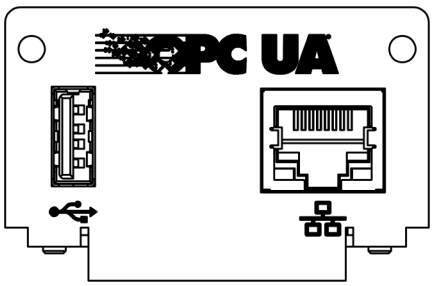
Operation manual

Interface module LRZ 934

OPC UA-Modul Advanced



V1R9

Read this manual prior to performing any task!

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Translation of the original operation manual
Q4DT-E_13-019, 1, en_US 26.03.2025

Table of contents

1 General

Many types of LAUDA constant temperature equipment have vacant module slots for installing additional interfaces. The number, size and arrangement of the module slots vary depending on the device and are described in the operating manual accompanying the constant temperature equipment. Two additional module slots available as accessories can be fitted to a LiBus module box, which is then connected as an external casing to the LiBus interface on the constant temperature equipment.

This operating manual describes how to install and configure the OPC UA interface module (catalog no. LRZ 934).

Constant temperature equipment can be connected to a PC or network via the OPC UA interface and controlled from there using the LAUDA command set. The interface functions provided for this purpose are described in chapters and .

The USB interface is intended for software updates for the OPC UA Module Advanced.

1.1 Intended use

The interface module can only be operated as intended and under the conditions specified in this operating manual.

The interface module may only be used in the following areas:

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

The interface module is an accessory item that is used to control and monitor the LAUDA constant temperature equipment. The interface module is built into the device and connected to the 24 volt supply. It may only be installed in constant temperature equipment that supports the interface provided. Refer to the chapter "Compatibility" in this operating manual for a list of compatible product lines.

Operation of the interface module is also permitted in combination with the LiBus module box (LAUDA catalog no. LCZ 9727). This operating manual also contains a description of how to install and connect up the module box.

Reasonably foreseeable improper use

- Operation on a non-compatible device
- Outdoor operation
- Operation in a potentially explosive area
- Operation after incomplete assembly
- Operation using defective cables or connections or those that do not confirm to standards
- Operation under medical conditions in accordance with DIN EN 60601-1 or IEC 601-1

1.2 Compatibility

The interface module is available as an accessory for the following LAUDA product lines:

- Integral IN

No operation of interfaces of the same type

Only one OPC UA interface or one Modbus TCP/IP interface can be used for each item of constant temperature equipment.

Using OPC UA and Modbus TCP/IP interfaces simultaneously is not permitted. The term "Comm. Module" (Communication Module) is used for both of these interfaces in this operating manual and in the device menus, because the hardware is identical.

No operation of multiple fieldbus systems

Operation in combination with other fieldbus systems such as CAN, EtherCAT or Profinet interfaces is not permitted either, as only one fieldbus system is supported at any one time.

1.3 Technical changes

All technical modifications are prohibited without the written consent of the manufacturer. Damage resulting from a failure to observe this condition will void all warranty claims.

However, LAUDA reserves the right to make general technical modifications.

1.4 Warranty conditions

LAUDA grants a standard warranty of one year.

1.5 Copyright

This operating manual was written in German, checked and approved. If the content of other language editions deviates from the German edition, the information in the German edition shall take precedence. If you notice any discrepancies in the content, please contact LAUDA Service, see ↳ Chapter 1.7 “Contact LAUDA” on page 7.

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

1.6 License texts

You can retrieve the license texts for the software used in the constant temperature equipment from the integral server in the Comm. Module

1. Type *https://<ID address of the OPC UA interface>* into your browser's address line and confirm your entry.
2. Navigate to the *Links* section on the website and click *Licenses*. This page contains information on all the software components used and the software license conditions. For information on the web server, see ↳ Chapter 7.4 “Web server” on page 35

1.7 Contact LAUDA

Contact the LAUDA Service department in the following cases:

- Troubleshooting
- Technical questions
- Ordering accessories and spare parts

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

Contact information

LAUDA Service

Phone: +49 (0)9343 503-350

Email: service@lauda.de

2 Safety

2.1 General safety information and warnings

- Read this operating manual carefully before use.
- Keep the operating manual in a place within easy reach of the interface module.
- This operating manual is part of the interface module. If the interface module is passed on, the operating manual must be kept with it.
- This operating manual is applicable in combination with the operating manual of the constant temperature equipment in which the interface module is installed.
- Manuals for LAUDA products are available for download on the LAUDA website: https://www.lauda.de
- The warnings and safety instructions in this operating manual must be observed without fail.
- There are also certain requirements for personnel, see Chapter 2.3 “Personnel qualification” on page 9.

Structure of warnings

Warning signs	Type of danger
	Warning – danger zone.

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

2.2 Information about the interface module

- Always disconnect the constant temperature equipment from the power supply before installing the interface module or connecting interfaces.
- Always take the recommended safety measures against electrostatic discharge before handling interface modules.
- Avoid touching the circuit board with metallic tools.
- Do not start up the constant temperature equipment before installation of the interface module is complete.
- Store any unused interface modules in their packaging in accordance with the specified ambient conditions.
- Use only suitable cables of sufficient length for cable connections.
- Make sure that the protective screen on the cables and connectors complies with EMC regulations. LAUDA recommends using preassembled cables.
- Always lay cables correctly so that they do not pose a tripping hazard. Secure the laid cables and make sure that they cannot be damaged during operation.
- Check the condition of the cables and interfaces prior to each operation.
- Immediately clean any soiled parts, in particular unused interfaces.
- Make sure that the signals transmitted via the interface correspond to the permitted operating parameters of the interface module.

2.3 Personnel qualification

Specialized personnel

Only specialized personnel are permitted to install interfaces modules. Specialized personnel are personnel whose education, knowledge, and experience qualify them to assess the function and risks associated with the device and its use.

3 Unpacking

NOTICE!
Transport damage

Device damage

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

NOTICE!
Electrostatic discharge

Material damage

- Always observe safety measures against electrostatic discharge.

Please observe the following installation sequence:

1. Remove the interface module from its packaging.
2. If you want to store the interface module at the installation location, use the outer packaging. This packaging is protected against static charging.
3. After installing the equipment, dispose of the packaging materials in line with environmental regulations, see ↳ “Packaging” on page 39.

If you discover any damage on the interface module, contact LAUDA Service immediately, see ↳ Chapter 1.7 “Contact LAUDA” on page 7.

4 Device description

4.1 Intended purpose

The OPC UA Module Advanced was developed for the following purposes:

- Integrating constant temperature equipment into an OPC UA network.
- Controlling constant temperature equipment via OPC UA.

4.2 Structure

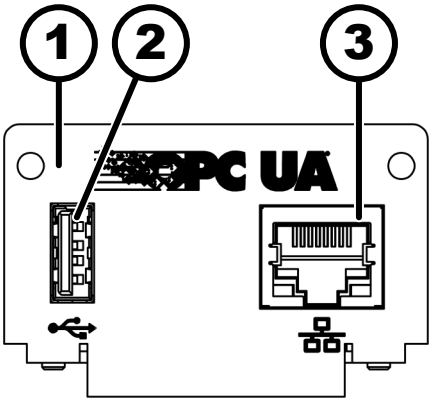


Fig. 1: OPC UA module

* The two LEDs indicate whether the interface is connected and whether data is being transmitted (link/activity).

5 Before starting up

5.1 Installing the interface module

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

WARNING!
Touching live parts

Electric shock

- Disconnect the device from the power supply before starting any installation work.
- Always observe safety measures against electrostatic discharge.

The module installation description essentially applies to all LAUDA constant temperature equipment; the example diagrams here show the installation of an analog module in constant temperature equipment from the Variocool product line.

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

You will require two M3 x 10 screws and a suitable screwdriver to secure the interface module.

Please observe the following installation sequence:

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

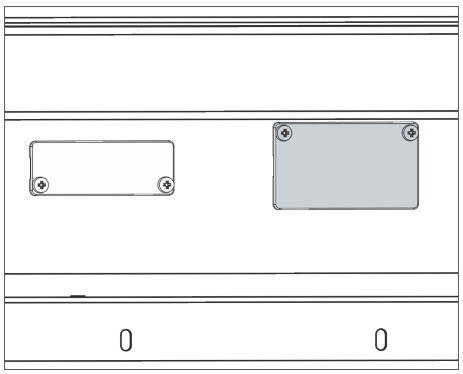


Fig. 2: Removing the cover (schematic diagram)

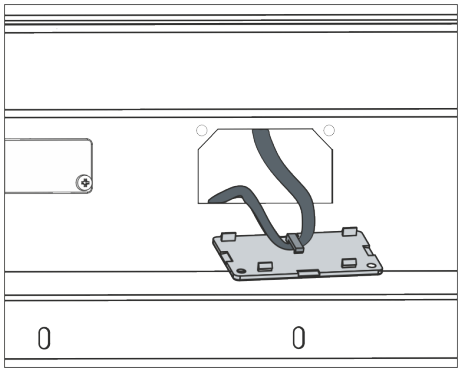


Fig. 3: Detaching the LiBus ribbon cable (schematic diagram)

3. Remove the cover from the module slot.
   - ▶ The module slot is open. The LiBus ribbon cable is attached to the inside of the cover and is easily accessible.
4. Disconnect the LiBus ribbon cable from the cover.

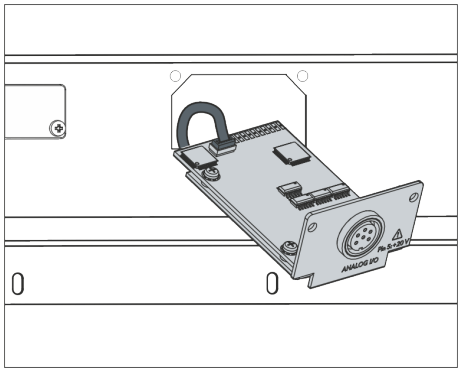


Fig. 4: Connecting the interface module (schematic diagram)

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

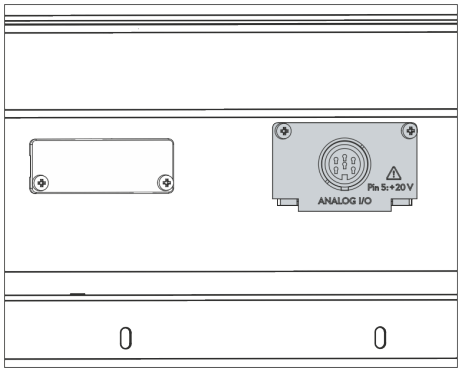


Fig. 5: Securing the cover (schematic diagram)

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

5.2 Using the module box

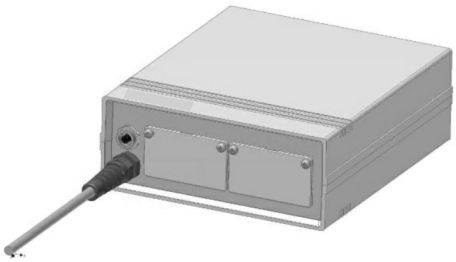


Fig. 6: LiBus module box, catalog no. LCZ 9727

You can extend LAUDA constant temperature equipment by two additional module slots using the LiBus module box. The module box is designed for interface modules with a large cover and is connected to constant temperature equipment via a vacant LiBus socket.
The socket on the constant temperature equipment bears the label **LiBus**.

Please observe the following installation sequence:

1. Switch off the constant temperature equipment.
2. Disconnect the cable on the module box from the constant temperature equipment.
   - ▶ The module box is disconnected from the power supply.
3. Check which interfaces are already present on the constant temperature equipment and module box.

   Observe the information on interface module compatibility. Only install an interface module with the same type of interface if operation with several of these interfaces is permitted.
4. Install the required interface module in the module box. Please read the information on installing the module box in the constant temperature equipment, see chapter "Installing the interface module".
5. Position the module box close to the constant temperature equipment.
6. Connect the cable on the module box to the LiBus socket on the constant temperature equipment.
   - ▶ The interfaces on the module box are ready for operation.

6 Commissioning

The integral OPC UA interface starts automatically when the LAUDA constant temperature equipment is switched on.

After starting up, the interface takes about 30 seconds to become operational. Please wait until this time has elapsed before activating the interface using the corresponding commands.

You can check the availability of the interface as follows:

- *Send a test command*
- *Display in the device menu (Main menu → Module → Comm. Module)*
  Attention! If the main menu is open while the interface is starting, the display is not automatically updated.
- *Accessibility of the interface's web server* ↳ Chapter 7.4 “Web server” on page 35

6.1 Contact assignment OPC UA interface

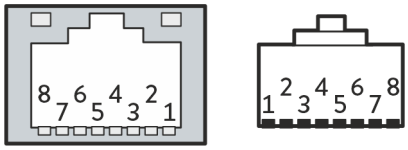


Fig. 7: RJ45 contacts on socket / plug

The OPC UA interface is equipped with standard type RJ45 sockets (8P8C modular plugs according to CFR Part 68). Standard Ethernet cables that correspond to category CAT5e or higher (8P8C assignment with twisted pairs) must be used for the connection.

Table 1: RJ45 contact assignment

Contact	Signal 10Base-T / 100Base-TX
1	Tx+
2	Tx-
3	Rx+
4	–
5	–
6	Rx-
7	–
8	–

6.2 Software update

6.2.1 Software update on the constant temperature equipment

Older software installed on constant temperature equipment may have to be updated for the new interface to work.

1. Switch on the constant temperature equipment after installing the new interface.
2. Check whether a software warning appears on the display.
   - Warning 510 – 532 *SW update required* or *SW too old* : Please contact LAUDA Service, see ↳ Chapter 1.7 “Contact LAUDA” on page 7.
   - No software warning: Operate the constant temperature equipment as normal.

6.2.2 Software update on the OPC UA Module Advanced

The software of the LRZ 934 interface module is updated independently of the device software. To do this, proceed as follows:

1. Copy the new software (.raucb file) provided by LAUDA to a USB stick. If necessary, format the USB stick before copying over the .raucb file.

   Only the latest .raucb file may be stored on the stick.

2. Switch on the constant temperature equipment after installing the new interface.
3. Make sure that the date and time on the constant temperature equipment are set correctly. This is important for verifying the digital signature of the raucb file.
4. Insert the prepared USB stick into the USB port on the interface module.

   Do not use the USB port on the constant temperature equipment.

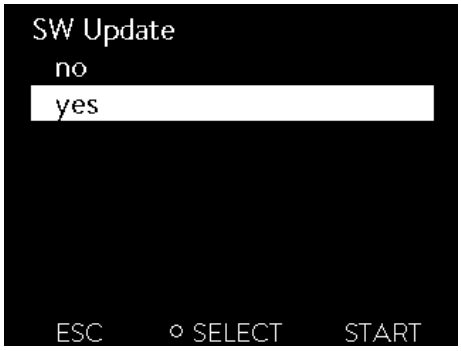


Fig. 8: Starting the software update

5. In the main menu of the constant temperature equipment, select *Module* → *Comm. Module* → *Module SW Update* → *SW Update* → *Yes* to start the update.

NOTICE!
Fault resulting from an interruption in the update process

Attention! Once started, the update process cannot be stopped and must not be interrupted by external interventions.

- Do not switch off the device during the update process.
- Do not remove the USB stick during the update process.

▶ The status changes to [Flashing] and the progress is displayed in %.

6. The interface module will restart at the end of the update process which may result in warning messages or error messages being displayed. If so, perform a restart as described in the next point.

7. Restart the thermostat. To do this, turn off the thermostat at the main switch and then turn it back on after 60 seconds. After switching on again, wait another 30 seconds for the interface module to complete the booting procedure.

▶ The software update for the OPC UA module is complete. After the update, the software version can be viewed in the main menu under *Device Status* → *Software Versions* → *Comm. Module*.

7 Operation

You can connect your constant temperature equipment directly to a PC via the OPC UA interface or integrate it into a local network so that the equipment can be controlled using a LAUDA command set/register.

Supported network protocols and standards

DHCP client	-	RFC2132, 3046, 2563
HTTP	-	RFC 1945, 2616, 2617, 2388 822 (TXT, CSS, RAW, JPEG, GIF, PNG, ICO, XML, TIFF, MPEG, MP3, etc.)
LLMNR	-	RFC 4795
TCP	-	RFC792, 793, 1122, 6298
UDP	-	RFC1035
IGMP	-	RFC1112, 2236 (V1, 2, 3)
TLS	-	RFC2246 (TLS 1.0), RFC4346 (TLS 1.1) and RFC5246 (TLS 1.2)
X.509	-	RFC5280
WebSocket	-	RFC6455
Auto IP	-	RFC3927
mDNS	-	RFC6762
OPC UA	-	IEC 62541

Command performance

The command performance achieved via the Ethernet depends on multiple factors, including the following criteria:

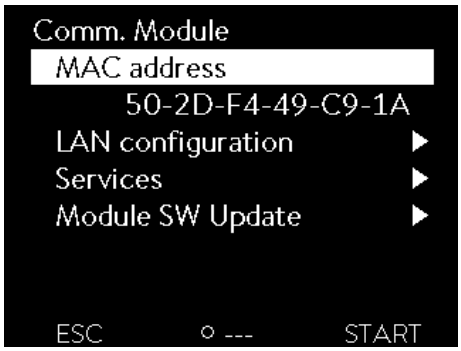
- Ideally, the constant temperature equipment and control station/PC should be located in the same (sub)network, otherwise the number of interconnected routers or switches should be kept to a minimum.
- A cable connection (LAN) to the control station/PC is usually more reliable for data transmission than a wireless connection (WLAN).
- Excessive network utilization can slow down the exchange of commands considerably.

Data is exchanged between the Comm. Module of the constant temperature equipment and an external application via the Ethernet interface on the Comm. Module in line with the command/response principle. In other words, a new command is usually only issued once the constant temperature equipment has responded to the previous command.

Under ideal conditions, commands can be sent to the constant temperature equipment every 100 ms. If there are multiple active OPC UA connections, the network load is high or a WiFi connection is being used, commands may have to be issued at intervals of more than 1 s.

A transmission rate of 500 ms is appropriate for many periodic commands (such as *Actual value of external temperature*). If this value is used as a control variable in the constant temperature equipment, a slower transmission rate will impair the control action.

7.1 Menu structure



The menu only ever shows functions that are available for the current constant temperature equipment.

The menu for configuring the interface is integrated in the main menu of the relevant constant temperature equipment:

Main menu → *Modules* → *Comm. Module*

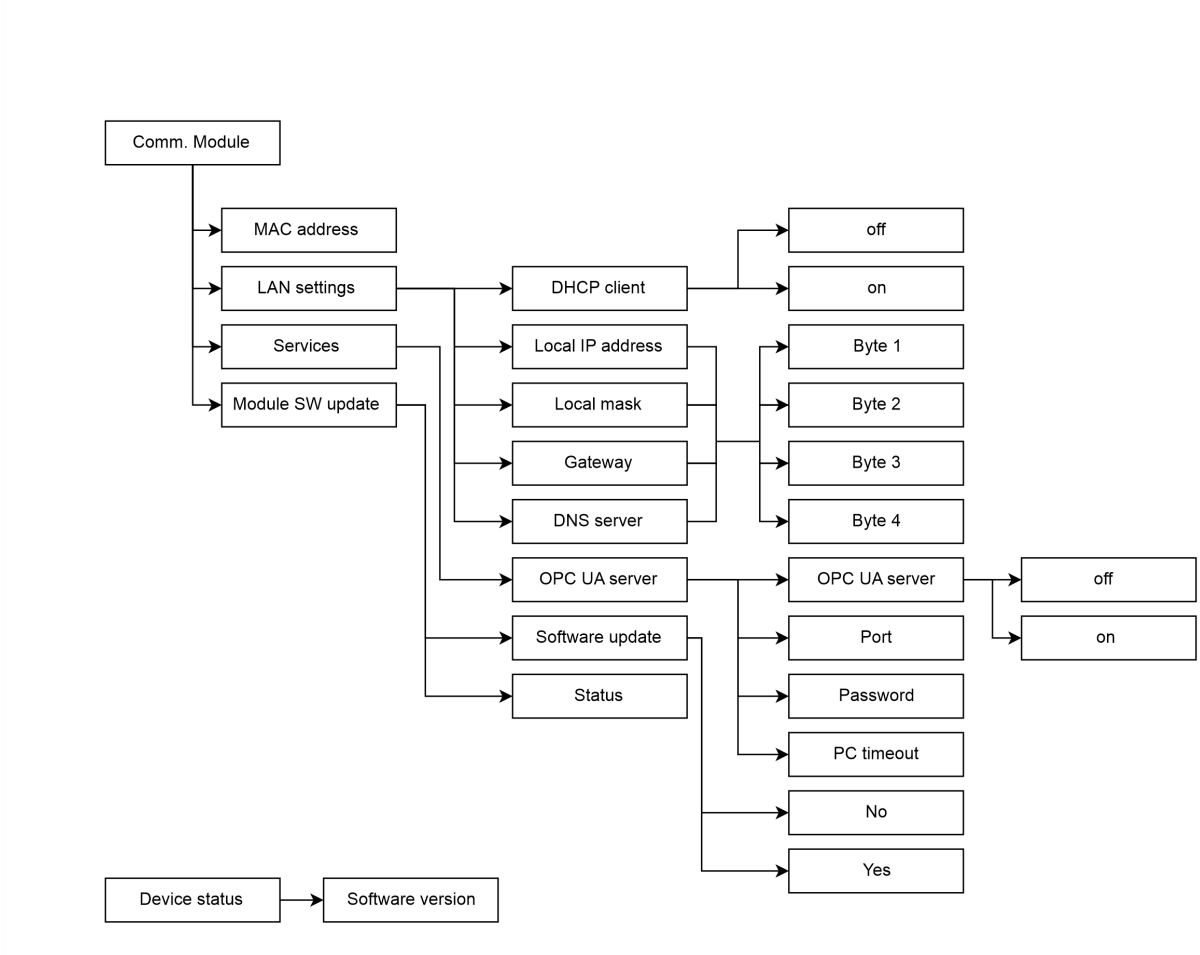


Fig. 9: OPC UA interface menu

7.2 Establishing a network connection

The Comm. module features an independent Ethernet interface that is connected to the module as an RJ45. The settings described here refer to the Ethernet interface of the Comm. module under the menu items *Modules* → *Comm. Module* → *LAN Settings*.

Before you can access the constant temperature equipment from a PC or in the local network via the OPC UA interface, you must make the following preparations:

1. Use an Ethernet cable (cat. 5e or higher) to connect the OPC UA interface of the constant temperature equipment to the remote device. The following systems can be used as remote stations, for example: PC, switch, router or WLAN access point

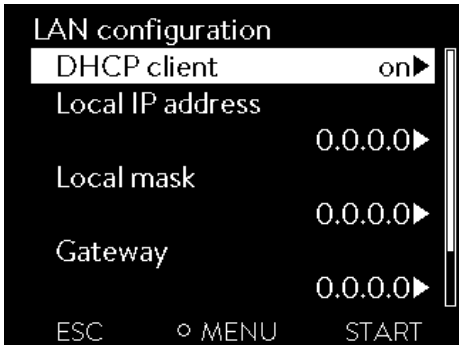


Fig. 10: LAN settings

2. Under the *Module* → *Comm. Module* → *LAN Settings* menu item, you can configure all settings that the connected system/network requires for communication. The DHCP service is enabled by default upon delivery and the necessary settings should be assigned automatically. Check these settings.

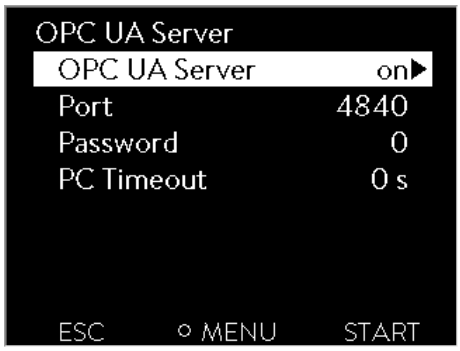


Fig. 11: OPC UA server

3. The OPC UA server is deactivated in the factory. Select the *Module* → *Comm. Module* → *Services* → *OPC UA Server* → *on* menu items to activate the OPC UA server.
4. Port 4840 is used for OPC UA by default, but the port can be changed, if required. Select *Module* → *Comm. Module* → *Services* → *OPC UA Server* → *Port* to change the port.
5. The factory setting for the solely numerical password is 0. With this setting, authentication can be performed from an OPC UA client via an anonymous access point without requiring a certificate or a user name/password. A password of 1 to 9999 can be selected. Select *Module* → *Comm. Module* → *Services* → *OPC UA Server* → *Password* to change the password. If the password is not 0, authentication must be performed using the user name `lauda` and the password that was set on the device.

Contact your system administrator for the relevant information and also note the following:

- *The OPC UA interface on the constant temperature equipment is prepared in the factory for operation on a DHCP server: When the DHCP Client = on setting is selected, the required configuration is automatically taken over from the network as soon as the cable is connected.*
- *If automatic configuration is not required because the equipment is operating on a single system or as a process interface, you must deselect the DHCP Client option. Then enter the network settings manually, see* ↳ Chapter 7.2.1 “Network settings with static IP address” on page 21.
- *The OPC UA port "4840" is selected by default and can be changed, if required*

7.2.1 Network settings with static IP address

The following requirements must be met before the constant temperature equipment can be connected manually to a system or network:

- The OPC UA interface is connected to a single system (PC) or a network component (hub, switch, router, WLAN access point) via an Ethernet cable.
- The local IP address assigned to the constant temperature equipment falls within the same address range as the connected system and is not used by any other system on the network.

1. Select the menu items *Module* → *Comm. Module* → *LAN Settings*.
2. Set the *DHCP Client* entry to *off*.
   - ▶ The entries for inputting IP addresses are enabled.
3. Enter the IP addresses for the following entries in succession.

> *Entering IP addresses*
>
> *IP addresses are entered byte by byte:*
>
> - *Select the Byte 1 field.*
> - *Enter the first numerical value of the 4-digit IP address and confirm your entry.*
> - *Repeat the process for the Byte 2, Byte 3 and Byte 4 fields.*

Local IP address	- Enter in the desired IP address, for example 120.0.1.12. Connected systems can access the constant temperature equipment using this IP address, see ↳ Chapter 7.2.2 “Checking the network connection” on page 21.
Local mask	- Enter the associated local mask address, for example 255.255.192.0.
Gateway	- Enter the IP address of the gateway (for example 120.0.0.13) that is used for communicating with neighboring networks. Note: The gateway address must be configured if the constant temperature equipment and control station (e.g. PC) are in different subnetworks (VLANs/LANs).
DNS server	- Enter the IP address of the DNS server (for example 120.0.1.40) that is used for the name resolution of connected systems. Note: Entering the address of the DNS server is not required.

7.2.2 Checking the network connection

Ping request

You can use the `ping` console command from a connected system to easily check whether the interface is available. Here, a single request (echo request) is sent to the configured local IP address. If the equipment is available, it usually returns four responses together with the respective transmission time.

Requirement: The constant temperature equipment is switched on and connected to a single system or the network.

1. Open the command line interpreter (console) on a connected system.

> *Starting the console*
>
> *A command line interpreter can be used on every operating system. On a Windows 10 or Windows 11 operating system, for example, it can be accessed as follows:*
>
> *Start (right-click) → Run → cmd.exe*

2. Enter the command "ping" and the IP address of the interface:

   Syntax: "`ping XXX.XXX.XXX.XXX`"

   Example: `ping 172.18.54.2`.

3. Press [Enter] to confirm the entry

   ▶ If available, the interface responds to the request immediately.

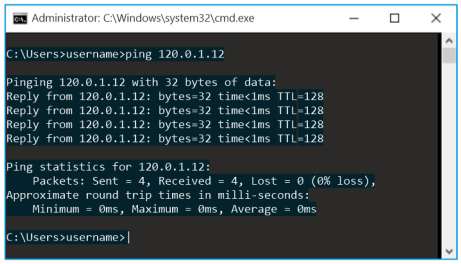


Fig. 12: Example of a ping request

If the remote station is unavailable, check whether the following criteria have been met:

- The interface is connected to the same network as the test system.
- The test address corresponds to the address displayed in the menu of the interface.
- The configured network settings are correct.

If necessary, contact your system administrator.

7.2.3 Time synchronization and NTP server

System time and synchronization

The LAUDA OPC UA interface module of your constant temperature equipment has an integrated system time. To ensure maximum accuracy, the system regularly compares this time with a preset external NTP (Network Time Protocol) server.

The preset NTP servers are:

- 0.1lauda.pool.ntp.org
- 1.1lauda.pool.ntp.org
- 2.1lauda.pool.ntp.org
- 3.1lauda.pool.ntp.org

> *These NTP servers are permanently configured in the LAUDA OPC UA interface module and cannot be changed by the customer. The standard NTP port is 123. Make sure that this port is available for outgoing connections on your network.*

Fallback mechanism

If a connection to one of the preset NTP servers cannot be established and the last successful synchronization was more than one hour ago, an internal security mechanism is activated:

- The system compares the interface time with the internal time of the constant temperature equipment.
- If there is a discrepancy, the interface time is adjusted to the time of the constant temperature equipment.

This mechanism ensures that your LAUDA interface module operates with the most accurate time possible, even without a connection to the external NTP server. For further details on the time of the LAUDA constant temperature equipment, please refer to the operating instructions of the corresponding device.

7.3 OPC UA server

The OPC UA interface provides access to an OPC UA server which makes it possible to read out the current operating parameters of the constant temperature equipment and predefine specific settings and process values. The interface functions supported by this interface are presented briefly below. They are sorted by topic according to the component affected and assigned a unique ID. Depending on the technical configuration of your constant temperature equipment, the number and scope of the interface functions actually available may vary from the list shown here, see chapter "Availability of the interface functions".

7.3.1 General information about OPC UA

OPC UA (Open Platform Communications Unified Architecture) is a modern, platform-independent communication standard for secure data exchange in the industrial sector. It is a manufacturer-independent protocol that enables reliable communication between devices, machines and systems from different manufacturers. OPC UA was developed specifically for Industry 4.0 and the Industrial Internet of Things (IIoT) and offers not only pure data transmission, but also semantic descriptions of transmitted information. The standard is characterized by integrated security mechanisms, scalability and a service-oriented architecture that allows for seamless integration into existing IT infrastructures and ensures future-proof data exchange from the sensor to the cloud. Detailed information on OPC UA can be found in the OPC Foundation specifications which are available at www.opcfoundation.org.

The OPC UA module allows device data to be read and written via a standardized information exchange that uses a hierarchically structured data model, also known as the OPC UA address space, in which all available variables, methods and events are defined as nodes. The data is accessed via unique NodeIDs and standardized services that allow data to be read, written, and monitored, and provide access to various methods.

7.3.2 OPC UA server settings

The OPC UA server settings are shown in the following.

The OPC UA server endpoint URL is compiled as follows:
opc.tcp://[IP address]:4840

Security

The following security settings are supported and can be selected on the OPC UA client:

Security Policy	Message Security Mode	
None	None	
Basic128Rsa15	Signal	Sign & Encrypt
Basic256	Signal	Sign & Encrypt
Basic256Sha256	Signal	Sign & Encrypt
Aes128Sha256RsaOaep	Signal	Sign & Encrypt
Aes128Sha256RsaPss	Signal	Sign & Encrypt

Authentication

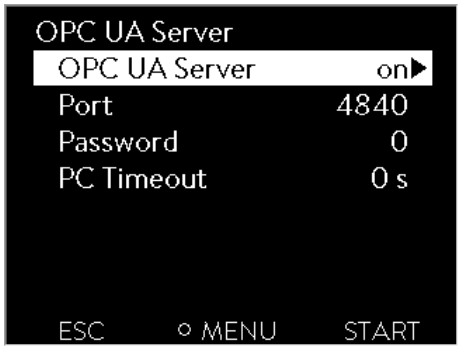


Fig. 13: OPC UA server

If the OPC UA server password is set to 0, authentication can be performed via an anonymous access point. The factory setting for the solely numerical password is 0.

If authentication via user name and password is required, a solely numerical password of 1 to 9999 must be set on the device under *Module* ➞ *Comm. Module* ➞ *Services* ➞ *OPC UA server* ➞ *OPC UA server* ➞ *Password*. Authentication is then performed using the user name `lauda` and the numerical password that was set on the device. Note: Certificate authentication is not supported at present.

Sessions

Three sessions are possible, which means that several OPC UA clients can be connected at the same time.

7.3.3 Establishing a connection to an OPC UA client

UaExpert

The example shows the configuration of the connection using the PC-based OPC UA client "UaExpert" from Unified Automation. This can be used to test the connection. It can be downloaded from https://www.unified-automation.com/downloads/opc-ua-clients.html. However, users must register on the website first.

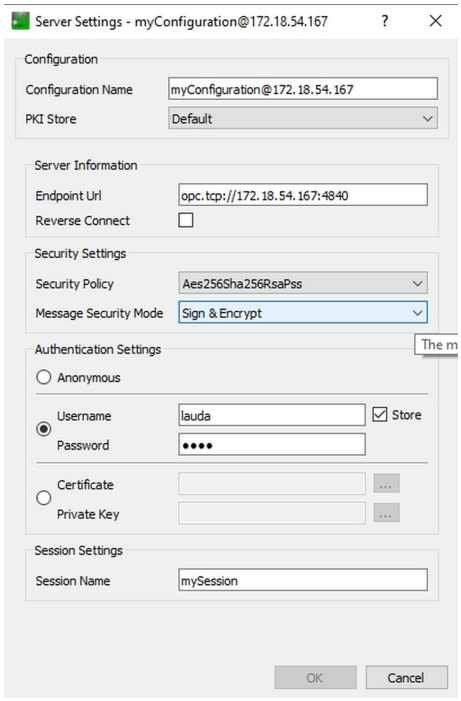


Fig. 14: *Server Settings* window

1. Start the program and select *Server* → *Add* to add a new server.
2. Enter a name for your server configuration in the *Advanced* tab. In the example *myServerConfiguration@172.18.54.167*.
3. Enter the Endpoint Url. You can view the local IP address (in the example 172.18.54.167) on the device in the menu under *Modules* → *Comm. Module* → *LAN settings*. See ↳ Chapter 7.2 “Establishing a network connection” on page 19.
4. Select the required security settings under *Security Setting*.
5. Select an authentication method under *Authentication Settings*. If the password is set to 0, select *Anonymous*. Otherwise, select *Username / Password*. The password can also be saved here by selecting the *Store* checkbox. Otherwise, a password prompt will appear when the connection is established. The Username is always ***lauda***. See ↳ “Authentication” on page 24

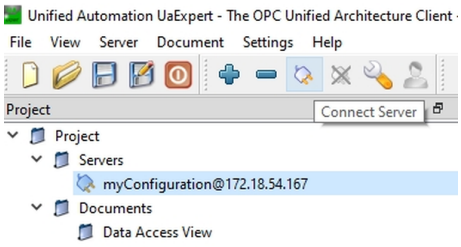


Fig. 15: Connect Server

6. Click on the plug icon (Connect Server) in the toolbar to establish the connection,

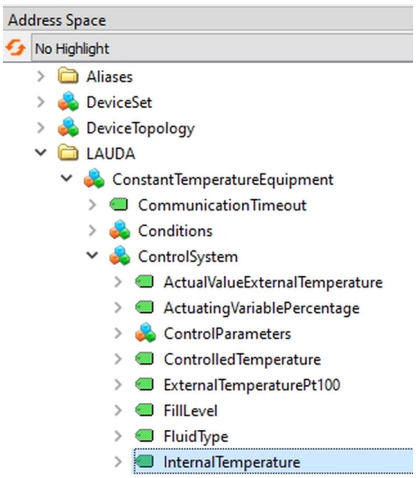


Fig. 16: *Address Space* window

7. Now enter the numeric password, if necessary.

▶ The connection is established and all the parameters of the information model are displayed in the *Address Space* window.

If the remote station is unavailable, check whether the following criteria have been met:

The network connection is a general connection, see ↳ Chapter 7.2.2 “Checking the network connection” on page 21.

In the constant temperature equipment menu, the OPC UA server is enabled for the [Comm. Module] interface.

The password entered matches the password displayed under the [Comm. Module] interface in the constant temperature equipment menu.

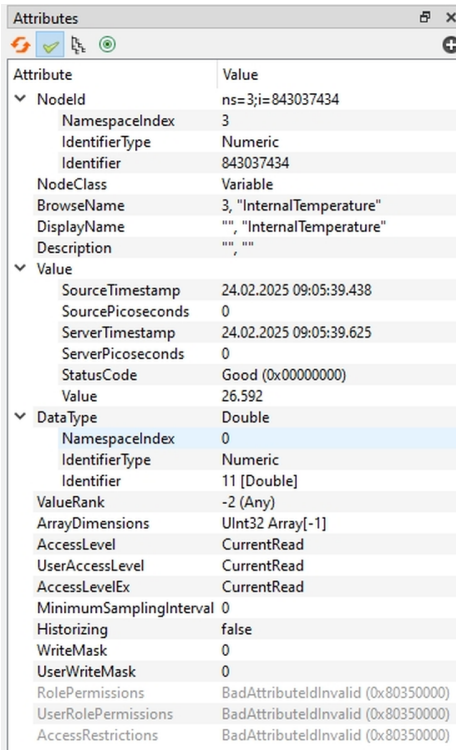


Fig. 17: Attributes window

8. When the *InternalTemperature* is selected, all information about this node is displayed in the *Attributes* window. The measured temperature value is displayed under *Value*.

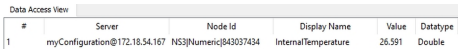


Fig. 18: Data Access View window

9. In order to periodically update the measured value, the *InternalTemperature* can be dragged into the *Data Access View* window. The measured value is updated here every time a change is made.

7.3.4 OPC UA Information Model for LAUDA Constant Temperature Equipment

The following table lists all information model data that can be read or written. Information transferred as metadata via the information model is not included. The table columns contain the following information:

- **ID:** LAUDA unique function ID
- **Function:** Description of the information.
- **Unit:** The unit of measurement, e.g. °C, RPM, %, etc.
- **Access:** Read (R) and/or write (W) access.
- **Data type**: Data type, e.g. double
- **Browse name**: The browse name of the parameter.

ID - LAUDA unique function ID

Function - Description of the information

Unit - The unit of measurement, e.g. °C, RPM, %, etc.

Access - Read (R) and/or write (W) access

Data type - Data type, e.g. double

Browse name - The browse name of the parameter

The table shows an overview of all defined data. However, it should be noted that some data is only supported by certain device types or installed accessories. You can view the supported data using the ID in the first column of the operating manual for the constant temperature equipment.

Write the browse name in the application continuously (without spaces or hyphens).

Root path

The path of the root node of the information model is:
`Objects/Devices/LAUDA/ConstantTemperatureEquipment`

Example:

Combined with the browse path, it produces the following overall path for accessing the set temperature:
`Objects/Devices/LAUDA/ConstantTemperatureEquipment/ControlSystem/TemperatureSetPoint`

ID	Function	Unit	Access	Data type	Browse Path
1	Temperature set point	°C	w	double	../ControlSystem/TemperatureSetPoint
2			r		
3	Bath temperature (out-flow temperature) with resolution 0.01°C	°C	r	double	../ControlSystem/InternalTemperature

ID	Function	Unit	Access	Data type	Browse Path
5	Query of the controlled temperature (internal/ external Pt/external analog/external serial)	°C	r	double	../ControlSystem/ControlledTemperature
6	Outflow pressure / pump pressure, relative to the atmosphere	bar	r	double	../PumpSystem/PumpPressure
7	External temperature TE (Pt)	°C	r	double	../ControlSystem/ExternalTemperaturePt100
8	External temperature TE (analog input)	°C	r	double	../AnalogModule/ExternalTemperatureAnalog
9	Bath level (fill level)	–	r	double	../ControlSystem/FillLevel
11	Controller actuating signal with resolution per mill [0.1%]	%	r	double	../ControlSystem/ActuatingVariablePercentage
12	Flow rate	l/min	r	double	../FlowControlSystem/FlowRate
15	Actual value of external temperature (via inter-face)	°C	w	double	../ActualValueExternalTemperature
17	Pump power stage (1–6 or 1–8)	–	w	byte	../ControlSystem/PumpStage
18			r		
23	Cooling mode Value: 0 = off; 1 = on; 2 = autom.	–	w	Lauda Cooling Mode	../CoolingSystem/CoolingMode
24			r		
25	Overtemperature turn off point T_Max	°C	r	double	../SafetySystem/OvertemperatureShutOffPoint
26	Limitation of outflow temperature TiH (upper limit)	°C	w	double	../ControlSystem/UpperTemperatureLimit
27			r		
28	Limitation of outflow temperature TiH (lower limit)	°C	w	double	../ControlSystem/LowerTemperatureLimit
29			r		
30	Outflow pres-sure/pump pressure set point (for pressure control settings)	bar	w	double	../PumpSystem/PumpPressureSetPoint
31			r		
32	Temperature set point Tset in safe mode	°C	w	double	../SafetySystem/SafeModeTemperatureSetPoint
33			r		

ID	Function	Unit	Access	Data type	Browse Path
34	Timeout communication via interface (1 99 [s]; 0 = Off)	s	w	uint16	../CommunicationTimeout
35			r		
36	Through-flow control set point	l/min	w	double	../FlowControlSystem/FlowRateSetPoint
37			r		
38	Control parameter Xp	–	w	double	../ControlSystem/ControlParameters/ InternalTemperatureControlParameterXp
39			r		
40	Control parameter Tn	s	w	uint16	../ControlSystem/ControlParameters/ InternalTemperatureControlParameterTn
41			r		
42	Control parameter Tv	s	w	uint16	../ControlSystem/ControlParameters/ InternalTemperatureControlParameterTv
43			r		
44	Control parameter Td	s	w	double	../ControlSystem/ControlParameters/ InternalTemperatureControlParameterTd
45			r		
46	Control parameter KpE	–	w	double	../ControlSystem/ControlParameters/ ExternalTemperatureControlParameterKp
47			r		
48	Control parameter TnE	s	w	uint16	../ControlSystem/ControlParameters/ ExternalTemperatureControlParameterTn
49			r		
50	Control parameter TvE	s	w	uint16	../ControlSystem/ControlParameters/ ExternalTemperatureControlParameterTv
51			r		
52	Control parameter TdE	s	w	double	../ControlSystem/ControlParameters/ ExternalTemperatureControlParameterTd
53			r		
54	Correction limitation	K	w	double	../ControlSystem/RelativeTemperatureLimit
55			r		
56	Control parameter XpF	-	w	double	../ControlSystem/ControlParameters/ TemperatureControlParameterXpf
57			r		
58	Setpoint offset	K	w	double	../ControlSystem/TemperatureSetPointOffset
59			r		
60	Control parameter Prop_E	K	w	double	../ControlSystem/ControlParameters/ ExternalTemperatureControlParameterPb
61			r		
62	Keyboard master (equivalent to "KEY"): 0 = unlock / 1 = lock	–	w	boolean	../ControlSystem/KeypadLock
63	Status of keyboard master: 0 = free / 1 = blocked		r		

ID	Function		Unit	Access	Data type	Browse Path
64	Keyboard remote control unit command: 0 = unlock / 1 = lock		–	w	boolean	../HmiSystem/KeypadLockRemoteControl
65	Status of keyboard (remote control): 0 = free / 1 = blocked			r		
66 67	Control in control variable X:		–	w r	Lauda Temperature ControlMode	../ControlSystem/TemperatureControlMode
	Value	Meaning				
	0	internal				
	1	external				
	2	external analog				
	3	external serial				
	5	external Ethernet				
	6	external EtherCAT				
	7	external Pt2				
	8	external OPC UA				
	9	external Modbus TCP				
68 69	Offset source X for set point:		–	w r	Lauda Temperature SetPointOffset Source	../ControlSystem/TemperatureSetPointOffset Source
	Value	Meaning				
	0	off				
	1	external Pt				
	2	external analog				
	3	external serial				
	5	external Ethernet				
	6	external EtherCAT				
	7	external Pt 2				
	8	external OPC UA				

ID	Function		Unit	Access	Data type	Browse Path
	9	external Modbus TCP				
70	Activate through-flow control: 0 = switch off / 1 = switch on		–	w	boolean	../FlowControlSystem/FlowControlEnable
71	Status of through-flow control: 0 = off / 1 = on			r		
72	Activation of Safe Mode		–	w	boolean	../SafetySystem/SafeModeRunning
73	Status of Safe Mode: 0 = off / 1 = on			r		
74	Operating status 0 = Unknown 1 = Standby 2 = In operation		–	w	Operation Mode	../SetOperationMode
75				r		../OperationMode
107	Product line / product series		–	r	string	../DeviceClass
	Value	Meaning				
	5	Variocool				
	6	PRO				
	7	Integral IN				
	8	Universa				
108	Control system software version		–	r	string	../SoftwareVersion
130	Device status		–	r	byte	../DeviceStatus
131	Fault diagnosis bits (error, alarm, warning, overtemperature, low level, high level)		–	r	Lauda Condition Type	../Conditions/..
154	Outflow pressure of through-flow control, relative to the atmosphere		bar	r	double	../FlowControlSystem/FlowControlOutletPressure
155	Pressure limitation set point with active through-flow control		bar	w	double	../FlowControlSystem/OutletPressureLimitation
156				r		
157	Overpressure turn off point with active through-flow control		bar	r	double	../FlowControlSystem/OverpressureShutOffPoint

ID	Function		Unit	Access	Data type	Browse Path
158	Actuating signal of master controller in case of external control		°C	r	double	../ControlSystem/TemperatureSetPointFollower Controller
160	Valve position of the flow controller		%	r	double	../FlowControlSystem/FlowControlValvePosition
161	Alphanumerical serial number (10 characters)		–	r	string	../SerialNumber
162	Overtemperature turn off point, tank		°C	r	double	../SafetySystem/OvertemperatureTankShutOff Point
163	Overtemperature turn off point, outlet		°C	r	double	../SafetySystem/OvertemperatureReturnflow ShutOffPoint
164	Set pressure for pressure overlay		bar	w	double	../ControlSystem/PressureOverlay/ OverlayPressureSetPoint
165				r		
166	Tank pressure of pressure overlay		bar	r	double	../ControlSystem/PressureOverlay/OverlayPressure
167	Pressure overlay hysteresis		bar	w	double	../ControlSystem/PressureOverlay/ OverlayPressureHysteresis
168				r		
169	Status of the filling/ draining unit		–	r	Lauda FillDrain System State	../FillDrainSystem/FillDrainSystemState
	Value	Description				
	0	Initialization				
	1	Idle state				
	2	Pre-temperature control				
	3	Drain				
	4	Application changes				
	5	Leak test				
	6	Filling				
	7	Hold				
	8	Refilling				
	9	Decommissioning				
170	Action at the filling/ draining unit		–	w	FillDrain Command	../FillDrainSystem/FillDrainCommand
	Value	Meaning				

ID	Function		Unit	Access	Data type	Browse Path
	0	No action				
	1	Start draining				
	2	Start filling				
171	Draining temperature		°C	w	double	../FillDrainSystem/DrainTemperatureSetPoint
172				r		
173	Pressure specification for leak test		bar	w	double	../FillDrainSystem/LeakTestPressureSetPoint
174				r		
175	Leak test duration		s	w	uint16	../FillDrainSystem/LeakTestDuration
176				r		
177	Max. permissible pressure difference during leak test		bar	w	double	../FillDrainSystem/AllowedLeakTestPressureLoss
178				r		
179	Venting time at the end of the filling process		s	w	uint16	../FillDrainSystem/DeAiringDuration
180				r		
181	Target filling level of the expansion tank of the constant temperature equipment during the filling process		-	w	byte	../FillDrainSystem/TargetFillLevelExpansionTank
182				r		
183	Status of automatic filling device for the filling/draining unit tank (0=off, 1=on)		-	w	boolean	../FillDrainSystem/FillDrainTankAutoRefillEnable
184				r		
185	Start of automatic filling device (lower fill limit -> refilling on)		%	w	byte	../FillDrainSystem/FillDrainTankRefillStartLevel
186				r		
187	Stop of automatic filling device (upper fill limit -> refilling off)		%	w	byte	../FillDrainSystem/FillDrainTankRefillEndLevel
188				r		
189	Filling/draining system outflow pressure		bar	r	double	../FillDrainSystem/FillDrainOutletPressure
190	Filling/draining system tank level		%	r	byte	../FillDrainSystem/FillDrainTankFillLevel
203	Fluid running hour counter		h	r	uint32	../ControlSystem/OperatingHoursFluid
204	Running hour counter for complete device		h	r	uint32	../ControlSystem/OperatingHoursDevice
206	Heater 1 running hour counter		h	r	uint32	../HeatingSystem/OperatingHoursHeating
207	Heater 2 running hour counter		h	r	uint32	../HeatingSystem2/OperatingHoursHeating

ID	Function		Unit	Access	Data type	Browse Path
208	Pump 1 running hour counter		h	r	uint32	../PumpSystem/OperatingHoursPump
209	Pump 2 running hour counter		h	r	uint32	../PumpSystem2/OperatingHoursPump
210	Pump 1 running hour counter above 200°C		h	r	uint32	../PumpSystem/OperatingHoursPump Over200Degree
211	Pump 2 running hour counter above 200°C		h	r	uint32	../PumpSystem2/OperatingHoursPump Over200Degree
213	Compressor 1 running hour counter		h	r	uint32	../CoolingSystem/OperatingHoursCooling Compressor1
214	Compressor 2 running hour counter		h	r	uint32	../CoolingSystem/OperatingHoursCooling Compressor2
215	Heat transfer liquid type		–	r	Lauda FluidType	../ControlSystem/FluidType
	Value	Meaning				
	0	undefined				
	1	n/a				
	2	KRYO 95				
	3	KRYO 70A				
	4	n/a				
	5	KRYO 65				
	6	KRYO 51				
	7	KRYO 30				
	8	KRYO 20				
	9	AQUA 90				
	10	ULTRA 350				
	11	ULTRA 301				
	12	USER defined 1				
	13	USER defined 2				
	14	USER defined 3				

7.3.5 Communication monitoring

Timeout

The parameter with the ID 34 *Timeout communication via interface* allows the timeout value to be set for communication monitoring. If the setting is more than 0 seconds, communication monitoring is activated for the interface. The timeout value can also be set from the device menu of the interface module (PC Timeout).

If none of the open OPC UA sessions perform read or write access operations for the duration of the preset timeout, the timeout has expired and a disconnection is detected.

In this case, *Alarm 22* is triggered and the constant temperature equipment

- stops the pump, the heater and the refrigerating machine if the Safe Mode function is deactivated.
- starts Safe Mode if the Safe Mode function is activated or supported by the constant temperature equipment.

> ***Safe Mode***
> *For information on Safe Mode, refer to the operating manual for the constant temperature equipment.*

7.4 Web server

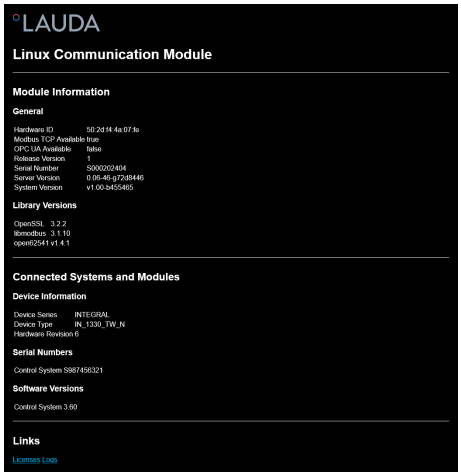


Fig. 19: Integrated web server

The Comm. Module is equipped with an integrated web server. The web server is used exclusively to visualize internal device data, such as software versions and software licenses.

The web server starts automatically when the system starts up. You can access the web server by entering the IP address (port 80) configured in the Comm. Module into the address bar of a web browser.

To view the configured IP address, select the *Module* → *Comm. Module* → *LAN Settings* menu items.

8 Maintenance

The interface module is maintenance-free.

Any dust and dirt deposits should be cleaned from the connections on the interface module on a regular basis, especially if the interfaces are not being used.

WARNING!
Live parts in contact with cleaning agent

Electric shock, material damage

- Disconnect the device from the mains supply before starting any cleaning work.
- Water and other fluids should not be allowed to enter the device.

NOTICE!
Repairs performed by unauthorized persons

Material damage

- Only specialized personnel are permitted to carry out repairs.

1. Use a damp cloth or brush to remove any dust and dirt deposits.
2. When using compressed air: Always set a low working pressure to prevent mechanical damage to the connections.

If you have any questions about technical modifications, please contact LAUDA Service, see ↳ Chapter 1.7 “Contact LAUDA” on page 7.

9 Faults

If a fault occurs, the interface distinguishes between different message types, e.g. alarms, errors and warnings. The procedure for rectifying a fault depends on the device. Follow the corresponding instructions in the operating manual accompanying the constant temperature equipment.

If you are unable to rectify a fault, please contact LAUDA Service, *see* Chapter 1.7 “Contact LAUDA” on page 7.

9.1 Alarms, errors and warnings on the constant temperature equipment display

The interface recognizes the following alarm, error and warning messages, which are shown on the display of the constant temperature equipment when a fault occurs:

Code	Type	Name	Description
72	Error	Timeout Comm Module L	Communication error between the constant temperature equipment and the module. Restart the constant temperature equipment and if the error is still present, check the cable connection between the constant temperature equipment and the module.
9	Alarm	Text missing	The control variable is set to External OPC UA. The alarm is triggered if no T ext value (ID 15) is received from the constant temperature equipment (e.g. Timeout Integral ~500 ms).
22	Alarm	Communication interrupted	The timeout preset in the module menu was triggered because a write or read command was not received via the interface/from the control station within the specified time. The constant temperature equipment behaves as follows: ■ Safe Mode deactivated: Device switches to standby mode ■ Safe Mode activated: Device switches to Safe Mode. Note: For information on Safe Mode, please refer to the operating manual for the constant temperature equipment.
54	Warning	T set (module) out of range	The warning is triggered if an attempt is made to write a value for Tset outside of the limit values via the interface (e.g. violation of Tih or Til limits).

10 Decommissioning

WARNING!
Touching live parts

Electric shock

- Disconnect the device from the power supply before starting any installation work.
- Always observe safety measures against electrostatic discharge.

Decommission the interface module by removing it from the constant temperature equipment:

1. Observe the information in ↳ Chapter 5.1 “Installing the interface module” on page 12. Proceed in reverse order to remove.
2. Always attach the LiBus connecting cable to the inside of the module slot cover.
3. Fit the cover to the vacant module slot to protect the constant temperature equipment against the ingress of dirt.
4. Protect the interface module against static charging before placing it in storage. The storage location must meet the ambient conditions specified in the technical data.
5. If you intend to dispose of the module, please read the information in ↳ “Old device” on page 39 first.

11 Disposal

Packaging

The packaging normally consists of environmentally friendly materials that can be easily recycled when properly disposed of.

1. Dispose of packaging materials in accordance with the applicable disposal guidelines in your region.
2. Comply with the requirements of Directive 94/62/EC (packaging and packaging waste) if disposing of the product in a member state of the EU.

Old device

The device must be properly decommissioned and disposed of at the end of its life cycle.

1. Dispose of the device in accordance with the applicable disposal guidelines in your region.
2. Comply with Directive 2012/19/EU (WEEE Waste of Electrical and Electronic Equipment) if disposing of the product takes place in a member state of the EU.

12 Technical data

Characteristic	Unit	Value/version
Interface module		
Catalog number	[–]	LRZ 934
Size of module slot, W x H	[mm]	51 x 27
External dimensions (excluding connectors), W x H x D	[mm]	56 x 36 x 83
Weight	[kg]	0.1
Operating voltage	[V DC]	24
Maximum current consumption	[A]	0.3
Ethernet connection		
Version	[–]	1x RJ45 socket, 8-pin
USB interface (host)		
Version	[–]	1x USB 2.0 socket, type A (intended for future expansion)
Service life	[–]	The interface module is designed for 20,000 operating hours.
Ambient conditions		
Relative humidity	[%]	Maximum relative humidity 80% at an ambient temperature of 31°C, relative humidity linearly decreasing to 50% at 40°C.
Height up to	[m]	2000
Ambient temperature range	[°C]	5 – 40
Temperature range during storage and transport	[°C]	-20 – 60
Degree of pollution according to EN 60664-1 / VDE 0110-1	[–]	2
IP protection level in installed state	[IP]	21

13 Declaration of Conformity

EU DECLARATION OF CONFORMITY

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

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

Product line: Accessories **Serial number:** from S250000001

Device type: Interface modules
LRZ 912, LRZ 914, LRZ 915, LRZ 918, LRZ 926, LRZ 927, LRZ 928, LRZ 929, LRZ 930, LRZ 931, LRZ 932, LRZ 933, LRZ 934, LRZ 935, LCZ 9727

comply with all the relevant provisions of the Directives listed below, based on the design and type of the version we have placed on the market:

EMC Directive	2014/35/EU
RoHS Directive	2011/65/EU in conjunction with (EU) 2015/863

The products may only be operated when incorporated or connected in accordance with the operating instructions.

Applicable standards:

- EN IEC 61326-1:2021

Authorized representative for the composition of the technical documentation:

Dr. Jürgen Dirscherl, Head of Research & Development

Lauda-Königshofen, Germany, 27.02.2025

A. Dinger

Dr. Alexander Dinger,
Head of Quality and Environmental Management

Q5WA-QA13-026-EN-04

°FAHRENHEIT. °CELSIUS. °LAUDA.

14 Glossary

Auto IP	Auto IP is a standardized procedure where two or more participants agree on the same network configuration.
DHCP Client (Dynamic Host Configuration Protocol Client)	A DHCP client facilitates the automatic integration of an Ethernet interface in an existing network. As a result, the interface does not have to be manually integrated in the existing network.
DNS server (Domain Name Service Server)	The Domain Name Service is a database where mainly information on names and IP addresses of the computer are stored. A DNS can, for example, disperse a web address or URL (Uniform Resource Locator) to an IP address. The Ethernet interface specifies the IP address of the DNS server present in the connected network.
Gateway	Various networks are connected with one another via a gateway. Here, an IP address is given that can be used to reach a gateway in a local network.
IP address (Internet Protocol Address)	Each device within a data network requires an address, so that it can be clearly identified. This is the only way to ensure that e.g. the data flow is received by the correct device. When an Internet page is opened, the browser always transfers the IP address of your device. This is the only way that the web server can know where to send the required data packet. The Internet Protocol (IP) is a widely adopted network standard that stipulates how information can be exchanged.
IP version	Provides information about the Internet standard: IPv4 or IPv6. A well-known example of an IP address is 192.168.0.1. This address is structured according to the IPv4 standard: Four numbers between 0 and 255, whereby a period separates the numbers from one another. However, this system only allows a limited number of combinations, which is why there are IP addresses structured according to the standard in version 6 (IPv6). They consist of eight blocks of characters that can contain both numbers and letters as shown in this example: fe80:0010:0000:0000:0000:0000:0000:0001. Because this can seem rather confusing, a long string of zeros can be replaced by a colon. The IPv6 address from the example would therefore appear in a shortened form as follows: fe80:0010::1.
Local IP address	The local IP address is an address for the Ethernet interface in the local network. The Ethernet interface in the local network can be reached using this address. If the DHCP client is deactivated, the local IP address and the local mask must be manually configured. For manual configuration start by contacting your IT department.
Local mask	Local (subnet) masks are used to flexibly adapt the rigid class division of IP addresses in networks and computers to actual conditions.
MAC (Media Access Control)	Media Access Control is an almost unique global hardware address which can be used to clearly identify the device in an Ethernet network.
NTP (Network Time Protocol)	Network time protocol is a standard for synchronizing the time and date in networks.
Port	Port is a number that is used to establish a connection between two network participants. The port is a part of the network address. The port for the Ethernet interface can be taken from the approved "dynamic ports" range. This lies between 49152 and 65535.

Process Interface	A process interface on the LAUDA constant temperature equipment is the interface that makes it possible to control or monitor the constant temperature equipment via Ethernet using LAUDA interface command sets.
TCP (Transmission Control Protocol)	This network protocol define how data is exchanged between network components.

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