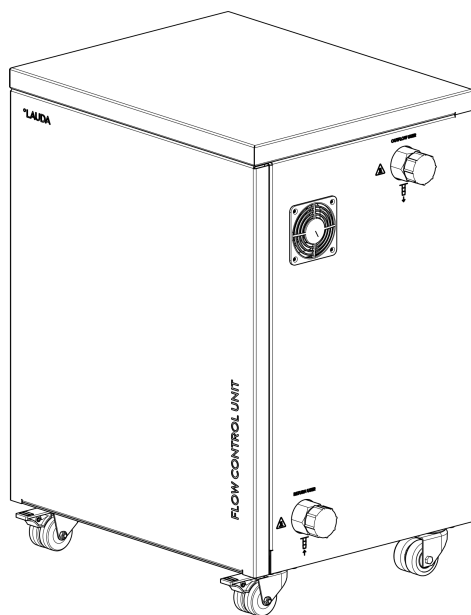


Operation manual

Flow controller FC 80 C

for LAUDA Integral process thermostats

IN 150 XT, IN 250 XT, IN 250 XTW, IN 280 XT(W), IN 550 XT(W), IN 590 XTW, IN 750 XT, IN 950 XTW,
IN 1040 XTW, IN 1090 XTW, IN 1590 XTW, IN 1850 XTW, IN 2040 XTW, IN 2040 PW, IN 2050 PW, IN 2560
XTW, IN 2560 PW, IN 3540 XTW, IN 3540 PW, IN 4 XTW, IN 8 XTW



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Translation of the original operation manual

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replaces issue V1R17

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1 Safety

1.1 Safety notices

The operating manual informs you how to handle the device as intended while taking safety aspects and hazards into consideration. The operating manual of the constant temperature equipment on which you operate the device and, if applicable, the safety data sheets of the accessories used also apply. In case of doubt, the applicable rules and regulations at the place of installation have precedence.

Operating manual



IMPORTANT
READ CAREFULLY BEFORE USE
KEEP FOR FUTURE REFERENCE

- Read this operating manual carefully before use.
- In addition, refer to the operating manual of the constant temperature equipment on which you operate the unit.
- Follow all the safety instructions on the device and in the operating manual.
- Always keep the operating manual within easy reach near the device.
- This operating manual is part of the device. Never pass the device on to third parties without the operating manual.

Personnel

- Ensure that the device is only operated by trained operating personnel or qualified personnel.
- The user must have read and understood this operating manual and be able to follow all the information and instructions given.
- Use appropriate personal protective equipment when carrying out any work on the device or connected components.

Installation

- Install the device on an even, non-slip surface. The installation surface must not be combustible or sensitive to moisture.
- Keep flammable materials and liquids away from the immediate vicinity of the device. Do not store them above the device.
- Only set up the device indoors and protect it from condensation and dripping.

Operation

- Always check the device, the LiBus cable and the hoses for damage and leaks before operation. Any defects found must be remedied in line with good professional practice before operation.
- Never operate the device without heat transfer liquid.

Hoses

- Only use suitable hoses.
The temperature, pressure and media resistance of the hoses must be suitable for the respective application.
- Connect the hoses in such a way that no kinks can occur during operation. When routing the hoses, make sure that the radii are as large as possible and secure the hoses with hose clips.
- Check the hoses regularly for damage and material fatigue.

Maintenance

- Do not make any technical changes to the device. If this is disregarded, you will lose the right to claim under warranty.
- All service and repair work must be performed by qualified personnel only.
- Observe the recommended maintenance intervals.

1.2 Intended use

The flow controller is an accessory item that is used to control the flow of heat transfer liquid in constant temperature equipment. The heat transfer liquid used for this purpose must be used within its working temperature range.

The device may only be operated as intended and under the conditions specified in this manual. Any other type of operation is considered improper and may impair the protection supported by the device. LAUDA accepts no liability for damage resulting from improper use of the device.

Reasonably foreseeable improper use

- Operation on a non-compatible device
- Outdoor operation
- Operation in a potentially explosive area
- Operation after incomplete assembly
- Operation with defective or non-standard cables, hoses or other connections
- Operation without heat transfer liquids or with unsuitable heat transfer liquids (corrosive, unstable, explosive, for example)
- Operation for heating or cooling of foodstuffs
- Operation under medical conditions in accordance with DIN EN 60601-1 or IEC 601-1

Service life

The device is designed for 20,000 operating hours.

Accompanying documents

The instructions in the manual of the respective constant temperature equipment must also be followed to ensure that the device is used as intended. If in doubt, these instructions take precedence.

1.3 Environmental limits

The device may only be used in the following areas:

- Production, quality assurance, research and development in an industrial environment
- Only used inside buildings

- Up to a height of 2,000 m above sea level
- Within an ambient temperature range from 5°C to 40°C
- Maximum relative humidity 80% at ambient temperatures up to 31°C, linearly decreasing until 50% relative humidity at 40°C.
- Pollution degree 2
- IP protection class IP 21
- Maximum storage and transport temperature of 50°C

1.4 Heat transfer liquid requirements

- Heat transfer liquids are used to control the temperature. LAUDA heat transfer liquids are recommended for the flow controller. LAUDA heat transfer liquids have been tested by the company LAUDA DR. R. WOBSE GMBH & CO. KG and approved for the flow controller.
- Heat transfer liquids are suitable for a specific temperature range. This temperature range must correspond to the temperature range of your application.
- The safety data sheet of the heat transfer liquid specifies hazards and the corresponding safety measures required for handling the liquid. The safety data sheet of the heat transfer liquid must therefore be observed to ensure proper use of the device.
- If you wish to use your own heat transfer liquid, check to ensure that the liquid is compatible with the materials ↪ Chapter 1.6 "Materials used" on page 7 used.
- The heat transfer liquid must be provided with corrosion protection.
- The device is designed for flammable and non-flammable heat transfer liquids according to class FL as per DIN 12876.

1.5 Hose requirements

The

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

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

1.6 Materials used

All parts in contact with the heat transfer liquid in the flow controller are made of high-quality stainless steel and red brass.
The device frame and the cover consist of painted sheet steel.

1.7 Personnel qualification

Operating personnel

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

Specialized personnel

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

1.8 Personal protective equipment



Protective gloves

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



Protective work clothing

Protective clothing must be worn for certain tasks. This protective clothing must meet the legal requirements for personal protective equipment. The protective clothing should be long-sleeved. Additionally safety shoes are required.





Safety glasses

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

1.9 Prohibition of modifications to the device

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

1.10 Structure of warnings

Warning signs	Type of danger
	Warning – hot surface.
	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.
CAUTION!	This combination of symbol and signal word indicates a possible dangerous situation that can result in minor injury if it is not avoided.
NOTICE!	This combination of symbol and signal word indicates a potentially dangerous situation that can result in material and environmental damage if it is not avoided.

2 Unpacking

2.1 Unpacking the device



WARNING!
Transport damage

Damage

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

Personnel: Operating personnel

1. Check the device and accessories for completeness and any transport damage immediately after delivery.



If the device or accessories are damaged contrary to expectations, immediately inform the shipping company so that a damage report can be compiled and the transport damage inspected. Also notify the LAUDA Service department immediately. You will find the contact information here [↗](#) Chapter 10.4 “Contact LAUDA” on page 35.

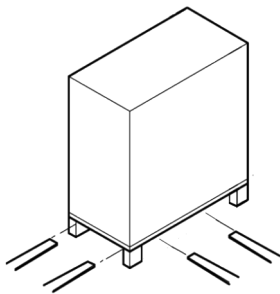


Fig. 1: Transport with forklift truck

2. Remove the lashing straps from the carton and the pallet.
3. Lift the folding corrugated cardboard carton vertically upwards.
4. Remove the end carton with the loose parts.
5. Remove the upper ring padding.
6. Lift the unit out of the bottom tray carton with four people.
7. Place the device on a suitable level surface.
8. Engage the locking brake on the front casters by pushing the lever down.
9. Dispose of the packaging materials in accordance with the applicable disposal guidelines in your region.



Keep the original packaging of your constant temperature equipment for subsequent transportation.

2.2 Scope of delivery

Table 1:

Quantity	Article	Order No.
1	Flow controller FC 80 C	L004110
4	Plastic screw cap	EZV 194
1	Operating manual	Q4DA-E_13-040

* Please complete the warranty card and return it to LAUDA.

2.3 Accessories

The following accessories are recommended for connecting the device:

Table 2:

Quantity	Article	Order No.
2 hoses	Hose with two different connection threads, M30 x 1.5(i) and M38 x 1.5(i); Hose length 1.9 m, insulation wall thickness 19 mm	LSOZ0015
2 hoses	Hose with connection thread M38 x 1.5(i) on both sides; Hose length 1.9 m, insulation wall thickness 19 mm	LSOZ0033
2 hoses	Corrugated metal hose with connection thread M38 x 1.5(i) at both ends; Hose length 2.0 m	LZM 095
2 hoses	PTFE hose with steel spiral and M38 x 1.5(i) connection thread at both ends; Hose length 2.0 m	LZM 101
2 hoses	PTFE hose with steel spiral as well as M30 x 1.5(i) and M38 x 1.5(i) connection threads at both ends; Hose length 2.0 m	LZM 102
2 adapters	Adapter M38 x 1.5(a) – M38 x 1.5(i), angled at 90°	HKA 165
1	LiBus extension cord, 5 meters	EKS 068

Table 3:

Order no.	Permissible temperature range	Operating pressure	Use with device, e.g.:
LSOZ0015	-40 – 100 °C	20 bar	IN 150 XT, IN 250 XT, IN 250 XTW, IN 280 XT(W), IN 550 XT(W), IN 590 XTW, IN 750 XT, IN 950 XTW, IN 1040 XTW
LSOZ0033	-40 – 100 °C	20 bar	IN 1090 XTW, IN 1590 XTW, IN 1850 XTW, IN 2040 XTW, IN 2560 XTW, IN 3540 XTW
LZM 095	-100 – 350 °C	10 bar	IN 1090 XTW, IN 2040 PW, IN 2050 PW, IN 2560 PW, IN 3540 PW
LZM 101	-40 – 150 °C	12 bar	IN 1090 XTW, IN 1850 XTW, IN 2040 XTW, IN 2560 XTW, IN 3540 XTW
LZM 102	-40 – 150 °C	12 bar	IN 150 XT, IN 250 XT, IN 250 XTW, IN 550 XT(W), IN 750 XT, IN 950 XTW, IN 1040 XTW

3 Device description

The flow controller extends the function of the constant temperature equipment by regulating the heat transfer liquid flowing to the application to a set flow rate (= volume flow). You can adjust the desired set point using the constant temperature equipment. The main menu of the constant temperature equipment is extended by the functions of the flow controller. The control valve in the flow controller is controlled and all status queries made via the LiBus connection between the constant temperature equipment and the flow controller. No setting options are available on the flow controller.

The flow controller generally limits the temperature range of the constant temperature equipment to a minimum of -40°C and a maximum of 140°C on XT devices.

The flow controller has an internal bypass. The electronically controlled bypass is used to adjust and regulate the flow rate.

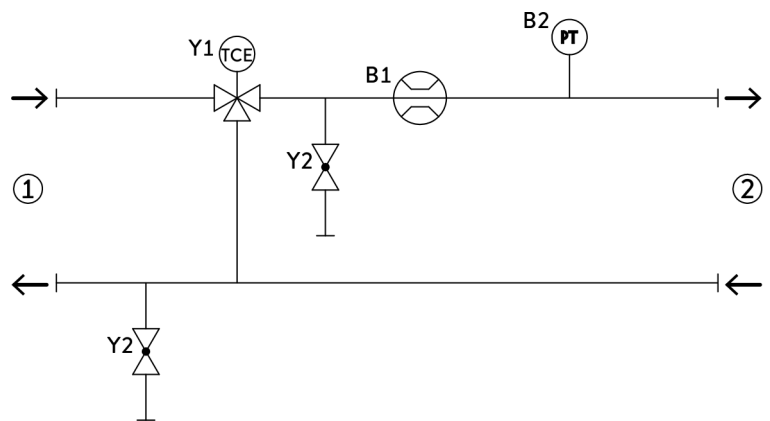
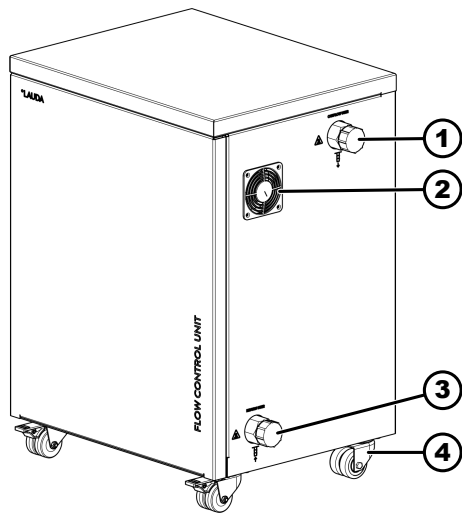


Fig. 2: Hydraulic diagram FC 80 C

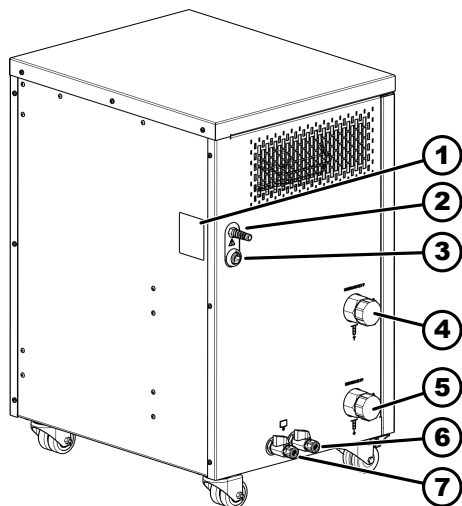
- 1 Constant temperature equipment
- 2 Application
- B1 Flow meter
- B2 Pressure sensor
- Y1 Motorized control valve
- Y2 Drains

3.1 Structure



- 1 Connecting sleeve, inlet to the application
- 2 Ventilator fan
- 3 Connecting sleeve, outlet from the application
- 4 4 casters for safe transport of the device; front casters with locking brake

Fig. 3: FC 80 C (right-hand side)



- 1 Type plate
- 2 LiBus cable for power supply and communication with the constant temperature equipment
- 3 Calibration socket with sealing cap (service)
- 4 Connecting sleeve, inlet from the constant temperature equipment
- 5 Connecting sleeve, outlet to the constant temperature equipment
- 6 Drain nozzle with drain tap for draining the flow controller on the side leading to the constant temperature equipment
- 7 Drain nozzle with drain tap for draining the flow controller on the side leading to the application

Fig. 4: FC 80 C (left-hand side)

3.2 Type plate



Fig. 5: Type plate of the FC 80 C (example)

The specifications on the type plate are described in more detail in the following table.

Table 4: Type plate

Specification	Description
Type	Device type
Part no.	Catalog number of the device
Serial No.	Serial number of the device
Voltage	Device is connected to the constant temperature equipment via the LiBus interface
Power consumption	Maximum power consumption of the device during operation
IP code	IP protection level of the device
Class according to DIN 12876	Class division according to DIN 12876

4 Before starting up

4.1 Installing the device



WARNING!
Overloading of the casters or rolling away of the device

Impact, crushing

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

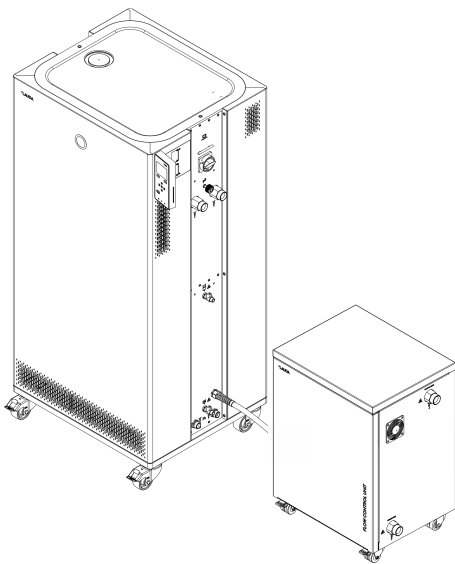


Fig. 6: Installing the devices

Recommendation for installation of the devices:

- The site must be level and insensitive to moisture.
- Do not cover the ventilation openings of the flow controller.
- If the local conditions require a different installation, the following criteria must be taken into account:
 - Long hoses between the flow controller and the application have a higher flow resistance. As a result, the target flow rate may not be reached.
 - Long hoses could promote temperature changes.
 - The site must be checked to ensure that it complies with the ambient conditions.
- The flow controller should be placed as close as possible to the application. This minimizes dead time, which has an unfavorable effect on control quality.
- If necessary, an extension cord must be used for the LiBus connection (EKS 068 extension cord LiBus 5 m gray).

1. Position the flow controller between the constant temperature equipment and the application. Position the constant temperature equipment to the left of the flow controller, and the application to the right of the flow controller.
 - ▶ This arrangement allows the temperature control hoses to be kept as short as possible.
2. Engage the locking brakes of the front casters.

4.2 Connect the hoses and LiBus cable



WARNING!
Bursting of the hose and leaking of heat transfer liquid

Scalding, cold burns

- The temperature, pressure and media resistance of the hoses must be suitable for the respective application, temperature range and heat transfer liquid used.
- Use hoses with a greater compressive strength than the maximum possible pump pressure. For liquids with a density above 1 kg/dm^3 , the pump pressure must be converted according to the density.
- Lay the hoses of the consumer in such a way that kinking and pinching are not possible.



WARNING!
Contact with hot or cold hoses

Hot and cold burns

- Use insulated hoses for temperatures below $0 \text{ }^\circ\text{C}$ and above $70 \text{ }^\circ\text{C}$.



CAUTION!
Risk of external hydraulic circuit bursting due to overpressure

Scalding, cold burns

- When laying the hoses, make sure they cannot kink.



CAUTION!
Bursting of the external application due to overpressure

Scalding, frostbite, impacts

- For applications with a maximum permissible working pressure that is less than the maximum pressure of the pump, use a pressure relief device for protection. This pressure relief device must be installed in the outflow to the application.
- Set the maximum pump pressure as per your application.



Mounting instructions for hoses and hose nozzles or ball bushes
Read and take note of the section "Mounting instructions for connecting an application" in the operating manual of the constant temperature equipment.
Refer to the operating manual of the constant temperature equipment for the permissible torque of the union nuts.

All hydraulic connections on the flow controller have an external thread M38 x 1.5 mm.

Connecting the constant temperature equipment

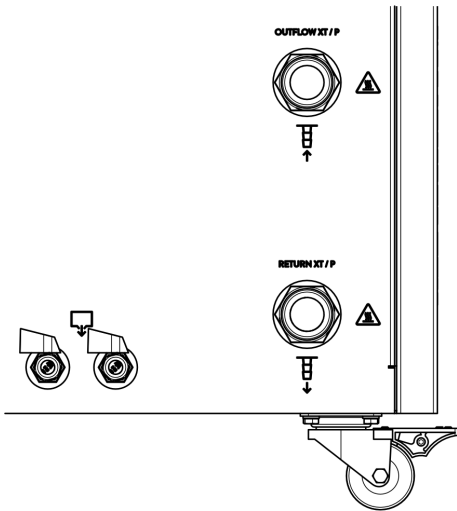


Fig. 7: Connection side to the constant temperature equipment

Tool:

- Open-end wrench size 41
- Open-end wrench size 46

1. The constant temperature equipment is switched off.
2. Place two hoses between the flow controller and the constant temperature equipment.
3. Unscrew the screw caps from the connection sleeves counterclockwise by hand. Keep the screw caps in a safe place for later use.
4. Connect the inlet of the constant temperature equipment to the input of the flow controller. The input on the flow controller is labeled **OUTFLOW XT / P**.
5. Connect the outlet of the constant temperature equipment to the output of the flow controller. The output on the flow controller is labeled **RETURN XT / P**.
6. Screw the union nut onto the connecting sleeve clockwise. Tighten up the union nut on the connecting sleeve clockwise. While doing so, brace the connecting sleeve with a second open-end wrench.

Connecting the LiBus cable

1. The constant temperature equipment is switched off.
2. Lay the LiBus cable of the flow controller to the constant temperature equipment in such a way that it cannot be tripped over.
3. Insert the LiBus cable in the LiBus interface on the constant temperature equipment. Secure the connection by turning the ring on the connector clockwise.



If a free LiBus interface is not available on the constant temperature equipment:

- *Use a T-extender adapter cable (EKS 073).*

Connecting an application



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

Scalding, cold burns

- Always use hydraulically sealed applications.



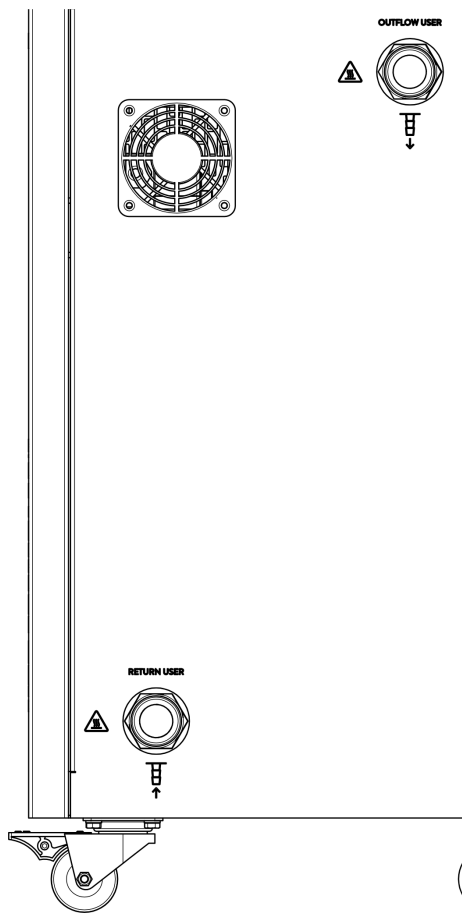
WARNING!
Bursting of the external application due to excessive pressure

Scalding, cold burns

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

Tool:

- Open-end wrench size 41
- Open-end wrench size 46



1. The constant temperature equipment is switched off.
2. Lay two hoses between the flow controller and the application.
3. Connect the outlet of the application to the input of the flow controller. The input on the flow controller is labeled **RETURN USER**.
4. Connect the input of the application to the output of the flow controller. The output on the flow controller is labeled **OUTFLOW USER**.
5. Screw the union nut onto the connecting sleeve clockwise. Tighten up the union nut on the connecting sleeve clockwise. While doing so, brace the connecting sleeve with a second open-end wrench.

Fig. 8: Connection side towards the application

Filling the thermostatic circuit with heat transfer liquid



WARNING!
Use of unsuitable heat transfer liquid

Fire, mutation, poisoning, environmental hazard, equipment damage

- Select a heat transfer liquid with a temperature range suitable for the application.
- When selecting the heat transfer liquid, refer to the information in the process thermostat operating instructions, as well as the information on the flow controller materials that come into contact with the media.

- The heat transfer liquid should only be filled using the constant temperature equipment.
Read the operating manual of the constant temperature equipment for instructions.
- The properties of the heat transfer liquid used can be found in this operating manual and in the operating manual of the constant temperature equipment.

5 Commissioning

5.1 Software versions

In order to operate the flow controller, the constant temperature equipment must be equipped with the specified version of the software or higher. If this is not the case, the software for your constant temperature equipment must be updated.

Table 5:

Software	Valid from version
Control system	1.65
Pump system	2.66
Flow module	3.59

5.2 Switching the device on and off



WARNING!
Use of unsuitable heat transfer liquid

Fire, mutation, poisoning, environmental hazard, equipment damage

- Select a heat transfer liquid with a temperature range suitable for the application.
- When selecting the heat transfer liquid, refer to the information in the process thermostat operating instructions, as well as the information on the flow controller materials that come into contact with the media.



WARNING!
Splashing heat transfer liquid

Eye damage

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

The system, consisting of constant temperature equipment, flow controller, application and hoses, must be properly filled, vented and degassed.

- The flow controller is automatically switched on when you switch on the constant temperature equipment.
- While starting up the system, the through-flow control and pressure limitation should be switched *off* and the pump set to *0* as appropriate until it is completely filled, if permitted by the application. Only then may the pump be started in filling mode. This can then be adjusted via the pump level.
- Read and follow the instructions on filling, venting and degassing in the operating manual of the constant temperature equipment.
- If degassing is necessary, carefully degas the entire circuit.

- Top up the constant temperature equipment with the same heat transfer liquid, if required.
- Always check the condition of the system before switching it on.
- Read and follow the instructions for setting the heat transfer liquid in the operating manual of the constant temperature equipment.

Setting the heat transfer liquid



For optimal flow rate control, the correct heat transfer liquid must be selected in the menu. This is especially important for operating points with very high viscosity. If using a custom liquid, it should be created as a user-defined FLUID [X] and five viscosity values at different temperatures should be entered.



The pressure indication of the pump on the Integral IN display switches to the measured pressure level in FC 80 C.



Fig. 9: Basic window of Integral XT and Integral P with flow controller

In the basic window of the constant temperature equipment, the pressure of the heat transfer liquid at the outlet of the flow controller is displayed in the direction of the application. Next to it, the corresponding measured flow in the direction of the application is displayed.

Please note:

- Once the through-flow control has been activated (*Status on*), the pump power is automatically controlled by the flow controller.
- The application (e.g. glass apparatus) and hoses must be suitable for the resulting pressure (maximum pressure of the pump on the Integral XT thermostat is 7 bar, and on the Integral P thermostat, 10 bar). If the adjustable maximum pressure is exceeded, the constant temperature equipment stops and reports the *gage pressure* alarm.
- Install a separate safety valve against gage pressure in the circuit to protect against operating errors.

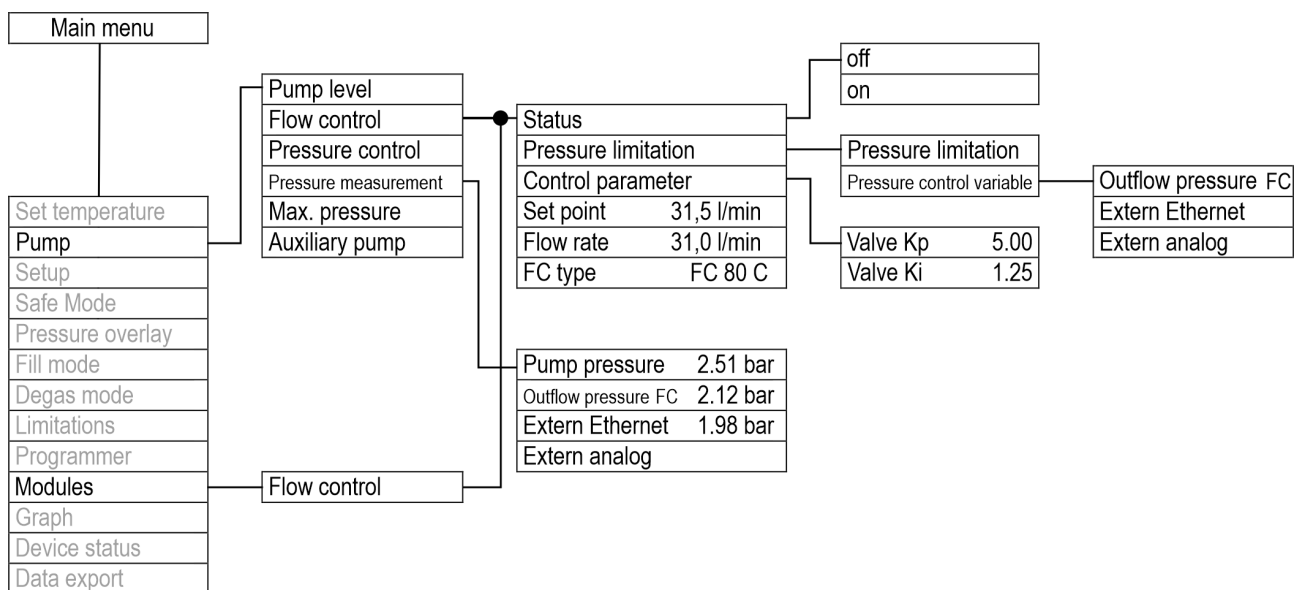


Fig. 10: Menüstruktur_FC80C

Switching on the devices

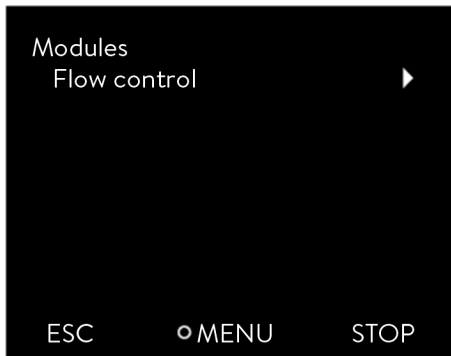


Fig. 11: Modules submenu



Fig. 12: Flow controller off/on

Personnel: Operating personnel

Protective equipment: Safety glasses
 Protective gloves

- The flow controller and the constant temperature equipment are connected via the LiBus cable and hoses.
- The flow controller and the application are connected via hoses.

1. Switch the constant temperature equipment on at the mains switch. The flow controller is also switched on thereby and is ready for operation.

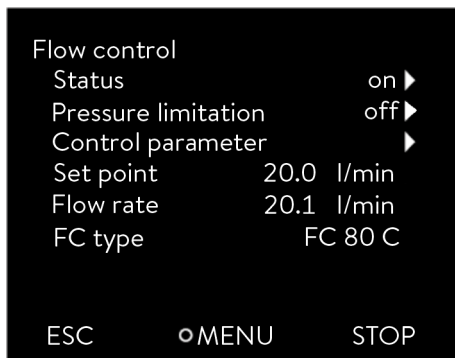
If the flow controller does not switch on, continue by working through the following points.

2. Check that the LiBus cable is inserted in the constant temperature equipment. If the flow controller is not connected to the constant temperature equipment by cable, the control valve in the flow controller remains closed. Insert the LiBus cable in the LiBus interface on the constant temperature equipment.
3. Press the [Enter key] on the constant temperature equipment to open the control menu.
4. Select the menu items → *Modules* → *Flow control* → *Status*.
 - ▶ The options [off] and [on] appear on the display.
5. Select the [on] option and press the Enter key to confirm.
 - ▶ The flow controller has been switched on.

The options on the → *Status* menu initiate the following actions of the flow controller:

off - The flow controller does not regulate; it functions purely as a volumetric flow meter. The valve of the flow controller is fully opened. The pump operates at the selected pump level. The currently measured flow rate continues to be displayed by the constant temperature equipment. This function is only performed when the pressure limitation is switched off (see ↪ Chapter 6.2.1 “Maximum pressure and pressure limit” on page 26). If the pressure limitation is still active, the system will regulate the pressure to the set pressure level.

on - The flow controller regulates to the flow rate set in the → *Setpoint* menu.



The currently measured flow rate in l/min is displayed in the → *Modules* → *Flow control* menu under the *Flow rate* menu item. To set the set point ↪ Chapter 6.1 “Setting the flow rate” on page 26.

Fig. 13: Flow controller menu

Switching off devices

1. Switch off the constant temperature equipment at the mains switch. This also switches off the flow controller.
2. Disconnect the constant temperature equipment from the power supply (mains plug) before carrying out any further installation or maintenance work.

6 Operation



WARNING!
Use of flammable heat transfer liquids

Fire

- Aeration openings on the device must not be blocked.
- Do not smoke! No naked flames!
- When working near the process thermostat, flow controller or application system, do not use electrical parts that can generate sparks.
- For the responsible department of the operator: Attach the warning symbol W021 "Warning: flammable substances" (included in the accessories) to the device in a clearly visible location.



CAUTION!
Contact with hot/cold surfaces

Hot and cold burns

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



NOTICE!
Contamination can damage the pump and clog the pipes

Device damage

- Avoid contamination in the connected application or the use of contaminated heat transfer liquids.
- If contamination is unavoidable, use a filter in the hydraulic circuit. In this case, ensure that the filter is cleaned thoroughly on a regular basis. Moreover, the expansion tank must also be cleaned regularly as described in the operating instructions.
- A filter may not be capable of separating the contamination, depending on the type of contamination. As a result, damage to the equipment cannot be ruled out.

6.1 Setting the flow rate

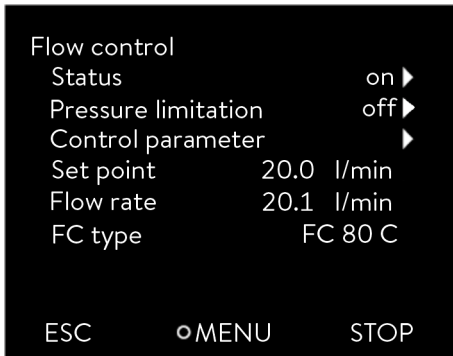


Fig. 14: Through-flow control menu

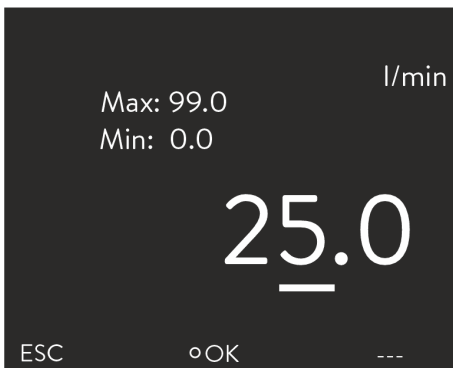


Fig. 15: Setting the flow rate set point

6.2 Pressure limitation

The currently measured flow rate is displayed in the → *Modules* → *Through-flow control* menu under the *Flow rate* menu item. A setting cannot be made in the *Flow rate* menu item.

1. Press the [Enter key] on the constant temperature equipment to open the menu.
2. Select the menu items → *Modules* → *Flow control* → *Setpoint*.
 - ▶ The Input window opens.
You can see the permissible limit values *Max:* and *Min:* as well as the set point currently set for the flow rate. The value is provided in l/min.
3. Enter the desired set point and confirm the entry with [OK].
 - ▶ The flow controller adjusts the flow to the new set point. It may take up to one minute before the new set point is reached.

The pressure limitation is used to protect pressure-sensitive applications by limiting the supply pressure. It is available when through-flow control is activated and is based on the supply pressure measured at the outlet of the flow controller.

When the pressure limitation is switched on, the system continues to regulate to the desired flow set point as long as the supply pressure remains below the set pressure limitation. If the supply pressure exceeds this limit, the constant temperature equipment regulates until the supply pressure corresponds to the value of the pressure limit.

6.2.1 Maximum pressure and pressure limit

Maximum pressure

The maximum pressure is a limit value which, when exceeded, causes the device to switch to the fault state and stops all consumers, including the pump.



Maximum pressure

The maximum pressure value must be lower than the bursting pressure of the connected application.

If the set maximum pressure is reached during operation, the constant temperature equipment switches off and signals the gage pressure alarm.

Setting the maximum pressure

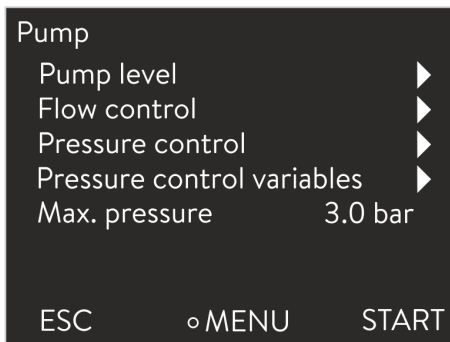


Fig. 16: Pump menu

1. Press the [Enter key] on the constant temperature equipment to open the menu.
2. Select the → *Pump* → *Max. pressure* menu items.
 - ▶ The Input window opens.
3. Change the value with the arrow keys.
4. Press [OK] to confirm the new value.
 - ▶ If the supply pressure reaches the set maximum pressure due to malfunctions or unsuitable control parameters, the constant temperature equipment switches off and signals the *gage ressure* alarm.

Pressure limitation

When the pressure limit is active, the device regulates the pressure automatically to prevent it from exceeding the set value. The maximum pressure must also be set because in most applications, there is always the possibility that the pressure will exceed the limit value.



Pressure limitation

The value of the pressure limitation must be lower than the set maximum pressure.

With the value "0 bar" you deactivate the pressure limitation.

Setting the pressure limit

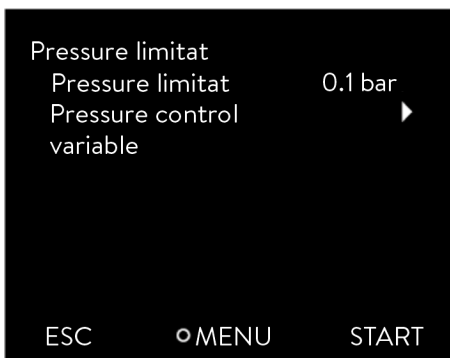


Fig. 17: Pressure limit menu

1. Select the menu item → *Pump* → *Flow control* → *Pressure limit* → *Pressure limit*.
 - ▶ The Input window opens.
2. Use the arrow keys to select a value that lies between 0 bar and the set maximum pressure.
3. Press [OK] to confirm the new value.
 - ▶ The pressure limitation is activated. The menu item → *Pump* → *Pressure measurement* → *Outfl. Press. FC* displays the pressure currently measured at the output of the flow controller.

6.2.2 Pressure limitation to external pressure measurement

The pressure can be measured directly before the application using an external pressure sensor, so that any significant changes in pressure between the flow controller and consumer can be taken into consideration. The measurement "OUT_PV_06_[Value]" can then be sent to the constant temperature equipment via the Ethernet interface. The pressure limit can be configured to act on this external pressure.



Fig. 18: Home screen, Integral XT/P with flow controller

1. Press the [Enter key] on the constant temperature equipment to open the menu.
2. Select the menu items → *Pump* → *Flow control* → *Pressure limit* → *Pressure control variable*.
3. Then select [Extern Ethernet] if the pressure limit should be based on the externally measured pressure measurement imported via the Ethernet interface.
 - ▶ The pressure limitation is activated. The flow rate is now limited so that the externally measured pressure does not exceed the pressure limit value.

The current external pressure imported via the Ethernet interface is displayed under the menu item → *Pump* → *Pressure measurement* → *Extern Ethernet*. On the home screen, this pressure value is displayed at the top right under the snowflake icon as "P_ext".

6.3 Setting the control parameters

!	NOTICE! Oscillation and overshooting of the system due to inappropriate control parameters
	Damage to the application
	<ul style="list-style-type: none"> ● The control parameters should only be configured by qualified personnel.

A continuous valve and the pump power (on Integral XT) are used as actuating signals for flow control. You can parameterize both actuating signals via separate PI controllers.

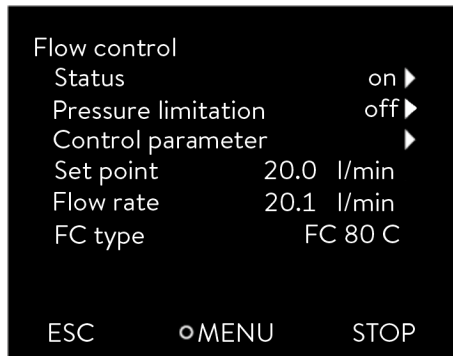


Fig. 19: Flow controller menu

Personnel: Specialized personnel

1. Open the → *Modules* → *Flow control* → *Control parameters* menu on the constant temperature equipment.
 - ▶ The available control parameters are displayed.
2. Select the control parameter you wish to change (see table below).
 - ▶ The permissible limit values *Max:* and *Min:*, as well as the currently set value, are displayed.
3. Enter the desired value and confirm the entry with *OK*.
 - ▶ The new value is activated.



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

Table 6: The table shows the available control parameters and the preset factory values:

Control parameters	Brief description	Factory setting
Valve K_p	Proportional component Valve controller	3.00
Valve K_i	Integrative component Valve controller	1.25

6.4 Draining the device



CAUTION!

Contact with hot or cold device parts, accessories and heat transfer liquid

Scalding, hot or cold burns

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



CAUTION!

Leakage of heat transfer liquid when moving the device

Slipping hazard, contamination

- Drain the device and execute the Drain program, so that the valve moves to the center position.
- Close the hydraulic connections with the caps provided.

The flow controller has a drain nozzle with two drain taps for easy drainage. Draining the flow controller is required, e.g. to change or replace the heat transfer liquid. The device must also be completely drained before transport or disposal.

There is approximately 1 liter of heat transfer liquid in the device.

Personnel: ■ Operating personnel

Protective equipment: ■ Safety glasses

The *Drain* submenu is only displayed if a flow controller is connected to the constant temperature equipment via LiBus.

1. Place a collecting basin under the drain nozzles on the flow controller and remove the blind caps.
2. Screw hose nozzles with hoses onto the drain nozzles (G 3/8" A).
3. Route the hoses along a slight downward gradient to a sufficiently large collecting vessel.
4. Press the [Enter key] on the constant temperature equipment to open the menu.
5. Select the menu items → *Fill mode* → *Drain* and confirm with the Enter key.
 - ▶ The options [off] and [on] appear on the display.
6. Select the option [on] and confirm the entry.
 - ▶ The control valve in the flow controller is moved to the center position for the optimum drainage of all lines.
7. Open the drain taps on the flow controller. To do this, turn the taps counterclockwise. Wait until the flow controller has been completely drained.
8. Close the drain taps, unscrew the hose nozzles, and screw the blind caps onto the drain nozzles.
 - ▶ The flow controller has been drained.
9. Press the [Enter key] on the constant temperature equipment to open the menu.
10. Select the menu items → *Fill mode* → *Drain* and confirm with the Enter key.
 - ▶ The options [off] and [on] appear on the display.
11. Select the option [off] and confirm the entry.
 - ▶ The draining of the flow controller has been completed.

7 Maintenance

7.1 Warning notes on maintenance and repair



WARNING!
Contact with moving parts

Impacts, cutting, crushing

- The main device must be disconnected from the mains or the flow controller from the main device before any maintenance work is carried out.
- Only skilled personnel are permitted to perform repairs.



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

Scalding, hot or cold burns

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

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

7.2 Maintenance intervals

Table 7:

Scope	Frequency
Check the LiBus cable for damage.	Before switching on the device.
Check whether the sealing caps are fitted to the drain nozzles and tightened.	After every filling or draining process.
Visual inspection of the external hoses, tubing clips and screw connections for leaks and damage.	As required, once a month at the latest.
Check the external condition of the device for damage and stability.	As required, once a year at the latest.

- Comply with these maintenance intervals without fail. Failure to do so endangers the safe operation of the constant temperature equipment and Durchflussregler.
- Remedy any defects found immediately, at the latest before the next operation.
- In the case of major damage, contact the manufacturer immediately
 ↪ Chapter 10.4 “Contact LAUDA” on page 35.

7.3 Faults

All alarms, error messages and warnings triggered appear in text form on the display of the constant temperature equipment. In-depth information about heat transfer liquids can be found in the operating manual for the constant temperature equipment.

Table 8: Warning

Code	Text in the display	Possible causes	User action
2206	Valve malfunction	<ul style="list-style-type: none">■ Calibration of analog input 1 (4 – 20 mA) or analog input 2 (0 – 10 V) in the flow controller not OK.■ Cable break of the lines to the control valve■ Motor of the control valve defective	Contact the LAUDA department.

Flow meter calibration

The internal flow meter can be calibrated on site, if required. To do so, contact LAUDA Service ↗ Chapter 10.4 “Contact LAUDA” on page 35.

8 Decommissioning




CAUTION!
Leakage of heat transfer liquid when moving the device

Slipping hazard, contamination

- Drain the device and execute the Drain program, so that the valve moves to the center position.
- Close the hydraulic connections with the caps provided.

Tool:

- Open-end wrench size 41
- Open-end wrench size 46

1. Drain the flow controller completely. Execute the [Drain] program to do this.
Refer to  Chapter 6.4 “Draining the device” on page 29 for more information on draining.
2. Switch off the constant temperature equipment at the mains switch. This also switches off the flow controller.
3. Disconnect the LiBus cable from the LiBus interface on the constant temperature equipment. Undo the connection by turning the ring on the connector counterclockwise.
4. Remove the hoses from the flow controller. Unscrew the union nut from the connecting sleeve counterclockwise. Hold back the connecting sleeve with a second open-end wrench when unscrewing the union nut.
5. Screw the screw caps onto the four connection sleeves by hand to protect the inside of the device from contamination.

9 Disposal

9.1 Disposing of packaging

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

- Dispose of packaging materials in accordance with the applicable disposal guidelines in your region.
- 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.

9.2 Disposing of heat transfer liquid

Different disposal guidelines may apply depending on the type of heat transfer liquid.

- Always read the safety data sheet of the heat transfer liquid before handling it and note the information on work safety and environmental protection in particular.
- Only collect waste heat transfer liquid in approved and sealable containers.
- Dispose of the heat transfer liquid without delay in accordance with the applicable disposal guidelines in your region.

9.3 Disposing of an old device



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

- Make sure that the device has been completely drained, .
- Dispose of the device in accordance with the applicable disposal guidelines in your region.
- 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.

10 General

10.1 Copyright

This manual is protected by copyright and only meant for internal use by purchasers.

The relinquishment of this manual to third parties, copying in any way whatsoever – even in the form of excerpts – and the utilization and/or conveyance of its content are not allowed, except for internal purposes, without written approval from the manufacturer.

Violation of this may obligate the violator to the payment of damages. Other claims reserved.

We point out that the designations and brand names of the respective companies used in the manual are generally subject to trademark, brand and patent protection.

10.2 Technical changes

The manufacturer reserves the right to make technical modifications to the device.

10.3 Warranty conditions

LAUDA grants a standard warranty of one year.

10.4 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

Fax: +49 (0)9343 503-283

Email: service@lauda.de

11 Technical data

Table 9: FC 80 C

Specification	Unit	Value
Ambient temperature range	°C	5 – 40
Temperature range for storage of the drained device	°C	-20 – 50
Temperature range for transport of the device	°C	-20 – 50
Protection class (IP code) according to IEC 60529	---	IP 21
Degree of pollution according to EN 60664-1 / VDE 0110-1	---	Pollution degree 2 Only <u>non-conductive</u> pollution occurs in the device. However, temporary conductivity due to condensation must be expected occasionally.
Class division according to DIN 12876	---	FL (suitable for non-combustible and combustible liquids)
EMC immunity	---	for industrial electromagnetic environments
EMC emitted interference	---	Class B in accordance with CISPR 11
Working temperature range		The temperature range is determined by the constant temperature equipment.
- with an Integral IN XT or Integral IN P	°C	-40 – 140
Measurable range of the flow rate (depending on the maximum possible flow rate of the constant temperature equipment)	l/min	0 – 99
Flow control range		
- Minimum	l/min	0.2
- Maximum	l/min	70
Limitations may arise from the system in the minimum and maximum flow range (Integral IN, application and temperature).		
Flow control accuracy, determined using Kryo 70 A at -10°C, 20 l/min, 1 bar	l/min	±0.2
Measurement deviation		
- at 1 l/min	%	±3.3
- at 70 l/min	%	±0.2
Pressure decrease in FC 80 C (using Kryo 70 A at -10°C and 20 l/min)	bar	0.25
Thread on the hydraulic connections (exterior thread)	mm	M38 x 1.5
Thread on the drain nozzle (exterior thread)	---	G 3/8" A
Filling volume	L	1
Dimensions (width x depth x height)	mm	605 x 420 x 720
Weight (empty)	kg	61.5

Specification	Unit	Value
Noise level	dB(A)	No increase in the noise level of the constant temperature equipment
Power supply via LiBus cable	VDC	24
Power consumption	kW	0.02
Distance between device and environment		
- Front	mm	200
- Back	mm	200
- Right	mm	200
- Left	mm	200

Measuring accuracy

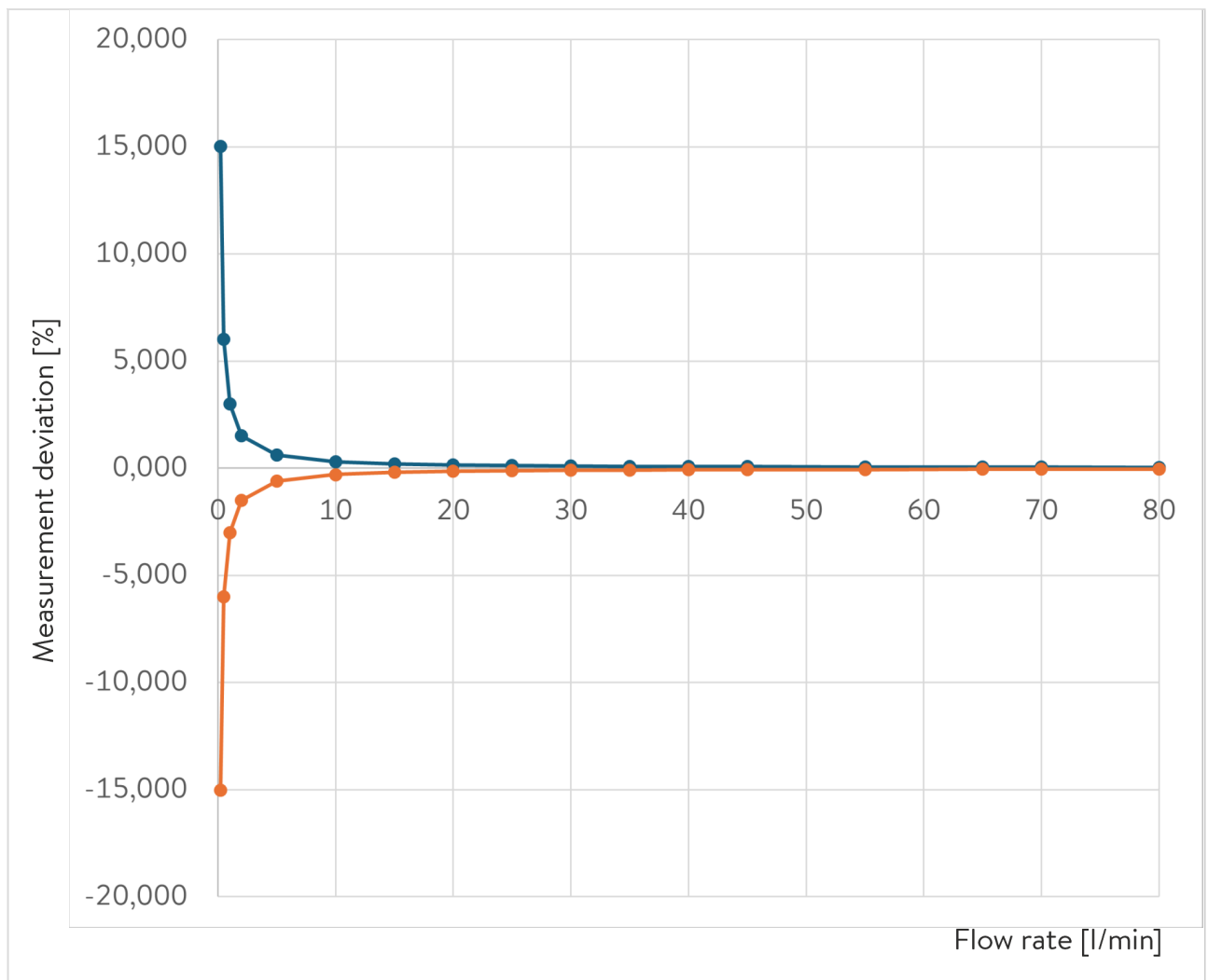


Fig. 20: Measuring accuracy FC 80 C

Table 10: Measuring accuracy values

Flow rate in l/min	Deviation in ± %	Total deviation in ± l/min
0.2	15.021	0.030
0.5	6.008	0.030
1	3.004	0.030
2	1.502	0.030
5	0.601	0.030
10	0.300	0.030
15	0.200	0.030
20	0.150	0.030
25	0.120	0.030
30	0.100	0.030
35	0.086	0.030
40	0.075	0.030
45	0.067	0.030
55	0.060	0.030
65	0.046	0.030
70	0.043	0.030
80	0.038	0.030

Flow rate

The maximum flow rate through the flow controller depends on

- the maximum flow rate of the constant temperature equipment,
- the temperature of the heat transfer liquid,
- the pressure decrease in the application and hoses.

Table 11: Maximum flow rate depending on the temperature, reference devices measured using Kryo 70 A. Lower values may result depending on the hydraulic resistance in the system.

Temperature t_b [°C] of the Heat transfer liquid	IN 2040 XTW	Unit for flow rate
140	>99	l/min
120	>99	l/min
90	97	l/min
60	92	l/min
40	90	l/min
20	88	l/min
0	84	l/min
-10	81	l/min
-20	77	l/min
-30	69	l/min
-40	66	l/min

Characteristics for IN 2040 XTW



The characteristics serve as a guide

- *The control accuracy depends on the outflow pressure, which in turn results from the resistance of the connected application.*
- *As a general rule:*
 - *The lower the flow rate, the higher the control accuracy.*
 - *The lower the temperature, the higher the control accuracy.*

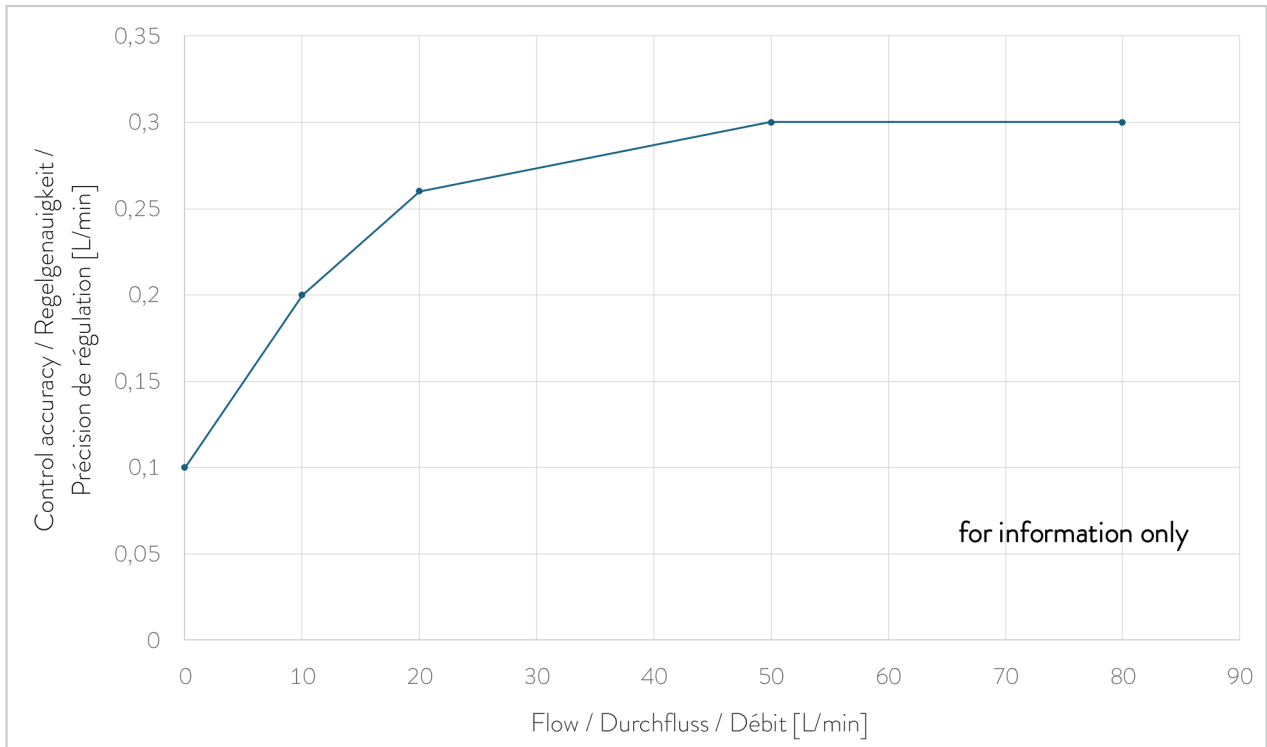


Fig. 21: Control accuracy characteristics with an outflow temperature of -10°C (measured using Kryo 70 A, without counterpressure)

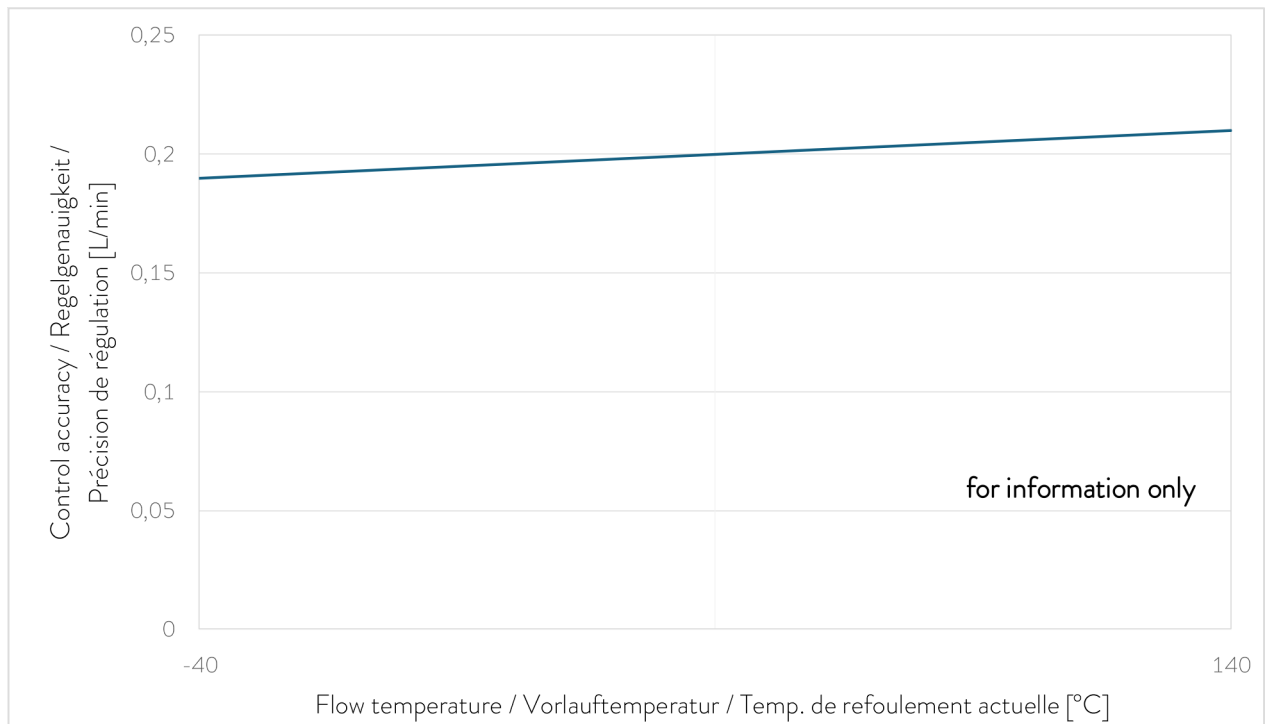


Fig. 22: Control accuracy characteristics with a flow rate of 10 l/min (measured using Kryo 70 A, without counterpressure)

12 Declaration of Incorporation



EC DECLARATION OF INCORPORATION

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

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

Type: FC 80 C **Serial number:** from S250000001

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

Machinery Regulation	(EU) 2023/1230 (valid from 20.01.2027)
Machinery Directive	2006/42/EG (valid until 19.01.2027)
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU in connection with (EU) 2015/863

The special technical documents were drafted in line with Machinery Directive/Regulation. The relevant authorized person sends all documents in writing to the national authorities on justified request.

The equipment may only be operated when incorporated or connected in accordance with the operating instructions and may not be put into service until the completed machinery into which it is to be incorporated or connected has been declared in conformity with the relevant provisions of the Machinery Directive/Regulation.

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

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

Applied standards (with date of publication):

- EN ISO 12100:2010 (Abl. 08.04.2011)
- EN 61010-1:2010/A1:2019/AC:2019-04 (Abl. 30.11.2020)
- EN IEC 61326-1:2021

Authorized representative for the composition of the technical documentation:

Dr. Jürgen Dirscherl, Head of Research & Development

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

Lauda-Königshofen, 08.10.2025



Dr. Marc Stricker,
Managing Director (COO)

13 Product Returns and Clearance Declaration

Product Returns

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

Return address

LAUDA DR. R. WOBSEY GMBH & CO. KG
Laudaplatz 1
97922 Lauda-Königshofen
Deutschland/Germany

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

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

Clearance Declaration

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

Place, date	Name in block letters	Signature

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