

3.3.4 Bath edge ventilation

The air flowing from the pump and control unit is directed over the edge of the bath to reduce any excessive cooling or heating of the bath edge when the bath is already cooled or heated. Depending on the operating status, this may reduce ice formation and condensation on the bath edge.

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

- Heating output:
  - Increase in the fan rotation speed at a heating output of 50% and above
- Bath temperature:
  - Linear increase in the fan rotation speed at a bath temperature below 10 °C
  - Maximum fan rotation speed at a bath temperature below -10 °C
- Pump power, depending on:
  - Selected pump level
  - Viscosity of the heat transfer liquid

3.4 Type plates and serial numbers

The bath thermostats from the LAUDA Universa product line are designed for a modular structure. The high and low temperature thermostats consist of a pump and control unit as well as a bath unit, which can be flexibly combined.

Both the pump and control unit and the bath units have separate type plates. The type plates contain important key data and other useful information.

Pump and control unit type plate

The pump and control unit is a separate assembly that can be mounted on a bath unit. Each pump and control unit has a separate type plate, which contains the following information. Certain specifications depend on the equipment installed.

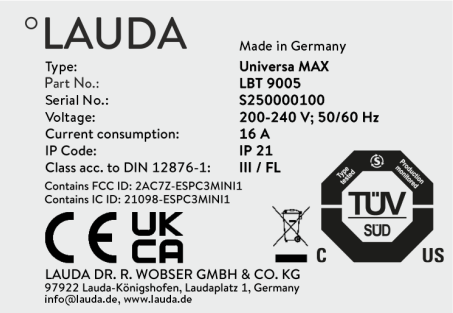


Fig. 16: Type plate of a pump and control unit

Table 6: For a pump and control unit:

Specification	Description
Type:	Type designation of the pump and control unit
Part No.:	Catalog number of the pump and control unit
Serial No.:	■ Serial number of the pump and control unit consisting of: ● the letter S, ● the year of manufacture (indicated by two digits), ● a 7-digit number.
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 cold baths)
IP Code:	Protection level of the casing according to EN 60529
Class acc. to DIN 12876-1	Class division according to DIN 12876-1
For devices with an integral 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.

Bath unit type plate

The bath unit of the high or low temperature thermostat is a separate assembly that has its own type plate containing the following information. Certain specifications depend on the equipment installed.

Fig. 17: Type plate of a stainless steel bath

Table 7: For a high temperature thermostat:

Specification	Description
Type:	Type designation of the stainless steel bath
Part No.:	Catalog number of the stainless steel bath
Serial No.:	■ Serial number of the stainless steel bath consists of: ● the letter S, ● the year of manufacture (indicated by two digits), ● a 7-digit number.

Fig. 18: Type plate of a cold bath

Table 8: For a low temperature thermostat:

Specification	Description
Type:	Type designation of the cold bath
Part No.:	Catalog number of the cold bath
Serial No.:	■ The serial number of the cold bath consists of: ● the letter S, ● the year of manufacture (indicated by two digits), ● a 7-digit number.
Refrigerant I:	Refrigerant used in cooling circuit 1 of the device.
Filling charge I:	Filling weight of refrigerant in cooling circuit 1.
PS high pressure I:	Maximum permissible working pressure on the high-pressure side of cooling circuit 1 (compression, condensation).
PS low pressure I:	Maximum permissible working pressure on the low-pressure side of cooling circuit 1 (expansion, evaporation).
Refrigerant II:	Refrigerant used in cooling circuit 2 of the device.
Filling charge II:	Filling weight of refrigerant in cooling circuit 2.
PS high pressure II:	Maximum permissible working pressure on the high-pressure side of cooling circuit 2 (compression, condensation)
PS low pressure II:	Maximum permissible working pressure on the low-pressure side of cooling circuit 2 (expansion, evaporation)
Voltage:	Permissible mains voltage and mains frequency of the cold bath
Current consumption:	Current consumption of the cold bath

Specification	Description
IP Code:	Protection level of the casing according to EN 60529
Refrigeration equipment with flammable refrigerant	Note: Refrigeration device containing flammable refrigerant

Power supply for low temperature thermostats

Before connecting a device to the mains power, always compare the mains voltage and mains frequency with the type plate on the pump and control unit and with the type plate on the cold bath.
If the specifications for the permissible mains voltage range of the pump and control unit and the cold bath are different, the overlapping range applies. The mains voltage and frequency must be within this range.

Serial number for the overall system

A LAUDA Universa high or low temperature thermostat is a complete system consisting of a pump and control unit as well as a bath unit. This complete system is assigned a separate serial number in the factory, which is indicated on an additional label on the bath unit. This serial number is provided as a means of identifying the complete system.

Complete system
Type: **U 890 M**
Part No.: **L003755**
Serial No.: **S250000300**

Fig. 19: Type plate of a low temperature thermostat

Table 9: For a complete system

Specification	Description
Type:	Type designation of the high or low temperature thermostat
Part No.:	Catalog number of the high or low temperature thermostat
Serial No.:	■ Serial number of the high or low temperature thermostat consists of: ● the letter S, ● the year of manufacture (indicated by two digits), ● a 7-digit number.

The serial numbers are also displayed in the Device status → Device information → Serial numbers menu.

4 Before starting up

4.1 Install device

Each cooling circuit of the Universa low temperature thermostats contains less than 150 g of flammable refrigerant.

- According to standard EN 378-1, sealed refrigeration systems below this filling limit are not subject to any special requirements regarding installation location, room volume or 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 cold appliance coupling detaches from the built-in connector

Electric shock

- Insert the built-in connector 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!
Danger of overpressure if ambient temperature is too high

Injury, escape of refrigerant, fire

- Note the permissible ambient temperature and storage temperature.

The following warning is relevant to Universa PRO:

WARNING!
The pump and control unit is mounted at an angle on the transparent bath

Fire

- Make sure that the pump and control unit is fixed correctly, i.e. horizontally, on the transparent bath.

WARNING!
Risk of heat transfer liquid leaking

Scalding, cold burns

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

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 heat transfer liquid in the bath

Fire

- Applications with non-flow areas are not permitted.
  - Otherwise, there is a risk of gas cushions forming during operation, which may force hot heat transfer liquid back into the bath vessel.
  - Check this by reducing the pump power by one or two stages. The level in the bath vessel should not rise.
- Ventilate the installation site. Vapors which are hazardous to health may be produced.

The following warning does not apply to the 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 to Universa MAX:

WARNING!
Risk of heat transfer liquid overflowing during operation with an open application

Scalding, cold burns

- Only use a hydraulically open application in conjunction with a pressure-suction pump and the constant level device accessory in the bath.

WARNING!
Bursting of the external application due to excessive pressure

Scalding, cold burns

- If the external application is located in a lower position and is sensitive to pressure, also take into account the additional pressure resulting from the difference in height between the application and the device.
- For pressure-sensitive applications (for example, glass apparatus) with a maximum permissible working pressure below the maximum pressure of the pump (see Technical data section), the hoses of the application must be laid in such a way that bending or squeezing is not possible.
- A separate safety valve must be installed in the outflow to protect against operating errors.
- Adjust the pump pressure by changing the pump level.

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 above 25 K below the firing point.
- Do not use any heat transfer fluid above 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 to Universa MAX:

CAUTION!
Risk of heat transfer liquid leaking when the system stops and an open application is connected

Slipping or falling over

- If the liquid levels in the application and thermostat are not the same, also use the shut down valve accessory A001753. The shut down valve prevents the liquid in the higher vessel from flowing into the lower vessel after the thermostat has been switched off.

The following warning is relevant to the Universa MAX version fitted with a ball bearing pump:

NOTICE!
Use of unsuitable heat transfer liquid with ball bearing pumps

Device damage

- Always use heat transfer liquids with a mineral or silicone oil base.
- Do not use water-based heat transfer liquids: 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 connector, use a second open-end wrench to hold the pump connector against it.
     - Secure the hoses on the hose nozzles using hose clips.
   - Set the pump flow changeover switch to *External*.
   - Use the shortest possible hoses with the largest possible diameter. If the diameter of the hose is too small, the temperature will drop between the constant temperature equipment and the external application due to the low flow rate. In this case, increase the pump level accordingly.
   - If you intend to control the constant temperature equipment externally, a temperature probe must be connected to the external application.
   - If the application is positioned higher than the constant temperature equipment, the following can happen:
     - Air can enter the external fluid circuit when the pump is not in operation,
     - which can allow liquid to flow from the application into the constant temperature equipment even though the circuit is sealed,
     - resulting in the liquid in the constant temperature equipment overflowing.

Disconnecting an external application

2. If the constant temperature equipment is disconnected from the external application,
   - the pump connectors on the constant temperature equipment must be closed with stoppers or
   - the inlet and outlet nozzle on the constant temperature equipment must be connected by a hose (pump link) and
   - the pump flow changeover switch must be set to *Internal*.

4.2 Installing the interface module

The interface module is connected to an internal LiBus ribbon cable and inserted into a vacant 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 casing 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 module installation description essentially applies to all LAUDA constant temperature equipment; the example diagrams here show the installation of a LiBus module in constant temperature equipment from the Variocool product line.

Please note that an interface module with a large cover can only be installed in a high module slot. The fitted cover must cover the opening on the module slot completely.

To secure the interface module, insert the screws (ISO14583-A2/70-TX10-M3X6) supplied as accessories for the interface modules and tighten using a suitable screwdriver.

Please observe the following installation sequence:

1. Turn off the constant temperature equipment and pull out the mains plug.
2. If necessary, remove the screws from the cover on the relevant module slot. If necessary, use a slotted screwdriver to prise off the cover.

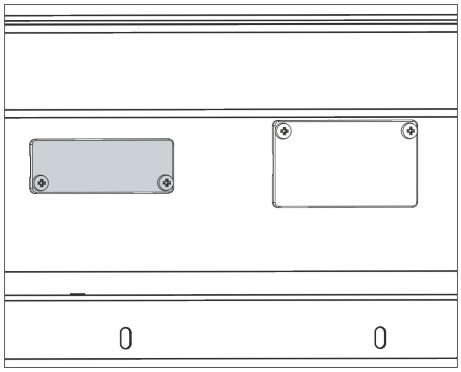


Fig. 20: Removing the cover (schematic diagram)

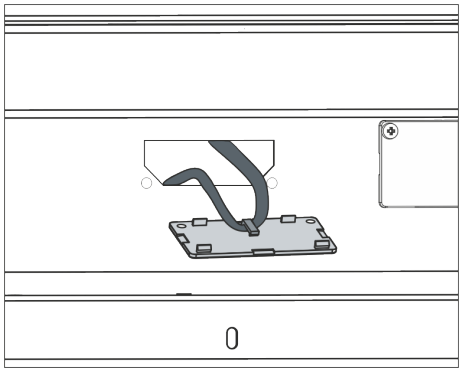


Fig. 21: Detaching the LiBus ribbon cable (schematic diagram)

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. Disconnect the LiBus ribbon cable from the cover.

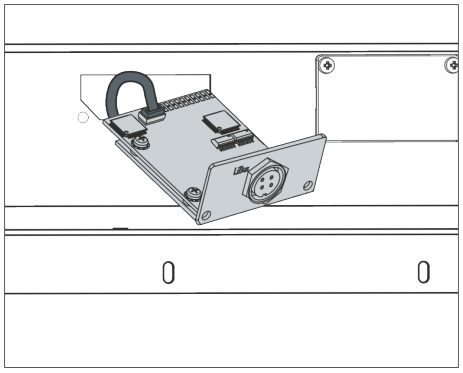


Fig. 22: Connecting the interface module (schematic diagram)

5. Connect the red plug on the LiBus ribbon cable to the red socket on the circuit board of the interface module. Plug and socket are reverse polarity protected: Make sure that the lug on the plug is aligned with the recess in the socket.
   - ▶ The interface module is correctly connected to the constant temperature equipment.
6. Slide the LiBus ribbon cable and the interface module into the module slot.

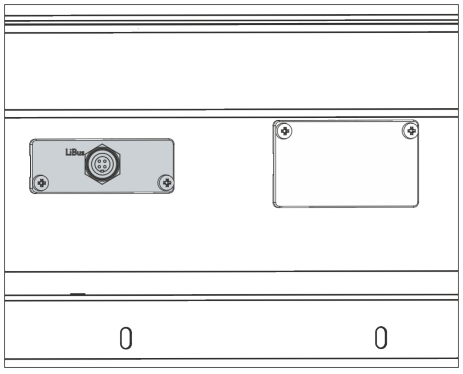


Fig. 23: Securing the cover (schematic diagram)

7. Secure the cover to the casing using two M3 x 10 screws.
   - ▶ The new interface on the constant temperature equipment is ready for operation.

4.3 Hoses

Approved elastomer hoses

Hose type	Clear Ø in mm	Outer diameter in mm	Temperature range of the hose in °C	Application area	Catalog number
EPDM hose, not insulated	9	13	10 – 90	for all LAUDA heat transfer liquids, except mineral oils	RKJ 111
EPDM hose, not insulated	12	16	10 – 90	for all LAUDA heat transfer liquids, except mineral oils	RKJ 112
EPDM hose, insulated	12	35	-35 – 90	for all LAUDA heat transfer liquids, except mineral oils	LZS 021
Silicone hose, not insulated	11	15	10 – 100	Water, water-glycol mixture	RKJ 059
Silicone tube, insulated	11	33	-60 – 100	Water, water-glycol mixture	LZS 007

Approved metal hoses

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

Hose type	Length in cm	Temperature range of the hose in °C	Application area	Catalog number
MC 50	50	10 – 400	With single insulation, suitable for all LAUDA heat transfer liquids	LZM 040
MC 100	100	10 – 400	With single insulation, suitable for all LAUDA heat transfer liquids	LZM 041
MC 150	150	10 – 400	With single insulation, suitable for all LAUDA heat transfer liquids	LZM 042
MC 200	200	10 – 400	With single insulation, suitable for all LAUDA heat transfer liquids	LZM 043
Pump short-circuit	18	10 – 400	With single insulation, suitable for all LAUDA heat transfer liquids	LZM 044
MK 50	50	-90 – 150	With foam insulation for the refrigeration sector, suitable for all LAUDA heat transfer liquids	LZM 052
MK 100	100	-90 – 150	With foam insulation for the refrigeration sector, suitable for all LAUDA heat transfer liquids	LZM 053
MK 150	150	-90 – 150	With foam insulation for the refrigeration sector, suitable for all LAUDA heat transfer liquids	LZM 054

Hose type	Length in cm	Temperature range of the hose in °C	Application area	Catalog number
MK 200	200	-90 – 150	With foam insulation for the refrigeration sector, suitable for all LAUDA heat transfer liquids	LZM 055
Pump short-circuit	18	-90 – 150	With foam insulation for the refrigeration sector, suitable for all LAUDA heat transfer liquids	LZM 045

4.4 LAUDA heat transfer liquids

Please note:

- If the heat transfer liquid reaches the lower limit of the temperature range, the temperature control properties can be expected to deteriorate as a result of the increase in viscosity. Therefore, only fully utilize this temperature range when absolutely necessary.
- Never use contaminated heat transfer liquids. Contamination in the pump housing can cause the pump to seize and the device to shut down.
- Observe the safety data sheet for the heat transfer liquid. You can request a copy of the safety data sheets at any time, if necessary.

Table 10: Approved heat transfer liquids

Designation	Chemical name	Working temperature range in °C	Viscosity (kin) in mm^2/s (at 20 °C)	Viscosity (kin) in mm^2/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/monoethylene 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 301[1]	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

[1] Recommendation: Nitrogen blanket from 150 °C

Table 11: Heat transfer liquid order numbers

Designation	Container size Catalog 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 longer periods of operation at higher temperatures and the mixture becomes combustible (flash point 119 °C). Check the mixing ratio using a hydrometer, for example.
- When using Aqua 90:
  Evaporation losses occur at higher temperatures. In this case, use a bath cover.
- Never use silicone oil in silicone tubes.
- When using mineral oils:
  Do not use in combination with an EPDM hose.

Heat transfer liquid, water

- The proportion of alkaline earth ions in the water must be between 0.71 mmol/L and 1.42 mmol/L (equivalent of 4.0 °dH and 8.0 °dH). Harder water leaves limescale deposits in the device.
- 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. High-purity water and distillates are suitable as a heat transfer liquid after 0.1 g of soda (Na_2CO_3, sodium carbonate) is added for every liter of water.
- Sea water is unsuitable due to its corrosive properties.
- Avoid chlorine in the water at all costs. Do not add chlorine to the water. Cleaning agents and disinfectants, for example, contain chlorine.
- The water must be free of impurities. Water with iron content is unsuitable due to rust formation and untreated river water is unsuitable due to algae growth.
- The addition of ammonia is not permitted.

5 Commissioning

5.1 Establishing a mains connection

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!
Formation of condensation (after transport)

Electric shock

- After transporting the device, wait for at least 24 hours, before putting it into operation to allow the device to adapt to the temperature at the installation location.

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 power supply for low temperature thermostats:

- Before connecting a device to the mains power, always compare the mains voltage and mains frequency with the type plate on the pump and control unit and with the type plate on the cold bath.
  If the specifications for the mains voltage range of the pump and control unit and the cold bath are different, the overlapping range applies. The mains voltage and frequency must be within this range.

Note for electric installation on site:

- The devices must be protected by a circuit breaker with a rated current not exceeding 16 amps.
  - Exception: For devices with a UK plug, the rated current is limited to a maximum of 13 amps.
- For information about the device's maximum current consumption, refer to the type plate of the pump and control unit.

Please note:

- The mains plug on the device is the primary component for disconnecting from the power supply.
  The mains switch (circuit breaker) on the device only has a safety function.
  - The mains plug must be easy to identify.
  - The mains plug must be easy to access.
  - It must be easy to pull the mains plug out of the socket.
- Always use standard power supply cables such as the one supplied.
- Connect the device to a socket with a protective earth conductor (PE).

5.2 Displays and basic navigation

5.2.1 Home window, navigation and softkeys

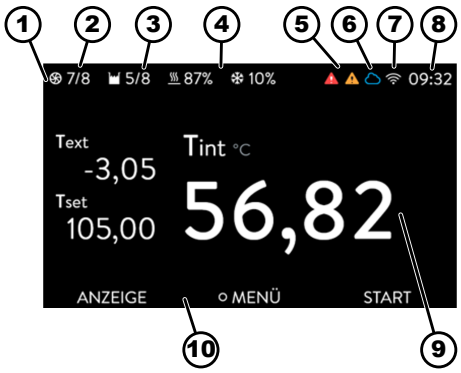


Fig. 24: Home window with status bar, temperature displays and softkey bar

After switching on the device and configuring the settings, the last active view is displayed. If no messages are active and the initial setup is complete, the basic view appears by default.

1 Status bar
2 Pump level
3 Level in the bath vessel (Universa MAX only)
4 Heating and cooling percentage value (low temperature thermostats only)
5 Alarm symbol (red) and warning symbol (yellow)
6 Cloud connectivity symbol
7 WLAN connectivity symbol (on devices with WLAN capability)
8 Current time
9 Temperature displays (adapted to the temperature displayed in large format)
10 Soft key bar

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

You can switch between the different windows in succession by pressing the DISPLAY softkey:

- Home window
- Home window with status bar
- Graph window
- Alarm messages
- Warning messages

A window showing alarm messages or warning messages is only displayed if an alarm or warning has actually been triggered. Please note:

- These windows do not appear while another menu is open.
- You must actively switch between windows to view the messages.

Alarm and warning messages are not displayed in the graph window of Universa PRO constant temperature equipment.

5.2.2 Graph window

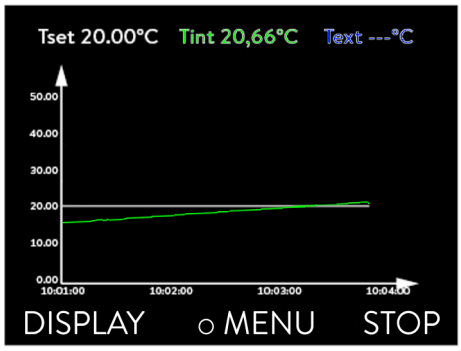


Fig. 25: Graph window

The display offers you the possibility to display temperature curves graphically.

The graphics window can be accessed via the [Display] softkey in the home window of the display.

- T_{set} indicates the set temperature (gray).
- T_{int} indicates the internal temperature (green) of the heat transfer liquid in the device.
- T_{ext} indicates the external temperature (dark blue) of the heat transfer liquid in the application.
- Use the arrow keys to scroll the graphic in any direction.

Adjusting the graph window

1. Press the Enter key to open the menu.
2. Select the → *Graphic* menu item.
   ▶ The Graphic submenu opens.

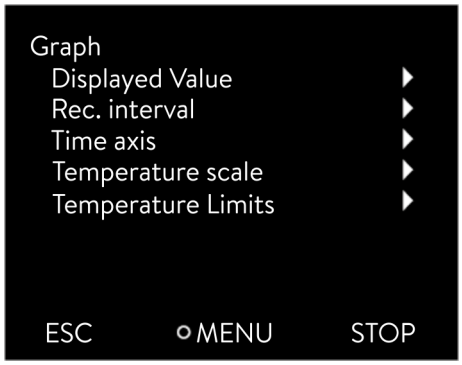


Fig. 26: Graphic menu

In this submenu, you can adapt the graphics window to your requirements.

- [Display measurement values]: T_{set}, T_{int}, T_{ext} and T_{ext2}.
  Here you can define which temperatures are displayed in the graph.
- [Sample time]: 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 can define the time interval at which new temperature values are measured.
- [Time Axis]: auto, 9 min, 45 min, 2 h 15 min, 4 h 30 min , 9 h, 24 h or 48 h.
  Here you can define the time range displayed in the visible graph window (corresponds to scaling of x axis).
- [Temperature scale]: automatic or manual.
  Here you can define which temperature range is displayed in the visible graph window.
  - [Autom.]: 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 in the visible graph window.

5.3 Switching on the device for the first time

WARNING!
Device is started using a remote control

Scalding, slipping, environmental hazard

- Do not switch on the device at the mains switch until all hydraulic connections for the application have been fully established and all measures for safe commissioning have been implemented.

You can change the following settings Menu language, Time zone and Temperature unit at any time from the → Setup → Basic setup menu.

Switch on the device

Fig. 27: Start screen

1. Switch on the device at the mains switch. An alarm tone will sound and the home screen will appear briefly.
   ▶ The language selection menu is displayed.

Fig. 28: Menu language

2. Use the up and down arrow keys to select the desired [menu language].
   Press the Enter key to confirm your selection (check mark appears) and then press the [>>] softkey.
   ▶ The time zone selection menu is displayed.
3. Use the up and down arrow keys to select the desired [time zone].
   Press the Enter key to confirm your selection and then press the [>>] softkey.
   ▶ The temperature unit selection menu is displayed.
4. Use the up and down arrow keys to select the desired [temperature unit].
   Press the Enter key to confirm your selection (check mark appears) and then press the [>>] softkey.
   ▶ The heat transfer liquid selection menu is displayed.
5. Use the up and down arrow keys to select the [heat transfer liquid].
   Press the Enter key to confirm your selection (check mark appears) and then press the [>>] softkey.
   ▶ The menu for selecting the bath unit is displayed.

6. Use the up and down arrow keys to select the [Bath unit].

   Press the Enter key to confirm your selection (check mark appears) and then press the [>>] softkey.

   ▶ The settings required after the initial start-up are complete and the home window is displayed.

5.4 Basic settings for commissioning

The basic settings must be configured on the device in the following cases:

- At initial start-up
- At every start-up
- Every time the heat transfer liquid is changed.

You may only fill the device after having configured the settings as described in the following chapters.

5.4.1 Sequence and limitation of inputs

The following diagram shows the prescribed entry sequence, which is necessary for safety reasons.

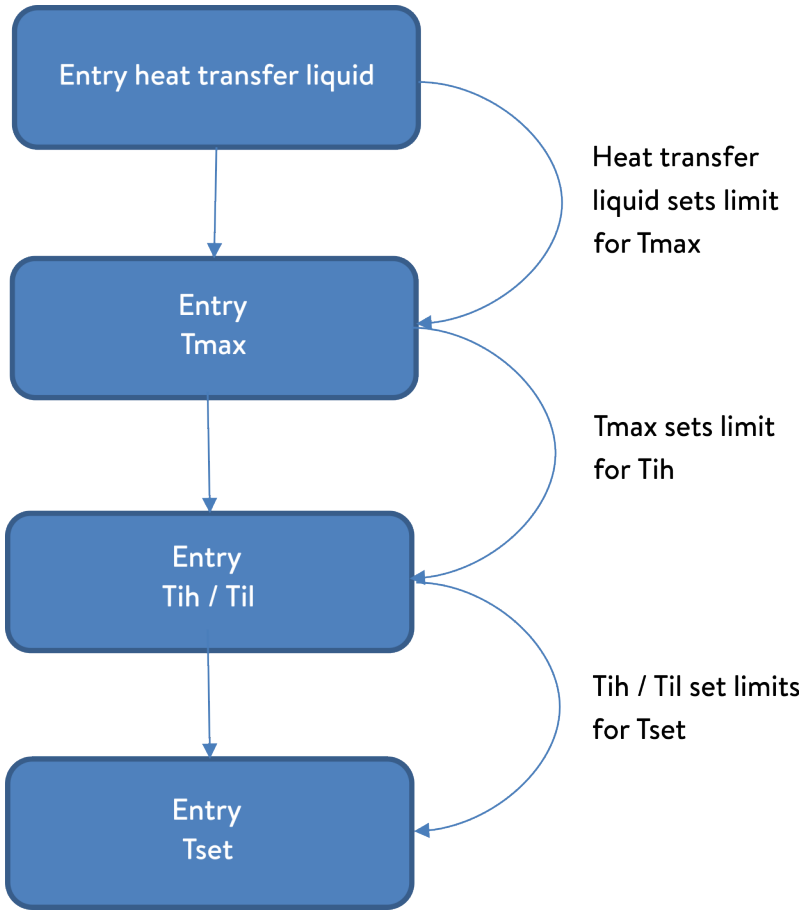


Fig. 29: Entry sequence

5.4.2 Setting the heat transfer liquid

In the device menu, specify the heat transfer liquid being used. This process loads the characteristics entered into the software in the device's controller.

The heat transfer liquid characteristics include:

- Flash point
- Tmax allowed
- Minimum temperature
- Maximum temperature
- Viscosity (optional)
- Density (optional)
- Specific heating capacity (optional)

In the [Reset hours] menu item, you can reset the operating time of the heat transfer liquid to 0.

Personnel: ■ Operating personnel

1. Press the Enter key to open the menu.
2. Select the menu items → *Tempering* → *Fluid* → *Select fluid*.
   ▶ A list of heat transfer liquids permitted for the device is displayed.
3. Scroll to mark a heat transfer liquid.

   Press the [ESC] *key to return to the home window without adopting any changes.*
4. Press [OK] to confirm the selection.
   ▶ A check mark appears next to the selection.
5. In the menu item → *Display fluid properties*, you can view the properties of the heat transfer liquid.

   Set Tmax immediately
   Once you have selected the heat transfer liquid, you must immediately set the overtemperature switch-off point T_{max}.
   ↬ Chapter 5.4.3 “Setting the overtemperature switch-off point (Tmax)” on page 53.

5.4.3 Setting the overtemperature switch-off point (Tmax)

The warning is relevant to:

- Devices with transparent baths

CAUTION!
Operating errors

Burning, device damage

- When setting Tmax, take into consideration the upper temperature range limit of 100 °C for transparent baths.

Personnel: ■ Specialized personnel

The overtemperature protection device on the unit may trigger an overtemperature alarm when reaching a temperature of 5 °C or less below the set T_{max} value.

This happens because the integrated safety system operates using a separate temperature sensor, which can deviate by a few degrees less than the value shown on the display.

Therefore, select a T_{max} setting that is high enough to avoid such disruptions in operation.

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

The permissible range (maximum and minimum values) for setting the T_{max} value is defined automatically as soon as the heat transfer liquid has been selected in the device menu.

1. Press and hold down the T_{max} key.
   - ▶ The T_{max} value is shown in the display.
2. Press the Enter key [O].
   - ▶ The entry window (Fig. 30) appears. The cursor flashes under the T_{max} value.
3. Change the value with the arrow keys.

   If you release the T_{max} key, the process is aborted and any changes to T_{max} are discarded.
4. Press the Enter key [O] to confirm the new value.
5. Check whether the value now flashing is correct.
6. Press the [ANW] softkey to confirm the new value.
   - ▶ The new value is active.
7. Release the T_{max} button.

Fig. 30: Entering the new Tmax value

5.4.4 Setting the temperature limits

There are two temperature limits:

Tih - upper limit (**T**emperature **i**nternal **h**igh)

Til - lower limit (**T**emperature **i**nternal **l**ow)

This function is used to set temperature limits Tih and Til. The temperature limits restrict the temperature target value. If the actual internal temperature is outside the temperature limits, a warning is issued and the heating is switched off. The temperature limits should reflect the limits of your application. A tolerance of 2 K should also be added to the upper and lower temperature limits to compensate for overshoots by the control, in particular external controls. The working temperature range of the heat transfer liquid must also be taken into consideration when defining temperature limits.

The adjustable range of the two limit values depends on the preset heat transfer liquid and the preset overtemperature switch-off point (Tmax) as well as the pump and control unit and the bath unit being used.

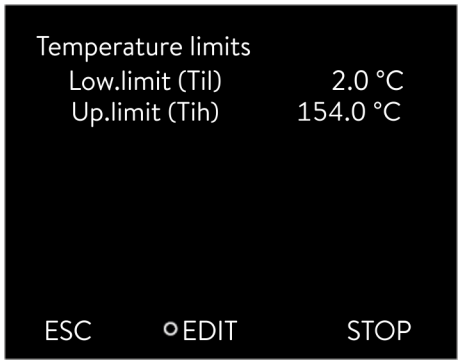


Fig. 31: Define temperature limits

1. Press the [Enter key] to open the menu.
2. Select the menu items → *Temperature control* → *Temperature limits* → *Lo.limit (Til)* or → *Up.limit (Tih)*.
   - ▶ The entry window appears. The cursor flashes under the value. The upper and lower limit are displayed.
3. Change the value with the arrow keys.

   By pressing the [ESC] *key, you return to the higher-level menu without making any changes.*
4. Press the Enter [OK] key.
   - ▶ The value is accepted.

5.4.5 Setting the setpoint value (set temperature)

Personnel: ■ Operating personnel

1. Press the [Enter key] to open the menu.
2. Select the menu items → *Tempering* → *Setpoint Value*.
   ▶ The entry window appears. The cursor flashes under the value. The set temperature can be set to a value (setpoint value) within the limits displayed.
3. Adapt the set temperature accordingly and press the Enter key to confirm.

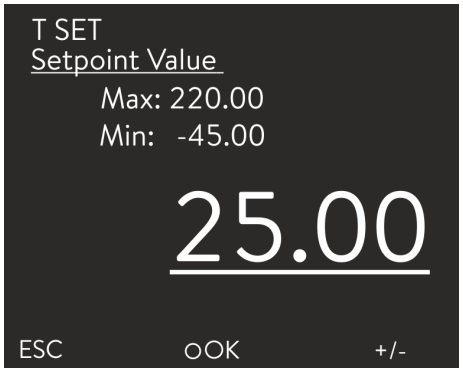


Fig. 32: Setting the set temperature

Press the [+/-] softkey to change the sign.

Press the ESC softkey to return to the previous display and discard any changes.

5.5 Filling the device

LAUDA is not liable for damages resulting from the use of unsuitable heat transfer liquids. Approved heat transfer liquids ↳ Chapter 4.4 “LAUDA heat transfer liquids” on page 46.
Depending on the software version, it may not be possible to enter arbitrary heat transfer liquid parameters. In this case, choose a LAUDA heat transfer liquid, the physical properties of which are closest to those of your liquid. Please follow the instructions for setting the overtemperature switch-off point Tmax.

DANGER!
Spraying of heat transfer liquid

Electric shock

- Do not spray heat transfer 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-off point Tmax, but not above the
  - flash point of the heat transfer liquid,
  - firing 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.

The following 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).

The following applies to PRO:

CAUTION!
Overflow of heat transfer liquid

Slipping or falling over

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

CAUTION!
Leaking heat transfer liquid

Slipping or falling over

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

Heat transfer liquids expand when heated (approx. 10% for every 100 °C). If an external application unit is connected, expansion occurs exclusively in the thermostat bath.

Bath thermostat

1. Close the drain valve by turning it clockwise.
2. Carefully fill the bath with heat transfer liquid.

The recommended fill level in the bath thermostat is between 30 and 100 mm below the upper edge of the bath.

For Universa MAX only:
Overlevel handling is initiated at a fill level of 25mm below the upper edge of the bath. Overlevel handling can be set according to requirements. A *Low Level Warning* is issued at approx. 110 mm and a *Low Level Alarm* is triggered at approx. 120 mm below the upper edge of the bath.

5.6 Basic settings menu

Personnel: ■ Operating personnel

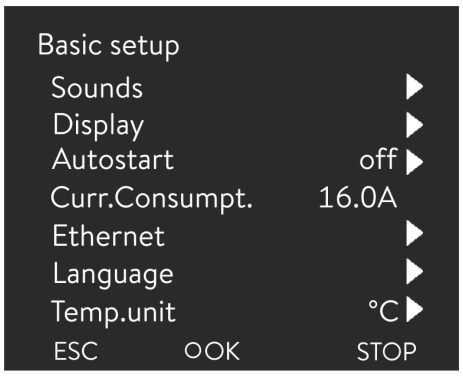


Fig. 33: Basic settings menu

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.

Set the brightness of the display

The display brightness can be set manually.

Fig. 34: Adjusting brightness

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 effect.

Displayed 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
- off

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 available for the device display.

Fig. 36: Select language

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 effect.

Select 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 effect.

Setting the clock

Always set the correct time zone before changing the time and date. Otherwise, the local time may change due to the changed time zone offset when the time zone is changed.

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

Obtaining the time/date via NTP from the network only works if the correct time zone has been set. The IP address of the NTP server must be communicated to the LAUDA constant temperature equipment via DHCP (option 42).

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

Setting the time format

Personnel: ■ Operating personnel

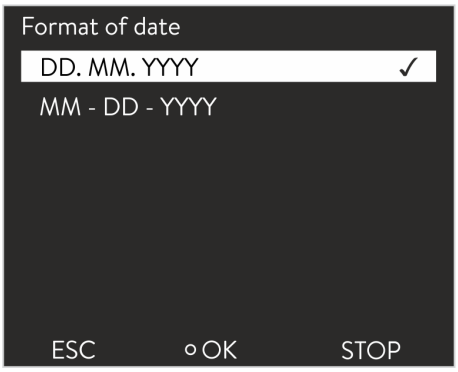


Fig. 37: Selecting options

You can display the date in two different formats.

- The setting [DD.MM.YYYY] means that the day, month and year are displayed in this order (European).
- The setting [MM - DD - YYY] means that the month, day and year are displayed in this order (US English).

1. Press the Enter key to open the menu.
2. Select the menu items → *Setup* → *Basic setup* → *Clock* → *Format of date*.
   - ▶ A list of settings opens.
3. The following options are available in the window:
   - Format [DD.MM.YYYY]
   - Format [MM - DD - YYYY]
   - ▶ The new setting is active with immediate effect.

Using a timer

A timer can be set in the constant temperature equipment to switch the constant temperature equipment 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!

In standby mode, the constant temperature equipment is not fully switched off. The constant temperature equipment may start inadvertently due to a previously activated timer.

Opening the timer menu

1. Press the Enter key to open the menu.
2. In the Basic setup menu, select the menu item → *Setup* → *Basic setup* → *Clock* → *Timer*.
   - ▶ A *weekly plan* is displayed.
3. Use the left and right arrow buttons to jump to the different columns. Press the Enter button to edit. Press the up and down arrow buttons to change the values. Select the required option: *no* or *yes*. The selected values are accepted without pressing the Enter key.

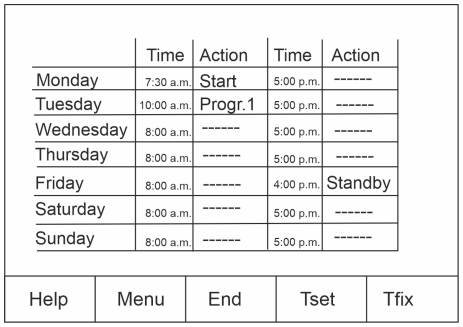


Fig. 38: Configuring a weekly plan

Configuring a *weekly plan*

- In the table containing the days Monday to Sunday, you can specify at which specific times the constant temperature equipment should switch on or off. Two actions can be executed each day.
- For example, the device can be switched on every Monday at 7 a.m. However, the device must be prepared in such a way that it can be operated safely from standby mode. After 7 days, the plan is repeated.

5.7 Operating settings

5.7.1 Settings for the overlevel safety function

Setting the overlevel

The device menu contains various settings that determine how the level detection function reacts to an overlevel in the bath vessel.

1. Press the Enter key to open the menu.
2. Select the menu item → *Setup* → *Operating settings* → *Overlevel handling*.
   - ▶ A submenu opens.

Depending on the structure, heat transfer liquid or operating conditions, one of the following reactions applies:

Table 12: Overlevel handling

Setting in the menu	Meaning	Device response and application recommendation
No warning	No message is displayed	Only select if there are no special safety requirements. For example, when operating with water.
Warning	A warning appears on the display	Continuous acoustic and visual warning that only stops when the level has dropped sufficiently. This is the factory setting.
Warning + heating off	A warning appears on the display and the heating switches off	■ Continuous acoustic and visual warning ■ Heating switches off automatically ■ These measures will remain in effect until the level has dropped sufficiently. Recommended for non-flammable heat transfer liquids and temperatures above 100 °C.
Alarm	An alarm message appears on the display	■ Pump and heating switch off automatically ■ Recommended for: ● external application or when ● using flammable heat transfer liquid

5.7.2 Bath unit setting

Selecting the bath unit

The bath unit operates the pump and control unit as a high or low temperature thermostat and must be adjusted if the system configuration is modified.

1. Press the Enter key to open the menu.
2. Select the menu item → *Setup* → *Operating settings* → *Bath unit*.
   - ▶ A list of bath units available for selection appears.
3. Select the bath unit according to the type information on the bath unit type plate.
4. Press [OK] to confirm the new value.
   - ▶ The new setting is active.

Incorrect configuration

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

5.7.3 Level wrn. thresh. setting

Setting the Level wrn. thresh.

This section is relevant to:

- Universa MAX devices

If the level falls below the minimum, a warning is issued before a low level alarm is triggered. You can set the low level warning to a setting between 1 and 3. Depending on the design, requirements, heat transfer liquid or operating conditions, different warning levels may apply.

1. Press the Enter key to open the menu.
2. Select the menu item → *Setup* → *Operating settings* → *Level wrn. thresh.*
   - ▶ The Input window opens.
3. Change the value using the arrow buttons
4. Press [OK] to confirm the new value.
   - ▶ The new setting is active.

5.7.4 Limiting the current consumption

Limiting the current consumption

The fuse on the installation side must at least correspond to the maximum current consumption of the device (see rating label). If the mains fuse is lower, you must reduce the maximum current consumption of the device. The heating output will be reduced accordingly. When setting the current consumption, consider whether other loads may be connected to a circuit together with your device.

Personnel: ■ Specialized personnel

Fig. 39: Specifying current consumption

1. In the [Setup] menu, select the menu items → *Operating settings* → *Max. Curr.Consumpt.*
   ▶ A window opens for entering a numerical value. The cursor flashes under the numerical value. The upper and lower entry range is displayed.
2. Change the value with the arrow keys.

   By pressing the [ESC] *key, you return to the* [Basic settings] *menu without making any changes.*
3. Press [OK] to confirm the new value.
   ▶ The new value is active.

The reduction of the maximum current consumption of the device reduces the heating power and thus influences the control characteristics, where applicable.

5.7.5 Autostart

Automatic start after power failure

The device will **not** resume operation (factory setting) after a power failure and restoration of the power supply. However, you can set the device to automatically resume operation after the power has been restored.

Fig. 40: Selecting the Autostart setting

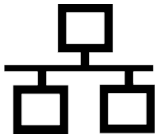
1. In the [Setup] menu, select the menu items → *Operating settings* → *Autostart*.
   ▶ A list of settings opens.
2. Select one of the following options:
   - With [off], the device is set to standby operating mode after a power failure and after the power supply has been restored.
   - With [On], the device is set automatically continue after a power failure and when the power supply is restored.

   Automatic running of the device may result in unattended operation.
3. Press the Enter key to confirm your selection.
   ▶ 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 enables the device to be accessed by a PC or control station. Activate this function if you wish to control or monitor the constant temperature equipment from an external control station.

Before the constant temperature equipment and control station can be operated together in a local network (LAN), the Ethernet interface must be configured.

The Ethernet interface can be configured in two different ways:

Automatically obtain LAN configuration	- In order for this to work, a DHCP server must be present in the local network (LAN). If communication is direct, the control station must support the auto IP procedure.
Manually configure LAN configuration	- Manual configuration must be performed if a DHCP server is not 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 constant temperature equipment.
2. Press the [Enter key] to open the menu.
3. (a) Select this menu item to configure the LAN interface:
   → *Interfaces* → *Network* → *LAN* → *LAN configuration* → *DHCP client*.

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

   ▶ The options [off] and [on] appear on the display.
4. Select the option [on] and press [OK] to confirm.

   ▶ A check mark is set. The DHCP client is active. The Ethernet interface is configured automatically.
5. Use the left arrow key to go back three menu levels to [Services].
6. Use the cursor keys to select the menu items → *PC control* → *PC control*.
   In the [PC control] menu, select the [on] entry.

   ▶ A check mark is set. The control for the control station is activated.
7. If required, enter the port number in the [PC control] menu.

Specify network settings manually (DHCP client off)

1. Switch on the constant temperature equipment.
2. Press the [Enter key] to open the menu.
3. (a) Select this menu item to configure the LAN interface:
   → *Interfaces* → *Network* → *LAN* → *LAN Configuration* → *DHCP client*.

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

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

4. Select the [off] option and press the Enter key to confirm.
   - ▶ A check mark is set. The entry has been accepted.
5. Use the left arrow key to go back one menu level.
6. Scroll to the numerical values of the [Local IP address] menu item and press the Enter key.
   - ▶ The *Local IP address* menu opens.
7. Byte 1 is marked. Press the right arrow key.
   - ▶ The Input window opens. The area for entering the numerical values is displayed.
8. Enter the numerical value for byte 1. Confirm the value with the Enter key [OK].

   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 key.
    - ▶ (a) You return to the *LAN configuration* menu.

      (b) You return to the *WLAN configuration* menu.
11. Scroll to the numerical values of the [Local mask] menu item and press the Enter key.
    - ▶ The *Local 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 key.
    - ▶ (a) You return to the *LAN configuration* menu.

      (b) You return to the *WLAN configuration* menu.
14. If required, also enter the numerical values for the [Gateway] and [DNS server].
15. Once you have entered the numerical values, press the left arrow key.
    - ▶ The entered numerical values of [Local IP address], [Local mask], [Gateway] and [DNS Server] are displayed.
16. Press the [EDIT] softkey to accept the entered numerical values.
17. Press the left cursor key to the move up one menu level and select the *PC control* menu item and press Enter.
18. Confirm the [PC control] entry once more.
19. Select the option [on] and confirm the entry.
    - ▶ The control for the control station is activated.

No settings are accepted if you leave the LAN configuration / WLAN configuration menu without first pressing the [OK] *key.*

Set the [DHCP client] *from* [off] *to* [on], *all numerical values are reset to 0. 0. 0. 0.*

If you have set up Ethernet communication between the control station and the constant temperature equipment, it may take 1 or 2 minutes to establish the connection.

Check the LAN network and the process interface

1. Start the Windows command processor by entering `cmd.exe`↵ on the PC with Microsoft Windows operating system.
   - ▶ The input window opens.
2. There are two ways of checking:
   - Enter the ping command together with the IP address.
     `ping XXX.XXX.XXX.XXX`↵
     For "XXX.XXX.XXX.XXX", put the IP address that was entered when the Ethernet interface was configured.
     Or
   - Enter the ping command together with the serial number of the constant temperature equipment (possible with software control system 1.36 or later).
     `ping serial number`↵
   - ▶ If the Ethernet interface is configured and connected correctly, the interface will return four responses within a very short time. See Fig. 41.

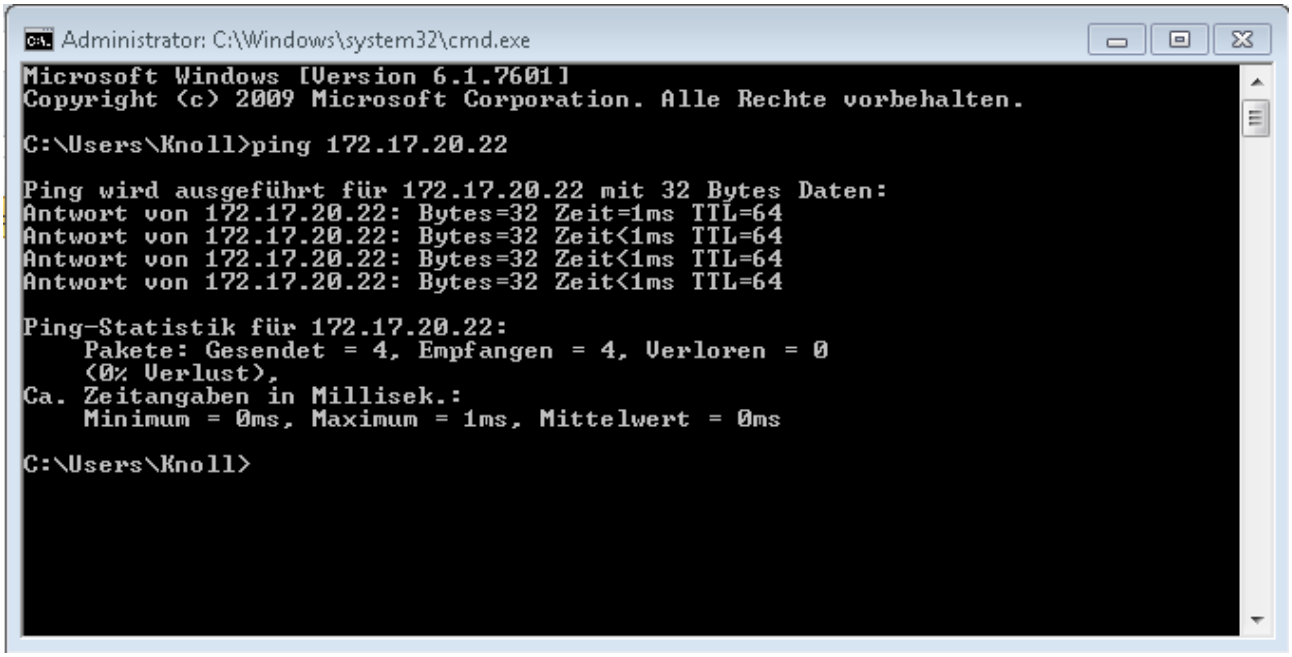


Fig. 41: Example for entering the ping command

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

Checking with RealTerm

1. Open the program "HyperTerminal" or the "terminal program" on a PC with Microsoft Windows operating system.

   ▶ The Input window opens.

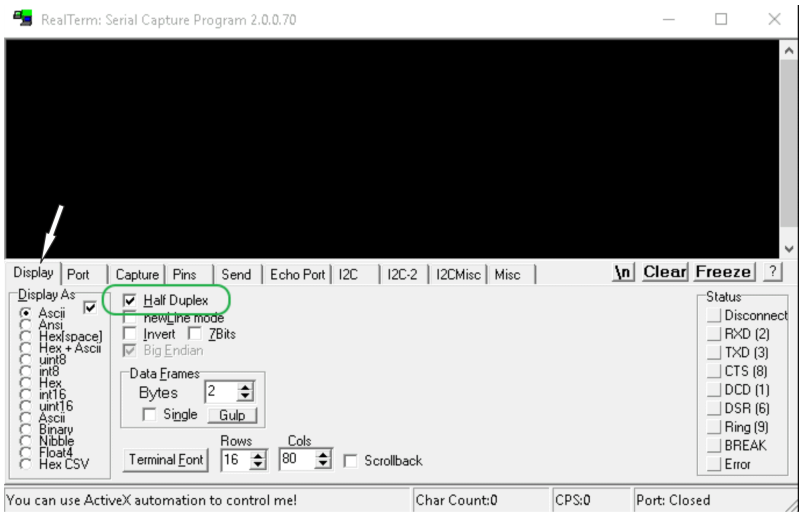


Fig. 42: "RealTerm" program

2. Place a check mark under *Half Duplex* in the *Display* tab.

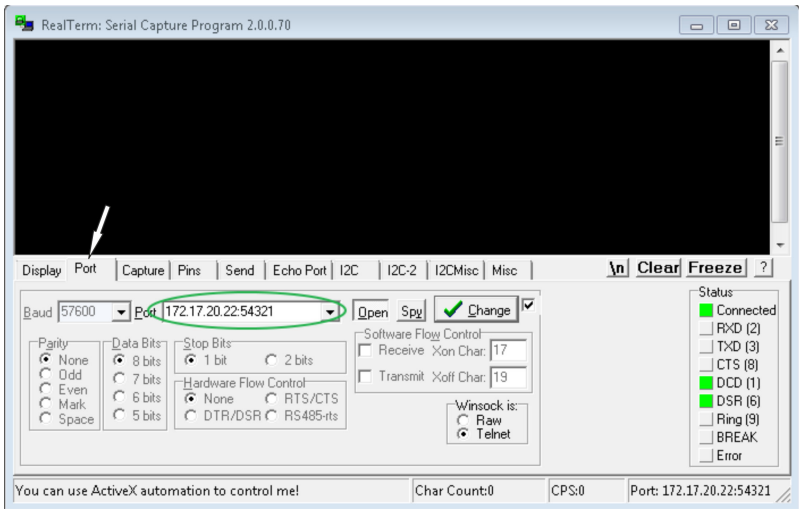


Fig. 43: Entry in the Port field

3. Enter the configured IP address and port number of the Ethernet interface on the constant temperature equipment in the *Port* tab. When you are doing this, be sure that the IP address and port number are separated by a colon.

   You can enter the serial number of the constant temperature equipment instead of the IP address.

4. Then press the [Open] button.

5. Open the *Send* tab.

   ▶ Now that the program has been configured, the actual test can begin.

6. Place a check mark under *+CR* and *+LF*.

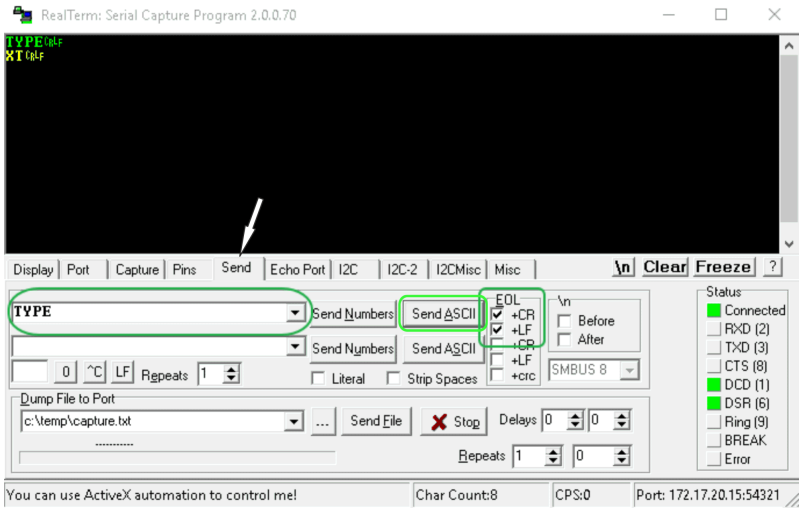


Fig. 44: Entries for the test

7. A command must be sent to the constant temperature equipment to test communication. For example, `TYPE`. Type the command and press [Send ASCII].

   ▶ If the connection is operational, the constant temperature equipment acknowledges the command.

A read command must be sent to the constant temperature equipment to test communication ↳ Chapter 6.12.2 “Read commands” on page 110.

5.9 Connecting to a wireless network (WLAN)

The WLAN menu and the WLAN icon are only visible if the constant temperature equipment supports the WLAN function.

The WLAN icon is found in the status bar on the main screen. The icon flashes if WLAN is turned on but there is no connection. It lights up continuously if a connection to an access point exists. It is not visible if the device does not support the WLAN function or if WLAN is turned off.

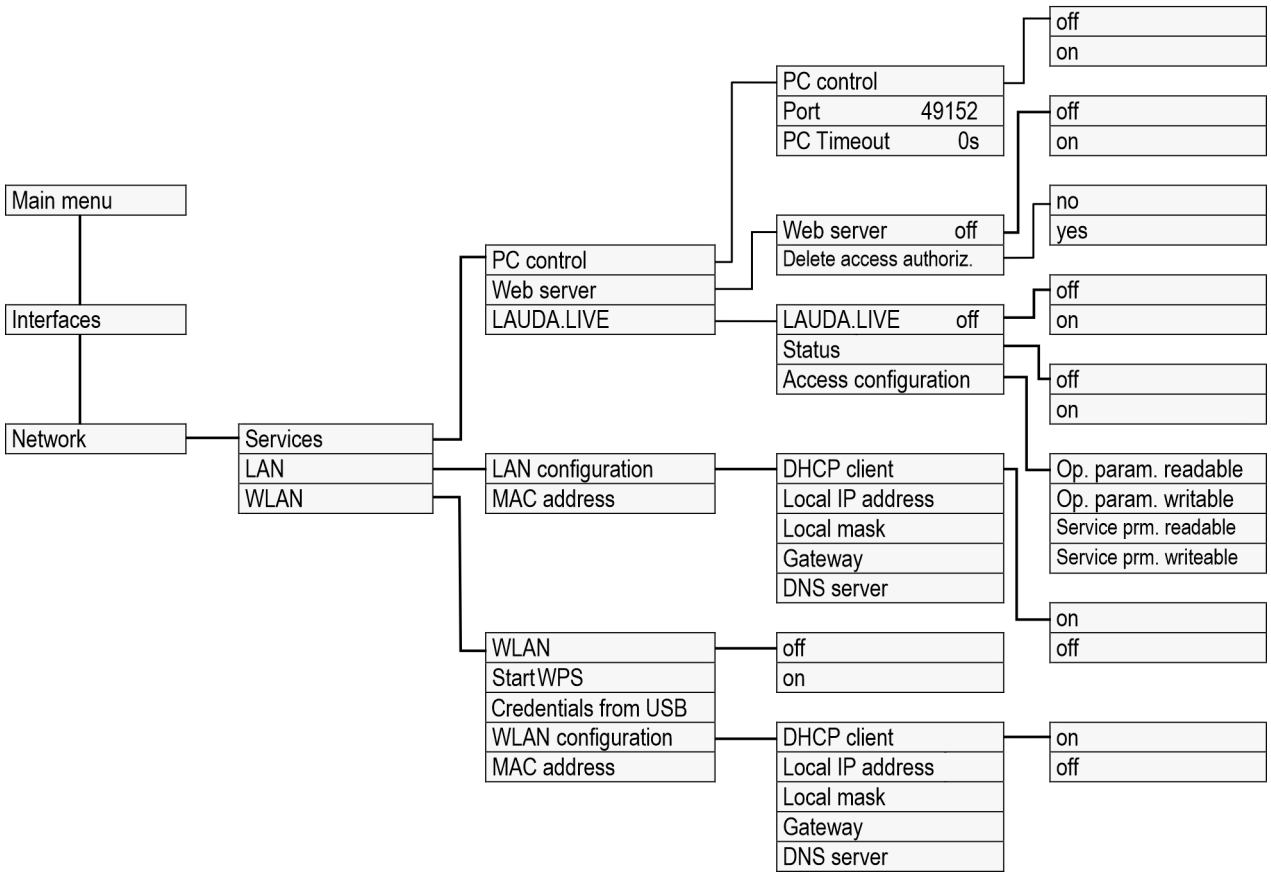


Fig. 45: WLAN interface menu

In some countries, the LAUDA Universa thermostats support connection to a wireless network. Once the connection has been established, you can operate the device very easily using wireless devices such as tablets and smartphones.

WLAN-capable devices are only available for purchase in the following regions:

- European Union
- United Kingdom
- Switzerland
- USA
- Canada
- India

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

The device can only connect to wireless networks in the 2.4 GHz band according to IEEE 802.11 b/g/n. The device supports WPA, WPA2 and WPA3 encryption to protect data transmission. When establishing a connection, the device adopts the encryption method and the connection parameters of your access point.

Note that you may have to enable the device's network services (e.g. integrated web server) individually and independently of the WLAN configuration in order to operate the device via this network.

Connecting to a wireless network

You can connect the device to a wireless network using various login mechanisms. Choose the method that is compatible with your existing infrastructure.

- WPS procedure (WiFi Protected Setup)
- WPA-PSK (WiFi Protected Access with Pre-Shared Key)

Connection using the WPS procedure

In order to establish a connection using the WPS method, your access point must support WPS.

Establish a connection 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 → *Interfaces* → *Network* → *WLAN* → *Start WPS*.
3. It may take up to 2 minutes for the connection to be established.
4. On the main screen, check whether the WLAN icon is continuously displayed. The connection to an access point is then established. A flashing WLAN icon indicates an attempt to establish connection.

Connection with pre-shared key (WPA-PSK)

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

Proceed as follows:

1. Download the text file with the name **pskCfg.txt** (UTF8 format) from the LAUDA website. https://www.lauda.de/de/services/download-center/filter/Installationsanleitung/Universa
2. Open the file with Windows text editor. Enter the name of your WLAN in `SSID`. Enter the password in `Password`.
3. Save the file onto a USB stick and insert it into your LAUDA constant temperature equipment.
4. Select the menu → *Interfaces* → *Network* → *WLAN* → *Read login information from USB*.
5. It may take up to 2 minutes for the connection to be established.
6. On the main screen, check whether the WLAN icon is continuously displayed. The connection to an access point is then established. A flashing WLAN icon indicates an attempt to establish connection.

Disconnecting from a wireless network

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

The entered connection parameters remain stored 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 permanently less than this.

5.10 Restore the factory setting

Reset control system

For Universa thermostats, the control parameter values are defined according to the bath units. When a bath unit is replaced, the control parameters are automatically reset to the factory settings.

Select these menu items to restore the factory settings stored in the constant temperature equipment.

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

- All default
- Only control parameters
- Other parameters

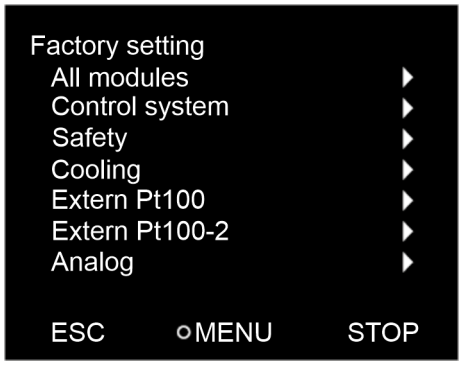


Fig. 46: Factory Setting menu

Other parameters include:

- The heat transfer liquid is set to "undefined".
- Operating button locking is deactivated.
- The temperature unit is set to *°C*.
- The volume of the signal tone is set to *Loud*.
- The display brightness is set to *Stage 5*.

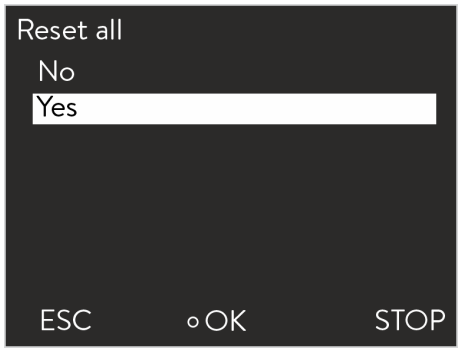


Fig. 47: Factory setting

Reset in the [All default] menu:

- Control
  - Control variable (Intern Pt)
  - Control parameter (Xp, Tn, Tv, etc.)
- Temperature limits (Tih and Til)
- Basic setup
  - Display
  - Sounds
  - Language
  - Temperature unit
  - Clock
  - Current consumption
  - Warning level
  - Cooling water circuit
  - Autostart: On
- Calibration (temperature probe)
- Graphic display
- Home window
- Operating mode (operation)

Personnel: ■ Operating personnel

Navigate to the factory setting menu

1. Press the Enter key to open the menu.
2. Select the menu items → *Setup* → *Factory setting*.
3. Select a menu item.
4. Select one of the following options:
   - By pressing the [no] key, you return to the higher-level menu without making any changes.
   - By pressing the [yes] key, the device is reset to factory settings when you confirm this action with the Enter key.

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

Factory setting values

Table 13: Control system

Parameter	Factory setting
Internal control parameter	Specific to device
External control parameter	Specific to device
Device configuration	Specific to device
Maximum temperature	Specific to device
Minimum temperature	Specific to device
Pump level	Specific to device
Display brightness	5
Low level warning (for Universa MAX)	1
Display text 2	off

Parameter	Factory setting
Programmer optimization	off
Dynamic heating limiter	off / 100%
Heating output limitation	off / 100%
Cooling output limitation	off / 100%
Standby	on
Autostart	off
Signal volume	Maximum
Setpoint value	20 °C
Maximum mains current consumption	16 amperes
Fluid	Undefined
Language	Undefined
Contr. Variable	internal
Correction limitation	500 K
Setpoint offset	off
Setpoint offset temperature	0 K
Graph record interval	2 seconds
Graph axis scaling	autom.
Parameters displayed on graph	Tset / Tint / Text
Program repeat	1
Delete program	All

Table 14: Cooling system

Parameter	Factory setting
Automatic cooling unit	autom.
Cooling controller output limit	100%

Table 15: Network

Parameter	Factory setting
Web server	off
LAUDA.LIVE	off
■ Op. param. readable	off
■ Op. param writeable	off
■ Service prm. readable	off
■ Service prm. writeable	off
DHCP	off

Parameter	Factory setting
PC control	off
Port number	49152

6 Operation

6.1 Safety instructions prior to operation

All work on the device

CAUTION!
Danger due to inaccessible mains switch

Scalding, cold burns

- Make sure that the mains plug is always easily accessible. It must be possible to quickly pull the mains plug out of the socket.

DANGER!
Risk of immersion thermostat falling into the bath

Electric shock

- Only operate immersion thermostats on circuits with a residual current device (RCD).
- Make sure that the immersion thermostat bracket is securely connected to the bath.
- Only use bath vessels that are stable enough to support the immersion thermostat and designed to withstand the intended operating temperatures.

DANGER!
When operated as an immersion thermostat, deposits may form on the printed circuit boards

Electric shock

- If vapors are generated above the heat transfer liquid, use a sealed cover on the bath, wherever possible. Vapors must be prevented from entering the pump and control unit.

DANGER!
If the pump and control unit are positioned incorrectly on the bath, vapors will cause deposits to form on printed circuit boards.

Electric shock

- If vapors are generated above the heat transfer liquid, use a sealed cover on the bath, wherever possible. Vapors must be prevented from entering the pump and control unit.

DANGER!
If the pump and control unit are positioned incorrectly on the bath, the power supply cable will be exposed to high temperatures. Contact with live cables.

Electric shock

- Immersion of the power supply cable in the heat transfer liquid and contact between the power supply cable and hot surfaces (> 70 °C) must be avoided.

WARNING!
Unauthorized control

Scalding, cold burns, fire

- Always 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 heat transfer liquid

Fire

Do not set the overtemperature switch-off point Tmax above the

- flash point of the heat transfer liquid,
- firing point of the heat transfer liquid minus 25 K or
- ignition temperature of the heat transfer liquid minus 100 K.

WARNING!
Overheating above the flash point of the heat transfer liquid due to an exposed heat source

Fire

- The thermostat must always be operated on a horizontal surface.

WARNING!
Overheating above the flash point of the heat transfer liquid

Ignition and spread of fire

- Check the low-level detection feature after replacing the heat transfer liquid, or at the prescribed maintenance interval at the latest.

WARNING!
Overheating above the firing point of the heat transfer liquid -25 K

Ignition and spread of fire

- Do not use heat transfer liquids with a firing point lower than 65 °C.

WARNING!
Risk of mechanical damage to refrigerant circuit

Burns, fire

- Do not use mechanical tools to accelerate de-icing.

WARNING!
Risk of cooling circuit bursting due to excessive gage pressure

Burns, fire

- Ensure that none of the ventilation grids on the fan of the constant temperature equipment are blocked, including the front air inlet of the cold bath and the air outlets.

WARNING!
Leaks in the cooling circuit

Burns, fire

- Do not use corrosive heat transfer liquids.

WARNING!
Use of flammable heat transfer liquids

Fire

- Aeration openings on the device must not be blocked.
- Do not smoke. No naked flames.
- When working near the constant temperature equipment and the application, do not use electrical parts that can generate sparks.
- Use a bath cover wherever possible.
- For the responsible department of the operator: Attach the warning symbol W021 "Warning: flammable substances" to the device in a clearly visible location (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 delay and thermal decomposition due to liquid residues

Scalding, burning

- Remove all liquid residues when changing the heat transfer liquid from water-based heat transfer liquids or other low-boiling liquids to heat transfer oils, including from hoses and consumers. Otherwise there is a risk of burns due to the boiling delay.
- To do so, also remove the blind caps from the pump outlets and pump inlets. Set the internal/external changeover switch to the central position and blow out the pump connectors with compressed air. Also remove any liquid residues behind the drain tap by draining the liquid, and then make sure that no liquid residues are visible.

WARNING!
Gas displaces atmospheric oxygen

Danger of asphyxia

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

WARNING!
Operating errors, technical defect

Fire

- Disconnect the mains plug to safely disconnect from the mains power.

WARNING!
Pump level selected is too high for small bath

Hot and cold burns

- When adjusting the pump level, ensure that the heat transfer liquid does not overflow from the bath.

CAUTION!
Object falling into the bath splashes heat transfer liquid

Scalding, cold burns

- 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!
Risk of heat transfer liquid leaking from incorrectly sealed pump connections

Scalding, cold burns

- Attach a stopper or pump link to the pump connections if no external application is connected.

CAUTION!
Contact with hot/cold surfaces

Hot and cold burns

- Never touch parts that are labeled with the warning symbol "Hot surface".

CAUTION!
Restrictions during operation or setup

Ergonomic impairment

- Position the LAUDA thermostat on a table, pedestal or the floor so that all operating elements are easy to use (bath, connections, interfaces, display, keyboard).
- Devices with 4 castors are only suitable for positioning on the ground so that they are prevented from falling from an elevated height.

CAUTION!
Contact with heat transfer liquid vapors

Breathing difficulties

- Use an extractor system.
- Use a bath cover wherever possible.

CAUTION!
Operating the cooling coil in a central cooling water system; heating steam/outflow of boiling cooling water

Scalding

- When operating on a central cooling water system, the cooling coil can be used up to a bath temperature of 95 °C.

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

Scalding

- Secure the open end of the cooling coil hose at the outlet.
- When operating with drinking water, the cooling coil can be used up to a bath temperature of 155 °C.

CAUTION!
Condensate drips from the cover into the hot heat transfer liquid

Scalding

- Open the cover by lifting one edge first so that any condensate can drain to the side. Observe whether any boiling delays occur.
- Only open the cover completely if no boiling delays are evident.

NOTICE!
Water damage caused by use of the cooling coil

Damage to the facility

- To avoid water damage caused by leaks from the cooling water system, use a leakage water detector with water shut-off function.

The following note is relevant to:

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

NOTICE!
Operating errors

Device damage

- Consider the maximum temperature range of the device type when setting Tmax. Refer to the technical data of the cold baths for information about the maximum temperature range.

6.2 Menu structure

Menu structure for MAX and PRO

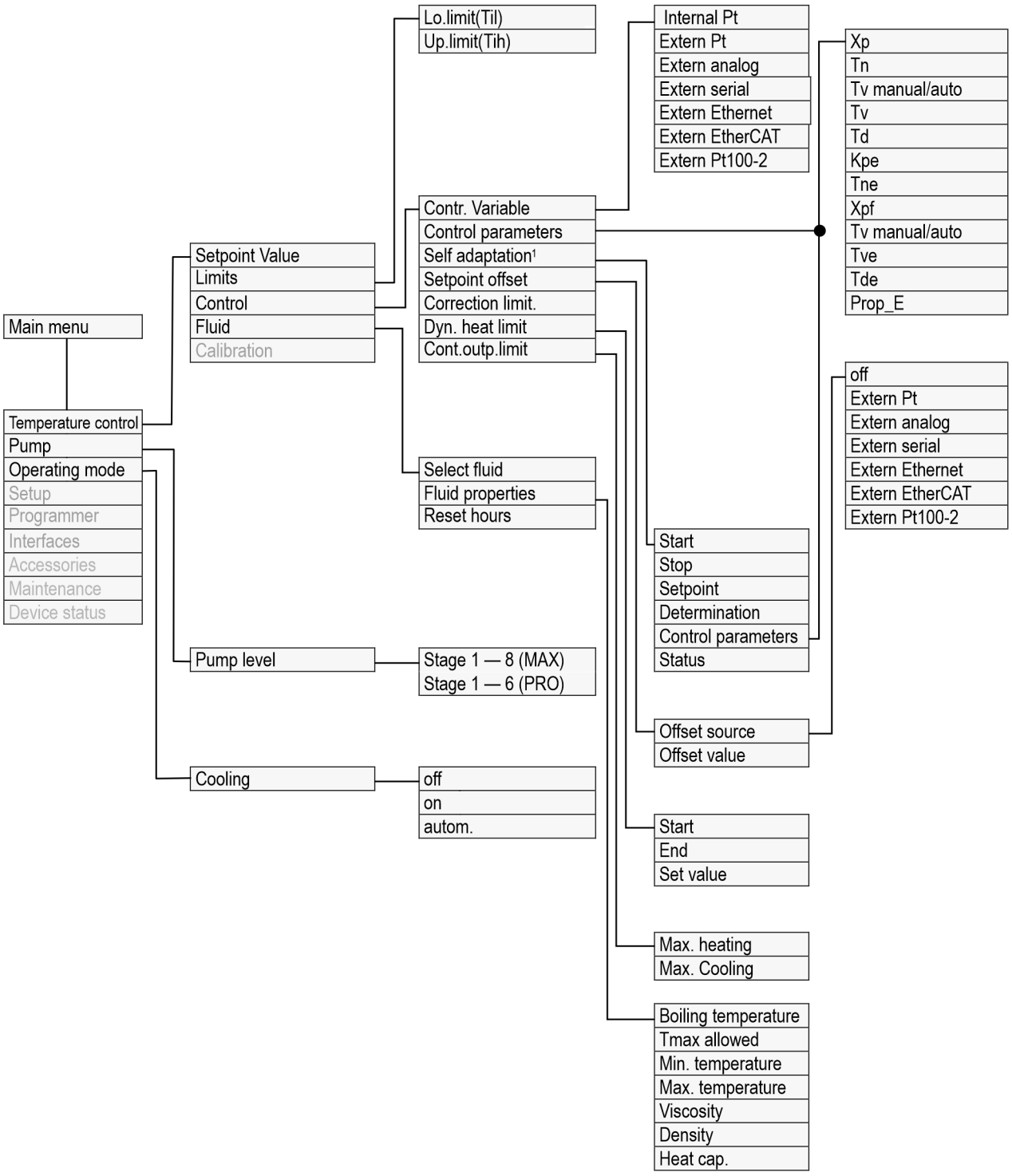


Fig. 48: Menu structure, part 1, MAX and PRO

[1] only available on Universa MAX

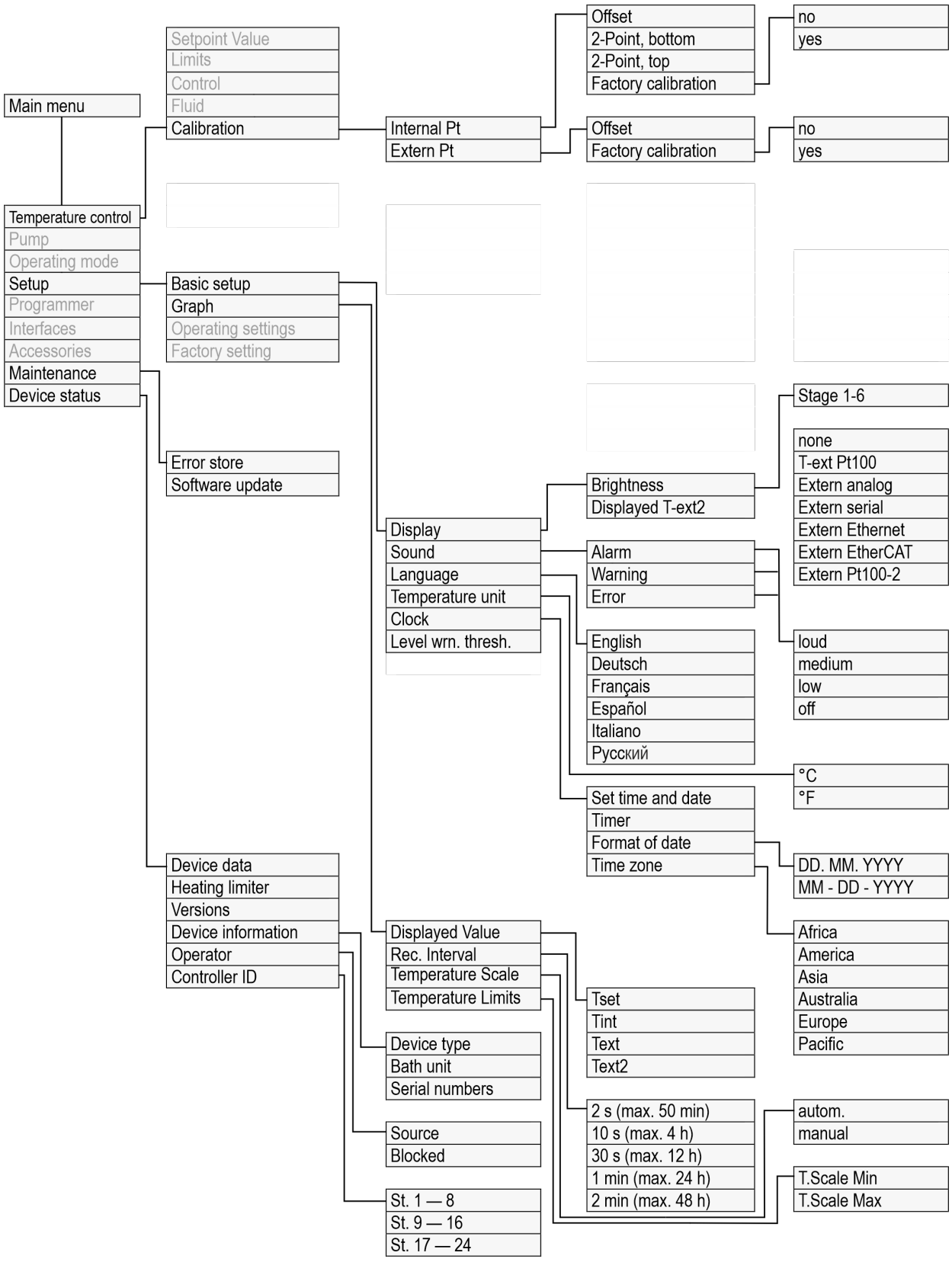


Fig. 49: Menu structure, part 2, MAX and PRO

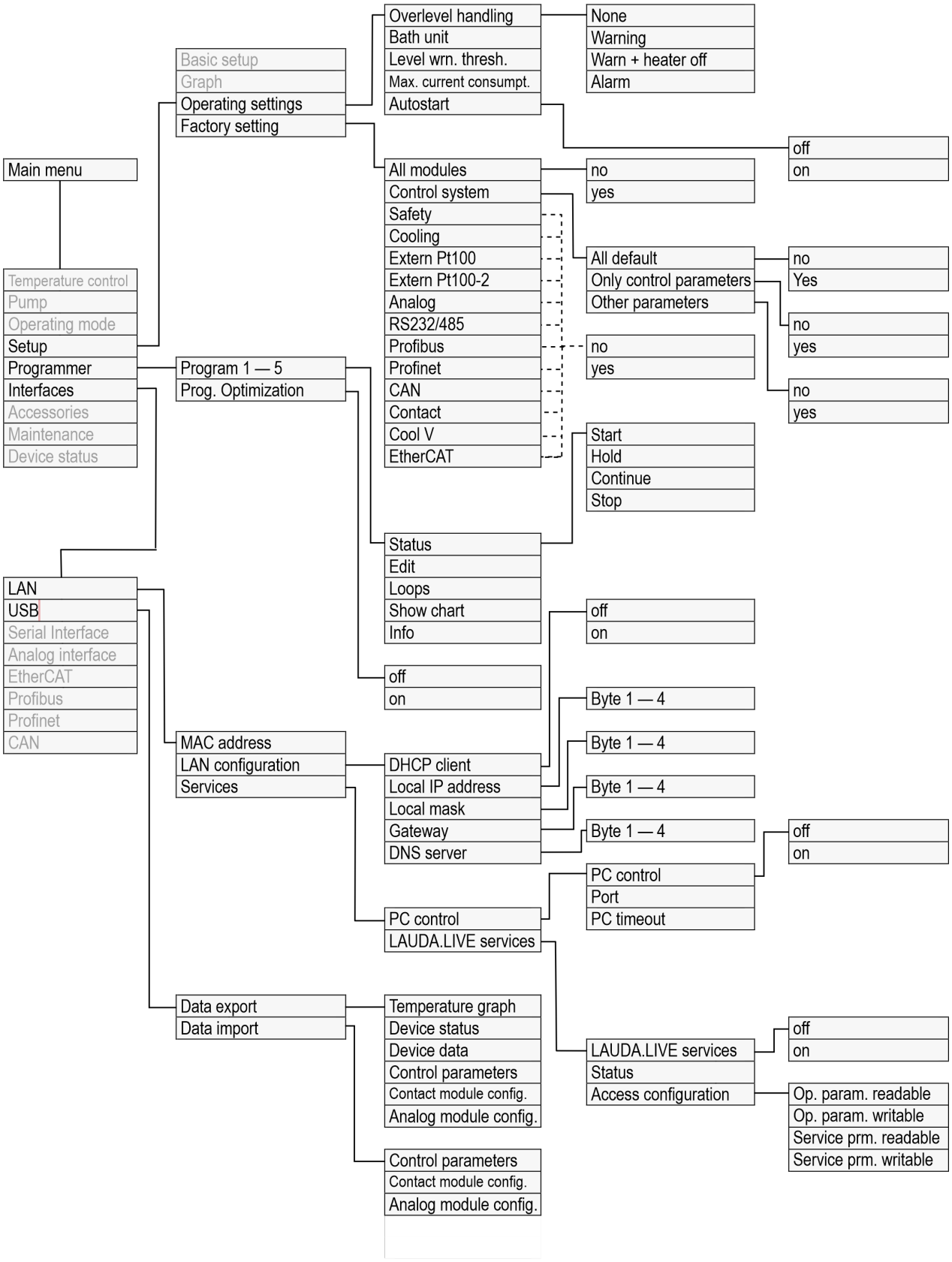


Fig. 50: Menu structure, part 3, MAX and PRO

Interfaces menu structure

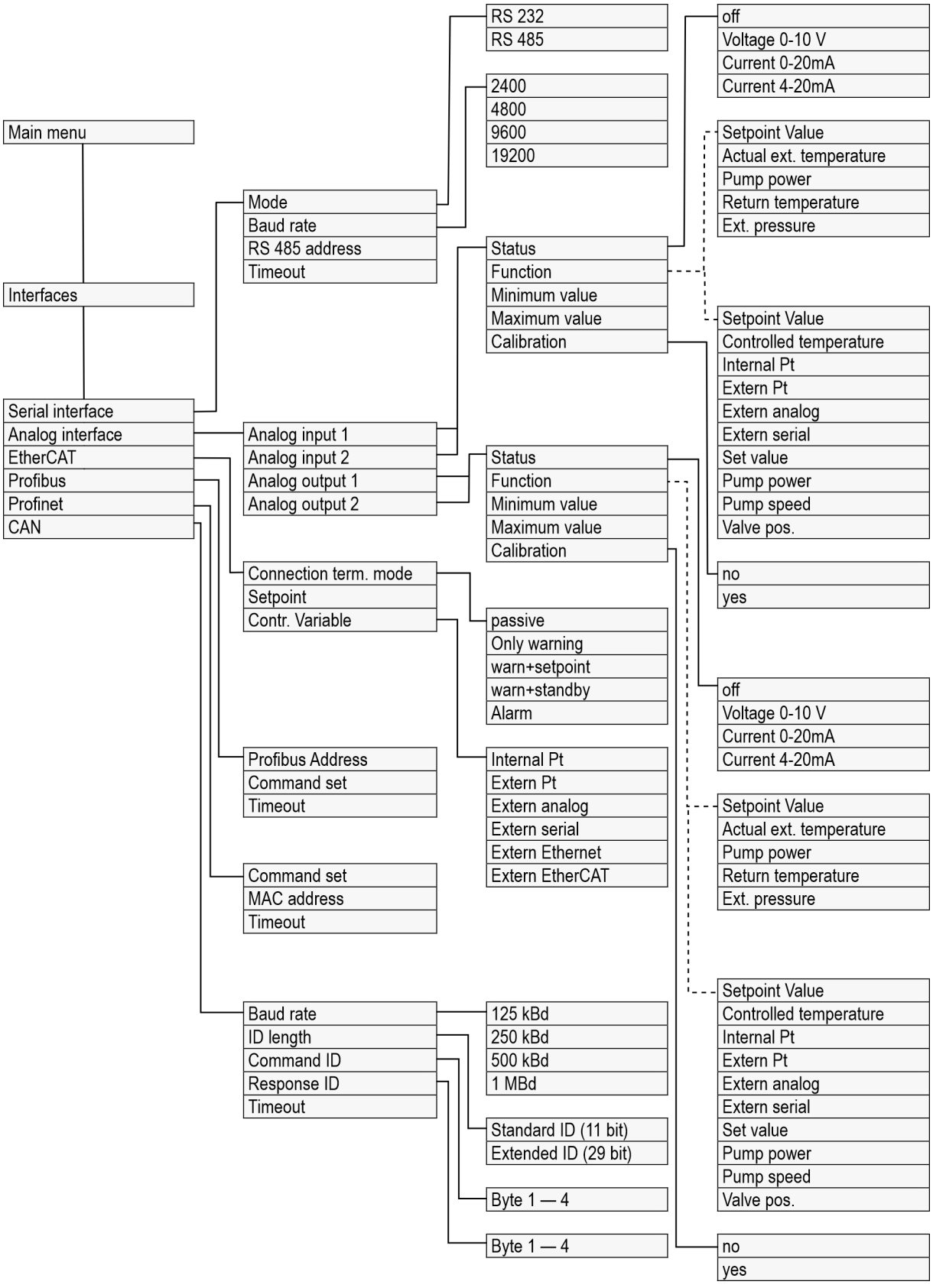


Fig. 51: Menu structure, part 4, MAX and PRO

Accessories menu structure

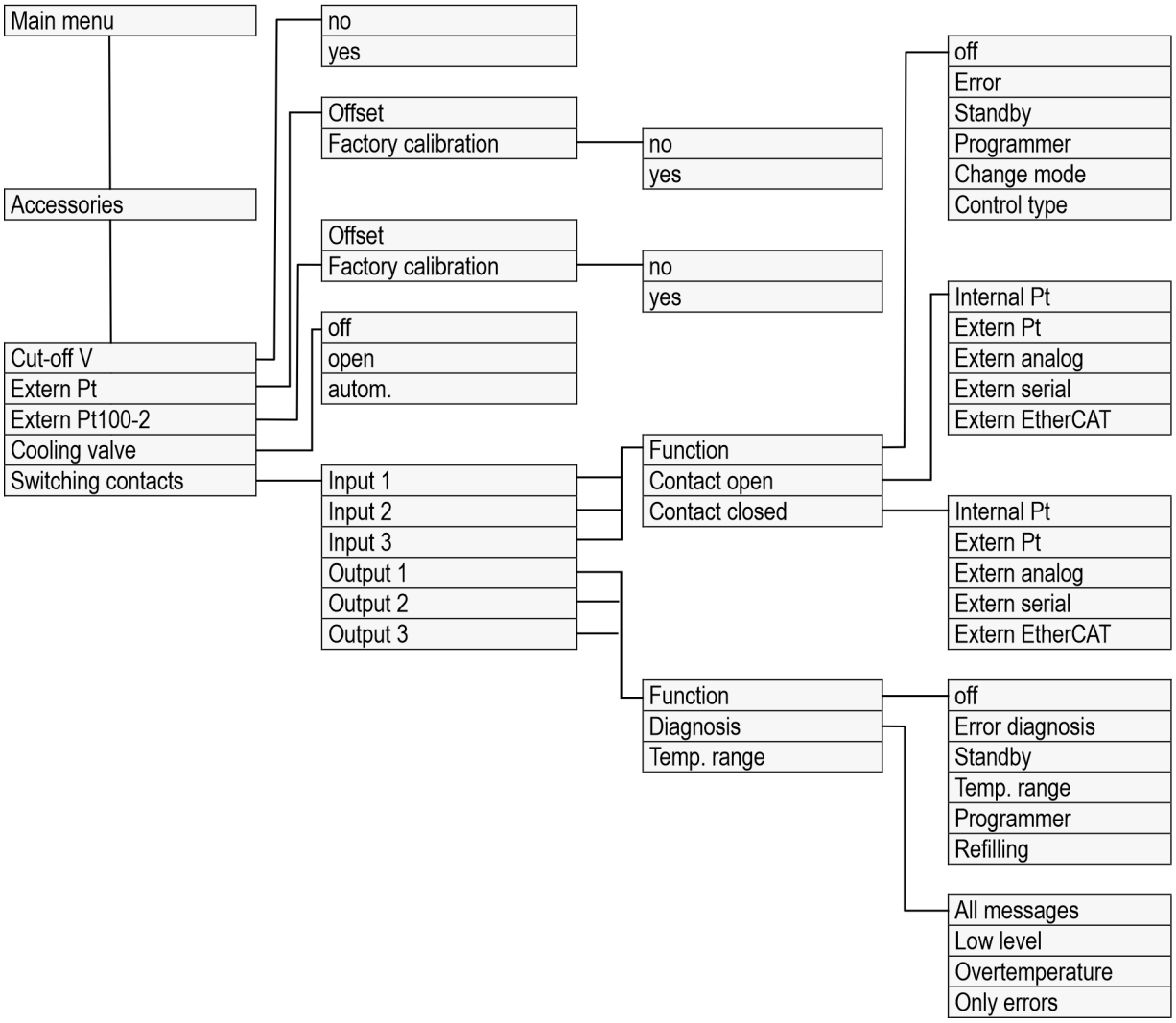


Fig. 52: Menu structure, part 5, MAX and PRO

6.3 Temperature control menu

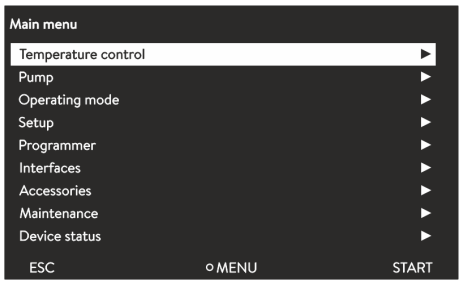


Fig. 53: Main menu

In the [Tempering] menu you can configure the following settings and open submenus:

- Setpoint value
  This function is used to set the set temperature for your application Chapter 5.4.5 “Setting the setpoint value (set temperature)” on page 56.
- Limits
  This function is used to set the temperature limits Tih and Til Chapter 5.4.4 “Setting the temperature limits” on page 54.
- Control
  In the [Control] submenu, you can set all the parameters relevant to temperature control Chapter 6.4.2 “ Opening the control parameter menu” on page 91.
- Fluid
  In the [Fluid] submenu, you can select the heat transfer liquid that you wish to use in your constant temperature equipment Chapter 5.4.2 “Setting the heat transfer liquid” on page 53.
  The fluid properties can be displayed.
- Calibration
  In the [Calibration] submenu, you can configure an offset or perform a 2-point calibration on the internal temperature probe and, if connected, the external temperature probe Chapter 6.8 “Calibrating the temperature probe” on page 105.

6.4 Control menu

The control parameters are optimized and stored at the factory for operation of the bath thermostat with water as the heat transfer liquid, and operation of the internal control.

- It may be necessary to adapt the configuration on a case by case basis, depending on the application. This applies to external applications, in particular.
- The heating capacity and viscosity of the heat transfer liquid also influence control actions.

Only modify the control parameters if you have adequate knowledge of control system engineering.

6.4.1 Control basics

Definition

A brief explanation of terms

Actuating signal	- Initial value of the controller to compensate for the difference 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 counteracts 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.

Effects 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

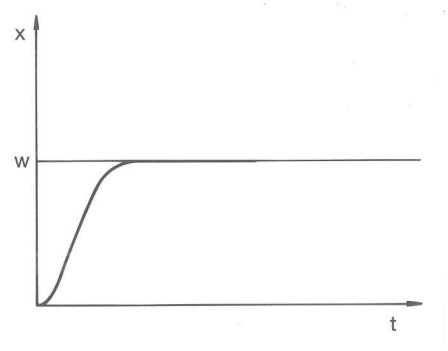
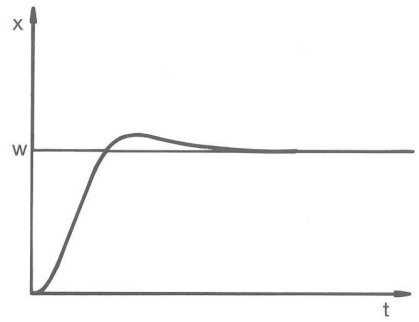
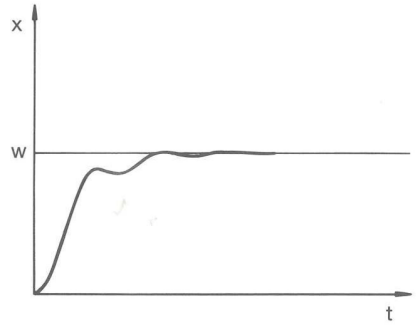


Fig. 54: Ideal setting



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 effective now, causes the actual value to move slowly towards the target value.

Fig. 56: Control parameter Xp too small

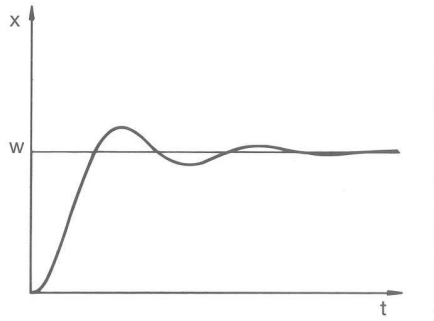


Fig. 57: Control parameters Tn and Tv too small

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.

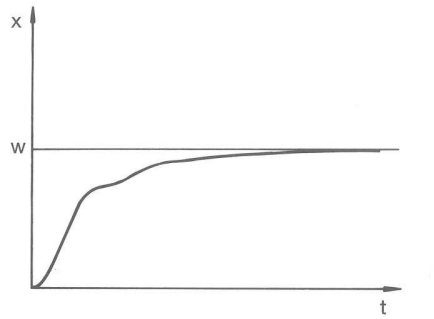


Fig. 58: Control parameters Tn and Tv too large

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 Opening the control parameter menu

1. Press the Enter key to open the menu.
2. Select the menu item → *Tempering* → *Control* → *Control parameter*.
   - ▶ A submenu opens.

6.4.3 Overview of internal control parameters

The internal control compares the setpoint value T_{set} with the bath temperature T_{int} and calculates the set value, i.e. the measurement used for heating or cooling.

Designation	Characteristics	Unit
Proportional range	Xp	K
Adjustment time	Tn	s
Hold-back time	Tv	s
Attenuation time	Td	s

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

The following parameters may also influence the internal control:

- Temperature limits: Til and Tih Chapter 5.4.4 “Setting the temperature limits” on page 54
- Controller output limit: Heating power and cooling capacity Chapter 6.4.9 “ Limiting heating and cooling (controller output limit)” on page 97
- Maximum current consumption of the device reduced
- Pump level too low

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 maximum 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 Activating external control, deactivating internal control

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

A standard interface marked **Pt100** is installed on the back of the MAX pump and control unit. The PRO control head can be upgraded with an optional Pt100 / LiBus interface module. Here you connect a Pt100 temperature probe to record the actual temperature in the external application. The standard indicator for the external measured temperature T_{ext} is always the preset external control variable. If the display shows a different actual temperature, this must be set explicitly.

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

List of the possible control variables

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

Activating the external control

1. Connect a Pt100 temperature probe to the Pt100 interface of the constant temperature equipment or connect the interface cable to the required interface.
2. Insert the Pt100 temperature probe into the heat transfer liquid in the external application and secure carefully. When controlling externally via one of the interfaces mentioned above, ensure that a specification is defined via the external control.
3. Press the Enter key to open the menu.
4. Select the menu item → *Temperature control* → *Control* → *Contr. Variable*.
   - ▶ The display shows which control variables can be selected, depending on the installed interfaces.
5. Select the required control variable using the arrow buttons.
   - ▶ The new setting is marked with a check mark.
6. Press the [ESC] softkey to switch to the home window.

You can also import the actual temperature via the Ethernet interface or another interface module.

Activating the internal control

Select the option [Intern Pt] *in the* [Contr. Variable] *submenu to activate the internal control again.*

6.4.6 Changing control parameters

Personnel: ■ Specialized personnel

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

Fig. 59: Change control parameters

1. Press the Enter key to open the menu.
2. Select the menu items → *Temperature control* → *Control* → *Control parameters*.
   - ▶ If an **external** control variable is active, the external control parameter is shown on the display.

     If the control variable **internal** is active, the internal control parameter is displayed on the display.
3. Scroll to another control parameter and select it with the Enter key.
   - ▶ An entry window opens. You can now change the numerical value. The displayed values *Max:* and *Min:* specify the limits for the value entry.
4. Press [OK] to confirm the new value.
   - ▶ The new value is active.

Enable control parameters for processing

- With *Tv manual/auto* you can define whether the control parameter *Tv* and *Td* or *Tve*, *Tde* and *Prop_E* are set manually or automatically. If the automatic setting is enabled, these control parameters are displayed with a lock and cannot be modified.
  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 offset value to the temperature measured by an external temperature probe and then process this temperature as a setpoint. Therefore, the setpoint for the bath temperature can be set, for example, to 15 K below the temperature of a reactor measured by the external temperature probe.

Navigating to the settings

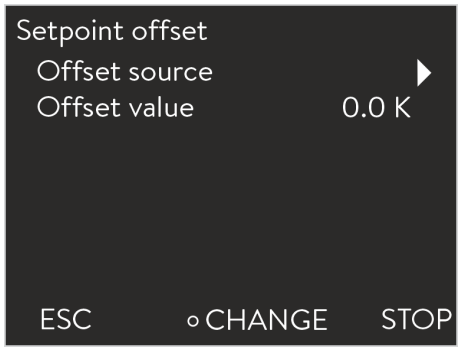


Fig. 60: Setpoint offset

1. Press the Enter key to open the menu.
2. Select the menu item → *Tempering* → *Control* → *Setpoint offset*.
   ▶ The options appear on the display.
3. Select one of the following options:
   - [Offset source] allows you to select the source used to measure the offset.
   - [Offset value] allows you to enter the value for the setpoint offset.

Entering the offset value

1. Select [Offset value] in the Setpoint offset menu.
   ▶ An entry window appears. An offset value can be entered within the limits displayed.
2. Enter the setpoint offset.
3. Press the [Enter key] to confirm.
4. The software returns to the previous Setpoint offset menu.

Activating an offset source

You can activate or deactivate the value entered for the setpoint offset of a corresponding source using the options in the [Offset source] menu. [External Pt100], for example, allows you to activate the setpoint offset for the external temperature probe.

1. Select the [Offset source] button in the Setpoint offset menu.
2. Select one of the following options:
   - Select [Off] to deactivate the offset source.
     Activate an offset source from the remaining options:
   - [Extern Pt]
   - [Extern analog]
   - [Extern serial]
   - [Extern Ethernet]
     and so on.
3. Press the [Enter key] to confirm.
4. Press the [ESC] softkey to switch to the home 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

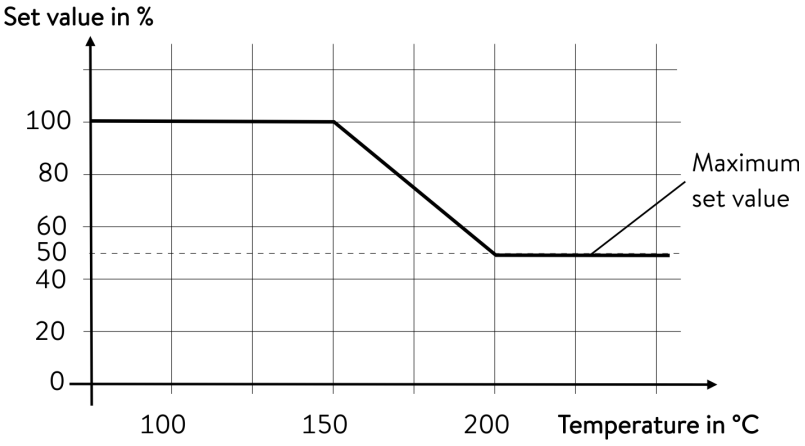


Fig. 61: Dynamic heat limiter

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 Limiting heating and cooling (controller output limit)

The maximum heating power or maximum cooling capacity (for a low temperature thermostat) can be limited using the controller output limit. The limit is set as a percentage of the maximum value.

The controller output limit for the heating capacity is designed to prevent excessive temperatures on the surface of the heater. Excessive heater temperatures may degrade the heat transfer liquid or damage the device.

1. Press the Enter key to open the menu.
2. Select the menu item → *Tempering* → *Control* → *Cont.outp.limit*.
   ▶ The options appear on the display.
3. Select [Max. heating] and press [OK] to confirm.
   ▶ An entry window appears. The controller output limit can be set to a value within the limits displayed.
4. Change the value accordingly.
5. Press the [OK] button to return to the previous screen with the new setting configured.
   ▶ The new setting is active.

6.5 Pump menu

Setting the pump level

The pump on Universa PRO thermostats has 6 stages and the pump on Universa MAX thermostats has 8 stages. A speed is assigned to each pump level. This speed is maintained regardless of the viscosity and density of the heat transfer liquid, as long as the pump motor operates within its load limit. Otherwise the speed is limited automatically so that even highly viscous and high-density fluids are circulated as effectively as possible. The pump level influences the bath circulation, flow rate, discharge pressure, mechanical heat input and noise generation.

A low pump level is appropriate for a small bath thermostat without an external consuming unit. Pump levels 1 to 3 are appropriate for the MAX device variant, while pump levels 1 and 2 are suitable for the PRO device variant. In order to minimize the temperature difference between the bath and external consuming unit, a higher output level is appropriate for use as a circulation thermostat.

1. Press the Enter key to open the menu.
2. Select the menu item → *Pump* → *Pump Level*.
   ▶ A submenu opens.

The selected pump level is activated automatically. It does not have to be activated separately.

6.6 Operating mode

6.6.1 Cooling

The cooling unit of the devices is operated in the standard setting [autom.] Depending on the temperature and operating status, the cooling unit is switched on or off automatically (recommended mode of operation). You can switch the cooling unit on or off permanently via the menu. In the case of sensitive control processes, control fluctuations can be prevented by automatically switching the cooling unit on or off.
When [Cooling off] is selected, only temperatures above room temperature can be reached. Selecting [Cooling on] may result in increased energy consumption due to permanent operation of the cooling unit.

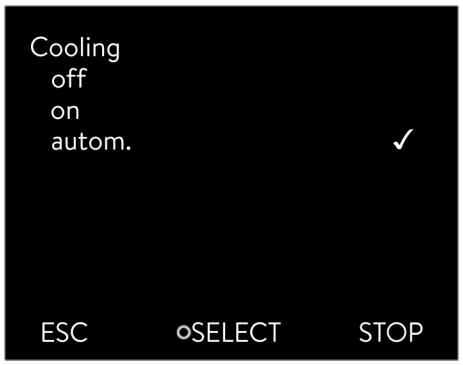


Fig. 62: Configuring cooling

1. Press the Enter key to open the menu.
2. Select the menu items → *Operating mode* → *Cooling*.
3. Select one of the following options:
   - With the [autom.] setting, the cooling unit is switched on and off automatically according to requirements.
   - With [off], the cooling unit remains switched off.
   - With [on] ,the cooling unit cools permanently.
4. Press [OK] to confirm the selection.

6.7 Programmer

6.7.1 Basic information

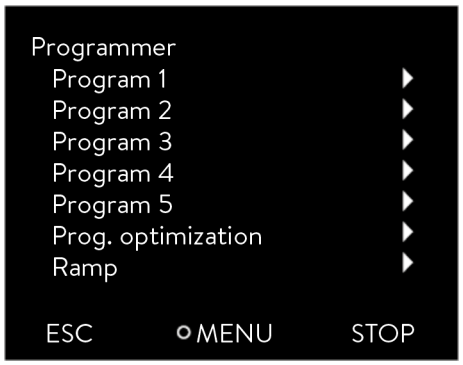


Fig. 63: Programmer

The programmer allows you to perform and save a temperature-time program. A program consists of several temperature-time segments. A segment contains information on the final temperature of the segment, the duration, the temperature tolerance, the pump level and the switch position (off/on) of the contact. Ramps, temperature jumps and temperature maintenance phases are possible.

The programmer of the constant temperature equipment has 5 programs. Together, these 5 programs share a total of 150 segments.

One program occupies at least one segment.
A maximum of 146 segments can be stored in one program.

- Ramp
  A ramp is defined by the specified duration between the start and the end of the segment, and by the destination temperature, i.e. the temperature at the end of the segment.
- Temperature jump
  If a time is not specified (time is 0), the end temperature is reached as quickly as possible.
- Temperature maintenance phase
  No temperature change (the temperatures at the start and end of a segment have remained identical).
- Pump level 0
  Pump level [---] (means that the pump is off) can be selected within a segment. As a result, the program ends when this segment is reached, even though other segments follow in the program. The status of the thermostat is set to “Standby”. When the program is started, a message appears indicating that the program will end at this segment with pump level 0.
- Program optimization
  Activating program optimization yields a very good control action in practice. With programs including both ramps and other types of segments, the actual temperature profile matches the target temperature profile more closely than programs without optimization. It reduces overshoots. There can only be increased undershooting at the ramp ends if the control parameters are very unfavorable. Deactivate optimization in this case.
  Tolerances that are too small will impair the control result. Work without tolerances where possible.
- Standby
  If the device switches to standby while a program is running, the active program is automatically paused.

1. Press the Enter key to open the menu.
2. Select the → *Programmer* → *Program X* menu item.
   ▶ The submenu opens in the selected program.
3. The following options are available:
   - [Status]
     - Select the option [Start] to start the program.
     - Once the program has started, you can press [Hold] to pause it.
     - A paused program can be continued by pressing [Continue].
     - Select the option [Stop] to end the program.
   - [Edit]
   - [Loops]
     - Here you enter the number of repetitions of the selected program.
4. Select the → *Edit* menu item.
   ▶ The program appears on the display and you can now edit it.

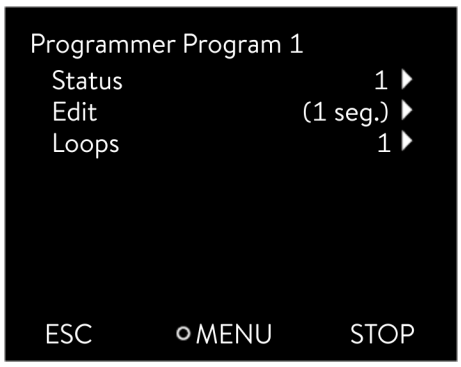


Fig. 64: Program 1

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

The programmer encoder can be controlled or modified using the timer.

Available settings

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		o OK		+/-

Fig. 65: In the program editor

Setup	Description
No.	Program segment number
Tend	End temperature that should be reached
hh	Time in hours (hh) by which the specified temperature should be reached
:mm	Time in minutes (:mm) by which the specified temperature should be reached
Tolerance	Tolerance defines how close the temperature should be to the set temperature before the next segment is processed. 0.0 means that there is no tolerance. In other words, the program focuses on the next temperature when the specified time elapses, even if the starting temperature has not yet been reached.
Pump	The segment is processed using the entered pump level.
S1, S2, S3	The switching state (off or on) of a contact module (if installed) can be entered here. Contact modules are available as an accessory.

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

- Functions of the inputs
  - Set fault
  - Set standby
  - Control programmer
  - Control alternating operation (2 different set temperatures)
  - Regulate internal or external control
- Output functions
  - Signal various error states
  - Signal standby
  - Specify position with respect to a temperature window (inside or outside)
  - Specify programmer status
  - Signal refilling

Editing program examples

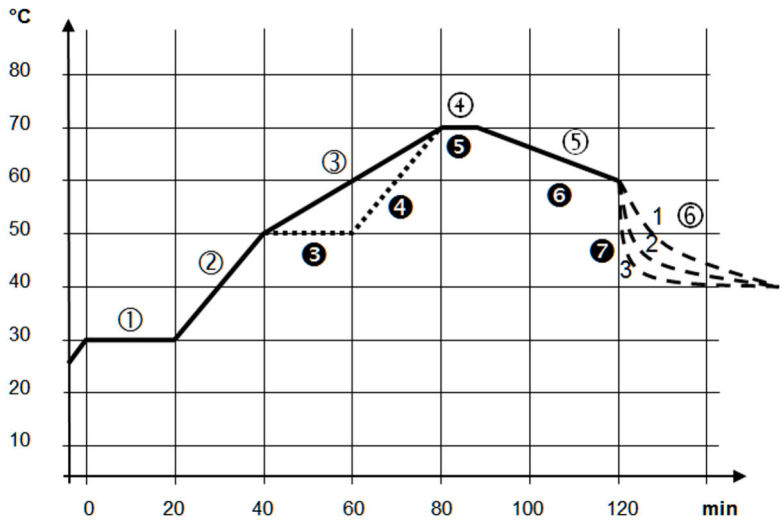


Fig. 66: Program profile (before and after), example

The graph shows an example of a reprogrammed set temperature profile.

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

The original values in the first table below (before) are represented by a solid line, while the values in the edited profile in the second table (after) are represented by a dashed line.

Start segment

Each program starts with the segment *Start*, which determines the temperature at which segment *1* continues the program. The temperature of the *Start* segment is reached as quickly as possible. It is not possible to specify a time limit for the *Start* segment. Without the *Start* segment, segment *1* would be different depending on the temperature of the heat transfer liquid at program start.

Table 18: Example of program before (values of the solid line in fig. Program profile)

No.	Tend	hh	:mm	Tolerance	Pump	S1	S2	S3
Start	30.00	---	---	0.0	---	off	off	off
1	30.00	0	20	0.1	2	off	off	off
2	50.00	0	20	0.0	3	off	off	off
3	70.00	0	40	0.0	4	off	off	off
4	70.00	0	10	0.1	2	off	off	off
5	60.00	0	30	0.0	2	off	off	off
6	40.00	0	0	0.0	2	off	off	off

In the edited table (below), a new segment with the number 3 has been entered. The time and pump level for segment 4 have also been modified. The tolerance and pump level for segment number 5 have been adapted.

Table 19: Example of program after (values of the dashed line in fig. Program profile)

No.	Tend	hh	:mm	Tolerance	Pump	S1	S2	S3
Start	30.00	---	---	0.0	---	off	off	off
1	30.00	0	20	0.1	2	off	off	off
2	50.00	0	20	0.0	2	off	off	off
3	50.00	0	20	0.1	3	off	off	off
4	70.00	**0**	**20**	0.0	**4**	off	off	off
5	70.00	0	10	**0.8**	**2**	off	off	off
6	60.00	0	30	0.0	2	off	off	off
7	30.00	0	0	0.0	2	off	off	off

Tolerance

Note the following and see Fig. 67:

- The Tolerance field ensures strict compliance with the residence time at a specific temperature, for example.
- The subsequent segment is only processed when the outflow temperature reaches the tolerance range (1) so that the ramp in the second segment is delayed and only starts at 2, for example.
- Selecting a tolerance range that is too small can cause undesired delays. In extreme cases, it may not be possible to continue the program. The selected tolerance range should not be too small, **especially if the control is external**. A greater tolerance has been entered for segment 5 to guarantee adherence to the required time of 10 minutes, even with transient responses (3).
- A tolerance range should only be programmed for flat (slow) ramps, if appropriate. Steep ramps that come close to the maximum possible heating-up or cooling rates of the device may be severely delayed (4) if the tolerance range is too small (in segment 2 here).

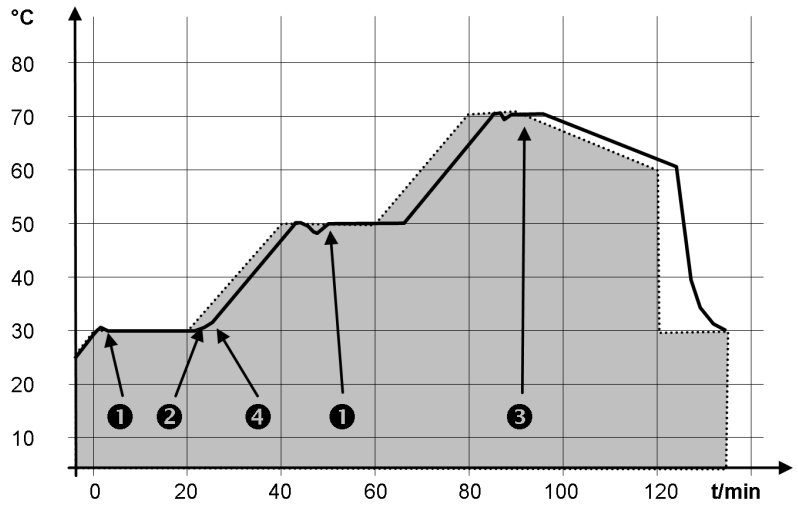


Fig. 67: Program profile for set temperature and actual temperature

The graph above showing the edited process illustrates the possible delay of the actual temperature (solid line) in relation to the set temperature of the programmer (gray area).

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:

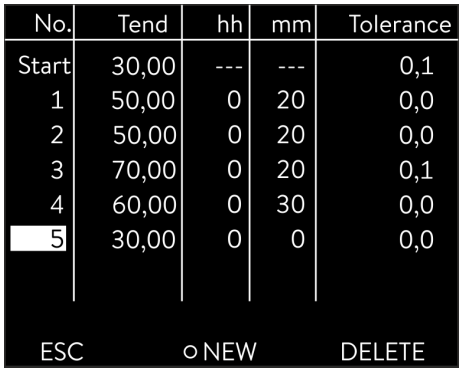
- If in the *hh* and *:mm* field the value "0" is entered, the temperature T_{end} will be started as quickly as possible.
- Changes to the pump level are entered in the respective segment (= program line).
- The default value of the contact module is *off*.

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 effective 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 Calibrating the temperature probe

A calibrated reference thermometer with the desired level of accuracy is necessary. Otherwise you should not change the calibration of your constant temperature equipment.

If, when checking the temperature in a steady state, you discover a constant temperature deviation of T_{int} or T_{ext} from the reference thermometer, this can be equaled out via the *Calibration* menu point.

With the menu point *Offset* (1-point comparison), the characteristic of the temperature switch is adjusted in parallel by the input value.

With the menu point *2-point calibration* (2-point comparison), the characteristic of the temperature switch is adjusted and the slope of the characteristic is changed.

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

Offset

- For internal bath applications, the reference thermometer must be hung into the bath according to the specifications on the calibration certificate.
- For the external application, the reference thermometer must be installed in the inlet of the application according to the specifications on the calibration certificate. The reference thermometer should be positioned as close to the application as possible.
- To measure the temperature, wait until the system is in a steady state.

1. Press the [Enter key] to open the menu.
2. Select the menu items → *Temperature control* → *Calibration* → *Intern Pt* or → *Extern Pt* → *Offset*.
   - ▶ The input window opens.
3. Enter the temperature value read from the reference thermometer into the entry window.
4. Press [OK] to confirm the new value.
   - ▶ The new value has been accepted.

2-point calibration

- For internal bath applications, the reference thermometer must be hung into the bath according to the specifications on the calibration certificate.
- For the external application, the reference thermometer must be installed according to the specifications on the calibration certificate. The position of the reference thermometer on the pressure side between the connecting sleeve on the thermostatic circuit pressure side and the application should be as close as possible to the application.
- The upper and lower 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 T_{set} setpoint on the device.
2. Wait until the setpoint and the temperature of the heat transfer liquid have equaled out.
3. Press the [Enter key] to open the menu.
4. Select the menu items → *Temperature control* → *Calibration* → *Intern Pt* or → *Extern Pt* → *2-Point lower*.
   - ▶ The input window opens.
5. Enter the temperature value read from the reference thermometer into the entry window.
6. Press [OK] to confirm the new value.
   - ▶ The lower value has been accepted.
7. Set a high T_{set} setpoint on the device.
8. Wait until the setpoint and the temperature of the heat transfer liquid have equaled out.
9. Select the menu item [2-Point, top] in the *Calibration* menu.
   - ▶ The Input window opens.
10. Enter the temperature value read from the reference thermometer into the entry window.
11. Press [OK] to confirm the new value.
    - ▶ The upper value has been accepted. 2-point calibration has been completed.

Restore factory calibration

Use this menu item to restore the calibration configured in the factory.

1. Press the [Enter key] to open the menu.
2. Select the menu items → *Temperature control* → *Calibration* → *Intern Pt* or → *Extern Pt* → *Factory Calibration*.
3. Select the option [yes].
4. Press [OK] to confirm the selection.
   - ▶ This deletes the customer's calibration and restores the calibration as it was configured in the factory.

6.9 Maintenance menu

1. Press the Enter key to open the menu.
2. Select the → *Maintenance* menu item.
   - ▶ A submenu opens.

These menu items are available:

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

Each device has an error memory for storing up to 48 warning messages, error messages and alarm messages that can be used to analyze errors.

- *No.* refers to consecutive numbers listed chronologically after the errors occur.
- The relevant module that triggered the message is displayed under *Source* .
- *Code* displays the encoded description of the alarm, warning or error.
- *Date* and *Time* display the exact time the error occurred.
- The last column in the list is *Detail code* .

6.10 Displaying the device status

In the Device Status menu and its submenus, you can view a large amount of information and data about the device. No settings are possible in the whole Device Status menu.

1. Press the Enter key to open the menu.
2. Select the → *Device Status* menu item.
   ▶ A submenu opens.

These menu items are available:

- Display device data,
  - Temperatures, current values, speeds, etc.
- Heating limiter,
  - Current consumption, dynamic heating limiter, upper limits (Tih), controller output limit, etc.
- Versions,
  - Hardware and software. The versions of any connected interface modules are also displayed.
- Device information,
  - Device type, bath unit, serial numbers.
- Operator and
- Controller ID.

6.11 Operating the device using the interface

The following operating units and interfaces are viewed:

- Pump and control unit
- Control station/PC
  - Connected to the constant temperature equipment via Ethernet interface or another optional interface (↳ “Additional interfaces” on page 30).
- Analog interface (optional accessory)
- Contact interface (optional accessory)

Allowing access to the device via the network

If you wish to enable digital access to the device from the outside, this must be configured in the device software beforehand.

Allowing access to the device

1. Press the [Enter key] to open the menu.
2. Select the menu items → *Interfaces* → *Network* → *Services* → *PC control* → *PC control*.
   - ▶ The options [off] and [on] appear on the display.
3. Select the [on] option and press the Enter key to confirm.
   - ▶ A check mark is set. The entry has been accepted.

Range of functions of the operating units

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

Operator and viewer

Applies equally to the pump and control unit, and the control station

- Operator, once at maximum, has write and read rights
  - All setting options (both reading and writing) are available to the operator if they are included in the operating unit's range of functions.
- Viewer, multiple times possible, only has read privileges
  - All menus are accessible to the viewer, but no settings which change the function of the device can be made. Exceptions are entries which are necessary to log in as Operator.

In the set delivery condition, the pump and control unit has operator rights.

An Operator is logged in and another operating unit requests Operator privileges (↳ "Requesting Operator privileges" on page 109). The first Operator becomes a Viewer after this Operator requests Operator privileges.

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

Control station monitoring

The connection to the control station is actively monitored in the set delivery condition. If no command is received by 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 in communication to the control station, the constant temperature equipment triggers alarm 22 ↳ Table 43 "Constant temperature equipment alarms" on page 127.
The timeout can be set from one to 99 seconds. Use the command [OUT_SP_08_XX] via the interface for this purpose.
The function can also be executed for the Ethernet interface via the menu → *Interfaces* → *Network* → *Services* → *PC control* → *PC Timeout*. This must be set before the start of communication.
If the monitoring of the control station is active, the Operator privileges are owned exclusively by the control station.

Therefore, operation on the constant temperature equipment is locked. The local control element of the pump and control unit can obtain operating rights at the request of the user. If a timeout occurs during monitoring, the Operator privileges can be transferred automatically to the constant temperature equipment.
A timeout value of 0 must be set to deactivate monitoring of the connection. The constant temperature equipment can be operated from the control station/PC or on the constant temperature equipment itself. The Operator privileges can be obtained on an alternating basis. In this case, there is no monitoring of the communication and a connection interruption is not detected.

The control station obtains Operator privileges for each write command of the control station, provided that the Operator privileges are not locked by another control element. If the control station sends write commands very frequently, operation can be made more difficult for another control element.

Cold start

The pump and control unit returns to the previous login level after the device has been switched off and on again. The same applies to the web server.

An exception to this is a situation where the operating unit which last requested the Operator privileges is not connected. In this case, the Operator privileges automatically return to the pump and control unit when the device is switched on.

Status display

If an operating unit has Viewer privileges, a lock symbol is displayed instead of the right-hand 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 operation is carried out using a control station, it is the responsibility of the user (customer) to display the status.

Requesting Operator privileges

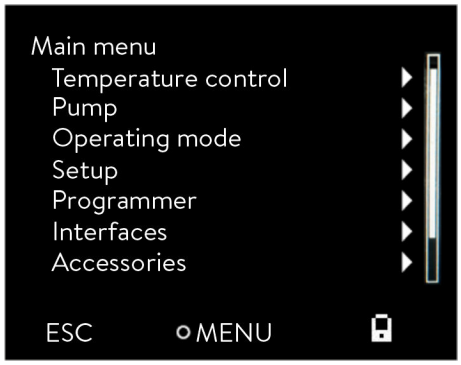


Fig. 70: Operation on the device is locked

Operator privileges are requested by selecting the lock symbol:

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

Locked Operator privileges	Description

Each operating unit with Operator privileges can disable the Operator privileges for other operating units/control stations (**lock**). In this case, no other operating unit/control station can obtain Operator privileges and it therefore remains a Viewer.

Locking the Operator privileges in the control station
If the monitoring of the control station is active, the Operator privileges are locked/owned exclusively by the control station.
No operating units can obtain Operator privileges. If an attempt is made to obtain Operator privileges, a message appears.
If the control station drops out, the constant temperature equipment is switched off and switched on again, an alarm is triggered or the control station monitoring is deactivated. Exclusive ownership is withdrawn from the control station.

6.12 Read 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 retrieve operating data of the constant temperature equipment.

Table 21: Temperature

ID	Function	Unit, resolution	Command
2	Temperature set point	[°C]	IN_SP_00
3	Bath temperature (outflow temperature)	[°C], 0.01°C	IN_PV_00
4	Bath temperature (outflow 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

ID	Function	Unit, resolution	Command
14	External temperature T_E (Pt)	[°C], 0.001°C	IN_PV_13
25	Overtemperature turn off point T_Max	[°C]	IN_SP_03
27	Limitation of outflow temperature TiH (upper limit)	[°C]	IN_SP_04
29	Limitation of outflow temperature TiL (lower limit)	[°C]	IN_SP_05
158	Actuating signal of master controller in case of external control	[°C]	IN_PV_11

Table 22: Pump

ID	Function	Unit	Command
18	Pump power stage	[–]	IN_SP_01

Table 23: Fill level

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

Table 24: Actuating signal

ID	Function	Unit, resolution	Command
11	Resolution of controller actuating signal in per mill – negative value → device is cooling – positive value → device is heating	[‰]	IN_PV_06
13	Controller actuating signal in watts – negative value → device is cooling – positive value → device is heating	[W]	IN_PV_08

Table 25: Cooling

ID	Function	Unit	Command
24	Cooling mode: 0 = Off / 1 = On / 2 = Automatic	[–]	IN_SP_02

Table 26: Safety

ID	Function	Unit	Command
35	Timeout communication via interface (1 - 99 seconds; 0 = Off)	[s]	IN_SP_08
202	Status of exclusive operator privileges 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 = Off)	[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 limitation	[K]	IN_PAR_09
57	Control parameter XpF	[–]	IN_PAR_10
61	Control parameter Prop_E	[K]	IN_PAR_15

Table 28: Control

ID	Function	Unit	Command
59	Setpoint offset	[K]	IN_PAR_14
67	Control in control 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	Offset source X for set point: 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 = blocked	[–]	IN_MODE_00

Table 30: Status

ID	Function	Unit	Command
75	Status of standby: 0 = device is on / 1 = device is off	[–]	IN_MODE_02
107	Product line / equipment 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

ID	Function	Unit	Command
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 = low level, ■ Bit 5 = high level	[–]	STAT
161	Serial number, alphanumerical (10 characters)	[–]	SERIAL_NO

Table 31: Programmer

ID	Function	Unit	Command
77	Program used as a basis for further commands	[–]	RMP_IN_04
85	Programmer segment	[–]	RMP_IN_00_[Seg.-[No.]
88	Current segment number	[–]	RMP_IN_01
90	Number of preset program sequences	[–]	RMP_IN_02
92	Current program loop	[–]	RMP_IN_03
94	Currently running program (0 = no program currently running)	[–]	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
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 devices with active cooling)	[–]	VERSION_T
112	Analog interface module (interface module must be present)	[–]	VERSION_A

ID	Function	Unit	Command
114	RS 232/485 interface module or Profibus/Profinet/CAN (interface module must be present)	[–]	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 for automatic filling device (Solenoid valve must be present)	[–]	VERSION_M_1
120	Solenoid valve for constant level device (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 (an external temperature module must be present)	[–]	VERSION_E
129	External Pt interface 1 (a 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 constant temperature equipment.

Table 34: Temperature

ID	Function	Unit	Command
1	Temperature set point	[°C]	OUT_SP_00_XXX.XX
15	Actual value of external temperature (via interface)	[°C]	OUT_PV_05_XXX.XX

ID	Function	Unit	Command
26	Limitation of outflow temperature TiH (upper limit)	[°C]	OUT_SP_04_XXX.XX
28	Limitation of outflow temperature TiL (lower limit)	[°C]	OUT_SP_05_XXX.XX

Table 35: Pump

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

Table 36: Cooling

ID	Function	Unit	Command
23	Cooling mode: 0 = Off / 1 = On / 2 = Automatic	[–]	OUT_SP_02_X

Table 37: Safety

ID	Function	Unit	Command
34	Timeout communication via interface (1 – 99 seconds; 0 = Off)	[s]	OUT_SP_08_XXX
201	Activate/deactivate exclusive operating privileges for interface 1 = obtain exclusive privileges. 0 = Relinquish exclusive privileges	[–]	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 = Off)	[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 = Off)	[s]	OUT_PAR_05_XXXX
50	Control parameter TvE (5 = Off)	[s]	OUT_PAR_06_XXXX
52	Control parameter TdE	[s]	OUT_PAR_07_XXXX.X
54	Correction 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: Control

ID	Function	Unit	Command
58	Setpoint offset	[K]	OUT_PAR_14_XXX.X
66	Control in control 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	Offset source X for set point: 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
Comment (ID 66 and 68): If X=3, the commands ID 66 and ID 68 cannot be executed in some constant temperature equipment until an external temperature specification has been received (via the command ID 15).			

Table 40: Rights

ID	Function	Unit	Command
62	Buttons on the control panel (equivalent to "KEY"): 0 = unlock / 1 = lock	[–]	OUT_MODE_00_X

Table 41: Status

ID	Function	Unit	Command
74	Switch the device on / off (standby): 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	End programmer	[–]	RMP_STOP
83	Delete program (all segments)	[–]	RMP_RESET
84	Programmer segment	[–]	RMP_OUT_00_[Temp.]_[Zeit]_[Tol]_[Pumpstep]
89	Number of preset program sequences XXX = 1 - 250; 0 = endless	[–]	RMP_OUT_02

6.13 Importing and exporting data

Data records and programs can be exported from the constant temperature equipment to a USB stick for subsequent import into other constant temperature equipment. The exported file is marked with a check mark.

All the exported files are saved on the USB stick in the *CommandFiles* folder and associated subfolders.

You can export the following files to the USB stick:

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

You can import the following data to an item of constant temperature equipment:

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

7 Maintenance

7.1 Maintenance safety instructions

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!
Risk of moisture/cleaning agent penetrating into the device

Electric shock

- Use a slightly damp cloth to clean the device.

WARNING!
Incorrect handling

Burning, fire, device damage

- Do not damage the cooling circuit.
- Do not use aggressive cleaners to clean the pump and control unit.
- Do not use chlorine-based cleaners for the bath vessel and evaporator.
- Do not use sharp or pointed objects to clean the evaporator.

WARNING!
Risk of mechanical damage to refrigerant circuit

Burns, fire

- Do not damage the cooling circuit.
- Use suitable materials/tools to clean the condenser (e.g. soft brush, vacuum cleaner or compressed air).
  To do this, remove the detachable cover plate from the front of the device.

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

Burns, scalding, fire

- Regularly check the Tmax function and the low-level protection.
- Carry out checks at the correct maintenance intervals.

WARNING!
Undetected failure of the safety function

Fire

- The device must be switched off briefly after a maximum of one month of continuous operation.

CAUTION!
Contact with hot / cold device parts, accessories and heat transfer liquid

Scalding, hot or cold burns

- Allow device parts, accessories and heat transfer liquid to reach room temperature before touching.

7.2 Maintenance intervals

Interval	Maintenance work
Before switching on the device	Check the power supply cable for damage
At least once a month	Perform a self-test by turning the device off and on again at the mains switch.
As required, once a month at the latest	(Visually) inspect the external hoses, tubing clips and screw connections for leaks and damage.
after changing the heat transfer liquid, once a month at the latest	Check the overtemperature protection
After filling for the first time after each transport operation, after changing the heat transfer liquid, once a month at the latest	Check the low-level protection
As required, every three months at the latest	Clean the air-cooled condenser
quarterly (a shorter interval must be selected, depending on the water hardness and operating period)	Descale the cooling coil
as required, once every six months at the latest	Check that the heat transfer liquid is suitable for use
As required, once a year at the latest	Check the external condition of the device for damage and stability.

Interval	Maintenance work
Annually	Check the cooling water quality
twenty years	Replacement of safety-relevant electrical and electromechanical components by LAUDA Service, including the circuit breaker and power printed circuit board.

7.3 Cleaning the air-cooled condenser

WARNING!
Risk of mechanical damage to refrigerant circuit

Burns, fire

- Do not damage the cooling circuit.
- Use suitable materials/tools to clean the condenser (e.g. soft brush, vacuum cleaner or compressed air).
  To do this, remove the detachable cover plate from the front of the device.

Removing the front panel

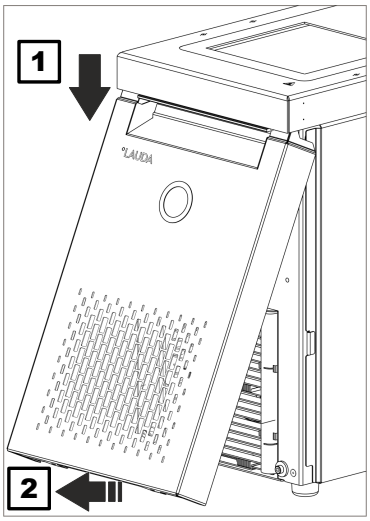


Fig. 71: Removing the front panel

1. Hold the front panel at the sides and slide it down (1).

   The front panel is attached to the bottom of the chassis by two magnets.

2. Tilt the lower end of the front panel outward as shown in the image (2).
3. Slide the top of the front panel further down and pull the front panel away from the unit.

Installing the front panel

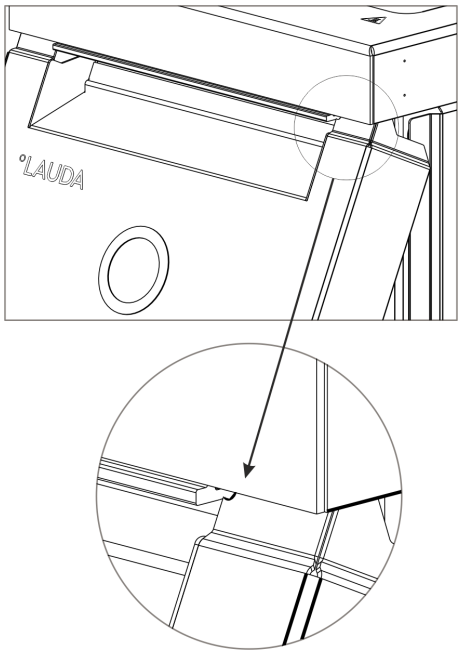


Fig. 72: Curves on the front panel

1. Hold the front panel at the sides, tilt the top edge toward the device and slide under the bath edge.
2. Push the front panel upward but make sure that the curves are still visible Fig. 72.
3. Push the lower end of the front panel toward the bottom edge of the chassis.
4. Slide the front panel vertically upward all the way under the bath edge.
   - ▶ The small tabs at the bottom of the front panel slide into the chassis.
5. Check that the front panel is installed correctly by attempting to pull the bottom end of the front panel outward. The front panel should sit firmly.
   - ▶ You have installed the front panel correctly.

7.4 Check the heat transfer 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 heat transfer 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 heat transfer liquids:

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 heat transfer liquid

- *Heat transfer liquid is subject to wear, such as cracking or aging (oxidation).*
- *The serviceability of the heat transfer liquid must be checked if necessary (e.g. if the operating mode is changed), at least every six months.*
- *Continued use of the heat transfer liquid is only permitted following successful testing.*

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

Where applicable, the following points should be considered when testing the heat transfer fluid:

Flash point	1. Impairment of the flash point, for example due to aging and oxidation, impurities and thermal stress.
Viscosity	2. Medium becomes tougher due to resinification caused by oxidation, for example.
Water content	3. Boiling delay due to water content in thermal oil. Interruptions in the flow of the heat transfer liquid due to boiling of low-boiling and non-homogeneous liquids. For water/monoethylene glycol mixtures: The water content decreases during longer periods of operation at higher temperatures and the mixture becomes flammable.
Boiling point	4. Lowered boiling point due to cracking (splitting of C-C chains into hydrocarbons).
Cloudiness	5. Increase in deposits, suspended matter and particles due to thermal reactions and oxidation, for example.
Color	6. Medium turns darker, even black, due to oxidation, for example.
Odor	7. Smells rancid or burnt, for example.
Application	8. General deterioration in thermal performance. Reduction in the achievable temperature stability.

7.5 Check the low-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 heat transfer liquid falls below a certain threshold, the device switches to a safe state: Components such as the heating elements, pump and cooling unit are switched off. The *Low Level* alarm is triggered.

1. Fill the device with a suitable heat transfer liquid.
2. Switch on the device. Set the set temperature to room temperature.
3. Attach a hose to the drain nozzle.
4. Open the drain tap to lower the heat transfer liquid level.
   - ▶ If the liquid falls below this level, the device switches to a safe state.
   - ▶ The *Low Level* alarm is triggered.
5. *The window containing the Low Level alarm message normally appears automatically unless the menu is currently open.*
   Press the [Display] *softkey to display the alarm message window. You may need to press the* [Display] *softkey several times, depending on the previously selected view.*
6. Close the drain tap.
7. Refill the bath with heat transfer liquid
   - ▶ to eliminate the cause of the alarm.
8. Acknowledge the alarm by pressing the Enter key [O].
   - ▶ The alarm message is deleted and the device switches to standby mode.
9. Switch the device to Temperature control mode by pressing the [START] softkey.

If the drop in the level of the heat transfer liquid does not cause the device to switch to a safe state within five seconds (heating elements, pump and cooling unit are de-energized, "Low Level" alarm), decommission the device and contact LAUDA Service.

7.6 Checking the overtemperature protection device

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

Burns, scalding, fire

- Regularly check the Tmax function and the low-level protection.
- Carry out checks at the correct maintenance intervals.

If the temperature of the heat transfer liquid exceeds a certain threshold (the preset maximum temperature T_{max}), the device switches to a safe state: Components such as the heating elements, pump and cooling unit are switched off.

The overtemperature protection device on the unit may trigger an overtemperature alarm when reaching a temperature of 5 °C or less below the set T_{max} value.

This happens because the integrated safety system operates using a separate temperature sensor, which can deviate by a few degrees less than the value shown on the display.

Therefore, select a T_{max} setting that is high enough to avoid such disruptions in operation.

The check is performed by temporarily setting the maximum temperature (Tmax) to a value below the current bath temperature. The device must then switch to a safe state: Components such as the heating elements, pump and cooling unit are switched off. The *Overtemperature* alarm is triggered.
The test can only be conducted at a bath temperature above 10 °C.

1. Change the set temperature T_{set} to a value above room temperature such as 50 °C. Wait until the bath temperature has approximately reached the set temperature.
2. Press and hold down the T_{max} key.
   ▶ The T_{max} value is shown in the display.
3. Press the Enter key [O].
   ▶ The entry window appears. The cursor flashes under the T_{max} value.
4. Use the arrow keys to set a T_{max} value that is 5 °C or more below the current liquid temperature.
5. Press the Enter key [O] to confirm the new value.
6. Check whether the value now flashing is correct.
7. Press the [ANW] softkey to confirm the new value and then release the T_{max} key again.
   ▶ The new value is active.

8. The device switches to a safe state:
   - ▶ Components such as the heating elements, pump and cooling unit are switched off.
   - ▶ The *Overtemperature* alarm is triggered.
9. *The window containing the Overtemperature alarm message normally appears automatically unless the menu is currently open.*
   In any case, you can press the [Display] *softkey to display the alarm message window. You may need to press the* [Display] *softkey several times, depending on the previously selected view.*
10. Set the T_{max} value back above the current liquid temperature
    - ▶ to eliminate the cause of the alarm.
11. Acknowledge the alarm by pressing the Enter key [O].
    - ▶ The alarm message is deleted and the device switches to standby mode.
12. Switch the device to Temperature control mode by pressing the [START] softkey.
    - ▶ Components such as the heating elements, pump and cooling unit are switched on.

If the above actions do not cause the device to switch to a safe state (heating elements, pump and cooling unit de-energized, Overtemperature alarm), decommission the device and contact LAUDA Service.

8 Faults

Troubleshooting/fault elimination 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 SelfCheck Assistant on the devices monitors a range of device parameters and issues alarms, warnings or errors in borderline cases. All alarms, error messages and warnings triggered on the device appear on the control panel as a code together with a description of the fault.

Procedure in event of alarm

Alarms affect safety. The components of the device, such as the pump, switch off. The device emits a sound. Once the cause of the fault has been eliminated, the alarm can be acknowledged using the Enter key.

Refer to ↳ Chapter 8.2 “Alarms” on page 127 for a list of alarms.

Procedure in event of warning

Warnings do not have a significant effect on safety. The device continues to operate. The device will make a continuous noise for a short period of time. Warnings are not issued periodically.
Warnings can be acknowledged manually once their cause has been eliminated. If the cause of the fault resolves itself, the warning will automatically disappear after two minutes.

Procedure in event of error

If an error occurs, the device emits a sound.

If this happens, switch off the device at the mains switch. If the error occurs again after switching on the device, make a note of the error code and the corresponding description, and contact the LAUDA Service department. You will find the contact information here ↳ Chapter 1.15 “Contact LAUDA” on page 12.

Errors are displayed under *Errorstore* in the menu structure together with a corresponding description and an error code in the form of a consecutive number.

8.2 Alarms

Alarms are shown on all displays in use.

Table 43: Constant temperature equipment alarms

Alarm code	Message	Description	User action
1	Low-level pump	Pump detects a low level, pump speed too high	Refilling the heat transfer liquid
2	Low level	Float detects low level	Refilling the heat transfer liquid
3	Overtemperature	Overtemperature (bath temperature/outflow temperature > Tmax)	Allow the device to cool down to T < Tmax; adjust Tmax, if necessary
4	Pump is blocked	Standstill of the pump	Switch off the device, check the viscosity
9	T ext Pt100	No actual value from the Pt100 module	Check the temperature probe
10	T ext analog	No actual value from the analog interface	Check the temperature probe
11	T ext serial	No actual value from the serial interface	Check the serial connection
12	Analog input 1	Analog module: Current interface 1, interruption.	Check the connection
13	Analog input 2	Analog module: Current interface 2, interruption.	Check the connection
14	High level	Float detects high level	Drain excess heat transfer liquid from the device. Caution: risk of burns
15	Digital input	Interference signal at the input of the contact module	(customer application)
16	Refilling	Heat transfer liquid level is too low	Refilling the heat transfer liquid
20	T ext Ethernet	No actual value from the Ethernet interface	Check the serial connection Check whether the control station specifies the actual temperature via the Ethernet interface

Alarm code	Message	Description	User action
22	Communication interrupted	A.) Connection to the control station interrupted (PC controller) B.) Preset control station monitoring timeout exceeded (interface function "ID34 Security")	A.) Check the cable connection B.) Check interface communication, adjust timeout, if necessary
23	T ext EtherCAT	No actual value from the EtherCAT interface	Check the 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.

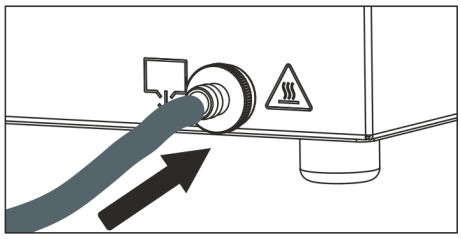


Fig. 73: Attaching hose

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

1. Allow the device and heat transfer liquid to cool or warm up to room temperature.
2. Turn off 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 Disposing of the 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. Always have any repair and disposal work 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	Inches mm
Display resolution	320 x 240	Pixels
Resolution of indication	0.01	°C
Setting resolution	0.01	°C

Table 45: Universa MAX display

Specification	Value	Unit
Display	TFT color display	---
Display size	5 108 x 65	Inches mm
Display resolution	800 x 480	Pixels
Resolution of indication	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 of	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	---
Class division according to DIN 12 876-1		
- Class designation	III	---
- Identification code	FL (suitable for combustible and non-combustible liquids)	---
High temperature thermostat temperature stability[1]	±0.01	K
Low temperature thermostat temperature stability[1]		
- PRO device variant	±0.02	K
- MAX device variant	±0.01	K
Air humidity	Maximum relative humidity 80% at temperatures up to 31 °C, linearly decreasing until 50% relative humidity at 40 °C	%
Degree of pollution according to EN 60664-1 / VDE 0110-1	Pollution degree 2 only non-conductive contamination, whereby temporary conductivity caused by condensation is occasionally expected	---
Ambient temperature at		
- Bath temperature up to maximum of 250 °C	5 – 40	°C
- Bath temperature up to maximum of 300 °C	5 – 35	°C
Storage temperature	5 – 40	°C
Transport temperature	-20 – 43	°C
Mains voltage tolerance range (high temperature thermostats)	with 200 – 240 V power supply: up to ±10% of the nominal voltage with 100 – 125 V power supply: up to +5% / -10% of the nominal voltage	---
With WLAN module installed:		
- RF output (theoretical maximum value)	19.96	dBm EIRP
- Frequency range	2.400–2.4835	GHz

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

Table 47: Mains voltage tolerance range on low temperature thermostats

Device variant	Low temperature thermostat device type	Voltage [V]	Tolerance range	Current strength [A]	Frequency [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 low temperature thermostats

Device type	Voltage/frequency	Current consumption
U 420	220 – 240 V; 50/60 Hz	1.5A
U 420	110 – 127 V; 60 Hz	3.2A
U 630	220 – 240 V; 50/60 Hz	1.9A
U 630	110 – 127 V; 60 Hz	4.2A
U 635	220 – 240 V; 50/60 Hz	1.9A
U 635	100 – 127 V; 50/60 Hz	5.6A
U 830	110 – 127 V; 60 Hz	4.2A
U 845	100 – 240 V; 50/60 Hz	7.4A
U 855	100 – 240 V; 50/60 Hz	8.7A
U 890	200 – 240 V; 50/60 Hz	8.6A
U 1225	110 – 127 V; 60 Hz	4.2A
U 1245	100 – 240 V; 50/60 Hz	7.4A
U 1625	110 – 127 V; 60 Hz	4.2A
U 1635	220 – 240 V; 50/60 Hz	1.9A
U 1635	100 – 127 V; 50/60 Hz	5.6A
U 1645	100 – 240 V; 50/60 Hz	8.7A
U 2040	100 – 240 V; 50/60 Hz	7.4A
U 4230	100 – 240 V; 50/60 Hz	7.4A

11.2 Stainless steel bath thermostats

Table 49: PRO immersion thermostat

	Unit	PRO
Working temperature range	°C	30 – 200
Operating temperature range	°C	30 – 200
Extended working temperature range[1]	°C	20 – 200
Device dimensions (W x D)	mm	195 x 234
Device height (H)	mm	333
Usable depth	mm	140
Noise level[2]	dB(A)	49
Weight	kg	4.1
Clearance		
- Front	mm	200
- Back	mm	200
- Right	mm	200
- Left	mm	200

Table 50: Universa PRO stainless steel 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
Device height (H)	mm	436	476	476	478
Bath 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
Usable depth	mm	140	180	180	180
Height top of bath	mm	240	280	280	282
Filling volume					
- Minimum	L	3.0	5.8	11.5	27.5
- Maximum	L	5.0	8.5	17.0	41
Drain connection outer diameter	mm	Ø12	Ø12	Ø12	Ø12
Noise 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
Clearance	mm	200	200	200	200

Table 51: Universa MAX stainless steel 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
Device height (H)	mm	497	497	497	617	499
Bath 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
Usable depth	mm	180	180	180	300	180
Height top of bath	mm	280	280	280	400	282
Filling volume						
- Minimum	L	5.8	8.5	11.5	9.5	29
- Maximum	L	8.5	13.0	17.0	22.0	42
Connecting thread (external) for application inlet/outlet	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12	Ø12	Ø12	Ø12
Noise 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
Clearance	mm	200	200	200	200	200

[1] - with external cooling from cooling coil

[2] - Noise level determined according to standard EN 11201 for operating position in front of the device at 1 meter distance

Device variants with ball bearing pump

Device types U 8 M, U 12 M, U 16 M and U 40 M are also available as a variant with ball bearing pump. The technical data is identical to the specifications in the table Table 51 “Universa MAX stainless steel bath thermostats” on page 136.

11.3 Cold bath thermostats

Table 52: Universa PRO cold bath thermostats

	Unit	U 420 P	U 630 P	U 635 P	U 845 P
ACC area[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
Device height (H)	mm	616	616	646	736
Bath 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
Usable depth	mm	140	140	140	180
Height top of bath	mm	420	420	450	540
Filling volume - Minimum - Maximum	 L L	 1.8 4	 3.2 5.7	 3.2 5.7	 5.0 8.0
Connecting thread (external) for application inlet/outlet	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12	Ø12	Ø12
Noise level[2]	dB(A)	50	50	52	56
Weight	kg	25	26	33	43
Clearance	mm	200	200	200	200

	Unit	U 855 P	U 1245 P	U 1635 P
ACC area[1]	°C	-50 – 200	-45 – 200	-35 – 200
Device dimensions (W x D)	mm	310 x 490	310 x 510	310 x 610
Device height (H)	mm	736	736	736
Bath opening (W x D)	mm	150 x 150	200 x 200	200 x 300
Bath depth (H)	mm	200	200	200
Usable depth	mm	180	180	180
Height top of bath	mm	540	540	540
Filling volume - Minimum - Maximum	 L L	 5.0 8.0	 8.5 13.0	 11.0 16.5
Connecting thread (external) for application inlet/outlet	mm	M16 x 1	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12	Ø12
Noise level[2]	dB(A)	60	56	52

	Unit	U 855 P	U 1245 P	U 1635 P
Weight	kg	43	43	38
Clearance	mm	200	200	200

Table 53: Universa MAX cold bath thermostats

	Unit	U 845 M	U 855 M	U 890 M	U 1245 M
ACC area[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
Device height (H)	mm	757	757	787	757
Bath 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
Usable depth	mm	180	180	180	180
Height top of bath	mm	540	540	570	540
Filling volume					
- Minimum	L	5.0	5.0	5.0	8.5
- Maximum	L	8.0	8.0	8.0	13.0
Connecting thread (external) for application inlet/outlet	mm	M16 x 1	M16 x 1	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12	Ø12	Ø12
Noise level[2]	dB(A)	58	60	56	58
Weight	kg	44	44	76	44
Clearance	mm	200	200	200	200

	Unit	U 1645 M	U 2040 M	U 4230 M
ACC area[1]	°C	-45 – 200	-40 – 200	-30 – 200
Device dimensions (W x D)	mm	310 x 610	350 x 540	450 x 690
Device height (H)	mm	757	927	927
Bath opening (W x D)	mm	200 x 300	200 x 200	300 x 350
Bath depth (H)	mm	200	320	320
Usable depth	mm	180	300	300
Height top of bath	mm	540	710	710
Filling volume				
- Minimum	L	10.5	9.0	19.0
- Maximum	L	16.5	21.0	47.0
Connecting thread (external) for application inlet/outlet	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	Ø12	Ø12	Ø12
Noise level[2]	dB(A)	60	55	55
Weight	kg	48	55	66
Clearance	mm	200	200	200

[1] - ACC area (Active Cooling Control) according to DIN 12876 is the working temperature range during operation with an active cooling unit.

[2] - Noise level determined according to standard EN 11201 for operating position in front of the device at 1 meter distance

Device variants with ball bearing pump

Device types U 845 M, U 855 M, U 890 M, U 1245 M and U 1645 M are also available as a variant with a ball bearing pump. The technical data is identical to the specifications in the table
Table 53 “Universa MAX cold bath thermostats” on page 138.

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	---	variopump	variopump	variopump
Pump levels	Quantity	6	6	6
Pump data 50/60 Hz				
- Maximum discharge pressure	bar	0.55	0.55	0.55
- Maximum flow rate	l/min	22	22	22
Connector thread (outer) outflow/ reverse flow	mm	---	---	M16 x 1
Drain connection outer diameter	mm	---	Ø12	Ø12

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 levels	Quantity	8	8
Pump data 50/60 Hz			
- Maximum discharge pressure	bar	0.7	0.7
- Maximum pump suction	bar	0.4	0.4
- Maximum flow rate (pressure)	l/min	25	25

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 flow rate (suction)	l/min	23	23
Connector thread (outer) outflow/reverse flow	mm	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12

Table 56: Universa MAX

Specification		U 20 M	U 2040 M, U 4230 M
Pump type	---	variopump	variopump
Pump levels	Quantity	8	8
Pump data 50/60 Hz			
- Maximum discharge 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 levels	Quantity	8	8
Pump data 50/60 Hz			
- Maximum discharge pressure	bar	0.7	0.7
- Maximum pump suction	bar	0.4	0.4
- Maximum flow rate (pressure)	l/min	25	25
- Maximum flow rate (suction)	l/min	23	23
Connector thread (outer) outflow/reverse flow	mm	M16 x 1	M16 x 1
Drain connection outer diameter	mm	Ø12	Ø12

Data is also valid for pumps with a ball bearing

11.5 Current consumption and heating output

Table 58: PRO immersion thermostat

Power supply	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 stainless steel bath thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Power supply	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 cold bath thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Power supply	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		
Power supply	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 stainless steel bath thermostats

		Maximum heating output in kW for lower / upper mains voltage				
Power supply	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 cold bath thermostats

		Maximum heating output in kW for lower / upper mains voltage			
Power supply	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		
Power supply	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 output

The cooling output is measured when the heat transfer liquid reaches a certain temperature. The ambient temperature for the measurement is 20 °C. Ethanol is used as a heat transfer liquid up to 20 °C, and thermal oil is used for temperatures above 20 °C.

PRO low temperature thermostats

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

	Unit	U 420 P	U 630 P	U 635 P	U 1635 P	Pump level
Cooling output at 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 level
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: Single-stage cooling unit 50/60 Hz

	Unit	U 845 P	U 855 P	U 1245 P	Pump level
Cooling output at 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

MAX low temperature thermostats

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

	Unit	U 845 M	U 855 M	U 1245 M	Pump level
Cooling output at 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 level
-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: Single-stage cooling unit 50/60 Hz

	Unit	U 1645 M	U 2040 M	U 4230 M	Pump level
Cooling output at 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: Twin-stage cooling unit 50/60 Hz

	Unit	U 890 M	Pump level
Cooling output at 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 charge

Cold bath thermostats

Table 68: PRO single-stage cooling 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

Cold bath 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: MAX twin-stage cooling unit

	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_2 comparison = 1.0

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

11.8 Heating curve

Heating curves measured with thermal oil as a heat transfer liquid and a closed bath cover.

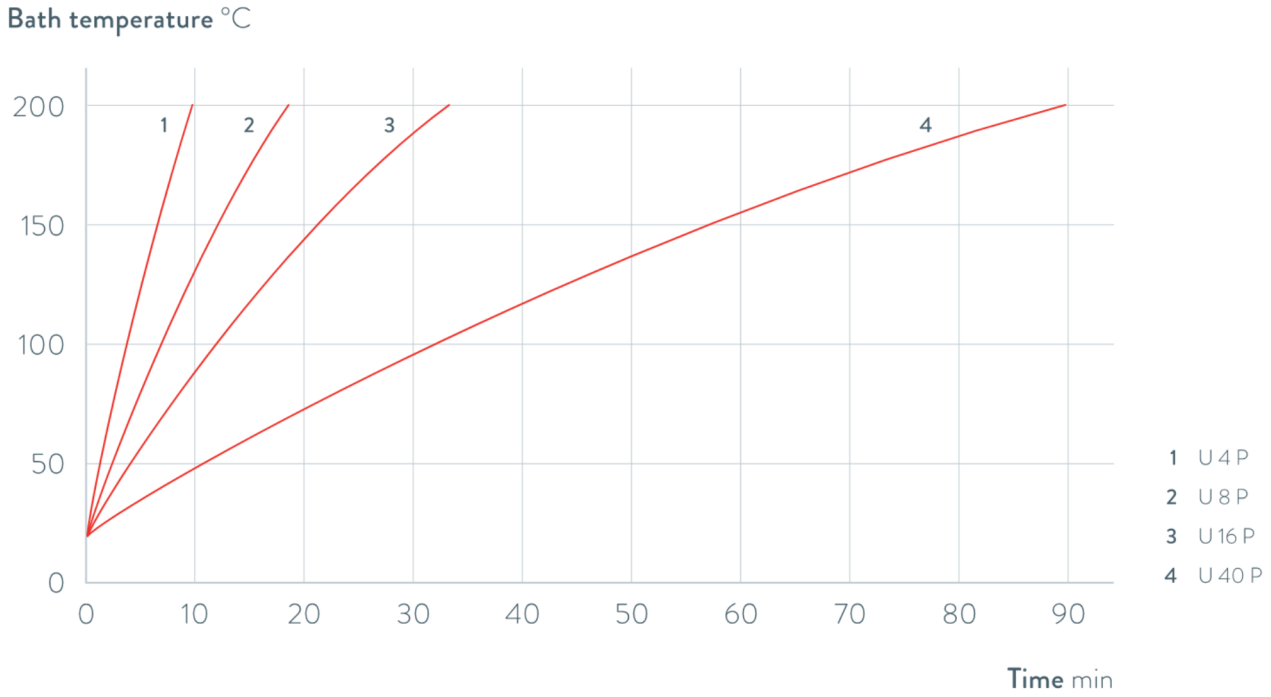


Fig. 74: Heating curves for Universa PRO high temperature thermostats

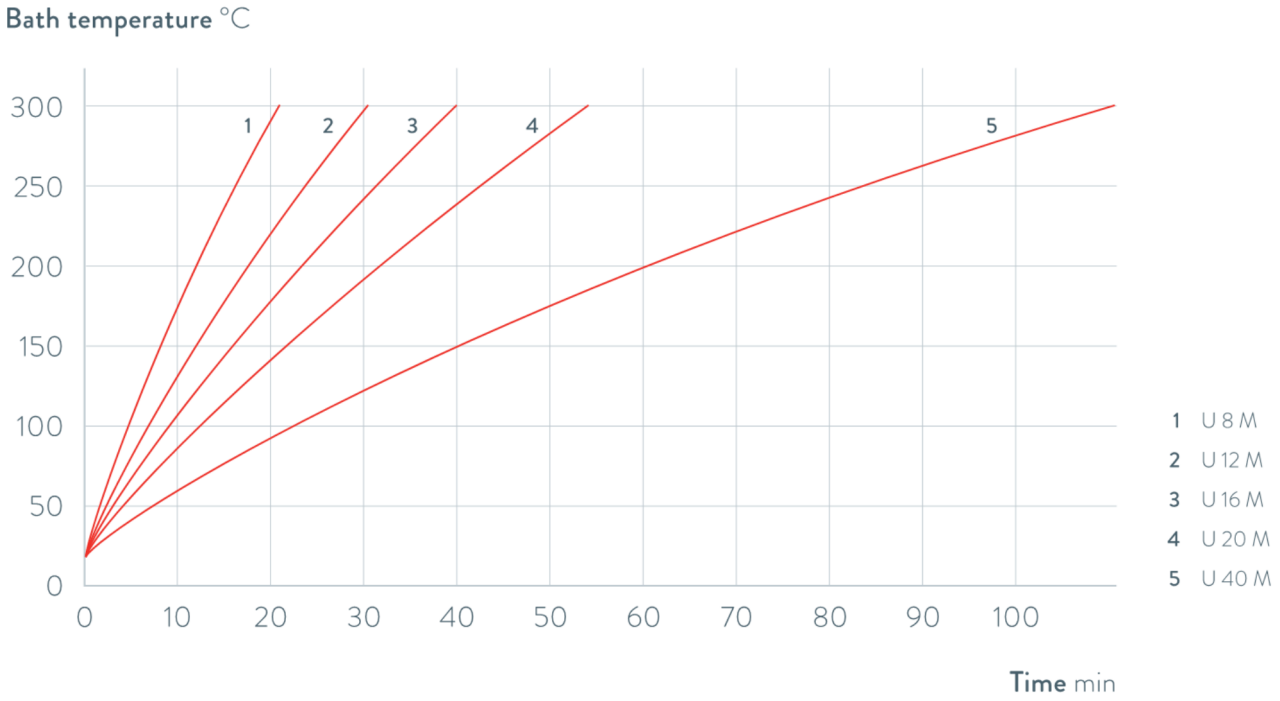


Fig. 75: Heating curves for Universa MAX high temperature thermostats

11.9 Cooling curve

Cooling curves measured with ethanol as a heat transfer liquid and a closed bath cover.

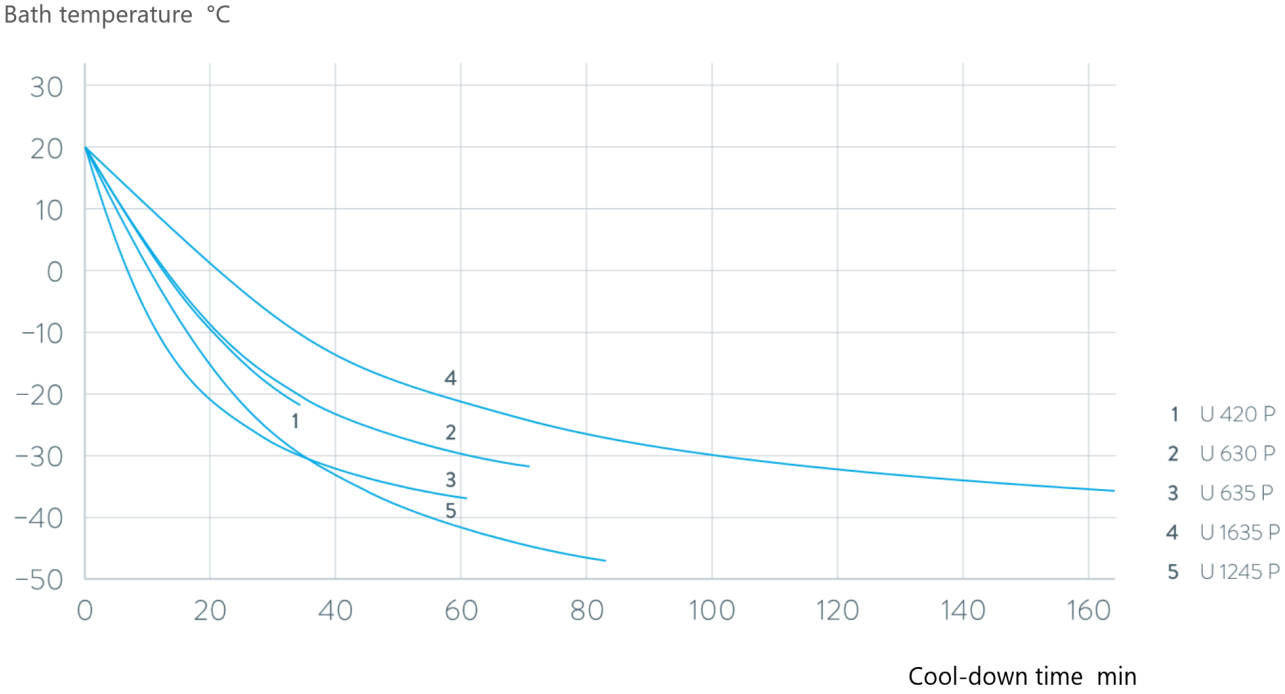


Fig. 76: Cooling curves for Universa PRO low temperature thermostats

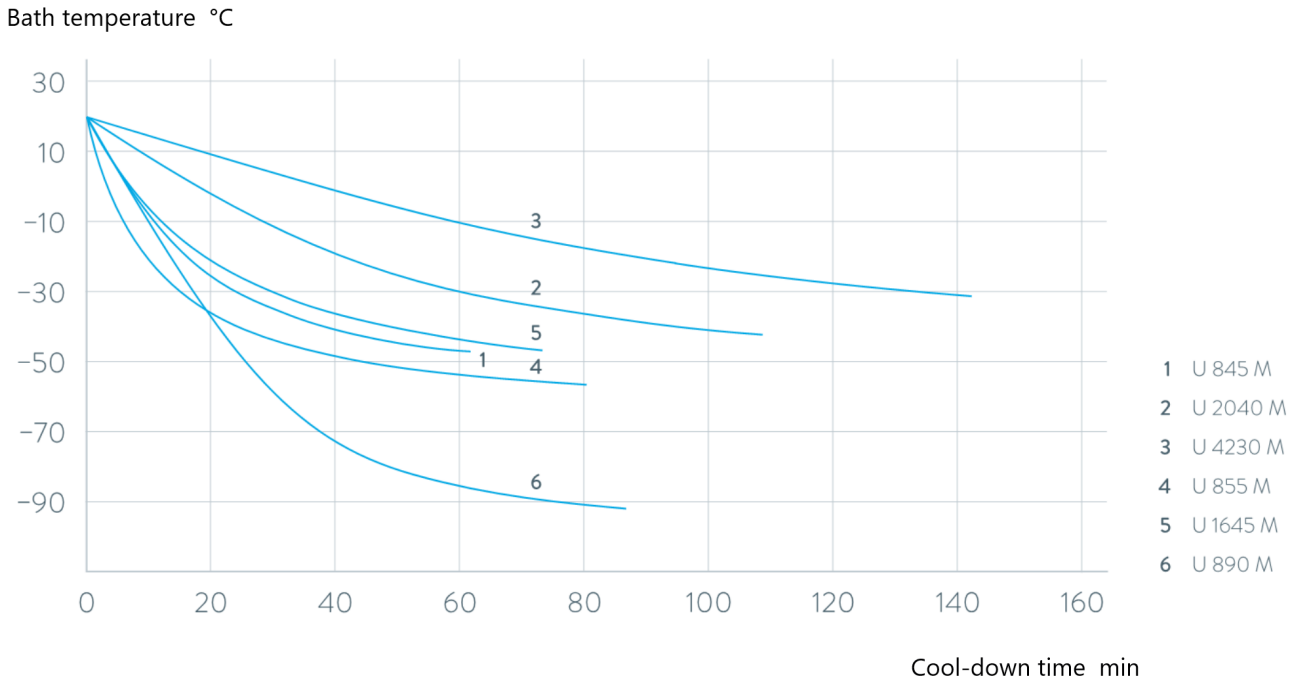


Fig. 77: Cooling curves for Universa MAX low temperature thermostats

11.10 Pump characteristics

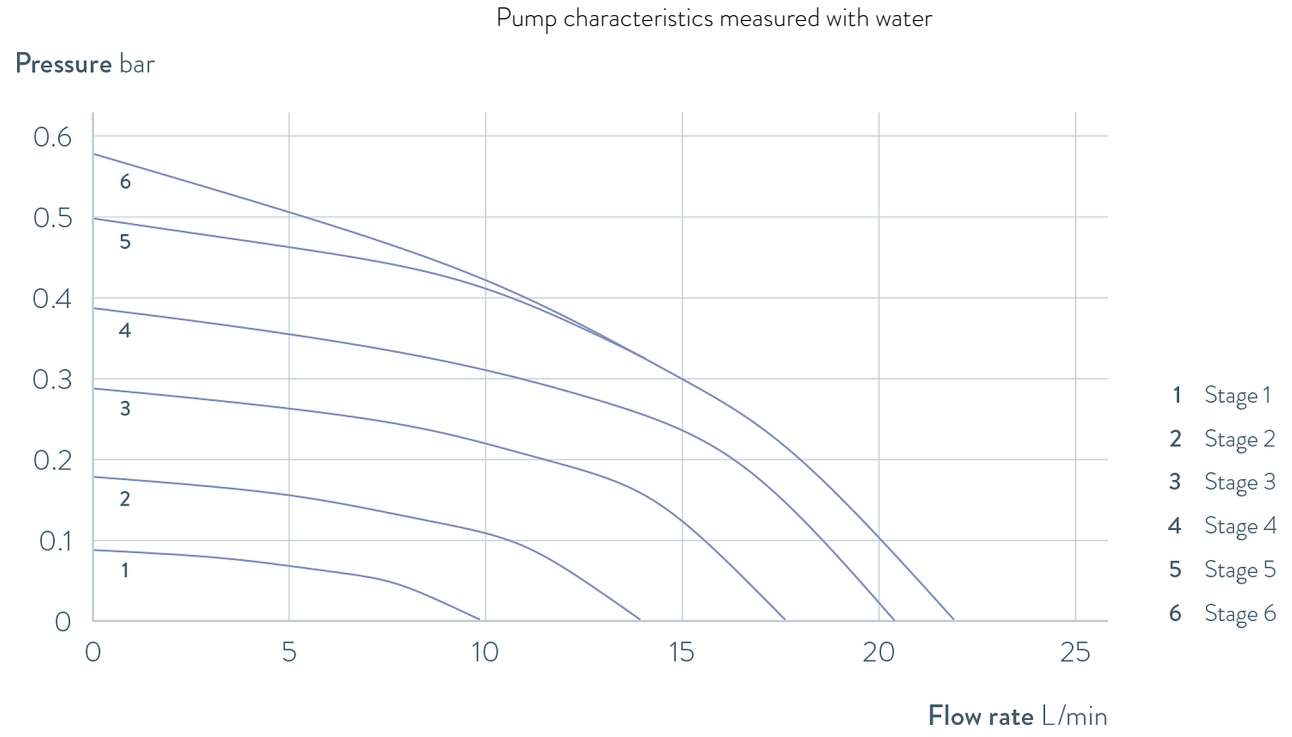


Fig. 78: Universa PRO pump characteristics

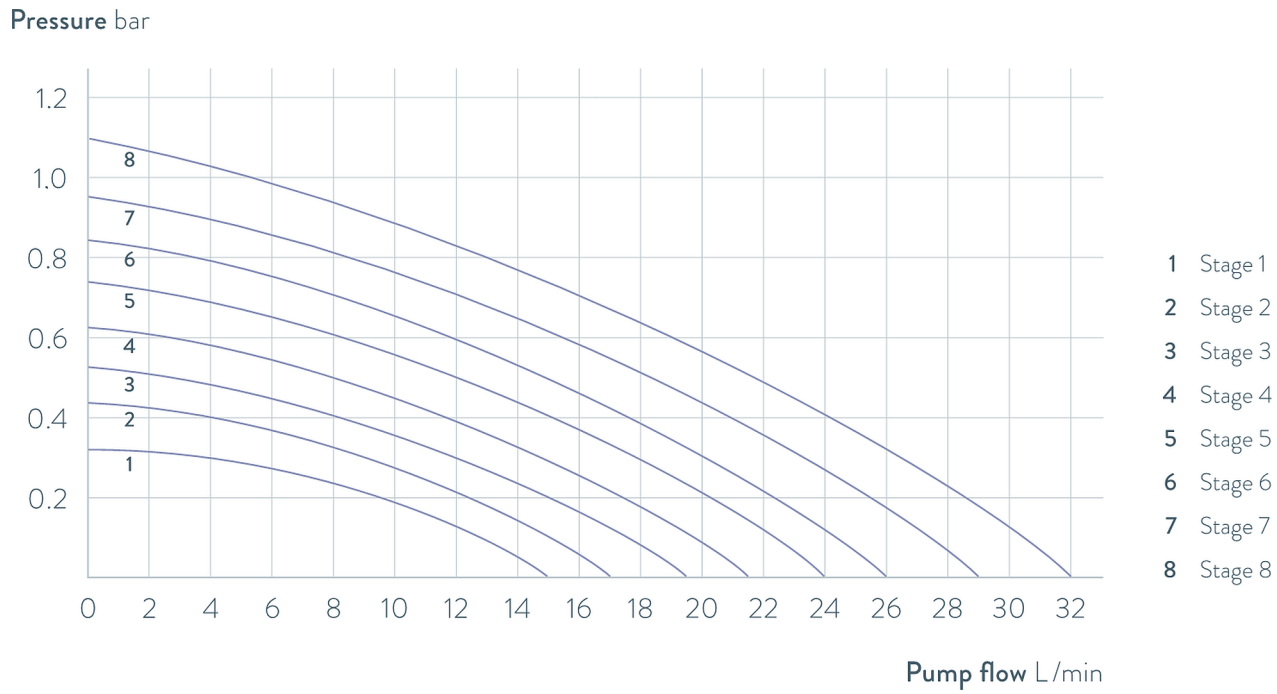


Fig. 79: Universa MAX pump characteristics with pressure pump (Vario pump) for a bath depth of 320 mm

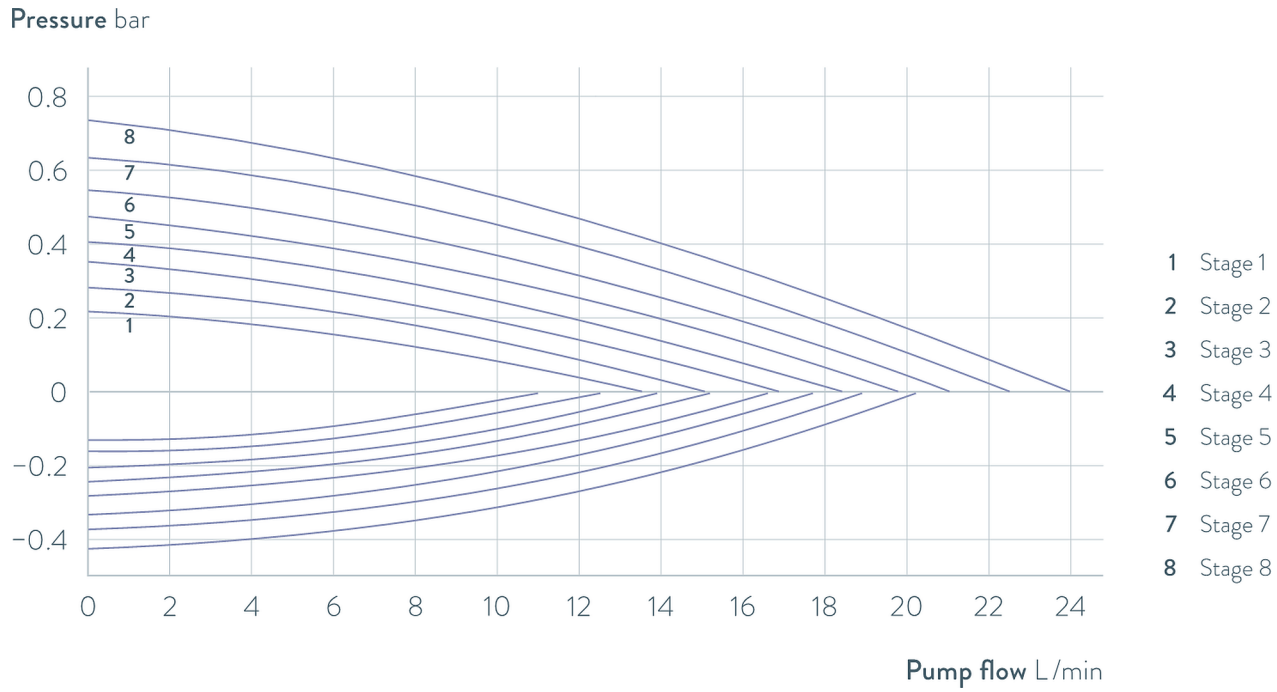


Fig. 80: Universa MAX pump characteristics with pressure/suction pump (Varioflex pump)

12 Accessories

Interface modules

The following optional accessories are available for Universa devices. It may only be possible to operate the interfaces from a certain software version onward. We recommend clarifying this prior to installation.

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

Accessories for Universa MAX and PRO	Characteristic	Catalog 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 cover	LRZ 925
RS 232/485-interface module Advanced	D-SUB miniature 9-pin socket	LRZ 926
Contact interface module Advanced with one input and one output	1 x input / 1 x output	LRZ 927
Contact interface module Advanced with three inputs and three outputs	D-SUB miniature 15-pin socket, 3 x input / 3 x output	LRZ 928
Profibus interface module Advanced	D-SUB miniature 9-pin socket	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-SUB miniature 9-pin socket	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	Characteristic	Catalog number
External Pt100 / LiBus interface module	Small cover	LRZ 918

Table 73: Racks and inset basket for bath vessel

Accessories for Universa MAX and PRO	Characteristic	Suitable for	Catalog number
Test tube racks 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	Characteristic	Suitable for	Catalog number
Hanging rack	for test tubes, External D = 16 mm	U 8, U 830, U 845, U 855, U 890, U 630, U 635	A001664
	for test tubes, External D = 30 mm	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
Hanging rack made from stainless steel RN 18/4	for 11 tubes, D = 14-18 mm, 110 mm ID[1]	U 4, U 420	UE 035
Inset basket	140x140x195 mm	U 8, U 830, U 845, U 855, U 890	LCZ 0658
Inset basket	180x190x195 mm	U12, U1225, U 1245	LCZ 0694
Rotorack, can be rotated and the height adjusted	Diameter 198 mm, Holes 6.5 mm, 10 mm and 12 mm in diameter, divided into twelve areas.	U 20, U 2040	A001764

[1]ID = immersion depth

Bath cover for ducts or openings

Table 74: Bath cover for Universa thermostats

Designation	Suitable for	Bath opening in mm x mm	Quantity	Catalog number
Bath cover with ducts	U 8, U 830, U 845, U 855, U 890	150 x 150	1	A001658
Bath cover with ducts	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 stainless steel baths

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

Designation	Device type	Bath opening in mm x mm	Quantity	Catalog number
	U 16	200 x 300	1	A001663
Bath cover, two-piece	U 40	300 x 600	2	A001794

Table 76: Bath cover for Universa cold baths

Designation	Device type	Bath opening in mm x mm	Quantity	Catalog 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 high temperature thermostats

Designation	Suitable for	Bath opening in mm x mm	Quantity	Catalog 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-piece	U 40	300 x 600	2	A001794

Table 78: Screw-on bath cover for Universa PRO high and low temperature thermostats

Designation	Suitable for	Bath opening in mm x mm	Quantity	Catalog number
Screw-on bath cover	U 4, U 420	130 x 100	1	A001761

Table 79: Hydraulic components

Designation	Suitable for	Characteristic	Catalog number
Pump connector set	Universa PRO	including M16 x 1 stainless steel connectors	A001737
Cooling coil set	Universa PRO	including M16 x 1 stainless steel connectors	A001740
Adapter	All	M16 x 1 I[2] to NPT 1/2" A[3]	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
	All	M16 x 1 I to G1/2" A	HKA 060

Designation	Suitable for	Characteristic	Catalog number
	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 to ball bush, 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
Angled hose nozzle	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	compatible with M16 x 1 connecting thread	A001656

[2] I = internal screw thread (female)
[3] E = exterior thread (male)

Table 80: Fastening components, mounts

Designation	Suitable for	Characteristic	Catalog 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 clamp for pipes	A001666 to A001672	Mounting hole: M10	A001720
Cover bracket	A001666 to A001672	compatible with standard rails	A001721
Base with castors	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: Connecting plug

Accessories	Characteristic	Item number
Module box	for connecting up to two additional interface modules	LCZ 9727
External temperature probe with socket and shielded connection cable		ETP 059

Accessories	Characteristic	Item number
Coupling connector, 6-pin for analog inputs/outputs		EQS 057
Connecting plug 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 connector for contact input		EQS 048
3-pin coupling socket for contact output		EQD 047

Table 82: Valve units

Accessories	Characteristic	Item number
Cooling valve with LiBus triggering	for M16x1 connecting thread	A001657
Shut down valve/reverse flow protection with LiBus triggering		A001753

13 Declarations of Conformity

13.1 Thermal equipment

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

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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

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13.2 Refrigeration equipment

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

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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:
LAUDA DR. R. WOBSER GMBH & CO. KG ◦ Laudaplatz 1 ◦ 97922 Lauda-Königshofen
Telephone: +49 (0)9343 503-0
E-mail: info@lauda.de ◦ Internet: https://www.lauda.de