LAUDA

Operating instructions

Kryoheater Selecta KHS 2190 W / Kryoheater Selecta KHS 3560 W
Process Cooling Unit

Read the instructions prior to performing any task!

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Translation of the original operating instructions

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1 General

1.1 Information about this operating manual

This manual enables safe and efficient handling of the system. This manual is an integral part of the system, and must be kept in close proximity to the system where it is permanently accessible for personnel.

Personnel must have carefully read and understood this manual before starting any task. The basic prerequisite for safe work is compliance with all safety instructions and handling instructions specified in this manual.

In addition, local accident prevention regulations and general safety instructions must be observed for the operational area of the system.

Illustrations in this manual are intended to facilitate basic understanding and may differ from the actual design.

The operating manuals of the installed components in the Appendix apply in addition to this manual.

1.2 Explanation of the symbols

Safety instructions

Safety instructions in this manual are indicated using symbols. The safety instructions are introduced by signal words that express the extent of the hazard.

The safety instructions must be strictly complied with; you must act prudently to prevent accidents, personal injury, and material damage.

DANGER!

This combination of symbol and signal word indicates an immediately hazardous situation that could result in death or serious injury unless avoided.

WARNING!

This combination of symbol and signal word indicates a potentially hazardous situation that can result in death or severe injuries if it is not avoided.

CAUTION!

This combination of symbol and signal word indicates a possibly dangerous situation that can result in minor or slight injuries if it is not avoided.

NOTICE!

This combination of symbol and signal word indicates a possibly dangerous situation that can result in damage to property and to the environment if it is not avoided.

Tips and recommendations

This symbol highlights useful tips and recommendations and information for efficient and faultless operation.

Special safety instructions

The following symbols are used in the safety instructions to draw attention to specific dangers:

DANGER!

This combination of symbol and signal word indicates hazards due to electric current. If the safety instructions are not complied with, there is danger of severe or fatal injuries.

Signs in this manual

The following signs and highlighting are used in this manual to identify handling instructions, the description of results, lists, references and other elements:

Sign	Description
⇨	Indicates a condition or an automatic sequence resulting from an action step.
	Indicates references to a chapter in this manual and accompanying documents.
■	Indicates lists and list entries without a specified sequence.
[button]	Indicates names of push buttons, buttons and other operating elements.

1.3 Limitation of liability

All specifications and instructions in this manual have been compiled taking account of applicable standards and regulations, the current state of technology and the experience and insights we have gained over the years.

The manufacturer assumes no liability for damage due to:

- Non-observance of this manual
- Non-intended use
- Deployment of untrained personnel
- Unauthorised conversions
- Technical changes
- Use of non-approved spare parts

The actual scope of supply may differ from the descriptions and illustrations in this operating manual in the case of special designs, application of additional ordering options or as a result of the latest technical modifications.

The duties and obligations agreed upon in the delivery contract apply in full, as well as the general terms and conditions, the terms of delivery of the manufacturer and the valid legal regulations applicable at the conclusion of the contract.

1.4 Copyright

This manual is protected by copyright and is intended exclusively for internal purposes.

The transfer of this manual to third parties, reproductions of any type and form, whether in whole or in part, and the dissemination and/or communication of the contents other than for internal purposes are not permitted without the written approval of the manufacturer.

Infringements will result in legal action for damages. We reserve the right to assert further claims.

1.5 Declaration of conformity

You can find the Declaration of Conformity in section 13.3.

1.6 Warranty terms

See general terms and conditions of LAUDA DR. R. WOBSER GMBH & CO. KG

1.7 Service

Our service department is available for technical information.

Your partner for maintenance and expert support.

LAUDA Service temperature control devices

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Furthermore, our employees are always interested in new information and experience arising from use and that can be valuable for the improvement of our products.

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2 Safety

This section provides an overview of all important safety aspects for optimum protection of personnel and for safe and trouble-free operation.

Failure to comply with the handling instructions and safety instructions specified in this manual can result in significant hazards.

2.1 Intended use

The system has been designed and constructed solely for the intended use described here.

The system is provided exclusively for adjusting the temperature of the gases or liquid previously agreed with the owner in accordance with the parameters stated in the technical data.

Proper use also includes compliance with all the information in this operating manual.

Any use that exceeds or differs from the intended use shall be considered as misuse.

WARNING!
Danger due to misuse!

Misuse of the system can result in dangerous situations.

- Never operate the system with heat transfer liquid, refrigerant or lubrication oil other than those specified in this manual.
- Never use the system for cooling flammable or explosive media.
- Never use the system for cooling food.
- The system must not be used in a potentially explosive atmosphere.
- Do not make any attachments to, conversion or modification of the system or its individual components.

No claims of any kind for damage will be entertained if such claims result from improper use.

2.2 Owner's responsibility

Owner

The owner is the person who himself operates the system for industrial or commercial purposes or assigns it to a third party for use and bears the legal product responsibility for the protection of the user, the personnel or third parties during operation.

Owner's obligations

The system is used in the industrial sector. The owner of the system must therefore comply with statutory occupational health and safety requirements.

In addition to the safety instructions in this operating manual, the applicable safety, accident prevention and environmental protection regulations for the system's area of application must be observed.

The following applies in particular:

- The owner must inform himself about the applicable occupational safety regulations, and determine any additional dangers in a risk analysis that arise due to the specific working conditions at the usage location of the system. The owner must then implement this information in a set of operating instructions for the operation of the system.
- Only for owners within the EEC: The owner must observe and comply with the applicable provisions of EU Directive 517/2014 together with Directive 303/2008/EC of the European Parliament and EU Council concerning specified fluorinated greenhouse gases and certified personnel.
- The owner must install additional dirt traps or start-up sieves if freedom from dirt is not guaranteed for the heat transfer system.
- The owner must instruct the operating personnel about the hazardous properties of the refrigerant and other operating materials.
- Throughout the entire period that the system is in operation, the owner must assess whether the operating instructions issued comply with the current status of regulations, and must update the operating instructions if necessary.
- The owner must clearly lay down and specify responsibilities with respect to placement, operation, troubleshooting, maintenance and cleaning.
- The owner must ensure that all personnel dealing with the system have read and understood these instructions. The owner must also train personnel and inform them about the dangers at regular intervals.
- The owner must provide the required protective equipment to personnel and instruct them that wearing the protective equipment is mandatory.

The owner is also responsible for ensuring that the system is always in proper working order. The following therefore applies:

- The owner must ensure that the maintenance intervals described in these instructions are observed.
- The owner must ensure that all safety units are regularly checked for functionality and completeness.
- The owner must ensure that the condition of the heat transfer fluid is checked at regular intervals.
- The owner must ensure the required water quality (↳ Chapter 3.3 ‘Operating materials’ on page 36) for the cooling water circuit and make the specified regular checks.

2.3 Personnel requirements

2.3.1 Qualifications

WARNING!
Danger of injury if personnel are insufficiently qualified.

If unqualified personnel perform work on the system or are in the system's danger zone, hazards may arise that can cause severe injuries and substantial damage to property.

- All work must be carried out by appropriately qualified personnel only.
- Keep unqualified personnel away from the danger zones.

This operating manual specifies the personnel qualifications required for the different areas of work, listed below:

Qualified electrician

Based on his technical training, knowledge, experience and knowledge of the applicable standards and regulations, the qualified electrician is able to perform work on electrical systems and recognise and avoid potential hazards himself.

The qualified electrician is specially trained for the area of responsibility he is involved with and knows the relevant standards and regulations.

The qualified electrician must comply with the requirements of the applicable legal regulations for accident prevention.

Specialist personnel

Based on their technical training, knowledge, experience and knowledge of the applicable regulations, specialist personnel are able to perform the work assigned to them and recognise and avoid potential hazards themselves.

Cooling specialist

The cooling specialist is trained for the special area of responsibility he is involved with and knows the relevant standards and regulations. The certification includes the required competence for avoidance of emissions, the recovery of fluorinated greenhouse gases and the safe handling of cooling equipment of the relevant type and size.

Based on his technical training and experience, the Cooling Specialist can perform work on cooling systems and can recognise and avoid potential hazards himself.

Crane operator

The crane operator must be at least 18 years old and, based on his physical and intellectual attributes and character, suited to operating cranes.

The crane operator has also been trained in the operation of cranes.

The crane operator must provide the owner with evidence of his skills in operating cranes and has been authorised in writing by the owner to operate the crane.

Trained person

The trained person has been instructed in an instruction by the owner about the tasks assigned to him and possible hazards in the event of improper behaviour.

Only persons who can be expected to perform their work reliably are permitted as personnel. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are not authorised.

The assigned personnel must master the language used in the operating instructions.

When selecting personnel, the age-related and occupation-related regulations governing the usage location must be observed.

2.3.2 Unauthorised persons

WARNING!
Risk to life for unauthorised persons due to hazards in the danger and working zone!

Unauthorised persons who do not meet the requirements described here will not be familiar with the dangers in the working zone. Therefore, unauthorised persons face the risk of serious injury or death.

- Unauthorised persons must be kept away from the danger and working zone.
- If in doubt, address the persons in question and ask them to leave the danger and working zone.
- Cease work while unauthorised persons are in the danger and working zone.

2.3.3 Instruction

Personnel must receive regular instruction from the owner. The instruction must be documented for better traceability.

The report must contain at least the following information:

- Date of the instruction
- Name of the trained person
- Type of instruction
- Name of the instructor
- Signature of the trained person

2.4 Personal protective equipment

Personal protective equipment is used to protect personnel against dangers that could impair their safety or health while working.

Personnel must wear personal protective equipment while carrying out the various tasks on and with the system. This equipment will be indicated separately in the individual chapters of this operating manual. This personal protective equipment is described below:

- The personal protective equipment specified in the different chapters of this manual must be put on before starting the respective task.
- Always comply with the instructions governing personal protective equipment posted in the work area.

Description of the personal protective equipment

Protective work clothing

Protective work clothing is tight-fitting work clothing with low resistance to tearing, with tight sleeves, and without projecting parts. It mainly provides protection against catching by moving machine parts. Do not wear any rings, chains and other jewellery.

Cold protection gloves

Cold protection gloves are acid and cold-resistant protective gloves made of leather. The protective gloves provide protection of the hands in the event of contact with supercooled components and small quantities of refrigerants.

Protective goggles

Protective goggles protect eyes from flying parts and liquid splashes.

Safety footwear

Safety footwear protects against heavy falling parts and slipping on slippery substrates.

Protective gloves

Protective gloves provide protection against injuries when removing external safety covers.

2.5 Basic dangers

The following section specifies residual risks that can arise from the system and that have been determined by a risk assessment.

In order to reduce health hazards and prevent dangerous situations, observe the safety instructions shown here and in the other chapters of this manual.

2.5.1 General workplace dangers

Accumulations of liquid

CAUTION!
Danger of injury from slipping in accumulations of liquid!

Slipping in accumulations of liquid on the floor may result in a fall. Falling may result in injuries.

- Remove accumulations of liquid immediately using appropriate means.
- Wear anti-slip safety shoes.
- Post warnings and instruction signs at or in the vicinity of any area where liquid could accumulate on the floor.

2.5.2 Danger due to mechanical elements

Compressor/pump with motor

WARNING!
Danger of injury from moving parts!

Rotating components and/or components moving in linear fashion can cause severe injuries.

- Do not reach into moving parts or handle moving parts during operation.
- Do not open covers and maintenance hatches during operation.
- Observe the run-on time: Before opening the covers to carry out maintenance, make sure that all components have stopped moving.
- When in the danger zone, wear close-fitting protective work clothing with low tear strength.
- Before working on moving parts of the system, shut down the system and take precautions to prevent restarting. Wait until all components have stopped moving.

2.5.3 Dangers from electric power

Electric current

DANGER!
Danger of fatal injury from electric current!

Contact with live parts poses an immediate danger to life due to electrocution. Damage to the insulation or individual components can be fatal.

- Work on the electrical system must only be performed by qualified electricians.
- In the event of damage to the insulation, switch off the power supply immediately and initiate repairs.
- Before starting work on active parts of electrical systems and equipment, cut off the power supply and ensure that the parts remain de-energised for the duration of the work. Observe the 5 safety rules:
  - Disconnect.
  - Secure against restarting.
  - Verify absence of voltage.
  - Ground and short circuit.
  - Cover or shield any adjacent live components.
- Never bypass or disable fuses. Comply with the correct current strength when replacing fuses.
- Keep moisture away from live parts. This can result in short circuits.

2.5.4 Dangers from chemical substances

heat transfer fluid

WARNING!
Danger of injury from heat transfer fluid (e.g. thermal oils)!

The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never use force to open the heat transfer circuit.
- Prevent damage to the associated lines.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- Collect spilled heat transfer fluid using liquid-binding material such as sand, diatomaceous earth, acid binder, universal binder or sawdust and dispose of in accordance with the regulations.
- Observe additional safety instructions of the material data sheet in the appendix of the heat transfer fluid used.

Nitrogen

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Liquid refrigerant

WARNING!
Danger of asphyxiation at high gas concentration!
Danger of frostbite in the event of contact with skin/ eyes!

Discharging liquid refrigerant in high concentration can cause unconsciousness coupled with paralysis and result in asphyxiation. If the liquid refrigerant comes into contact with skin or eyes, it can cause frostbite. The refrigerant in the cooling circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never carry out work on the refrigerant circuit. Never use force to open the cooling circuit.
- Prevent damage to the associated lines.
- Avoid contact with skin and eyes. Wear protective gloves and safety goggles with side guard when working on refrigerant containers, lines or supply equipment.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- In the event of contact with the skin or eyes, rinse immediately with plenty of water. Seek medical attention.
- Observe all additional safety instructions of the material data sheet for the refrigerant used. The material data sheet is included in the appendix.
- Do not eat, drink or smoke while working.

2.5.5 Dangers from hydraulic forces

Pressure tanks/pipes

WARNING!
Danger of fatal injury from improper work on the pressure tank/pipes!

Improper handling of pressure vessels can cause a sudden release of pressure, resulting in severe injuries or death and in significant damage to property.

- Never carry out welding or soldering work on the pressure tank.
- Never perform any mechanical machining on the pressure tank.
- After connection of the hydraulic line, completely vent the pressure tank using the fitted vent screw.
- Do not start work on systems with pressure tanks until the hydraulic pressure has been completely relieved and the depressurisation has been verified.
- Do not start work on the pressure tank until the gas preload pressure has been completely relieved.

2.5.6 Dangers from gases under pressure

Pressurised components

WARNING!
Danger to life from pressurised components!

If improperly handled, pressurised components may move in an uncontrolled manner, causing severe injuries. If improperly handled or defective, pressurised components may leak liquid under high pressure, causing severe injuries or death.

Before starting work on these components:

- Establish depressurised condition. Residual energies must also be discharged.
- Always ensure that liquids cannot accidentally escape.
- Defective components that are subject to pressure during operation must be replaced immediately by the appropriate specialised personnel.

2.5.7 Dangers due to high or low temperatures

Hot or supercooled surfaces

WARNING!
Danger of injury from hot or supercooled surfaces!

Surfaces of flanges and piping can heat up or cool down greatly during operation. Skin contact with hot surfaces causes severe skin burns. Skin contact with supercooled surfaces causes severe skin frostbite.

- Always wear temperature-resistant protective work clothing and protective gloves when working in the vicinity of hot or supercooled surfaces.
- Insulate all flanges and piping to prevent injuries and thermal losses.
- Before carrying out any work, ensure that all surfaces have reached the ambient temperature.

Hot operating materials

WARNING!
Danger of injury from hot operating materials!

Operating materials can reach high temperatures during operation. Skin contact with hot operating materials will cause severe skin burns.

- Always wear heat-resistant protective work clothing and protective gloves as a matter of principle when carrying out any work with operating materials.
- Always check whether operating materials are hot before working with them. Allow to cool down if necessary.

2.5.8 Dangers from fire

Fire prevention

WARNING!
Danger of injury due to limited or improper fire-fighting!

Severe injuries including death and substantial damage to property can occur in the event of fire.

- Always keep escape routes clear.
- Do not bring any open flames or external heat sources into the danger zone.
- Do not store any inflammable materials in the vicinity.
- Ensure that suitable equipment for firefighting is present and operational.
- Observe the following regarding the use of fire extinguishers:
  - Ensure that suitable fire extinguishers, depending on the potential hazard, are available.
  - Check fire extinguishers for operational readiness in accordance with the nationally prescribed intervals.
  - In the event of use, observe the safety and operation instructions on the fire extinguisher.
- Ensure that personnel are familiar with the measures to be taken in the event of fire.

2.6 Behaviour in the event of fire and accidents

Precautions

- Always be prepared for fire and accidents.
- Keep first aid equipment (first-aid kit, blankets etc.) and fire extinguishing equipment functional and ready to hand.
- Ensure that personnel are familiar with accident reporting, first aid and rescue equipment.
- Keep access routes clear for emergency service vehicles.

Measures for fire outbreak and accidents

- Immediately use the emergency stop device to trigger an emergency stop.
- Rescue persons from the danger zone if there is no danger to your own health.
- Initiate first aid measures if required.
- Notify the fire brigade and/or rescue services.
- In the event of outbreak of fire: If there is no danger for your own health, fight the fire with fire extinguishing equipment and continue firefighting until the arrival of the fire brigade.
- Notify the responsible persons at the operating site.
- Clear access routes for emergency service vehicles.
- Marshal emergency service vehicles.

2.7 Safety units

WARNING!
Risk of fatal injury due to non-functional safety devices!

If safety units are not functional or they are disabled, there is a risk of severe injuries including death.

- Check that all safety devices are functional and correctly installed before starting work.
- Never disable or bypass safety devices.
- Ensure that all safety devices are always accessible.

2.7.1 Position of the safety devices

The illustrations below show the position of the safety devices.

The positions of the safety devices are also on the dimension sheets in the appendix.

Safety units

Fig. 1: Position of emergency stop button and safety valve

1. Emergency stop button
2. Safety valve S100 (installed)

3. Main switch

2.7.2 Description of the safety devices

Emergency stop button

Fig. 2: Emergency stop button

Pressing the emergency stop button shuts down the system immediately by disconnecting the power supply or by mechanical disconnection of the drives. After an emergency stop button has been pressed, it must be unlocked by rotating it to enable a restart.

WARNING!
Risk of fatal injury from uncontrolled restarting!

Uncontrolled restarting of the system can result in severe injuries or death.

- Before a restart, ensure that the cause for the emergency stop has been rectified and that all safety devices are installed and functional.
- Do not unlock the emergency stop button until the danger is no longer present.

Main switch

Fig. 3: Main switch

Turning the main switch to the “0” position shuts down the system by immediately disconnecting the power supply.

WARNING!
Risk of fatal injury from uncontrolled restarting!

Uncontrolled restarting of the system can result in severe injuries or death.

- Before a restart, ensure that the cause for the emergency stop has been rectified and that all safety devices are installed and functional.
- Do not turn the main switch to the "I" position again until there is no longer any danger present.

Safety valves form part of the safety fittings. They are relieving devices for pressurised spaces such as steam boilers, pressure vessels, piping and transport vessels. In the event of an inadmissible pressure increase, safety valves discharge gases, vapours or liquids into the atmosphere.

Fig. 4: Safety valve

2.8 Safety components

Heat transfer system		
Pos. no.	**Name**	**Effect**
F100	Flow monitor	System shutdown*
F105	Safety temperature limiter	System shutdown*
F110	Level control min.	System shutdown*
F194	Temperature limiter	Function (cooling)
S100	Safety valve	Discharge of the heat transfer fluid, pressure relief

* The system shutdown causes the shutdown of the pump and the heater and sets an alarm.

Refrigeration system		
Pos. no.	**Name**	**Effect**
F505	Oil pressure controller	Compressor shutdown V500
F510	High pressure limiter	Compressor shutdown V500
F515	High pressure safety cut-out	Compressor shutdown V500

2.9 Securing against restarting

WARNING!
Risk of fatal injury from unauthorised or uncontrolled restarting!

Unauthorised or uncontrolled restarting of the system can result in severe injuries or death.

- Ensure that all safety devices are installed and functional and that there are no dangers to persons before restarting.
- Always comply with the procedure described below to prevent a restart.

Securing against restarting

1. Switch off the power supply.
2. Inform the responsible person about work in the danger zone.
3. Attach a sign to the system that points out the work in the danger zone and prohibits switching on. Mark the sign with the following information:
   - Switched off on (date):
   - Switched off at (time):
   - Switched off by (person):
   - Note: Do not switch on!
   - Note: Do not switch on until after it has been ensured that there are no dangers for persons.

2.10 Environmental protection

NOTICE!
Hazards for the environment due to improper handling of environmentally hazardous substances!

If environmentally hazardous substances are handled incorrectly, particularly if they are disposed of incorrectly, significant environmental damage can occur.

- Always comply with the instructions shown below for handling and disposal of environmentally hazardous substances.
- If environmentally hazardous substances inadvertently get into the environment, immediately implement suitable measures. If in doubt inform the responsible municipal authorities about the damage and ask about suitable measures that should be implemented.

The following environmentally hazardous substances are used:

Refrigerant

Refrigerants are environmentally hazardous products with harmful climate effects (greenhouse effect) and therefore must not get into the atmosphere. Maximum care and caution is therefore mandatory. Ensure that personnel handling refrigerants are regularly informed about potential dangers and are instructed in the safe handling of refrigerants.

Always observe the safety data sheet issued by the manufacturer.

Fluorinated greenhouse gases (F-gases)

F-gases is the designation for partially fluorinated hydrocarbons (HFC), perfluorinated hydrocarbons (PFC) and sulphur hexafluoride (SF6) and mixtures which contain these substances. F-gases are used as refrigerants, therefore the same conditions apply.

In addition: F-gases must only be handled by certified persons.

Always observe the safety data sheet issued by the manufacturer.

Heat transfer fluids (thermal oils)

Heat transfer fluids can contain substances that are toxic and hazardous to the environment. They are water-polluting substances and must not get into the environment. Disposal must be performed by a specialist disposal company.

Always observe the safety data sheet issued by the manufacturer.

Lubricants

Lubricants such as greases and oils contain toxic substances. These substances must not get into the environment. Disposal must be performed by a specialist disposal company.

F-gases

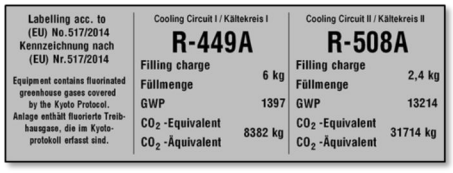


Fig. 5: KHS 2190 W

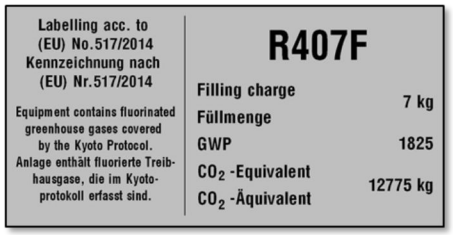


Fig. 6: KHS 3560 W

2.11 Signage

The following symbols and information signs can be found in the work area. They refer to the immediate surroundings in which they are applied.

WARNING!
Danger of injury due to illegible symbols!

Stickers and signs can become dirty or otherwise obscured over time so that dangers cannot be recognised and necessary operating instructions cannot be followed. This causes a danger of injury.

- Always keep all safety notices, warnings and operating instructions in a clearly legible condition.
- Replace damaged signs or stickers immediately.

2.11.1 Warning signs

Electrical voltage

Only qualified electricians are permitted to work in a work room marked by this sign.

Unauthorised persons must not enter the workplaces thus marked and must not open the marked cabinet.

3 Technical data

3.1 Dimensions

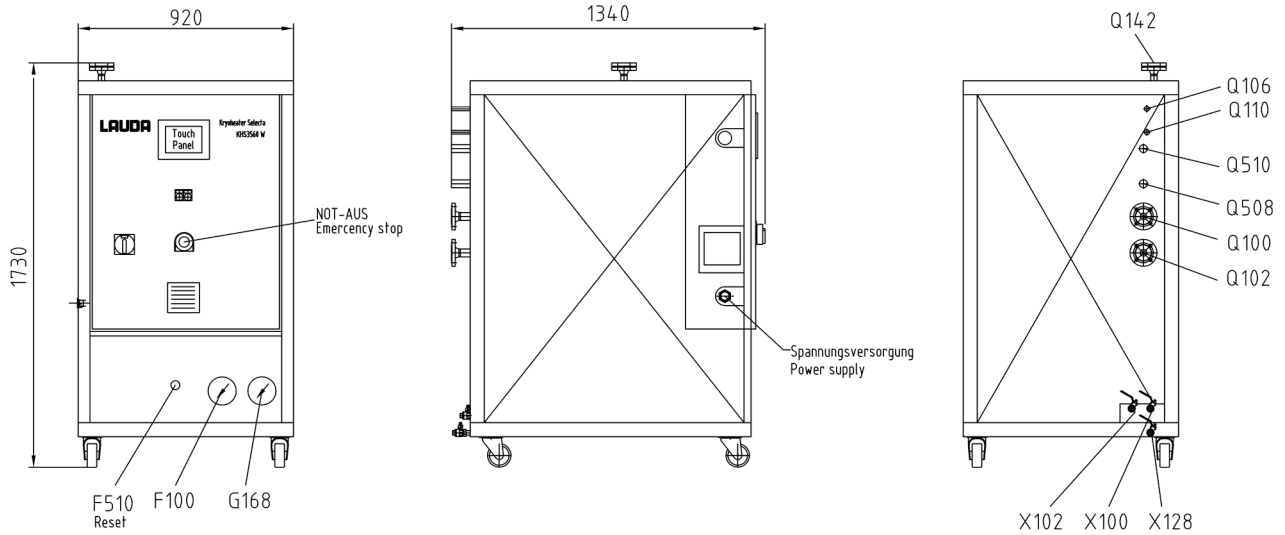


Fig. 7: Dimensions

3.2 Technical data

	KHS 3560 W	KHS 2190 W	Unit
	Value	Value	
Operating temperature range	-60 to 200	-90 to 200	°C
Ambient temperature range	5 to 40	5 to 40	°C
Relative humidity, max. at 35°C	35	35	°C
Distance between device and surroundings			
front	1	1	m
rear	1	1	m
right	1	1	m
left	1	1	m
Storage temperature	+10°C to +35°C	+10°C to +35°C	°C
Adjustment resolution	0.1	0.1	°C
Display resolution	0.1	0.1	°C
Fill capacity, minimum	15	15	l
Additional fill capacity in expansion tank	40	40	l
Refrigerant stage 1	R-407F	R-449A	
Refrigerant stage 2	./.	R-508A	
Refrigeration unit cooling	Water	Water	
Connections for cooling water	G1”, G= outside	G1”, G= outside	
Minimum diameter of cooling water tubes	25	25	mm
Cooling water temperature range/ cooling water temperature range without power loss	5 to 30 5 to 25	5 to 30 5 to 25	°C °C
Cooling water pressure	2.5 to 10	2.5 to 10	bar
Maximum cooling water consumption at 20°C, differential pressure 3 bar	4	2.3	m³/h

	Temp.	KHS 3560 W			KHS 2190 W		
		HTF	Value	Unit	HTF	Value	Unit
Cooling capacity at 20°C ambient temperature, 22°C cooling water temperature	200°C	Kryo 65	35	kW	Kryo 90		kW
	100°C	Kryo 65	35	kW	Kryo 90		kW
	20 °C	Kryo 65	35	kW	Kryo 90	21	kW
	10°C	Kryo 65	32	kW	Kryo 90		kW
	0°C	Kryo 65	30	kW	Kryo 90	18	kW
	-10°C	Kryo 65	29	kW	Kryo 90		kW
	-20°C	Kryo 65	18	kW	Kryo 90	11	kW
	-30°C	Kryo 65	14	kW	Kryo 90		kW
	-40°C	Kryo 65	10	kW	Kryo 90	10	kW
	-50°C	Kryo 65	6	kW	Kryo 90		kW
	-60°C	Kryo 65	2.5	kW	Kryo 90	9	kW
	-70°C	Kryo 65			Kryo 90		kW
	-80°C	Kryo 65			Kryo 90	3.5	kW
	-90°C	Kryo 65			Kryo 90	1	kW

Technical data

		KHS 3560 W	KHS 2190 W	Unit
		Value	Value	
Heating power Total power consumption @ 400 V; 3/PE; 50 Hz		18 43.1	18 32.8	kW kW
Max. current consumption 400 V; 50 Hz		65.3	56.1	A
Protection level		IP54	IP54	
Pump type		Peripheral pump	Peripheral pump	
Pump power (water 20°C)	Max. flow rate*	5.5	5.7	bar
	Max. flow rate*	85	85	l/min
Connections		DN 25	DN 25	mm
Overall dimensions	Width	1340	1340	mm
	Depth	920	920	mm
	Height	1730	1730	mm
Weight (empty)		850	890	kg
Safety equipment (class)		III, FL	III, FL	
Protection class				
The devices belong to the following classes of the EMC standard				

*Pressure at the pump's pressure joint **without** blanket pressure

	KHS 3560 W	KHS 2190 W
Installation indoors	yes	yes
Installation outdoors	no	no
Installation in EX-zone	no	no
Maximum continuous operating duration	Continuous operation**	Continuous operation**

**except maintenance times required legally and for safety reasons

Water consumption

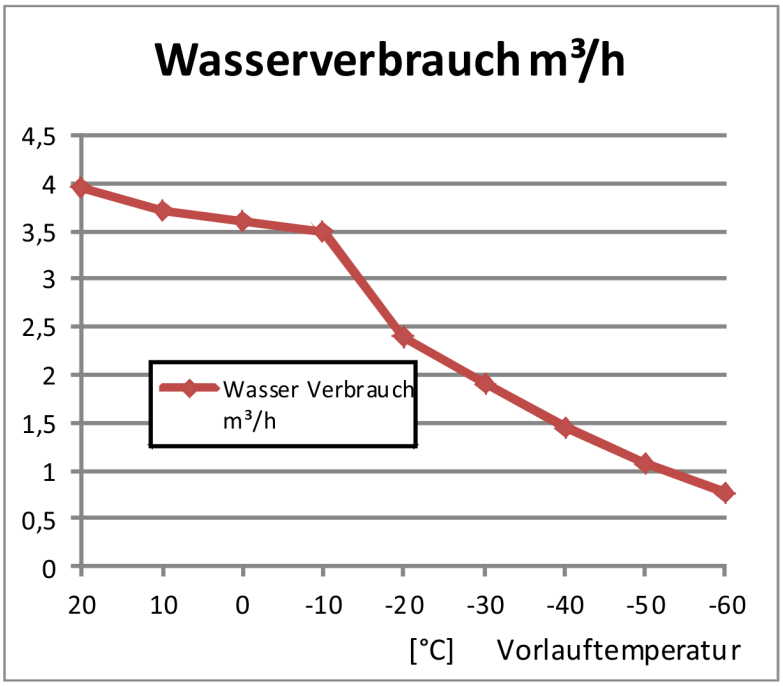


Fig. 8: KHS 3560 W water consumption

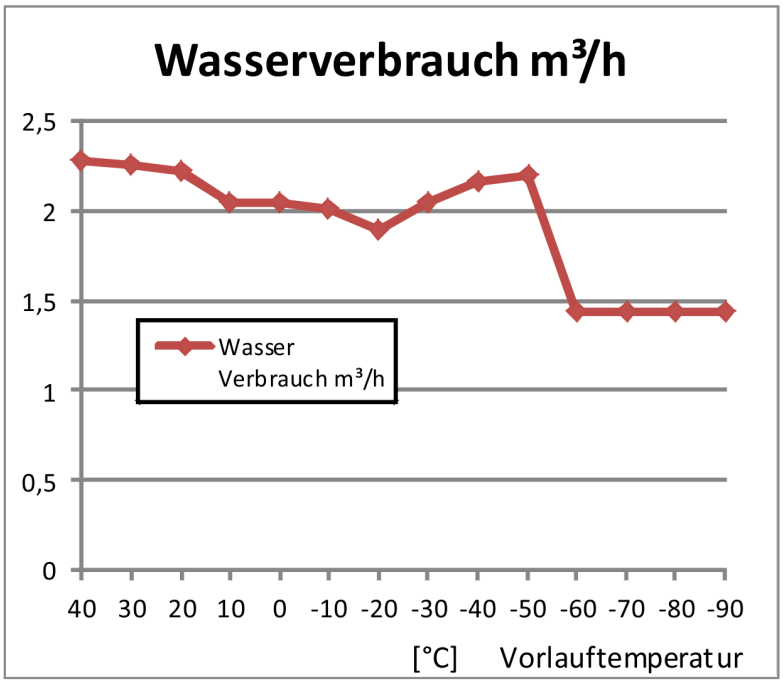


Fig. 9: KHS 2190 W water consumption

Water consumption

The water consumption was determined at an ambient temperature of 20°C and a cooling water temperature 22°C.

Pump characteristic curve

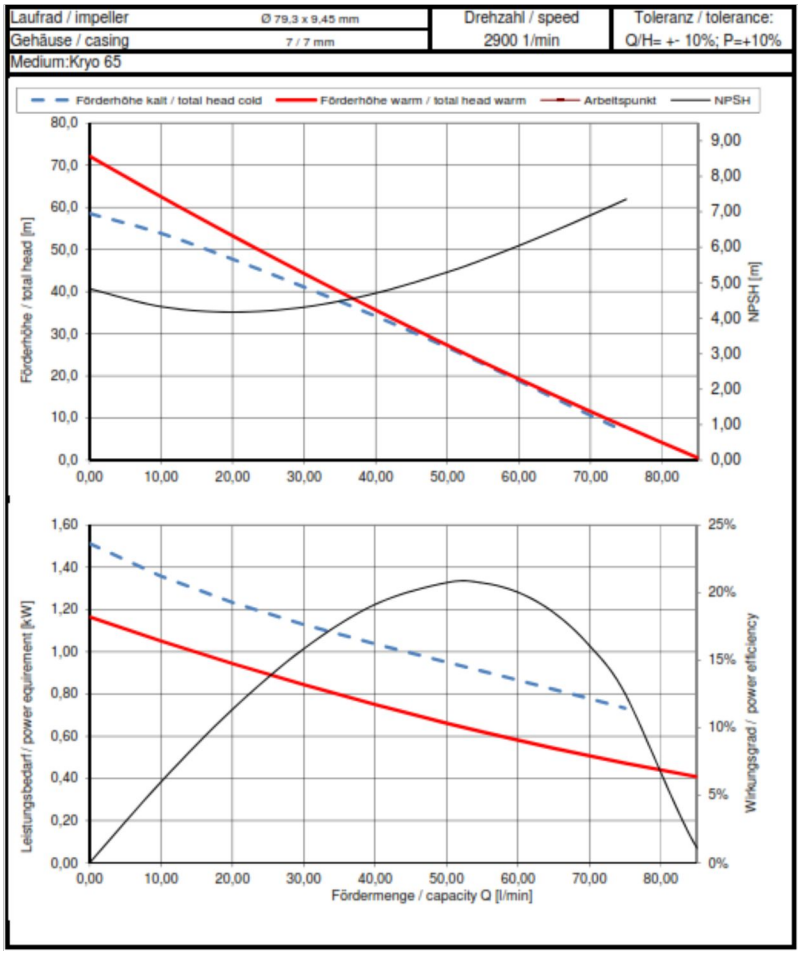


Fig. 10: KHS 3560 W pump characteristic curve

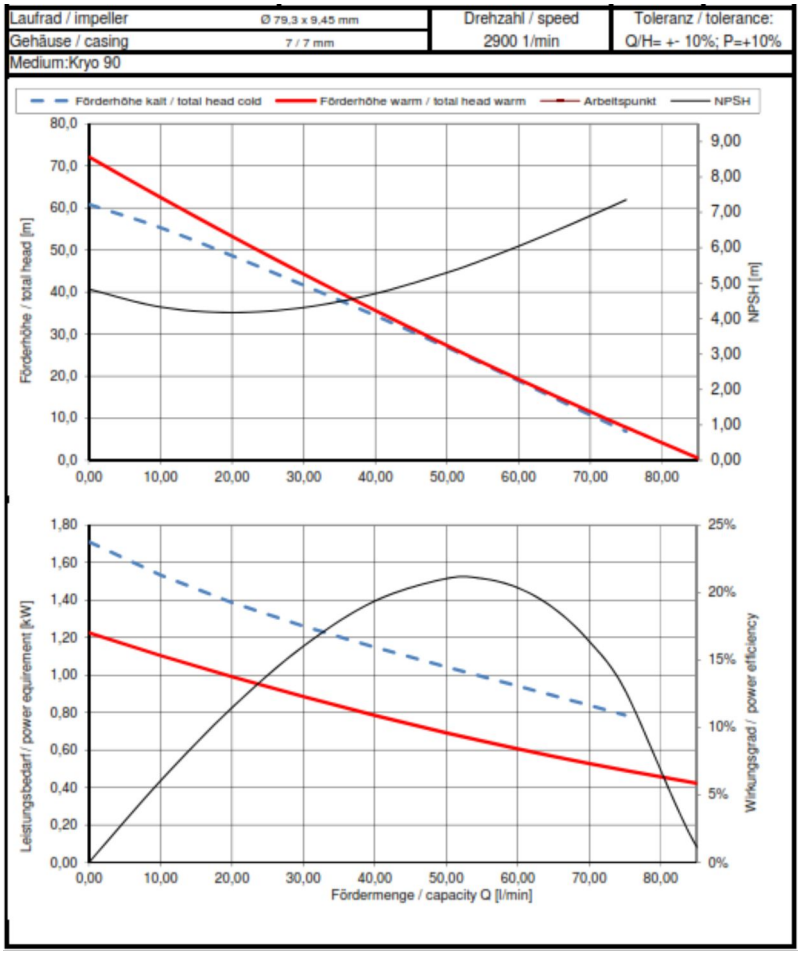


Fig. 11: KHS 2190 W pump characteristic curve

Pump

Specification	Value	Unit
Pump motor	2.2	kW
	2900	rpm
Min. flow rate	7.5	l/min
Max. flow rate	85	l/min
Maximum pressure at pressure joint KHS 3560 W*	5.5	bar
Maximum pressure at pressure joint KHS 2190 W*	5.7	bar
Maximum blanket pressure KHS 3560 W**	1.5	bar
Maximum blanket pressure KHS 2190 W**	3.5	bar

* Pressure at the pump's pressure joint without blanket pressure

**see also Fig. 10 and Fig. 11

Minimum necessary blanket pressure

Outflow temperature setpoint [°C]	Minimum necessary blanket pressure* [bar]		
	Kryo 90	Kryo 70	Kryo 65
< 140	n. r.**	n. r.	n. r.
150	0.2	n. r.	n. r.
160	0.3	n. r.	n. r.
170	0.4	n. r.	0.2
180	0.7	n. r.	0.3
190	1.0	n. r.	0.5
200	1.4	n. r.	0.8

* Minimum necessary blanket pressure is valid up to 1000 m above sea level and must be adjusted for placement at higher altitudes, due to the risk of cavitation.

** n.r. = not relevant

3.3 Operating materials

Operating material	Type KHS 3560 W	Filling quantity	Unit
Refrigerant	R-407F	7	kg
Refrigerator oil 1st stage	SEZ 32	4.75	l
Heat transfer fluid	Kryo 65	50	l

Operating material	Type KHS 2190 W	Filling quantity	Unit
Refrigerant 1st stage	R-449A	5.5	kg
Refrigerant 2nd stage	R-508A	2.4	kg
Refrigerator oil 1st stage	SEZ 32	1.3	l
Refrigerator oil 2nd stage*	SEZ 32	1.3	l
Heat transfer fluid	Kryo 90	50	l

*only for KHS 2190 W

Safety instructions

DANGER!
Danger due to improper use

Only use heat transfer fluids that have been approved in writing by LAUDA and/or are shown on the type plate of the system. Use of other heat transfer fluids can result in evaporation, cavitation, explosion, fire, cracking or other dangerous operating conditions! The respective suitability of any heat transfer fluid must be verified in each case by LAUDA.

Cooling water

There are specific requirements for the cooling water concerning its purity. In accordance with the cooling water requirements, a suitable process for treatment and/or maintenance of the water must be used. The heat exchanger and the complete cooling water circuit can be clogged, damaged and leak due to unsuitable cooling water. Extensive consequential damage to the complete refrigerant circuit can occur. The cooling water quality is dependent on the local conditions. If unsuitable water qualities result in faults or damage, these shall not be covered by our guarantee obligation.

Water quality

Specification	Value	Unit
Inlet temperature	variable	°C
Pressure difference (inlet)	2.5	bar
pH value	7.5 –8.5	
Conductivity	< 150	mS/m
Total hardness	< 15	°dH
Carbonate hardness	< 4	°dH
Chloride (Cl-)	< 100	mg/l
Sulphate (SO42-)	< 150	mg/l
Ammonium (NH4+)	< 1	mg/l
Iron (Fe)	0.2	mg/l
Manganese (Mn)	0.1	mg/l

If the temperature of the water drops below +5°C, anti-freeze must be added. If the water quality is different from that described above, faults or damage to the system cannot be ruled out. In this case, contact the manufacturer directly. See page 10 for the contact address.

In the case of low water temperatures and high relative humidity, condensation can form on water-carrying lines and components. This is not caused leaks. The system can continue to be operated without problems. Always agree any insulation measures with the manufacturer. See page 10 for the contact address.

3.3.1 Approved heat transfer fluids

LAUDA designation	Working temperature range*	Chemical designation	Viscosity (kin)	Viscosity (kin) at temperature	Flash-point	Container size cat. no.	
	from °C to °C		mm²/s at 20°C	mm²/s	°C	10 l	20 l
Kryo 65	-65 to 140	Mixture of aliphatic carbons	1.8	14.8 at -50°C	71	LZB 218	LZB 318
Kryo 70	-70 to 220	Silicone oil	5	43 at -60 °C	> 162	LZB 227	LZB 327
Kryo 90	-90 to 140	Silicone oil	1.76	15 at -70 °C	≥ 56	LZB 228	LZB 328

*The specifications for the working temperature range only apply for applications without a pressure blanket. If there is a pressure blanket, the heat transfer fluids' operating ranges are higher (see table of blanket pressure values ↬ 'Minimum necessary blanket pressure' on page 36)

Safety data sheets for heat transfer fluids can be provided on request.

Use of organic heat transfer fluids

The relevant industry provides numerous variations of organic heat transfer media. LAUDA must check whether a medium is suitable for the specified application case, particularly with respect to the maximum permitted temperature, viscosity when cold and steam pressure.

LAUDA will recommend suitable heat transfer fluid on request.

All potential organic heat transfer fluid should not come into contact with oxygen when hot, otherwise the service life will be significantly reduced; at low temperatures, there is the risk of condensation forming. Therefore, all LAUDA systems have a cold oil blanket in the separate expansion tank whose temperature in continuous operation is between room temperature and max. 140 °C (if other temperatures occur over a long period, a fault condition for the overall system or the heat transfer fluid is certainly present).

When replacing the heat transfer fluid, as much as possible of the existing filling must be removed. The fluid should be drained when it is lukewarm. Residual quantities of max. 5% are usually not critical. However, if particular contamination is present, e.g. from solvents or other low-boiling liquids or corrosive liquids, the system must be flushed. Either the heat transfer fluid intended for the new filling or a special flushing agent (e.g. petroleum-based whose specification must be requested from the respective heat transfer medium manufacturer) can be used for this.

Water (in combination with thermal oil) must never be used for the flushing; attention must also be paid to any possible aggressiveness towards black steel, cast iron and the usual sealing materials (graphite, Viton).

After flushing, blow out the system if necessary with dry air or nitrogen, particularly if low-boiling flushing media are used. The service life of the heat transfer fluid depends on numerous factors, such as outflow temperature, heater design, operational mode of the complete system etc.

A total heat transfer fluid service life of several years can be expected in most cases thanks to the flow design of the LAUDA heaters. However, all organic heat transfer fluids tend to decompose at high temperatures and due to ingress of oxygen. In order to prevent further damage from the start, we recommend taking a sample at least every 6 months and arrange its examination by the application laboratory of the manufacturer. In the (few) cases where a particularly high load can be expected from the start such as in the case of heat consumers that do not enable complete exclusion of air or in the case of continuous temperatures close to the permitted outflow temperature of the heat transfer fluid, the sampling interval should be shortened; at least until operating experience is gained.

We also recommended blanketing the places at risk (e.g. expansion tank) with nitrogen.

An analysis of the used heat transfer medium must include at least the following factors:

- ***Viscosity***
  (increases in the event of damage due to oxidation)
- ***Flashpoint***
  (for detecting highly volatile crack products)
- ***Acid number***
  (for detecting system and operating errors)

Such control analyses are usually carried out as part of the customer service of the respective heat transfer fluid manufacturer.

3.4 Type plate

When making enquiries about service and maintenance or when ordering spare parts, please specify the serial number (rating plate). This prevents further enquiries and incorrect deliveries.

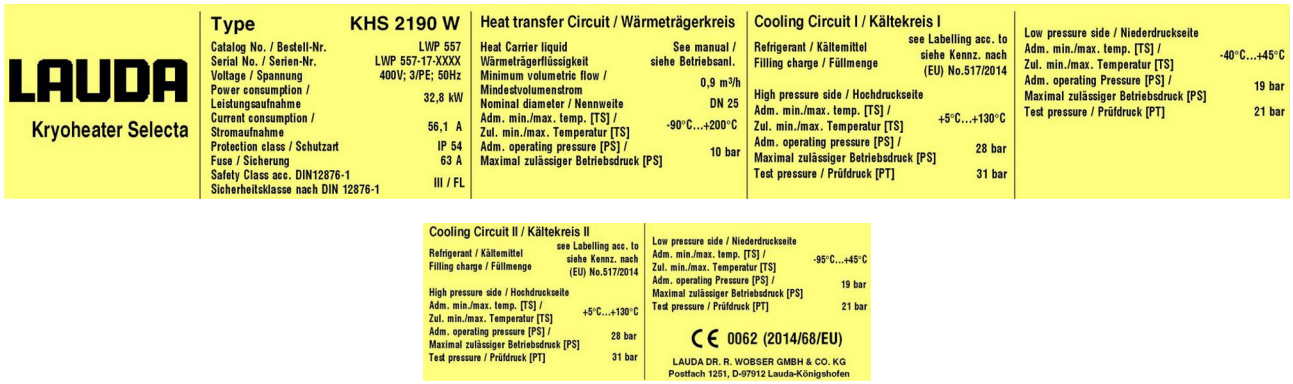


Fig. 12: Rating plate (example)

The type plate is located at the front on the frame.

The serial number consists of the following elements:

e.g. **LWP 556-15-0001**

Designation	Meaning
LWP 556	Order number
15	Year of manufacture 2015
0001	Consecutive number

4 Transport and storage

Installation and initial commissioning must only be carried out by employees of the manufacturer or persons authorised by the manufacturer.

Nevertheless, it may happen in the course of installation and further use that the owner's operating or maintenance personnel are entrusted with handling packages. In this case, strictly comply with the instructions shown below.

4.1 Safety instructions for transport

Improper transport

NOTICE!
Material damage due to improper transport!

Transport items can fall or tip over if transported improperly. This can cause considerable material damage.

- Proceed carefully and observe the symbols and instructions on the packaging when unloading the packages on delivery and during in-house transport.
- Only use the intended attachment points.
- Do not remove packaging until just before installation.

4.2 Transport inspection

On receipt, immediately inspect the delivery for completeness and transport damage. Use the packing list in the appendix to check the completeness.

Proceed as follows in the event of externally discernible transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate a complaint.

Make a complaint for every defect as soon as it is recognised. Damage compensation claims can only be made within the applicable complaint deadlines.

4.3 Transport

Transport with a crane

The temperature adjustment system is suitable for transport by crane. To do so, four lifting eyes can be fitted to the top corners. Transport requirements:

- The crane must be designed for the weight of the packages.
- The package must be attached securely.

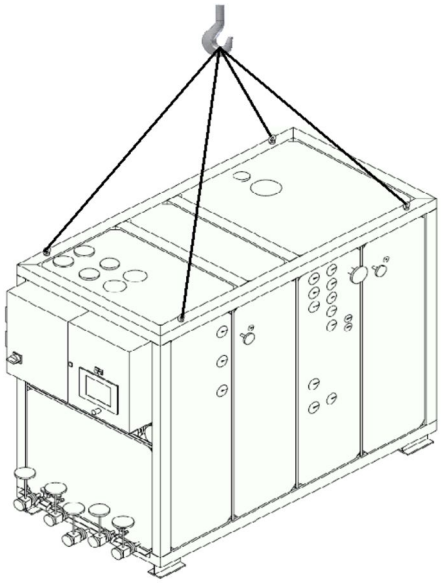


Fig. 13: Transport with a crane

Personnel:

- Crane operator

1. Inspection of the attachment points for unacceptable distortions and/or damage
2. Selection of suitable slings
3. Lift the system as gently as possible and start transport.
4. In the event of an eccentric centre of gravity, ensure that the system cannot tip over.
5. Note any cross winds when performing lifting work outdoors.

Transport with a forklift

Packages can be transported with a forklift under the following conditions:

- The forklift must be designed for the weight of the packages.
- The package must be securely fixed to the pallet.

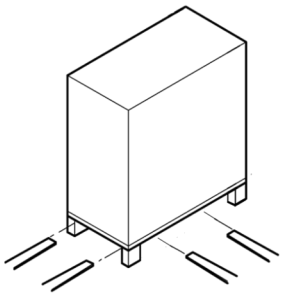


Fig. 14: Transport with a forklift

Personnel:

- Forklift driver

1. Only drive the forks of the forklift between the feet or skids of the system's frame from the front or side.
2. Drive the forks in to such an extent that they protrude from the opposite side. When loading from the narrow side, the forks must be inserted at least 3/4 of the total length.
3. Ensure that the forks have contact with both the metal bars of the frame.
4. In the event of an eccentric centre of gravity, ensure that the system cannot tip over.
5. Lift the system as gently as possible and start transport. Ensure that the system cannot tip over or slide during travel over uneven surfaces and when braking.

4.4 Storage

Storage of the packages

Store the packages under the following conditions:

- Do not store outdoors.
- The storage location must be frost-free.
- Store in dry and dust-free conditions.
- Do not expose to any aggressive media.
- Protect against direct sunlight.
- Avoid mechanical shocks.
- Storage temperature: +10 to +35°C.
- No direct ingress of moisture: Relative humidity: max. 60%.
- If stored for longer than 3 months, regularly check the general condition of all parts and the packaging. If necessary, renew or replace preserving agents.
- In the event of storage (decommissioning) after the system has already been commissioned, or if the system is to be dismantled, the complete cooling water circuit must also be drained.

5 Preparation

When the device is ordered, the installation document IQ/OQ (chapter 13) is also sent. This document can be used to check the necessary installation requirements.

5.1 Requirements for the installation location

The installation location must fulfil the following requirements:

- The installation location is level and designed for the weight of the system.
- The machine is easily accessible from all sides.
- The stability of the machine is guaranteed.
- A power supply is available.
- The machine is not exposed to any vibrations/oscillations.
- The machine is not exposed to a corrosive atmosphere.
- The machine is not exposed to any direct sunlight.
- The complete installation location is clean and cleared of objects.
- Sufficient lighting for the complete installation space is present.
- There are no machines in the surroundings that can interfere electrically or electronically.
- Fire prevention precautions have been taken.
- Ensure sufficient ventilation.

5.2 Assembly instructions

Connecting the outflow and return for heat transfer fluid

1. Remove the dummy flange
2. Connect the heat transfer fluid tube
3. Insert an unused graphite seal
4. Tighten the screws cross-wise with 52 Nm

Connecting the cooling water supply

1. Remove the dummy plug
2. Apply Teflon tape
3. Unscrew the tube coupling
4. Attach the cooling water tube

Connecting the cooling water

Note the following conditions when connecting the cooling water supply:

Designation	Value
Cooling water pressure (inlet – outlet)	max. 10 bar positive pressure
Pressure difference (inlet – outlet)	min. 2.5 bar
Cooling water temperature	10 to 25°C recommended, 5 to 30°C permitted (with performance restrictions)
Cooling water consumption at 20°C	Chapter 3.2 ‘Technical data’ on page 30
Cooling water tube for connecting to device	minimum 25 mm

Connecting the nitrogen line

1. Remove the dummy plug
2. Unscrew the connection
3. Plug on the polyurethane hose and secure it with a nut

*When the system is running, limit the nitrogen pressure to **6 bar**.*

Opening the blow-out line

1. Remove the dummy plug
2. Unscrew the connection
3. Plug on the blow-out tube and secure it with nuts

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Tubes Metal tubes with cold insulation with M38 x 1.5 union nuts

Cat. no.	Designation	Length [cm]	d_i [mm]	d_o [mm]	Temp. range [°C]
LZM 094	M38X 100S	100	25	78	-100 to 350
LZM 095	M38X 200S	200	25	78	-100 to 350
LZM 096	M38X 300S	300	25	78	-100 to 350

EPDM cooling water tube

Cat. no.	Designation	d_i [mm]	d_o [mm]	Temperature range [°C]	Pressure range [bar]
RKJ 033	EPDM tube, fabric reinforced	25	34	-40 to 100	max. 10 bar

Preparation for the installation

WARNING!
Danger of injury from hot or supercooled surfaces!

Surfaces of flanges and piping can heat up or cool down greatly during operation.

Skin contact with hot surfaces causes severe skin burns. Skin contact with supercooled surfaces causes severe skin frostbite.

- Always wear temperature-resistant protective work clothing and protective gloves when working in the vicinity of hot or supercooled surfaces.
- Insulate all flanges and piping to prevent injuries and thermal losses.
- Before carrying out any work, ensure that all surfaces have reached the ambient temperature.

The following conditions must be fulfilled:

- The nominal width of the connection lines corresponds to the nominal width of the specified connections of the system.
- Only valves locked in the open position are permitted to be installed in the primary medium returns (if present). The media must be able to flow out freely.
- The owner has installed a bleed valve at the highest point and a drain valve at the lowest point of the connected piping.
- Warning for glass equipment or consumers with similarly low permissible operating pressures: The owner has installed a bypass with a safety valve in case operating states with impermissibly high pressure values occur. The safety valve is directly connected to the part of the system to be protected. The safety valve cannot be shut off.
- Dirt traps or start-up sieves have been installed if the complete heat transfer system is not guaranteed to be free of dirt.
- Before the system is filled, all parts must be free of water and coarse impurities.
- The electrical connections have been made in accordance with the circuit and terminal diagrams.

Acceptance of the installation

After completion of the installation of the temperature adjustment system, the heat transfer system must undergo a further acceptance test. Make sure here that no heat transfer fluid has been filled yet and the heat insulation provided by the customer has not yet been installed. The acceptance test should ensure the compliance of the heat transfer system with the planning documents of the owner (flow diagram, installation plans and circuit diagrams) and thus the functionality and suitability of the heat transfer system.

The following points must be strictly observed for the acceptance test:

- Check the owner's on-site piping for the heat transfer system based on the flow diagram and the installation plans.
- Inspect the piping for fixed points, loose points and possible elongation.
- Check whether vents at the highest points and drains at the lowest points of the heat transfer system are present.
- Check the heat transfer system to ensure that no screw connections with sealants in the thread are installed in the hot heat transfer section (particularly at the heat consumers and when using thermal oil as a heat transfer fluid).
- Check that the electrical cables are protected against the effects of any escaping heat transfer fluid.
- Check that safety valve blow-off lines are safely routed to the open air.
- Check the installation points of fittings, dirt traps and control valves.
- Check all measurement ports are welded.
- Check the heat consumer with respect to maximum permitted operating temperature and maximum permitted operating pressure.
- Are all (TÜV) certifications for tanks, heat exchangers and other apparatus present in accordance with the Pressure Vessel Directive?
- Check that no heat transfer fluid can be trapped in the external heat transfer system. If heat transfer fluid can be trapped in pipe sections, safety valves must be provided by the customer.
- Is a sufficient quantity of heat transfer fluid available or has it been ordered?

Cleaning

After completion of the installation and acceptance test, the heat transfer system must be cleaned. The cleaning should ensure that no dirt particles remain in the heat transfer system.

The following points must be strictly observed for the cleaning:

The consumers provided by the customer (reactor, piping etc.) must be cleaned as far as possible of impurities such as welding beads, scaling and rust. If intended, chemical cleaning with pickling agents, which makes subsequent neutralisation and drying of the heat transfer system necessary, is only carried out for large heat transfer systems.

It is usual to blow through the heat transfer system with compressed air and to inspect all components. Dirt particles that accumulate in dirt traps and low-lying heat transfer system parts and impurities must be thoroughly removed.

Leak check

After completion of the installation, acceptance test and cleaning, the heat transfer system must undergo a further leak check. The leak check is intended to ensure that no leaks can occur during subsequent operation.

The following points must be strictly observed for the leak check:

The consumers and piping connected by the customer must be checked for leak tightness. Liquids or gases can be used as test media. However, if water is used, it must be noted that this cannot usually be completely removed from the heat transfer system again and thus long “boiling times” can be expected during commissioning. Therefore, water should never be used as a test medium if thermal oil is to be used later as a heat transfer fluid.

LAUDA therefore recommends using air as the test medium. The test pressure itself is set to approx. 0.5 bar for this. All flange and connection points as well as weld seams must be brushed or sprayed with a soap solution and attention must be paid as to whether leaks that manifest themselves in the form of soap bubbles are present.

Increasing the test pressure above approx. 1 bar does not make much sense as there is then the risk that air will flow through the applied soap solution without bubbles forming due to the pressure and thus high speed of the emitted test gas. A strength test can also not be performed with an increased pressure as the main stresses occurring in operation (resulting from the thermal stresses) cannot be represented.

WARNING!
Danger from excessive pressures

The permitted pressures of the consumers must be observed during leak checks.

After completion of the installation, acceptance test, cleaning and leak check, the heat transfer system can be filled with the intended heat transfer fluid (see next chapter).

6 Design and function

6.1 Overview

Overview drawing and dimensions ↳ Chapter 3.2 ‘Technical data’ on page 30

6.2 Brief description

The cold required for the process cooling system is produced using electric drive energy for a compression refrigeration process. In doing so, heat energy is transported from a low temperature to a higher temperature. The compressor capacity required for this depends on the heat flow over time and the temperature difference. The cooling of the refrigerant condenser is performed using a tube bundle heat exchanger (W version).

The Kryoheater Selecta series consists of the following modules:

- Circulation pump
- Expansion vessel
- Heat exchanger
- Temperature control system
- Heat transfer system
- Water-cooled refrigeration system
- Safety unit

Semi-hermetic compressors are used. In the case of very low temperatures, two cascade-connected (down to -90°C) refrigeration systems are used.

Only non-toxic, chlorine-free substances which comply with the Montreal Protocol for the protection of the ozone layer are used as refrigerants at the factory. Refer to the corresponding safety data sheets in the Appendix for the exact specification and environmental impact.

6.3 Description of the modules used

Circulation pump

The circulation pump P100 provides continuous circulation of the heat transfer fluid through the temperature adjustment system. The internal heat transfer system forms a closed circuit with the external consumer system in which the heat transfer fluid circulates. An external pump maintains this circulation. The circulation flow rate and associated conveyance pressure occurring during operation are significantly dependent on the external pressure losses in the consumer.

Expansion vessel

The expansion tank BX100 acts as storage reservoir and equalises the volume change in the complete (internal and external) heat transfer system in the event of thermal expansion of the liquid. The expansion line of the expansion tank must never be shut off, otherwise pressures in the heat transfer system can rise to a level that can result in pipes and components bursting. LAUDA always recommends blanketing the expansion tank with nitrogen, even for operation below the boiling point of the heat transfer fluid. The nitrogen overlay prevents the ingress of moisture and oxygen. This ensures the constant functionality of the system and a long service life for the heat transfer fluid.

Heat exchanger

The installed W500 evaporator (heat exchanger) is implemented as a plate heat exchanger. The heat exchanger is used to cool the heat carrier to the required operating temperature. The heat exchanger consists of a brazed plate package with profiled stainless steel plates.

Temperature control system

The installed temperature controller is a PID controller. The temperature controller receives the setpoint for the outflow temperature of the heat transfer fluid from the internal LAUDA control system in the case of the "Cool" command. The cooling output is continuously adjusted by the control system by constant measurement of the temperature of the heat transfer fluid and comparison with the setpoint (control deviation) so that continuous regulation of the temperature is ensured. The output is continuously adjusted by the control system so that very precise regulation of the temperature is guaranteed. In addition, programs and ramps can be programmed.

Heat transfer system

The internal heat transfer system forms a closed circuit with the external consumer systems in which the heat transfer fluid circulates. All components are connected using piping; the connections are brazed, welded or made leak tight using suitable seals (technically). No losses of the heat transfer fluid can occur in normal operation. This ensures the constant functionality of the system and a long service life for the heat transfer fluid. Operating conditions that are different from normal operation and could result in damage or even danger are constantly monitored and result in safe shutdown of the system. Nevertheless, if another impermissible pressure increase in the heat transfer system occurs (e.g. due to external influences), the safety valve opens and limits the operating pressure of the system to the permitted value by discharging compressed air and/or heat transfer fluid.

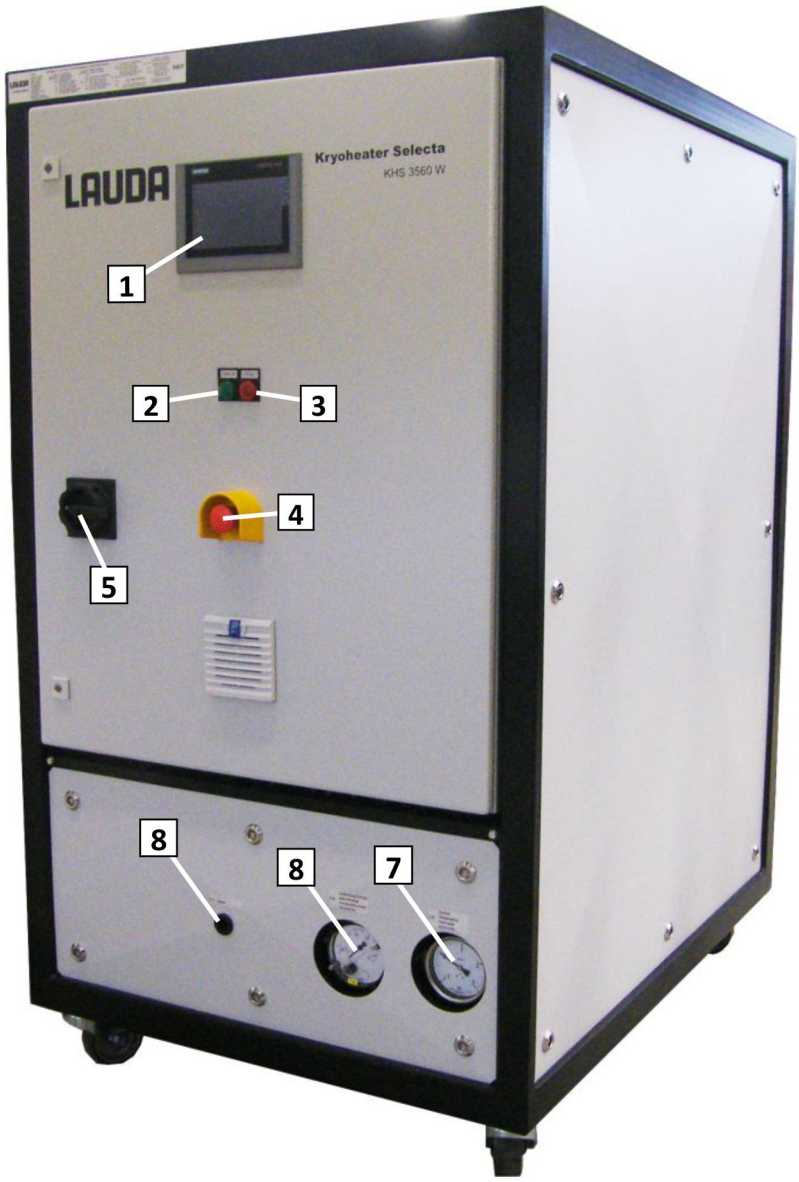
Safety units

The system is equipped with numerous safety devices intended to protect the system and its surroundings against inadmissible operating conditions. The safety components are shown in chapter 2.8.

The settings for the safety devices can be found in “Important information for the owner”. Operating conditions that are different from normal operation and could result in damage or even danger are constantly monitored and result in safe shutdown of the system.

6.4 Displays and controls

Overview of outside of switch cabinet



1 Visualisation (touch screen)	**5** Main switch
2 Operation signal lamp	**6** Reset button
3 Fault signal lamp	**7** Pressure gauge, blanket pressure G168
4 Emergency stop	**8** Flow monitor, pump F100

Touch screen (switch cabinet)

The system is operated by a 7” colour display with built-in touch function. For details of operation, see chapter 8 of this manual.

Fig. 15: Touch screen

Display panel

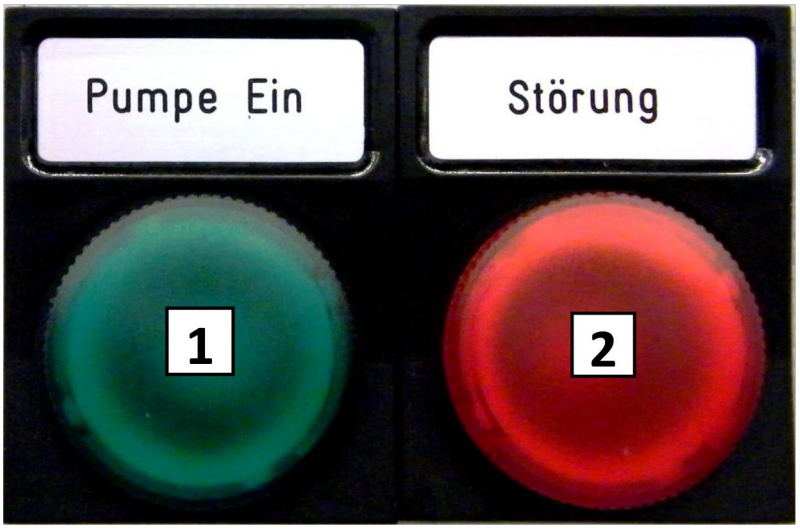


Fig. 16: Display panel

1 Pump On signal lamp	**2** Fault signal lamp

Pressure gauge and flow monitor

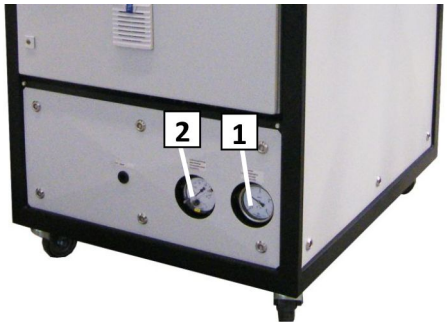


Fig. 17: Pressure gauge and flow monitor

1 Pressure gauge, blanket pressure G168

2 Flow monitor, pump F100

The components described below are related to the refrigeration system for the system. If any faults occur in relation with these components, please contact the LAUDA Service department without delay.

Reset

Fig. 18: Reset

1 Reset button F510

Reset button for high pressure cut-out

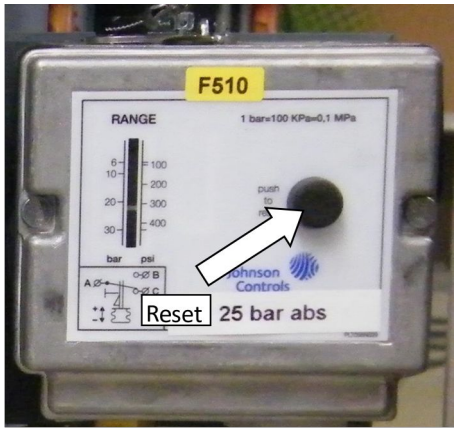


Fig. 19: Reset button for high pressure cut-out

1. Press black button on the high pressure limiter (hardware reset)
   ⇨ Pressure switch is reset
2. Acknowledge group fault on controller.
   ⇨ System can be restarted with the Start command
3. Restart system.

6.5 Connections

Electrical connections

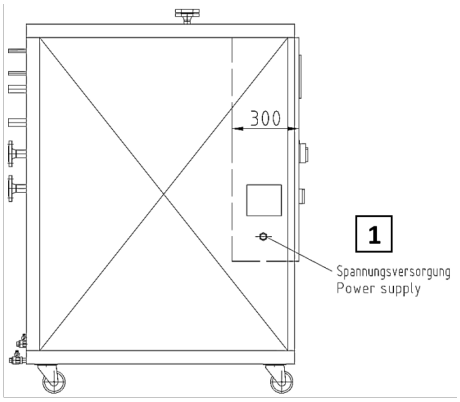


Fig. 20: Electrical connections

1 Mains power connection

The connection is located on the right side of the system.

The devices are delivered with a 2 m/16 mm² cable and a CEE 63 A plug.

Fig. 21: Connection plug

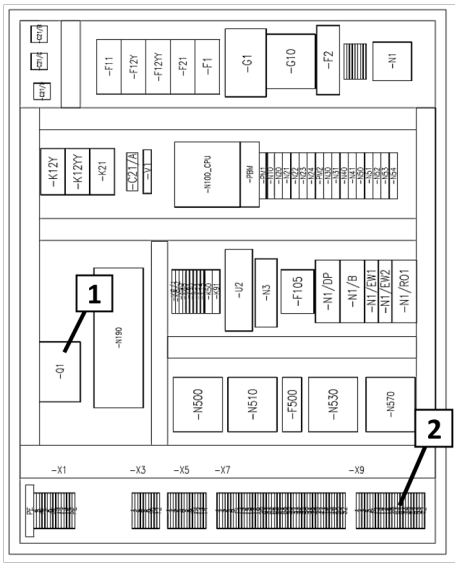


Fig. 22: Switch cabinet interior

1 Power supply Q1

2 Interface connection X9

Interface

There is a frame on the right side of the system, above the mains power connection; all the available interface connectors are mechanically installed in this frame. When placing an order, the customer must specify the interfaces to be connected in the IQ/OQ (see Chapter 7.1).

The Lemo socket for an external temperature sensor, the USB port and one interface (chosen freely by the customer) are included in the price of the device; all other interfaces can be ordered as options.

Note: It is not possible to operated EtherCAT, Profinet and Profibus in parallel. However, an analogue module can be used in parallel with a digital interface.

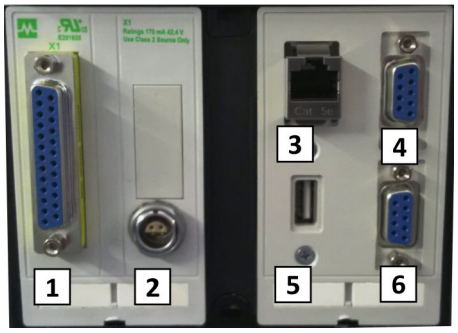


Fig. 23: Built-in interface connectors

1 Multi-pin plug for analogue module

2 Lemo socket for external Pt-100

3 RJ 45 connection for Profinet module

4 9-pin Sub-D connection for Profibus interface

5 USB port

6 9-pin Sub-D connection for RS-232/-485 interface

If other interface modules are needed, these can be ordered as options. The following modules are available:

- Analogue module (LAUDA cat. no. LWZ 937) with 4 inputs and 4 outputs on a multipolar DIN socket. The inputs and outputs can be adjusted independently as 4 to 20 mA or 0 to 10 V interface. See chapter 13.2 of the appendix for the signal list.
- 9-pin Sub-D connection for Profibus interface (LAUDA cat. no. LWZ 938).
- RJ 45 connection for Profinet module (LAUDA cat. no. LWZ 939).
- RJ 45 connection for EtherCat module (LAUDA cat. no. LWZ 940).
- RS-232/-485 interface module (LAUDA cat. no. LWZ 941) with 9-pin Sub-D socket.

See chapter 13.2 of the appendix for the signal list for data protocols.

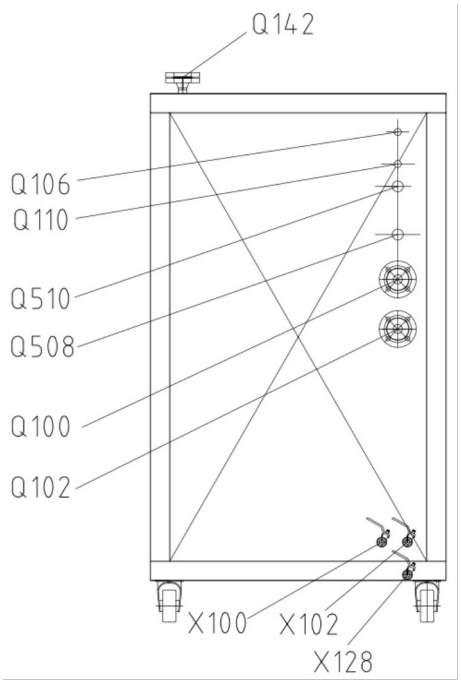


Fig. 24: Pipe connections and drain valves

Q100 Heat transfer fluid outflow

Q102 Heat transfer fluid return

Q106 Nitrogen inlet (max. pressure 6 bar)

Q110 Nitrogen outlet (ensure safe discharge)

Q508 Cooling water inlet

Q510 Cooling water outlet

X100 Heat transfer fluid drain

X102 Heat transfer fluid drain

X128 Drip tray drain

The connections are located on the rear side. The connections are also labelled according to their use.

7 Installation and initial commissioning

Installation and initial commissioning must only be carried out by employees of the manufacturer or persons authorised by the manufacturer.

WARNING!
Danger of fatal injury from incorrect installation and initial commissioning!

Errors during the installation or initial commissioning can result in lethal danger and cause significant property damage.

- The installation and initial commissioning must only be carried out by employees of the owner or by persons authorised by the owner.
- Also consult the manufacturer in the event of subsequent location changes.
- Refrain from unauthorised installation and location changes.

7.1 Installation process – IQ/OQ

LAUDA always aims to provide customers with the best possible support before, during and after installation of a thermostat. For process thermostats, in particular, in-depth communication with customers is important because a third-party application is always connected to the device. The application, peripherals and process thermostat must be coordinated with each other.

LAUDA offers commissioning as part of qualification. This includes installation qualification (IQ) that checks the necessary prerequisites on the customer's side. In the functional qualification (OQ), the device is commissioned by trained LAUDA employees or representatives.

The installation document can be found in chapter 13.1 of the appendix.

7.2 Starting and operating the tempering system

Initial commissioning

The first thermal commissioning of the temperature adjustment system and the heat transfer system begins when the process cooling system is switched on. If the maximum operating temperature has been reached, the system must be vented again if necessary and checked for leak tightness. Visually inspect flanges and screw connections for leak tightness and tighten with torque wrench.

DANGER!
Danger of fatal injury from the use of unsuitable heat transfer fluid

Only use heat transfer fluids that have been approved by LAUDA and/or are shown on the system type plate so that the heat transfer fluids never escape from the system. The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Observe temperature and boiling point of the heat transfer fluid.
- In the case of planned operation above the boiling point of the heat transfer medium, the heat transfer circuit must be operated closed (pressure blanketed).

DANGER!
Danger of fatal injury from the use of expansion tanks that are too small

All heat carriers expand during heating. The heat transfer fluid volume thus increases as the temperature rises. The expansion tank must be dimensioned for the total volume of the heat transfer fluid at the highest temperature so that the heat transfer fluid does not discharge from the system.

- Check before starting up whether the total content of the heat transfer circuit at the highest flow temperature can be accommodated by the expansion tank.

After successful ventilation of the heat transfer system, the setpoint for the outflow temperature can now slowly be increased until no more pressure fluctuations occur in the heat transfer system and it is thus ensured that gases and vapours are no longer present in the heat transfer system.

If the system has not been sufficiently ventilated, this can result in the system being shut down by the flow controller. If this is the case, the heat transfer circuit or peak points in the customer's equipment may have to be ventilated again.

DANGER!
Danger of fatal injury from residual water in the thermal oil

When thermal oil is used as a heat transfer fluid, evaporation can occur if residual water is present in the heat transfer circuit and thus cause discharge of the hot heat transfer fluid due to the different boiling points.

- Remove any water residues from the heat transfer circuit when thermal oil is used as heat transfer medium

In the case of heat transfer fluids that are to be circulated above the boiling point, the expansion tank must be pressure blanketed in order to prevent evaporation and discharge of the heat transfer fluid. As any water present in the heat transfer system starts to evaporate at approx. 100°C, it must also be checked whether there is still residual water in the system when thermal oil is used. Any residual water present must be removed. Due to the pressure blanketing of the circulation pump, the evaporation temperature can change under certain circumstances.

If vapour bubbles form in the system during operation, this can result in the flow controller shutting down the system. If this is the case, the necessary blanket pressure must be reset or the residual water must be removed from the heat transfer system.

A gas separator must be installed in the temperature adjustment system so that any gases and vapours in the heat transfer system can be removed relatively quickly. There is the danger during the rise of the gases into the expansion line and into the expansion vessel that the vapours will be condensed again by cooling down. Longer degassing times must be expected as a result.

Set the necessary blanket pressure (see for the min. setpoint) for the expansion tank in the visualisation and connect the nitrogen.

There must now be an intermediate check of the heat transfer system for leak tightness, pipe elongations, pump function, etc. Afterwards, the temperature adjustment system can slowly be raised to the operating temperature. Once the operating temperature is reached and the heat transfer system has been checked again for leak tightness and proper condition (tighten flange connections if necessary), the safety equipment must then be checked for functionality and correct settings. Following this, a measurement report about the temperature adjustment system and the heat transfer system must be produced.

The most important characteristics for operation under nominal load must be recorded in the measurement report:

- Outflow temperature
- Return temperature
- Pressures at pumps and apparatus
- Differential pressure of the flow controller (F100)
- Current consumption data

The conditions must be constant during the measurements!

7.3 Shutdown in emergency situations

In a danger situation, it is vital to stop components moving as quickly as possible and to switch off the power supply.

Shutdown in emergency situations

Proceed as follows in an emergency:

1. Immediately use the emergency stop device to trigger an emergency stop.
2. Rescue persons from the danger zone if there is no danger to your own health.
3. Initiate first aid measures if required.
4. Notify the fire brigade and/or rescue services.
5. Notify the responsible persons at the operating site.
6. Shut down the system and secure it against restarting.
7. Clear access routes for emergency service vehicles.
8. Marshal emergency service vehicles.

After the rescue actions

1. If warranted by the gravity of the emergency, notify the responsible authorities.
2. Delegate specialist personnel to rectify the fault.

WARNING!
Risk of fatal injury from unauthorised or uncontrolled restarting!

Unauthorised or uncontrolled restarting of the power supply can result in severe injuries or death.

- Ensure that all safety devices are installed and functional and that there are no dangers to persons before restarting.

3. Before the restart, check the system and ensure that all safety units are installed and fully functional.

7.4 Brief instructions

These brief instructions are intended to provide users with a quick guide to operating the device.

However, to ensure safe operation of the thermostats, it is necessary to read the entire manual carefully and to follow the safety instructions.

In particular, observe the conditions in chapter 5 “Preparation”.

Preparation and switching on

1. Assemble and complete the device

The device must never be tilted or positioned upside down.

Ensure tube connections are connected.

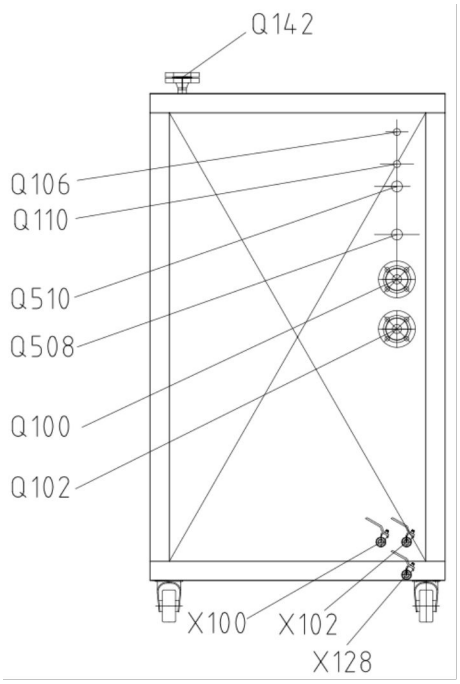


Fig. 25: Pipe connections and drain valves

Q100 Heat transfer fluid outflow

Q102 Heat transfer fluid return

Q106 Nitrogen inlet

Q110 Blow-out line

Q508 Cooling water inlet

Q510 Cooling water outlet

X100 Heat transfer fluid drain

X102 Heat transfer fluid drain

X128 Drip tray drain

The connections are located on the rear side. The connections are also labelled according to their use.

Please note:

- *Observe the maximum pressure for pressure-sensitive consumers*
- *Only operate KHS if a flow through the external consumer is possible*

2. Connect the hose and pipe connections

WARNING!

Danger of asphyxiation!

- Ensure nitrogen is discharged safely through a blow-off hose!

3. Compare specifications on the type plate with the mains voltage

Three-phase device: Ensure clockwise rotating field!

4. Insert mains plug

5. Open any shut-off valves in the external consumers

6. Ensure the supply of media

Nitrogen for the pressure blanket must be available and connected (max. pressure 6 bar).

Fig. 26: Switch on the system.

7. Put main switch Q1 on the switch cabinet (Fig. 26 [1]) in position I [ON]

⇨ Start screen is displayed (Fig. 27)

As the last operating state is always displayed on the touch screen when it is switched on again, a defined starting position must be set to fill the system.

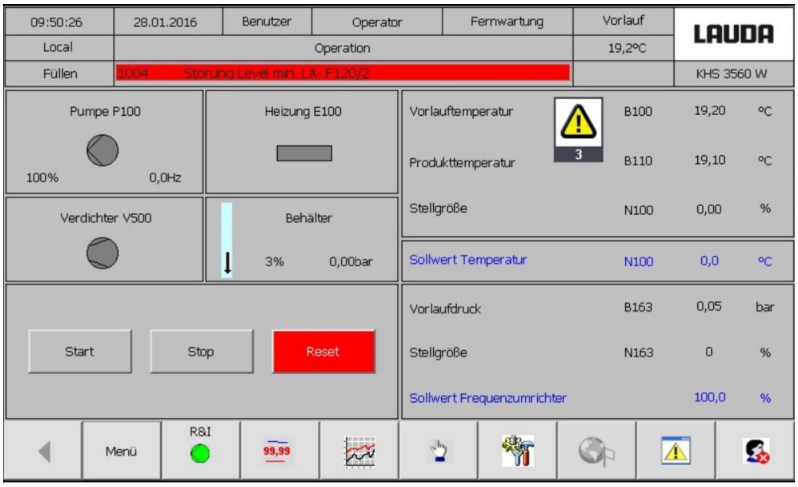


Fig. 27: Start screen

8. The password input is activated by tapping the touch screen.

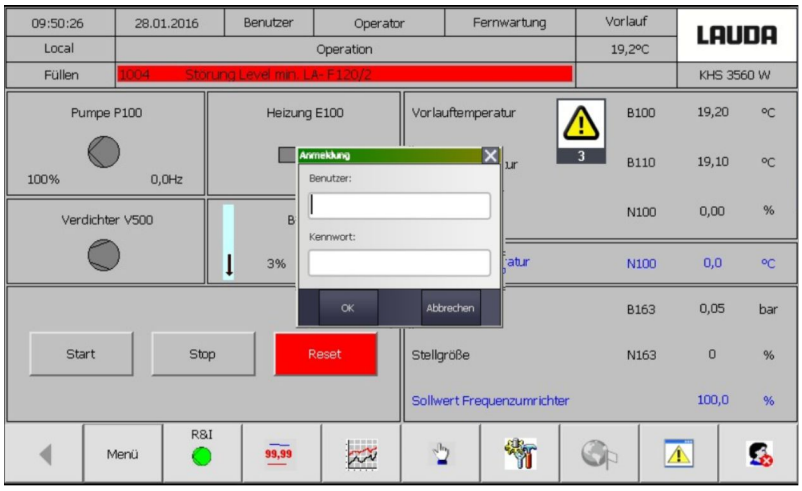


Fig. 28: Password input

9. Tap on the user input field

⇨ The keyboard appears

10. Enter user: **operator**

11. Enter password: **operator**

12. Tap OK to confirm

For details, see chapter ↳ Chapter 8.2 ‘Password management/user management’ on page 80

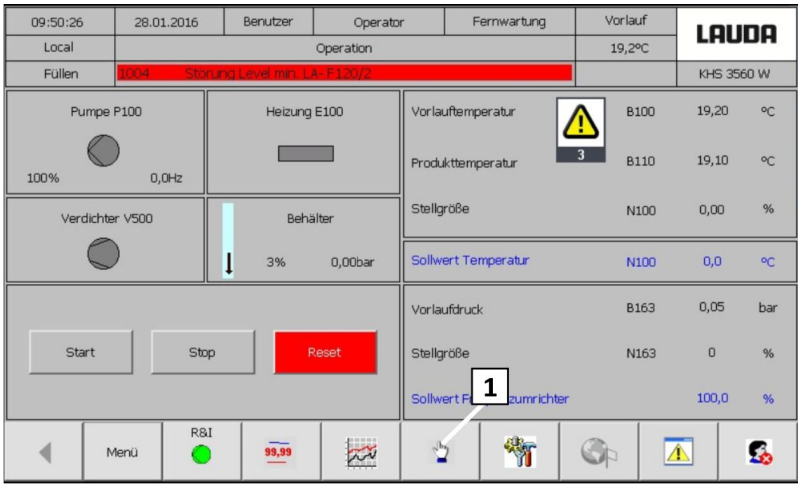


Fig. 29: Operation screen

13. Call up the basic setup screen (Fig. 29 [1])

⇨ Basic setup screen is displayed

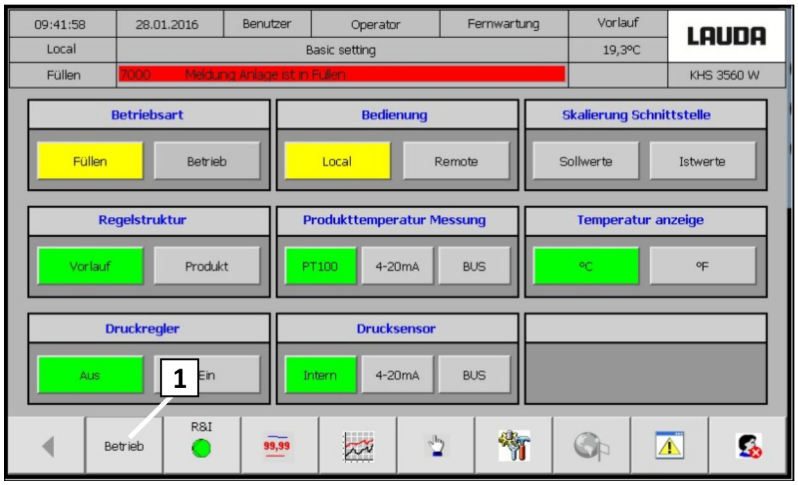


Fig. 30: Basic setup screen (defined initial settings)

14. Set the defined initial settings. See (Fig. 30)

15. Call up the operation screen (Fig. 30 [1])

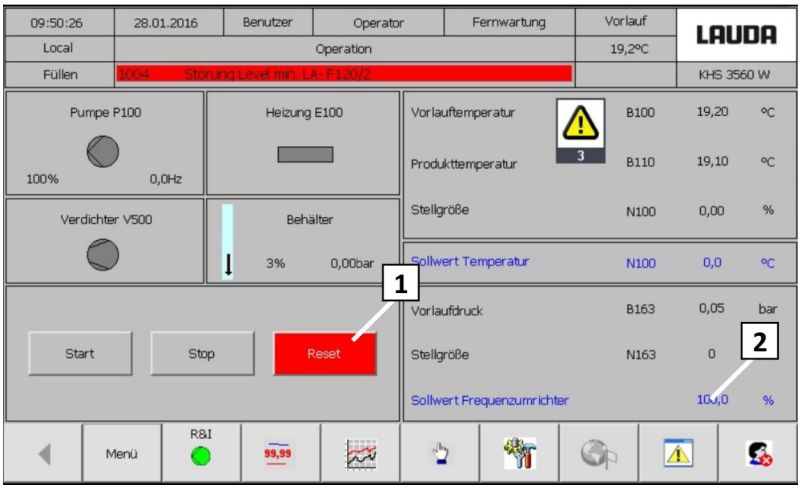


Fig. 31: Operation screen

16. Acknowledge accumulated faults with the [reset button]. (Fig. 29 [1])

17. Tap on setpoint/frequency converter (Fig. 31 [2])

⇨ The number pad appears

Fig. 32: Number pad setpoint

18. Adjust the setpoint to a range between 40% and 60% and confirm (Fig. 32 [1]). Notice! Glass equipment requires special precautionary measures. For glass equipment, we recommend activating pressure control (see also chapter ↳ Chapter 8.4.1.3 ‘Outflow pressure controller N163’ on page 87).

If the minimum flow (F100) does not exceed the switch-off point for a long period, it is possible that the setpoint for the frequency converter has been set too low.

Filling

NOTICE!
Filling the heat transfer system with thermal oil

The filling must only be performed when the heat transfer fluid and the system are at the ambient temperature. It must be ensured that only the specified heat transfer fluid is filled and refilled (see “Technical Data Sheet”).

Water and water/glycol are not permitted!

For filling, see also: ↳ Chapter 7.5 ‘Filling and venting’ on page 74*, and also (*www.youtube.com*)*

19. Open the flange (Q142) (Fig. 33 [1]) on the expansion tank.

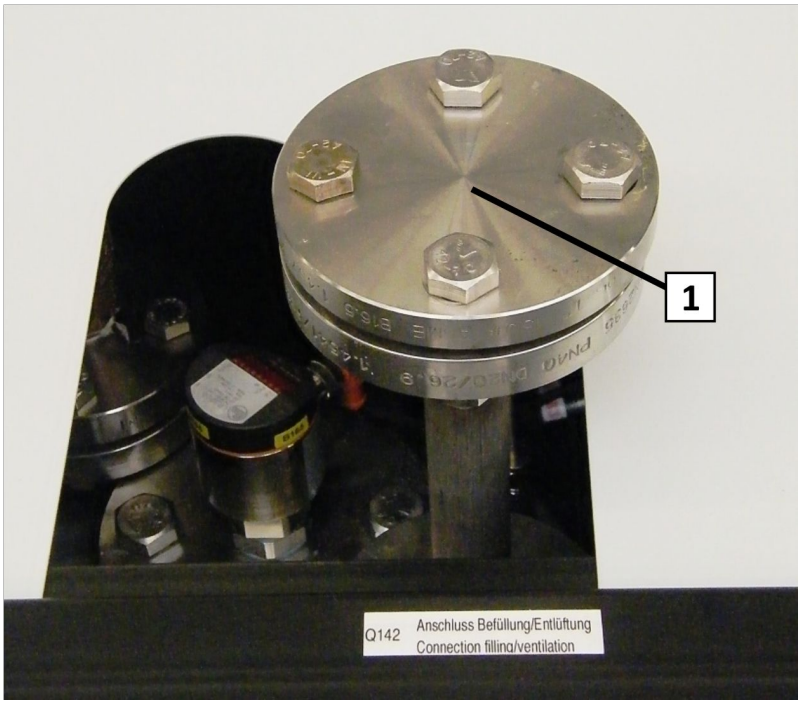


Fig. 33: Q142 connection

20. Fill the heat transfer system using a barrel pump via the drain valve (X100) of the temperature adjustment system until the minimum fill level in the expansion vessel is exceeded.

⇨ Check the fill level using level sensor B165.

Alternatively, the heat transfer system can also be filled via the expansion vessel of the temperature adjustment system.

If sufficient heat transfer fluid has been filled into the heat transfer system, the circulation pump (P100) should be used to help fill the system and to accelerate the venting and filling process. The filling pump, if present, should now be inactive. Before switching on the circulation pump (P100), check again that all drain and ventilation valves are closed. It must always be ensured that the circulation pump (P100) does not run dry; if this happens, it must be switched off immediately to prevent any damage.

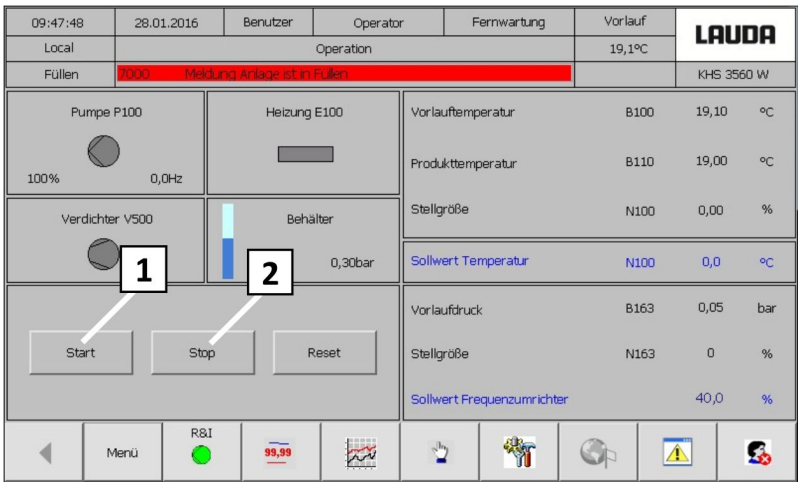


Fig. 34: Operation screen

21. Check the rotation direction of the circulation pump motor by pressing the start button (Fig. 34 [1]) and shortly afterwards the stop button (Fig. 34 [2]).

If the rotation direction does not match the specified one, the phase wires must be reversed. The rotation direction (arrow) is shown on the motor (M100) or the housing of the circulation pump (P100).

If the flow monitor (F100) trips after pressing the Start button again, this indicates air in the heat transfer system. Air bubbles present in the heat transfer system are separated into the expansion tank via the gas separator (Q104) – flange Q142 can be open during the filling process.

The filling and venting process can be accelerated by switching the circulation pump (P100) on and off several times using the start and stop buttons. The apparatus and components installed in the temperature adjustment system are vented by reversing the valves.

*The selector switch at the switch cabinet must not be put back into the “Operation” position (*Fig. 35*) until the minimum fill level in the expansion tank is reached, the heat transfer system is completely vented and the minimum flow rate (F100) is also constantly exceeded.*

22. Close the filling flange (Q142)

23. Close the drain valve (X100)

24. Call up the basic setup screen

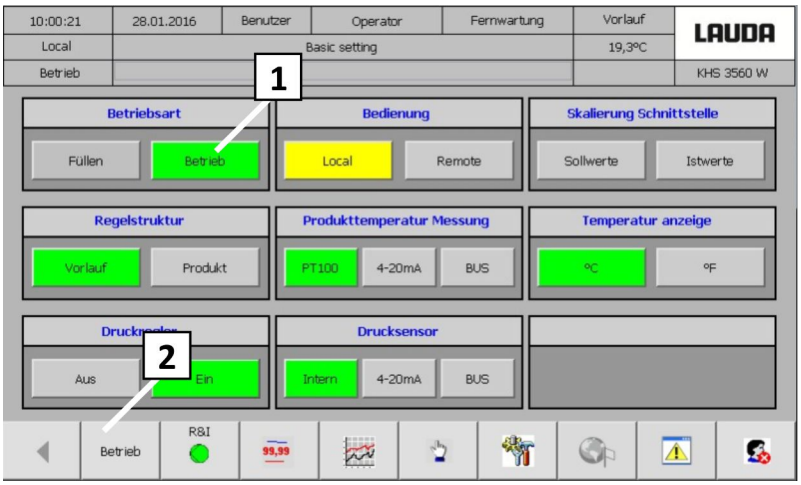


Fig. 35: Basic setup screen

25. Switch the selector switch on the touch screen from “Fill” to “Operation” (Fig. 35 [1])

26. If desired, make other settings

27. Call up the operation screen (Fig. 35 [2])

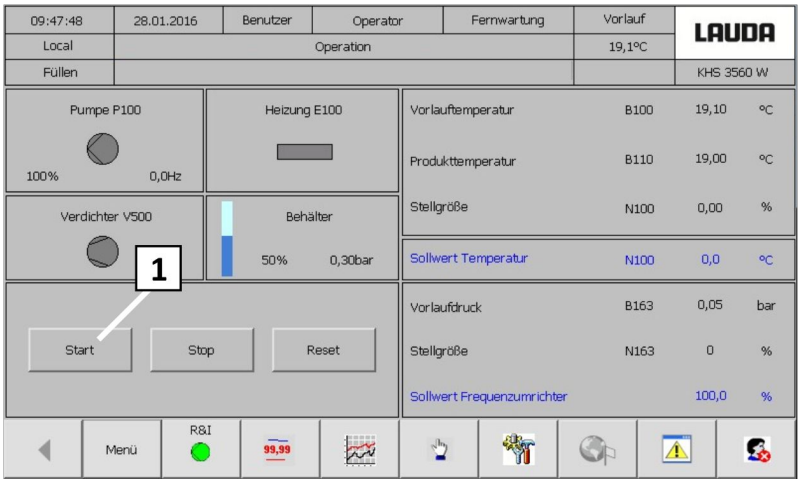


Fig. 36: Operation screen

28. Enter setpoints for temperature, frequency converter or, if pressure control is selected, enter the setpoint for the outflow pressure

29. Press the start button (Fig. 36 [1]): Pump P100 active, heating or cooling active (according to setpoint entered)

Operation

The “Operation” screen displays the status of all actions and all system values that are relevant to operation. If you select “Local”, you can make settings and enter the setpoint directly on the control panel. If you select “Remote”, the device can only be operated and the set-point only entered via the interface.

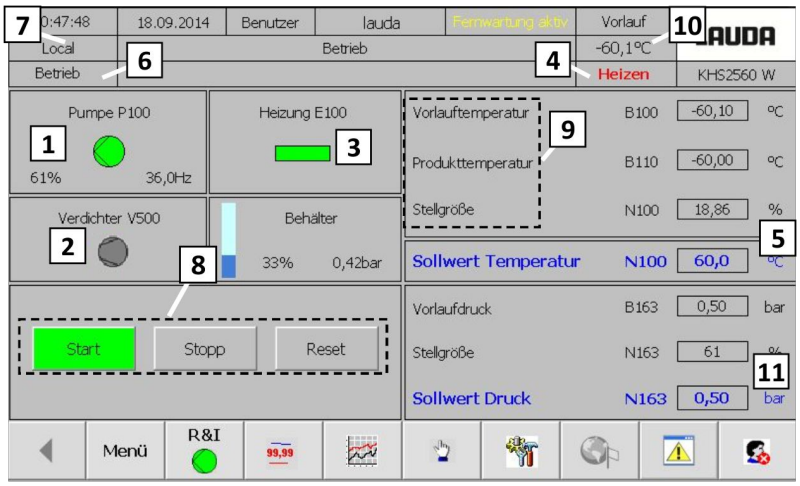


Fig. 37: Operation screen

1 Display status of pump P100, current setpoint in % , current speed frequency in Hz

2 Display operation of compressor V500

3 Display operation of heating E100

4 Display operating state of temperature control (e-heating, cooling)

5 Input/output of temperature controller setpoint

6 Status display for Filling/Operation

7 Status display for Local/Remote (operation via interface: status =Remote)

8 Selector button “START”, “STOP”, “RESET”

9 Display the measured values for outflow temperature, active set-point, return temperature

10 Display controlled temperature

11 Input/output outflow pressure controller setpoint or pump speed setpoint in % if pressure controller is not active.

Switching off

1. Press the [Stop] button on the visualisation (touch screen) (Fig. 38 [1]).

2. Log out user (Fig. 38 [2]).

3. Switch off main switch Q1.

4. Interrupt the media supply.

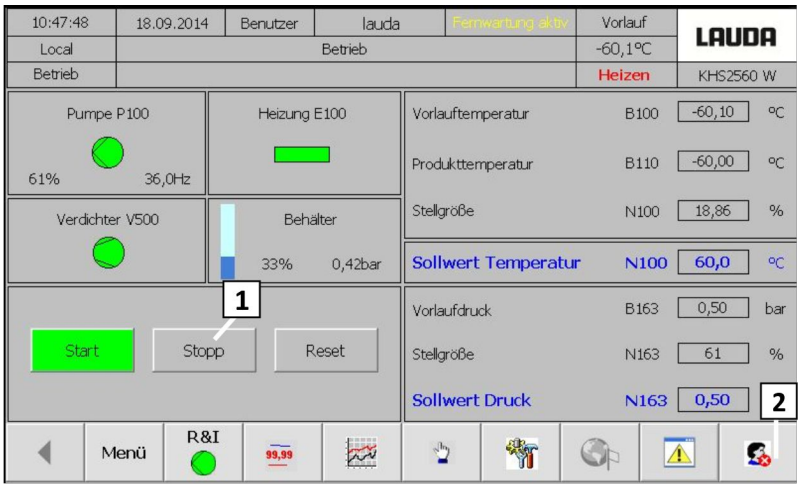


Fig. 38: Switching off

7.5 Filling and venting

"Filling" operating mode must only be used under supervision as the flow monitor of the pump and thus the dry running protection are not active.

Filling the heat transfer system

When filling the heat transfer system with the intended heat transfer fluid, always be aware that the temperature adjustment system is only permitted to be filled with the heat transfer fluid specified on the system type plate. The written permission of LAUDA must be obtained for the use of other heat transfer fluids. Particular instructions, such as the safety data sheets, of the heat transfer fluid's manufacturer must also be observed.

It is advisable to fill the heat transfer system from the lowest point so that the air can escape through the opened vent pipes.

The filling process must be continued until the minimum fill level (when using open expansion tanks as expansion vessel) or the minimum pressure (when using diaphragm expansion vessels as expansion tanks) is reached.

WARNING!

All system components and pressure equipment must be approved for the load caused by underpressure due to vacuum.

A sample of approx. 1 litre of the freshly filled heat transfer fluid must be taken and submitted for examination. The analysis data produced from these examinations represents the data of the fresh heat transfer fluid shown in the operating log.

After filling the heat transfer system, the pressurised system parts must undergo a pressure test with the heat transfer fluid if the heat transfer system and the associated piping and apparatus are subject to the Pressure Tank Directive. The test circuits must be specified by the owner.

Refer to the piping plan in the appendix for help with the filling process.

You can also view a video on YouTube (www.youtube.com) about filling and draining heat transfer liquids.

NOTICE!
Filling the heat transfer system

The filling must only be performed when the heat transfer fluid in the system is at the ambient temperature. It must be ensured that only the specified heat transfer fluid is refilled (see “Technical Data Sheet”).

Proceed as follows when filling:

Open the flange (Q142) on the expansion tank.

Fill the heat transfer system using a barrel pump via the drain valve (X100) of the temperature adjustment system until the minimum fill level in the expansion vessel is exceeded.

Check the fill level in the expansion tank via the fill level measurement. The fill level is shown on the display.

Ensure for the filling that other additional drain valves are closed, the main switch is switched on and that the flow controller (F100) is not active (the “Filling” mode must be active) (see Chapter 7.5 ‘Filling and venting’ on page 74).

Alternatively, the heat transfer system can also be filled via the expansion vessel of the temperature adjustment system. The corresponding flange (Q142) on the expansion tank must be opened for this.

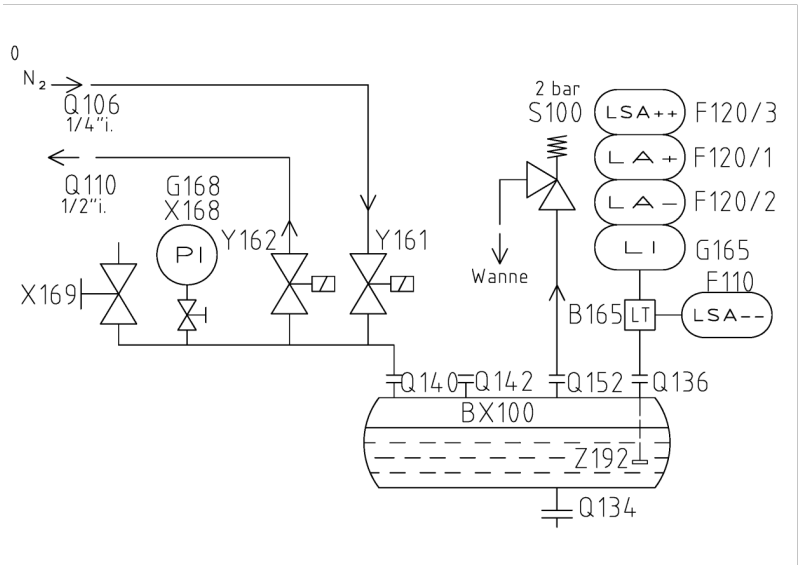


Fig. 39: Q142 connection

If sufficient heat transfer fluid has been filled into the heat transfer system, the circulation pump (P100) should be used to help filling the system and for accelerating the venting and filling process. The filling pump, if present, should now be inactive. Before switching on the circulation pump (P100), check again that all drain and ventilation valves are closed. It must always be ensured that the circulation pump (P100) does not run dry; if this happens, it must be switched off immediately to prevent damage.

Check the rotation direction of the circulation pump motor by pressing the start button and shortly afterwards the stop button. If the rotation direction does not match the specified one, the phase wires must be reversed. The rotation direction (arrow) is shown on the motor (M100) or the housing of the circulation pump (P100).

If the flow monitor (F100) trips after pressing the Start button again, this indicates air in the heat transfer system. Air bubbles present in the heat transfer system are separated into the expansion vessel (this must be open during the filling process) by the air separator (Q104). The filling and venting process can be accelerated by switching the circulation pump (P100) on and off several times using the start and stop buttons. The apparatus and components installed in the temperature adjustment system are vented by reversing the valves. The selector switch at the switch cabinet must not be put back into the “Operation” position until the minimum fill level in the expansion tank is reached and the minimum flow rate (F100) is also constantly exceeded.

Insufficient ventilation in the heat transfer fluid circuit is one of the most frequent fault causes. Pressure fluctuations are a certain indication of this.

⇨ Observe the flow controller and pressure gauge.

After filling, close the filling flange (Q142). After the filling and venting, the leak test with the heat transfer fluid and the functional check and inspection of the installed system components are performed.

The following points must be strictly observed for the leak test and functional check:

- Perform the leak test (↳ Chapter 9.3 ‘Maintenance work’ on page 114) with the heat transfer fluid for the pressurised parts in compliance with the permitted operating pressures of the connected piping and apparatus. The LAUDA temperature adjustment system has already undergone leak tightness and pressure testing in the factory. The specification of the test pressures for the connected piping and apparatus is the owner’s responsibility.
- The filling/venting connection socket (Q142) must be reconnected to the piping
- Set and check the measuring, control, monitoring and limiting equipment
- Check whether all valves (except drain and vent valves) in the heat transfer system are open.
- Inspect the lubrication of the circulation pump bearings
- Check that the circulation pump shaft rotates freely and check the coupling operation.
- Switch on the main switch (installed in the electrical control cabinet).
- Vent the heat transfer system and refill the heat transfer fluid (if necessary).
- Switch off the circulation pump after approx. ½ an hour and clean installed dirt traps if necessary.→ Repeat this work cycle of switching on the circulation pump, venting and cleaning dirt trap until the heat transfer system is completely vented and there are no more deposits in the dirt trap.
- Fine mesh screens must be installed by the owner for the start-up operation which will be replaced after the cleaning cycle by coarsely meshed screens if a lot of soiling is expected (e.g. when using used apparatus and piping, etc.).

Draining the heat transfer system

- Switch off the system before draining.
- When draining the system, the heat transfer fluid must be at the ambient temperature so that thermal expansion of the medium is prevented.
- The pump must be switched off so that no parts are rotating. Press the “Stop” button to switch off.
- The system can be drained completely or only partially. Certain valves must be closed manually for partial draining.

- The positions of the drain valves are shown in the dimension sheet and in the piping diagram.
- In order to guarantee complete draining of the heat transfer system, the draining tap (X100) must be connected.
- Open draining tap (X100).

Filling the heat transfer system

The minimum level in the expansion tank is indicated as alarm via the level controller (F110). Refilling the heat transfer fluid is required when the lowest fill level is reached.

The “Fill” operating mode should only be used for a heat transfer medium temperature <90°C. It must be ensured that only clean and the specified heat transfer fluid is refilled (see “Technical Data Sheet”). Thermal oil must be refilled in the correct concentration.

Care must be taken here that the heat transfer fluid circuit is not overfilled and there is still enough room in the expansion tank for volume expansion.

NOTICE!
Filling the heat transfer system

The filling and the refilling must only be performed when the heat transfer fluid in the system is at the ambient temperature. It must be ensured that only the specified heat transfer fluid is refilled (see “Technical Data Sheet”).

When refilling the heat transfer fluid, follow the steps as described in the “Filling heat transfer system” chapter.

Enclosed liquids must always have enough room for volume expansion.

7.6 Commissioning the operating materials systems

The commissioning of the operating materials systems before thermal start-up with the heat transfer fluid is an essential requirement for putting the temperature adjustment system into operation. Therefore, it is carefully synchronised in terms of content and chronologically with the work described above. As the operating materials such as steam and condensate, cooling water, compressed air and control air and nitrogen are non-flammable and are non-toxic, commissioning of the operating materials systems in parallel with the commissioning of the heat transfer system is usually quite feasible.

The operating materials systems include (among others):

- Nitrogen system
- Cooling water/cooling brine system

Proper commissioning of the operating materials systems is a prerequisite for faultless functioning of the tempering system and of the heat transfer system. The system owner is responsible for the commissioning of the operating materials systems and assurance of the operating data at the system limits specified by LAUDA.

The operating materials systems are usually flushed with the intended operating materials by the owner and then put into operation immediately afterwards. The instructions for this are generally applicable in most cases. The corresponding operating material feed lines must be blown out from the originating station up to the respective connection of the tempering system. If the corresponding system is to be flushed, a short-circuit line (bypass) between inlet and outlet flanges of the temperature control device may be required to prevent contamination of the LAUDA temperature adjustment system.

The following points must be strictly observed for the commissioning of the operating materials systems:

Nitrogen system

- The piping system must be gradually blown out into the open air starting from the inlet valve.
- Check of the nitrogen quality (primarily oxygen content).
- The system must be checked for leaks and the pressures at the system limit must be checked.

Cooling water/cooling brine systems

- The quality of water must be checked. The focus points are the salt content (hardness constituents, chloride ions). For all media, impurities (sand, earth, putrid constituents) and the temperature must be checked. Flush the feed lines for a long time via the drain system before taking the samples.
- If possible, completely shut off the chillers of the temperature adjustment system and first flush the collector/ring line from the inlet to the outlet.
- Gradually connect in the chillers of the temperature adjustment system in the following way:
  - Open inlet valve at the chiller of the temperature adjustment system
  - Check leak tightness and pressures.

8 Operation

The basics of operation are explained in a short video on YouTube (www.youtube.com), which will help you with training.

8.1 General description

After the visualisation software starts, the “Operation” screen opens. The various “subscreens” and the system’s configuration levels can be reached from this central screen.

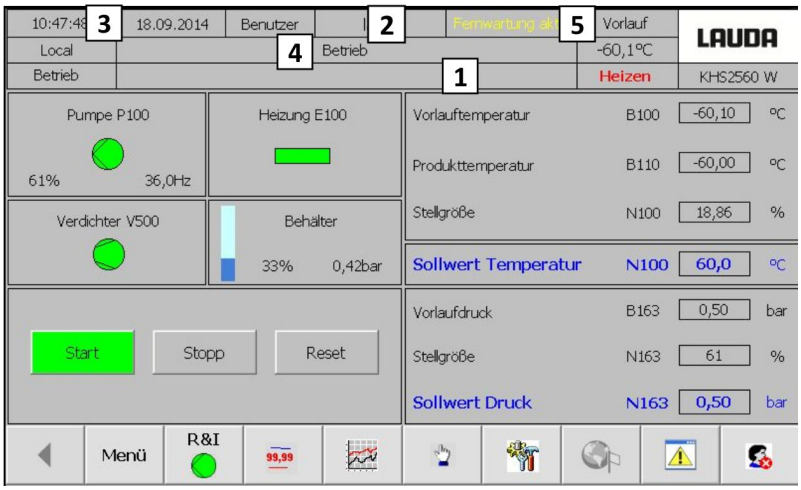


Fig. 40: Operation screen

1 Alarm text line: the last error to occur is displayed here

2 User name

3 Display date/time

4 Display screen name

5 Display remote maintenance status

Fields in which users can change the values (input fields) are shown with blue font against a grey background. For example: Temperature setpoint 60.0°C.

The values in fields shown in black font cannot be changed, e.g. product temperature -60°C. These are display fields.

8.2 Password management/user management

To operate the device or change setpoints, the user must first log in via the “touch function” after the visualisation software has started.

Fig. 41: Login window

User name: operator

Password: operator

After logging in with the user name and password, it is possible, depending on the user level granted by the Administrator (LAUDA), to perform switching operations and make adjustments using the visualisation.

NOTICE!

If desired, password management can be set up separately after consultation and sent to the responsible persons of the operating company.

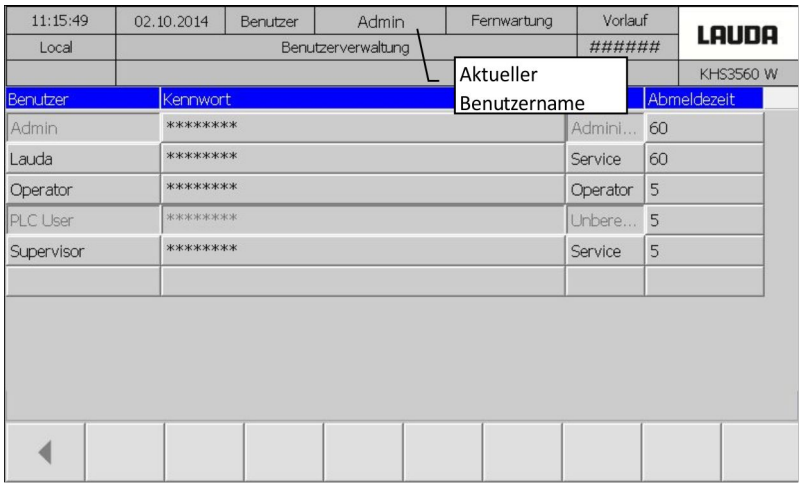


Fig. 42: Password management

There are various user groups with different rights.

no.	Display name	Rights	User level	Comment
1	Administrator group	User management	Service	
2	Service	User	Service	“User management” right for managing users in the user display during runtime
3	Operator	Operation	Operation	“Operation” rights
4	Technology	Monitoring	Technology	“Monitoring” rights

The following user names and groups are set up ex works with the following passwords:

no.	User name	User group	Password
1	Admin	Administrator group	**********
2	Lauda	Service	**********
3	Operator	Operator	operator
4	Supervisor	Technology	**********

Users can decide for themselves how many users are to be set up with which user rights. Password management is set up separately after consultation and sent to the responsible persons of the operating company.

8.3 Key functions

The “Operation” screen displays the status of all actions and all system values that are relevant to operation. If you select “Local”, you can make settings and enter the setpoint from here. If you select “Remote”, the device can only be operated and the setpoint only entered via the interface.

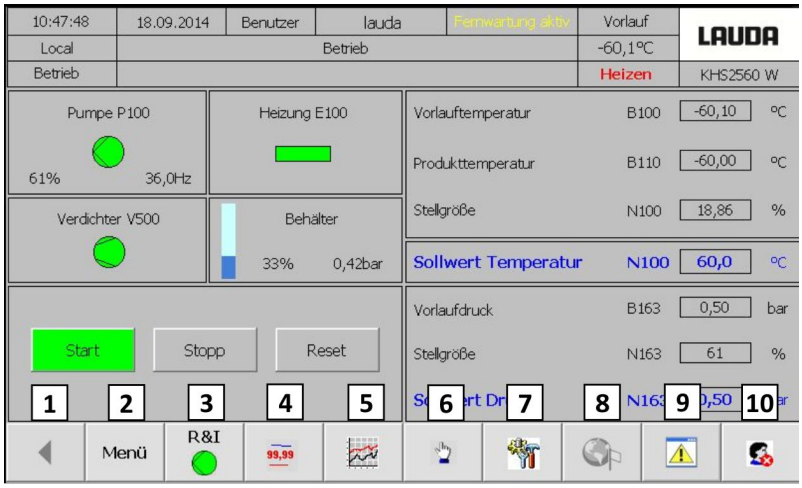


Fig. 43: Operation screen

1 “Back” to previous screen

2 Switch to “Menu” screen

3 Switch to “System P&I schema” screen

4 Switch to “System values” screen

5 Switch to “Trend” screen

6 Switch to “Basic setup” screen

7 Switch to “System” screen

8 “Change language”

9 Switch to “Alarm list” screen

10 Log out user

8.4 Operation

Operation

The “Operation” screen displays the status of all actions and all system values that are relevant to operation. If you select “Local”, you can make settings and enter the setpoint directly on the control panel. If you select “Remote”, the device can only be operated and the set-point only entered via the interface.

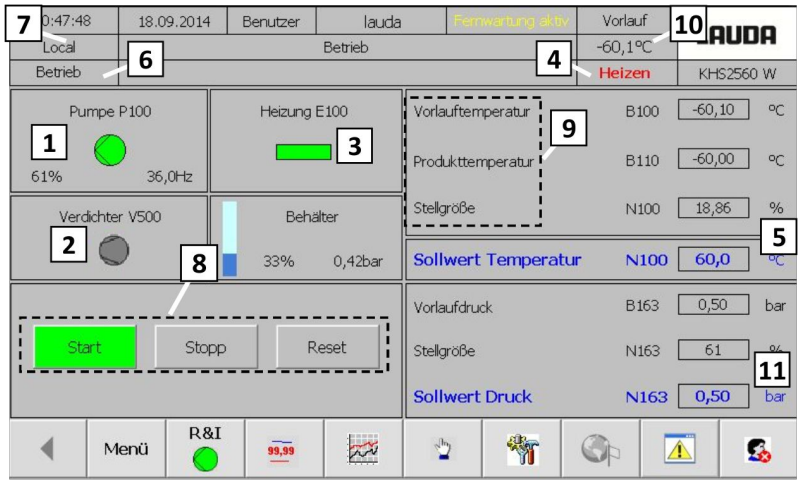


Fig. 44: Operation screen

1 Display status of pump P100, current setpoint in % , current speed frequency in Hz

2 Display operation of compressor V500

3 Display operation of heating E100

4 Display operating state of temperature control (e-heating, cooling)

5 Input/output of temperature controller setpoint

6 Status display for Filling/Operation

7 Status display for Local/Remote (operation via interface: status =Remote)

8 Selector button “START”, “STOP”, “RESET”

9 Display the measured values for outflow temperature, active set-point, return temperature

10 Display controlled temperature

11 Input/output outflow pressure controller setpoint or pump speed setpoint in % if pressure controller is not active.

8.4.1 Menu

Selecting the “Menu” button on the “Operation” screen opens the “Menu” screen. Here, you can call up the parameters for the various controllers, both for the heat transfer circuit and for the cooling module.

Heat transfer circuit menu

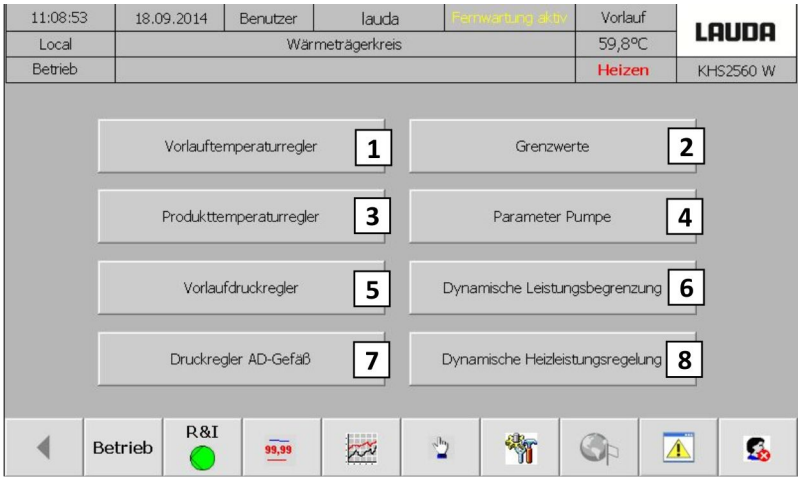


Fig. 45: Heat transfer circuit menu

1 Button for screen change “N100 outflow temperature controller” (on B100 temperature sensor)

2 Button for screen change “Temperature limits”

3 Button for screen change “N110 product temperature controller” (on B110 temperature sensor)

4 Button for screen change “Pump parameters” (operating hours and speed setpoint in %)

5 Button for screen change “N163 outflow pressure controller” (on B163 pressure sensor)

6 Button for screen change “Dynamic capacity limit” (temperature controller setpoint limiting heating/cooling)

7 Button for screen change “Expansion tank pressure controller” on B161 blanket pressure sensor

8 Button for switching the screen to “Dynamic heating regulation”. Pump speed limiter when outflow temperature B100>140°C

8.4.1.1 Temperature controller (outflow temperature)

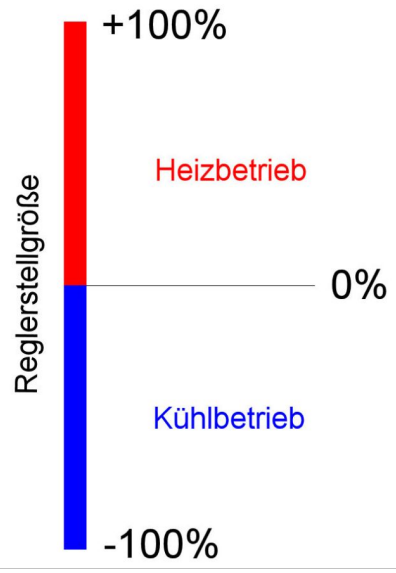


Fig. 46: Controller setpoint

The “Temperature controller” screen displays the current setpoints, the actual temperatures and the PID parts that are currently effective.

In addition, the PID parameters for the temperature controller are set on this screen. The controller structure (e.g. PI, PID) can be selected or deselected by pressing the corresponding buttons, e.g. D heating. The status can be seen by the colour, where grey means an option is deselected and green means it is selected. The parameters can be entered into the numeric fields. Tap the keypad to activate the touch-screen keyboard and enter values.

The internal controller calculates a setpoint from -100% to +100%. A negative setpoint refers to “cooling” while a positive setpoint refers to “heating”.

Outflow temperature controller N100

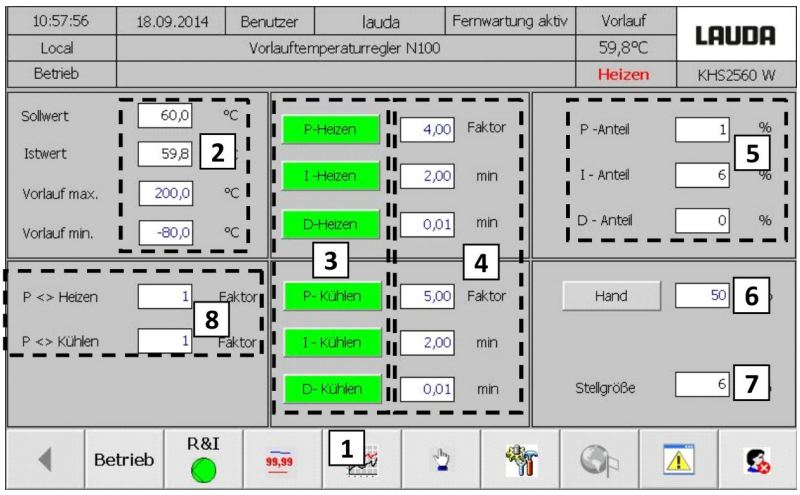


Fig. 47: Outflow temperature controller

1 Switch to the “Trend” screen

2 Display setpoint for outflow controller and actual value for outflow temperature

3 Buttons for setting the outflow controller structure, separate buttons for heating and cooling

4 Display/enter the PID parameters for heating and cooling

5 Display the outflow controller’s PID parts that are currently effective

6 Manual operation of the outflow controller, manual button activates manual mode, controller setpoint input

7 Display the current outflow controller setpoint

8 Parameters for PI temperature controller

8.4.1.2 Product temperature controller N110

Product temperature controller N110

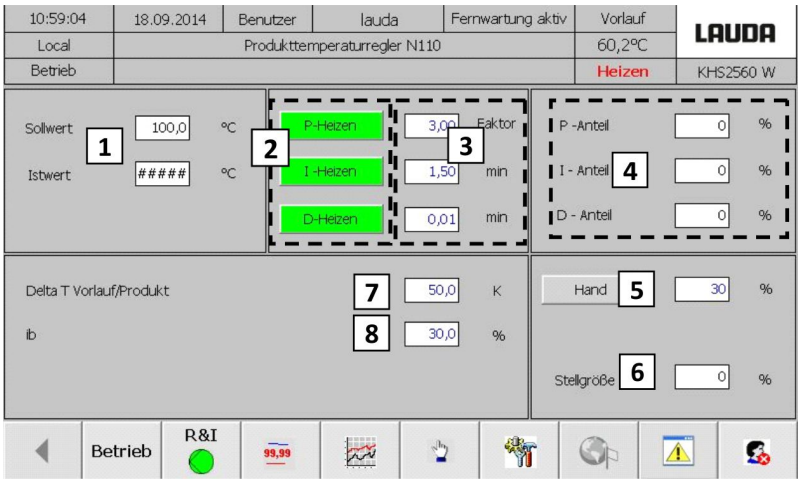


Fig. 48: Product temperature controller N110

1 Display setpoint for product temperature controller and actual value for product temperature

2 Display the current setpoint

3 Buttons for setting the product controller structure

4 Display/enter the PID parameters

5 Display the product controller's PID parts that are currently effective

6 Manual operation of the product controller, manual button activates manual mode, enter the controller setpoint

7 Enter Delta T-temperature limit for outflow/product

8 Integration restriction parameters for temperature controller (ib)

8.4.1.3 Outflow pressure controller N163

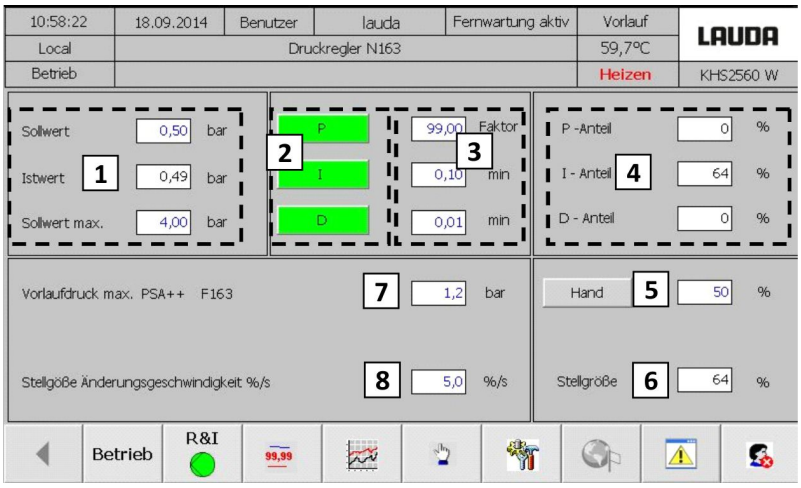


Fig. 49: Outflow pressure controller N163

1 Display setpoint for outflow pressure controller and actual value for outflow pressure

2 Buttons for setting the pressure controller structure

3 Display/enter the PID parameters

4 Display the pressure controller's PID parts that are currently effective

5 Manual operation of the pressure controller, manual button activates manual mode, controller setpoint input

6 Display the current setpoint

7 Enter limit for max. outflow pressure (max. pressure. reached = system off)

8 Enter setpoint for speed of change

8.4.1.4 Expansion tank pressure controller

Expansion tank pressure controller

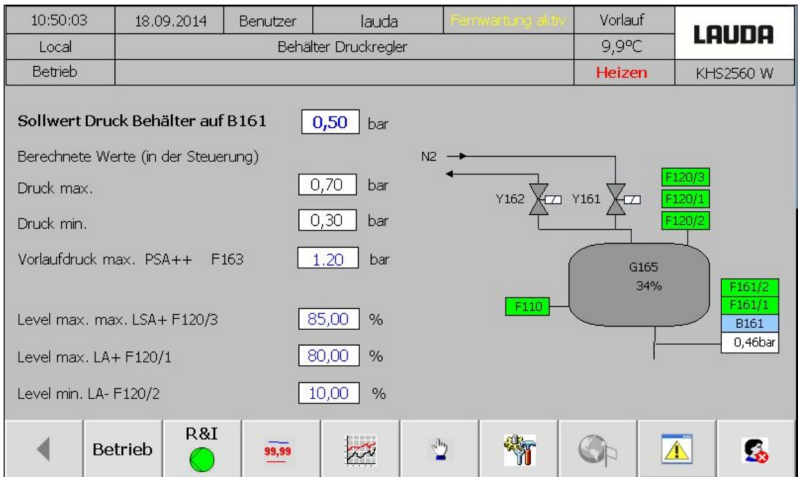


Fig. 50: Expansion tank pressure controller

Parameters for the basic setup of the pressure tank can be entered on the "Expansion tank pressure controller" screen. The max. and min. pressure are calculated automatically on the basis of the tank setpoint entered.

8.4.1.5 Temperature limit values

Parameters for basic setup of the system can be entered on the "System limits" screen.

Temperature limit values

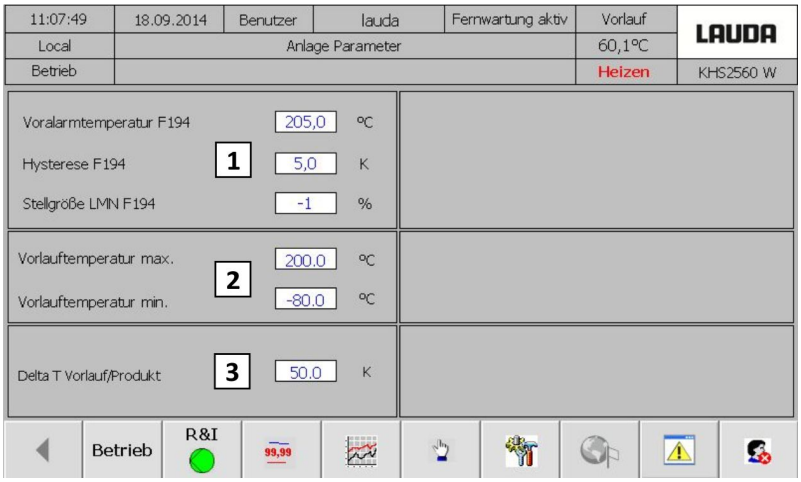


Fig. 51: Temperature limit values

1 Parameters for the temperature pre-alarm F194 (limit value and hysteresis). When the pre-alarm temperature is reached, the system switches to error mode and the controller is stopped. The system continues with the set setpoint. When the hysteresis temperature is reached (pre-alarm temperature - hysteresis), the controller starts again and the system continues with the controller setpoint (error message remains until reset).

2 Enter parameters for max. and min. outflow temperature.

3 Enter parameters for Delta T-limitation of outflow temperature and product temperature.

8.4.1.6 Pump parameters

Pump parameters

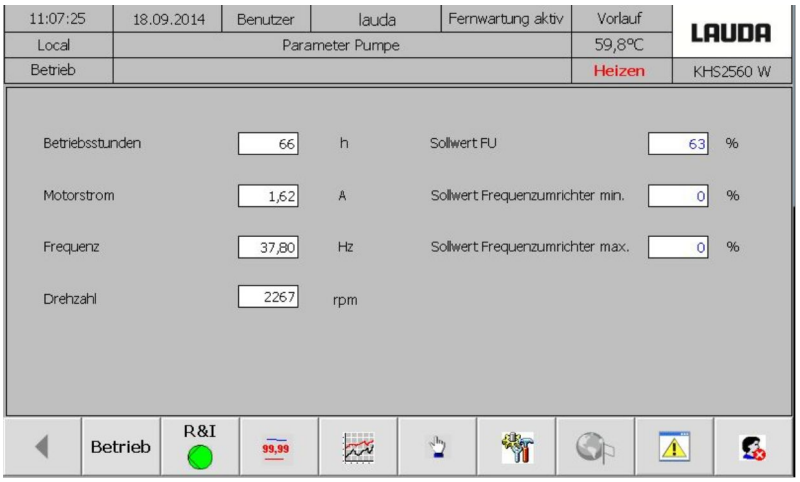


Fig. 52: Pump parameters

The current operating hours and frequency converter parameters for the pump are displayed on the “Pump parameters” screen. In addition, users can enter parameters for the maintenance interval.

8.4.1.7 Dynamic capacity limit

Dynamic capacity limit

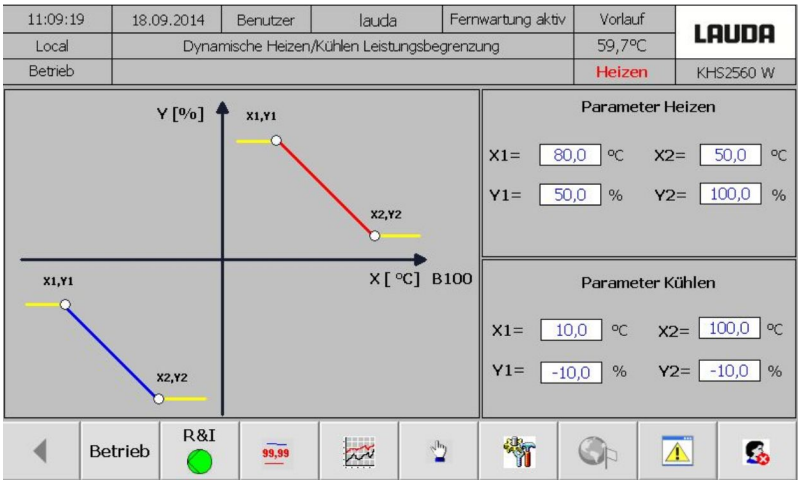


Fig. 53: Dynamic capacity limit

The values of the setpoint limits are entered on the “Dynamic capacity limit” screen.

“Setpoint limitation” means that the calculated setpoint for the controller in certain ranges is not given directly but only in a limited manner to the control valve (system protection).

Control limitation: Two points are produced in a coordinates system by entering the four values. Here, the X-axis/X-value corresponds to the return temperature and the Y-axis/Y-value corresponds to the slave controller setpoint. A limitation line is produced from horizontal lines to the reference point 1 or away from the reference point 2 and by connecting the two reference points.

For the “Cooling setpoint limitation”, all setpoints that are above this limitation line are now “allowed” and passed directly to the actuator (control valve, heater etc.).

Setpoints calculated by the controller underneath the limitation line are limited to the setpoint specified by the limitation line.

Example:

Outflow temperature: 110°C, controller setpoint: -10% => actuator setpoint: 10% cooling (not limited)

Outflow temperature: 110°C, controller setpoint: -60% => actuator setpoint: 25% cooling (limited)

Outflow temperature: 90°C, controller setpoint: -95% => actuator setpoint: 62.5% cooling (limited)

For the “Heating setpoint limitation”, all setpoints that are below this limitation line are now “allowed” and passed directly to the actuator (control valve, heater etc.).

Setpoints calculated by the controller above the limitation line are limited to the setpoint specified by the limitation line.

Example:

Outflow temperature: 10°C, controller setpoint: 19% => actuator setpoint: 19% heating (not limited)

Outflow temperature: 10°C, controller setpoint: 55% => actuator setpoint: 25% heating (limited)

Outflow temperature: 50°C, controller setpoint: 100% => actuator setpoint: 100% heating (not limited)

8.4.1.8 Dynamic heating regulation

Dynamic heating regulation

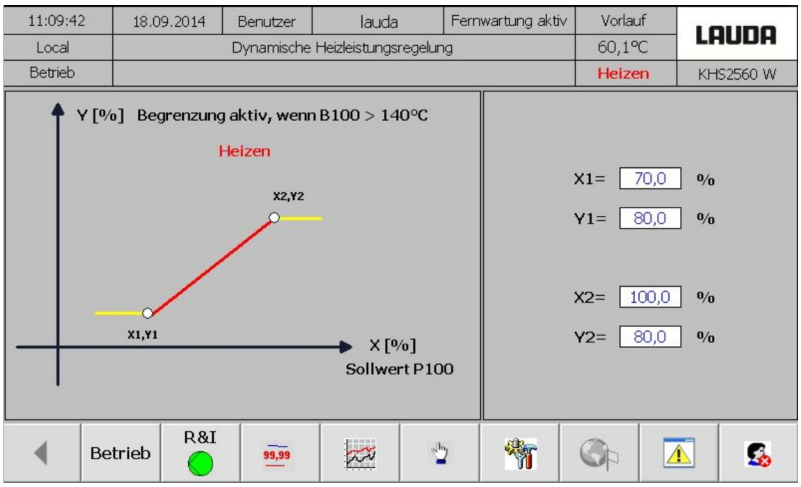


Fig. 54: Dynamic heating regulation

The values of the setpoint limits are entered on the “Dynamic heating power controller” screen. This is only active at outflow temperatures B100>140°C. “Setpoint limitation” means that the calculated setpoint for the controller is not applied directly to the pump speed in certain ranges but only up to a certain limit (reactor protection). Control limitation: The four values entered produce two points in a coordinate system where the x-axis (or x value) corresponds to the return temperature and the y-axis (or y value) corresponds to the slave controller setpoint. A limitation line is produced from horizontal lines to the reference point 1 or away from the reference point 2 and by connecting the two reference points.

8.4.2 System P&I schema

Choosing “P&I” on the bottom row of the screens opens the system screen.

The “Heat transfer fluid schema” screen displays the piping plan (in various views). The principal components (pumps, heating etc.) are dynamic and show the current status of the component.

Heat transfer circuit P&I schema

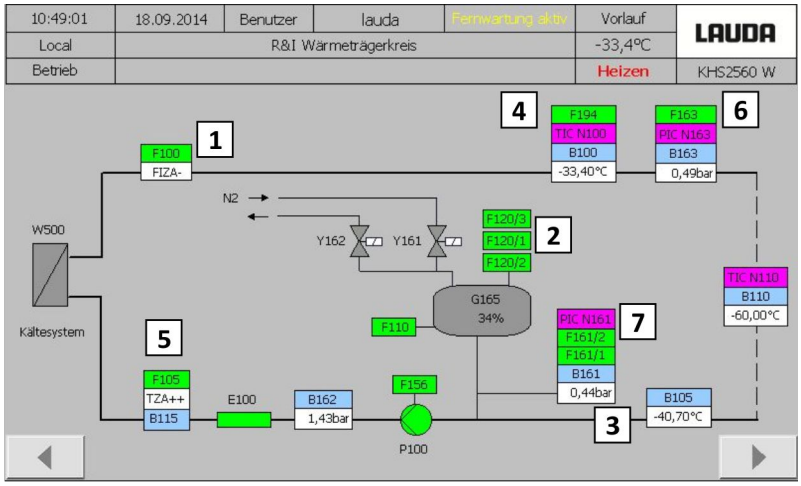


Fig. 55: Heat transfer circuit P&I schema

The terms TIC and PIC are abbreviations for the controllers:

TIC N100 – outflow temperature controller

TIC N110 – product temperature controller

TIC N110 – product temperature controller

PIC N161 – tank pressure controller

1 Display field for flow monitoring (red = error, green = status Ok)

2 Display field for max., min. level monitoring, (red = error, green = status Ok)

3 Display field for temperature °C

4 Display field for pre-alarm temperature monitoring F194

5 Display field for temperature limiter

6 Display field for max. outflow pressure F163

7 Display field for outlet tank pressure monitoring: F161/1 - min. pressure F161/2 - max. pressure

8.4.3 Values

The “System values” screen is reached by pressing the “Values” button. All relevant values for the system can be viewed here.

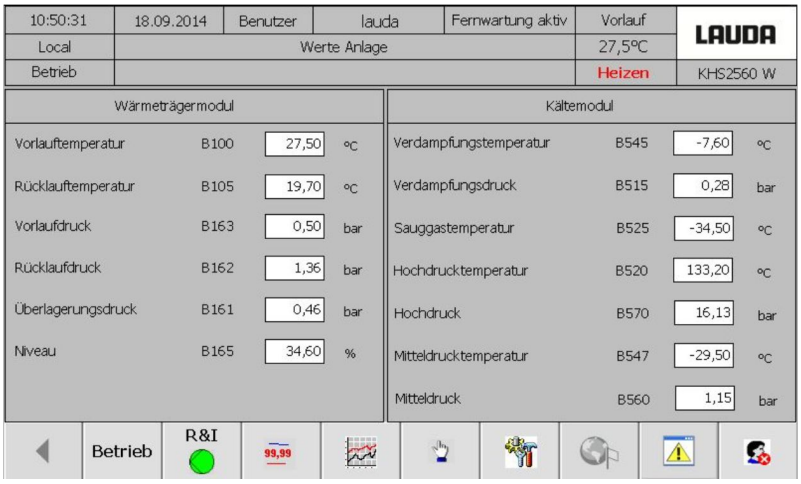


Fig. 56: Values

8.4.4 Trend

To open the “Trend” screen, choose the graph symbol on the top visualisation level. This screen shows the following important system values:

- B100 outflow temperature
- B110 product temperature
- Temperature setpoint

Trend

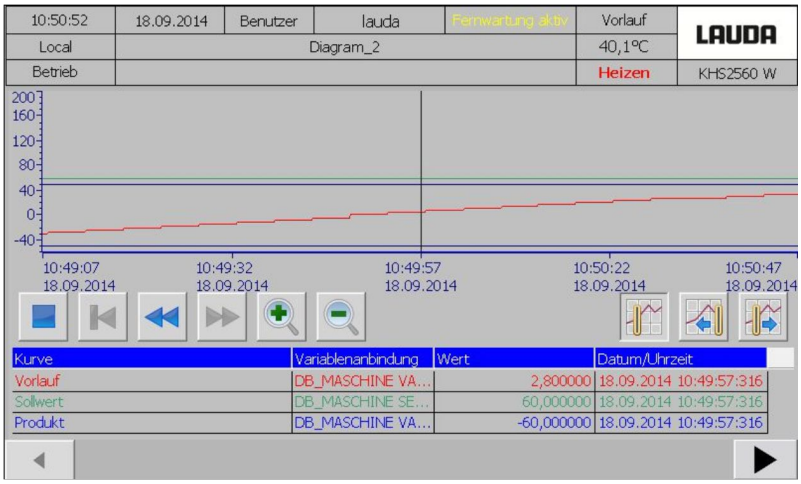


Fig. 57: Trend

8.4.5 Basic setup

Basic setup

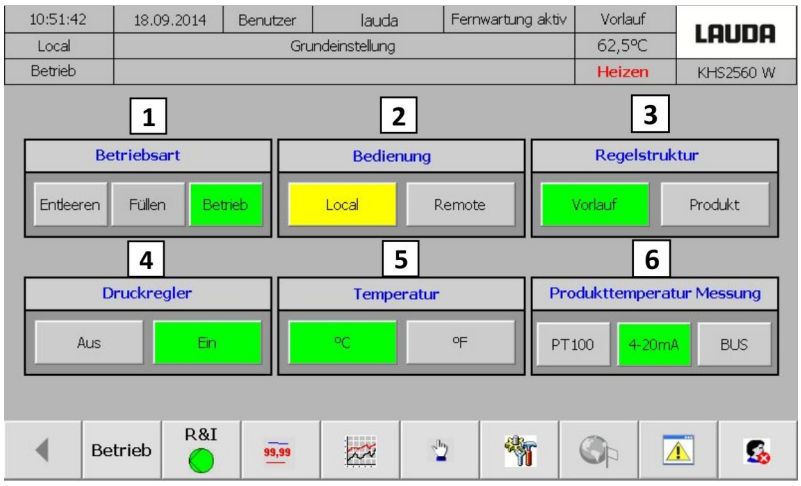


Fig. 58: Basic setup

1 Switch test operating mode (drain at T < 140°C)

2 Operation directly at the system or remote operation via interface

3 Temperature controller for outflow temperature or product temperature

4 Outflow pressure regulation on/off If pressure regulation is “off”, the pump operates with a fixed setpoint

5 Temperature display in °C or °F

6 Customer-specific temperature measurement via temperature sensor, an analogue input or via BUS interface

8.4.6 System

Touch the “tool symbol” to view different system screens. Users can select between the following system screens: SIMATIC PLC, project information, various tasks, user management, system information, system settings

There is an “On/Off” icon in the right-hand corner of the bottom row that can be used to switch off the visualisation program.

The individual system screens are shown below:

SIMATIC PLC status/control

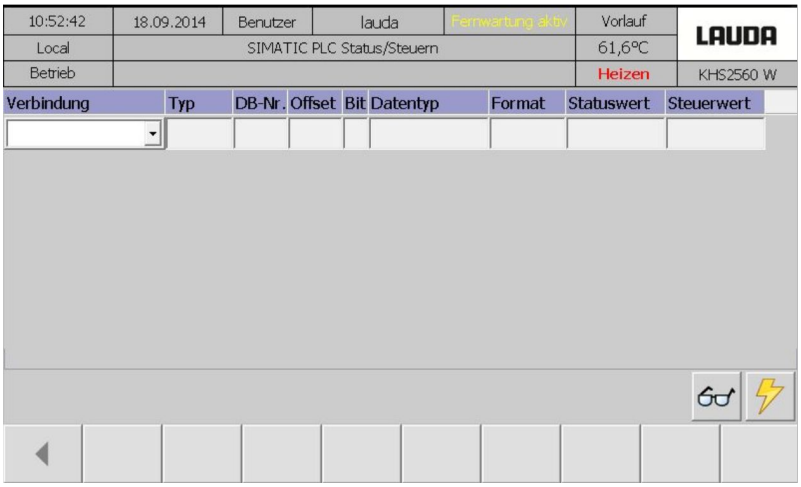


Fig. 59: Screen for LAUDA Service (1)

Project information

Fig. 60: Screen for LAUDA Service (2)

Various tasks

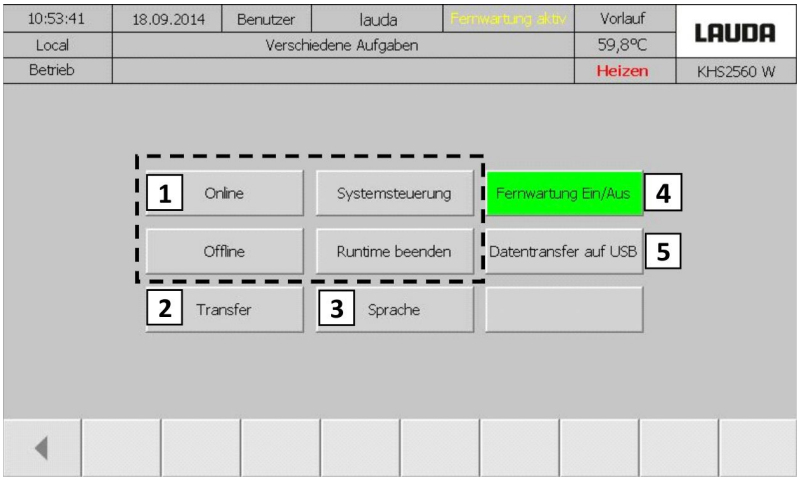


Fig. 61: Various tasks (1)

1 Button for control panel management

2 Button for programmers

3 Button to change language (German and English)

4 Button for customer approval of online connection to LAUDA Service (remote maintenance)

5 Button for screen change “Data transfer to USB”

Use button “5” (transfer data to USB) to read and save the desired data via the USB interface. There is a video on YouTube www.youtube.com about exporting data to a USB memory device.

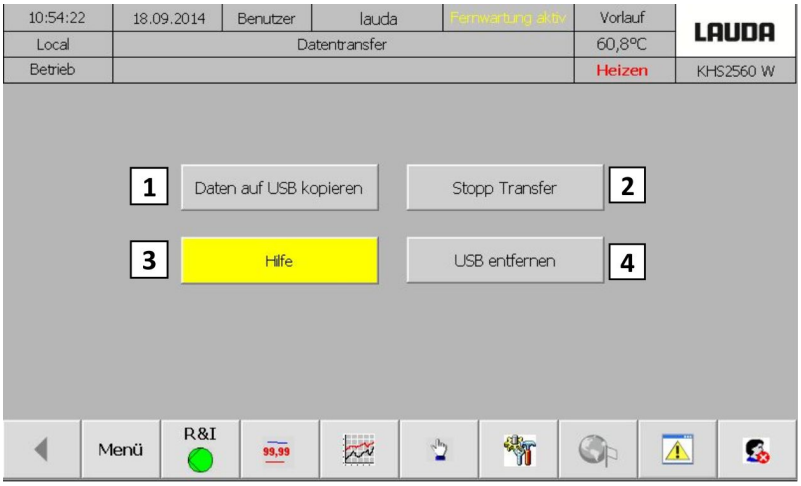


Fig. 62: Various tasks (2)

1 Button to start data transfer to USB device (archive values and alarm logs)

2 Stop transfer button

3 Help button (provides helpful information)

4 Button to remove USB once the data transfer is complete

User management

Users and their passwords can be managed on the “User management” screen.

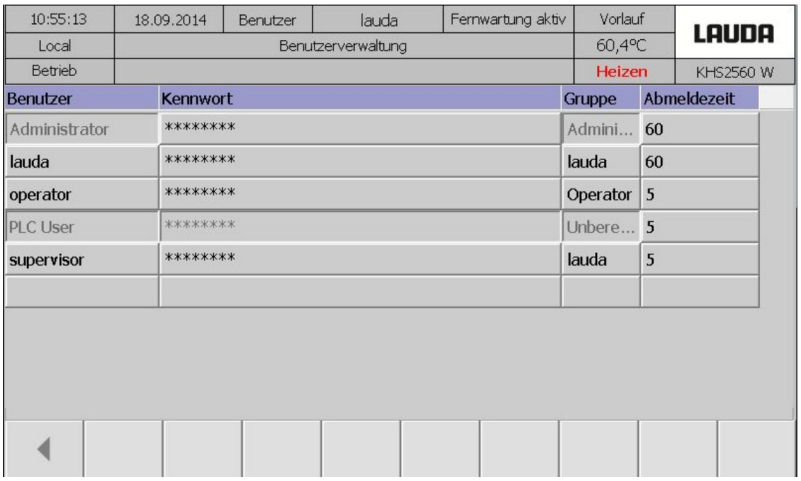


Fig. 63: User management

1 Created users

2 User level (group) assigned to the user

3 To create a new user, select “New user”

4 Button for customer approval of online connection to LAUDA Service (remote maintenance)

5 Button for screen change “Data transfer to USB”

For a more detailed description of user management, see Chapter 8.2 ‘Password management/user management’ on page 80.

System information

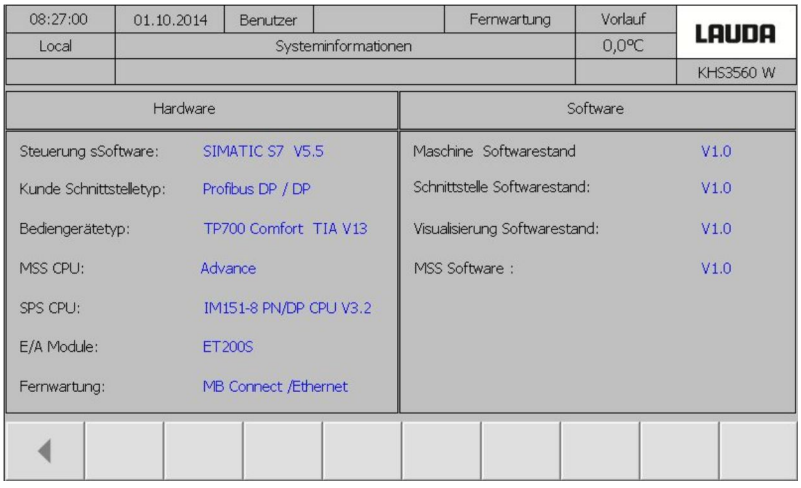


Fig. 64: Screen for LAUDA Service (3)

System setup

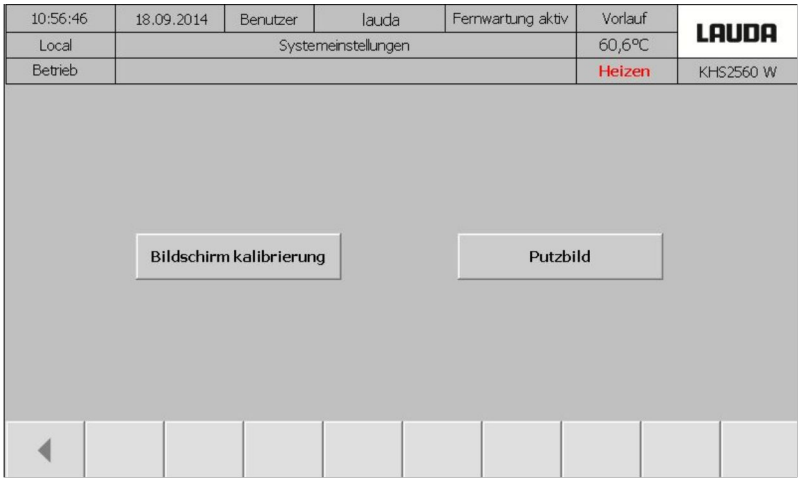


Fig. 65: Screen for LAUDA Service (4)

8.4.7 Alarm list

The alarm list displays current pending faults with the date and time that the fault began. Pressing the button closes the alarm list again.

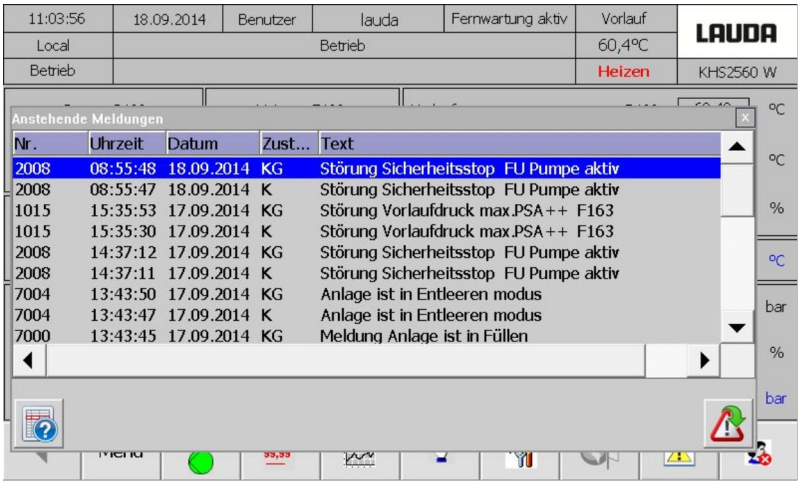


Fig. 66: Alarm list

1 Start date for fault

2 Start time for fault

3 Error message text

4 Pressing the button [X] closes the alarm list again.

8.5 Safety

Improper operation

WARNING!
Danger of injury from improper operation!

Improper operation can result in severe injuries and significant damage to property.

- Carry out all operating steps in accordance with the specifications and instructions in this manual.
- Observe the following before starting work:
  - Ensure that all covers and safety devices are installed and functioning correctly.
  - Ensure there are no persons in the danger zone.
- Ensure there are no persons in the danger zone.

Electrical system

WARNING!
Danger of fatal injury from electric current!

There is a danger of fatal injury in the event of contact with live components. Switched-on electrical components can execute uncontrolled movements and can cause severe injuries.

- Switch off the power supply before starting work and make sure that it cannot be switched on again.

Hot or supercooled surfaces

WARNING!
Danger of injury from hot or supercooled surfaces!

Surfaces of flanges and piping can heat up or cool down greatly during operation. Skin contact with hot surfaces causes severe skin burns. Skin contact with supercooled surfaces causes severe skin frostbite.

- Always wear temperature-resistant protective work clothing and protective gloves when working in the vicinity of hot or supercooled surfaces.
- Insulate all flanges and piping to prevent injuries and thermal losses.
- Before carrying out any work, ensure that all surfaces have reached the ambient temperature.

heat transfer fluid

WARNING!
Danger of injury from heat transfer fluid (thermal oils)!

The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never use force to open the heat transfer circuit.
- Prevent damage to the associated lines.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- Collect spilled heat transfer fluid using liquid-binding material such as sand, diatomaceous earth, acid binder, universal binder or sawdust and dispose of in accordance with the regulations.
- Observe additional safety instructions of the material data sheet in the appendix of the heat transfer fluid used.

Nitrogen

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Liquid refrigerant

WARNING!
Danger of asphyxiation at high gas concentration!
Danger of frostbite in the event of contact with skin/ eyes!

Discharging liquid refrigerant in high concentration can cause unconsciousness coupled with paralysis and result in asphyxiation. If the liquid refrigerant comes into contact with skin or eyes, it can cause frostbite. The refrigerant in the cooling circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never carry out work on the refrigerant circuit. Never use force to open the cooling circuit.
- Prevent damage to the associated lines.
- Avoid contact with skin and eyes. Wear protective gloves and safety goggles with side guard when working on refrigerant containers, lines or supply equipment.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- In the event of contact with the skin or eyes, rinse immediately with plenty of water. Seek medical attention.
- Observe all additional safety instructions of the material data sheet for the refrigerant used. The material data sheet is included in the appendix.
- Do not eat, drink or smoke while working.

8.6 Shutdown in emergency situations

In a danger situation, it is vital to stop components moving as quickly as possible and to switch off the power supply.

Shutdown in emergency situations

Proceed as follows in an emergency:

1. Immediately use the emergency stop device to trigger an emergency stop.

2. Rescue persons from the danger zone if there is no danger to your own health.

3. Initiate first aid measures if required.

4. Notify the fire brigade and/or rescue services.

5. Notify the responsible persons at the operating site.

6. Shut down the system and secure it against restarting.

7. Clear access routes for emergency service vehicles.

After the rescue actions

8. Marshal emergency service vehicles.

9. If warranted by the gravity of the emergency, notify the responsible authorities.

10. Delegate specialist personnel to rectify the fault.

WARNING!
Risk of fatal injury from unauthorised or uncontrolled restarting!

Unauthorised or uncontrolled restarting of the power supply can result in severe injuries or death.

- Ensure that all safety devices are installed and functional and that there are no dangers to persons before restarting.

11. Before the restart, check the system and ensure that all safety devices are installed and fully functional.

8.7 Switching on

Please note:

- *Observe the maximum pressure for pressure-sensitive consumers*
- *Only operate KHS if a flow through the external consumer is possible*

1. Open any shut-off valves in the external consumers

2. Ensure the supply of media

Nitrogen for the pressure blanket must be available and connected.

Fig. 67: Switch on the system.

Put main switch Q1 on the switch cabinet (Fig. 67) in position I [ON]

⇨ Start screen is displayed (Fig. 68)

Observe the maximum pressure for pressure-sensitive consumers

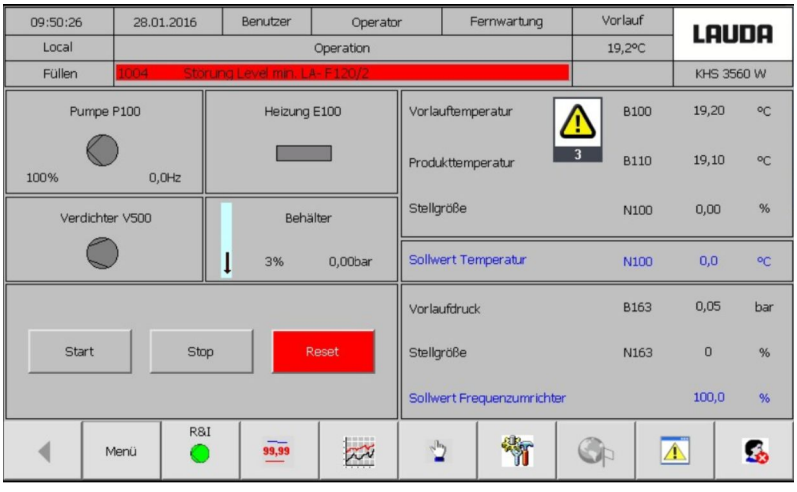


Fig. 68: Start screen

4. The password input is activated by tapping the touch screen.

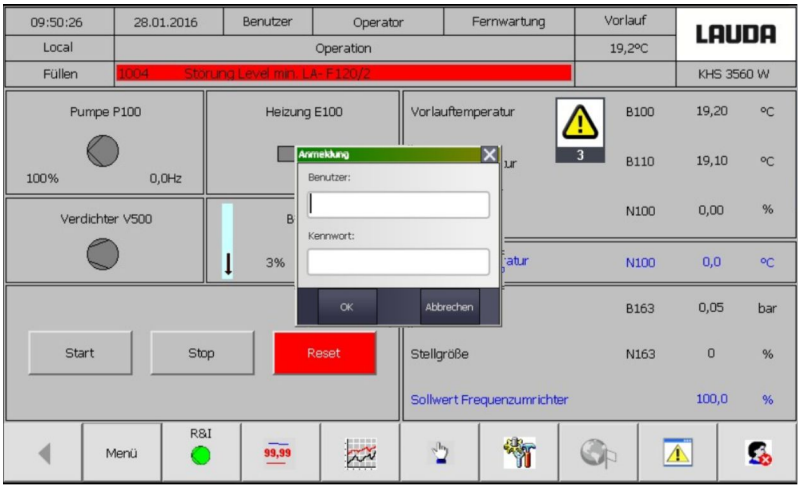


Fig. 69: Password input

5. Tap on the user input field

⇨ The keyboard appears

6. Enter user: **operator**

7. Enter password: **operator**

8. Tap OK to confirm

For details, see chapter

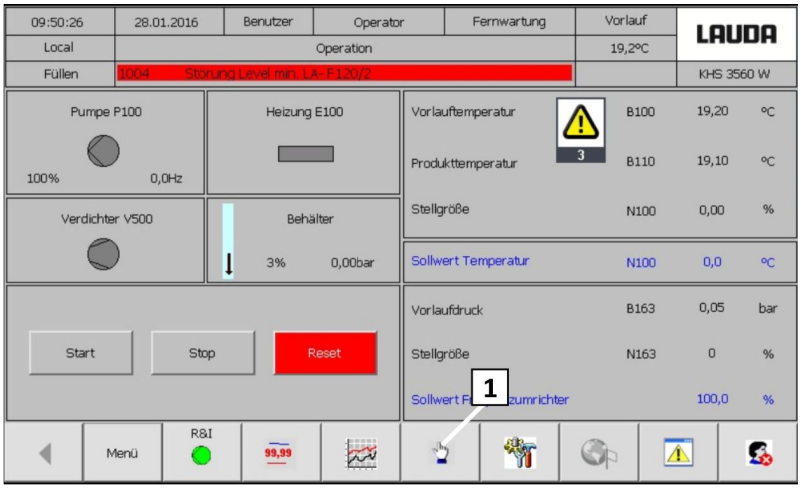


Fig. 70: Operation screen

9. Call up the basic setup screen (Fig. 70 [1])

⇨ Basic setup screen is displayed

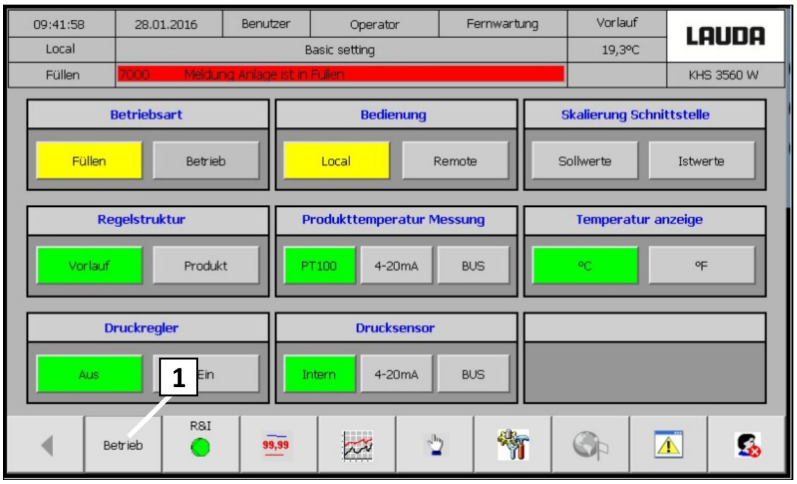


Fig. 71: Basic setup screen

10. Set the defined initial settings. See (Fig. 71)

11. Call up the operation screen (Fig. 71 [1])

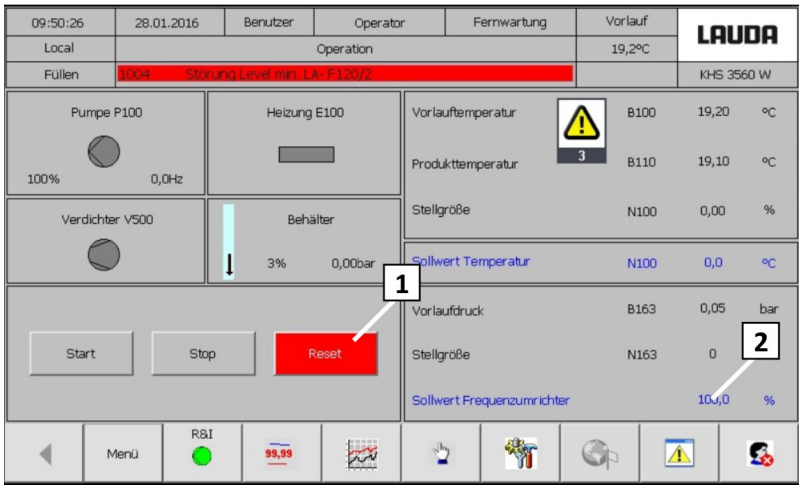


Fig. 72: Operation screen

12. Acknowledge accumulated faults with the [reset button]. (Fig. 72 [1])

13. Call up the basic setup screen

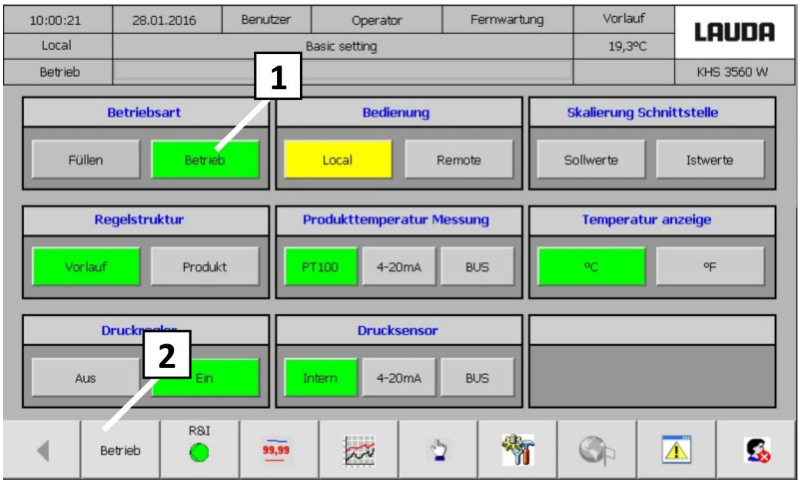


Fig. 73: Basic setup screen

14. Switch the selector switch on the touch screen from “Fill” to “Operation” (Fig. 73 [1])

15. If desired, make other settings

16. Call up the operation screen (Fig. 73 [2])

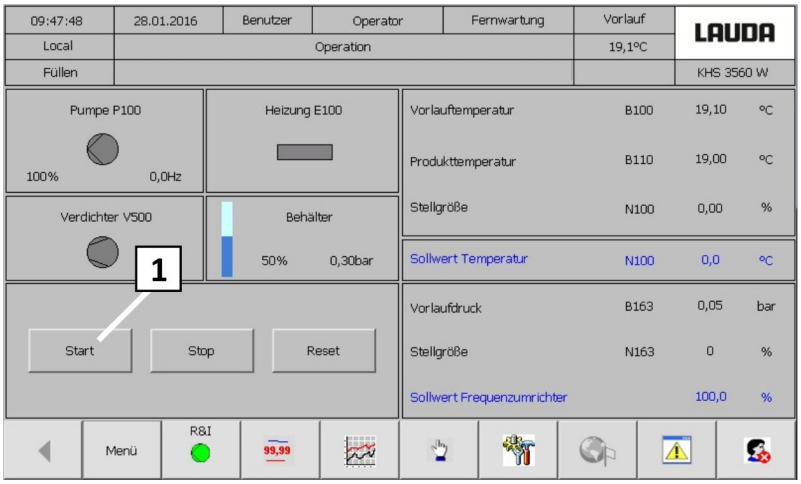


Fig. 74: Operation screen

17. Enter setpoints for temperature, frequency converter or, if pressure regulation is selected, enter the setpoint for the outflow pressure

18. Press start button (Fig. 74 [1]) Pump P100 active, heating or cooling active, according to setpoint entered

Operation

The “Operation” screen displays the status of all actions and all system values that are relevant to operation. If you select “Local”, you can make settings and enter the setpoint directly on the control panel. If you select “Remote”, the device can only be operated and the setpoint only entered via the interface.

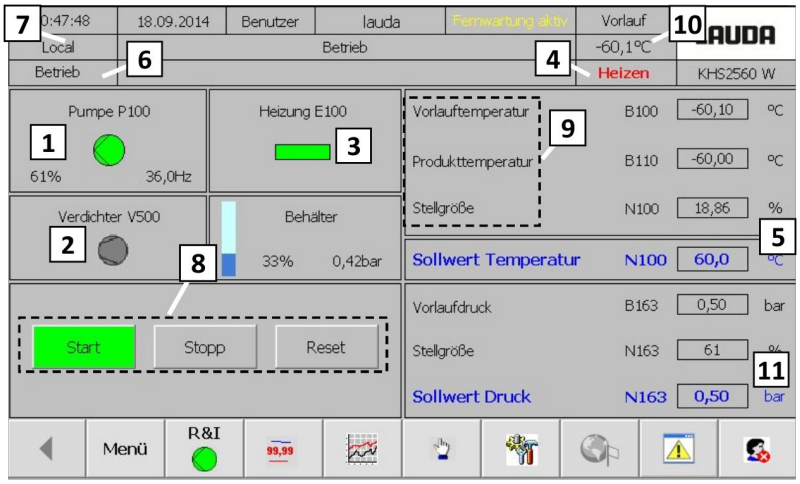


Fig. 75: Operation screen

1 Display status of pump P100, current setpoint in % , current speed frequency in Hz

2 Display operation of compressor V500

3 Display operation of heating E100

4 Display operating state of temperature control (e-heating, cooling)

5 Input/output of temperature controller setpoint

6 Status display for Filling/Operation

7 Status display for Local/Remote (operation via interface: status =Remote)

8 Selector button “START”, “STOP”, “RESET”

9 Display the measured values for outflow temperature, active set-point, return temperature

10 Display controlled temperature

11 Input/output outflow pressure controller setpoint or pump speed setpoint in % if pressure controller is not active.

Switching off

1. Press the [Stop] button on the visualisation (touch screen) (Fig. 76 [1]).
2. Logout user (Fig. 76 [2]).
3. Switch off main switch Q1.
4. Interrupt media supply

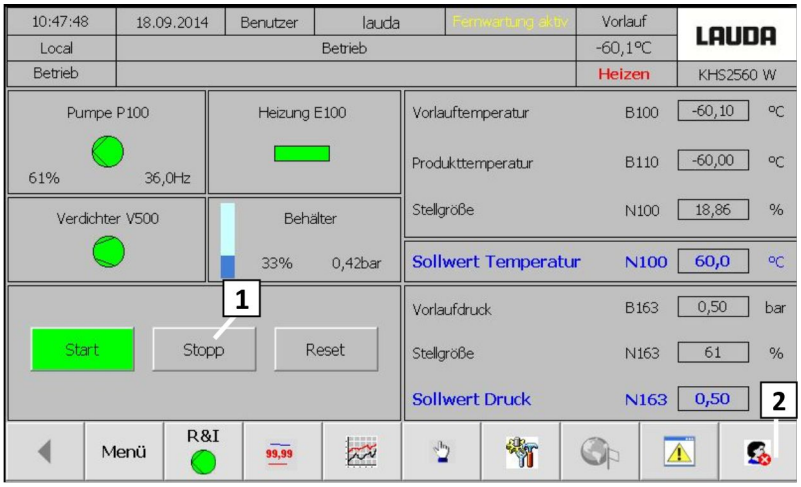


Fig. 76: Switching off

8.8 Setting the setpoint(s)

Personnel:

- Trained person

Protective equipment:

- Protective work clothing
- Safety footwear

See Visualisation description

9 Maintenance

The maintenance tasks required for optimum and trouble-free operation of the system are described in the following sections.

If increased wear is detected when performing regular checks, then shorten the required maintenance intervals in accordance with the actual indications of wear. If you have any questions about maintenance tasks and intervals, contact the manufacturer; see the contact details on page 2.

9.1 Safety

Electrical system

DANGER!
Danger of fatal injury from electric current!

There is a danger of fatal injury in the event of contact with live components. Switched-on electrical components can execute uncontrolled movements and can cause severe injuries.

- Switch off the power supply before starting work and make sure that it cannot be switched on again.

Sheet metal parts

WARNING!
Sheet metal parts

During removal of the side protective covers, there is the danger of injury from sheet metal parts (weight and possible sharp edges).

- Wear protective gloves and safety footwear before removing the protective covers.

Compressor/pump and motor

WARNING!
Danger of injury from moving parts!

Rotating components and/or components moving in linear fashion can cause severe injuries.

- Do not reach into moving parts or handle moving parts during operation.
- Do not open covers and maintenance hatches during operation.
- Observe the run-on time: Before opening the covers to carry out maintenance, make sure that all components have stopped moving.
- When in the danger zone, wear close-fitting protective work clothing with low tear strength.
- Before working on moving parts of the system, shut down the system and take precautions to prevent restarting. Wait until all components have stopped moving.

Hot or supercooled surfaces

WARNING!
Danger of injury from hot or supercooled surfaces!

Surfaces of flanges and piping can heat up or cool down greatly during operation. Skin contact with hot surfaces causes severe skin burns. Skin contact with supercooled surfaces causes severe skin frostbite.

- Always wear temperature-resistant protective work clothing and protective gloves when working in the vicinity of hot or supercooled surfaces.
- Insulate all flanges and piping to prevent injuries and thermal losses.
- Before carrying out any work, ensure that all surfaces have reached the ambient temperature.

heat transfer fluid

WARNING!
Danger of injury from heat transfer fluid (thermal oils)!

The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never use force to open the heat transfer circuit.
- Prevent damage to the associated lines.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- Collect spilled heat transfer fluid using liquid-binding material such as sand, diatomaceous earth, acid binder, universal binder or sawdust and dispose of in accordance with the regulations.
- Observe additional safety instructions of the material data sheet in the appendix of the heat transfer fluid used.

Nitrogen

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Liquid refrigerant

WARNING!
Danger of asphyxiation at high gas concentration!
Danger of frostbite in the event of contact with skin/ eyes!

Discharging liquid refrigerant in high concentration can cause unconsciousness coupled with paralysis and result in asphyxiation. If the liquid refrigerant comes into contact with skin or eyes, it can cause frostbite. The refrigerant in the cooling circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never carry out work on the refrigerant circuit. Never use force to open the refrigerant circuit.
- Prevent damage to the associated lines.
- Avoid contact with skin and eyes. Wear protective gloves and safety goggles with side guard when working on refrigerant containers, lines or supply equipment.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- In the event of contact with the skin or eyes, rinse immediately with plenty of water. Seek medical attention.
- Observe all additional safety instructions of the material data sheet for the refrigerant used. The material data sheet is included in the appendix.
- Do not eat, drink or smoke while working.

Securing against restarting

WARNING!
Risk of fatal injury from unauthorised restarting!

In the event of an unauthorised restart of the power supply during maintenance, there is a danger of serious injuries or death for persons in the danger zone.

- Switch off all energy supplies and secure against restarting before starting work.

Maintenance work not carried out correctly

WARNING!
Danger of injury from improperly executed maintenance work.

Improper maintenance may result in serious injury and significant damage to property.

- Ensure sufficient assembly space before starting work.
- Keep the installation area clean and orderly. Loosely stacked components or components and tools that are lying around can cause accidents.
- If components have been removed, ensure that they are properly reinstalled, that all fastening elements are reinstalled, and that all threaded connections are tightened with the specified tightening torque.
- Comply with the following instructions before restarting:
  - Ensure that all maintenance work has been carried out and completed in accordance with the specifications and instructions in this manual.
  - Ensure there are no persons in the danger zone.
  - Ensure that all covers and safety devices are installed and functioning correctly.

Incorrect spare parts

WARNING!
Danger of injury from the use of incorrect spare parts!

Using the wrong or defective spare parts can pose a risk to personnel and damage, malfunction or total machine failure can occur.

- Only use the manufacturer’s original spare parts or spare parts that are expressly approved by the manufacturer.
- Always contact the manufacturer in the event of uncertainty.

Voidance of warranty

The manufacturer warranty is void in the event that unapproved spare parts are used.

Only purchase spare parts from authorised dealers or directly from the manufacturer. See ↳ Chapter 1.7 ‘Service’ on page 9 for contact details.

Environmental protection

Comply with the following instructions for environmental protection when performing maintenance tasks:

- At all lubrication points that are supplied manually with lubricant, remove any escaping, used or surplus grease and dispose of in accordance with applicable local regulations.
- Collect replaced oils in suitable containers and dispose of in accordance with applicable local regulations.

9.2 Maintenance schedule

The maintenance tasks required for optimum and trouble-free operation of the system are described in the following sections.

If increased wear is detected when performing regular checks, shorten the required maintenance intervals in accordance with the actual indications of wear. If you have any questions about maintenance tasks and intervals, contact the manufacturer; see the contact details ↳ Chapter 1.7 ‘Service’ on page 9

Interval	Maintenance task	Personnel
Daily	Carry out visual inspection for damage and leaks and check for unusual operating noises (↳ Chapter 9.3.1 ‘Visual inspection’ on page 114)	Trained person
Weekly	Read and check current pump pressure on pressure gauge (↳ Chapter 9.3.2 ‘Reading pump pressure from the pressure gauge’ on page 115)	Trained person
Monthly	Check pump for noises and leaks (↳ Chapter 9.3.3 ‘Check pump for noises and leaks’ on page 115)	Specialist personnel
	Check compressor for noises (↳ Chapter 9.3.8 ‘Check compressor for noises’ on page 117)	Specialist personnel
Annually	Check heat transfer fluid (colour, moisture content) (↳ Chapter 9.3.4 ‘Checking the heat transfer fluid’ on page 116)	Specialist personnel
	Leak check of the complete system (↳ Chapter 9.3.5 ‘Complete system leak check’ on page 116)	Cooling specialist
	Leak test according to EN 378 (↳ Chapter 9.3.6 ‘Performing a leak test according to EN 378’ on page 116)	Cooling specialist
	Test safety devices for function (emergency stop, main switch etc.) (↳ Chapter 9.3.7 ‘Checking the safety devices’ on page 117)	Cooling specialist

9.3 Maintenance work

9.3.1 Visual inspection

Personnel:

- Trained person

Protective equipment:

- Protective work clothing
- Protective goggles
- Cold protection gloves

1. Check the system daily for possible damage, leaks and unusual operating noises.

9.3.2 Reading pump pressure from the pressure gauge

Personnel:

- Trained person

Protective equipment:

- Protective work clothing
- Protective goggles

Fig. 77: Pump pressure indicator

1. Read and document pump pressure weekly at pressure gauges F100 (Fig. 77 [1]) and G168 (Fig. 77 [2]).

9.3.3 Check pump for noises and leaks

Personnel:

- Specialist personnel

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Pay attention to irregular noises or water accumulation in the area of the system during operation at least monthly.

9.3.4 Checking the heat transfer fluid

Personnel:

- Specialist personnel

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Annual sample

   The following points must be strictly observed here:

   - Thorough rinsing of the sampling point
   - Sample from the main flow
   - Temperature of the heat transfer fluid significantly below 100 °C during the sampling
   - Only use suitable sample containers

2. Submission of the sample to an application technology laboratory

   ⇨ Comparison of the determined parameters of the sample with the parameters of the sample during initial filling.

9.3.5 Complete system leak check

Personnel:

- Specialist personnel

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Let the system cool down to ambient temperature
2. Examine the surroundings of the system for possible oil discharge
3. Examine insulation for moisture by running your hands over it.
4. Check components (valves, pump and heat exchanger) for leaks.

9.3.6 Performing a leak test according to EN 378

Personnel:

- Cooling specialist

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Check with leak detector.

One information source that can be included to assess the leak tightness of any installation is the VDMA Standard Sheet 24243 "Refrigeration units and systems – Leak tightness of refrigeration systems and heat pumps – Leak detection/leak testing". According to the VDMA Standard Sheet, a refrigeration system is leak-tight if its permissible leakage rate is not exceeded.

Max. specific loss of refrigerant: 2% per year, maximum individual leak rate ≤ 5 g per year

9.3.7 Checking the safety devices

Personnel:

- Specialist personnel

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Check safety units at least once per year. See also “Important information for the owner”.

9.3.8 Check compressor for noises

Personnel:

- Specialist personnel

Protective equipment:

- Protective work clothing
- Protective goggles
- Safety footwear

1. Check for irregular noises of the compressor during operation at least monthly.

9.4 Actions after maintenance has been completed

After completing the maintenance work and before switching on the system, carry out the following steps:

1. Check that all previously loosened screw connections are tight.
2. Check that all previously removed protective devices and covers have been replaced properly.
3. Check that all tools, materials and other equipment used have been removed from the work area.
4. Clean the work area and remove any substances which may have escaped, such as liquids, processing material or similar.
5. Ensure that all the system’s safety units are completely functional.

10 Faults

The following chapter describes the possible causes of faults and the work required to rectify them.

If faults occur increasingly, the maintenance intervals must be shortened in accordance with the actual load.

In the event of faults which cannot be rectified with the following instructions, contact the manufacturer; see contact details on Chapter 1.7 ‘Service’ on page 9.

10.1 Safety

Electrical system

DANGER!
Danger of fatal injury from electric current!

There is a danger of fatal injury in the event of contact with live components. Switched-on electrical components can execute uncontrolled movements and can cause severe injuries.

- Switch off the power supply before starting work and make sure that it cannot be switched on again.

Compressor

WARNING!
Danger of injury from moving parts!

Rotating components and/or components moving in linear fashion can cause severe injuries.

- Do not reach into moving parts or handle moving parts during operation.
- Do not open covers and maintenance hatches during operation.
- Observe the run-on time: Before opening the covers to carry out maintenance, make sure that all components have stopped moving.
- When in the danger zone, wear close-fitting protective work clothing with low tear strength.
- Before working on moving parts of the system, shut down the system and take precautions to prevent restarting. Wait until all components have stopped moving.

Hot or supercooled surfaces

WARNING!
Danger of injury from hot or supercooled surfaces!

Surfaces of flanges and piping can heat up or cool down greatly during operation. Skin contact with hot surfaces causes severe skin burns. Skin contact with supercooled surfaces causes severe skin frostbite.

- Always wear temperature-resistant protective work clothing and protective gloves when working in the vicinity of hot or supercooled surfaces.
- Insulate all flanges and piping to prevent injuries and thermal losses.
- Before carrying out any work, ensure that all surfaces have reached the ambient temperature.

heat transfer fluid

WARNING!
Danger of injury from heat transfer fluid (thermal oils)!

The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never use force to open the heat transfer circuit.
- Prevent damage to the associated lines.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
  - Collect spilled heat transfer fluid using liquid-binding material such as sand, diatomaceous earth, acid binder, universal binder or sawdust and dispose of in accordance with the regulations.
- Observe additional safety instructions of the material data sheet in the appendix of the heat transfer fluid used.

Nitrogen

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Liquid refrigerant

WARNING!
Danger of asphyxiation at high gas concentration!
Danger of frostbite in the event of contact with skin/ eyes!

Discharging liquid refrigerant in high concentration can cause unconsciousness coupled with paralysis and result in asphyxiation. If the liquid refrigerant comes into contact with skin or eyes, it can cause frostbite. The refrigerant in the cooling circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never carry out work on the refrigerant circuit. Never use force to open the cooling circuit.
- Prevent damage to the associated lines.
- Avoid contact with skin and eyes. Wear protective gloves and safety goggles with side guard when working on refrigerant containers, lines or supply equipment.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- In the event of contact with the skin or eyes, rinse immediately with plenty of water. Seek medical attention.
- Observe all additional safety instructions of the material data sheet for the refrigerant used. The material data sheet is included in the appendix.
- Do not eat, drink or smoke while working.

Securing against restarting

WARNING!
Risk of fatal injury from unauthorised restarting!

In the event of an unauthorised restart of the power supply while tracking down and rectifying a fault, there is a danger of serious injuries or death for persons in the danger zone.

- Switch off all energy supplies and secure against restarting before starting work.

Improperly executed fault correction tasks

WARNING!
Danger of injury due to improper fault correction!

Improperly executed fault correction tasks can cause severe injury and significant material damage.

- Ensure sufficient assembly space before starting work.
- Keep the installation area clean and orderly. Loosely stacked components or components and tools that are lying around can cause accidents.
- If components have been removed, ensure that they are properly reinstalled, that all fastening elements are reinstalled, and that all threaded connections are tightened with the specified tightening torque.
- Comply with the following instructions before restarting:
  - Ensure that all fault correction tasks have been properly executed and concluded in accordance with the instructions in this manual.
  - Ensure there are no persons in the danger zone.
  - Ensure that all covers and safety devices are installed and functioning correctly.

Behaviour in the event of faults

The following always applies:

1. Immediately initiate an EMERGENCY STOP in the event of faults posing an immediate danger to persons or property.
2. Determine the cause of the fault.
3. If fault rectification requires work in the danger zone, shut down the system and secure it to prevent restarting.

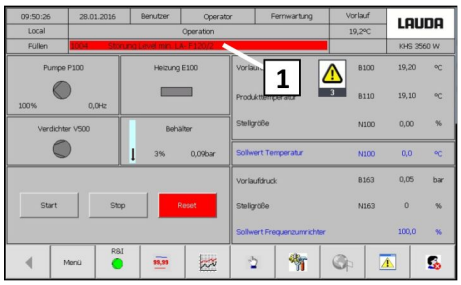
   Inform the responsible person at the operating site about the fault immediately.
4. Depending on the type of fault, arrange for this to be rectified by authorised specialist personnel or rectify it yourself.

The fault table below provides information concerning who is authorised to correct the fault.

10.2 Fault indicator

The fault lamp lights up in the event of a fault (Fig. 78). The fault lamp is located in the control panel's indicator panel.

Fig. 78: Fault lamp



The fault is also displayed in the status line (Fig. 79).

Fig. 79: Fault indicator

10.3 Troubleshooting

Error no.: 1 – 5	Error: EMERGENCY STOP
Cause:	■ EMERGENCY STOP has been pressed
Remedy:	■ Find cause of pressing and eliminate cause.
Restart:	■ If danger is no longer present, unlock/release EMERGENCY STOP ■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.

Error no.: 1 – 5	Error: EMERGENCY STOP
Personnel qualification:	■ Trained person
Group fault:	■ Yes

Error no.: 6 – 25	Fault with MSS, PLC, bus communication (Profibus, Profinet, Ethernet)
Cause 1:	■ No communication present
Remedy 1:	■ Check bus lines ■ If applicable, check position of the switches for terminating resistors ■ Check couplers to establish whether address assignment is correct
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Cause 2:	■ Components are switched off/not active
Remedy 2:	■ Check voltage supply/current path for the components
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Cause 3:	■ Components defective or in fault status
Remedy 3:	■ Check components ■ Press RESET button for components
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 26 – 30	Error in 24 VDC voltage
Cause:	■ 24 VDC fuse has tripped
Remedy:	■ 24 VDC fuse has tripped
Restart:	■ Reset the tripped path on the FC2 fuse ■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ See circuit diagram entries
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 31 – 100	Error: Wire break or short circuit in analogue inputs
Cause 1:	■ Wire break or short circuit at the input of the analogue input cards
Remedy 1:	■ Check sensor on the input card for wire break or short circuit
Cause 2:	■ Analogue input cards defective
Remedy 2:	■ Replace card
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 1000	Error F105 TZA++ safety temperature limiter
Cause:	■ Temperature limiter F105 has tripped.
Remedy:	■ Let heat transfer liquid cool down
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ Switching point: 210°C; hysteresis: 10K
Personnel qualification:	■ Trained person
Group fault:	■ Yes

Error no.: 1001	Error: Min. level F110 LZA-
Cause 1:	■ System is not sufficiently filled with heat carrier medium.
Remedy 1:	■ Refill heat carrier medium
Settings:	■ 15% above minimum level of the expansion tank BX100 (where TU= 25°C).
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Leak in piping system including components.
Remedy 2:	■ Perform leak test of the piping system including components ■ Refill heat transfer fluid if system does not leak.
Settings:	■ 15% above minimum level of the expansion tank BX100 (where TU= 25°C).
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 3.

Error no.: 1001	Error: Min. level F110 LZA-
Cause 3:	■ Wire break in the wiring.
Remedy 3:	■ Check wiring/cables.
Restart:	■ No RESET necessary. ■ If the fault cannot be rectified, continue with Cause 4.
Cause 4:	■ Level switch malfunctioning.
Remedy 4:	■ Check level switch for correct operation. ● Check mechanical function ● Check switching contact
Restart	■ No RESET necessary. ■ If the fault cannot be rectified, contact LAUDA Service.
Personnel qualification:	■ Trained person/Qualified electrician
Group fault:	■ Yes

Error no.: 1005	Error: Max. level F120/3 LSA++
Cause 1:	■ System is filled with too much heat transfer fluid.
Remedy 1:	■ Drain heat transfer fluid (30% above minimum level of the expansion tank BX100 (where fluid temperature = 25°C)). ● ATTENTION Danger of burns ● Only drain heat transfer medium if the temperature of the heat transfer medium is approx. 25°C
Settings:	■ For approx. 90% of the volume of the expansion tank BX100 (where media temperature = 25°C)
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ External medium has penetrated the heat transfer system. ● Consumer leaking ● Heat exchanger leaking
Remedy 2:	■ Perform leak test of the piping system including components ■ Analyse heat transfer medium.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 3.
Cause 3:	■ Capacity of the expansion tank not sufficient for the occurring expansion of the heat transfer fluid.
Remedy 3:	■ Check overall system volume, temperature range of the system and capacity of the expansion tank.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 4.
Cause 4:	■ Wire break in the wiring.

Error no.: 1005	Error: Max. level F120/3 LSA++
Remedy 4:	■ Check wiring/cables.
Restart	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 5.
Cause 5:	■ Level switch malfunctioning.
Remedy 5:	■ Check level switch for correct operation. ● Check mechanical function ● Check switching contact
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Personnel qualification:	■ Trained person/Qualified electrician
Group fault:	■ Yes

Error no.: 1015	Error: Max. pressure F163 PSA++
Cause 1:	■ Pressure control defective.
Remedy 1:	■ Check pressure control.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Safety valve S100 defective.
Remedy 2:	■ Check safety valve S100.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 3.
Cause 3:	■ Pressure reducer/pressure controller/safety valve in the pressure blanket assembly not set in accordance with P&I (if installed)
Remedy 3:	■ Set pressure reducer/pressure controller/overflow valve in the pressure blanket assembly in accordance with the P&I
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 4.
Cause 4:	■ Wire break in the wiring.
Remedy 4:	■ Check wiring/cables.
Restart	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 5.
Cause 5:	■ Pressure switch function defective.
Remedy 5:	■ Check pressure switch function.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.

Error no.: 1015	Error: Max. pressure F163 PSA++
Personnel qualification:	■ Trained person/Qualified electrician
Group fault:	■ Yes

Error no.: 1018	Error: Overtemperature pre-alarm F107 TSA+
Cause 1:	■ PID parameters/setpoint of temperature controller for system are not set correctly
Remedy 1:	■ Check PID parameters/setpoint of temperature controller for system
Settings:	■ See visualisation documentation
Restart:	■ Fault resets automatically when hysteresis is reached ■ Press RESET button to acknowledge the error message ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Function/actuation of the actuators/safety contactor(s) defective
Remedy 2:	■ Check function/actuation of the actuators/safety contactor(s)
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 3.
Cause 3:	■ Switching point setting in temperature controller for VISU does not comply with the factory setting
Remedy 3:	■ Check switching point setting in temperature controller for VISU
Restart:	■ Press RESET button. ■ Press RESET button.
Settings:	■ Switching point and hysteresis in temperature controller for VISU are configurable ■ Factory settings: ● Switching point: 205°C ● Hysteresis: 10K
Personnel qualification:	■ Trained person
Group fault:	■ Yes

Error no.: 2000	Error: F11 motor overload switch P100 pump
Cause:	■ Motor circuit breaker for pump has tripped
Remedy:	■ Check whether the three phases are correctly connected. ■ Check the current consumption of the component.
Restart:	■ Reset the motor overload switch ■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ See circuit diagram entries

Error no.: 2000	Error: F11 motor overload switch P100 pump
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 2002	Error: Flow F100 FIZA-
Cause:	■ Insufficient flow at the P100 pump
Remedy:	■ Check whether there is air in the system. (Indicator F100 not stable during operation of the pump) ■ Check whether all shut-off valves in this circuit are open.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ Switching point: 0.05 bar; hysteresis: 0.01 bar
Personnel qualification:	■ Specialist personnel
Group fault:	■ Yes

Error no.: 2005	Error: Motor winding protection F156 TSA+ pump P100
Cause 1:	■ Motor has a short circuit or winding short circuit.
Remedy 2:	■ Check the motor for short circuit and winding short circuit.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Phase failure
Cause 2:	■ Check whether a phase failure is present. ■ Check whether the three phases are correctly connected.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 3.
Cause 3:	■ Motor has been overloaded.
Remedy 3:	■ Check the current consumption of the pump motor.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 4
Cause 4:	■ Sensor short circuit/wire break.
Remedy 4:	■ Check wiring between sensor and controller. ■ Check plug connection if present.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.

Error no.: 2005	Error: Motor winding protection F156 TSA+ pump P100
Personnel qualification:	■ Trained person/Qualified electrician
Group fault:	■ Yes

Error no.: 2007	Error: N190 frequency converter P100 pump
Cause:	■ Error message on display.
Remedy:	■ Rectify the error message as per the fault table for frequency converter.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Personnel qualification:	■ Trained person/Qualified electrician
Group fault:	■ Yes

Error no.: 2015	Group fault: P100 pump
Cause:	■ A fault in the group (error numbers 2000 – 2015) has occurred
Remedy:	■ Rectify all faults in the group
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.
Personnel qualification:	■ Trained person
Group fault:	■ Yes

Error no.: 3100	Error: F21 motor overload switch E100 electric heater
Cause:	■ Motor circuit breaker for electric heater has tripped
Remedy:	■ Check whether the three phases are correctly connected. ■ Check the current consumption of the component.
Restart:	■ Reset the motor overload switch ■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ See circuit diagram entries
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 5000 **Error no.: 5100**	**Error: F12Y motor overload switch V500 compressor** **Error: F13Y motor overload switch V600 compressor**
Cause:	■ Motor circuit breaker for compressor has tripped
Remedy:	■ Check whether the three phases are correctly connected. ■ Check the current consumption of the component.
Restart:	■ Reset the motor overload switch ■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ See circuit diagram entries
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 5001 **Error no.: 5101**	**Error: F12YY motor overload switch V500 compressor** **Error: F13YY motor overload switch V600 compressor**
Cause:	■ Motor circuit breaker for compressor has tripped
Remedy:	■ Check whether the three phases are correctly connected. ■ Check the current consumption of the component.
Restart:	■ Reset the motor overload switch ■ Press RESET button. ■ Reset the motor overload switch
Settings:	■ See circuit diagram entries
Personnel qualification:	■ Qualified electrician
Group fault:	■ Yes

Error no.: 5002 **Error no.: 5102**	**Error: F500 TSA+ thermistor V500 compressor** **Error: F600 TSA+ thermistor V600 compressor**
Cause:	■ An excess temperature in the motor winding of a compressor can have many different causes, depending on the application.
Remedy:	■ In order to be able to find the cause of the excess temperature in the motor winding, sound knowledge of general cooling technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we strongly recommended that you contact LAUDA Service.
Restart:	■ Only restart if the cause of the fault has been found and rectified ■ Press RESET button.
Settings:	■ ./.

Error no.: 5002 Error no.: 5102	Error: F500 TSA+ thermistor V500 compressor Error: F600 TSA+ thermistor V600 compressor
Personnel qualification:	■ Certified refrigeration specialist/Lauda Service
Group fault:	■ Yes

Error no.: 5003 Error no.: 5103	Error: Oil pressure F505 PDSA- V500 Error: Oil pressure F605 PDSA- V600
Cause:	■ Insufficient pressure in the lubrication oil pump can have many different causes depending on the application.
Remedy:	■ In order to be able to find the cause of the insufficient pressure in the lubrication oil pump, sound knowledge of general cooling technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we strongly recommended that you contact LAUDA Service.
Restart:	■ Only restart if the cause of the fault has been found and rectified ■ Press RESET button.
Settings:	■ 0.5 bar – 1.6 bar
Personnel qualification:	■ Certified refrigeration specialist/Lauda Service
Group fault:	■ Yes

Error no.: 5004 Error no.: 5104	Error: F510 PZA+ high pressure limiter V500 compressor Error: F610 PZA+ high pressure limiter V600 compressor
Cause 1:	■ Cooling of the condenser not sufficient
Remedy 1:	■ For systems operated with liquid cooling medium: ● Check pressure, flow rate and temperature of the cooling medium ● Check dirt trap (if installed) ● Check valve settings (if installed), ensure that all appropriate pusher systems are open or closed (see piping diagram)
Restart:	■ Press Reset button at pressure switch. ■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Excess pressure on the high pressure side of the compressor can, depending on the application, have other causes apart from the malfunction of the condenser described under Cause 1
Remedy 2:	■ In order to be able to find the cause of the excess pressure in the high pressure side of the compressor, sound knowledge of general cooling technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we recommended that you contact LAUDA Service.

Error no.: 5004 **Error no.: 5104**	**Error: F510 PZA+ high pressure limiter V500 compressor** **Error: F610 PZA+ high pressure limiter V600 compressor**
Restart:	■ Only restart if the cause of the fault has been found and rectified ■ Press RESET button.
Settings:	■ 24 bar
Personnel qualification:	■ Certified refrigeration specialist/Lauda Service
Group fault:	■ Yes

Error no.: 5005 **Error no.: 5105**	**Error: F515 high pressure safety limiter PZA++ V500 compressor** **Error: F615 high pressure safety limiter PZA++ V600 compressor**
Cause 1:	■ Cooling of the condenser not sufficient
Remedy 1:	■ ATTENTION! The high pressure safety limiter is upstream of the high pressure limiter. In the event of an error message, always check whether error message is also pending. If no error message is pending, the function and setting of the high pressure limiter must be checked! ■ For systems operated with liquid cooling medium: ● Check pressure, flow rate and temperature of the cooling medium ● Check dirt trap (if installed) ● Check valve settings (if installed), ensure that all appropriate pusher systems are open or closed (see piping diagram) ■ For systems operated with gaseous cooling medium: ● Check fins of the condenser for soiling. ● Check temperature of the cooling medium. ● Check function/actuation of the fan(s) ● Check valve settings (if installed), ensure that all appropriate pusher systems are open or closed (see piping diagram)
Restart:	■ Press Reset button at pressure switch. ■ Press RESET button. ■ If the fault cannot be rectified, continue with Cause 2.
Cause 2:	■ Excess pressure on the high pressure side of the compressor can, depending on the application, have other causes apart from the malfunction of the condenser described under Cause 1
Remedy 2:	■ In order to be able to find the cause of the excess pressure in the high pressure side of the compressor, sound knowledge of general cooling technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we recommended that you contact LAUDA Service.
Restart:	■ Only restart if the cause of the fault has been found and rectified ■ Press RESET button.
Settings:	■ 25 bar

Error no.: 5005 **Error no.: 5105**	**Error: F515 high pressure safety limiter PZA++ V500 compressor** **Error: F615 high pressure safety limiter PZA++ V600 compressor**
Personnel qualification:	■ Certified refrigeration specialist/Lauda Service
Group fault:	■ Yes

Error no.: 5006 **Error no.: 5106**	**Error: Overtemperature F520 TSA+ pressure joint V500 compressor** **Error: Overtemperature F620 TSA+ pressure joint V600 compressor**
Cause:	■ An excess temperature on the pressure joints can have many different causes, depending on the application.
Remedy:	■ In order to be able to find the cause of the excess temperature on the pressure joints, sound knowledge of general cooling technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we strongly recommended that you contact LAUDA Service.
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Personnel qualification:	■ Cooling specialist
Group fault:	■ Yes

Error no.: 5011 **Error no.: 5111**	**Error: F550 PSA- low pressure monitor V500 compressor** **Error: F550 PSA- low pressure monitor V500 compressor**
Cause:	■ Too low pressure in the suction side of the compressor can have many different causes depending on the application.
Remedy:	■ In order to be able to find the cause of the too low pressure in the suction side of the compressor, sound knowledge of general refrigeration technology and specific technical knowledge of the LAUDA system technology are needed. To prevent further damage to the system, we strongly recommended that you contact LAUDA Service.
Restart:	■ Only restart if the cause of the fault has been found and rectified ■ Press RESET button.
Settings:	■ 1 bar
Personnel qualification:	■ Certified refrigeration specialist/Lauda Service
Group fault:	■ Yes

Error no.: 5015 **Error no.: 5115**	**Group fault: V500 compressor** **Group fault: V600 compressor**
Cause:	■ A fault in the group (error numbers 5000 – 5015) has occurred ■ A fault in the group (error numbers 6000 – 6015) has occurred
Remedy:	■ Rectify all faults in the group
Restart:	■ Press RESET button. ■ If the fault cannot be rectified, contact LAUDA Service.
Settings:	■ ./.
Personnel qualification:	■ Trained person
Group fault:	■ Yes

10.4 Start-up after corrected fault

After correcting the fault, perform the following steps to restart the system:

1. Reset the emergency stop devices.
2. Acknowledge the fault in the control system.
3. Ensure there are no persons in the danger zone.
4. Start up in accordance with the instructions in the “Operation” chapter.

11 Dismantling and disposal

After the end of its service life has been reached, the system must be dismantled and disposed of in accordance with environmental regulations.

Dismantling is only carried out by personnel of the owner. Only for owners within the EEC: The owner must observe and comply with the applicable provisions of EU Directive 517/2014 together with Directive 2015/2067/EU of the European Parliament and EU Council concerning specified fluorinated greenhouse gases and certified personnel.

WARNING!
Danger to life from incorrect dismantling!

Errors during dismantling can result in lethal danger or may cause significant damage to property.

- Only allow dismantling to be carried out by employees of the owner.
- Also consult the manufacturer in the event of subsequent location changes.
- Refrain from unauthorised dismantling and location changes.

11.1 Safety

Electrical system

DANGER!
Danger of fatal injury from electric current!

There is a danger of fatal injury in the event of contact with live components. Switched-on electrical components can execute uncontrolled movements and can cause severe injuries.

- Before starting dismantling tasks, switch off the power supply and disconnect it completely.

Improper dismantling

WARNING!
Danger of injury due to improper dismantling!

Stored residual energies, sharp-edged components, points and corners on or in the system or on the necessary tools can cause injuries.

- Ensure sufficient space before starting work.
- Handle exposed sharp-edged components carefully.
- Keep the workplace clean and orderly! Loosely stacked components or components and tools that are lying around can cause accidents.
- Dismantle components properly. Pay attention to the high intrinsic weight of some of the components. If necessary use hoists.
- Secure parts so that they do not fall down or fall over.
- Always contact the manufacturer in the event of uncertainty.

11.2 Dismantling

Pressurised components

WARNING!
Danger to life from pressurised components!

If improperly handled, pressurised components may move in an uncontrolled manner, causing severe injuries. If improperly handled or defective, pressurised components may leak liquid under high pressure, causing severe injuries or death.

Before starting work on these components:

- Establish depressurised condition. Residual energies must also be discharged.
- Always ensure that liquids cannot accidentally escape.

heat transfer fluid

WARNING!
Danger of injury from heat transfer fluid (thermal oils)!

The heat transfer fluid in the heat transfer circuit of the system can cause severe damage to health and the environment in the event of leaks.

- Never use force to open the heat transfer circuit.
- Prevent damage to the associated lines.
- In the event of a leak:
  - Shut down the system and secure to prevent restarting.
  - Ventilate the installation area well.
- Collect spilled heat transfer fluid using liquid-binding material such as sand, diatomaceous earth, acid binder, universal binder or sawdust and dispose of in accordance with the regulations.
- Observe additional safety instructions of the material data sheet in the appendix of the heat transfer fluid used.

Nitrogen

WARNING!
Nitrogen blow-out line

Danger of asphyxiation!

- The blown-out nitrogen must be routed away safely via the blow-out hose.

Before starting dismantling:

- Shut down the system and secure it against restarting.
- Physically disconnect the power supply from the system; discharge stored residual energy.
- Remove operating and auxiliary materials and remaining processing materials and dispose of in accordance with the environmental regulations.

Then clean assemblies and components properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

11.3 Disposal

The following applies for Europe: This device may only be disposed of by qualified specialist personnel, as defined in EC Directive (EU) 2015/2067 in combination with 517/2014/EU.

Disposal is regulated by EC Directive 2002/96/EC.

In Germany, ChemKlimaschutzV (Chemicals Climate Protection Ordinance) applies.

NOTICE!
Danger to the environment due to incorrect disposal!

Incorrect disposal may pose risks to the environment.

- Arrange for electrical scrap and electronic components, lubricants and other auxiliary materials to be disposed of by approved specialist companies.
- If in doubt, obtain information about disposal in accordance with environmental regulations from local municipal authorities or specialised disposal companies.

11.3.1 Disposal of refrigerant

The refrigerant circuit is filled with CFC-free HFC refrigerant. The type and fill quantity are indicated on the rating plate. Repairs and disposal to be carried out by refrigerant technicians only!

The global warming potential (GWP)

[CO2 = 1.0]

Designation	Value
Refrigerant	GWP (100a)*
R-407F / HFKW-407F	1800

*Time horizon 100 years – according to IPCC IV (2007)

The following applies for Europe: The refrigerant must disposed of in accordance with EC Directive (EU) 2015/2067 in combination with 517/2014/EU.

In Germany, ChemKlimaschutzV (Chemicals Climate Protection Ordinance) applies.

NOTICE!
Environmental damage due to escaping refrigerants!

Fluorinated greenhouse gas is an environmentally hazardous product with harmful climate effects (greenhouse effect) and therefore must not get into the atmosphere.

- Refrigerants must only be disposed of by certified refrigeration specialists.
- Observe the usual country regulations for the disposal.

If no return or disposal agreement has been made, supply dismantled parts for recycling:

- Scrap metals.
- Send plastic elements for recycling.
- Sort and dispose of other components in accordance with their material composition.

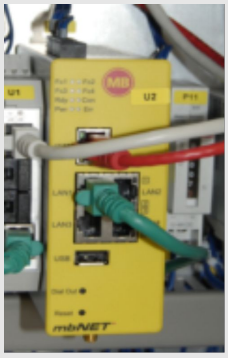
11.3.2 Disposal of packaging

The following applies for Europe: The packaging must be disposed of in accordance with EU Directive 94/62/EC.

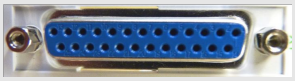
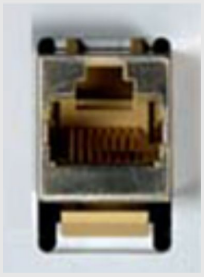
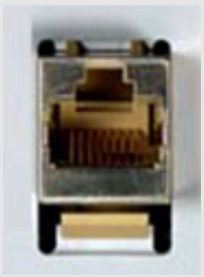
In Germany, VerpackV (Packaging Ordinance) applies.

12 Accessories

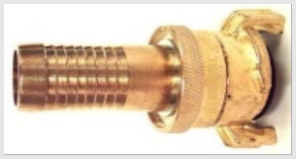
12.1 Accessories

Designation		Application	LAUDA order no.
	Modem for remote maintenance		LWZ 936
	Additional expansion tank, 50 l	The expansion tank is placed on top of the device. This increases the height of the device from 1650 to 2350 mm.	LWZ 942
	Optional steel machine foot with adjustable height	Installed ex works	EZ 214
	Transport lugs with fastening		EZ 211

12.2 Interfaces and modules

Designation		Application	LAUDA order no.
	Analogue module	Current and voltage interface	LWZ 937
	Profibus module	Digital communication via Profibus	LWZ 938
	Profinet module	Digital communication via Profibus	LWZ 939
	EtherCAT module	Digital communication via Profibus	LWZ 940
	RS-232/-485 interface	Digital interface	LWZ 941

12.3 Cooling water connection

Designation		Application	LAUDA order no.
	EPDM tube	fabric-reinforced, di = 25 mm; -40 to 100°C; max. 10 bar	RKJ 033
	Tube clamp	for outside Ø 25–40 mm, 1”	EZS 016
	Quick-release coupling	with 1” inner thread	EOF 539
	Quick-release coupling	with 1” hose nozzle	EOF 540

12.4 Heat transfer fluid connection

Designation		Application	LAUDA order no.
	Graphite seal	Flat; DN25-PN40 DIN2690	EDF 222
	Metal tubes with cold insulation	M38 x 100S M38 x 200S M38 x 300S	LZM 094 LZM 095 LZM 096
	Stainless steel corrugated hose	DN25 with stainless steel braid	RVW 069
	Flange adapter	M38 x 1.5A on 2633/DN25	HKA 198
	Hexagon screw	M12 x 50	DSM 055
	Washer	DIN125; A13 x 24 x 2.5	DO 020
	Hexagon nut	DIN934; M12	DM 031

12.5 Heat transfer liquids

Designation		Application	LAUDA order no.
	Kryo 65	For safe and reliable operation, it is essential to select the right heat transfer liquid. Container in 10 or 20 litre size.	LZB 218, LZB 318
	Kryo 70		LZB 227, LZB 327
	Kryo 90		LZB 228, LZB 328

13 Appendix

13.1 Installation document – IQ/OQ

The form for the IQ/OQ process includes checks for the necessary installation requirements on the customer side and is sent when the customer places an order. It is used to ensure the electrical supply, the placement conditions, the cooling water supply, the choice of interfaces and other preparations on the customer side that are necessary to setup and initial commissioning.

Sprache auswählen
Language selection

Gerätetyp auswählen
Selection of type/ unit

Kryoheater Selecta Aufstellung und Einweisung LAUDA

Diese Seite ist vom Auftraggeber auszufüllen (nur weiße Felder).

Zu installierendes Gerät: KHS 3560 W Artikelnummer LWP 556

1. Notwendige Technische Werte am Aufstellungsort: Wird vom Kunden erfüllt: vorhandener Wert / Ty

1.1 Elektrische Versorgung
- Spannung; Frequenz [V; Hz]:
- Anzahl der Phasen: 3/PE
- Absicherung: 63A
- Steckertyp: CEE 63A

1.2 Aufstellungsbedingungen
- Untergrund trägt Gerätegewicht [kg]: 850
- Umgebungstemperaturbereich [°C]: 5...40
- Freier Bereich um das Gerät [cm]: 100/100/100/100 (vorne, hinten, rechts, links)
- Über die Luft abzuführende maximale Wärmemenge [kW]: 1,2

1.3 Kühlwasserversorgung
- Bedarf bei einer Kälteleistung von 35 kW @ 20-200 °C [L/ 3960
- Vorlauftemperatur des Kühlwassers [°C] (für max. Kälteleistung 5°C bis 25°C)
- Druckunterschied Kühlwasserein- und -ausgang min.[bar]: 2,5
- Absolutdruck max.[bar]: 10
- Querschnitt Kühlwasserschläuche min. [mm]: 25
- Kühlwasserschläuche vorbereitet auf Aufeingewinde: G1"

Seite 1

1.4 Stickstoffversorgung
- Bedarf min [m³/Tag] 0,5
- Stickstoff Vordruck min [bar] 3...4
- Stickstoffschläuche vorbereitet auf Innengewinde: G1/4"
- Abführung des Stickstoffs über Ausblaseleitung

1.5 Schnittstellen ja/nein 0..10 V 4...20 mA
- Soll eine Analogschnittstelle vorkonfiguriert werden?

ja/nein Profibus Profinet
- Soll eine digitale Schnittstelle (Profibus, Profinet, EtherCat, RS-232/RS-485) vorkonfiguriert werden?
- Bitte beachten Sie: Eine Profibus, Profinet oder EtherCAT Bussystem kann nicht parallel konfiguriert werden!

EtherCAT RS-232/-
- Signalliste auf Anfrage.

2. Notwendige Vorbereitungen auf Kundenseite:

2.1 Verbraucher
- Schlauchleitung muss angeschlossen sein
- Verbraucher und Leitungen müssen trocken sein (keine Lösungsmittel oder andere Temperiermedien)
- Verbraucherentlüftung muss möglich sein (z.B. durch konstruktive Maßnahmen oder Entlüftungsventil)

2.2 Temperiermedium
- Die für eine vollständige Befüllung der gesamten Anlage notwendige Menge an Temperiermedium muss bereitstehen (inklusive Füllvolumen des KHS)
- Für NICHT-LAUDA-Temperiermedien muss eine schriftliche Freigabe durch LAUDA / authorisierte
- Das bereitgestellte Temperiermedium muss für den gewünschten Temperaturbereich geeignet sein.
- Daten- und Sicherheitsdatenblatt müssen vorliegen.
- Schriftliche Freigabe durch LAUDA (Temperaturbegrenzung) wenn ohne eine Stickstoffüberlagerung

2.3 Externer Temperaturfühler (nur wenn vom Kunden beigestellt)
- Kabellänge muss ausreichend sein
- Steckertyp: Lemo Größe 1

2.4 Bei der Aufstellung müssen vorliegen:
- Alle relevanten Betriebsanleitungen und technische Unterlagen
- Dieses Dokument zum Gegenzeichnen

Seite 2

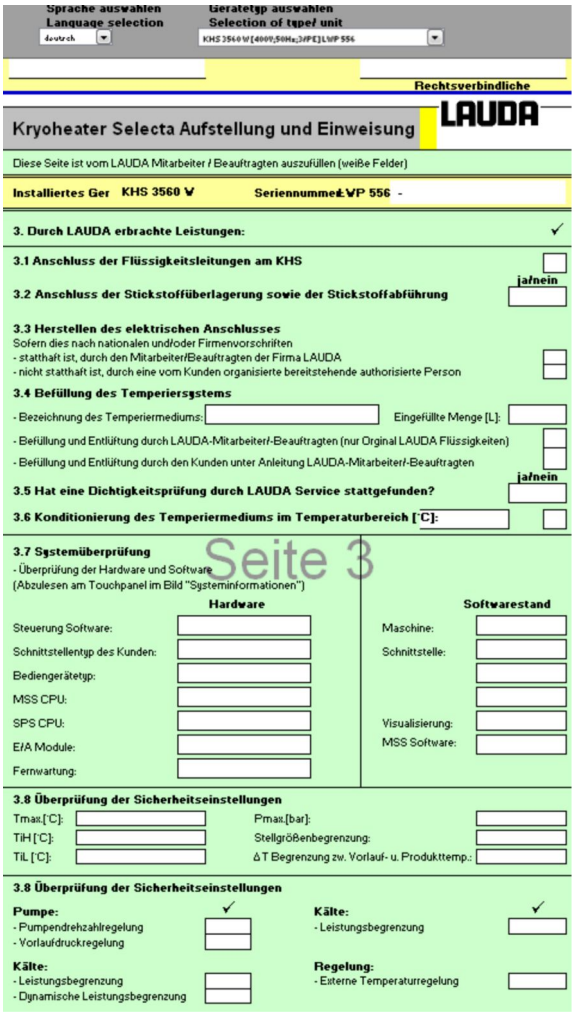
Firmenadresse:

Verantwortliche(r):
Abteilung:
Telefon:
E-Mail:

Rechtsverbindliche

Fig. 80: Installation document – IQ/OQ (1)

Services provided by LAUDA are defined in another part of the form. These include connecting the fluid lines on the Kryoheater Selecta, establishing the electrical connections, filling the tempering system, checking the system and providing instruction in how to operate the system.



Sprache auswahlen / Language selection: deutsch

Geratetyp auswahlen / Selection of type/ unit: KHS 3560 W [400V,50Hz,3/PE] LWP 556

Rechtsverbindliche

Kryoheater Selecta Aufstellung und Einweisung LAUDA

Diese Seite ist vom LAUDA Mitarbeiter / Beauftragten auszufüllen (weiße Felder)

Installiertes Ger KHS 3560 W **Seriennummer LWP 556** -

3. Durch LAUDA erbrachte Leistungen: ✓

3.1 Anschluss der Flüssigkeitsleitungen am KHS

ja/nein

3.2 Anschluss der Stickstoffüberlagerung sowie der Stickstoffabführung

3.3 Herstellen des elektrischen Anschlusses
Sofern dies nach nationalen und/oder Firmenvorschriften
- statthaft ist, durch den Mitarbeiter/Beauftragten der Firma LAUDA
- nicht statthaft ist, durch eine vom Kunden organisierte bereitstehende authorisierte Person

3.4 Befüllung des Temperiersystems
- Bezeichnung des Temperiermediums: Eingefüllte Menge [L]:
- Befüllung und Entlüftung durch LAUDA-Mitarbeiter/-Beauftragten (nur Orginal LAUDA Flüssigkeiten)
- Befüllung und Entlüftung durch den Kunden unter Anleitung LAUDA-Mitarbeiter/-Beauftragten

ja/nein

3.5 Hat eine Dichtigkeitsprüfung durch LAUDA Service stattgefunden?

3.6 Konditionierung des Temperiermediums im Temperaturbereich [°C]:

3.7 Systemüberprüfung Seite 3
- Überprüfung der Hardware und Software
(Abzulesen am Touchpanel im Bild "Systeminformationen")

Hardware		Softwarestand	
Steuerung Software:		Maschine:	
Schnittstellentyp des Kunden:		Schnittstelle:	
Bediengerätetyp:			
MSS CPU:			
SPS CPU:		Visualisierung:	
E/A Module:		MSS Software:	
Fernwartung:			

3.8 Überprüfung der Sicherheitseinstellungen

Tmax.[°C]:		Pmax.[bar]:	
TiH [°C]:		Stellgrößenbegrenzung:	
TiL [°C]:		ΔT Begrenzung zw. Vorlauf- u. Produkttemp.:	

3.8 Überprüfung der Sicherheitseinstellungen

Pumpe: ✓
- Pumpendrehzahlregelung
- Vorlaufdruckregelung

Kälte:
- Leistungsbegrenzung
- Dynamische Leistungsbegrenzung

Kälte: ✓
- Leistungsbegrenzung

Regelung:
- Externe Temperaturregelung

Fig. 81: Installation document – IQ/OQ (2)

13.2 Signal list

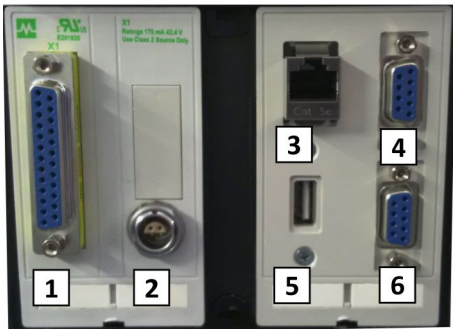


Fig. 82: Built-in interface connectors

The customer can adjust the interfaces or data protocols to the specific process environment.

The following interfaces/data protocols are available as accessories:

1 Multi-pin plug for analogue module

2 Lemo socket for external Pt-100

3 RJ 45 connection for Profinet module

4 9-pin Sub-D connection for Profibus interface

5 USB port

6 9-pin Sub-D connection for RS-232/-485 interface

The Lemo socket for an external Pt-100 sensor and the USB port are connected as standard in the KHS 3560 W and KHS 2190 W.

Signal list for analogue connection

Signalaustausch LAUDA –> Kunde via analog Verbindung	Warn- und Störungsmeldungen LAUDA –> Kunde	Aktion	Signalaustausch Kunde –> LAUDA via analog Verbindung
Abfrage der Vorlauftemperatur in C°	Sammelstörung (jeglich Störung am Gerät)		Sollwert Vorlauftemp.(Produkttemp.)
Abfrage der Produkttemperatur in C°			Sollwert Vorlaufdruckregelung (Wert 0 = off)
Abfrage des Vorlaufpumpendrucks in bar (Überdruck)			Produkttemperatur Ist Wert
			Vorlaufdruck Ist -Wert
Abfrage Betriebszustand (ein/standby)			Auswahl Start / Stopp

Signal list for BUS connection

Signalaustausch LAUDA –> Kunde via BUS Verbindung	Warn- und Störungsmeldungen LAUDA –> Kunde	Aktion	Signalaustausch Kunde –> LAUDA via BUS Verbindung
Abfrage der Vorlauftemperatur in C°			
Abfrage der Produkttemperatur in C°			
Abfrage des Vorlaufpumpendrucks in bar (Überdruck)			
Abfrage max Vorlaufdruck in bar (Überdruck)	Störungsmeldung Vorlaufdruck max.	Gerät aus	
Abfrage Sollwert Vorlaufdruckregelung in bar (Überdruck)			Sollwert Vorlaufdruckregelung (Wert 0 = off)
Abfrage des Niveaus im Ausdehnungsgefäß in %			
	Warnmeldung Niveau max. (F120/1)		
	Warnmeldung Niveau min. (F120/2)		
	Störungsmeldung Niveau max. (F120/3)	Heizung aus	
	Störungsmeldung Niveau min. (F110)	Gerät aus	
Abfrage des Temperatursollwerts (Vorlauftemp./Produkttemp.)			Sollwert Vorlauftemp.(Produkttemp.)
Abfrage der Pumpendrehzahl in %			Sollwert Pumpendrehzahl in % (Bereich 30% bis100%) (Achtung Vorlaufdruckregelung Pumpe steht über Pumpendrehzahlregelung)
	Störungsmeldung Temp max (F105)	Gerät aus	
Abfrage max Vorlauftemperatur in C° (eingestelltes Limit)			
Abfrage min Vorlauftemperatur in C° (eingestelltes Limit)			
Abfrage Delta T Begrenzung (zwischen Produkttemp und Vorlauftemp.)			Sollwert Delta T Begrenzung in K (zwischen Vorlauftemp. Und Produkttemp.)
Abfrage Stickstoffüberlagerungsdruck in bar (Überdruck)	Warnmeldung Stickstoffüberlagerungsdruck min.		
Abfrage der Regelungsart (Vorauftemp/Produkt)			Auswahl Regelungsart intern/extern)
Abfrage der Betriebsart (Füllmodus oder Betrieb)			
Abfrage Quelle Produkttemperaturvorgabe (PT 100 über Lemostecker, ext. analog, ext. seriell)			
Abfrage Betriebszustand (ein/standby)			Auswahl Start / Stopp
	Warnmeldung Verbindung Kunde --> LAUDA gestört		
	Sammelstörung (jeglich Störung am Gerät)	Gerät aus	
	Sammelwarnung (jegliche Warnung am Gerät)		

13.3 EC Declaration of Conformity

LAUDA

EG – Konformitätserklärung

EC Declaration of Conformity / Déclaration „CE" de Conformité / Declaración «CE» de conformidad

Hiermit erklären wir, dass das nachfolgend bezeichnete Produkt den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der nachstehend aufgeführten Richtlinien und Normen entspricht. Bei einer nicht mit uns abgestimmten Änderung des Produktes verliert diese Erklärung ihre Gültigkeit.

We declare herewith that the product described below conforms to the relevant basic safety and health requirements of the Directives listed below. Any modification of the product not approved by us renders this Declaration invalid.

Par la présente, nous déclarons que les produits désignés ci-dessous répondent aux critères de base relatifs à la sécurité et à la santé qui ont été définis dans les directives sous-indiquées. En cas de modification du produit sans notre consentement préalable, cette déclaration devient nulle.

Manifestamos en la presente, que el producto al que se refiere esta declaración está de acuerdo con los requisitos de seguridad y salud en las normas siguientes. En caso de modificación del producto sin nuestra afirmación anterior, esta declaración pierde su validación.

Prozeßkühlanlage / Process Cooling Unit / Groupe frigorifique de processus/Refrigerador de proceso

Art. Nr. Cat. No. No. de réf. N° del art.	**Typ** Type Type Tipo	**Serien-Nr** Serial-No Numéro N° de serie	**Spannung** Voltage Tension Tensión	**Frequenz** Frequency Fréquence Frecuencia	**Leistung** Power Consumption Puissance Potencia
LWP-556	KHS3560W	LWP-556-XX-XXXX	400 V	50 Hz	29,5 kW
LWP-557	KHS2190W	LWP-557-XX-XXXX	400 V	50 Hz	32,8 kW
LWP-656	KHS3560W	LWP-656-XX-XXXX	480 V	60 Hz	30,1 kW
LWP-657	KHS2190W	LWP-657-XX-XXXX	480 V	60 Hz	33,8 kW

EU-Richtlinien / EC Directives / Directives CEE / Directiva de CE

- Maschinenrichtlinie 2006/42/EG ; Directive 2006/42/EC relating to machinery ; Directive 2006/42/CE relatives aux machines ; Directiva sobre maquinería 2006/42/CE
- Druckgeräterichtlinie 2014/68/EU und gewähltes Modul gemäß Anhang III Modul H ; Pressure Equipment Directive 2014/68/EU and elected module according to Annex III Module H ; Directive sur les équipements sous pression 2014/68/EU et module sélectionné suivant le module annexe III-H

Notified body:	Bureau Veritas S.A. 67/71, boulevard du Château, 92200 Neuilly-sur-Seine, France
Code number of notified body:	0062
EC certificate of conformity applied:	CE-PED-H-LDA 001-14-DEU
Pressure Equipment Directive 2014/68/EU and selected module according to Annex II and III	Modul H

- EMV-Richtlinie 2014/30/EU ; EMC ; Electromagnetic Compatibility 2014/30/EU ; Directive sur la compatibilité électromagnétique 2014/30/EU ; Directiva de compatibilidad electro-magnética 2014/30/EU

Hinweis / Reference / Référence / Referencia :
Die Schutzziele der Niederspannungsrichtlinie 2014/35/EU wurden entsprechend Anhang I, 1.5.1 der Maschinenrichtlinie 2006/42/EG eingehalten. / The protection goals of the Low Voltage Directive 2014/35/EU have been met in accordance with Annex I, 1.5.1 of the Directive 2006/42/EC relating to machinery / Les objectifs de protection de la Directive Basse Tension 2014/35/EU ont été remplies conformément à l'annexe I, 1.5.1 de la Directive 2006/42/CE relatives aux machines / Los objetivos de protección de la Directiva de Baja Tensión 2014/35/EU se han cumplido de conformidad con el anexo I, 1.5.1 de la Directiva sobre maquinería 2006/42/CE.

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Dateiname: YLWP-556-557-656-657_2017_07_27_AD.doc

F-Gas-Verordnung / F-Gas-Regulation / F-Gaz-Règlement / F-Gas-Reglamento
• F-Gas-Verordnung 517/2014/EG Verordnung (EG) Nr. 842/2006 des Europäischen Parlaments und des Rates vom 17. Mai 2006 über bestimmte fluorierte Treibhausgase (Text von Bedeutung für den EWR) *(ABl. L 161 vom 14.6.2006, S. 1–11)*
• F-Gas-Regulation 517/2014/EC Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases (Text with EEA relevance) *(OJ L 161, 14.6.2006, p. 1–11)*
• F-Gaz-Règlement 517/2014/CE Règlement (CE) n o 842/2006 du Parlement européen et du Conseil du 17 mai 2006 relatif à certains gaz à effet de serre fluorés (Texte présentant de l'intérêt pour l'EEE) *(JO L 161 du 14.6.2006, p. 1–11)*
• F-Gas-Reglamento 517/2014/CE Reglamento (CE) n o 842/2006 del Parlamento Europeo y del Consejo, de 17 de mayo de 2006 , sobre determinados gases fluorados de efecto invernadero (Texto pertinente a efectos del EEE) *(DO L 161 de 14.6.2006, p. 1/11)*

Angewendete harmonisierte Normen, nationale Normen / Applicable harmonised standards, national standards/ Normes harmonisées appliquées, Normes nationales appliquées / Normas armonizadas utilizadas, Normas nacionales			
DIN EN ISO 13585:2012-10	DIN EN 13134:2000-12	DIN EN 9606-1:2013-12	DIN EN ISO 15607:2004-03
DIN EN ISO 15609-1 :2005-01	DIN EN ISO 15614-1:2012-06	DIN EN 378-1:2012-08	DIN EN 378-2:2012-08
DIN EN 378-3:2012-08	DIN EN 378-4:2012-08	DIN EN 61000-6-2:2006-03	DIN EN 61000-6-2 Ber 1:2011-06
DIN EN 61000-6-4:2011-09	DIN EN ISO 12100:2011-03	DIN EN ISO 12100 Ber 1 :2013-08	DIN EN ISO 13857:2008-06
DIN EN 349:2008-09	DIN EN 349 Ber 1:2009-01	DIN EN 60204-1:2007-06	DIN EN 60204-1/A1:2009-10
DIN EN 60204-1 Ber 1 :2010-05	DIN EN ISO 13849-1:2016-06	DIN EN ISO 13849-2 :2013-02	

Dokumentationsbevollmächtigter/Documentation agent/Documentation de l'agent/Documentación de Agente
Günther Andreas ; Email: andreas.guenther@lauda.de

LAUDA DR. R. WOBSER GMBH & CO. KG

Lauda-Königshofen, im Januar 2017

A. Dinger

Dr. Alexander Dinger
Leiter Qualitätsmanagement/
Director Quality Management

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