°LAUDA

LAUDA PLANT ENGINEERING

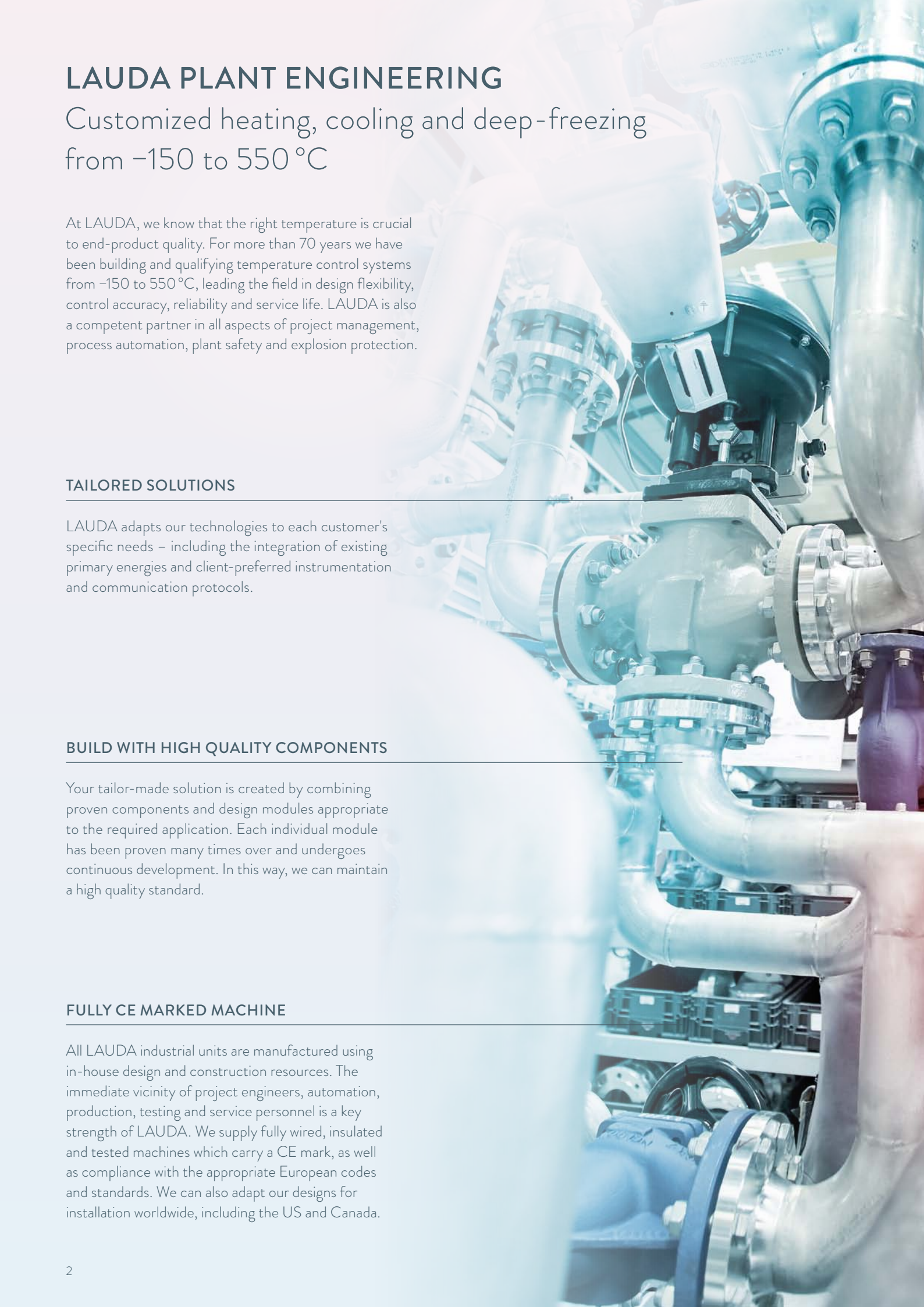
Customized solutions
from −150 to 550 °C

°FAHRENHEIT. °CELSIUS. °LAUDA.

LAUDA PLANT ENGINEERING

Customized heating, cooling and deep-freezing from –150 to 550 °C

At LAUDA, we know that the right temperature is crucial to end-product quality. For more than 70 years we have been building and qualifying temperature control systems from –150 to 550 °C, leading the field in design flexibility, control accuracy, reliability and service life. LAUDA is also a competent partner in all aspects of project management, process automation, plant safety and explosion protection.



TAILORED SOLUTIONS

LAUDA adapts our technologies to each customer's specific needs – including the integration of existing primary energies and client-preferred instrumentation and communication protocols.

BUILD WITH HIGH QUALITY COMPONENTS

Your tailor-made solution is created by combining proven components and design modules appropriate to the required application. Each individual module has been proven many times over and undergoes continuous development. In this way, we can maintain a high quality standard.

FULLY CE MARKED MACHINE

All LAUDA industrial units are manufactured using in-house design and construction resources. The immediate vicinity of project engineers, automation, production, testing and service personnel is a key strength of LAUDA. We supply fully wired, insulated and tested machines which carry a CE mark, as well as compliance with the appropriate European codes and standards. We can also adapt our designs for installation worldwide, including the US and Canada.

COMPACT DESIGN

Space is a critical resource on any project. From the outset, LAUDA engages with plant layout considerations to deliver the most compact unit possible. We can design for limited maintenance access and offer multiple-loop skid, stackable or containerised configurations.

FACTORY ACCEPTANCE TEST (FAT)

In our test beds we can connect the units to a variety of primary energies, such as steam, brine, thermal oil and liquid nitrogen. In each case, the temperatures and pressures of these services can be adapted to the actual client site conditions, which ensures the most authentic testing conditions. Each unit is operated over its full working range to demonstrate its leak tightness, with all control functions and safety devices fully tested prior to shipment.

QUICK TO COMMISSIONING AND RELIABLE

With LAUDA, all units are supplied to site fully functional and ready to go, so they can be put into service immediately, thereby avoiding costly commissioning delays. This is especially true where control functions are provided by the client, as these can be incorporated into the FAT, allowing all communication interfaces to be verified pre-commissioning. As we test using site conditions as far as is possible, the risk of unexpected variations in performance during commissioning are minimised.

HIGHLY ACCURATE TEMPERATURE CONTROL (TO ±0.1K)

For applications demanding the highest accuracy – such as pharma/biopharma – LAUDA designs to meet the required control performance before shipment. We also offer GAMP5 / Audit Trail / 21 CFR Part 11 compliant solutions for Computer System Validation.

LAUDA UNIT TYPES
Overview

HEAT TRANSFER UNITS

−35 °C — 470 °C

LAUDA heat transfer units combine an electric heater module with at least up to one additional heat exchanger (cooler). The heat transfer fluid – thermal oil, water or water/glycol – is selected based on the required temperature range. Combined with a process cooling unit, the system covers an extended heating and cooling range.

Series

ITH	ITH Ex

PROCESS COOLING UNITS

−100 °C — 250 °C

Active refrigeration systems for temperature control of consumer circuits, available in single-stage or dual-circuit cascade configuration, water- or air-cooled. Choose between a ›pure‹ refrigeration system (DV), a version with integrated heat carrier circuit and pump (SUK), or a Kryoheater (KH) for wide temperature ranges. All versions are available with natural refrigerants for F-Gas compliance.

Series

SUK	SUK Ex
DV	DV Ex
KH	KH Ex

SECONDARY CIRCUIT UNITS

−150 °C 550 °C

These units tap into existing primary energy supplied by the customer – steam, thermal oil, cooling water or brine – and automatically extract the heating or cooling energy required, either via heat exchangers or by direct injection. Kryopac units (KP) extend coverage to ultra-low temperatures using liquid nitrogen technology.

Series

TR	TR Ex
KP	KP Ex

EXPLOSION-PROOF UNITS (EX)

All LAUDA unit types – heating and cooling alike – are available in ATEX-certified versions for installation in Ex Zone 1 or Zone 2 (Directive 2014/34/EC).

LAUDA PLANT ENGINEERING

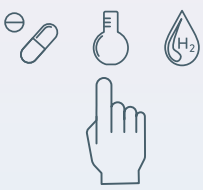
Expert advice from LAUDA in a complex process

Fundamental component – competent consultation
At LAUDA, you work with specialists from day one. Drawing on decades of project experience, our recommendations are always application-specific. Our project team supports design reviews and HAZOP (Hazard and Operability Study) discussions, integrates equipment into your facility's control architecture, and provides calculations for safety relief devices and safety-critical interlocks. We are well-versed in detailed RFQ package compliance and web-portal-based

A LAUDA engineer accompanies you every step of the way ...

CONSULTING SERVICES

1. SPECIFY THE APPLICATION



Discuss your temperature control requirements with your local LAUDA sales representative.

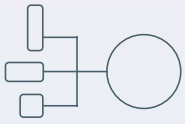
2. DEFINE THE HEAT TRANSFER LIQUID

Which temperature ranges must be covered?

documentation systems. Competent consultancy is the foundation of successful implementation, on-time delivery and customer satisfaction.

... to an individual solution, right up to start-up.

3. DETERMINE THE BEST DESIGN CONCEPT

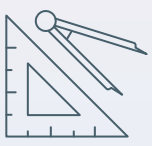


Consider client specifications and available primary energies. Evaluate future needs and space limitations.

4. IDENTIFY THE MODULES

Field-tested individual system modules are configured to provide an adaptable modular system.

5. CONFIGURE THE UNIT



The tailor-made units undergo detailed design and construction.

SPECIFYING THE APPLICATION

Defining the needs of our clients

Precise temperature control begins with a thorough understanding of the process equipment to be controlled. Key parameters include the mass, geometry and available heat transfer surface of the consumer, as these directly influence the rate of energy transfer.

The required temperature range and any time-critical step changes must be clearly defined. Together with the consumer's overall heat transfer coefficient, these determine the power requirements – a useful rule of thumb: 1 kW per 10 litres of process material.

The consumer's pressure rating must be considered when selecting the heat carrier fluid. If operating temperatures exceed the fluid's boiling point, pressurised nitrogen must be applied; the combined system pressure must comply with the consumer's limits.

LAUDA can achieve temperature control accuracies of ±0.1 K when required, though this demands additional design measures and must be specified upfront.

Automation can be implemented using LAUDA's own PID controller, a Siemens S7-1500 PLC, or a client-preferred control system. Client controls can be integrated directly into the Factory Acceptance Test (FAT), minimising commissioning risk and time on site.

Finally, the installation location and any preferred materials or components must be specified. LAUDA can supply ATEX-rated units for hazardous areas (Zone 1 or 2) and adapt designs to client-specific requirements worldwide.

Research & development labs

Automotive industry

Biotechnology

Chemical industry

Pharmaceutical industry

Semi-conductor industry

Aerospace industry

Medical technology

Hydrogen

Mechanical & system engineering

Printing industry

Food


2"-4-VW-A13-4973

DEFINING THE HEAT TRANSFER LIQUID

Making the correct choice for stable performance

Heat transfer fluids carry energy between the LAUDA unit and the consumer. A higher circulating flow rate (at constant power) reduces the temperature difference across the consumer and improves control accuracy. Each fluid must be evaluated for maximum operating temperature, cold-state viscosity and vapour pressure.

Organic fluids must be kept away from oxygen at elevated temperatures to prevent degradation. At low temperatures, water formation is a risk. LAUDA thermal oil systems therefore include an expansion vessel with nitrogen overlay blanketing to prevent degradation or moisture ingress.

Additional selection criteria include compatibility with plant materials and process substances, flammability, toxicity, shelf life and local regulations. The economical aspect should, of course, also not be neglected. The range of technical heat transfer fluids varies widely and is being continually expanded. LAUDA will assist in making the right selection.

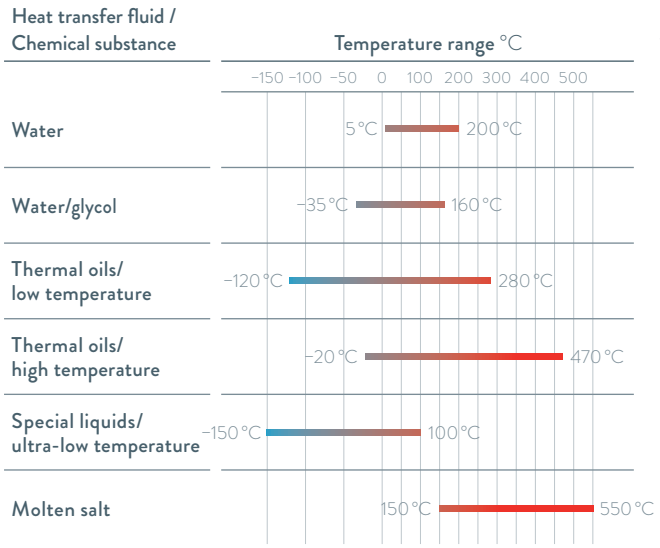
LAUDA systems are closed, pressurised units. Nitrogen pressurisation and inertisation extend the usable temperature range significantly beyond what is possible with open systems.

Water (specific heat capacity ~4.2 kJ/kgK) is the preferred medium where possible. Adding glycol extends the range down to −35 °C. Organic heat transfer fluids or silicone oils cover −120 to 470 °C; fluorine-based inert liquids are used where residue-free evaporation is essential; molten salts are required above 470 °C.

Tips on the use of a suitable heat transfer liquid

Ideal criteria for optimum heat transfer:

- High boiling point or boiling range
- Low solidification temperature
- Good heat transfer properties
- Low viscosity in the temperature range employed
- Good thermal stability
- Low fire hazard (high flash and fire points)
- Low tendency to corrosion when in contact with the plant-equipment materials
- Low sensitivity to extraneous materials (e.g. oxygen)
- Non-toxic with no obnoxious odors



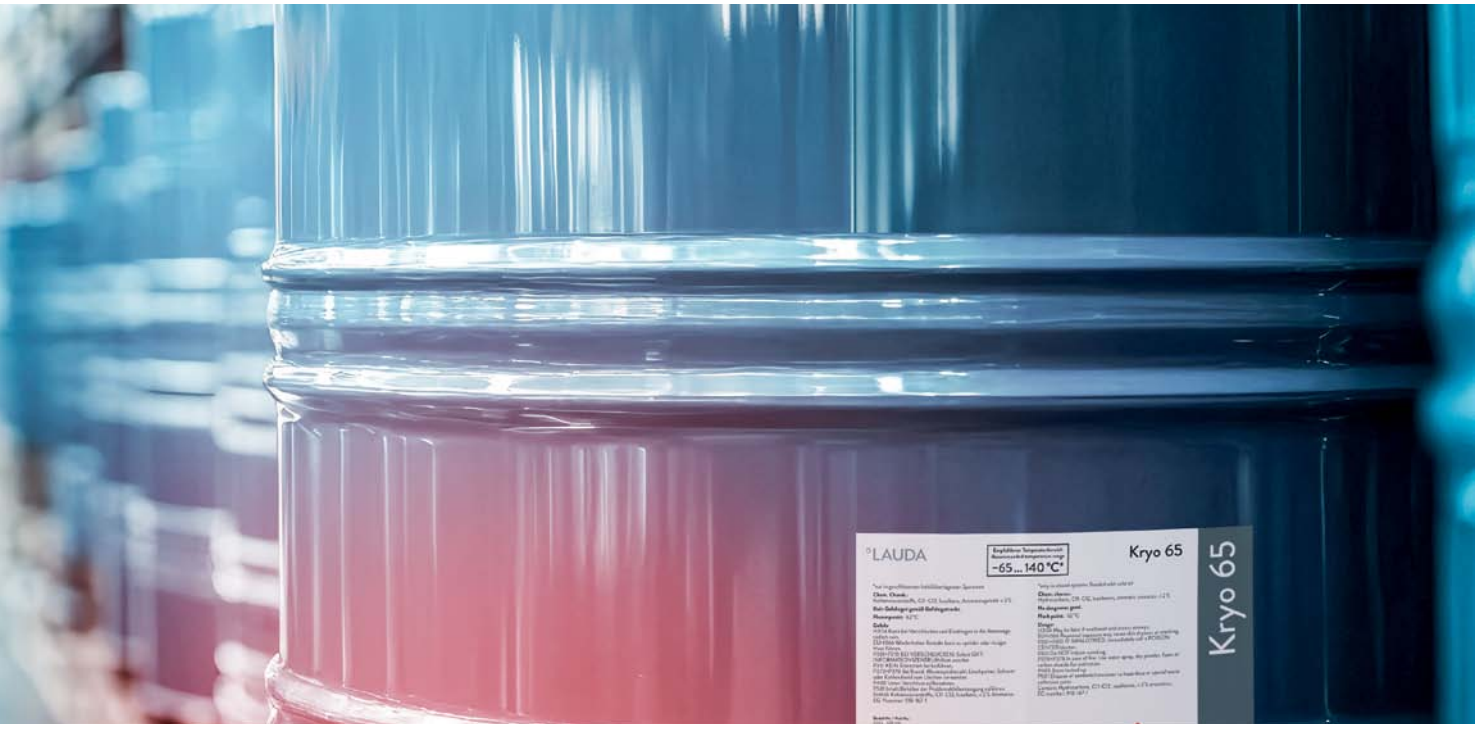
The following standards provide information:

- DIN 4754
  Heat transfer installations working with organic heat transfer fluids - Safety requirements, test
- DIN 51522
  Heat transfer fluids Q - Specifications, test
- DIN 51529 Testing of mineral oils and related products - Test and assessment of used heat carrier media
- VDI 3033
  Heat-transfer systems with organic heat-transfer media - Operation, maintenance and repair

Safety regulations

There are special safety regulations for different heat transfer fluids. The specifications of a heat transfer fluid are described in the so-called safety data sheets which are put at your disposal by LAUDA on request.

LAUDA will recommend suitable heat transfer fluids on request.



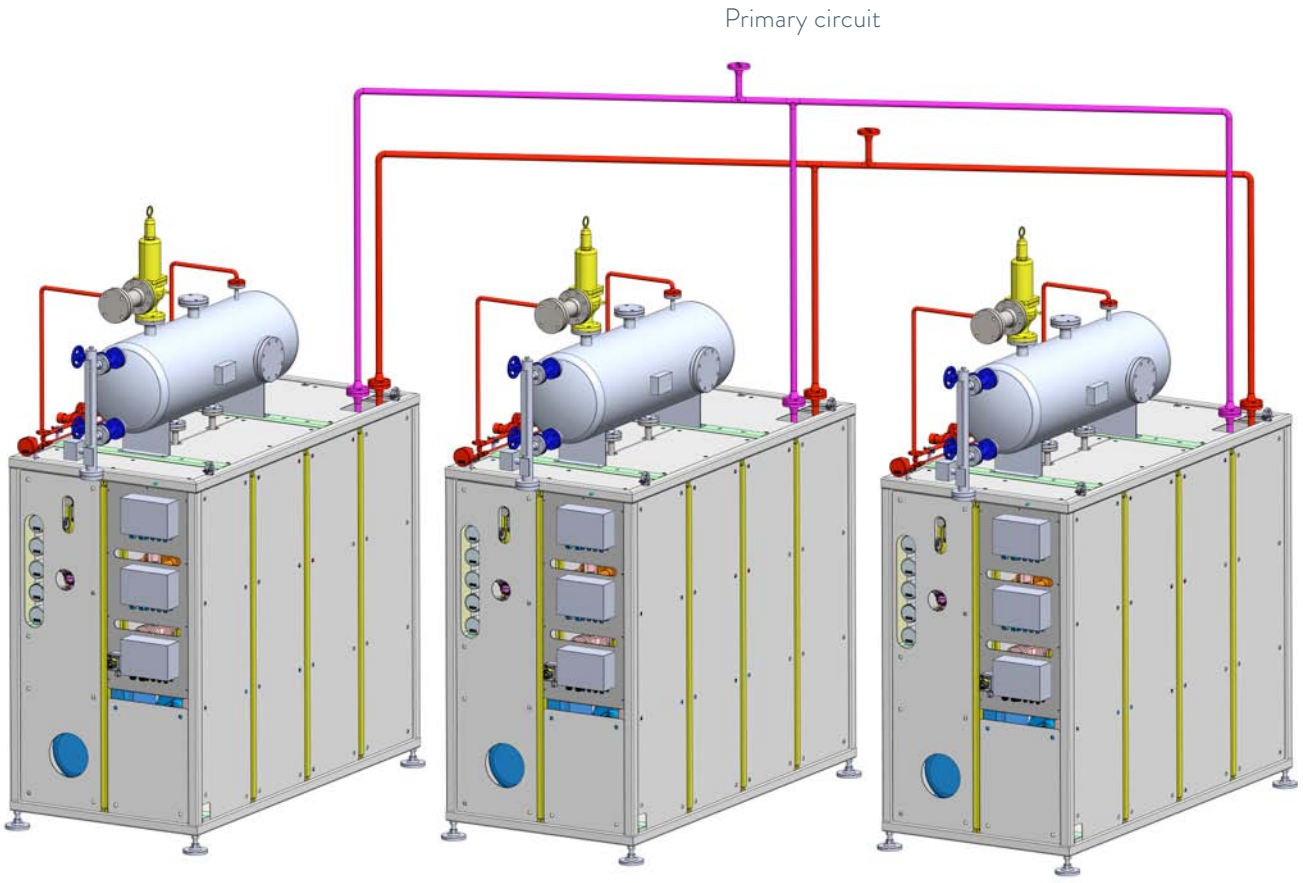
DETERMINING THE BEST DESIGN CONCEPT

Applying more than 70 years of know-how

Selecting the right unit type begins with the minimum operating temperature and the primary energy sources provided by the customer – such as steam, thermal oil, cooling water, or brine. If no suitable primary cooling energy is available, a process cooling unit is required; without primary heating energy above the maximum operating temperature, an electrically heated heat transfer unit is needed. Where suitable primary energies exist, a secondary circuit unit is typically the optimum choice. Hybrid combinations of unit types are often the best solution.

Where multiple units are needed, a centralised or decentralised approach must be evaluated – for example, one central cooling unit serving several smaller temperature control units versus individual units per consumer. Site layout and space constraints are key factors in this decision.

It is important therefore to consult LAUDA early in the conceptual design phase, so that such possibilities can be fully explored.



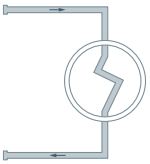

Common buffer tank
Central process cooling unit
Compact heat transfer unit

IDENTIFYING THE MODULES

Realizing the selected concept

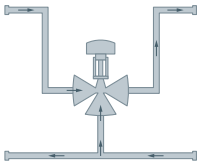
With more than 70 years of experience, LAUDA has developed a comprehensive range of field-proven individual modules centred around the major equipment components illustrated below. These modules contain various additional components designed to protect against excessive temperatures and/or pressures arising during dynamic temperature control operations, which could otherwise significantly limit the working lifetime of both the components and the heat transfer liquid(s). They are combined at the design stage to create systems which are precisely matched to each client's unique requirements but at the same time benefit from our longstanding know-how in delivering reliably repeatable temperature control to our clients.

BASIC MODULES



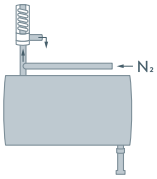
External application
The control result depends on the object to be controlled and is taken into account during the planning phase.

Controller
Temperature control means avoiding fluctuations and controlling temperature processes.

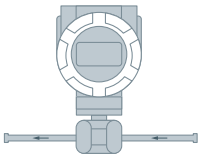


Three-way valve
Where steady regulation is particularly required, the three-way valve is capable of mixing two flows exactly.

Pump
Pumps are responsible for circulation of the heat transfer fluid.

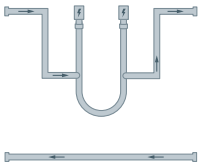


Expansion vessel
Expansion vessels can be atmospherically open, pressure blanketed, inerted or designed as a membrane vessel.

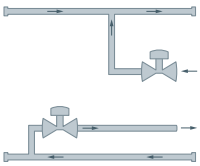


Volumetric flow controllers
These are responsible for flow control.

EXPANSION MODULES



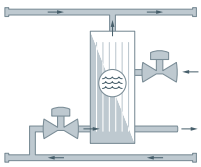
Electric heaters
Electric heaters are used where heating with steam or other media is not possible.



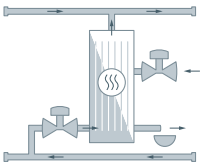
Direct media coupling
Coupling without a heat exchanger can be energetically advantageous if the same medium is used in the primary system.

Heat exchangers
Heat exchangers are always used when heating or cooling energy of various media is to be used.

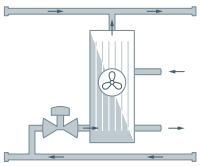
Versions:



Heating or cooling with fluid media

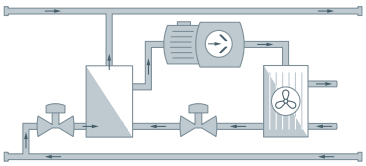


Heating with steam

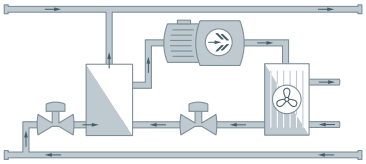


Heating or cooling with air

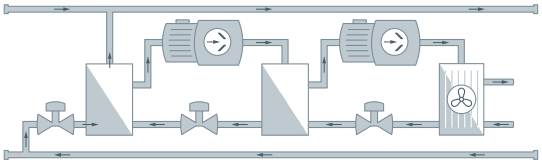
AIR-COOLED REFRIGERATION MODULES



Single stage compressor
Single stage refrigeration system with air-cooled condenser for generating temperatures from –35 to 20 °C.

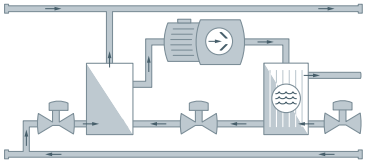


Two stage compressor
Two stage refrigeration system with air-cooled condenser for generating temperatures from –50 to 20 °C

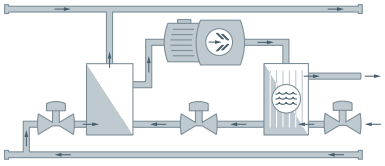


Two stage cascade refrigeration system
Two stage cascade refrigeration system with air-cooled condenser for generating temperatures from –100 to 20 °C

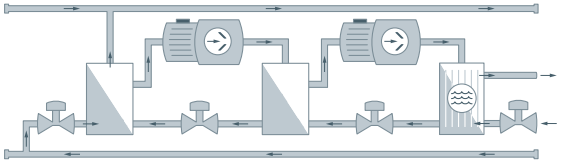
WATER-COOLED REFRIGERATION MODULES



Single stage compressor
Single stage refrigeration system with water-cooled condenser for generating temperatures from –35 to 20 °C



Two stage compressor
Two stage refrigeration system with water-cooled condenser for generating temperatures from –50 to 20 °C

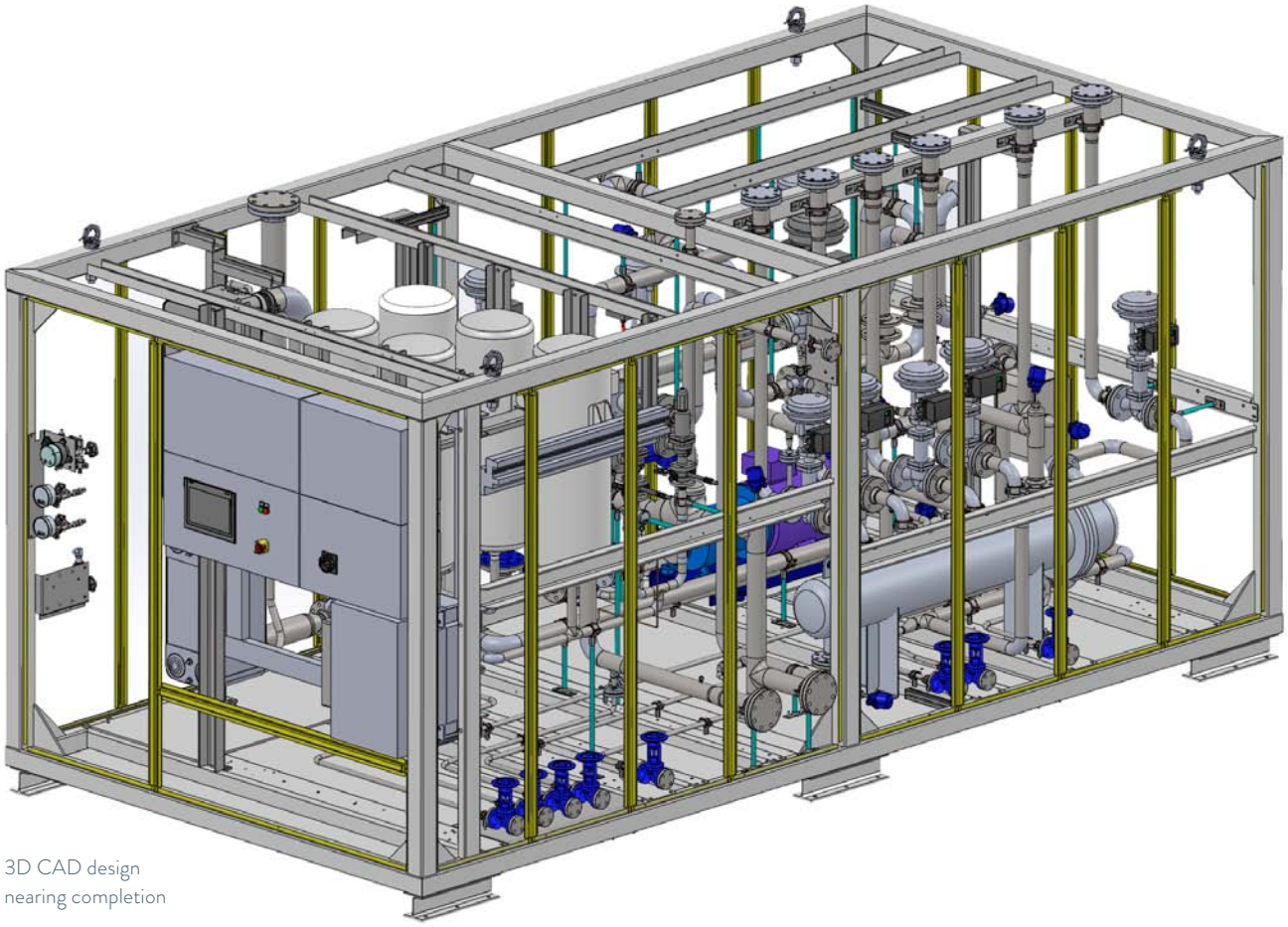


Two stage cascade refrigeration system
Two stage cascade refrigeration system with water-cooled condenser for generating temperatures of –100 to 20 °C

CONFIGURATION OF THE UNIT

From design to construction

3D CAD design enables integration of the LAUDA unit into the overall project design at the earliest opportunity. Ergonomic design studies can also be performed upon request, to confirm all maintenance access considerations have been fully met prior to construction.



3D CAD design
nearing completion

Construction begins once design is frozen

Pressure testing after mechanical completion

LAUDA design flexibility permits overall dimension adjustments to suit any space limitations which may arise. Interface pipework connections can also be relocated to facilitate simplified integration with existing (or preferred) pipework routings.

Completed unit ready for delivery

Performance testing during FAT

Insulation applied following successful testing

TYPICAL APPLICATIONS: BIOPHARMACEUTICALS

Temperature control of Single-Use Mixers (SUMs) and bioreactors, up to 30,000 L capacity

Device overview – TR Unit

Powerful temperature control unit, for the highly accurate control of pharma/biopharma processes, without the need to employ refrigeration technology.

- Heating using steam, using robust shell and tube heat exchanger
- Cooling via direct injection coupling, using existing primary energies for high thermal efficiency
- Product temperature control to within ±0.1 K
- Operation up to 120 °C, for sterilisation of bioreactors
- OPC Unified Architecture (OPC UA) communication interface to client DCS
- Powerful condensate return pump (6 m + lift)
- Compact design to minimise footprint
- Robust stainless steel frame and outer panelling
- Full function Factory Acceptance Test (FAT) prior to delivery, with unit certified leak-free over full working range
- Fully insulated and ready to use day-one

All components are manufactured, tested and certified to the following design standards:

- 2014/68/EU (Pressure Equipment Directive)
- AD2000 (Merkblätter Pressure Equipment)
- 2006/42/EC (Machinery Directive)
- 2014/35/EU (Low Voltage Directive)
- 2014/30/EU (EMC Directive)
- DIN EN 60204-1 (Safety and electrical equipment
- of machinery)

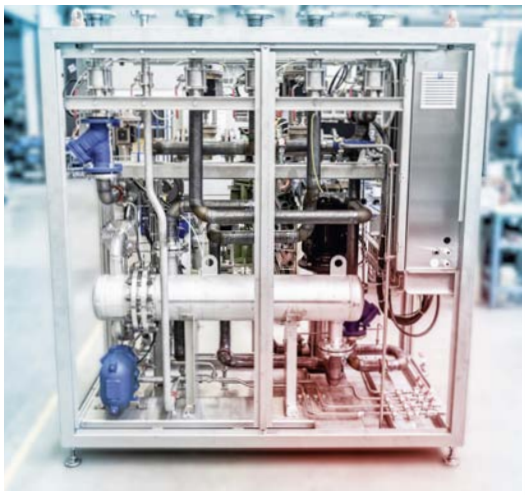
Technical data

Selected system examples

Unit type	Working temperature range °C	Temperature stability ±K	Heater power max. kW	Cooling output at 20 °C kW	Nominal flow rate m^3/h	Protection level	Power consumption kW	Current consumption A	Dimensions (W x D x H) mm	Weight (empty) kg	Part number
TR Unit											
TR 250 HKi	−20 ... 120	0.1	30	50	4	IP54	3.4	5.4	1,000 × 1,800 × 2,170	800	LSI 100723
TR 400 HKi	−20 ... 120	0.1	200	250	20	IP54	6.2	9.9	1,000 × 1,800 × 2,170	1,000	LSI 100724
TR 600 HKi	−20 ... 120	0.1	250	250	30	IP54	8.4	13.5	1,000 × 1,800 × 2,170	1,200	LSI 100725

More powerful units can be provided on request and additional options can be selected, such as:

- Electrical heating in lieu of steam
- Incorporation of client-specific components
- GAMP 5/21CFR Part 11 (Audit Trail) compliance module
- US version
- Additional communication protocols



TYPICAL APPLICATION: HYDROGEN REFUELING STATIONS

Temperature control of hydrogen dispensers

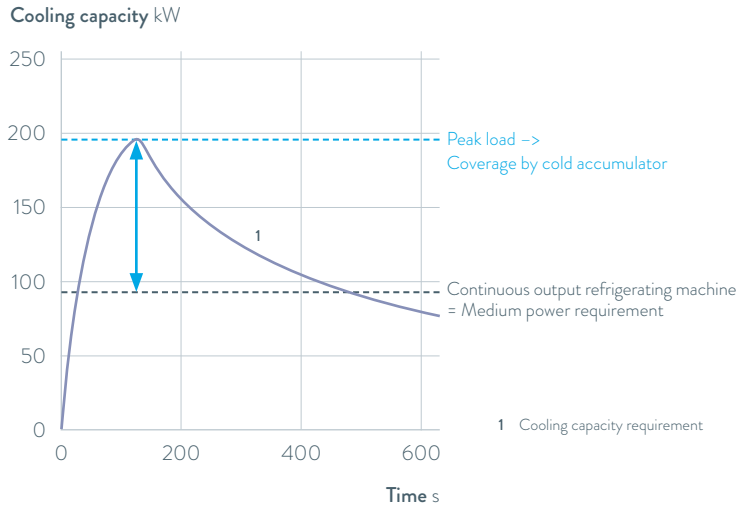
−40 °C — 50 °C

Device overview – SUK Chiller units

Indirect chilling unit for H_2 refuelling per SAE J2601, with integrated buffer tank technology.

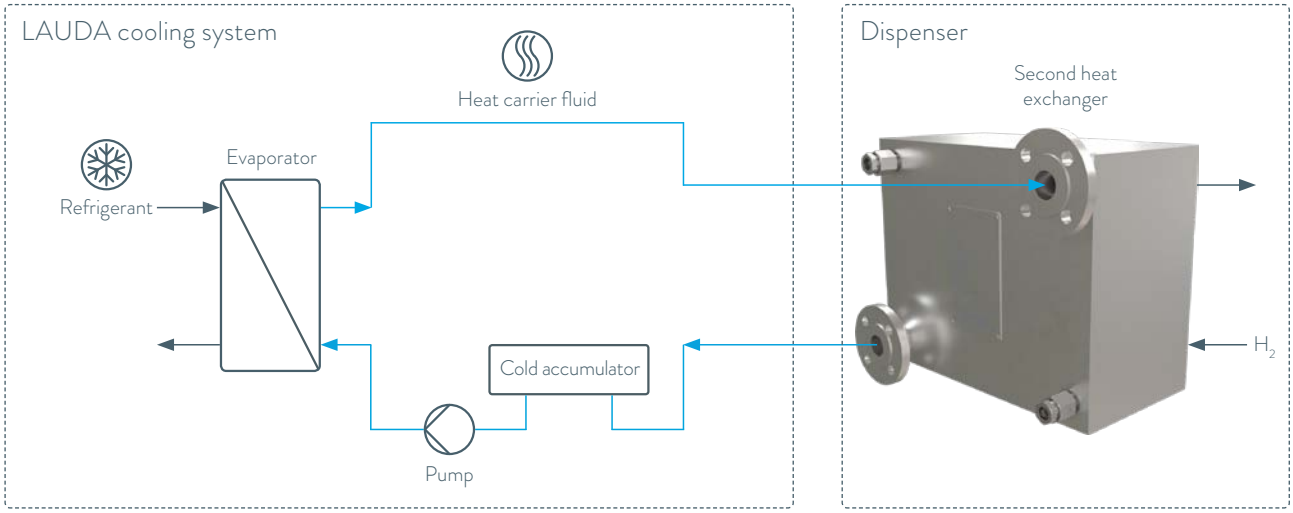
- Refueling rates up to 300g/s (Peak) / 150g/s (Average)
- Temperature categories T10, T30, T40; Pressure classes H35, H70
- Compact design to minimise footprint
- Can be installed up to 50 m from dispenser for optimum forecourt layout
- Dispenser heat exchanger can be supplied in combination with chiller for guaranteed hydraulic performance
- Natural refrigerants (GWP <7), according to European F-Gas Regulation
- Rugged Design for outdoor installation (C4 protection class available for marine environment installations)
- Quiet operation (approx. 75 dB(A) @ 1 m)
- On-board PLC with control interface to dispenser controller
- Remote diagnosis module for on-line technical interface with unit
- Full function factory acceptance test (FAT) prior to delivery, with unit certified leak-free over full working range
- Unit delivered fully insulated and ready to use day one
- ATEX designs available

TYPICAL H_2 REFUELING PROCESS



The integral buffer tank absorbs peak load during refuelling and regenerates rapidly for back-to-back operation – enabling a more compact unit with reduced electrical power consumption.

SCHEMATIC ILLUSTRATION – INDIRECT COOLING SYSTEM WITH BUFFER TANK



Indirect cooling system:
Evaporator cools using refrigerant. Heat carrier circuit cools hydrogen H_2.

Technical data

Selected system examples

Unit type	Working temperature range °C	Peak cooling power kW	Average cooling power kW	Refueling protocol	Nominal flow rate m^3/h	Refrigerant	Protection level	Power consumption kW	Current consumption A	Dimensions (W x D x H) mm	Weight (empty) kg	Part number
SUK/DV Chiller unit												
SUK 350 LN	−35 ... 40	35	22	T30	5	R1270	IP 54	38	62	1,500 × 2,690 × 2,820	1,700	-
SUK 400 LNII	−50 ... 50	90	40	T40	5	R1270/ R170	IP 54	78	132	1,400 × 2,980 × 2,700	2,300	LSI 100901
SUK 400 LNII with CO_2	−45 ... −20	100	30/ 60**	T40/ T20	6	R290/ R744	IP 54	88	155	1.400 × 2.980 × 2.700	~ 2,700 kg	-
DV 400 LNII*	−50 ... 50	150	50	T40	up to 10	R1270/ R170	IP 54	95	160	1,400 × 2,800 × 2,930	1,900	LSI 100855

* for heavy-duty application, multiple DV chillers can be combined with a common pump station to deliver H_2 charging rates of up to 300g/s for refueling to T40 protocol

** 30 kW at −42 °C outlet temperature; 60 kW at −25 °C outlet temperature

System for heavy duty application

TYPICAL APPLICATIONS: AUTOMOTIVE

LAUDA Process cooling units
for temperature control of parts and components

−40 °C 130 °C

Device overview – SUK chiller

LAUDA heating and cooling systems for the automotive industry combine efficiency, precision and flexibility across a typical working range of −40 to 130 °C. Multiple test specimens can be operated simultaneously at identical temperature profiles, with individually adjustable volume flow rates per circuit. The systems are designed for seamless integration and meet the highest control accuracy requirements.

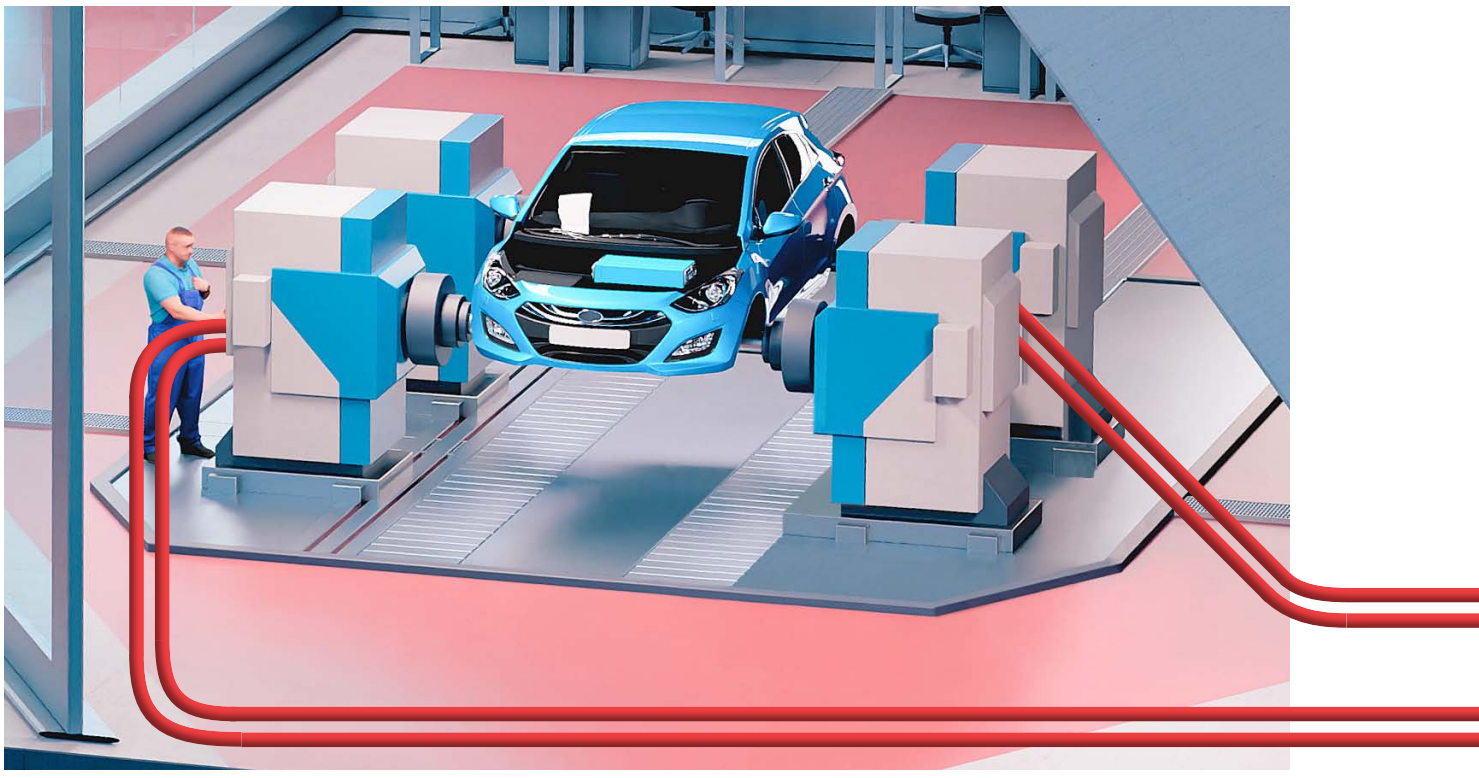
General performance features

- Ambient temperature range: 5 to 40 °C
- Working temperature: −40 to 130 °C
- Heat transfer medium: water/ethylene glycol
- Max. pump pressure: 6 bar
- Available cooling output:
  8 - 35 kW at −40 °C flow temperature,
  15 - 60 kW at −30 °C flow temperature
- Temperature control accuracy: ±0.5 °C
- Cooling water: max. 20 °C, min. 2 bar pressure difference
- Profinet interface

Optional

- Volume flow control up to 10 circuits possible (control accuracy: ±0.2 L/min)
- Automatic filling and emptying of test specimens
- Pressure monitoring/pressure control
- Pressure test for test item
- Non-ferrous metal-free
- Other interfaces (Ethernet, Modbus, ...)
- Quick couplings
- Natural refrigerants
- Oil as heat transfer medium
- Low-temperature version down to −50 °C brine

Automotive production requires extensive component testing



Technical data

Selected system examples

Unit type	Working temperature range °C	Cooling power kW	Heating power kW	Number of flow channels	External flow rate L/min	Flow control accuracy	Protection level	Power consumption kW	Current consumption A	Dimensions (W x D x H) mm	Weight (empty) kg	Part number
SUK Unit												
SUK 400 W	−40 ... 130	30 @ −40 °C	18	1	1 - 30	±0.2	IP54	85.8	141.8	1,180 × 2,700 × 2,800	1,900	LSI 100624
2 SUK 400 W	−40 ... 130	30 @ −30 °C	18	2	1 - 30	±0.2	IP54	75.0	115.3	1,180 × 2,900 × 2,800	2,100	LSI 100963
SUK 400 WHe	−40 ... 120	30 @ −40 °C	25	3	1 - 40	±0.2	IP54	80.0	124.0	1,260 × 3,660 × 2,100	2,680	LSI 100902

Single-circuit unit

Twin-circuit unit

Triple-circuit unit

TYPICAL APPLICATIONS: CHEMISTRY & PHARMA

Temperature control of industrial reactor systems

Device overview – TR Unit

- Powerful temperature control units (TCUs) for large scale production facilities
- Heating, cooling, chilling functions incorporating client primary energies
- Rapid control response to handle exothermic/ endothermic processes
- Highly accurate control, with ramp functionality for crystallization processes
- Fully-sealed, durably technically tight solutions for hot oil applications
- Low electrical power consumption
- Client preferred instruments and communication protocols can be provided
- Designs can be adapted in response to client HAZOP, building layout reviews and ergonomic design studies
- Controls can be provided by LAUDA or by client
- Temperature control units can be supplied with on-board or de-mounted controls
- In case of control by client, remote I/O (RIO) panels will be supplied in lieu of control panel
- US compliant versions available on request

Typical chemical production hall

Technical data

Selected system examples

Unit type	Working temperature range °C	Heating power kW	Cooling power kW	Chilling power kW	Nominal flow rate m³/h	Temperature control accuracy	Protection level	ATEX classification	Power consumption kW	Current consumption A	Dimensions (W x D x H) mm	Weight (empty) kg	Part number
TR Unit													
TR 400 HK Ex	20 ... 230	200 (steam)	180 (water)	-	6	±0.5	IP54	II 3G IIB T2	21	28.2	1,200 × 2,400 × 2,000	2,000	LSI 100956
TR 600 HK Ex	20 ... 230	200 (steam)	180 (water)	-	29	±0.5	IP54	II 3G IIB T2	21	28.2	1,200 × 2,400 × 2,000	2,000	LSI 100958
TR 600 HKKT Ex	−90 ... 155	180 (hot oil)	145 (glycol)	100 (LN_2)	30	±1.0	IP54	II 3G IIB T2	22	40.5	2,700 × 5,500 × 2,650	5,500	LSI 101043

Operating temperature range can be expanded within range −140 to 470 °C if suitable primary energies are available.
More powerful units can be provided (1 MW+).
Electric heaters can be used in lieu of, or in combination with steam.
Solutions available for ATEX zone 1, zone 2 or non-Ex locations.

ATEX unit
using client controls

ATEX unit
with LAUDA
controls

FACTORY ACCEPTANCE TESTING (FAT)

Our performance demonstration to you

Our dedicated test bed engineers put every industrial machine through a rigorous testing programme, designed to ensure that every machine leaves our factory fully functional and ready to use.

Where primary energies are involved, these are connected and then adjusted to match the precise conditions that exist at the customer site, so that the test results achieved are a valid representation of the expected performance on site. Where the units are controlled directly by customer software, this is used in our testing areas whenever possible, so that all control interfaces can be checked prior to commissioning.

As we cycle the equipment over its full working temperature range several times, we can be sure of a leak-tight result and can fully insulate our units without risk. All functions and safety interlocks are demonstrated, which allows us to CE mark our units as complete machines. Our world class FAT testing ensures that our units can be quickly put to work once delivered.

Our technical advantages when testing your system:

- Thermal oil closed-loop system: for testing secondary circuit units in the range of −30 to 140 °C
- Water-glycol closed-loop system: for testing secondary circuit units in the range of −30 to 120 °C
- Steam generator: for testing secondary circuit units up to 180 °C
- Liquid nitrogen tank: for comprehensive testing of Kryopac systems with an injection temperature of −196 °C
- Load systems: for simulating thermal loads up to 150 kW to test the performance of the process cooling units
- Heat transfer units: can be tested to 430 °C


°LAUDA
°LAUDA

LAUDA Heat transfer units

Technical data systems examples

Unit type	Heat carrier fluid	Working temperature °C	Pump flow rate m³/hr	Heater power kW	Cooling	Dimensions (W x D x H) min./max. mm
LAUDA Heat transfer units with thermal oil						
ITH 150	Thermal oil	max. 470	0.5 ... 2	3 ... 6	via heat exchanger*	500 × 800 × 1,000 600 × 1,300 × 1,400
ITH 250	Thermal oil	max. 470	2 ... 4	9 ... 12	via heat exchanger*	500 × 1,000 × 1,200 600 × 1,400 × 1,400
ITH 350	Thermal oil	max. 470	4 ... 10	18 ... 50	via heat exchanger*	500 × 1,000 × 1,500 800 × 1,500 × 1,500
ITH 400	Thermal oil	max. 470	10 ... 30	60 ... 100	via heat exchanger*	600 × 1,500 × 1,500 1,000 × 1,500 × 1,900
ITH 600	Thermal oil	max. 470	30 ... 80	120 ... 500	via heat exchanger*	1,000 × 1,500 × 1,900 1,300 × 1,900 × 2,000
ITH 1000	Thermal oil	max. 470	90 ... 100	600 ... 1,000	via heat exchanger*	1,500 × 4,500 × 2,500 2,000 × 5,000 × 3,000

* Connection to primary energy sources provided by the customer

As there are many possible variables that can affect price, a technical questionnaire must first be completed with your LAUDA sales representative before a formal quotation can be provided.

ATEX versions can be provided for Zone 1 & Zone 2 installation.
Cooling can be achieved using water, brine or air-cooled heat exchangers.

Note: More powerful versions available on request.

LAUDA Process cooling units

Technical data systems examples

Unit type	Heat carrier fluid	Working temperature °C	Pump flow rate m³/hr	Heater power kW	Cooling output kW								Dimensions (W x D x H) min./max. mm
					single-stage compressor				two-stage compressor	two-stage cascade			
					@20 °C	@0 °C	@–20 °C	@–40 °C	@–50 °C	@–60 °C	@–70 °C	@–80 °C	
LAUDA Process cooling units including pump and heat carrier circuit													
SUK 150 W SUK 150 L*	Water, water/glycol, thermal oil, special liquids	–40 ... 150	0.5 ... 2	up to 9	up to 10	up to 5	up to 3	up to 1	-	-	-	-	400×800×1,000 500×1,000×2,750
SUK 250 W SUK 250 L*	Water, water/glycol, thermal oil, special liquids	–50 ... 150	2 ... 6	up to 18	up to 20	up to 15	up to 6	up to 2	up to 1	-	-	-	500×1,000×1,500 600×1,500×2,750
SUK 350 W SUK 350 L*	Water, water/glycol, thermal oil, special liquids	–70 ... 150	2 ... 20	up to 50	up to 50	up to 35	up to 18	up to 7	up to 4	up to 3	up to 2	up to 0.5	800×1,700×1,500 1,500×2,700×3,150
SUK 400 W SUK 400 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 150	4 ... 30	up to 60	up to 150	up to 120	up to 60	up to 45	up to 35	up to 25	up to 10	up to 5	1,000×1,500×1,900 1,600×3,000×3,250
SUK 600 W SUK 600 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 150	5 ... 50	up to 120	up to 300	up to 240	up to 120	up to 90	up to 70	up to 50	up to 20	up to 10	1,500×2,200×2,000 2,000×3,500×3,250
SUK 1000 W SUK 1000 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 150	10 ... 80	up to 240	up to 400	up to 300	up to 180	up to 120	up to 90	up to 70	up to 35	up to 20	1,500×2,200×2,000 2,000×3,500×3,250
LAUDA Process cooling units excluding pump and heat carrier circuit													
DV 150 W DV 150 L*	Water, water/glycol, thermal oil, special liquids	–40 ... 20	-	-	up to 10	up to 5	up to 3	up to 1	-	-	-	-	400×800×1,000 500×1,000×2,750
DV 250 W DV 250 L*	Water, water/glycol, thermal oil, special liquids	–50 ... 20	-	-	up to 20	up to 15	up to 6	up to 2	up to 1	-	-	-	500×1,000×1,500 600×1,500×2,750
DV 350 W DV 350 L*	Water, water/glycol, thermal oil, special liquids	–70 ... 20	-	-	up to 50	up to 35	up to 18	up to 7	up to 4	up to 3	up to 2	up to 0.5	800×1,700×1,500 1,500×2,700×3,150
DV 400 W DV 400 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 20	-	-	up to 150	up to 120	up to 60	up to 45	up to 35	up to 25	up to 10	up to 5	1,000×1,500×1,900 1,600×3,000×3,250
DV 600 W DV 600 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 20	-	-	up to 300	up to 240	up to 120	up to 90	up to 70	up to 50	up to 20	up to 10	1,500×2,200×2,000 2,000×3,500×3,250
DV 1000 W DV 1000 L*	Water, water/glycol, thermal oil, special liquids	–100 ... 20	-	-	up to 400	up to 300	up to 180	up to 120	up to 90	up to 70	up to 35	up to 20	1,500×2,200×2,000 2,000×3,500×3,250
LAUDA Process cooling units for wide operating temperature range, including pump and heat carrier circuit													
KH 150 W KH 150 L*	Thermal oil, special liquids	–40 ... 250	0.5 ... 2	up to 9	up to 10	up to 5	up to 3	up to 1	-	-	-	-	500×1,000×1,500 600×1,500×2,750
KH 250 W KH 250 L*	Thermal oil, special liquids	–50 ... 250	2 ... 6	up to 18	up to 20	up to 15	up to 6	up to 2	up to 1	-	-	-	600×1,500×1,500 800×1,700×2,750
KH 350 W KH 350 L*	Thermal oil, special liquids	–70 ... 250	2 ... 20	up to 50	up to 50	up to 35	up to 18	up to 7	up to 4	up to 3	up to 2	up to 0.5	800×1,700×1,500 1,500×2,700×3,150
KH 400 W KH 400 L*	Thermal oil, special liquids	–100 ... 250	4 ... 30	up to 60	up to 150	up to 120	up to 60	up to 45	up to 35	up to 25	up to 10	up to 5	1,000×1,500×1,900 1,600×3,000×3,250
KH 600 W KH 600 L*	Thermal oil, special liquids	–100 ... 250	5 ... 50	up to 120	up to 300	up to 240	up to 120	up to 90	up to 70	up to 50	up to 20	up to 10	1,500×2,200×2,000 2,000×3,500×3,250
KH 1000 W KH 1000 L*	Thermal oil, special liquids	–100 ... 250	10 ... 80	up to 240	up to 400	up to 300	up to 180	up to 120	up to 90	up to 70	up to 35	up to 20	1,500×2,200×2,000 2,000×3,500×3,250

* W denotes water-cooled; L denotes air-cooled.
ATEX versions can be provided for Zone 1 & Zone 2 installation.

LAUDA Secondary circuit units

Technical data systems examples

Unit type	Heat carrier fluid	Working temperature °C	Pump flow rate m³/hr	Heater power kW	Thermostatic functions	Energy transfer	Cooling output at –100 °C kW	Dimensions (W x D x H) min./max. mm
LAUDA TR Loop								
TR 150	Water, water/glycol, thermal oil, special liquids	–110 ... 470	0.5 ... 3	3 ... 6	H (Heating); K (Cooling); T (Chilling)	via heat exchanger* or direct injection	-	500 × 1,000 × 1,500 600 × 1,500 × 1,500
TR 250	Water, water/glycol, thermal oil, special liquids	–110 ... 470	4 ... 12	9 ... 12	H (Heating); K (Cooling); T (Chilling)	via heat exchanger* or direct injection	-	600 × 1,500 × 1,500 800 × 1,700 × 1,500
TR 350	Water, water/glycol, thermal oil, special liquids	–110 ... 470	18 ... 50	18 ... 50	H (Heating); K (Cooling); T (Chilling)	via heat exchanger* or direct injection	-	800 × 1,700 × 1,500 1,000 × 1,500 × 1,900
TR 400	Water, water/glycol, thermal oil, special liquids	–110 ... 470	60 ... 100	60 ... 100	H (Heating); K (Cooling); T (Chilling)	via heat exchanger* or direct injection	-	1,000 × 1,500 × 1,900 1,300 × 1,900 × 2,000
TR 600	Water, water/glycol, thermal oil, special liquids	–110 ... 470	120 ... 180	120 ... 500	H (Heating); K (Cooling); T (Chilling)	via heat exchanger* or direct injection	-	1,000 × 1,800 × 2,000 2,000 × 2,500 × 2,000
TRMS 600	Molten salt	150 ... 550	20	130	H (Heating); K (Cooling)	via heat exchanger*	-	2,600 × 4,400 × 4,350 -
LAUDA Kryopac (Liquid nitrogen units)								
KP 150	Thermal oil, special liquids	–150 ... 280	0.5 ... 2	3 ... 6	H (Heating); K (Cooling); T (Chilling)	via heat exchanger*	up to 5	500 × 1,000 × 1,500 600 × 1,500 × 1,500
KP 250	Thermal oil, special liquids	–150 ... 280	2 ... 4	9 ... 12	H (Heating); K (Cooling); T (Chilling)	via heat exchanger*	up to 10	600 × 1,500 × 1,500 800 × 1,700 × 1,500
KP 350	Thermal oil, special liquids	–150 ... 280	4 ... 10	18 ... 50	H (Heating); K (Cooling); T (Chilling)	via heat exchanger*	up to 15	800 × 1,700 × 1,500 1,000 × 1,500 × 1,900
KP 400	Thermal oil, special liquids	–150 ... 280	10 ... 30	60 ... 100	H (Heating); K (Cooling); T (Chilling)	via heat exchanger*	up to 30	1,000 × 1,500 × 1,900 1,300 × 1,900 × 2,000
KP 600	Thermal oil, special liquids	–150 ... 280	30 ... 80	120 ... 500	H (Heating); K (Cooling); T (Chilling)	via heat exchanger*	up to 80	1,500 × 2,200 × 2,000 2,000 × 2,500 × 2,000

* Connection to primary energy sources provided by the customer

ATEX versions can be provided for Zone 1 & Zone 2 installation.
The following primary energies can be incorporated into these units:
steam, hot oil, hot water, air, cooling water, brine, cold oil, liquid nitrogen.

Note: More powerful versions available on request.

For your notes

Kryopac® is a registered trademark
of LAUDA DR. R. WOBSER GMBH & CO. KG

LAUDA DR. R. WOBSER GMBH & CO. KG
Laudaplatz 1 • 97922 Lauda-Königshofen • Germany
www.lauda.de

6-678 - e - 1/8.26