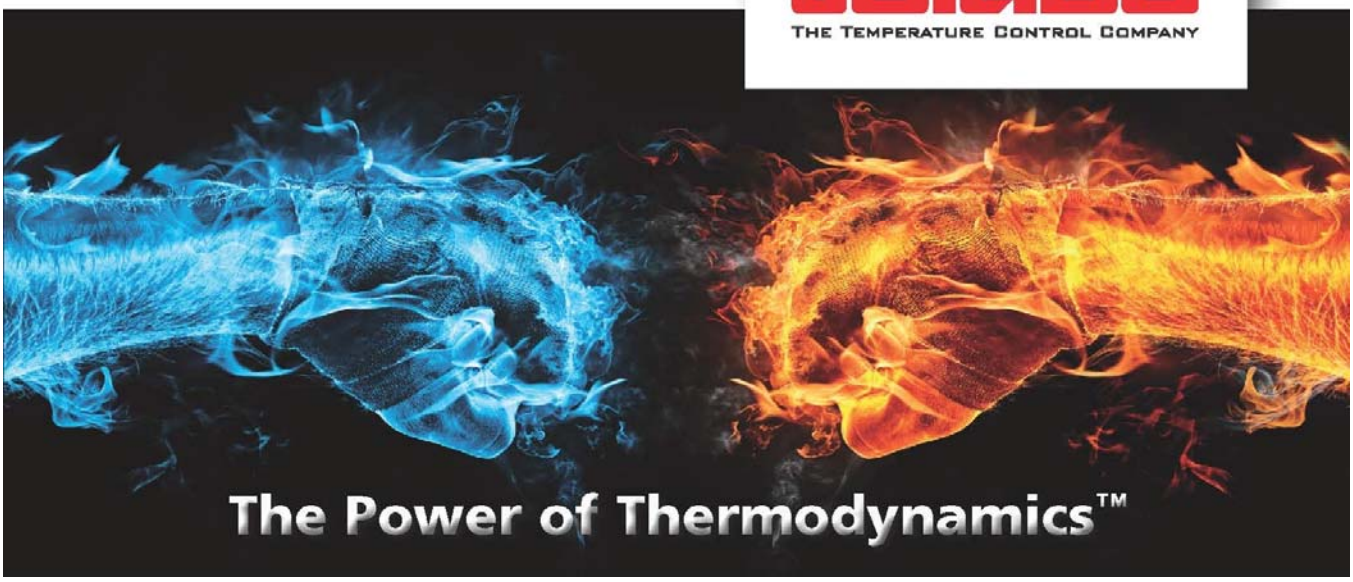
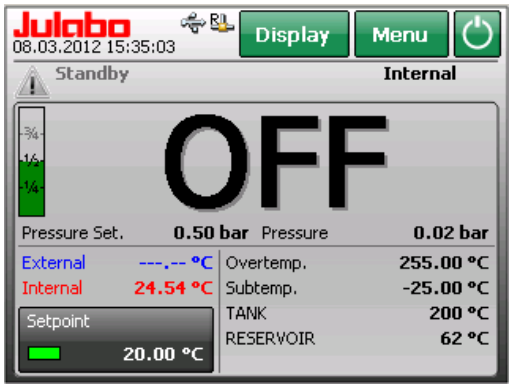
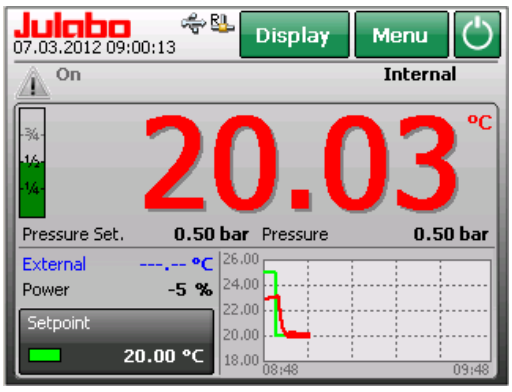


Operating Manual

PRESTO®

User Interface





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Important: keep operating manual for future use

Table of Contents

1. Initial Operation

1.1. Connecting to power supply

Caution:

- This device may be attached to protected earth (PE) mains power outlets only!
- The mains plug serves as a reliable way to disconnect the unit from its power supply for safety reasons and must be readily accessible at all times.
- Do not attempt to use the unit if the power cable is damaged!
- Regularly inspect the power cable for damage.
- No liability for improper power connection!

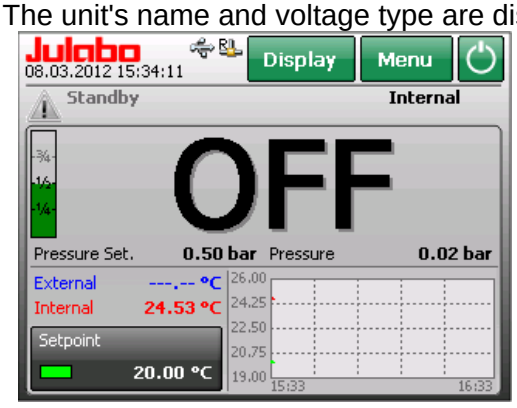
Compare the available mains voltage and mains frequency with the specifications on the type label.

- Connect the mains plug to a protected earth (PE) power supply socket!

1.2. Switching the unit on / selecting language

To switch the unit on:
Use the mains switch to bring the unit into operation.
The integrated lamp indicates that the power is on.

As initialization proceeds, the unit will assume the start positions and emit mechanical sounds.
The unit's name and voltage type are displayed briefly.

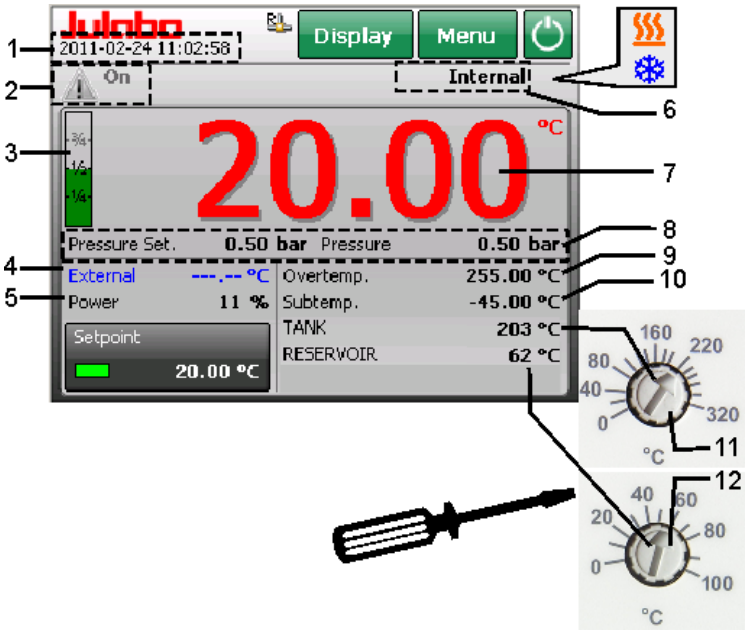


The unit will enter the same operating mode that it was in before shutdown, i.e.
manual model (operation with the unit's controls or remote control (operation via PC).

ⓘ Refer to >Settings menu< on page 18 for language selection.

2. Normal display

The normal display contains important values and functions.



ⓘ Adjust the high temperature cut-off by slowly turning the dial with a screwdriver. The exact value will appear on the display.

Note:
The order and availability of values 9 to 12 will depend on the settings in the > Customize Home display < menu. Page 20 The factory state is shown here.

1 Date / time
2 Status: on/Standby
3 Fill level indicator
4 External temperature sensor value
5 Current power (X% heating, -X% cooling)
6 Selected temperature control (internal/external)
7 Actual liquid temperature
8 Selected max. pressure and actual pressure
9 Selected high temperature cut-off (page 45)
10 Selected low temperature cut-off
11 High temperature cut-off (**TANK**)
12 High temperature cut-off (**RESERVOIR**)

Cooling icon Blinking or continuous

Heating icon Blinking or continuous

< Setpoint button

Adjust normal display

Call up main menu

Start/Stop button

State information
Examples:

Remote control mode through interface (page 94)

A storage medium is inside the unit. (page 41)

The unit is connected to a PC via ethernet. (page 52)

Access to unit is blocked (page 13)

Remote control mode via "Wireless Temp"

Warning

- The > **TANK** < high temperature cut-off should be set to 15 °C above the working temperature setpoint.
- The > **RESERVOIR** < high temperature cut-off **must** be set to at least 25 °C below the heattransfer liquid's firepoint.

Adjust the normal display

ⓘ You can adjust the normal display to your requirements by pressing the >Display< key.

ⓘ You may select the colors used in the normal display's chart.
>**Settings menu**< page 18.

Chart shows the progression of the setpoint and actual temperature.

Displays during errors

The unit provides straightforward and intuitive operation on the color TFT display even during errors.

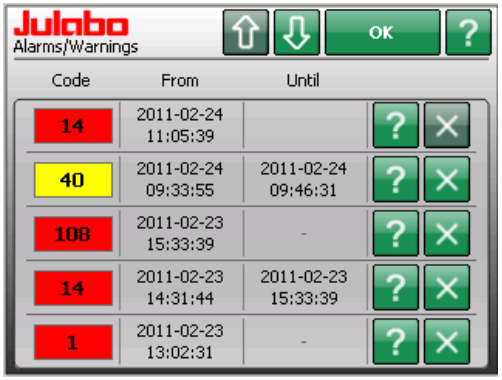
Error messages are divided into two categories:
>ALARM< and >WARNING<

ALARM red > 14

WARNING yellow > 40

Help is always accessible through the icons  or  .

Touch the icon and a list of errors will be displayed. ⇨



Date and time when the error appeared are stored and displayed.
If possible, this data will also be stored during removal of the error.
Example code 40 14

ALARM display

Error messages are displayed in a red box.

Resolution for example E14:

Touch the red box to mute the alarm.

Press <?> button for help text.

The module and the configuration are displayed. ⇨

Follow the instructions in the help text. ⇨⇨

Press <OK> button. ⇨

Press <?> button again for help text. ⇨

Press <Reset> button. ⇨⇨

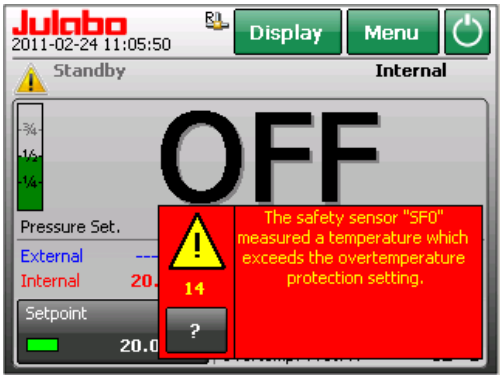
Another error message (E108) appears and describes a pathway for overcoming the alarm.

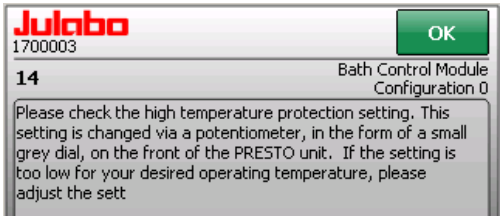
Press <?> button for help text. ⇨

Follow the instructions in the help text. ⇨⇨

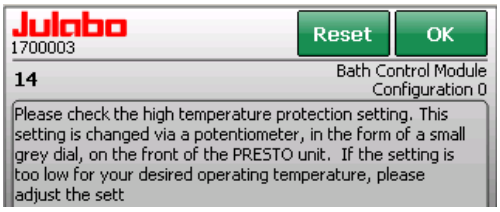
The unit is now ready to continue operation.

The unit switches to „Standby“. Heater, refrigeration unit and circulation pump are switched off.

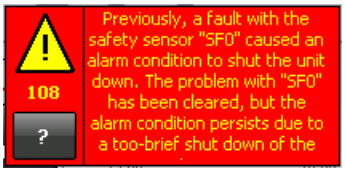


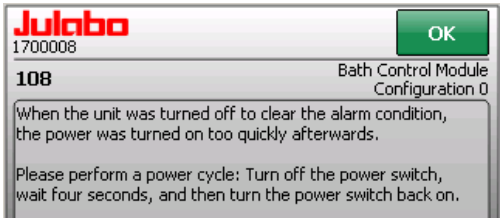


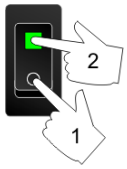
ⓘ Error message (E 14) remains although the safety temperature has been raised.



ⓘ A <Reset> is not permitted in this case because, according to NAMUR, this condition must be resolved via hardware.
Errors not subject to this regulation are resolved via <Reset>.







Not all alarms may be removed on-site.
List of all error messages see page 108

WARNING display:

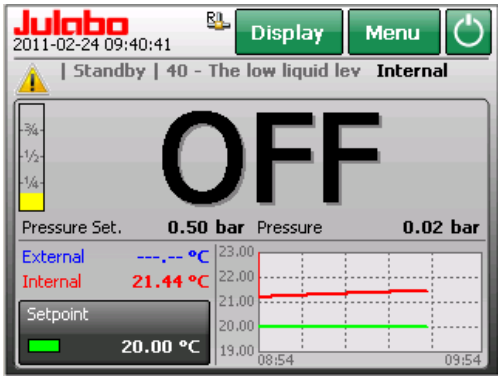
A warning does not result in shutdown of the heater, refrigeration unit, and circulation pump.

The unit provides the option of defining some warning limits independently, such as limits for pump pressure, limits for over-temperature and under-temperature.
If one of these limits is exceeded, a warning (ticker and signal) will continue for as long as the cause is active.

The yellow attention symbol will remain. It will draw attention to events that occurred during absence of the operating personnel. The events are stored in a list of errors.

Warnings are displayed as a ticker in the status line.

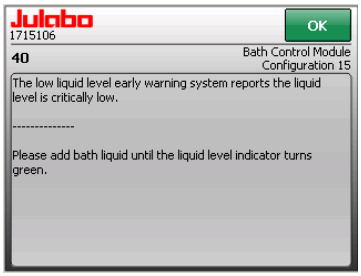
Example: Warning 40

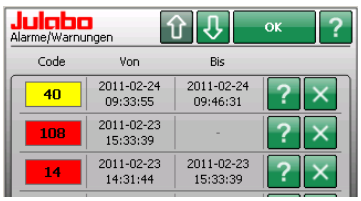


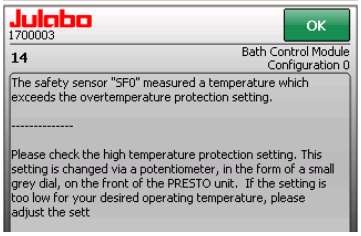
Touch the icon to mute the signal.

Touch or and a list of errors will be displayed.

Use the keys to view the list.
Use the OK key to exit the list. The yellow Attention icon " " is reset to " ".







Buttons in the list -

Press the <?> button for help text.

Press <X> to delete an error message from the list.
The 10 most recent events are shown.

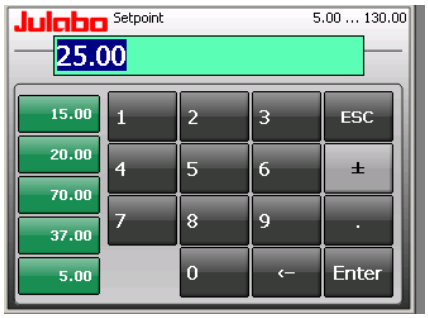
The complete list may be viewed in the password-protected service menu.

Service page 44

2.1. Set temperature

Select setpoint

Setpoint button



⇦ Input panel (example: 25.00 °C)

⇦⇦ The green keys display the most recently selected values.

⇦ Input keys
Keys 0 to 9 (digits keypad)

Decimal point button

Minus/plus button

Backspace key

Exit window without changes

Input/confirm entry

2.2. Start / Stop

Press Start/Stop button

The unit switches to „**On**“ and runs through a start-up phase, during which various parameters are checked and/or adjusted.
When the ticker is no longer displayed, the unit operates normally.

The start-up phase can last up to 30 seconds.

3. Main menu view

Select menu

3.1. Available keys in the main menu

Block access to unit  / password-protected actions.

Go back one menu level.

Home (return to normal display).

Retrieve help menu
Press <?> and then press the desired entry in the menu.

Indicates available submenu.

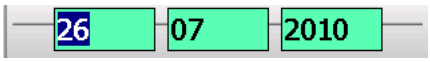
Digits keypad

Keys 0 to 9 (digits keypad)

Exit window without changes

Move cursor: left / right

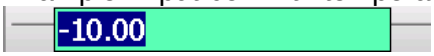
Example: Date input boxes



Backspace key

Input/confirm entry

Example: Input box with temperature value -10 °C



Decimal point button

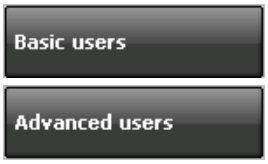
Minus/plus button

3.2. Unit Access/Safety Settings

Without an entry in the menu, the unit can be operated by any authorized person. You can change the unit's safety settings in this menu. The authorized users and user rights can be restricted.

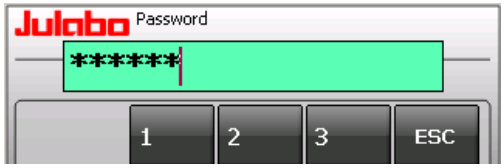
have full rights.

An >Administrator< is authorized to manage access to the unit. He can approve differing rights for two groups of users. Access is always password-protected.



Administrator assignment of password and access rights.

A six-digit password was set at the factory so the administrator can gain initial access.
Six zeros: **000000**



ⓘ Refer to page 16 to change the administrator password.

3.2.1. Administrator - Managing Access to the Unit

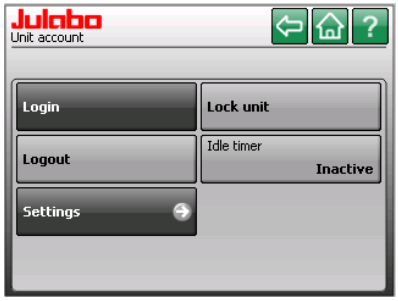
Press the key  in > **Main menu** <.

The >**Unit account**< menu is displayed.

ⓘ Light gray buttons are blocked.

Press the key

Enter the administrator password.

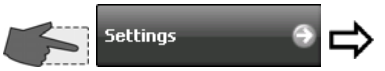


>**Lock unit**< >**Idle timer**<
Description page 17

Press >**Logout**< to re-enable access to the unit.

The administrator uses the password-protected >**Settings**< menu to grant access rights and passwords.

Press the key



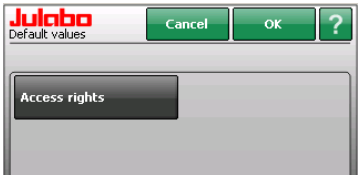
Enter administrator password

Default settings

If none of the user groups are logged in, the released functions and menus will be accessible by all users.

Press the key

>**Access rights**<
are granted in the >**Default values**< menu.



Press the key

☑ = released, ☐ = blocked

Confirm setting with

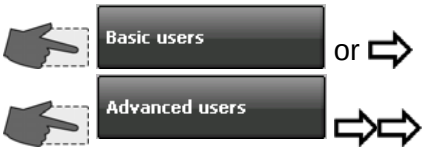
Buttons
in the Normal view and in the main menu

User groups

This is where the administrator assigns a password and access rights to specific user groups.

If a user group is logged in, settings can be changed only after entering the corresponding password.

Press the key



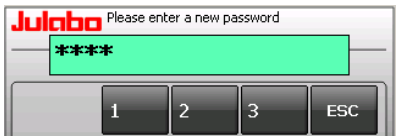
Press the key

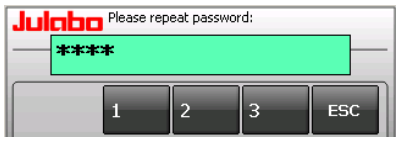
The user is asked to enter a new password and reenter the password for confirmation.

Confirm setting with

Example:

Basic users





Example:

4-digit password for > Basic users <

Press the key

Use the check box to grant ☑ or deny ☐ access rights to user groups.

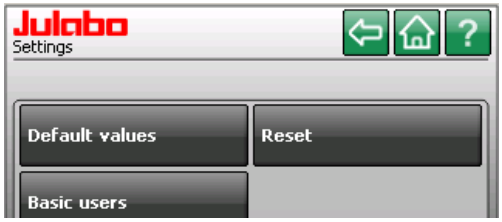
Basic users ↓ Factory settings ↓ Advanced users

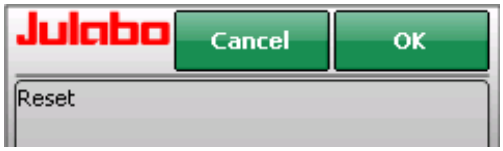
Confirm setting with

Reset

Press this button to reset all access rights to factory settings.

Press the key





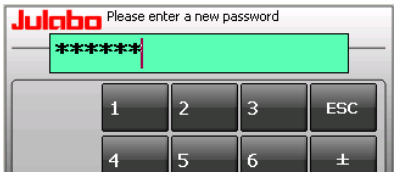
Administrator

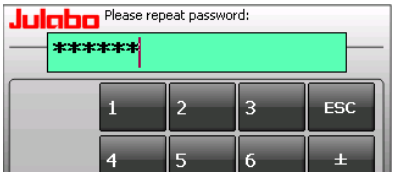
Change Password:

Press the key

The user is asked to enter a new password and reenter the password for confirmation.

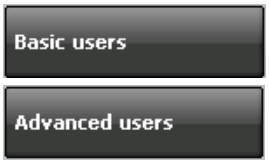
ATTENTION:
Record the new password in a secure place.
It will not be possible to access the unit without this password. The factory password will be overwritten.





Forget your password?
This can be resolved only through the >Service menu< Page 44. The authorized service person can delete the stored password and reset it back to the factory setting.

3.2.2. User Groups - Managing Access to the Unit



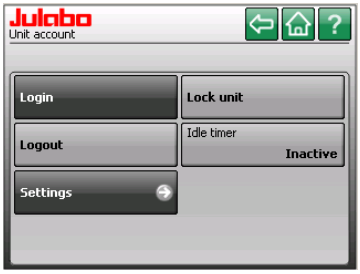
Users can sign on with the password that has been assigned to them.
After login, all settings approved for the relevant user group will be accessible by everyone without reentering the password. Press "Lock unit" to prevent misuse.

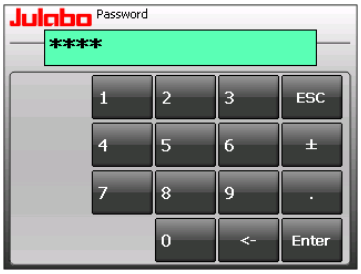
Press the key  in > **Main menu** <.

The >**Unit account**< menu is displayed.

ⓘ Light gray buttons are blocked.

Press this button to login





Enter the password

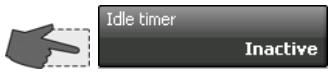
Access to the unit is enabled for the respective user group. Permitted adjustments can now be performed.

Block unit access immediately

Press the key

Block with time delay.

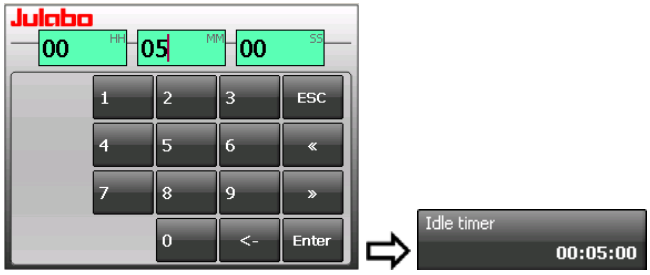
Press the key



Set time.

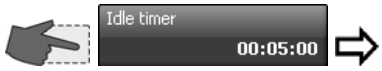
Enter the desired time here, after which the unit will be blocked if no additional entries are made.

Example: 5 minutes.

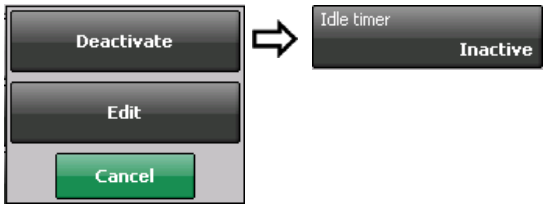


The current setting is shown on the button and will remain until changed.

Press the key



"Deactivate" time or
"Edit" time.

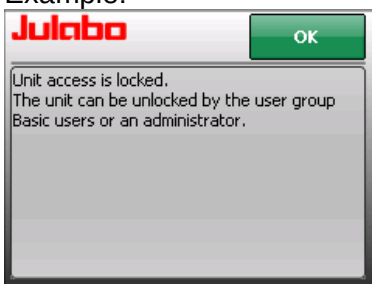


The unit will automatically switch to the normal display.

If someone attempts to use a locked unit, a window will open to notify the user that the unit is locked.
Example:

Press 

to enter password



Access to the unit can be restored by entering the password of the user group that locked the unit or the administrator password.
If an incorrect user group password is entered three times in a row, the administrator password will be required to enable the unit.

Enable access to the unit.

Press Logout.

After pressing >Logout<, access to the unit is re-enabled.

4. "Settings" menu

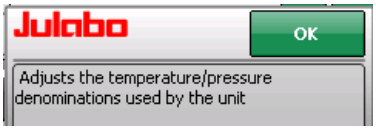
Select in the main menu

Select menu here

The buttons will display the current settings
or
indicate availability of a submenu:  .

Example: Call up the >Units< Help menu.

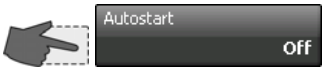
Press the <?> button and then press the >Units< button in the menu.



4.1. "Language" menu

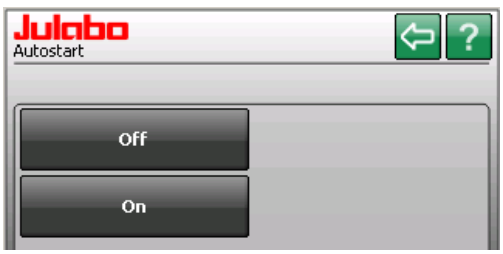
Select language.

4.2. "Autostart" menu



Switch Autostart on/off

Allows the direct start of the temperature control systems via the mains power switch.



>**Autostart**<

Note:

The temperature system has been configured and supplied by JULABO according to N.A.M.U.R. recommendations. This means for the start mode, that the unit must enter a safe operating state after a power failure (non-automatic start mode). This safe operating state is indicated by "OFF", on the TFT-Display. A complete shutdown of the main functional elements such as heater and circulation pump is effected simultaneously.

Using the AUTOSTART function is only possible when a set-point is set via >TFT Display< and >EPROG-input<.

Should such a safety standard not be required, the AUTOSTART function (automatic start mode) may be activated, thus allowing the start of the instrument directly by pressing the mains power switch or using a timer.

4.3. "Units" menu

The buttons will display the current settings.

Select the temperature units

°C or °F

Select pressure units

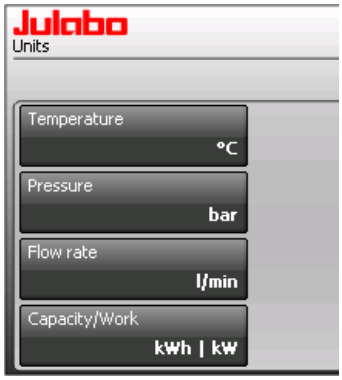
bar or psi

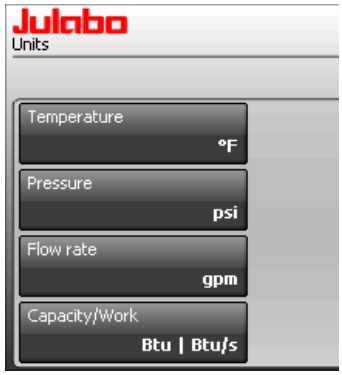
Select flow rate units

l/m or gpm

Select Capacity / Work units

kWh; kW or Btu; Btu/s

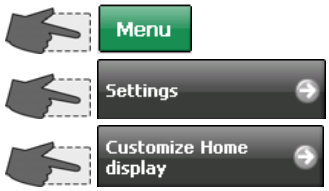




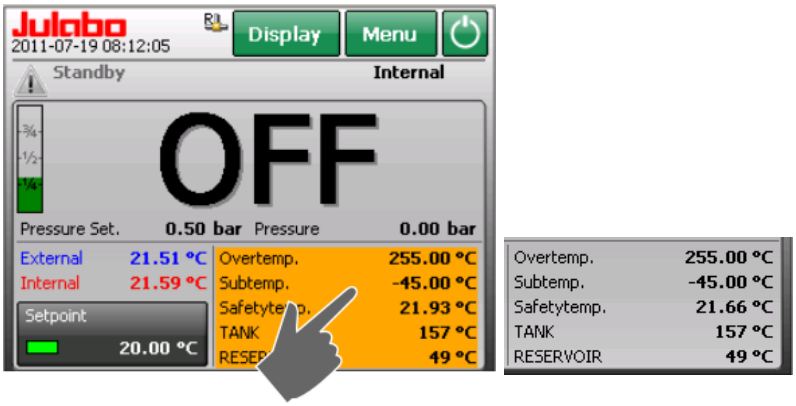
4.4. Menu Customize Home display

Two paths to the submenu
> Customize Home display <.

1. Via



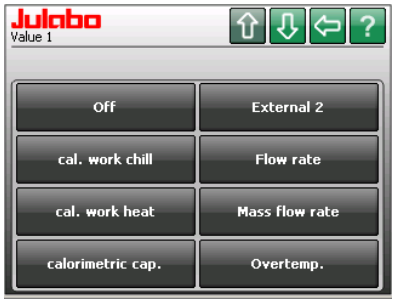
2. Touch the field. ⇨



The current setting is displayed on the keypad. ⇨

Choose value X.
Example: value 1

Choice of displayable values. ⇨⇨

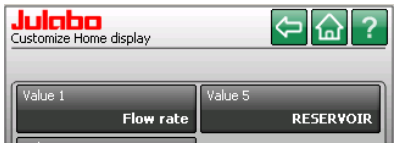


Push ⇩ for further values.

Choose value and automatic return to
> Customize Home display <.

Or push ⇦ and leave the display without changes.

Example: Value 1 / Flow rate



ⓘ Active key light green.
⇧⇩ or ⇧⇩

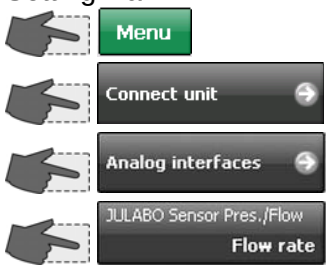
ⓘ The sequence and choice of the values in the orange field can be changed.

ⓘ The partial area in the lower right is a keypad which turns orange when touched.

ⓘ Message in case of incorrect choice.

Whether >Pressure< or >Flow rate< are settable, depends on the setting of >JULABO Sensor Pres./Flow<.

Setting via



(page 61)

4.5. "Date / time" menu

Set date / time

Enter values with digits keypad.

ⓘ Various options each are available for >Format< and >Separator<.

4.6. "Colors" menu

Select colors

You may select the colors used in the normal display's chart.

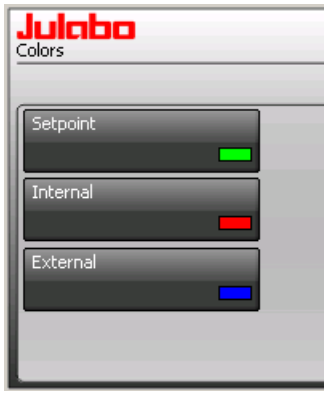
Use  to change the settings in the selected submenu.

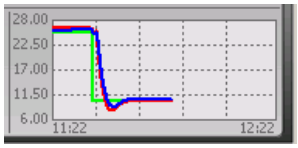
Red

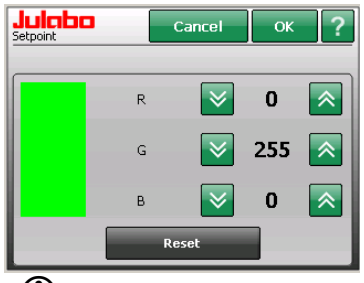
Green (example at left, setpoint)

Blue

Confirm setting with  .

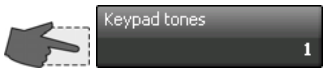






ⓘ In this way you can choose custom colors from the RGB color palette.

4.7. "Keypad tones" menu



Switch tones on/off

An audible tone will be emitted each time you press a button.

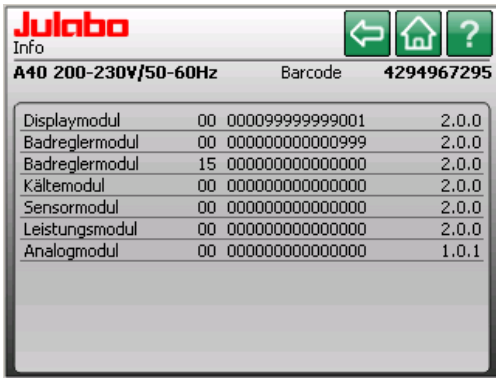
Three different tone lengths are available.

4.8. “Info“ menu

Select Info

Information on module configuratioin.

ⓘ Examples

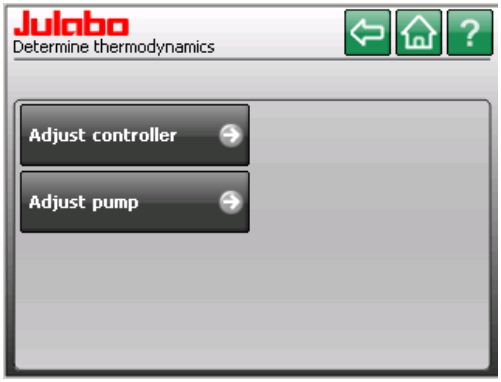


5. "Determine thermodynamics" menu

Select in the main menu

Select menu here

 indicates available submenu.

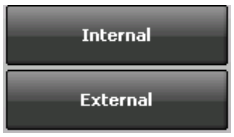


5.1. "Adjust controller" menu

Select menu

The buttons will display the current settings or indicate availability of a submenu:  .

Select desired control type



Presto temperature-control units let you choose between internal (inside the heat exchanger) or external (directly at the application or temp.-control loop) temperature control.

ⓘ Your selection is shown in the normal display.

5.1.1. "Self-tune" menu

Select setting

During self-tuning, the controlled process's parameters Xp, Tn, and Tv will be automatically determined and stored.

Available parameters:

Off - no self-tuning
The control parameters of the most recent identification are stored and will be used for control purposes.

Once - one-time self-tuning
The unit will perform a one-time identification of the controlled process each time the unit is started with the button or via the start command through the interface.

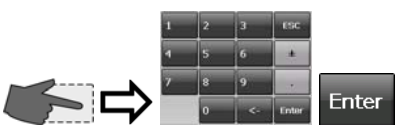
Always - continuous self-tuning
The circulator will identify the controlled process at each setpoint jump.
Select this option only if the controlled system changes continuously.

5.1.2. Bandlimit Selftune

During self-tuning, it is important to prevent the speed of the temperature change in the rapid internal system (Presto) from greatly exceeding the speed of the temperature change in the slower external application.
A bandlimit during self-tuning ensures that temperature changes in the unit (small mass) and in the application (usually larger masses) proceed uniformly. This applies to the heat up and cool down phases.
The maximum permissible temperature difference is defined with the value >Bandlimit selftune<.

ⓘ As long as >Bandlimit selftune< is engaged, the bandlimit will be switched off during external control.
(See >Lower/upper bandlimit< Page 29)

Set value



Example: 50 K

Setting range see display of unit. ↓

5.1.3. "Adjust control performance" menu

Select menu


indicates available submenu.

Preparing for external control:

Connect the Pt100 external sensor to the socket in the socket panel. It is normally not necessary to calibrate the sensor.

In special situations, a three-point calibration, for example, can be performed with the "Adjust sensors" function (see Page 83).

The buttons will display the current settings.

Select parameters

Set new values.

Internal parameters

or

External parameters

Internal/external control parameters

In most cases, the factory-set control parameters will be adequate for achieving an optimal temperature sequence in the item being controlled.
Adjustable control parameters give you the ability to adapt to unusual processes.

Setting range:
internal/external
0.1 ... 99.9 K

Proportional range >Xp<

The proportional range is the temperature range below the setpoint in which the heating capacity is controlled from 100% to 0%.

Setting range:
internal/external
0 ...10000 s

Reset time >Tn< (integral proportion)

Compensation for the control deviation that remains due to the proportional controller. Reset times that are too small may lead to instability. Reset times that are too large will make compensation of the control difference unnecessarily long.

Setting range:
internal/external
0 ... 1000 s

Rate time >Tv< (differential proportion)

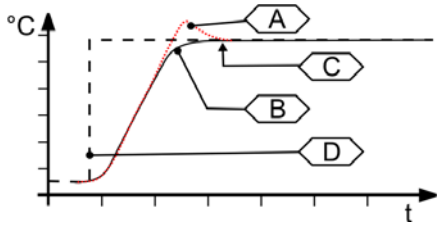
The differential proportion shortens the adjustment time. If the rate time is too small, equalization of an interference value will be extended and you will

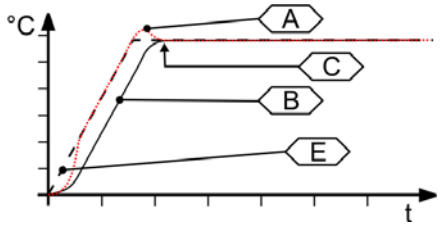
experience large overshoots when approaching a setpoint. If the rate times are too great, you may experience instability (oscillations).

Setting range:
0.1 ... 99.9 K

Proportional range >Xpu<

The Xpu proportional range of the underlying controller is needed only for external control.





A Standard
B Aperiodic
C Temperatur stability
D Setpoint
E Temperature ramp

> **Dynamic <**

This parameter influences the temperature sequence only during **internal** control.

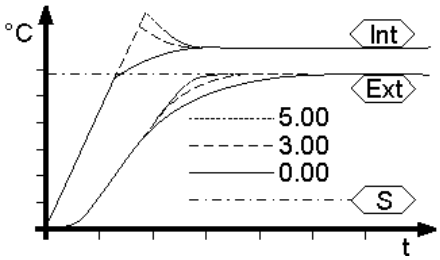
Available parameters:

Standard The temperature will climb faster, but may overshoot by up to 5%. If a ramp is defined, the temperature sequence will largely follow this ramp.

Aperiodic. Temperature will increase with time offset (no overshoots).

Both settings will achieve adequate temperature stability after approximately the same amount of time.

Setting range: 0.00 to 5.00



S Setpoint
Ext External temperature
Int Internal temperature

>CoSpeed factor<

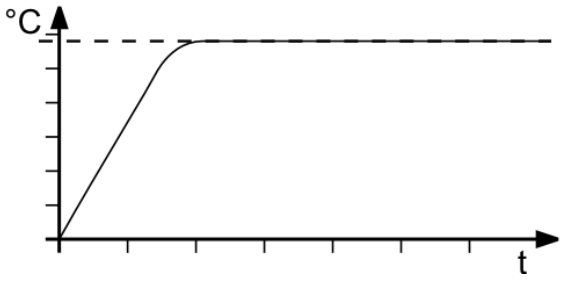
This parameter will influence the temperature sequence only with **external** control.

The setting influences calculation of the control parameters during identification, thereby influencing control behavior.

Optimization tips for PID control parameters

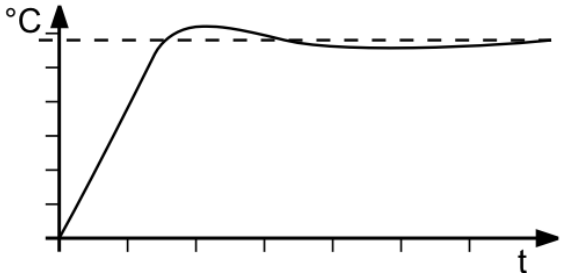
The progression of the control object's temperature over time can indicate improperly adjusted control parameters.

Optimal

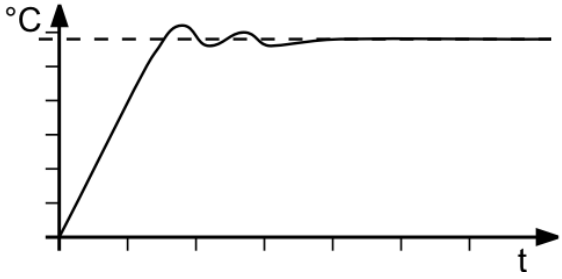


Improper adjustment may lead to the following heat-up curves:

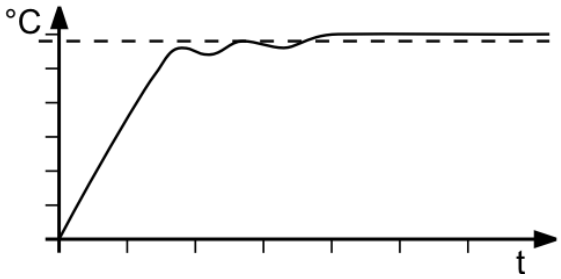
Xp too small



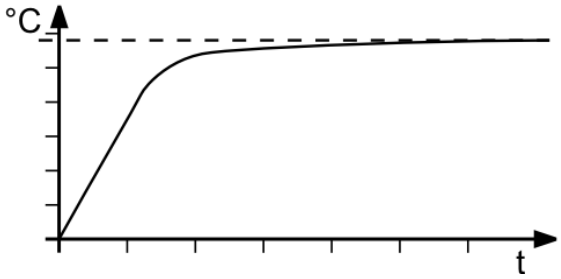
Tv/Tn too small



Xp too large or Tv too large



Tv/Tn too large or Xp too large

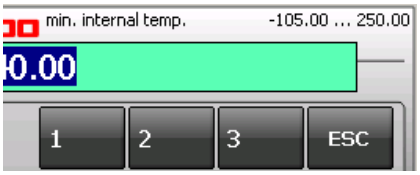


5.1.4. "Adjust limits" menu

Select menu

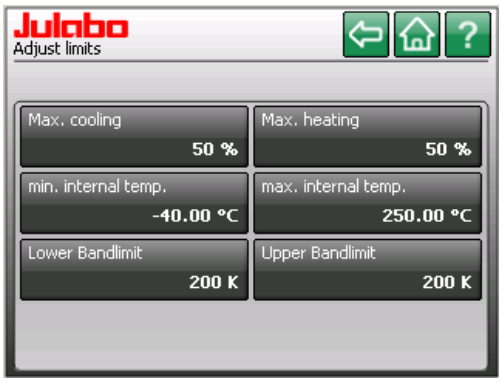
The buttons will display the current settings.

ⓘ Example: setting ranges see display of unit. ➘



The >Limits< menu allows you to define the minimum and maximum values for all important setting ranges and power variables.

The setting ranges depend on the performance category of the temperature control system.



Selected maximum heating / cooling capacity

The unit's heating and cooling capacities are adjustable. 100% corresponds to the capacity specified in the technical data.

Setting range:

Max. heating capacity 0 to 100% in 1% steps
Max. cooling capacity 0 to 100% in 1% steps

Min. internal temp and **max. internal temp**

Maximum and minimum setpoint in internal bath.

The max. internal temp and min. internal temp limits apply only when using the "external" operating mode. Max. internal temp and min. internal temp define static limits for the anticipated temperatures in the internal bath. The temperature controller cannot exceed these limits, even if this would be necessary in order to achieve the desired temperature in the external system. In some situations this may prevent you from reaching the external setpoint.

Reasons for setting limits:

- ☑ Protect the heat transfer liquid from overheating.
- ☑ Prevent the high temperature cut-off >Error 14< from triggering an undesired alarm shutoff.
  Set the > Internal max.**<** value at least 5 °C below the >High temperature cut-off (tank)< value.
- ☑ Protect the pump motor from excessive viscosity of the heat transfer liquid at low temperatures.

Lower bandlimit and **Upper bandlimit**

Bandlimits are active during external control.
Various settings are possible for the heat-up and cool-down phases as required.

Setting range: 0 °C ... 200 K

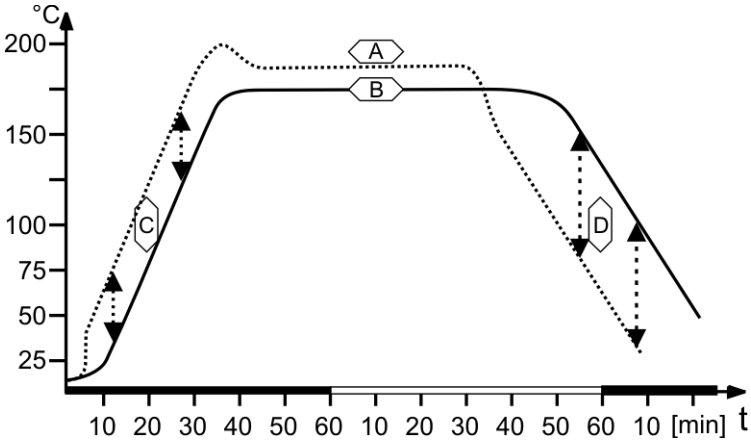
Legend:

A Internal bath

B External system

C Upper bandlimit

D Lower bandlimit



> **Upper bandlimit** < and > **Lower bandlimit** < define the maximum permissible temperature difference between the internal bath and the external system during the heat-up or cool-down phase, respectively.
During the heat-up phase, this difference value is always added to the current external temperature. During the cool-down phase, the difference value is subtracted.

Reasons for setting limits:

☑ Protect the object being controlled with gentle temperature control.

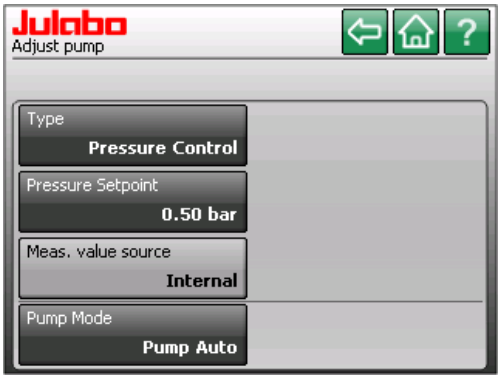
☑ Protect glass reactors or other objects from thermal tension.

ⓘ As long as >Bandlimit selftune< is engaged, the bandlimit will be switched off during external control.
(See Page 24)

5.2. "Adjust pump" menu

Select

The buttons will display the current settings.



Select the pressure display in the **Units menu:** psi or bar
Page 19

5.2.1. „Type“ menu

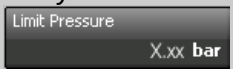
Select

Type of pump control.

Attention

Observe the external consumer's pressure limits!

Pressure limits
refer to page 47
Set your value here.



Pump control can be realized in three different ways.

5.2.1.1. Type „Stage control“

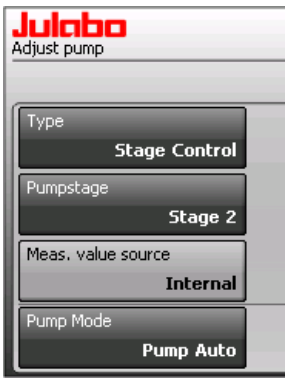
Select

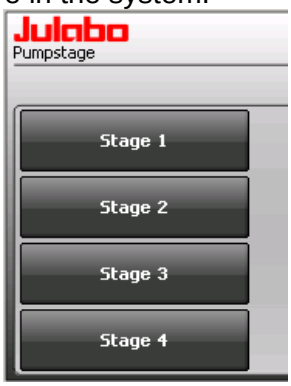
Change presetting in the respective submenu.

Select >Pumpstage<

Example: Stage 2

Adjustable in 5 stages. The number of stages depends on the temperature-control system's performance class and is displayed in the Pump Stage menu.
Each stage increases pressure in the system.

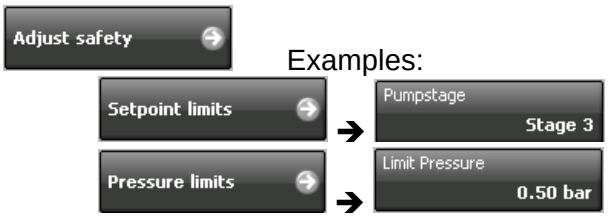




ⓘ Presto A30 has only one Pumpstage.

Notice

Settings of setpoint limits for >**Pumpstage**< and >**Limit Pressure**< are active.



If the >max. permissible pressure< is exceeded at >stage 3< an alarm including the cut-off of the unit is activated!

5.2.1.2. Type „Pressure control“

Select .

Set pressure setpoint.

Example „0.5“

The setting ranges depend on the performance category of the temperature control system.

Example: see display of unit.

Setpoint limits

refer to page 46

ⓘ Settings in the >**" Adjust safety " menu**< will influence these values. If a >**Setpoint limit**< is set, you will not be able to exceed or fall below this value, respectively.
You will receive a message stating "Value is too small or too large"

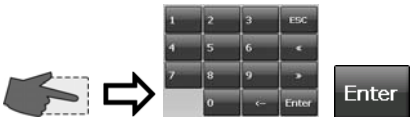
Example:

The displayed value, in this case „Max:0.65“, always refers to the next higher limit.

5.2.1.3. Type „Flow rate Control“

Select

Set value.



Note

Check the selected pressure limits! (Page 47)

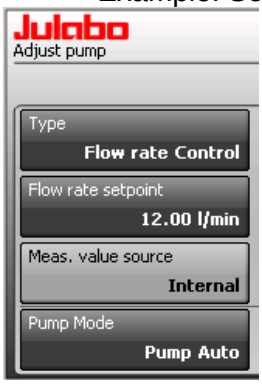
The selected pressure limits are monitored during flow control as well.

A high flow rate may exceed these limits and cause the unit to shut down.

The flow rate is infinitely adjustable and is actively controlled.

The setting range depend on the performance category of the temperature control system.

Example: Setting range see display of unit.

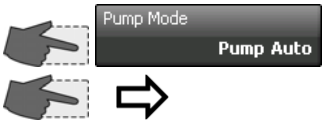


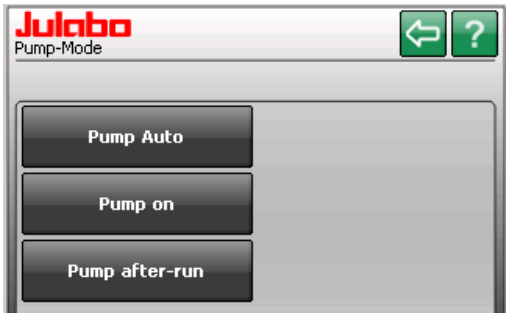
Example: 12.00 l/min

ⓘ Refer to the operating manual of the utilized VFC flow control unit (accessories) for additional notes on possible flow rates.

5.2.2. "Pump mode" menu

Select





>**Pump Auto**<
The pump is controlled via the start/stop button or via the interface.

>**Pump on**<
Pump runs continuously.

>**Pump after-run**<
You must select the pump’s after-running time.

>**Pump after run**<

Set time.

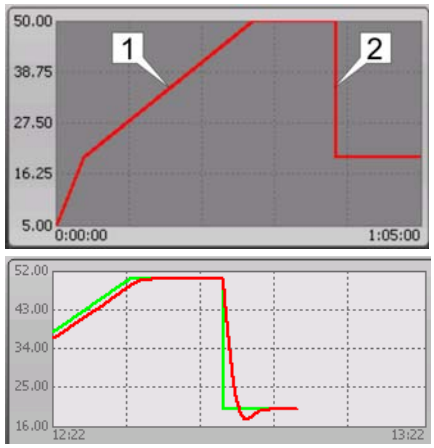
Example: 5 minutes

6. "Using a programmer" menu

In the main menu select

A programmer makes it easy to quickly program setpoint temperature profiles. A profile is a series of temperature setpoints. A profile consists of several individual steps. Each step is defined according to a length of time (t:) or gradient (°/t) and target temperature.

The target temperature is the setpoint that will be reached when the step is complete. The programmer references the time and temperature difference in a step to calculate a temperature ramp.



Setpoint = green

Actual value = red

Attention:
If the time specification is too short, there will not be enough time to reach the setpoint. The programmer contains an easy way to handle this situation.

If a step time of 00:00:00 is entered, the setpoint will "jump" (2) to the target temperature as quickly as possible.
The profile will continue with the next step only after reaching the specified temperature (±0.2 °C).

Eight profiles with up to 60 steps each can be stored.
The **Standard** and **Gradient** settings can be used together in a single profile.

Edit Profile:
Create or edit a temperature profile.

Start Profile:
Start a temperature profile**.**

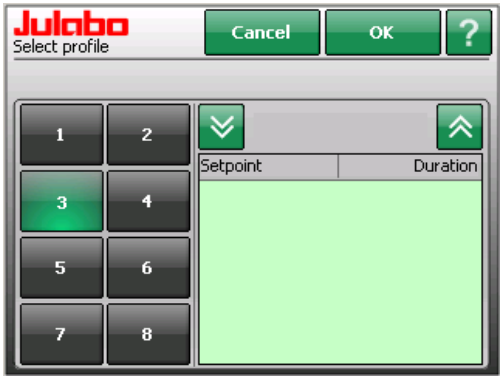
Use programmer series:
This feature allows you to set a series so a certain profile will run at the same time on several different days.

6.1. "Edit a profile" menu

Create a new profile.

Press

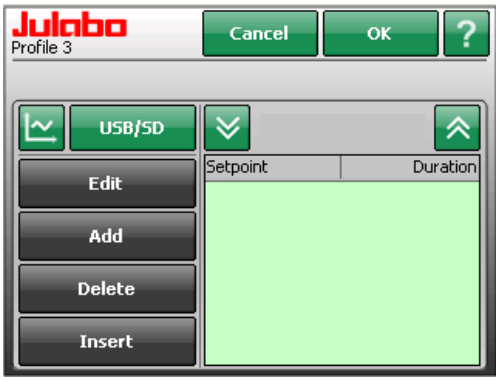
Example:



Select profile 3 from profiles 1 to 8

 and 

You will use the following four menus to create a profile.



Edit:
Edit the currently selected step.
Change setpoint / duration.

Add:
Adds a new step to the profile at the end of the list.

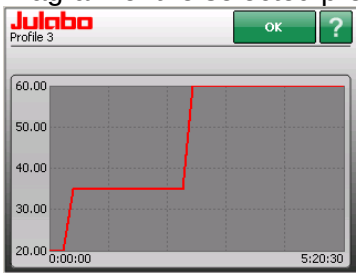
Delete:
Delete the currently selected step.

Insert:
Adds a step to the profile in front of the currently selected step.

Import or export the profile to or from an external data carrier.

Scroll up and down in the >Setpoint / Duration< list or select the desired line by touching it with your finger.

Diagram of the selected profile.



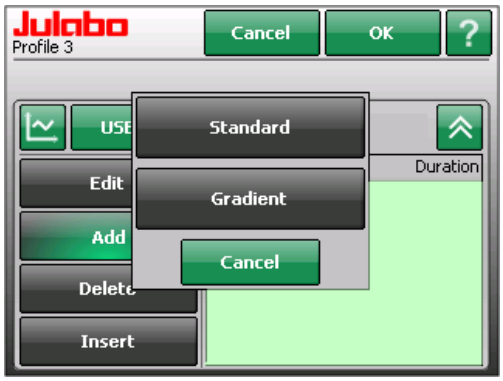
6.1.1. Add

Select

Now select
Standard or **Gradient**.

Standard: Set setpoint and duration.

Gradient: Set target temperature and gradient.



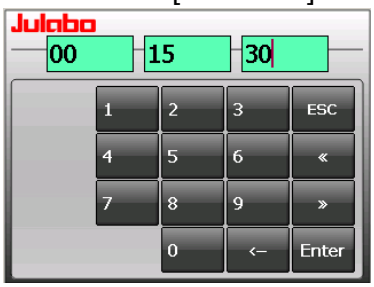
ⓘ Settings in the "Limits" menu will constrain the setting range.

Examples: **Standard**
Temperature setpoint [°C/°F] and duration [hh:mm:ss]

Set **setpoint** and **duration**

 and Enter

20.00 °C --- 00:15:30
35.00 °C --- 00:10:00
35.00 °C --- 05:30:00



Examples: **Gradient**
Temperature [°C/°F] and Gradient [°/min]

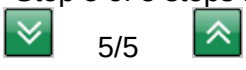
Set **setpoint** and **gradient**

 and Enter

60.00 °C --- 2.5 °C/min

The **Standard** and **Gradient** settings can be used together in a single profile.

ⓘ Example: Step 5 of 5 steps is selected.



The currently selected step is saved.

6.1.2. Edit

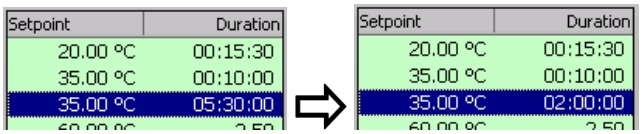
Use  to select step.

Press

Set new values.

Edit the currently selected step.

Set new values.



Setpoint	Duration
20.00 °C	00:15:30
35.00 °C	00:10:00
35.00 °C	05:30:00

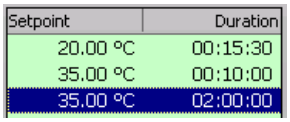
Setpoint	Duration
20.00 °C	00:15:30
35.00 °C	00:10:00
35.00 °C	02:00:00

6.1.3. Delete

Use  to select step.

Press

Delete the currently selected step.



Setpoint	Duration
20.00 °C	00:15:30
35.00 °C	00:10:00
35.00 °C	02:00:00

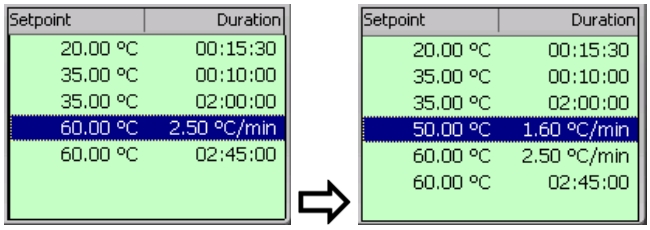
6.1.4. Insert

Use  to select step.

Press.

Set values.

Insert a step in front of the selected step.



Setpoint	Duration
20.00 °C	00:15:30
35.00 °C	00:10:00
35.00 °C	02:00:00
60.00 °C	2.50 °C/min
60.00 °C	02:45:00

Setpoint	Duration
20.00 °C	00:15:30
35.00 °C	00:10:00
35.00 °C	02:00:00
50.00 °C	1.60 °C/min
60.00 °C	2.50 °C/min
60.00 °C	02:45:00

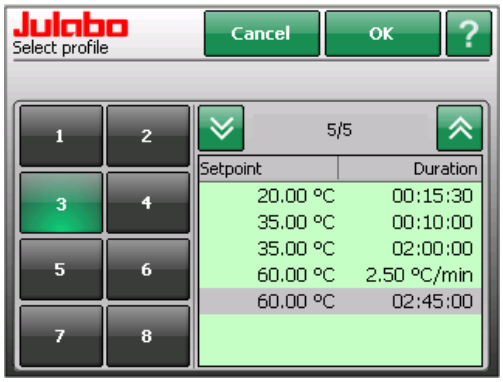
6.2. "Starting a profile" menu

Select.

Example:

Select profile 3

 and 



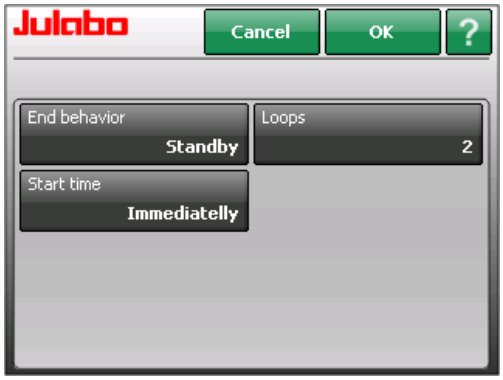
The buttons will display the current settings.

End of profile: 

Status at the end of the profile. (See page 39 for description).

Repeats: 

A profile can be repeated up to 99 times.



ⓘ 1 run + 2 repetitions (Loops) = 3 runs

Start time: 

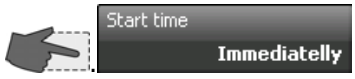
Start **immediately** with 

or

define start time.

ⓘ Refer to page 21 for date and time format.

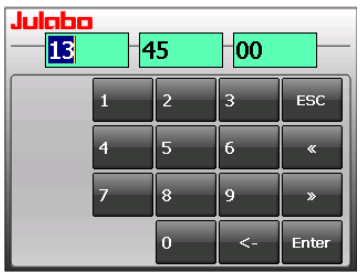
Select



Set values.

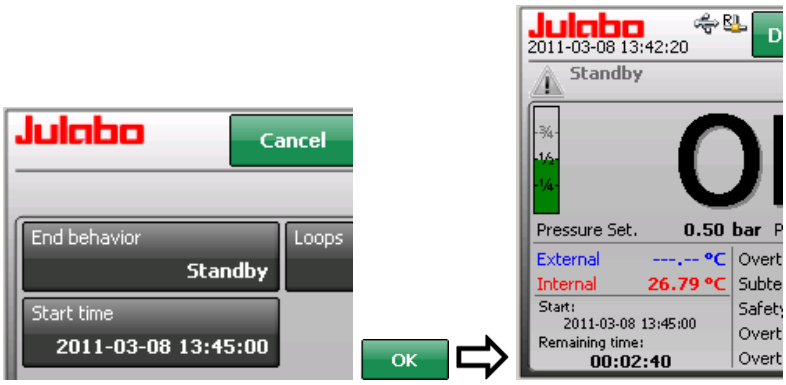
Year / Month / Day

Hour / Minute / Seconds



The >Start time< button will then display the current setting.

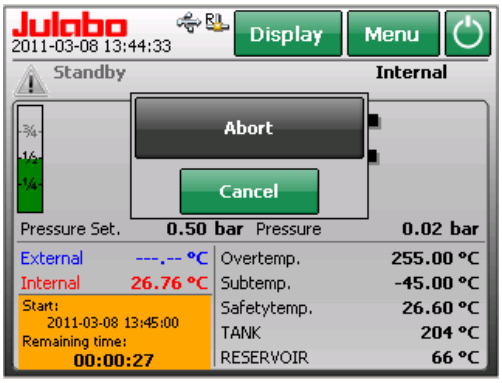
Press OK for normal view. The normal display will show the current time, the selected start time, and the remaining time until starting.



Before starting:

This area at the lower left is a button that turns orange when touched.

New buttons will then appear in the center of the screen.

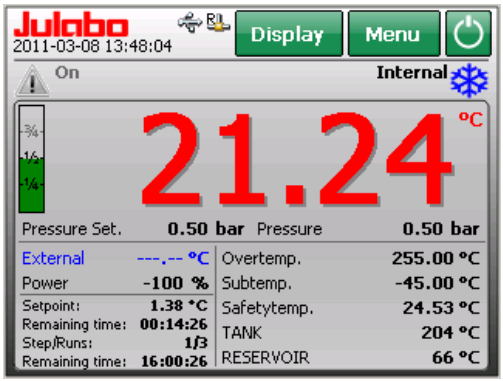


You **can** still exit the start phase by pressing >**Abort**<.

After starting:

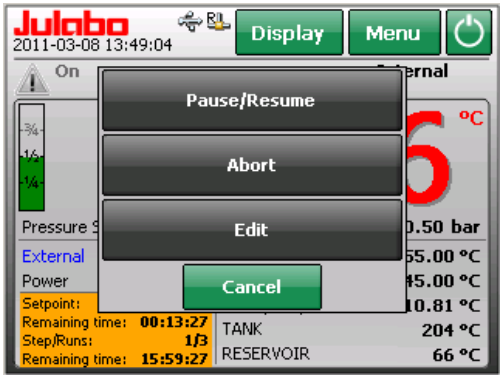
The following values will be shown at the bottom left of the normal display:

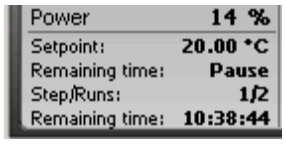
- The computed setpoint
- The current step's remaining time
- Current step / remaining number of runs
- Time remaining in profile



This area at the lower left is a button that turns orange when touched.

New buttons will then appear in the center of the screen.





Pause/Resume

"Pause" will stop the progression of a profile.

Press "Resume" to restart.

Abort

The program will end; return to normal display.

Edit

Refer to >Edit a profile< on page 33.

ⓘ **Pause/Resume**

The setpoint and both remaining times will be paused.
Visible on the display: Remaining time: **Pause**

End behavior

Here you can decide whether the unit will switch OFF at the end of a program or whether temperature control will continue. You also select the working temperature setpoint to be used at this time.

Standby

The unit will turn >OFF< at the end of the program.

PG setpoint

At the end of the program, the unit will continue to run with the final step's setpoint.

Press  to end or start a new program.

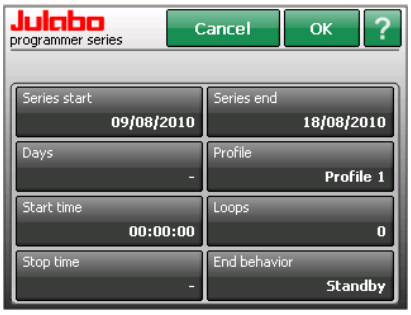
Start setpoint

At the end of the program, the unit will continue to run with the first step's setpoint.

6.3. "Using a programmer series" menu

Select

Use this function to run a profile at the same time on a series of days.



The buttons will display the current settings.

Press a button

Examples:

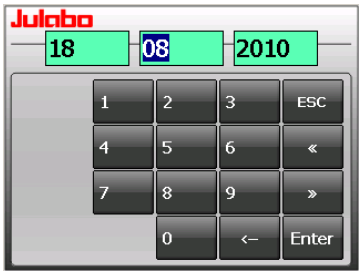
Day / Month / Year

Set the series start date.

 and Enter ⇨

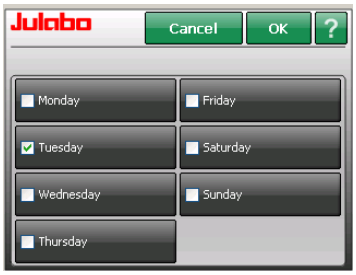
Set the series end date.

 and Enter ⇨⇨



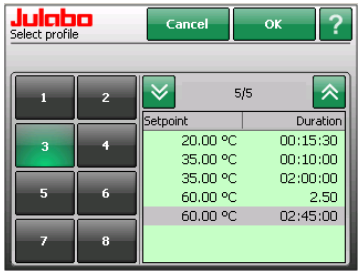
Select days

 and OK ⇨



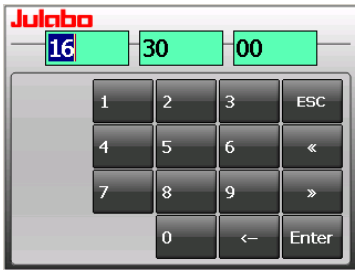
Select profile

 and OK ⇨⇨



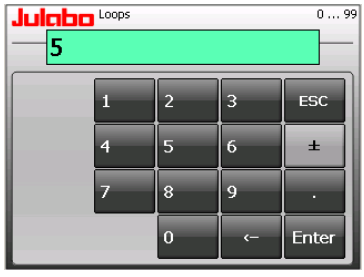
Set start time.

 and Enter ⇨



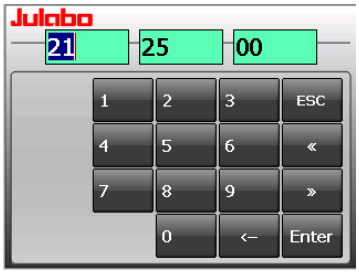
Set the number of times the profile will repeat.

 and Enter ⇨⇨



Set stop time.

 and Enter ⇨



Set status at end of profile.

 and Enter ⇨⇨

End of profile:

See page 39 for description

7. "Recording data" menu

Caution:

Danger caused by viruses on data carriers!

Only use data carriers which have been checked for viruses prior to use with temperature control systems.
Please integrate all data carriers in your quality management system.

Select in the main menu.

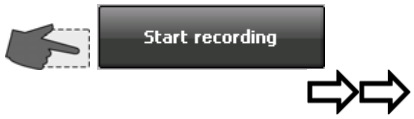
The menu >recording data< allows documentation of following important settings of the unit:

Date, time, setpoint, internal actual value, external actual value, performance, pressure, status.

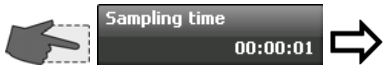
2011-02-28	15:32:21	40.00	22.69	-	0	0.51	1
2011-02-28	15:32:22	40.00	22.70	-	0	0.51	1
2011-02-28	15:32:23	40.00	22.71	-	100	0.51	1
2011-02-28	15:32:24	40.00	22.72	-	100	0.50	1
2011-02-28	15:32:25	40.00	22.73	-	100	0.46	1
2011-02-28	15:32:26	40.00	22.74	-	93	0.45	1
2011-02-28	15:32:27	40.00	22.82	-	81	0.45	1
2011-02-28	15:32:28	40.00	23.08	-	74	0.46	1
2011-02-28	15:32:29	40.00	23.53	-	69	0.46	1
2011-02-28	15:32:30	40.00	24.10	-	68	0.47	1
2011-02-28	15:32:31	40.00	24.67	-	68	0.48	1
2011-02-28	15:32:32	40.00	25.19	-	69	0.47	1
2011-02-28	15:32:33	40.00	25.60	-	71	0.48	1
2011-02-28	15:32:34	40.00	26.00	-	72	0.48	1
2011-02-28	15:32:35	40.00	26.46	-	74	0.49	1

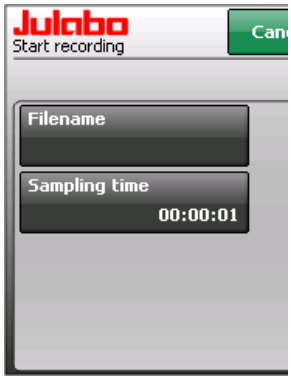
Please insert data carrier., e.g. USB stick.

Start recording

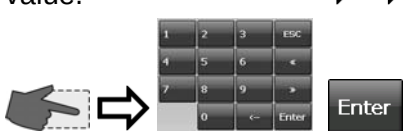


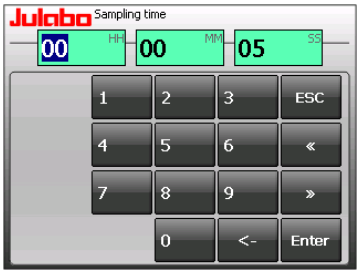
Sampling time is set to one row of data per second.





Set sampling time to desired value.





Continue with

If only one data carrier is inserted, the unit will recognize and display it on the <Storage> button.
If both interfaces are occupied, the user can choose between them.

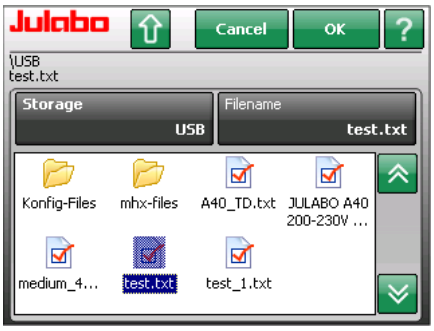
Select data carrier

- SD card
- USB stick

Select the existing >txt< file

test.txt and OK

The file will be overwritten.



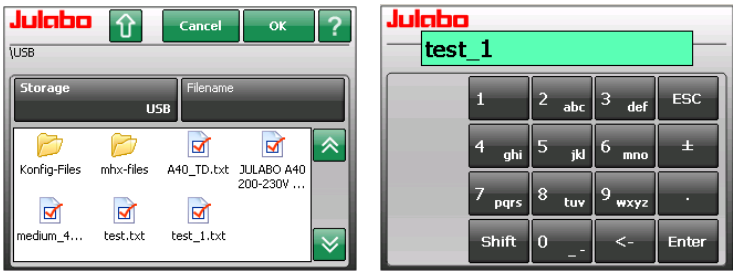
or

Create a new file.
Select file name

Filename

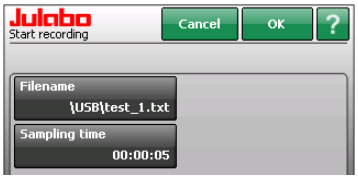
and Enter

e.g. „test_1“.



Start recording

OK



ⓘ A disc icon in the standard display indicates active data recording.

Select in the main menu.

Menu

Record data

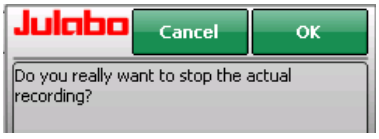
Stop data recording.

Stop recording

Confirm the help text.

OK

#

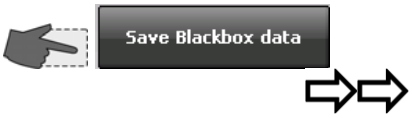


7.1. JULABO Service – Online remote diagnosis

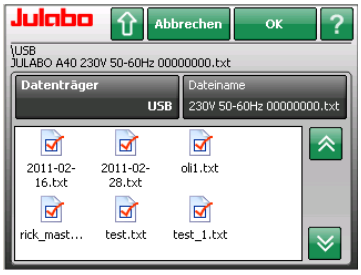
The >Record data< menu also contains a function for saving black box data.

JULABO Presto units are equipped with a so-called "black box". It is integrated into the controller, where all relevant data of the most recent 30 minutes are recorded.
This data can be exported when servicing the unit. To receive rapid and competent assistance, e-mail the file to our service department at service@julabo.de.

Please insert data carrier, e.g. USB stick.

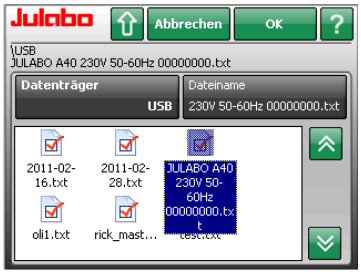


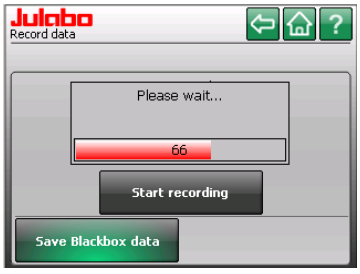
The file name will be generated automatically. Unit designation, mains voltage, frequency, barcode number



Select data carrier

The file is created.

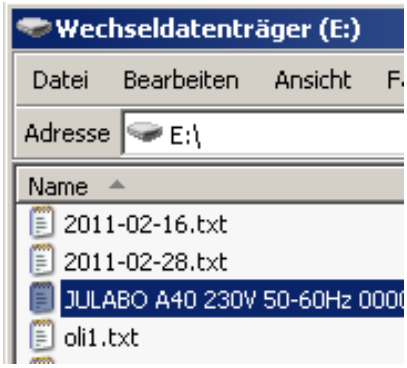


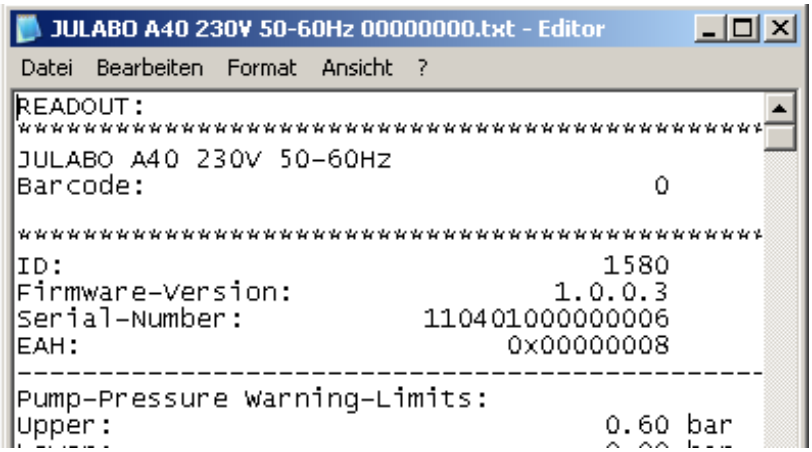


Start the recording

Recording active

Connect data carrier to a PC and transfer the txt file.





8. "Service" menu

Select in the main menu

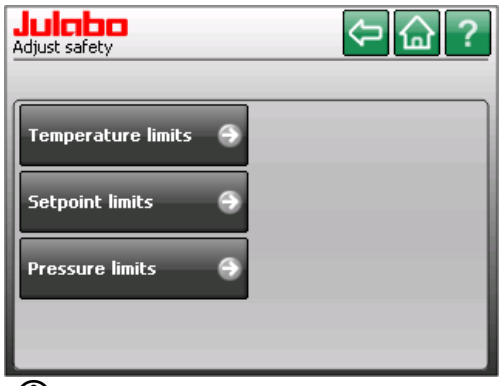
This menu is password--protected. It is accessible only by authorized persons.

9. "Safety adjustments" menu

Select in the main menu.

Select menu

 indicates available submenu

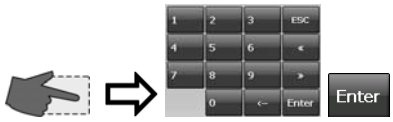


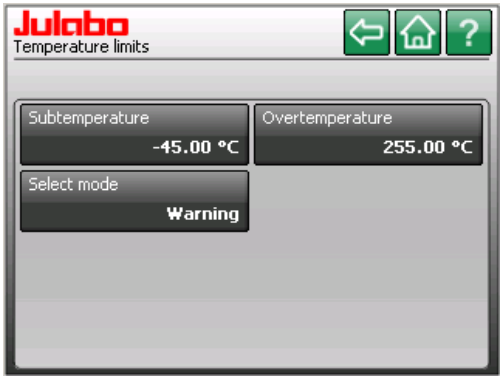
ⓘ Setting ranges depend on the performance class of the temperature control system.

9.1. "Temperature limits" menu

The buttons will display the current settings.

Choose button and set value.

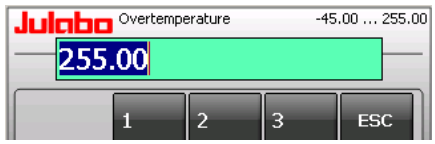




Subtemperature

Overtemperature

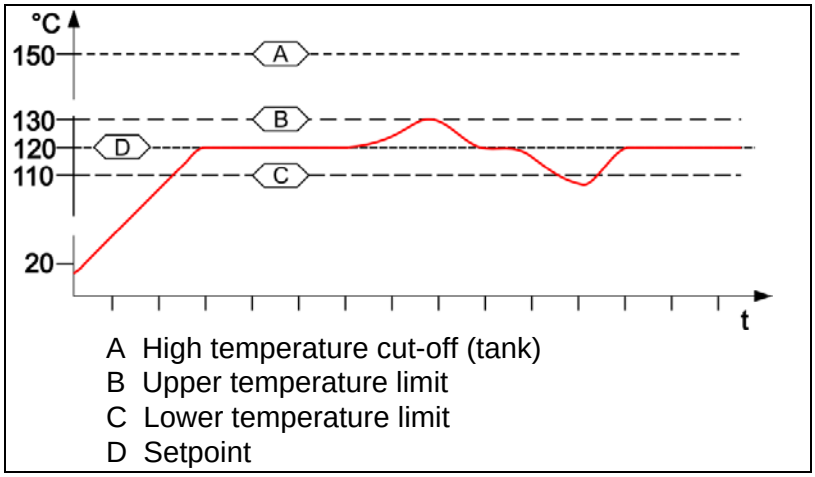
For setting range see display of unit



The lower and upper temperature warning functions flank the working temperature value. As soon as the actual temperature crosses one of the preset limit values, an acoustic warning signal will be emitted.
Depending on your selection for "Select mode", the reaction will remain a warning signal or the power components will be shut down.

Select mode

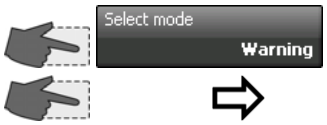
Warning or alarm



A High temperature cut-off (tank)
B Upper temperature limit
C Lower temperature limit
D Setpoint

The warning function will be activated only when the temperature value is within the selected limit values for three seconds after starting from the "OFF" condition.

Select mode



Select reaction (mode)
>Warning< or >Alarm<
For each of the two menu items >Upper temperature< and >Lower temperature< you can choose between a warning and an alarm shutoff of the power components, such as the heater and circulation pump.

9.2. “Setpoint limits“ menu

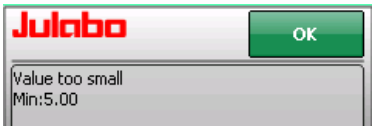
The buttons will display the current settings.

Choose button and set value.

Setpoint min.

Setpoint max.

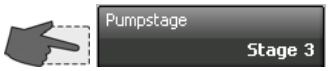
Minimum and maximum setpoint:
Limits the selectable temperature range.
The selected working temperature values must be between the limit values defined here.
Example of a message after attempting to set a temperature that is lower than 5.00 °C:



Pumpstage

Pressure Setpoint
The setting ranges depend on the performance category of the temperature control system..
See display of unit.

Select



and choose a stage

The **pump stage** can be limited here.

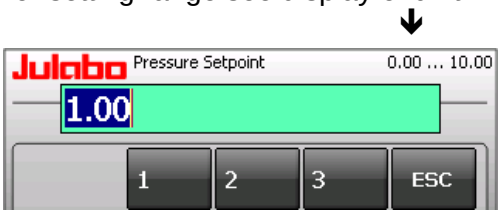
> **Stage control** < Refer to page 30

Select

and set value.

The **maximum pressure** can be limited here.
Limits the setting > **Pressure control** < refer to page 31

For setting range see display of unit

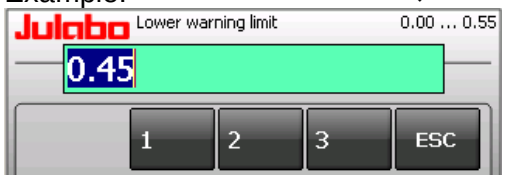


9.3. “Pressure limits“ menu

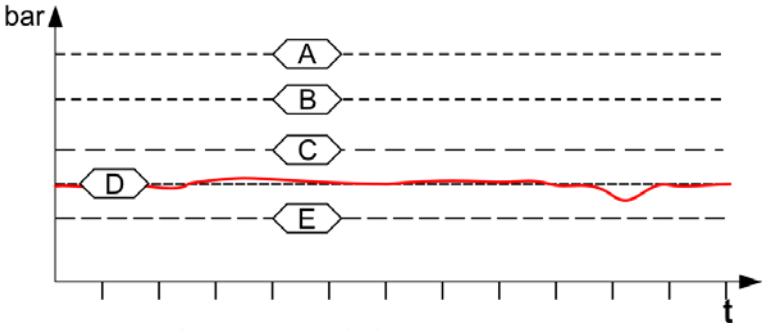
The buttons will display the current settings.

Choose button and set value.

For setting ranges see respective display of unit.
Example:



Hierarchy of pressure values

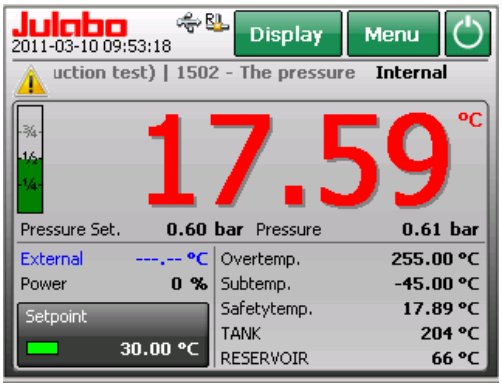


A Peak Pressure Limit
B Pressure limit
C Upper warning limit
D Actual pressure in temperature system
E Lower warning limit

A >upper warning limit< and a >lower warning limit< can be set for monitoring the pressure in the system.
If a warning limit is exceeded or undercut a signal will sound and a warning appears on the TFT-Display.

Warning:

Ticker in the status line



If the pressure setpoint is too close to the warning limit, the warning will appear continuously and fill the list of errors.

Touch the icon and the list of errors will be displayed.

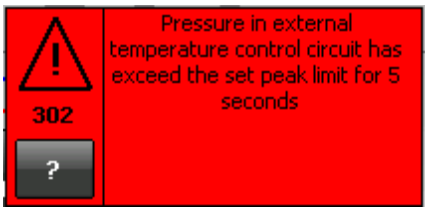
Alarm:

Alarm messages are shown in a red window.

For the pressure setpoint following limits must be set.

The >**limit pressure**< sets the upper limit.
Exceeding this pressure for more than 5 seconds, results in an alarm cut-off and an error message
(Error 302).

Press <?> button for help text.



Achieving the >**Limit Pressure Peak** < results in an alarm cut-off and an error message (Error 301).

10. "Connect unit" menu

Select in the main menu.

The buttons will display the current settings.

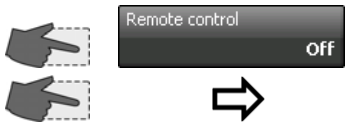
Select menu here

 indicates available submenu.

Use this menu to select how the unit is controlled and how control variables are set.
The digital interface settings can be adjusted here.

10.1. "Remote control" menu

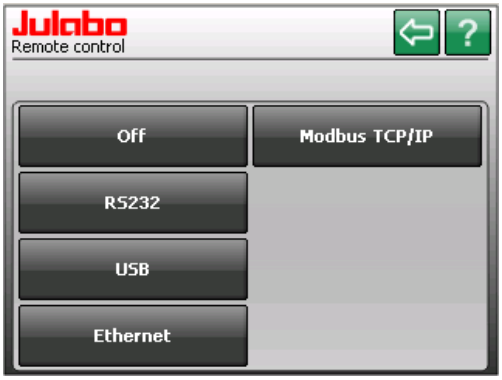
Switching remote control on and off.



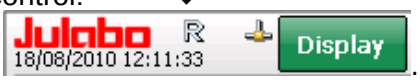
Choose between >**Off**< (normal control) or
remote control via >**RS232**<
or
remote control via >**USB**<
or
remote control via >**Ethernet**<
or
remote control via >**Modbus TCP/IP**< Internetprotokoll..

The unit can be controlled remotely through the digital interfaces.

ⓘ Use an interface cable to connect the unit to a PC.



ⓘ The letter >R< in the normal display indicates remote control:



ⓘ

Connections are behind the venting grid on the front side of the unit.

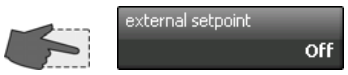
Ethernet

USB

SERIAL RS232

10.2. „External setpoint“ menu

Select external setpoint



Choose between

>Off<

>Pt100<

>EProg<

In addition to the serial interface via remote control the unit offers the possibility to adjust the setpoint via analog interface >EXT. Pt100< or >REG+E-PROG<.

Possible parameters:

Off - Setpoint is set via the touch screen or via the integrated programmer. (factory setting)

Pt100 - Setpoint setting via the analog socket „ext. Pt100“ using an external temperature sensor or an appropriate voltage/current source.

REG+E-PROG

Eprog - Can only be adjusted when an electronic module with analog connections is used (option).
Setpoint setting via the analog interface REG+E-PROG connection with an external voltage or current source or a programmer.

Important:

ⓘ Connect the external voltage or current source or a programmer to the circulator via the socket REG+E-PROG (see page 75).

10.3. "Actuating variable" menu

The variable is the degree to which the heater or the refrigeration unit is activated. The bath is heated or cooled in accordance with this variable. If this is controlled via the unit's control electronics, referred to as the >**Controller**<, the bath temperature will be brought precisely to the selected setpoint and stabilized at that temperature.

ⓘ The unit must be in Start mode in order to input variables in the >**Digital**< and >**Eprog**< positions.

Selecting how variables are inputted.

Choose between inputting variables via
>**Controller**<
or
>**Digital**<
or
> **EProg**<.

Possible parameters:

Controller –The internal control electronics of the unit controls the heater and the connected cooling unit. Self-tuning is possible. (factory setting)

Digital –The unit receives the control signal via the digital interfaces.
Self-tuning is not possible.

EProg - The unit receives the control signal via the E-Prog input. Self-tuning is not possible.
- Setting requires electronic module.

10.4. "Digital interfaces" menu

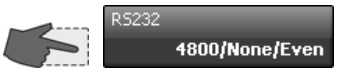
Select in the main menu

Select interface

The buttons will display the current settings.

10.4.1. RS232

Select



Digital interfaces settings

Parity:
none, odd, even

Baud rate: [Baud]

1200	19200
2400	38400
4800	57600
9600	115200

Handshake:
none, software, hardware

Check the interface parameters of the two interfaces (Unit and PC) and make sure they match.

Use an RS232 interface cable to connect the unit to a PC.

Factory settings:
- 4800 Baud
- even
- Hardware handshake

10.4.2. Watchdog

Watchdog function

This temperature system provides a watchdog function for monitoring the digital interface (RS232, USB) with the temperature system being in remote control mode.
In case of a disturbance/failure in the superordinate data system the watchdog function ensures the temperature system enters a defined operating state.

In the defined operating state the temperature system accepts the watchdog setpoint as setpoint for continuing temperature control.

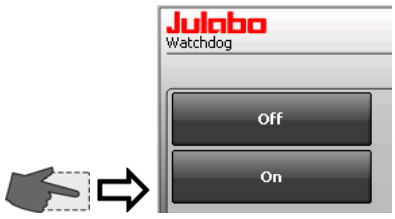
The watchdog setpoint **must** thus be set to an uncritical value depending on the application task

Activation of the watchdog function:

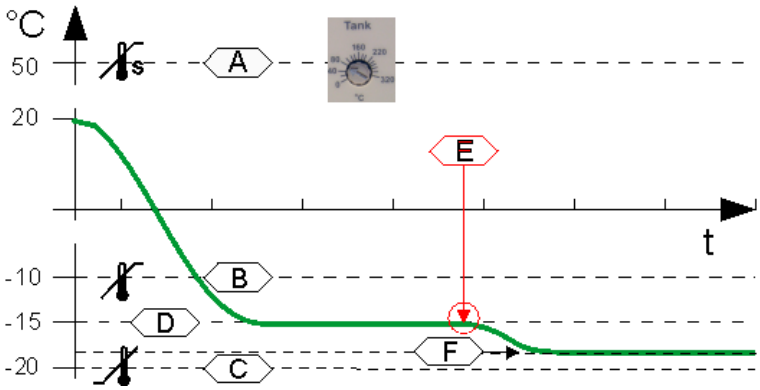
- Set the desired interface in the >Remote control< menu.
- In the >Actuating variable< menu, choose between >Controller< or >Digital< for the variable input.
- Press the >Watchdog< button in the >Digital interfaces< menu.
- Select >On<.
- The interface command – out_sp_06 – sets a watchdog setpoint.
- The watchdog function is activated as soon as a valid working temperature setpoint or a valid variable is received via interface.
  The values are valid (plausible) providing they lie between the upper temperature limit and the lower temperature limit.
  (Refer to „ Safety adjustments" menu page 45)
- If the temperature system does not receive any plausible values for longer than 30 seconds, the watchdog function is triggered.

Select

Select >On<



Example:



A High temperature cut-off (tank)

B Upper temperature limit

C Lower temperature limit

D Setpoint
(out_sp_00 -15.00) [°C]
or
Variable
(out_sp_10 xxx) [%]

E Watchdog function is triggered

F Watchdog setpoint
(out_sp_06 -18.00)

Touch the icon to mute the signal.

See warnings on page 10

Consequence:

- A buzzer sounds and the message 1501 „Timeout serial interface “ appears on the TFT-Display.
- The unit accepts the watchdog setpoint as valid setpoint for temperature control.
- If the warning symbol is touched during setting of the variable, the most recently received variable will be re-used.
- If another plausible variable is sent after activation of the Watchdog function, this variable will be used.
  Reset the warning by touching the symbol.

10.4.3. Ethernet

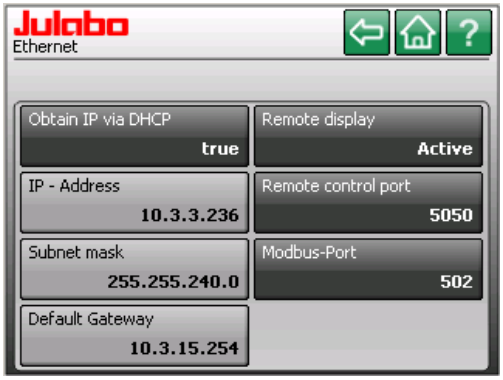
With the Ethernet interface, you can use a PC to communicate with the Presto® unit over an Ethernet network. You can connect the Presto® to a network or use a network cable to establish a direct connection between the PC and Presto®.

Attention:
Please contact a network administrator before connecting the Presto® to your network!

The Presto® will recognize when it has been attached to a network. An icon ( ) will appear in the normal display.

Ethernet menu

Select **Ethernet**



Obtain IP via DHCP

ⓘ Light gray buttons are blocked if > **true** <, accessible if > **false** < (switch to dark grey).

DHCP (Dynamic Host Control Protocol) facilitates dynamic assignment of IP addresses. If your network contains a DHCP server, then you can use this server to configure the Presto's® network settings. If you do not have a DHCP server in your network, or if you wish to connect the Presto® directly to a PC, you will have to manually set the IP address, subnet mask, and possibly the default gateway.

>**true**< The IP address, subnet mask, and default gateway will be automatically requested from a DHCP server.

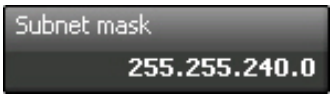
>**false**< Parameters set manually

IP address:

Example: 10.3.3.236
Addresses such as x.x.x.0 and x.x.x.255 are not permitted.

The IP address is used to identify the unit in the network. Every IP address in a network must be unique. IP addresses are used to send data from one network device to another. The IP address consists of a four-byte number, with each byte separated by a dot. It is divided into a network part and a device part, with the subnet mask handling the division.

Subnet mask:

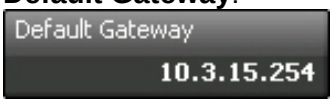


Example: 255.255.240.0

The subnet mask is a bit mask that indicates which part of the Presto® IP address represents the network and which part represents the device.
If a bit is set to "1" in the subnet mask, the corresponding bit belongs to the subnet mask; otherwise, it belongs to the device address.
In the example, the part 10.3.3.236 of the IP address would define the subnet and the last part 2 would define the device address.
The final byte of the subnet mask can be set so that it belongs partially to the subnet and partially to the device address. For example, a subnet mask of 255.255.240.0 would mean that the first two bytes belong completely to the IP address and from the third byte the first 4 bits belong to the subnet. In this case, the device address would consist of the last 4 bits of the third byte and the entire fourth byte.

Remark:
The subnet part and the device part may not be mixed with each other. For example, a subnet mask of 255.240.255.0 is not permitted.

Default Gateway:

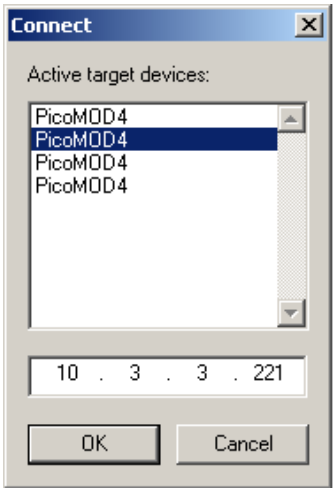


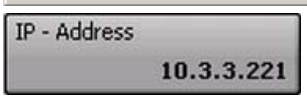
Example.:10.3.15.254

The default gateway serves as the communications interface between your own network and other networks.
If you wish to communicate with a PC that is not located in the same network as the Presto® (subnet mask), this communication will always pass through the gateway.

Remote display:

The remote display allows you to remotely control the Presto® using a PC.



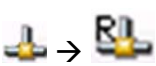


At the Presto®, switch the **Remote Display** menu item to **active** and start the 

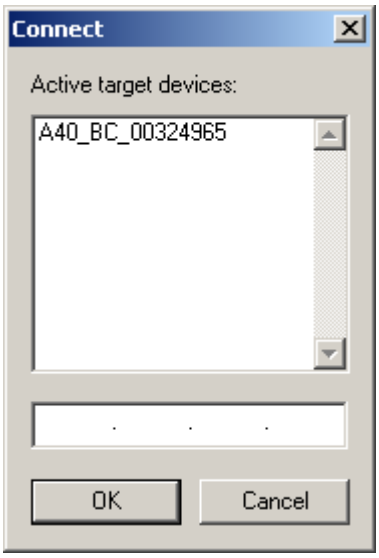
program on your PC. Then click on **File → Connect**. A dialog window will appear that lists all of the devices found in the network.

ⓘ It may take a few seconds before all devices in the network are found and added to the list. Please wait until your device is displayed.

When you click on one of the Prestos® in the list, that unit's IP address will appear in the lower field of the window. Please compare the IP address of the selected Presto® with the settings in the **Ethernet menu** of the Presto® you wish to control remotely.



When **Remote display** is **active**, the letter **R** will be added to the icon in the main window. This does not mean that remote control via ethernet is activated.



Attention!
Active target devices

Several devices may be attached to the Ethernet simultaneously.
You have the option of giving each device a name in order to more easily distinguish between the various devices.
See page 87

Select the Presto® and click on OK.

You can use your mouse to control and monitor the unit from the PC screen.

Remote control port:

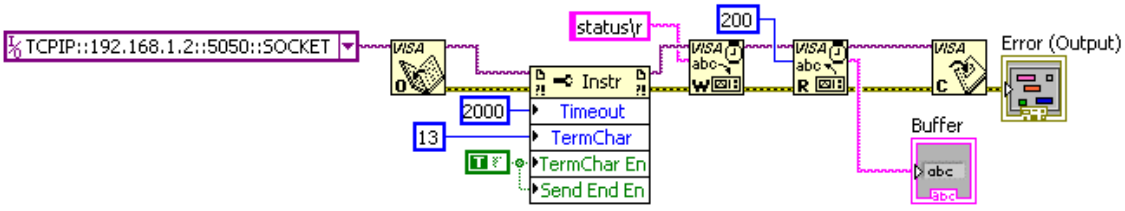
The remote control port provides communication between the control system and the Presto® using the same commands as those used for communication through the RS232 interface, for example.

Attention:
Some ports are already occupied and may not be used. Please contact a network administrator before changing the settings on the Presto®!

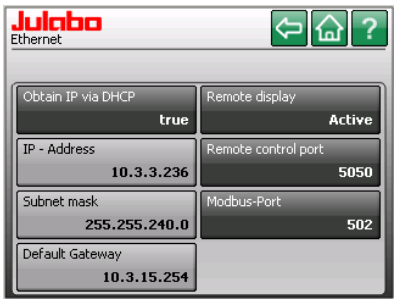
Example:

Communication between a PC and Presto®

LabVIEW:
The easiest way to enable communication between a PC and Presto® is with VISA from NI-LabVIEW.
In addition to the unit's IP address, you must also indicate the port:



Network-based connection



Obtain IP via DHCP
>true<

If you would like to connect the Presto® to your network and your network has a DHCP server, then the Presto® will be automatically assigned an IP address.
To enable this, set the item **Obtain IP via DHCP** to **>true<**. Connect the Presto®'s network socket to a socket in your network. The Presto® will be automatically detected in the network and the DHCP server will issue an IP address. A few seconds later, this IP address will appear in the Presto®'s menu.

Obtain IP via DHCP
>false<

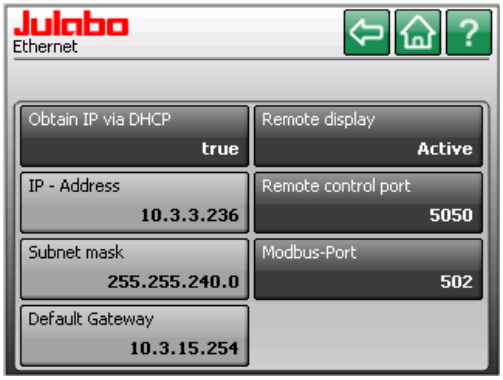
You can also assign a fixed IP address to the Presto®.
To do this, set the item **Obtain IP via DHCP** to **>false<** and manually enter into the Presto®'s Ethernet menu the IP address, subnet mask, and, if required, the default gateway.

Attention:
Most networks have certain address ranges that are reserved for the issuance of fixed IP addresses. Please contact a network administrator before changing the settings on the Presto®!

Remark:
When manually setting network parameters, you must always enter both the IP address and the subnet mask. The settings will be shown in the display only after both parameters have been entered!

Modbus-Port page **Fehler! Textmarke nicht definiert.**

Creating a Direct Connection between Presto® and PC



To establish a direct connection between Presto® and a PC, you must manually enter the IP address and subnet mask. A default gateway is not required.

Additionally, the IP settings of the PC must match the IP settings of the Presto® for communication to be established.

PC and Presto® must be located in the same subnet, but have different IP addresses.

Example settings:
PC:

IP address:	**10.3.3.235**
Subnet mask:	**255.255.240.0**

Presto®:

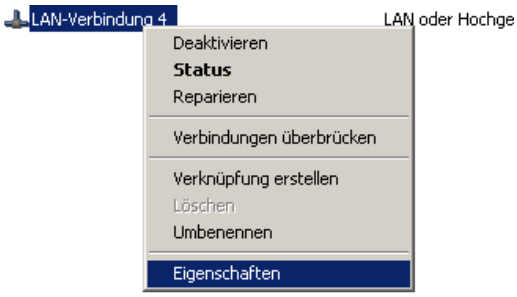
IP address:	**10.3.3.236**
Subnet mask:	**255.255.240.0**

Explanation:
The subnet mask 255.255.240.0 indicates that the first three parts of the IP address define the network.
The IP addresses of the two devices differ only in the final part of the IP address, which (according to the subnet mask) defines the device part of the IP address. Accordingly, the two devices are located in the same network (**10.3.3.**).

PC Settings (Windows XP)

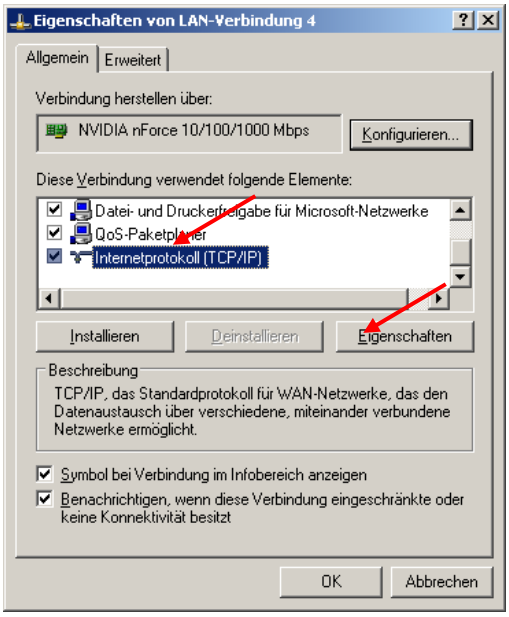
The following section provides an example of how to manually change the IP settings in Windows XP. The procedure may differ slightly depending on your operating system.

Attention:
Modifying network settings may prevent your PC from working properly in the network. Please contact a network administrator before changing the network settings!

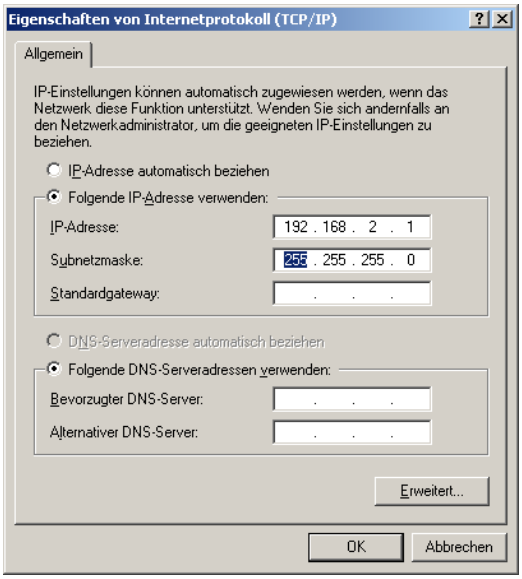


To change the IP settings on your PC, click on **Start→Settings→Control Panel**.

Double-click on and open the properties page for the network connection that you want to use to connect to the Presto® to the PC. To do this, right-click on the network connection and select **Properties**.



Under
This connection uses the following items:
click on
Internet protocol (TCP/IP)
and click on
Properties.



To manually enter the IP address, activate the item **Use the following IP address:** and enter the IP address and subnet mask into the appropriate fields.

Confirm the settings by clicking on 

.

10.5. "Analog interfaces" menu

Select menu

The buttons will display the current settings.

 indicates available submenu

ⓘ If the electronic module has not been installed, the key >Analog Module< will not be displayed in this menu.

10.5.1. Alarm output

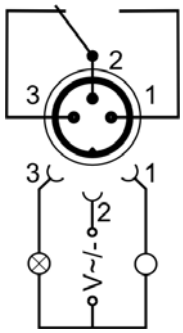
The buttons will display the current settings.

Breaking capacity
max. 30 W / 40 VA
with turn-on voltage
max. 125V~/–
with switching current
max. 1 A

Socket on the front

Alarm output: Output for external alarm signal.

This contact is a potential-free change-over contact. All of the unit's operating conditions can be sent externally via settings in the >Alarm output< menu without modifying the plug connection.



Setting **Standby** or **Alarm** or **Alarm+Stdby**< connects pins 2 and 3.

Setting **Standby / Inverted** or **Alarm / Inverted** or **Alarm+Stdby / Inverted** < connects pins 2 and 1.

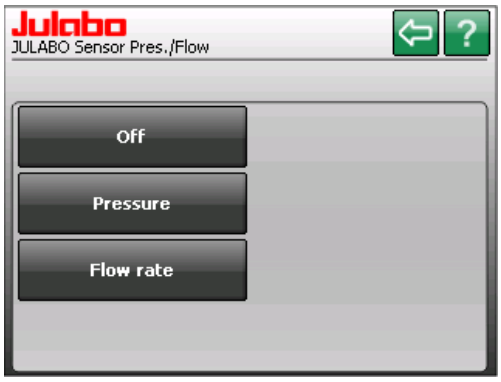
10.5.2. JULABO Sensor Pressure / Flow

Attention
The socket may be used with original JULABO accessories only. Any other use may damage the unit's electronics.

EXT Sensor

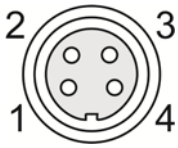
Switch the external sensor signal on and off.

Choose between
>**off**<,
or
>**Pressure**<, (signal of an external pressure sensor)
or
>**Flowrate**< (signal of an external flow-through sensor, e. g. VFCpro)



ⓘ **Preparations:**
Connect the external sensor to the 4-pole socket at the rear of the unit.
To display the value see
4.4. Menu page 20

Socket at the rear
JULABO Sensor Pressure / Flow



Pin	Signal
1	24 V
2	5 V
3	4…20 mA
4	GND (0 V)

Attention
If using an external pressure sensor, the unit and the application must be at the same height.

Accessories:

Order No.	Description
8980782	**VFC** Volume Flow Control assembly unit Flow rate max. 50 Lpm, (-100…300°C)
8980762	**VFCpro-24** Volume Flow Control unit, with circuit points and mount. M24x1.5 male, (-100…300°C)
8980764	**VFCpro-38** Volume Flow Control unit, with circuit points and mount. M38x1.5 male, (-100…300°C)
8980771	External pressure sensor M24x1.5 male
8980772	External pressure sensor M30x1.5 male
8980773	External pressure sensor M38x1.5 male

10.5.3. EXT Pt100 2 (accessory)

The socket **EXT Pt100 2** on the rear side of the unit is available as an accessory. (not on A30)

Accessories:

Order No.:	Description
8900106	Module with Pt100 connector

Flow sensors appropriate for Presto:

8981021	M+R adapter M24x1.5 external with Pt100
8981022	M+R adapter M30x1.5 external with Pt100
8981023	M+R adapter M38x1.5 external with Pt100

10.5.4. “Edit flow rate settings” menu

Note

Check the selected pressure limits! (Page 47)

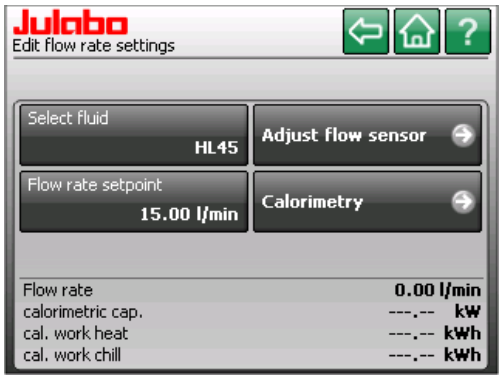
The selected pressure limits are monitored during flow control as well.

A high flow rate may exceed these limits and cause the unit to shut down.

The buttons will display the current settings.

For the user to determine the calorimetry, certain accessories are needed, such as a VFCpro flow control unit, attached evaluation electronics, and an additional external temperature sensor. The unit must also be equipped with a second external Pt100 connection on its rear side (not available on A30).
The VFCpro flow control unit is attached to the four-pin socket on the rear side of the unit.
See Menu > JULABO Sensor Pres./Flow < Page 61.

Both of these accessory parts may also be used independently of each other.
The second external Pt100 sensor (manual sensor or flow sensor) is suitable for measuring temperature at a specific spot in the application. This value may be outputted with other data during logging.



ⓘ The Flow rate setpoint button will be greyed out when the >Type of pump control< (Page 30) is set to >Flow rate setpoint<. The user has the opportunity to change this value at this time.

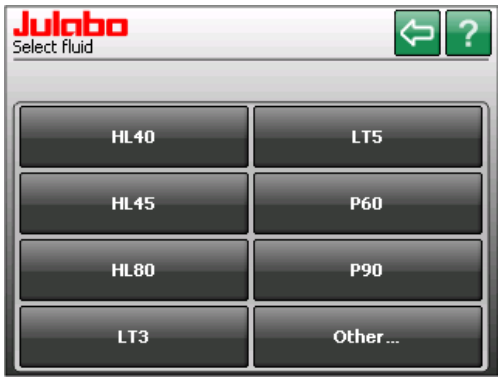
ⓘ Refer to the operating manual of the utilized VFC flow control unit (accessories) for additional notes on possible flow rates.

10.5.4.1. Selecting the fluid

Select a given fluid.

or

press the >Other…< button to enter the submenus.



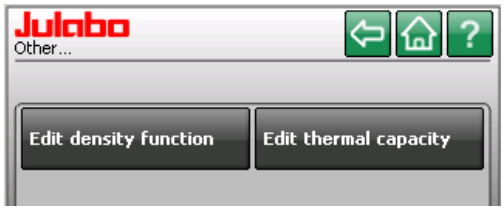
ⓘ To make the best use of these two menus, you must know the following pairs of values for the heat transfer liquid:

Temperature	°C, °F
Density	g/cm³
Thermal capacity	kJ/(kg x K)

Density at a given temperature
or
heat capacity at a given temperature.

These values must be entered into the following tables.

Select menu

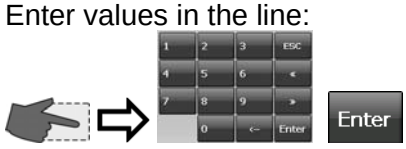


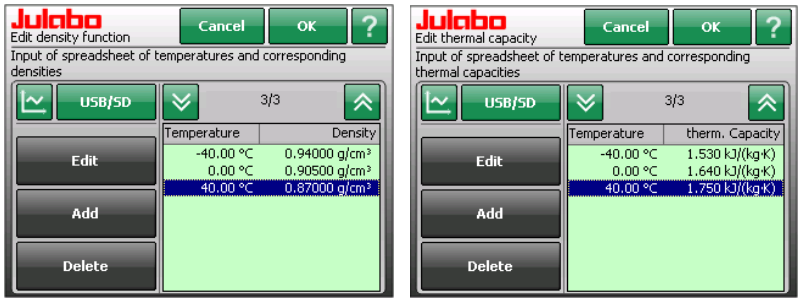
ⓘ In the event of ALARM 506 see the "**Note**" on Page 64.

Create table:

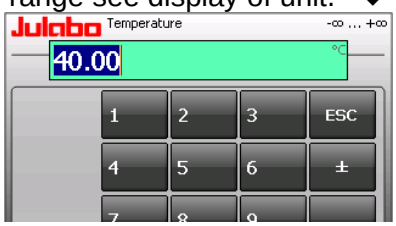
Press

Enter values in the line:





Example:
Setting range see display of unit.



Use the following three menus to create the table.

Add:
Adds a new line at the end of the table.

Edit:
Edit the selected line.
Change temperature/density.
(Line 3/3 in the figure, shown in blue or grey)

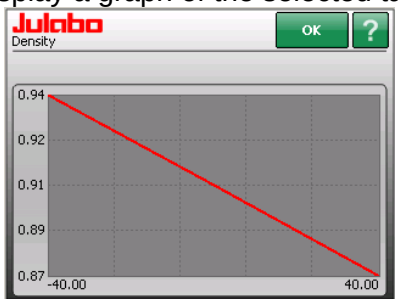
Delete:
Delete the selected line.

Buttons in this display:

Import/export data to/from an external medium (Page 65).


Scroll up and down in the table or select the desired line directly from the list by tapping it with your finger.


Display a graph of the selected table.

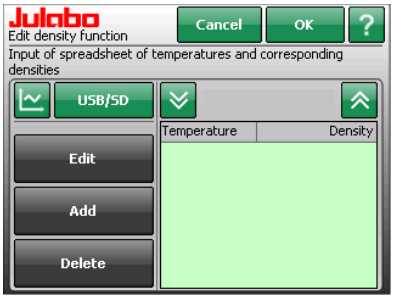


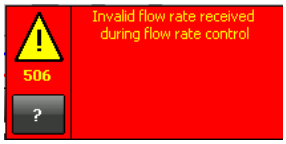
ⓘ Visually inspect the entered values.

Note: Error 506

If no data are stored, the unit will trigger Alarm 506. This is intended to prevent the unit from operating uncontrolled.

Press





Enter values into the table:

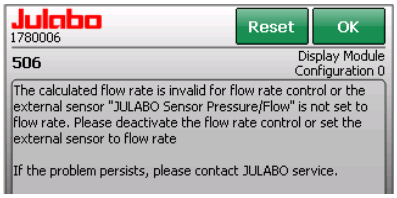
ⓘ ***How to mute the alarm signal:***

Press the  button to go to the normal display and mute the audible alarm signal (see Page 9 for help during alarm).
Then return to the empty input window.

If the table is complete, press the  button for the normal display.

Press the <?> button for help.
Only now will the Reset button be shown in the Help window.

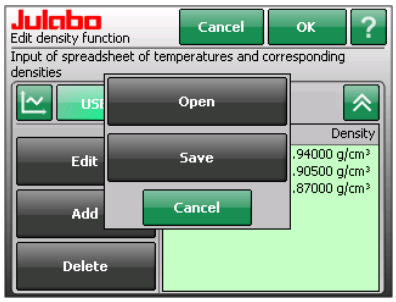
Press the <Reset> button.



Working with a data carrier:

Insert the data carrier into the appropriate slot, such as a USP port.

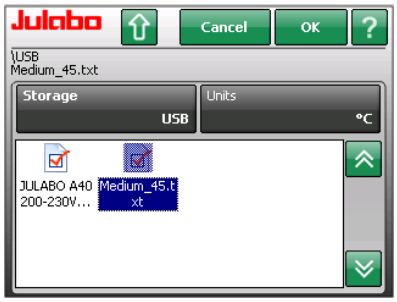
Import/export data to/from an external medium.



Importing data:

Select txt file

The data will be imported.



Exporting data:

A new file is created.

Enter file name.


and 

such as "Medium_45".

Store table on data carrier.

10.5.4.2. Adjust flow sensor

The VFCpro flow control units are available as accessories from JULABO. The **type** of flow sensor must be set here. (Accessories on page 61) The selection will affect the setting range of the warning limits.

A lower and an upper **warning limit** can be set for the flow rate. (l/min)

⚠ Warnings are displayed as running text in the status line.

The unit allows you to set an **Offset** of +/- 5 l/min in order to calibrate the flow sensor to a reference.

The **Filter time** is set by default to 3 seconds. The filter time can be extended for a smoother display of the values. (0 … 1000 s)

Note: This will change the flow control's reaction time!

Select

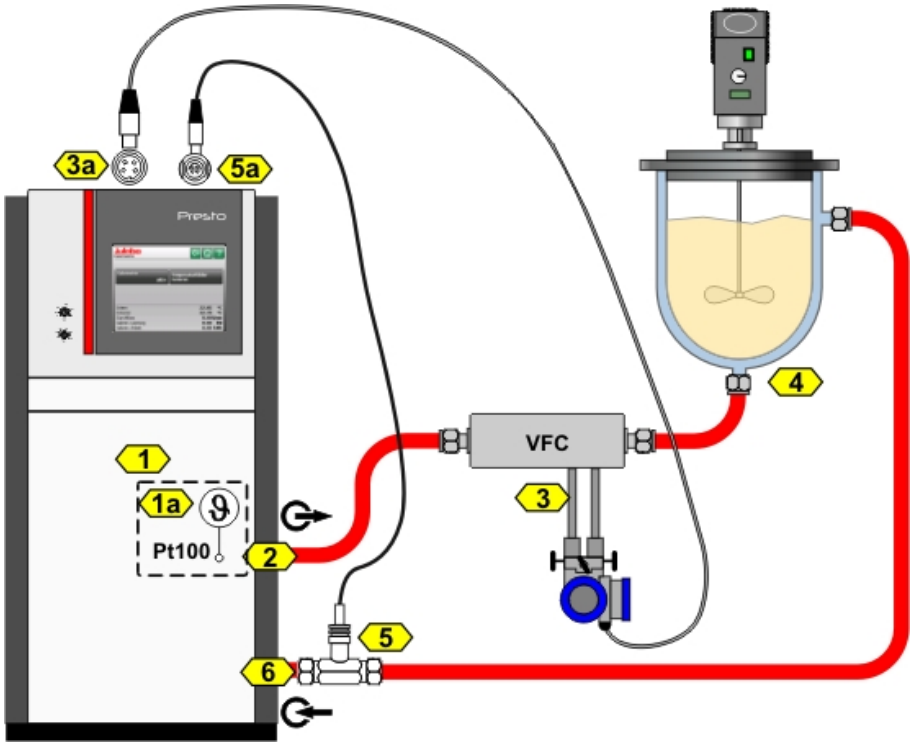
Set **type**.

Set values:

Example:
Setting range see display of unit. ↓

10.5.4.3. Calorimetry

Using Presto to determine calorimetric capacity and work.
The drawing shows a typical application. The order of VFC and consumer in the temperature loop is not important. To obtain an accurate measurement, all components in the entire system must be well insulated. Install the Pt100 flow sensor directly at the pump connection (runback).



1	Presto Axx or Wxx (not possible with A30)
1a	Pt100 internal (TFT display: "Internal")
2	Pump connection: Feed
3	VFC flow sensor (accessories)
3a	Socket: JULABO pressure / flow sensor
4	Consumer/application
5	Pt100 flow sensor (TFT display: "External2")
5a	Socket: EXT Pt100 2
6	Pump connection: Runback

Attention

Danger of breakage during measurements with glass reactors!

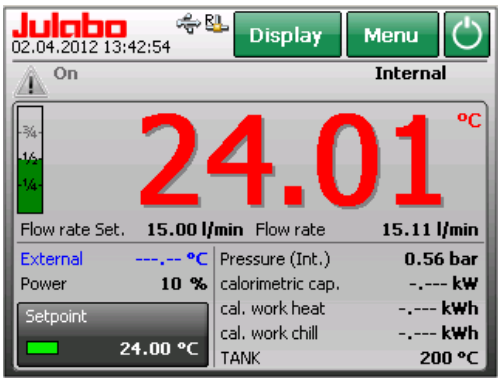
Respect strength limits of the external consumer!

- Check the selected pressure limits! (Page 47)
- Enter the maximum pressure permitted by the manufacturer of the glass reactor under >Limit pressure<.
  This will eliminate the danger of a broken glass reactor.
- The selected pressure limits are monitored during flow-rate control as well. A high flow rate may exceed these limits and cause the unit to shut down.

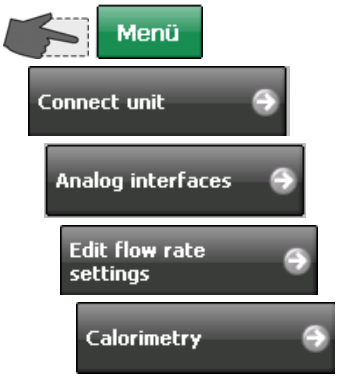
Example:
Determining calorimetry with a constant setpoint (24 °C in this example).

Set the setpoint to 24.00 °C and start Presto.

Wait until the temperature stabilizes in the system.



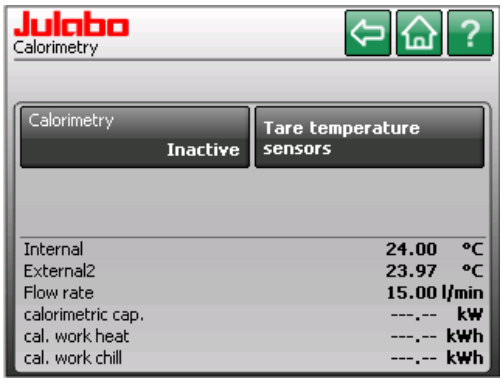
Switch to the Calorimetry submenu.



ⓘ The relevant measurement values will be shown in the display.

Internal: Value from control sensor
Extern2: Value from **EXT Pt100 2**
The two temperature values are still different.

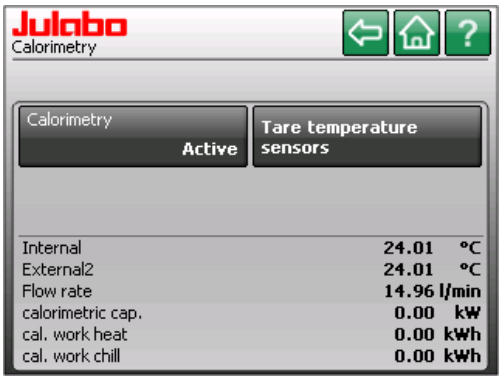
Press the >Tare temperature sensors< and the two values will be equalized.



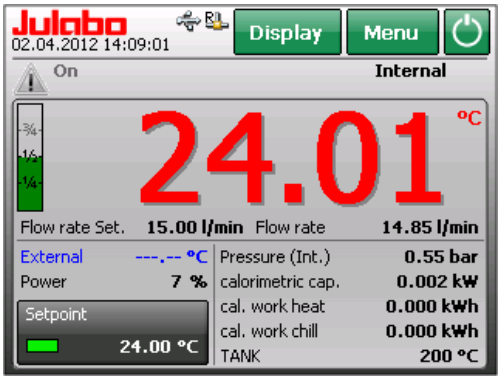
Set >Calorimetry< to >Active<.

The value >calorimetric work< is thereby set to zero..

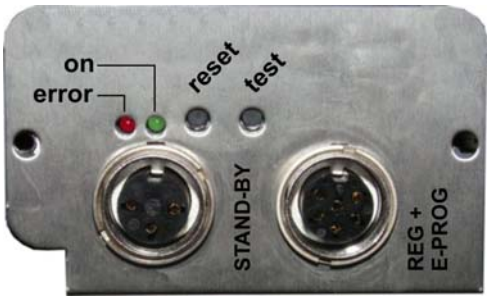
Measurement begins and values are now displayed in the lower lines.



The > Customize Home display < menu allows you to include the values >calorimetric work< and >calorimetric capacity< in the normal display.



10.5.5. Analog module (optional)



The analog module has two circular female connectors.

6a Female connector **Standby** input external „off“-key).

6b Female connector **REG+E-PROG** with three logging outputs and one input for an external programmer or other voltage and/or current sources.

ⓘ Information regarding labeling:

test For service purposes only. This key has no function during regular operation.

reset The module can be „reset“ with this key. This may be necessary in case of an error, for example if the red LED (error) lights up.

on 🟢

Green LED is illuminated
The module has operating voltage but does not receive any information (CAN-Messages).

Green LED is not illuminated
The unit is turned off or the module is damaged or it has no power supply.

Green LED blinks
Irregular blinking indicates that the module receives information (CAN-Messages) and works correctly.

error 🔴

Red LED is illuminated
Alarm of the module. The TFT display shows the type of error and required measures.

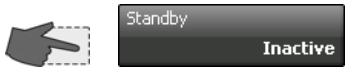
Red LED is not illuminated
If the unit is operating and the diode is not illuminated the module works correctly.

Red LED blinks
An unknown error has occurred during the data transfer on the CAN-Bus. The CAN-Bus has deactivated itself for safety reasons. Turn the unit off and then on again after several second. If the error occurs again, please contact JULABO service.

The buttons will display the current settings.

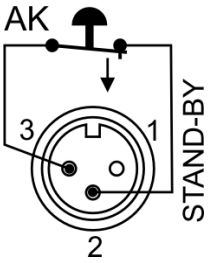
Standby connector

Select



Choose between
>**Inactive**<
or
>**Active**<

Standby



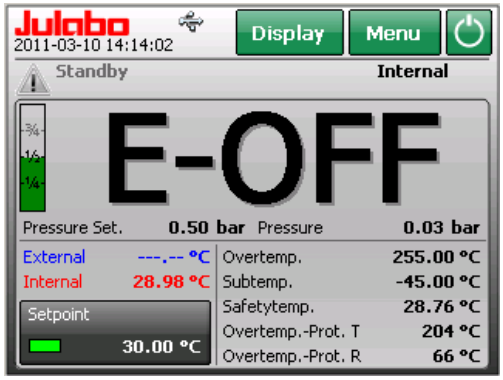
<u>Activate the standby input:</u>

1. Under menu item >**Standby**<, set the parameter to >**Active<**.
2. Connect an external contact “AK” (e.g., for external switch-off) or an alarm contact of the superordinated system.

If the connection between pin 2 and pin 3 is interrupted by opening the contact “AK”, a complete shutdown of the circulating pump and heater is effected, and the unit enters the condition “**E OFF**”.

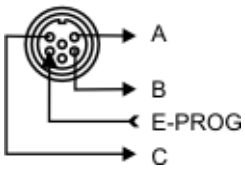
If the contact is closed again, the unit remains in status "Extern-OFF".

Press  to start.



REG+E-PROG connector

REG+E-PROG



Three logging outputs and one input for an external programmer:

A	Channel 1	voltage output for recorder	(V)
B	Channel 2	voltage output for recorder	(V))
C	Channel 3	current output for recorder	(mA)
	E-PROG	external programmer input	

Outputs of the connector
(Description on page 74)

(voltage output)

Push value

First define output value for channel 1.

Example: 

Confirm with 

Define scale:

Assign the value to 0 V.

 and 

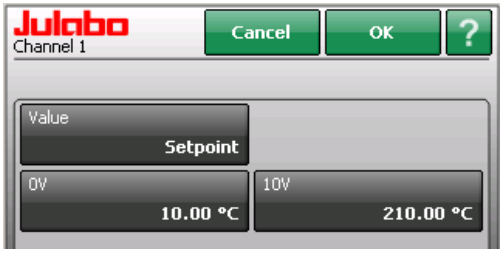
Assign the value to 10 V

 and 

Assign the lowest value which is to be emitted to 0 V, the highest to 10 V (in the example on the right: °C).

The setting is displayed on the keypad.

Examples:

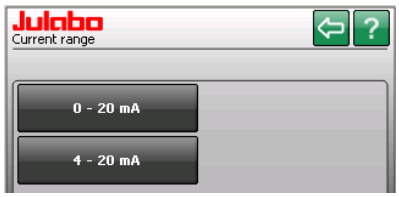


Channel **2** (voltage output)
Same procedure as channel1.
First define output value for channel 2 then define scale.

Channel **3** (current output)

Push value. ⇨
First define output value for channel 3. ⇨⇨
Confirm with OK .
Push current range ⇨

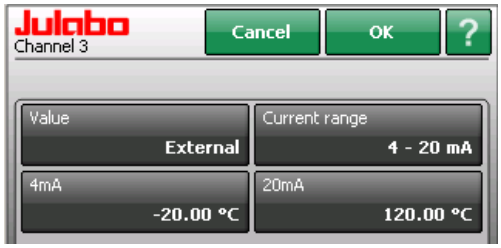
Then define current range for channel 3 ⇨⇨
Confirm with OK .



Define scale:
Set value for 4 mA .
and Enter ⇨
Set value for 20 mA
and Enter ⇨⇨
Assign the lowest value which is to be emitted to 4 mA, the highest to 20 mA (in the example on the right: °C).

The setting is displayed on the keypad.

Example: current range 4 – 20 mA



Outputs of the connector - **Reg+E-Prog**
First define the desired output value for channels 1 to 3:

Setpoint active setpoint temperature (setpoint / integr. programmer/external programmer)

Internal internal actual temperature value (bath temperature)

External external actual temperature value (external sensor)

Power periodic or intermittent heating or cooling

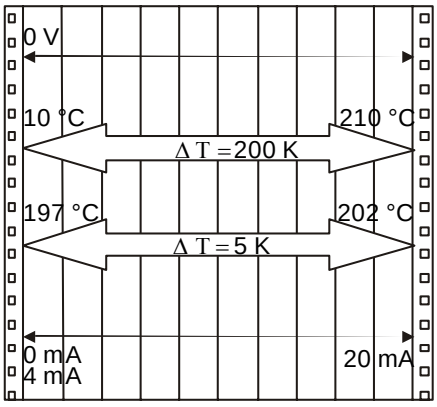
Pressure actual pump pressure at unit
or
signal of external pressure sensor
at socket **JULABO Sensor.Pressure/Flow**

Flow-through signal of external flow-through sensor
at socket **JULABO Sensor.Pressure/Flow**

1. First define the desired output value for channels 1 to 3:

   Channel **1 and 2:** output for temperature (°C) / power (%) / pressure (bar, psi) / flow-through (l/m)
   Assign the lowest value to be emitted to 0 V
   the highest value to10 V
   Channel **3:** Output for temperature (°C) / power (%) / pressure (bar, psi) / flow-through (l/m)
   Assign the lowest value to be emitted to 0 mA and/or 4 mA, the highest to 20 mA.

2. The current output (channel 3) offers 2 ranges for selection:
   0 to 20 mA or 4 to 20 mA.



Examples:

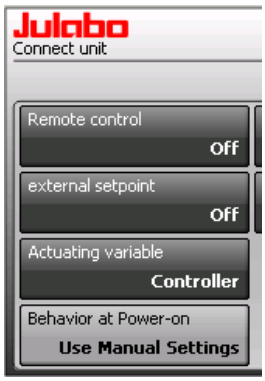
lowest temperature value: 10 °C
highest temperature value 210 °C
Fig. shows 200 °C scaled to paper width
slope: 50 mV/°C

lowest temperature value: 197 °C
highest temperature value: 202 °C
Fig. shows 5 °C scaled to paper width
slope: 2000 mV/°C

E-PROG - Input

Setting is necessary if

1. the Setpoint is to be set via an external voltage or current source or programmer
   For this, in the menu > **Connect unit** <, first set the menu item > **external setpoint** < to >EProg<.
2. the heater variable should be controlled via an external control pulse.
   For this, in the menu > **Connect unit** <, set the menu item > **Actuating variable**.< to >EProg<.



or

ⓘ The E-Prog input can only be used either under menu item > **external setpoint** < or under menu item >**Actuating variable** <.

- Connect the external voltage or current source or programmer to the REG+E-PROG socket of the unit.

Select input variable (value): (Step 1 see below)

Setpoint	in °C or °F
Power	in %

Selecting the signal: (Step 1 see below)

Voltage	voltage input
Current	current input

The programmer (E-PROG) input of the unit can be matched to the output signal of the external voltage or current source.

Set >Lower value<: (Step 2 see below)
Set the desired lower value at the external signal generator and wait for approx. 30 seconds.
Then set this value also via the numeric keypad of the unit and confirm by pushing Enter.

Set >Upper value<: (Step 3 see below)
Set the desired upper value at the external signal generator and wait for approx. 30 seconds.
Then also set this value via the numeric keypad of the unit and confirm by pushing Enter.

Important:
The usable temperature range between the >„lower value“ < and the > upper value < is limited to the configured working temperature range of the unit.
(see technical data for working temperature range)

Select

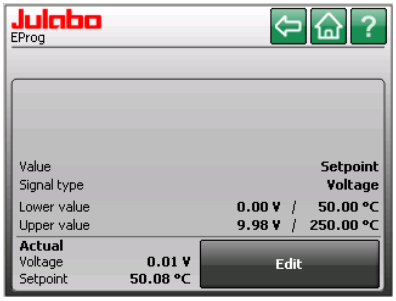
Analog Module

Push EProg

The current settings are displayed.

0.0 V equals 50.0 °C
10.0 V equals 250 °C

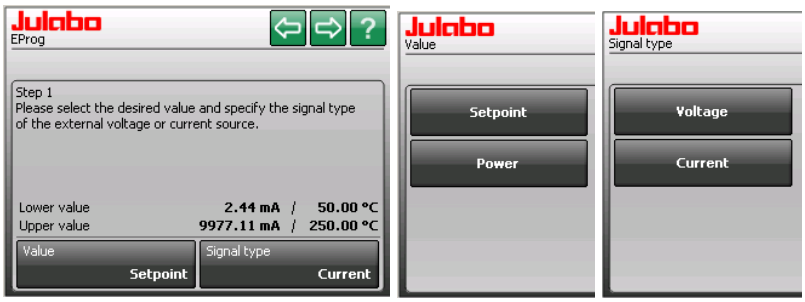
Push edit



Step 1 is displayed.

Push value and select.

Push signal type and select.



ⓘ Continue automatically to step 2

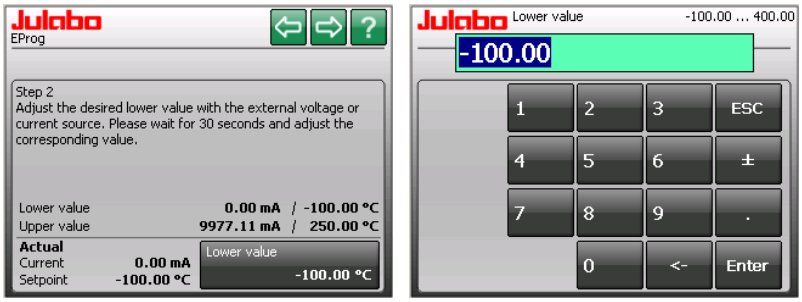
ⓘ switch window

Please observe the instructions for step 2.

Example: 0.0 mA

Set lower value and Enter.

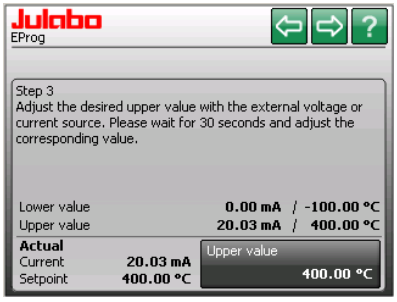
Example: -100 °C



ⓘ Continue automatically to step 3

Please observe instructions for step 3.

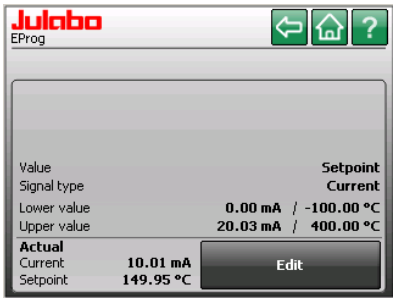
Example: 20.0 mA



Set upper value and Enter.

Example: 400 °C

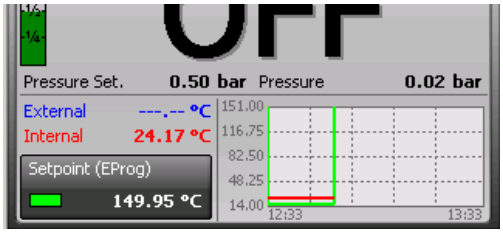
ⓘ Continue automatically

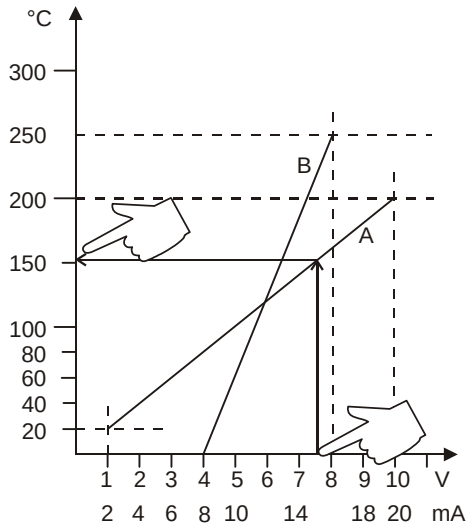


You can check the result using a control setting.
Example:
Set 10.0 mA and the unit will calculate 150.0 °C.

Standard display:

Under the tab setpoint the setting of the signal is displayed above the EProg-input.





This EPROG input enables the use of different voltage and current values as program parameters.

- **Setting the lower value**
  1. Adjust and set the lowest desired value on the voltage or current source (Example A: 1 V).
     Wait approximately 30 seconds.
  2. Assign a lower temperature threshold value to this adjusted voltage/current value by pressing the appropriate keys on the digits keypad of the instrument (Example A: 20 °C) and set by pressing Enter.
- **Setting the upper value**:
  1. Adjust and set the highest desired value on the voltage or current source (Example A: 10 V).
     Wait approximately 30 seconds.
  2. Assign an upper temperature threshold value to this adjusted voltage/current value by pressing the appropriate keys on the digits keypad of the instrument
     (Example A: 200 °C) and set by pressing Enter.

Example B in the diagram illustrates that the end point values are freely selectable (e.g., 8 mA and 16 mA).

Example out of diagram A:

- Adjust the voltage source for an output of 7.6 V!

The unit calculates the temperature value from the gradient of the two specified end points
(7.6 V correspond to a setpoint 152.0 °C).

This value is shown in the standard display

NOTICE:
If this adjustment is not correctly performed at two different points, the setpoint setting will be incorrect.

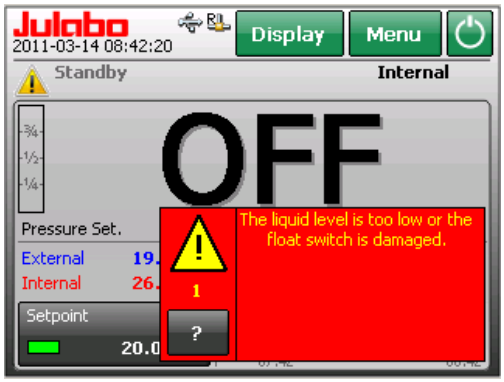
11. "Install unit" menu

Select in the main menu.

11.1. "Fill unit" menu (refilling)

Connect the mains power and switch on the unit at the mains switch.
Following the self-test, the unit will be in the "OFF" status and emit an audible signal.

To mute the signal, press the alarm notice's red box.

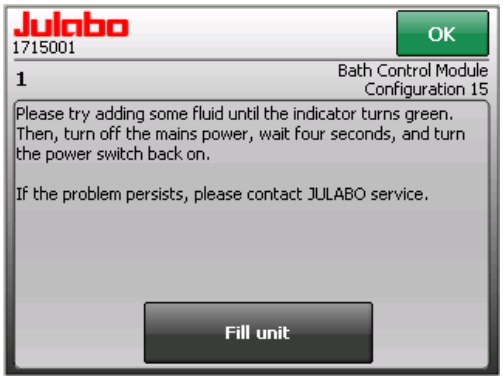


Error 1: Low-level alarm

Proper filling procedure:

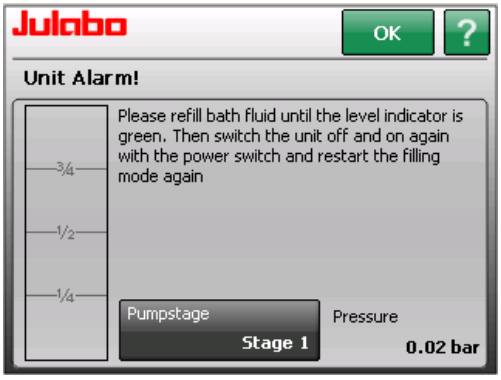
Press 

The >**Fill unit**< box will appear in the help text.



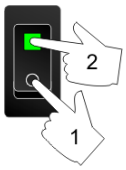
Press >**Fill unit**<.

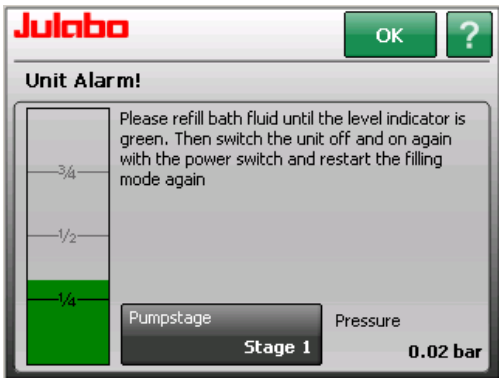
Follow the instructions on the screen.



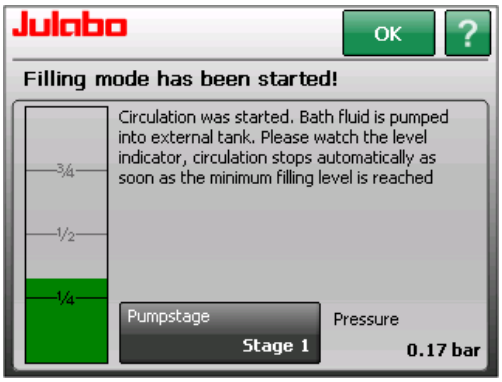
Filling the unit

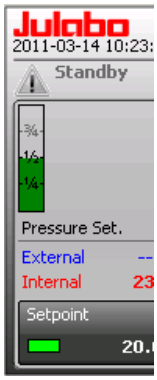
- Open the cover on the housing.
- Remove the plug.
- Slowly pour heat transfer liquid into the round opening.



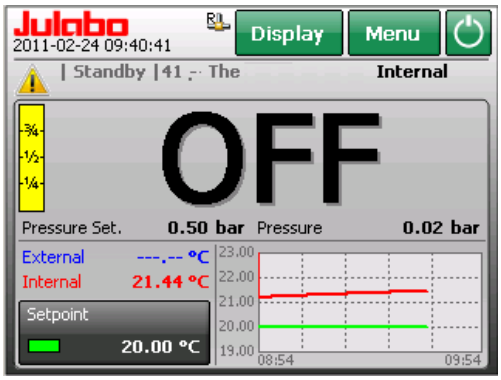


Fill in liquid up to the desired fill level.





Return to standard display by pressing OK



If there is too much bath fluid or if the bath fluid extends due to heating during operation, a high level warning is activated.

Ticker:

The early warning system for high level reports a critical fluid level.
Please drain bath fluid.

In this case use the drain (6) to discharge bath fluid.

See next chapter for description of drain (7).

Example: Image A40

11.2. "Empty the unit" menu

Caution:
Do not drain the bath fluid while it is hot or cold !
Store and dispose the used bath fluid according to the laws for environmental protection.

Preparations:

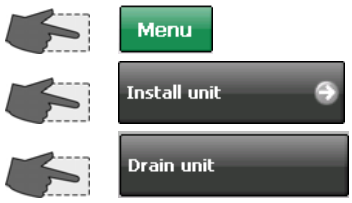
Please also see the separate operating manual „Presto® Highly Dynamic Temperature Control System“

The drain nozzle and the drain screw are located at the bottom of the unit behind the ventilation grid.

Draining:

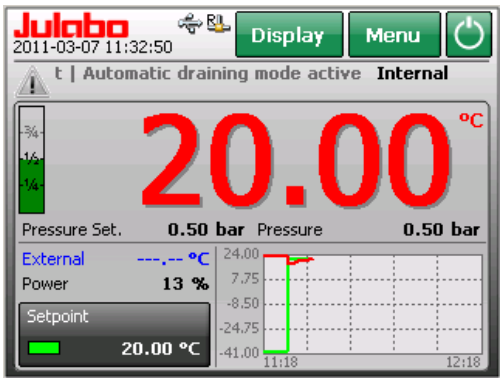
- Slide a short piece of tubing onto the drain port (7).
  12 mm inner dia. tubing.
- Place a suitable container for catching the liquid under the unit.

After the mechanical preparations the unit is drained menu-driven via the user interface.



The ticker in the display reports the start of the automatic draining mode.
The setpoint is adjusted to 20.00°C.
As soon as a temperature of 20 °C (± 10 K) is reached the ticker text will change and prompts the draining of the unit.

- Unscrew the drain screw (8) by some turns.



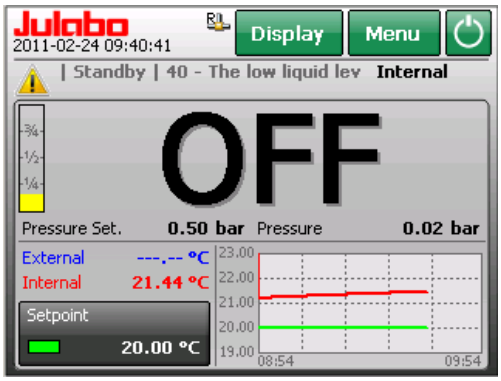
Ticker:
Automatic draining mode active. Wait until the medium temperature has reached the adjusted setpoint.

Automatic draining mode finished. You can drain the unit now.

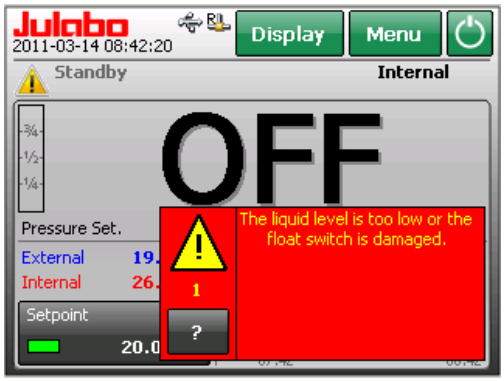
As the liquid drains, the unit will emit first the low-level warning (warning 40) and then the low-level alarm (alarm 1, red).

Warnings are displayed as a ticker in the status line.

Mute the audible signal by pressing the yellow symbol.



Mute the audible signal by pressing the red box.



In case of a complete exchange of the bath fluid the expansion tank must also be drained.

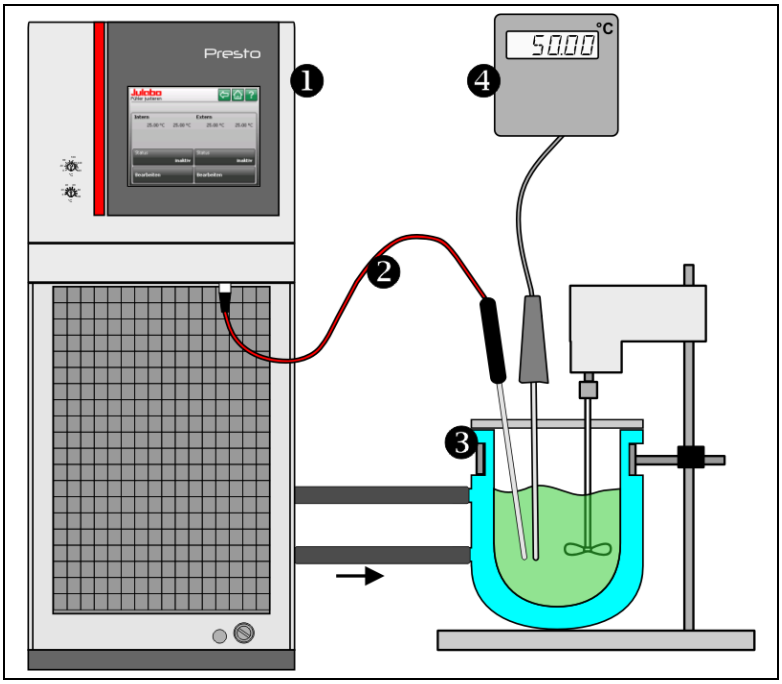
In this case use the drain (6) to discharge bath fluid.

11.3. "Adjust sensors" menu

Notice:
Do not alter the factory-setting for the internal sensor!
This is a closed temperature control system: only the calibration of the external sensor is sensible.

Both the internal temperature sensor and any external temperature sensor (attached to the "ext. Pt100" socket) may be calibrated.

Principle: external sensor calibration
During calibration in the external bath, a reference temperature sensor is used to determine the bath temperature in a stabilized condition.
This value is then entered under the >Adjust sensors< menu, >Calibration value< menu item.

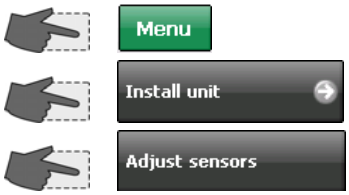


1. Temperature system
2. External temperature sensor Pt100
3. External bath
4. Temperature measuring device with a reference temperature sensor. (Indicates the calibration value)

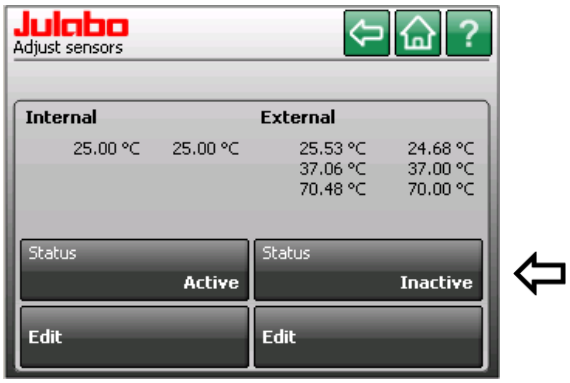
Preparations:

ⓘ Connect the external sensor Pt100 to the connecting socket „ EXT Pt100 “.

ⓘ Set unit to >internal control<. (see page 23)



Example: Calibration of the **external** sensor.



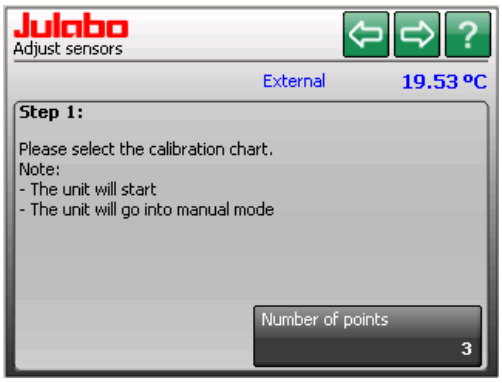
Select **>Status< >Inactiv<**

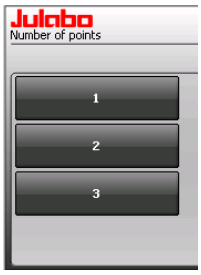
Select >**Edit**<

Important:
During calibration **>Status< >inactive<** must be activated.
Switch to **>activ<** after calibration.

You can perform a **>1-point<, >2-point<,** or **>3-point< calibration**

Select >**Number of points**<.



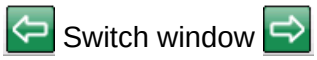


Example: **>3-point< calibration**

ⓘ This setting determines the number of the following steps.

Follow the instructions on the screen.

(Values are examples only).

ⓘ  Switch window

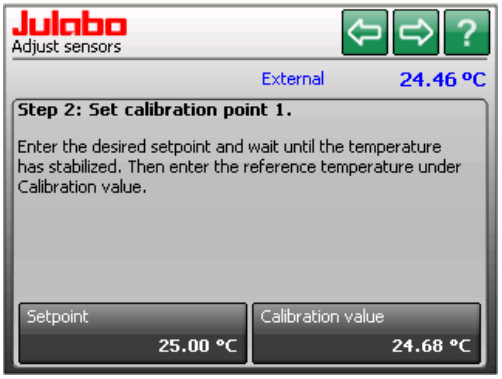
Calibration point 1


Set >**Setpoint**<

Wait


Set >**Calibration value**<

It is not possible to enter a calibration value while a button is light grey. 



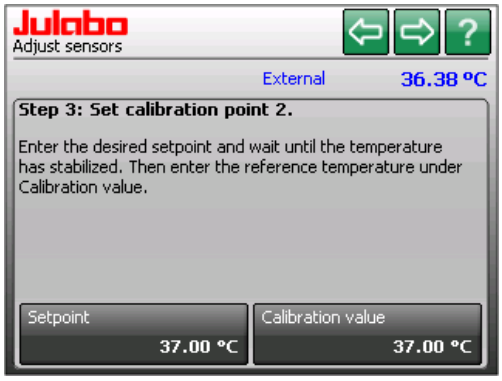
Wait

Calibration point 2

Set >**Setpoint**<

Wait

Set >**Calibration value**<

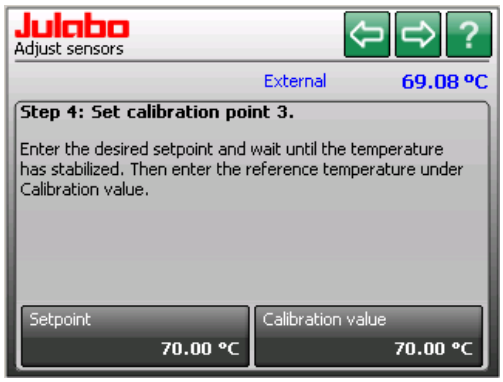


Calibration point 3

Set >**Setpoint**<

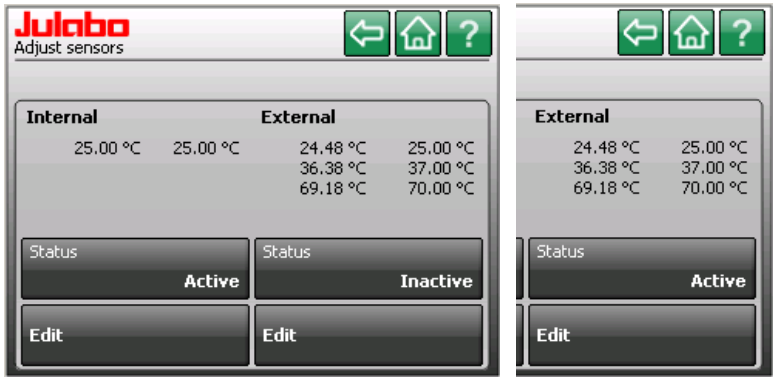
Wait

Set >**Calibration value**<



After the final value has been entered, all calibration points (three in this case) will be displayed.

(Values are examples only).

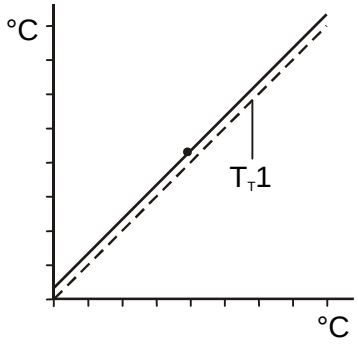


Set **>Status< >active<** after the calibration.

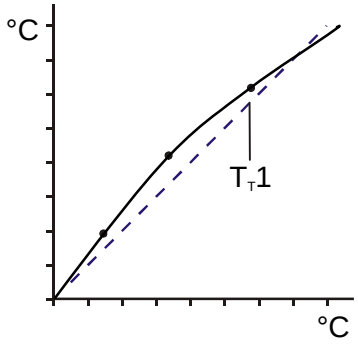
In the > **Status** < >**active**< the calibration curve always affects the current working temperature; also the one set via interface.

Examples:

1-point< calibration



3-point< calibration



T_T 1 = Original curve

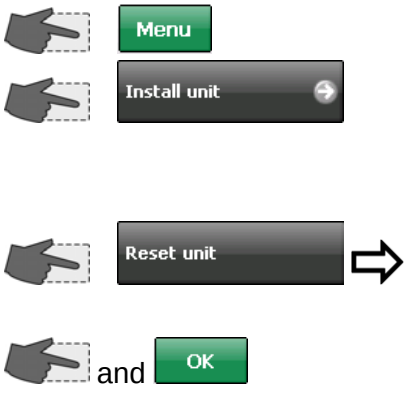
In case of a 1-point-calibration the calibration curve is moved entirely towards the original curve of the sensor.

In case if a 3-point calibration a bent curve may result. Thus the accuracy of the temperature indication can be improved in areas important to the application.

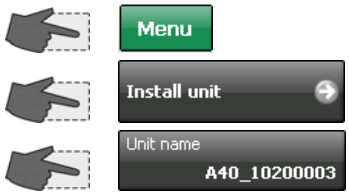
Example:

Working temperature setpoint 150 °C
The comparison points can be set at 140 °C, 150 °C and 160 °C.

11.4. "Reset unit" menu



11.5. "Unit name" menu



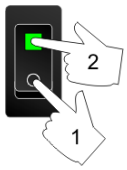
Use the keypad to enter the name 

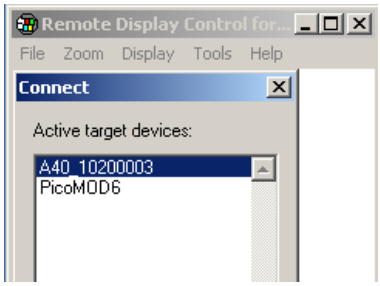
Example: A40 and Barcode

Then use the mains switch to switch the unit off and switch it back on approximately 4 seconds later.

It will now be easier to identify the unit in the ethernet.

At delivery every unit has a name which can be changed here.

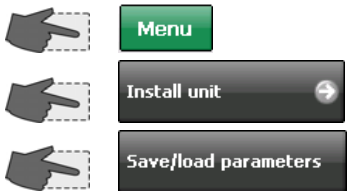




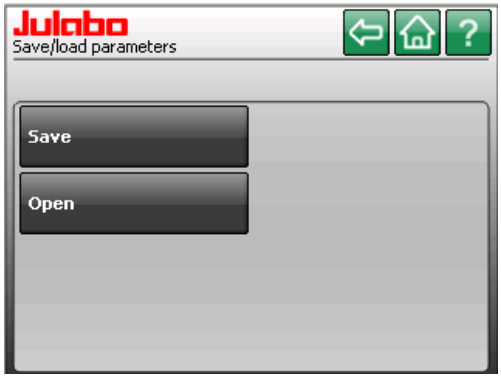
11.6. Save/load parameters

Once the optimum settings of the parameters of an application have been determined, this menu will enable you to save these on an external data carrier. It is therefore possible to specify various unit settings which can be used over and over again or can be transferred to additional units.

Important Note:
Unit data can only be exchanged between identical models.
Examples: A40 to A40 / W40 to W40
Not possible from A40 to W40



Please insert data carrier, e.g. USB stick.



Save parameters

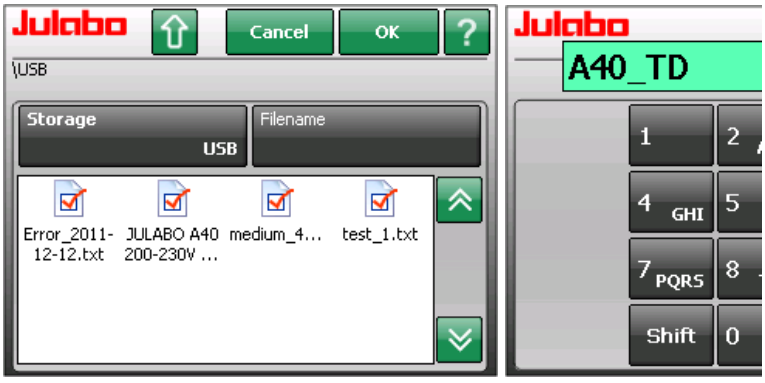
Select data carrier

Create a new file.

Select file name

and

Example: A40_TD

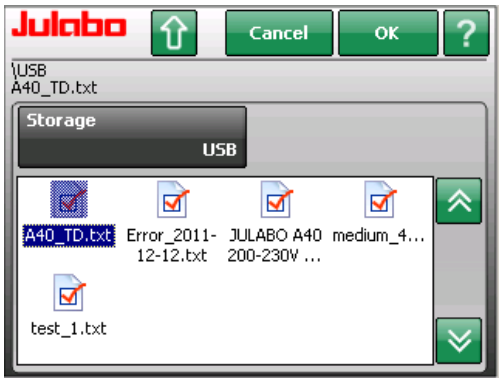


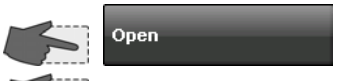
Save parameters

ⓘ The unit data are saved on an external data carrier.

Load parameters

Please insert data carrier., e.g. USB stick.





Select data carrier

Select file 

Load parameters.

ⓘ The unit data are loaded from the external data carrier.

11.7. Configure unit

The unit can be configured through the CAN Bus interface using a TFT display module (with USB stick, for example). Configuration files must be approved by JULABO.

ⓘ Button to go back one step

Please insert data carrier., e.g. USB stick.

Menu

Install unit

Configure unit

Select data carrier

1. / 2. Double click to select and open the configuration file.

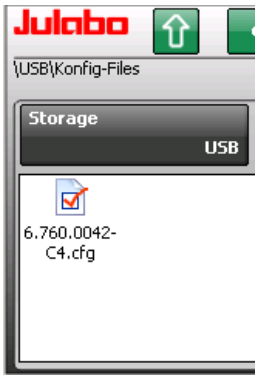
3. Select desired file and start the configuration with double click or OK.

OK

Example:

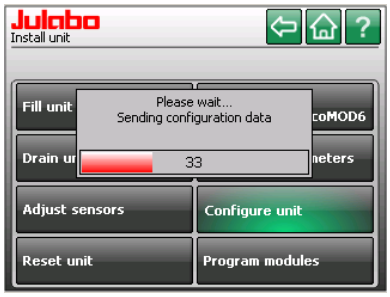
1.

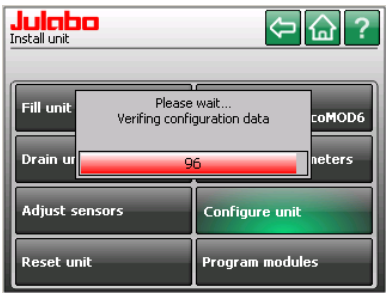
2.



3.

The configuration data will be sent in the first step and examined in the second step.





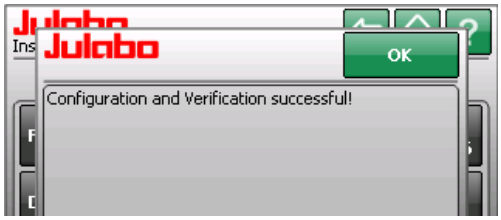
Attention:

When examining the configuration data the language may change!

See **Note** below.

Successful configuration is confirmed at the end.

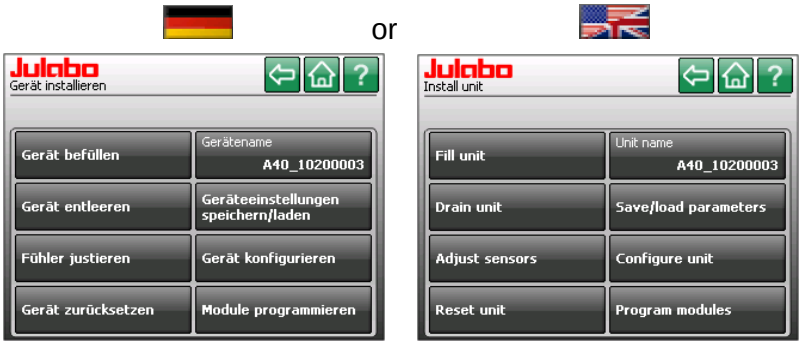
OK



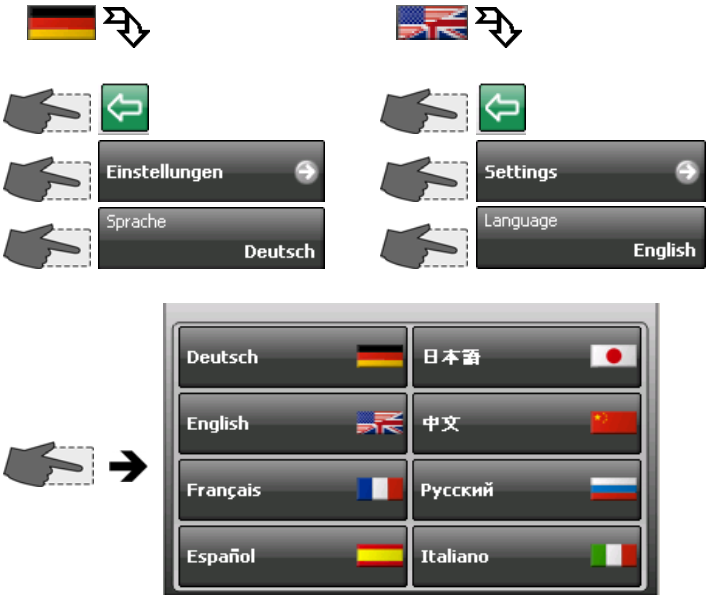
Note:

The language setting (German or English) in a configuration file is based primarily on the unit's mains voltage or mains frequency.
This is defined by JULABO, since each unit has only one configuration file.

If the language is switched during examination of the configuration data, one of the following two displays will appear:



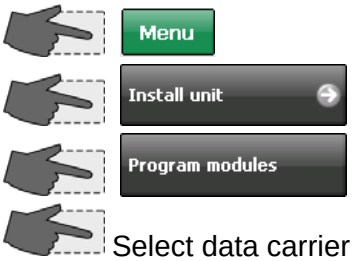
Return to desired language setting.



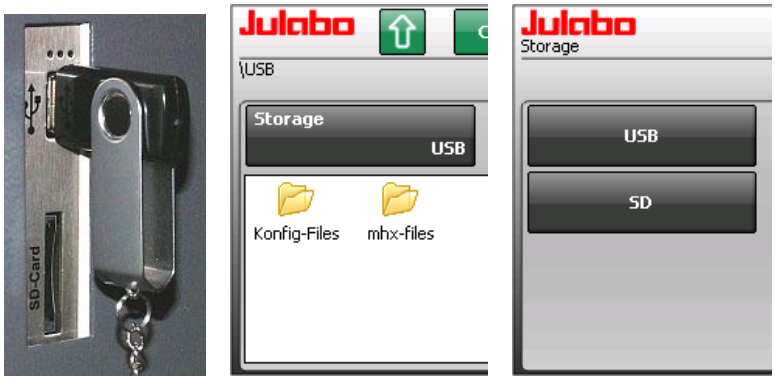
11.8. Program modules

The unit's electronic modules can be programmed through the CAN Bus interface using a TFT display module (with USB stick, for example). Removal not required.
As a result, upgrades are completed quickly and at low cost.

Insert the data carrier into the appropriate slot, such as a USP port.



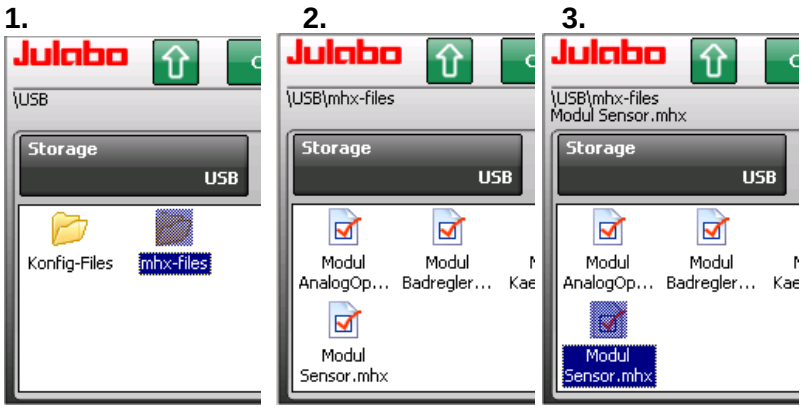
Select data carrier



Example:

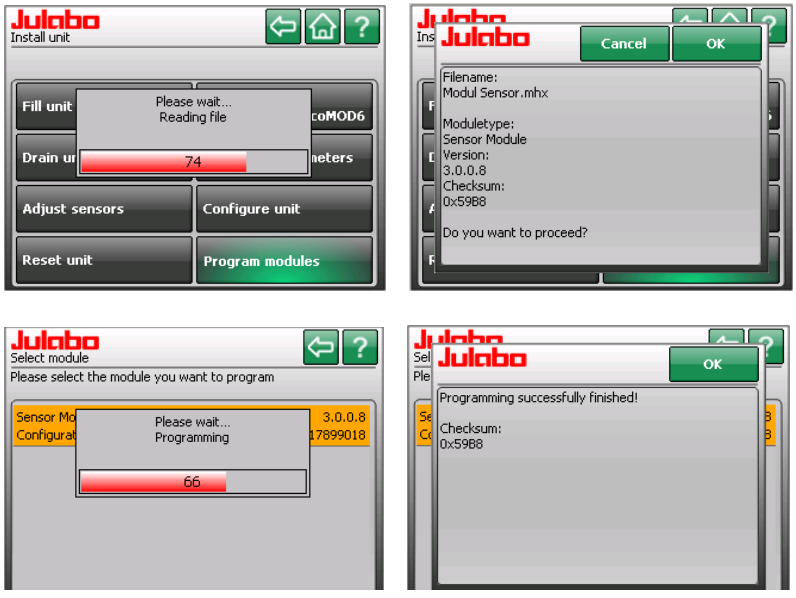
1. / 2. Double click to select and open the folder that contains the programs.
Example: mhx-files

3. Select desired file and start the programming with double click or OK.



The file will be read and the module ID shown on the display.

Click OK to continue.



Select the module.

Your selection will turn orange. Additional information provided on the display.

Successful programming is confirmed at the end.

ⓘ The unit compares the firmware version that is currently installed with the version on the data carrier. If the installed version is lower or the same, this will be indicated on the display.

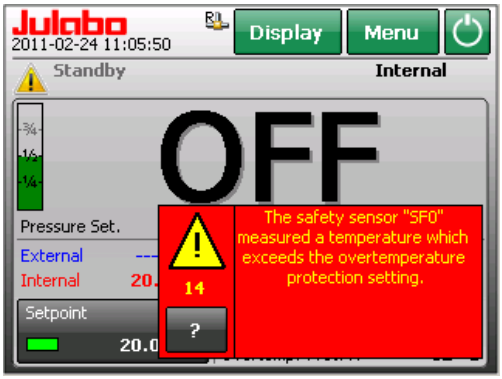
12. Error messages, fault causes, remedies

Error messages are divided into two groups, alarms and warnings. For quick differentiation both are shown in different colors on the TFT display. Possible fault causes as well as repair measures are listed.

ALARM display

Error messages are displayed in a red box.

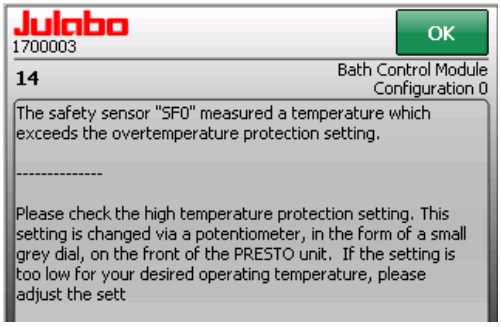
Example: Error 14



Touch the red box to mute the alarm.

Press <?> button for help text.
The module and the configuration are listed.

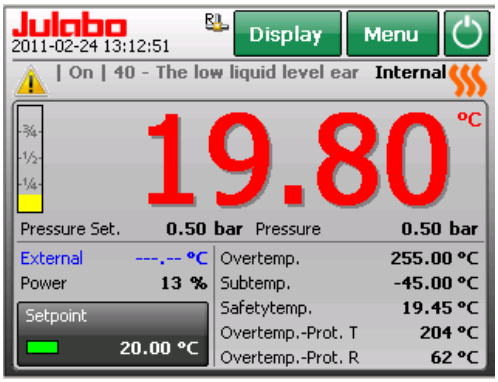
The unit switches to status „Standby“. Heater, refrigeration unit and circulation pump are switched off.



WARNING display

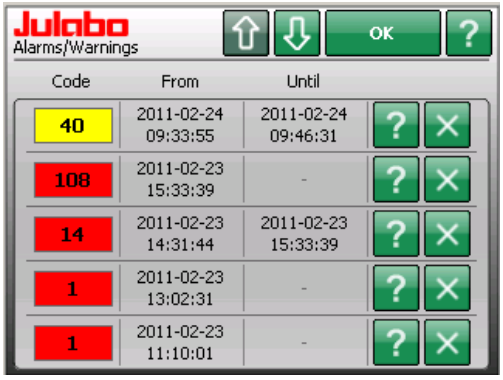
Warnings are displayed as a ticker in the status line.

Example: Warning 40



Touch the icon to mute the signal.

Help is always accessible through the icons  or  .
Touch the icon and a list of errors will be displayed. ⇨



Displays during errors

ALARM **Red >** 14

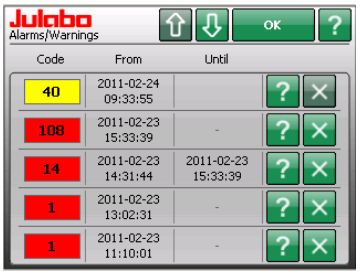
WARNING **Yellow >** 40

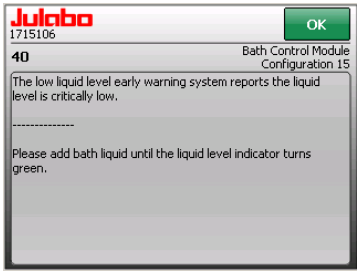
Date and time when the error appeared are stored and displayed.
If possible, this data will also be stored during removal of the error.
Example code 40 14

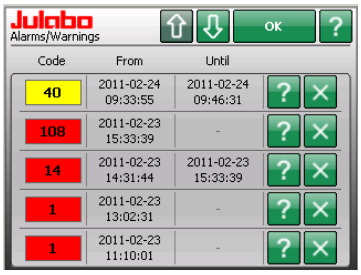
Use the ⇧⇩ keys to view the list.
Use the OK key to exit the list. The yellow Attention icon "⚠" is reset to "⚠".

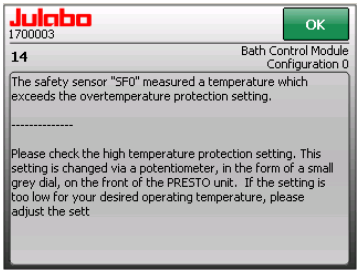
Press the <?> button for help text. ⇨⇨

Press <✕> to delete an error message from the list.
The 10 most recent events are shown.









13. Remote control

13.1. Setup for remote control

Adjust the interface in the „Connect unit Menu“ under menu item „Remote control“ (refer to page 49).

The mostly one-time adjustment of the interface parameters is carried out at the unit in its "Digital interfaces" menu (refer to page 52).

Factory settings: RS232

BAUDRATE	4800 Baud
PARITY	even parity
HANDSHAKE	Protokoll RTS/CTS (hardware handshake)
Data bits	7
Stop bit	1

The interface parameters are stored in the memory even after the unit is turned off.

13.2. Communication with a PC or a superordinated data system

If the unit is put into remote control mode, the TFT-DISPLAY will read “R” = REMOTE.

In general, the computer (master) sends commands to the instrument (slave). The instrument sends data (including error messages) only when the computer sends a query.

In remote control mode, the start command and all values to be set must be resent by the PC via the interface in case of a power interruption.
AUTOSTART is not possible.

A transfer sequence consists of:

- command
- space (⇔; Hex: 20)
- parameter (decimal separation with a period)
- end of file (↵; Hex: 0D)

- The response (data string) after an **in** command is always followed by a line feed (LF, Hex: 0A).

The commands are divided into **in** or **out** commands.

in commands: retrieve parameters

out commands: set parameters

The **out** commands are valid only in remote control mode.

Command to set the working temperature

>Setpoint1< to 55.5 °C **out_sp_00 ⇔ 55.5↵**

Command to retrieve the working temperature

>Setpoint1< **in_sp_00↵**

Response from the temperature system:

55.5↵ LF

13.3. List of commands

		This list of commands includes all available commands for Presto Axx and Presto Wxx. Some commands may be used only in limited situations and are shown with an appropriate note. Example: [not on A30]

13.3.1. in commands

in commands: Asking for parameters or temperature values to be displayed.

Command	Parameter	Response of instrument
version	none	Number of software version (V X.xx)
status	none	Status message, error message).
in_pv_00	none	Actual bath temperature.
in_pv_01	none	Heating power being used (%).
in_pv_02	none	Temperature value registered by the external Pt100 sensor.
in_pv_03	none	Temperature value registered by the safety sensor. >TANK<
in_pv_04	none	Over-temperature safety device setting
in_pv_05	none	Pump pressure in bar.
in_pv_06	none	Pump pressure of the external sensor socket
in_pv_07	none	Flow value of the external sensor socket
in_pv_08	none	Pressure 2 [not on Presto]
in_pv_09	none	Cooling water flow
in_pv_10	none	Calorimetric capacity [not on A30]
in_pv_11	none	Calorimetric work [not on A30]
in_pv_12	none	Temperature at external sensor2
in_sp_00	none	Working temperature (setpoint 1)
in_sp_01	none	Working temperature (setpoint 2)
in_sp_02	none	Working temperature (setpoint 3)
in_sp_03	none	Upper temperature limit

Command	Parameter	Response of instrument
in_sp_04	none	Lower temperature limit
in_sp_05	none	Setpoint temperature of the external programmer (socket REG+E-PROG) .
in_sp_06	none	Watchdog set point
in_sp_07	none	Pump pressure stage. Selected pump stage [not on A30]
in_sp_08	kein	Flow rate setpoint [not on A30]
in_sp_09	none	Value from pump pressure setpoint [not on A30]
in_sp_10	none	Selected variable setting via the serial interface
in_sp_11	none	Temperature indication in °C or °F
in_sp_12	none	Pump pressure indication in bar or psi
in_sp_13	none	Flow indication in l/min or gpm
in_sp_14	none	Pressure warning limit, upper
in_sp_15	none	Pressure warning limit, lower
in_sp_16	none	Pressure alarm limit (5 s)
in_sp_17	none	Pressure alarm limit (1 s)
in_sp_18	none	Flow rate warning limit, upper
in_sp_19	none	Flow rate warning limit, lower
in_sp_20	none	Final temperature of gradient function
in_sp_21	none	Display calorimetric capacity/work (kW/kWh or Btu/s, Btu)
In_hil_00	none	Max. cooling power (%).
In_hil_01	none	Max. heating power (%).
in_mode_01	none	Setpoint for control set to: 0 = Setpoint1 1 = Setpoint2 2 = Setpoint3
In_mode_02	none	Selftuning type: 0 = Selftuning “off” 1 = Selftuning “once” 2 = Selftuning “always”
in_mode_03	none	Type of external programmer input: 0 = Voltage 0 V to 10 V 1 = Current 0 mA to 20 mA

Command	Parameter	Response of instrument
in_mode_04	none	Internal/external temperature control: 0 = Temperature control with internal sensor. 1 = Temperature control with external Pt100 sensor.
in_mode_05	none	Unit in stop/start condition: 0 = stop 1 = start
in_mode_08	none	Adjusted control dynamics 0 = aperiodic 1 = standard
in_mode_09	none	Selected pump control 0 = Stage control 1 = Pressure control
in_mode_10	none	Calorimetric function active/inactive [not on A30] 0 = inactive 1 = active
in_mode_20	none	Gradiant function started/stopped? 0 = inactive 1 = active
in_par_00	none	Difference between the working sensor and the safety sensor
in_par_01	none	Te - Time constant of the external bath.
in_par_02	none	Si - Internal slope
in_par_03	none	Ti - Time constant of the internal bath.
in_par_04	none	Control parameter CoSpeed of the external controller 0 ... 5.0.
in_par_06	none	Xp control parameter of the internal controller.
in_par_07	none	Tn control parameter of the internal controller.
in_par_08	none	Tv control parameter of the internal controller.
in_par_09	none	Xp control parameter of the cascade controller.
in_par_10	none	Proportional share of the cascade controller.
in_par_11	none	Tn control parameter of the cascade controller.
in_par_12	none	Tv control parameter of the cascade controller.
in_par_13	none	Adjusted maximum internal temperature of the cascade controller.
in_par_14	none	Adjusted minimum internal temperature of the cascade controller.
in_par_15	none	Band limit (upper) Upper band limit
in_par_16	none	Band limit (lower) Lower band limit
in_par_20	none	Gradient of the gradient function

13.3.2. out commands

out commands: Setting parameters or temperature values.

Command	Parameter	Response of instrument
out_mode_01	0	Use working temperature (Setpoint 1)
out_mode_01	1	Use working temperature (Setpoint 2)
out_mode_01	2	Use working temperature (Setpoint 3)
out_mode_02	0	Selftuning “off”. Temperature control using the stored parameters.
out_mode_02	1	Selftuning “once” Single selftuning of the controlled system after the next start.
out_mode_02	2	Selftuning “always” Continual selftuning of the controlled system whenever a new setpoint is to be reached.
out_mode_03	0	Set external programmer input to voltage. Voltage 0V … 10V
out_mode_03	1	Set external programmer input to current. Current 0mA … 20mA
out_mode_04	0	Temperature control of internal bath.
out_mode_04	1	External control with Pt100 sensor.
out_mode_05	0	Stop the unit = R –OFF-.
out_mode_05	1	Start the unit.
out_mode_08	0	Set the control dynamics - aperiodic
out_mode_08	1	Set the control dynamics - standard
out_mode_09	0	Set pump to stage control
out_mode_09	1	Set pump to pressure control
out_mode_10	0	Deactivate calorimetry function [not on A30]
out_mode_10	1	Activate calorimetry function (must have been previously deactivated) [not on A30]
out_mode_20	0	Stop gradient function
out_mode_20	1	Start gradient function
out_sp_00	xxx.x	Set working temperature. (Setpoint 1)
out_sp_01	xxx.xx	Set working temperature. (Setpoint 2)
out_sp_02	xxx.xx	Set working temperature. (Setpoint 3)
out_sp_03	xxx.x	Set upper temperature limit
out_sp_04	xxx.x	Set lower temperature limit

Command	Parameter	Response of instrument
out_sp_06	xxx.xx	Set watchdog set point
out_sp_07	x	Set the pump pressure stage. (1 ... 4) [not on A30]
out_sp_08	xxx.xx	Set flow rate setpoint [not on A30]
out_sp_09	xxx.xx	Set pump pressure setpoint [not on A30]
out_sp_10	xxx	Set variable via the serial interface -100 … 100 [%]
out_sp_14	xxx.xx	Set pressure warning limit, upper
out _sp_15	xxx.xx	Set pressure warning limit, lower
out _sp_16	xxx.xx	Set pressure alarm limit (5 s)
out _sp_17	xxx.xx	Set pressure alarm limit (1 s)
out _sp_18	xxx.xx	Set flow rate warning limit, upper
out _sp_19	xxx.xx	Set flow rate warning limit, lower
out _sp_20	xxx.xx	Set final temperature of gradient function
out_hil_00	-xxx	Set the desired maximum cooling power (0% to 100%). **Note:** Enter the value with a preceding negative sign!
out_hil_01	xxx	Set the desired maximum heating power (10% to 100%).
out_par_04	xxx	Control parameter CoSpeed of the external controller 0 ... 5.0.
out_par_06	xxx	Xp control parameter of the internal controller.
out_par_07	xxx	Tn control parameter of the internal controller.
out_par_08	xxx	Tv control parameter of the internal controller.
out_par_09	xxx	Xp control parameter of the cascade controller.
out_par_10	xxx	Proportional portion of the cascade controller.
out_par_11	xxx	Tn control parameter of the cascade controller.
out_par_12	xxx	Tv control parameter of the cascade controller.
out _par_13	xxx	Maximum internal temperature of the cascade controller.
out _par_14	xxx	Minimum internal temperature of the cascade controller.
out_par_15	xxx	Upper band limit 0 ... 200 K
out_par_16	xxx	Lower band limit 0 ... 200 K
out_par_20	xx.xxx	Set gradient of the gradient function

13.4. Status messages

Status messages	Deskription
00 MANUAL STOP	Presto® in "OFF" state.
01 MANUAL START	Presto® in normal control mode
02 REMOTE STOP	Presto® in "Remote OFF" state.
03 REMOTE START	Presto® in remote control mode.

13.4.1. Status messages as reply to sent commands

Messages	Deskription
-08 INVALID COMMAND	The unit did not recognize the most recently received command.
-09 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	The most recently received command is not permitted in the current operating mode (example: setpoint specification while the unit is working in manual mode)
-10 VALUE TO SMALL	Entered value too small.
-11 VALUE TO LARGE	Entered value too large.
-13 VALUE EXCEED TEMPERATURE LIMITS	Value lies outside the adjusted range for the high and low temperature warning limits. But the value is stored..

	Note: In addition to status messages, error messages are also transferred. (See error messages starting on Page 108)

14. Communication via Modbus TCP/IP

14.1. Datatypes

14.1.1. Used Datatypes

The PRESTO-Modbus protocol uses the following datatypes:

Datatype	Description	Number of used registers
short	signed value with 16 bits	1
ushort	unsigned value with 16 bits	1
int	signed value with 32 bits	2
uint	unsigned value with 32 bits	2
float	floating point value with 32 bits	2

Table 1: Datatypes

The data types of the several values are listed in the parameter description tables (**Table 3 Table 4**).

14.1.2. Data Encoding

MODBUS uses 16 bit registers for data transaction. Therefore, data values, which have more than 16 bit (float, int, uint) need to be divided into two (or more) contiguous registers. According to the MODBUS specification, these data values are encoded with the HIGH-WORD in the first and the LOW-WORD in the second register.
It is absolutely required that the complete bus system uses the same format so that all data is decoded correctly. Some masters use the so called INTEL format (LOW-WORD first, HIGH-WORD second).

Therefore you can change the data encoding between INTEL format and MODBUS format by using holding-register 93.

Floats are encoded in IEEE754 format (1Bit Sign, 8Bits Exponent, 23Bits Mantissa).

14.2. Error Handling

If the unit detects an illegal data frame, it responses with an exception response. The following exception responses are supported by the unit.

Code	Name	Description
01	ILLEGAL FUNCTION	The function code received is not supported by the unit. Attempt to change any parameter and the unit is not in remote control
02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the unit (see register tables below) The combination of data address and data length is not allowed for the unit. (e.g. only the first or only the second register on an multi-register value is set)
03	ILLEGAL DATA VALUE	The adjusted value is not in the allowed range for the unit.

Table 2: Exception-Codes

14.3. Holding-Registers

14.3.1. Function-Codes

Name	Code (dec.)	Code (hex.)	Description
Read Holding Registers	03	03	Read multiple Holding Registers from the PRESTO
Write Single Registers	06	06	Write a single holding register to the PRESTO
Write Multiple Registers	16	10	Write multiple contiguous holding registers (1-123) to the PRESTO. Use this function if you want to change values which which have a datalength greater than 1 register (float-values)
Read/Write Multiple registers	23	17	Combination of one read operation and one write operation in a single MODBUS transaction. The write operation is performed before the read.

14.3.2. Register table

Register-address	Protocol Address	Datatype	Description	Adjustable range	
	0	ushort	Start/Stop the unit	0: Unit is in OFF-Mode 1: Unit is started	
	1	ushort	Acting variable input	0: Controller 1: Digital 2: EPROG	
	2 – 3	float	Working temperature (Setpoint)	Setpoint min. – Setpoint max.	
	4	short	Heating/Cooling power via MODBUS	-100 … 100	
Control parameters					
	10	ushort	Temperature control of internal bath/external PT100 sensor	0: Temperature control of internal bath 1: External control with Pt100 sensor	
	11	ushort	Selftuning function	0: No selftuning 1: Single selftuning of the controlled system after the next start 2: Continual selftuning of the controlled system whenever a new setpoint is to be reached	
	12 – 13	float	Xp control parameter of the internal controller	0.1 … 99.9 1/K	
	14	ushort	Tn control parameter of the internal controller	3 … 9999 s	
	15	ushort	Tv control parameter of the internal controller	0 …999 s	

Register-address	Protocol Address	Datatype	Description	Adjustable range	
	16	ushort	control dynamics	0: Aperiodic 1: Standard	
	17 – 18	float	Xp control parameter of the cascade controller	0.1 … 99.9 1/K	
	19	ushort	Tn control parameter of the cascade controller	3 … 9999 s	
	20	ushort	Tv control parameter of the cascade controller	0 …999 s	
	21 – 22	float	XpU control parameter of the cascade controller	0.1 … 99.9 1/K	
	23 – 24	float	CoSpeed for external control	0.0 … 5.0	
Controller limits					
	40	short	maximum cooling power	-100 … 0	
	41	short	maximum heating power	0 … 100	
	42 – 43	float	Min. internal temperature of the cascade controller		
	44 – 45	float	Max. internal temperature of the cascade controller.		
	46	short	Lower band limit	0 … 200 K	
	47	short	Upper band limit	0 … 200 K	
Pump settings					
	50	ushort	control type pressure control / stage control	0: Stage control 1: Pressure control 2: Flow control	
	51	ushort	Pressure control of internal/external pressure sensor	0: Pressure control of internal sensor 1: Pressure control of external sensor	
	52	ushort	Pumpstage	1 – Pumpstage max. (74)	
	53 – 54	float	Working pressure (Pressure setpoint)	0 … Pressure setpoint max (75)	
	55 – 56	float	Working flow rate (Flow rate setpoint)		
Temperature limits					
	60 – 61	float	Low temperature warning limit (SubTemp)		
	62 – 63	float	High temperature warning limit (Overtemp)		
	64	ushort	Reaction if the temperature exceeds the adjusted limits	0: Warning 1: Alarm	
Setpoint limits					
	70 – 71	float	minimum adjustable temperature setpoint		
	72 – 73	float	maximum adjustable temperature setpoint		
	74	ushort	maximum adjustable pump stage	1 – 4	
	75 – 76	float	maximum adjustable pressure setpoint		

Register-address	Protocol Address	Datatype	Description	Adjustable range	
Pressure limits					
	80 – 81	float	lower warning limit for pump pressure	0 … upper warning limit	
	82 – 83	float	upper warning limit for pump pressure	lower warning … Pressure limit	
	84 – 85	float	Pressure limit	upper warning limit … Pressure peak limit	
	86 – 87	float	Pressure peak limit	Pressure limit – sensor measurement range	
Units					
	90	ushort	Temperature unit	0: °C 1: °F	
	91	ushort	Pressure unit	0: bar 1: psi	
	92	ushort	Flow unit	0: l/min 0: gpm	
	93	ushort	Modbus-Format[1]	0: BigEndian, NoSwap 1: LittleEndian, NoSwap 2: BigEndian, Swap 3: LittleEndian, Swap	
	94	ushort	Unit capacity/Work	0: kW/kWh 1: Btu/s or Btu	
DateTime					
	100	ushort	Year		
	101	ushort	Month		
	102	ushort	Day		
	103	ushort	Hour		
	104	ushort	Minute		
	105	ushort	Second		
Additional					
	110	ushort	CalorimetryActive	0: Inactive 1: Active	

Table 3: Holding registers

[1] Defines the data encoding format of all registers (see chapter 14.1.2) EXCEPT this.
THIS REGISTER IS ALWAYS IN MODBUS FORMAT!!!

14.4. Input-Registers

Input-Registers can be read by the master.

14.4.1. Function-Codes

Name	Code (dec.)	Code (hex.)	
Read Input Registers	04	04	

14.4.2. Register-Table

Register-address	Protocol Address	Datatype	Description	Range / Meaning	
30001-30002	0 – 1	uint	Firmwareversion	Byte1: Major Byte2: Minor Byte3: Build Byte4: Revision	
30003	2	ushort	Unit type		
30004-30005	3 – 4	uint	Unit barcode		
30006	5	short	Unit remote control status	0: ManualControl 1: RS232 2: USB 3: Ethernet 4: Modbus 5: WirelessTEMP	
30007	6	short	Unit Alarmcode	Error messages see page 108	
	7	short	Unit Warncode	Error messages see page 108	
Act. values					
30011-30012	10 – 11	float	Current bath temperature		
30013-30014	12 – 13	float	Temperature value registered by the external Pt100 sensor		
30015	14	short	Heating/Cooling power being used	-100 … 100	
30016-30017	15 – 16	float	Temperature value registered by the safety sensor **TANK**		
30018-30019	17 – 18	float	Temperature value registered by the safety sensor **RESERVOIR**		
30020-30021	19 – 20	float	Excess temperature protection setpoint **TANK**		
30022-30023	21 – 22	float	Excess temperature protection setpoint **RESERVOIR**		
30024-30025	23 – 24	float	Pressure value registered by the internal pressure sensor		

Register-address	Protocol Address	Datatype	Description	Range / Meaning	
30026-30027	25 – 26	float	Pressure value registered by the external pressure sensor		
30028-20029	27 – 28	float	Flow value registered by the external pressure sensor		
30030-30031	29 – 30	float	Pressure2		[not on Presto]
30032-30033	31 – 32	float	Cooling water flow rate		[not on Presto]
30034-20035	33 – 34	float	Calorimetric capacity		
30036-20037	35 – 36	float	Calorimetric work		
30038-20039	37 – 38	float	External Temperature 2		
30051-30052	50-51	float	Si - Internal slope		
30053	52	ushort	Ti - Time constant of the internal bath		
30054	53	ushort	Te - Time constant of the external bath		

Table 4: Input registers

15. Error messages

In the following all error messages for Presto II units, which may occur, are listed. Due to the varying performance classes of the units the number of displayed error messages differs. 1-stage units do not display error messages which affect only errors of stage 2.

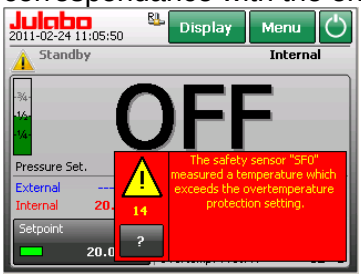
For better orientation the tables are colored in correspondance with the error messages on the TFT display.

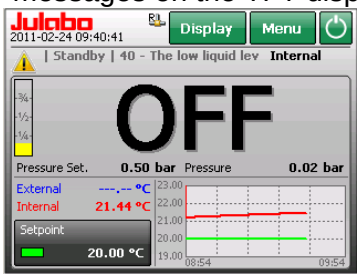
ALARM display

Error messages are displayed in a red box.

WARNUNG display

Warnings are displayed as a ticker in the status line.





Legend of the tables:

Alarm-Code		Cause	Diagnosis / Remedy
0	E01		
0, Konfiguration	Code / Nummer Exx	**Abbreviations used:** SF Safety sensor (SF0, SF1, …) SF0_0 Safety sensor 0 in configuration 0 SF0_1 Safety sensor 0 in configuration 1 etc. CAN CAN-Bus (Internal bus system)	
0 •	E03	• Warnings with high priority	
0 •	E2101	• Warnings with low priority	

15.0.1. Bath Control Module

		Bath Control Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15	E01	The liquid level is too low or the float switch is damaged.	Please try adding some fluid until the indicator turns green. Then, turn off the mains power, wait four seconds, and turn the power switch back on.
0	E05	Open circuit at "SF0" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF0". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
1 2 3 4 15	E102	Open circuit at "SF0" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF0". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0 1 2 3 4 15	E14	The safety sensor "SF0" measured a temperature which exceeds the overtemperature protection setting.	Please check the high temperature protection setting. This setting is changed via a potentiometer, in the form of a small grey dial, on the front of the PRESTO unit. If the setting is too low for your desired operating temperature, please adjust the setting correspondingly. WARNING: Please make sure that your high temperature cut-off settings are in line with the bath fluid used in the PRESTO unit. Consult the fluid manufacturer for more information on operating limits for your fluid.
0 1 2 3 4 15	E104	The A/D conversion circuit for safety sensor "SF0" is defective.	If the problem persists, please contact JULABO service.
0	E05	Short circuit at "SF0" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF0". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.

		Bath Control Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
1 2 3 4 15	E105	Short circuit at "SF0" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF0". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0 1 2 3 4 15	E106	SF0 exceeds the set temperature protection.	If the problem persists, please contact JULABO service.
0 1 2 3 4 15	E107	Temperature protection in security chain of SF0 falls below the lower range limit.	If the problem persists, please contact JULABO service.
0 1 2 3 4 15	E108	Previously, a fault with the safety sensor "SF0" caused an alarm condition to shut the unit down. The problem with "SF0" has been cleared, but the alarm condition persists due to a too-brief shut down of the mains power.	When the unit was turned off to clear the alarm condition, the power was turned on too quickly afterwards. Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0	E33	Open circuit at "SF1" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF1". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
1 2 3 4 15	E110	Open circuit at "SF1" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF1". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0 1 2 3 4 15	E14	The safety sensor "SF1" measured a temperature which exceeds the overtemperature protection setting.	Please check the high temperature protection setting on the front of the PRESTO unit. If the setting is too low, please adjust the setting correspondingly. Then, turn off the mains power, wait four seconds, and turn the power switch back on. WARNING: If unsure, please consult the fluid manufacturer and/or JULABO for more information on operating limits for your fluid.

		Bath Control Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15	E112	The A/D conversion circuit for safety sensor "SF1" is defective.	If the problem persists, please contact JULABO service.
0	E33	Short circuit at "SF1" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF1". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
1 2 3 4 15	E113	Short circuit at "SF1" safety sensor.	The unit has detected a problem with the connection of the safety temperature sensor, "SF1". Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0 1 2 3 4 15	E114	Protection temperature in safety chain of SF1 is exceeds the upper range limit.	If the problem persists, please contact JULABO service.
0 1 2 3 4 15	E115	Protection temperature in safety chain of SF1 is below the lower range limit.	If the problem persists, please contact JULABO service.
0 1 2 3 4 15	E116	Previously, a fault with the safety sensor "SF1" caused an alarm condition to shut the unit down. The problem with "SF1" has been cleared, but the alarm condition persists due to a too-brief shut down of the mains power.	When the unit was turned off to clear the alarm condition, the power was turned on too quickly afterwards. Please perform a power cycle: Turn off the power switch, wait four seconds, and then turn the power switch back on.
0	E06	The maximum allowable temperature difference between the internal safety sensors, "SF0" and "SF1", has been exceeded.	(1) Please verify that the bath fluid is not too thick for use in this unit. The viscosity of the fluid should not exceed 70 cSt at any operating temperature. (2) One of the safety sensors, "SF0" or "SF1", may have failed.
1 2 3 4 15	E117	The maximum allowable temperature difference between the internal safety sensors, "SF0" and "SF1", has been exceeded.	(1) Please verify that the bath fluid is not too thick for use in this unit. The viscosity of the fluid should not exceed 70 cSt at any operating temperature. (2) One of the safety sensors, "SF0" or "SF1", may have failed.

Bath Control Module			
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15	E118	There is an error in an A/D conversion circuit.	If the problem persists, please contact JULABO service.
0	E15	There is an open circuit at the external Pt100 sensor socket.	The current user-configuration specifies that the PRESTO unit should control the temperature using the external Pt100 sensor. However, there is an open circuit at the Pt100 sensor socket. If you have removed the external Pt100 sensor from its socket, please change the control type from "external" to "internal", or plug the external Pt100 sensor back into its socket.
0	E15	There is a short circuit at the external Pt100 sensor socket.	The external Pt100 sensor is plugged in, but there is a fault with the sensor. If possible, please check the resistance of the Pt100 sensor, to ensure the sensor has not failed.
15	E119	Open circuit external working temperature sensor 2 (medium return temperature during activated calorimetric function)	Open circuit external working temperature sensor 2 (fluid return line sensor during activated calorimetry function) (1) Check sensor connection (2) Check sensor cable for damage
15	E120	Short circuit external working temperature sensor 2 (medium return temperature during activated calorimetric function)	Short circuit external working temperature sensor 2 (fluid return line sensor during activated calorimetry function) (1) Check sensor connection (2) Check sensor cable for damage
0 1 2 3 4 15	E60	Read/write error in FRAM	If the problem persists, please contact JULABO service.
0 1 2 3 4 15	E61	CAN controller reports fault	CAN reports an error. Data probably could not be transmitted. Recommendation: turn off the unit via the power switch, wait 4 seconds and turn it on again.

	Bath Control Module	
Alarm-Code	**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15 E62	The Display module has stopped sending the Module ID to the CAN-Bus for unknown reasons.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.

	Bath Control Module	
Alarm-Code	**Cause**	**Diagnosis / Remedy**
0 • E03	The user-set high temperature limit has been exceeded.	The measured temperature is above the user-set high temperature limit. Please increase the user-set high temperature limit, or decrease the setpoint.
0 • E04	The user-set low temperature limit has been exceeded.	The measured temperature is below the user-set low temperature limit. Please decrease the user-set low temperature limit, or increase the setpoint.
0 1 2 3 4 15 • E1103	Level detection is configured, but not connected.	Check the connection of the level detection circuit!
0 1 2 3 4 15 • E1104	Level detection is not configured, but is connected anyway.	Check connection!
0 1 2 3 4 15 • E41	The high liquid level early warning system reports the liquid level is critically high.	Please drain bath liquid until the liquid level indicator turns green.

		Bath Control Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15 •	E40	The low liquid level early warning system reports the liquid level is critically low.	Please add bath liquid until the liquid level indicator turns green.
0 •	E1107	The temperature SF0 of the tank or of the reservoir is close to the cut-off temperature	Possible reason: Due to an exothermic reaction in the external system, the internal temperature is increasing uncontrollably! ---------- The unit does not have enough capacity to counter the exothermic reaction. Please provide cooling to the external system, or the unit will reach the safety cut-off temperature and switch off.
0 1 2 3 4 15 •	E1108	The temperature SF1 of the tank or of the reservoir is close to the cut-off temperature	Possible reason: Due to an exothermic reaction in the external system, the internal temperature is increasing uncontrollably! ---------- The unit does not have enough capacity to counter the exothermic reaction. Please provide cooling to the external system, or the unit will reach the safety cut-off temperature and switch off.
0 •	E1109	Due to a flow problem in the internal heat exchanger, the sensor-difference limit has been reached.	Please check that the fluid used in this unit is suitable for use in this unit. Fluids which have a viscosity higher than 70 cSt at any temperature within your desired temperature range are not suitable for use. If you have questions regarding suitability of your fluid, please contact JULABO service.
0 1 2 3 4 15 •	E2101	The safety sensor "SF0" measured a temperature which is above the user-set high temperature limit.	1. Check that the user-set high temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.

		Bath Control Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1 2 3 4 15 •	E2102	The safety sensor "SF0" measured a temperature which is below the user-set low temperature limit.	1. Check that the user-set low temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
0 1 2 3 4 15 •	E2103	The safety sensor "SF1" measured a temperature which is above the user-set high temperature limit.	1. Check that the user-set high temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
0 1 2 3 4 15 •	E2104	The safety sensor "SF1" measured a temperature which is below the user-set low temperature limit.	1. Check that the user-set low temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
0 •	E2105	The external Pt100 sensor measured a temperature which exceeds the user-set high temperature limit.	1. Check that the user-set high temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
15 •	E2105	The external Pt100 sensor 2 (fluid return line sensor during activated calorimetry function) measured a temperature which exceeds the user-set high temperature limit.	1. Check that the user-set high temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
0 •	E2106	The external Pt100 sensor measured a temperature which exceeds the user-set low temperature limit.	1. Check that the user-set low temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.
15 •	E2106	The external Pt100 sensor 2 (fluid return line sensor during activated calorimetry function) measured a temperature which exceeds the user-set low temperature limit.	1. Check that the user-set low temperature limit is correct, and plausible for your temperature setpoint. 2. Check the sensor for the proper wiring and resistance.

15.0.2. Sensor Module

		Sensor Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	201	Defective internal medium-pressure sensor or loose connector.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.
0	202	External fluid pressure sensor is defective or not connected	Replace the sensor or disable this sensor in the EXT sensor menu
0	203	External fluid flow rate sensor is defective or not connected	Please replace the sensor or deactivate the function of the sensor "JULABO Sensor Pressure/Flow"
0	204	Total current measurement phase 1 defective or bad connection	If the problem persists, please contact JULABO service.
0	205	Current measurement compressor stage 1 defective or bad connection	If the problem persists, please contact JULABO service.
0	206	Current measurement compressor stage 2 defective or bad connection	If the problem persists, please contact JULABO service.
0	207	Current measurement pumps defective or bad connection	If the problem persists, please contact JULABO service.
0	208	Mains voltage measurement defective or bad connection	If the problem persists, please contact JULABO service.
0	E60	Read/write error in FRAM	If the problem persists, please contact JULABO service.
0	E61	CAN controller reports fault	CAN reports an error. Data probably could not be transmitted. Recommendation: turn off the unit via the power switch, wait 4 seconds and turn it on again.
0	E62	The Display module has stopped sending the Module ID to the CAN-Bus for unknown reasons.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.

		Sensor Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E41	The high liquid level early warning system reports the liquid level is critically high.	Please drain bath liquid until the liquid level indicator turns green.
0	E40	The low liquid level early warning system reports the liquid level is critically low.	Please add bath liquid until the liquid level indicator turns green.
0	E1203	The internal medium-pressure sensor measured a pressure which is above the user-set high pressure limit.	1. Check that the user-set high pressure limit is correct, and plausible for your pressure setpoint. 2. Check the sensor.
0	E1204	The internal medium-pressure sensor measured a pressure which has fallen below the user-set low pressure limit.	1. Check that the user-set low pressure limit is correct, and plausible for your pressure setpoint. 2. Check the sensor.
0	E1205	The cooling water flow-rate is too high.	1. Check that the user-set limit is correct, and plausible for your target flow-rate. 2. Check the sensor.
0	E1206	The cooling water flow-rate is too low.	1. Check that the user-set limit is correct, and plausible for your target flow-rate. 2. Check the sensor.
0	E1207	The total current draw has exceeded the specified high current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1208	The total current draw has fallen below the specified low current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1209	The current draw of the first stage compressor has exceeded the specified high current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.

		Sensor Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	E1210	The current draw of the first stage compressor has fallen below the specified low current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1211	The current draw of the second stage compressor has exceeded the specified high current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1212	The current draw of the second stage compressor has fallen below the specified low current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1213	The current draw of the pump has exceeded the specified high current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1214	The current draw of the pump has fallen below the specified low current limit.	1. Check that the user-set limit is correct, and plausible for your target current draw. 2. The responsible sensor and/or module may be defective.
0	E1215	The voltage input to the unit is too high.	1. Check the power supply 2. Check that the limit is correct, and plausible for your input voltage/model combination 3. The responsible sensor or module may be defective.
0	E1216	The voltage input to the unit is too low.	1. Check the power supply 2. Check that the limit is correct, and plausible for your input voltage/model combination 3. The responsible sensor or module may be defective.

		Sensor Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E1217	The frequency input to the unit is too high.	1. Check the power supply 2. Check that the limit is correct, and plausible for your input frequency/model combination 3. The responsible sensor or module may be defective.
0	E1218	The frequency input to the unit is too low.	1. Check the power supply 2. Check that the limit is correct, and plausible for your input frequency/model combination 3. The responsible sensor or module may be defective.

15.0.3. Power Module

		Power Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E301	The pressure in the external temperature control circuit has exceeded the peak pressure limit for 1 second.	Lower the pressure setpoint, or, if safety allows, increase the peak pressure limit.
0	E302	The pressure in the external temperature control circuit has exceeded the pressure limit for 5 second.	Lower the pressure setpoint, or, if safety allows, increase the pressure limit.
0	E303	The fuses Si2 and/or Si3 on the power module are blown.	The power module and/or the fuse must be replaced.
0	E304	Mains voltage detected even though the unit is in Standby.	If the problem persists, please contact JULABO service.
0	E60	Read/write error in FRAM	If the problem persists, please contact JULABO service.
0	E61	CAN controller reports fault	CAN reports an error. Data probably could not be transmitted. Recommendation: turn off the unit via the power switch, wait 4 seconds and turn it on again.
0	E62	The Display module has stopped sending the Module ID to the CAN-Bus for unknown reasons.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.

		Power Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	E1301	The temperature of the power module has exceeded the critical value of 80°C.	Please turn off the power to the unit, and provide adequate cooling, or lower the ambient temperature.
0	E1302	The heater output has been locked due to a pump pressure below the minimum threshold.	Please locate the source of the pressure loss, or increase the "heater output block" setting.
0	E1303	The fan speed is below the set limit.	The fan is defective or dirty.

15.0.4. Refrigeration Module

		Refrigeration Module	
Alarm-Code		Cause	Diagnosis / Remedy
	Modul1		
0 1 2 3	E401	Defective evaporator outlet temperature sensor	The evaporator outlet temperature sensor is short-circuited.
0 1 2 3	E402	Defective evaporator outlet temperature sensor	The evaporator outlet temperature sensor is open (disconnected).
00 1 2 3	E403	Defective compressor outlet temperature sensor	The compressor outlet temperature sensor is short-circuited.
0 1 2 3	E404	Defective compressor outlet temperature sensor	The compressor outlet temperature sensor is open (disconnected).
0 1 2 3	E405	Defective compressor inlet temperature sensor	The compressor inlet temperature sensor is short-circuited.
0 1 2 3	E406	Defective compressor inlet temperature sensor .	The compressor inlet temperature sensor is open (disconnected).
0 1 2 3	E407	Defective air intake temperature sensor.	The air intake temperature sensor is short-circuited.
0 1 2 3	E408	Defective air intake temperature sensor	The air intake temperature sensor is open (disconnected).
0 1 2 3	E409	Defective compressor shell temperature sensor	The compressor shell temperature sensor is short-circuited.
0 1 2 3	E410	Defective compressor shell temperature sensor	The compressor shell temperature sensor is open (disconnected).
0 1 2 3	E411	Faulty water-cooled condenser inlet temperature sensor	The water-cooled condenser temperature sensor is short-circuited.

		Refrigeration Module	
Alarm-Code		Cause	Diagnosis / Remedy
0 1 2 3	E412	Faulty water-cooled condenser inlet temperature sensor	The water-cooled condenser temperature sensor is open (disconnected).
0 1 2 3	E413	Defective evaporation pressure sensor	The evaporation pressure sensor is short-circuited.
0 1 2 3	E414	Defective evaporation pressure sensor	The evaporation pressure sensor is open (disconnected).
0 1 2 3	E415	Defective reserve pressor sensor	The reserve pressure sensor is short-circuited.
0 1 2 3	E416	Defective reserve pressor sensor	The reserve pressure sensor is open (disconnected).
0 1 2 3	E417	Defective condensing pressure sensor	The condensing pressure sensor is short-circuited.
0 1 2 3	E418	Defective condensing pressure sensor	The condensing pressure sensor is open (disconnected).
0	E419	One or more of the following conditions has occurred: (1) The ambient temperature is too high (2) The inlet cooling water temperature is too high (3) The cooling water flow rate is too low (4) The postinjection circuit is defective (5) A refrigerant leak has occurred (6) The condenser fan has failed (7) The condenser is dirty	Please check the on-site installation conditions, including the ambient temperature, cooling water (if applicable), air-flow, and the cleanliness of the air-cooled condenser.
1	E419	While testing functionality of the first stage refrigeration system, found one of the following has occurred: (1) The postinjection circuit is defective (2) A refrigerant leak has occurred	If the problem persists, please contact JULABO service.

		Refrigeration Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E420	One or more of the following conditions has occurred: (1) Insufficient postinjection (2) Expansion valve EEV2 is defective (3) A refrigerant leak has occurred	If the problem persists, please contact JULABO service.
0	E421	Ambient temperature exceeds specifications	Please check the on-site installation conditions, including the ambient temperature, cooling water (if applicable), air-flow, and the cleanliness of the air-cooled condenser.
0	E422	Ambient temperature exceeds specifications	Please check the on-site installation conditions, including the ambient temperature, cooling water (if applicable), air-flow, and the cleanliness of the air-cooled condenser.
0 1 2 3	E425	One or more of the following conditions has occurred: (1) The expansion valves EEV1 and/or EEV2 have failed (2) A pressure transducer has failed (3) The evaporator outlet temperature sensor has failed. (4) compressor failure	If the problem persists, please contact JULABO service.
0 1 2 3	E426	One or more of the following conditions has occurred: (1) The expansion valves EEV1 and/or EEV2 have failed (2) A refrigerant leak has occurred (3) The evaporator outlet temperature sensor has failed. (4) Poor or no circulation	Please check: (1) The pump settings (2) The tubing diameter of the external system - too small? (3) Please ensure there are no clogs or blockages in the tubing or in the external system (4) Please verify that the bath fluid is suitable for the application and is not outside the 70 cSt viscosity limit of the unit
0	E427	One of the following conditions has occurred: (1) The ambient temperature is too high (2) The cooling water temperature is too high (3) The cooling water flow rate is too low (4) The air-cooled condenser fan is defective (5) The condenser is dirty	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
1	E427	Check that the first stage refrigeration system is working	If the problem persists, please contact JULABO service.

		Refrigeration Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	E428	The high pressure switch has tripped, due to one or more of the following: (1) The ambient temperature is too high (2) The cooling water temperature is too high (3) The cooling water flow-rate is too low (4) The air-cooled condenser fan has failed (5) The condenser is dirty	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
1		Check that the first stage refrigeration system is working	If the problem persists, please contact JULABO service.
0 1 2 3	E429	The Kriwan (compressor temperature safety device) has cut-out, due to one or more of the following: (1) The winding temperature is too high (2) Postinjection is insufficient (3) The compressor inlet temperature is too high	Please check the mains power supply.
1	E430	Check that the first stage refrigeration system is working	Please check the on-site installation conditions, including the ambient temperature, cooling water (if applicable), air-flow, and the cleanliness of the air-cooled condenser.
0 1 2 3	E431	No current draw detected from the compressor / compressor defective	If the problem persists, please contact JULABO service.
0	E432	One of the following conditions has occurred: (1) One of the expansion valves, EEV1 or EEV2, has failed (2) The reservoir cooling solenoid has failed (3) The compressor has failed	If the problem persists, please contact JULABO service.
1	E432	One of the following conditions has occurred: (1) One of the expansion valves, EEV1 or EEV2, has failed (2) The compressor has failed	If the problem persists, please contact JULABO service.
0 1 2 3	E433	One of the following conditions has occurred: (1) One of the expansion valves, EEV1 or EEV2, has failed (2) A pressure transducer has failed (3) The evaporator outlet temperature sensor has failed	If the problem persists, please contact JULABO service.

		Refrigeration Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E434	Cooling water temperature too high	Please check the cooling water.
0	E435	Cooling water temperature too low	Please check the cooling water.
0 1 2 3	E60	Read/write error in FRAM	If the problem persists, please contact JULABO service.
0 1 2 3	E61	CAN controller reports fault	CAN reports an error. Data probably could not be transmitted. Recommendation: turn off the unit via the power switch, wait 4 seconds and turn it on again.
0 1 2 3	E62	The Display module has stopped sending the Module ID to the CAN-Bus for unknown reasons.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.

		Refrigeration Module	
Alarm-Code		Cause	Diagnosis / Remedy
0	E1419	One or more of the following conditions has occurred: (1) The ambient temperature is too high (2) The inlet cooling water temperature is too high (3) The cooling water flow rate is too low (4) The postinjection circuit is defective (5) A refrigerant leak has occurred (6) The condenser fan has failed (7) The condenser is dirty	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
1	E1419	One or more of the following conditions has occurred: (1) The postinjection circuit is defective (2) A refrigerant leak has occurred Please check that the first stage refrigeration system is functioning	If the problem persists, please contact JULABO service.

		Refrigeration Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0 1	E1420	One or more of the following conditions has occurred: (1) The postinjection is insufficient. (2) The expansion valve EEV2 is defective. (3) A refrigerant leak has occurred.	If the problem persists, please contact JULABO service.
0	E1421	Ambient temperature exceeds specifications.	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
0	E1422	Ambient temperature exceeds specifications	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
0 1	E1423	Check crankcase heater.	If the problem persists, please contact JULABO service.
0 1	E1424	Please check the cooling water.	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
0 1	E1425	One of the following conditions has occurred: (1) One of the expansion valves, EEV1 or EEV2, has failed (2) A pressure transducer has failed (3) The evaporator outlet temperature sensor has failed	If the problem persists, please contact JULABO service.
0 1	E1426	One or more of the following conditions has occurred: (1) The expansion valves EEV1 and/or EEV2 have failed (2) A refrigerant leak has occurred (3) The evaporator outlet temperature sensor has failed. (4) Poor or no circulation	Please check: (1) The pump settings (2) The tubing diameter of the external system - too small? (3) Please ensure there are no clogs or blockages in the system (4) Please verify that the bath fluid is suitable for the application and is not outside the 70 cSt viscosity limit

		Refrigeration Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	E1427	One of the following conditions has occurred: (1) The ambient temperature is too high (2) The cooling water temperature is too high (3) The cooling water flow rate is too low (4) The air-cooled condenser fan is defective (5) The condenser is dirty	Please check the following: (1) The onsite conditions - ensure they meet the operating requirements of this device (2) Clean the condenser, if dirty
1	E1427	Check that the first stage refrigeration system is working	If the problem persists, please contact JULABO service.
0 1	E1433	One of the following conditions has occurred: (1) One of the expansion valves, EEV1 or EEV2, has failed (2) A pressure transducer has failed (3) The evaporator outlet temperature sensor has failed	If the problem persists, please contact JULABO service.
0	E1434	Cooling water temperature too high	Please check the cooling water.
0	E1435	Cooling water temperature too low	Please check the cooling water.

15.0.5. Analog Interface Module

		Modul Analoge Schnittstelle	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	E60	Read/write error in FRAM	If the problem persists, please contact JULABO service.
0	E61	CAN controller reports fault	CAN reports an error. Data probably could not be transmitted. Recommendation: turn off the unit via the power switch, wait 4 seconds and turn it on again.
0	E62	The Display module has stopped sending the Module ID to the CAN-Bus for unknown reasons.	Please reset the unit. First, turn off the power switch, wait four seconds, and then turn the power switch back on.

15.0.6. Display Module

	Display Module	
Alarm-Code	**Cause**	**Diagnosis / Remedy**
o E38	Failed to read an external Pt100 to change the setpoint.	The setpoint is supposed to be set by an external Pt100, but none is found. Please check that the external Pt100 is connected, or change this setting in the configuration of the unit.
0 E502	Error in communicating to the WirelessTEMP USB-stick with remote control	The WirelessTEMP USB stick has been disabled or disconnected. Please reconnect the WirelessTEMP USB stick, or switch the remote control to another interface.
0 E503	Setpoint controlled by Eprog but no Analog Module found!	Please deactivate the external setpoint control or connect an Analog Module!
0 E504	Actuating variable controlled by Eprog but no Analog Module found!	Please deactivate the external actuating variable control or connect an Analog Module!
0 E505	Invalid setpoint received by Eprog	The Analog module sends an invalid setpoint. Please check the Eprog settings.
0 E506	Invalid flow rate received during flow rate control	The calculated flow rate is invalid for flow rate control or the external sensor "JULABO Sensor Pressure/Flow" is not set to flow rate. Please deactivate the flow rate control or set the external sensor to flow rate

	Display Module	
Alarm-Code	**Cause**	**Diagnosis / Remedy**
0 E1501	A timeout occurred on the serial interface	When activated, the Watchdog function requires that the setpoint is sent at least once every 30 seconds.
0 1502	The pressure in the fluid circuit is above the high input signal limit.	(1) Decrease the pressure setpoint, or (2) If safety permits, increase the high warning limit
0 1503	The pressure in the fluid circuit is below the low input signal limit.	(1) Increase the pressure setpoint, or (2) If safety permits, decrease the low warning limit

		Display Module	
Alarm-Code		**Cause**	**Diagnosis / Remedy**
0	1504	The flow rate in the fluid circuit is above the high input signal limit.	(1) Decrease the flow rate setpoint, or (2) If safety permits, increase the high warning limit
0	1505	The flow rate in the fluid circuit is below the low input signal limit.	(1) Increase the flow rate setpoint, or (2) If safety permits, decrease the low warning limit