Operating Manual

SINGLE Controller Touch (SCT) *standard*

SINGLE Controller Touch (SCT) *professional*

Preliminary Note

This manual describes the operation and functionality of the SCT standard and professional.

The SCT professional includes a greater range of features, which are marked accordingly throughout the documentation.

This manual covers the full range of functions of the controller. The temperature control systems include some of the features as optional add-ons. Actual functionality is based on each SINGLE customer order and technical specifications.

The range of functions is controlled through release mechanisms which affect the operation of the SCT and what you see on screen. Buttons and parameters for non-released features are not displayed, which might lead to discrepancies between the images shown in this manual and the output on your system.

A release can be specified at a later stage using software code (see chapter “User settings”). The corresponding components must, however, be installed in the temperature control system. For more information please contact SINGLE Temperature Controls customer service. Any features defined in your customer order and in the technical specifications are included and enabled in your temperature control system.

Table of contents

GUI interface and operation

The SCT starts up once you turn on the temperature control system via the main switch. This takes approximately 30 seconds, and a start screen is displayed during this period.

Start screen

Next the Home menu displays. This is the main view from which you access the process data view, activate functions and launch the Setup menu.

Home menu

1. Controller operation

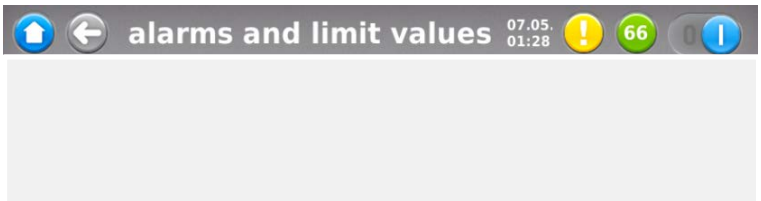
1.1 Navigation bar

The SCT includes a navigation bar and an operating panel. It is equipped with a 7" touch screen. Operation is almost exclusively screen-based.

The navigation bar is available in all menus. It displays important content and is used for quick navigation.

Navigation bar from left to right:

Home icon:	Press the Home button -> jumps to Home screen
Arrow icon (only if controller is in submenu):	Press the arrow -> jumps to the previous page
Name of the currently displayed screen	
Date and Time	
Message icon (only if messages are available)	Press the message icon -> jumps to the message list
Current temperature	Press the current temperature -> jumps to the process screen
On/Off button	Switches the unit on and off

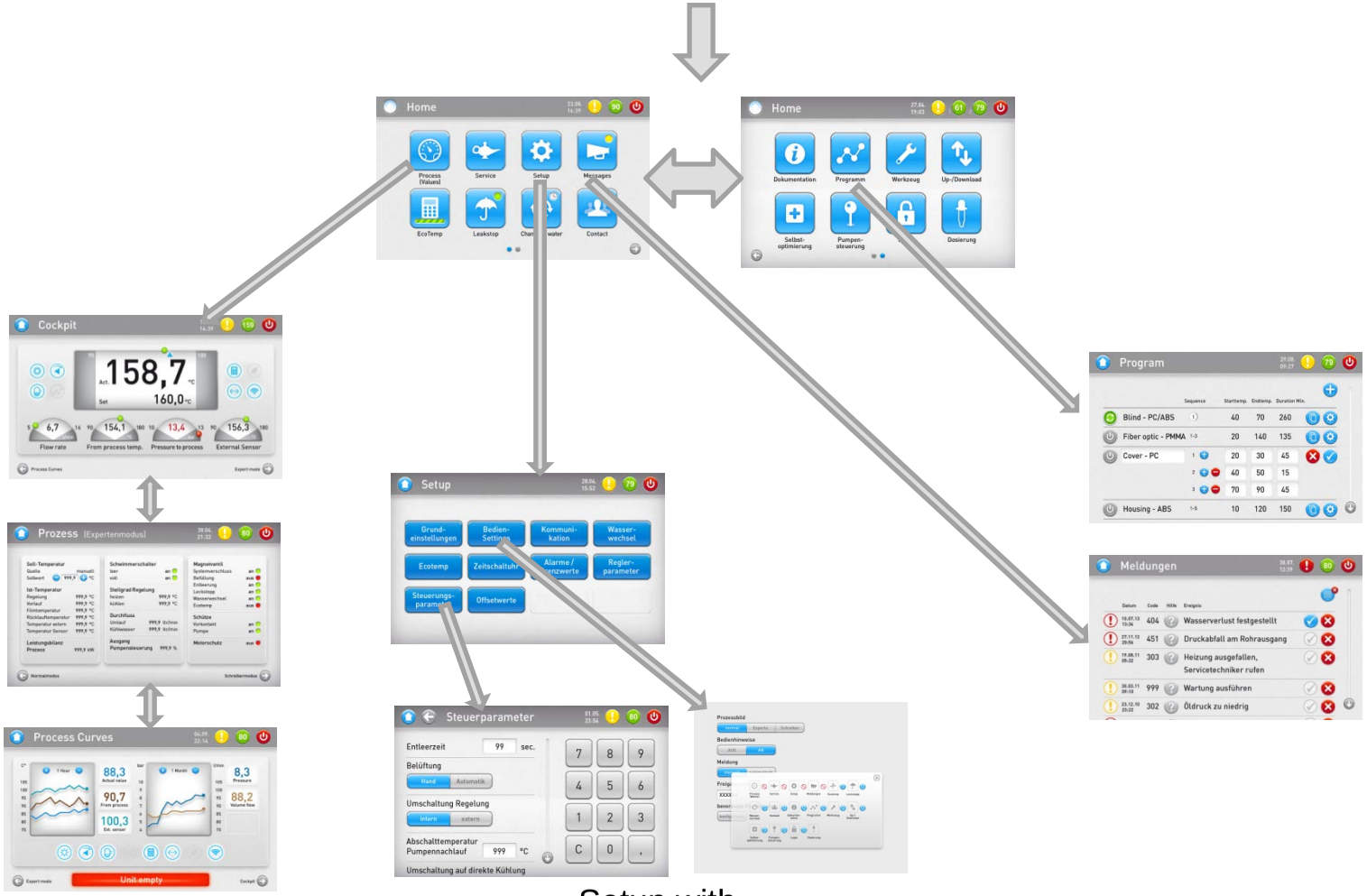


1.2 Entering values

Important note: You need to confirm your input (such as names and numbers) by pressing Enter. Otherwise the system reverts to the original value after a few seconds. Many fields have minimum and maximum values, and input values must be within these limits, othervice the system reverts to original value. The minimum and maximum values are defined in the parameter sheets at the end of this manual.

1.3 Overview of the operating process

After Power on and Start screen



Process displays

Setup with submenues (Exsamples)

Various functions (exsamples)

1.4 Home menu

Depending on the range of features, a maximum of 16 tiles are displayed across two windows. These tiles are used to execute functions and access different screens.

The start screen shows four fixed tiles (see below). The user can arrange the position of the other tiles for each device via the “User settings” menu. It might make sense, for example, to place commonly used functions onto the first screen. Press the arrow at the buttom of the screen to scroll to the next page.

Features that are available for your device but cannot be used due to the current device state, are greyed out (e.g. leakstop when the device is switched off), active tiles are blue.

You can display tiles for the following functions and features. You will find more details on their mode of operation further on in this documentation:

Process (Values)	(fixed position)
Service	(fixed position)
Setup	(fixed position)
Messages	(fixed position)
EcoTemp	
Leakstop	
Change of water	
Contact	

Documentation

Program

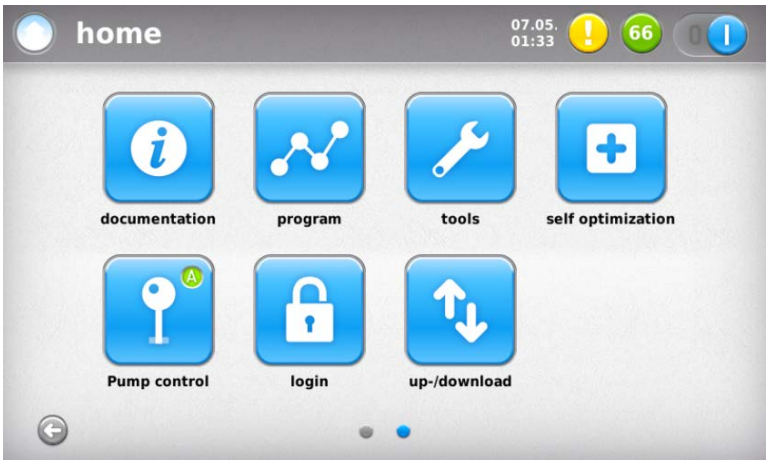
Tools

Self-optimization

Pump control

Login (customer access authorization)

Upload/download



2. Operation of the temperature control system

2.1 Switching on and off, pump overrun

The temperature control system is turned on and off at the on/off switch. If the device is empty and the “Filling” setting in the control parameters is set to automatic, the system starts the filling process (see chapter “Filling”) automatically. After reaching a sufficient level the pump starts working and the system regulates to the specified target temperature.

The system can also be switched on or off using a signal contact, which is available to customers (see wiring diagram). Before the unit starts with the signal contact, the unit has to be switched on manually once. In interface mode, the system expects a power-on command via the interface.

If the system is not turning on, check the “Messages” tile for faults (such as power supply fault, motor protection switch activated, etc.). Please be aware, that some alarms occur with a delay of 10 seconds.

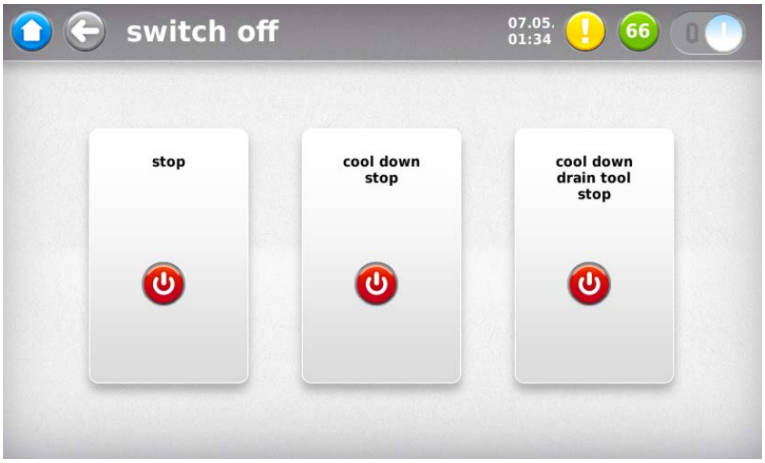
When you switch off the system, the controller asks if you want to drain the consumer (if the draining feature is installed in the system, see chapter “Draining”) and if you want to let the mould cool down before switching off. The cooling temperature is set with the “Shut down temperature” control parameter. If this feature is selected, the system cools down with the specified maximum regulation ratio to the minimum of the three following temperatures:

- Shut down temperature
- System closing temperature
- 60°C

We recommend a shut down temperature of 50°C to 60°C. Please make sure that the device has sufficient cooling water. This option is also available if the cool down mode parameter is set to off.

If the temperature control system has no (optional) heat exchanger installed, the cooling down process relies on heat loss only. Since the pump introduces additional energy into the cycle, the temperature may level out at values above the shut down temperature and the system will not turn off automatically.

The system shuts down after it has cooled down or after the consumer has been drained, if you select “Draining”. To protect the device and the cooling water pipes, the system cannot be drained before cooling down. If the cooling down mode is set to off, the device will cool down to the preset value of 60°C before draining.


switch off
07.05.
01:34
66
stop
cool down
stop
cool down
drain tool
stop

Options

If you select “Shut down now”, the device turns off immediately. It remains filled and at its operating temperature.

If you select “Cool / shut down”, the device cools down at the specified maximum regulation ratio until it reaches the shut down temperature. Then it turns off.

If you select “Drain / Cool / shut down”, the device cools down and is drained (see chapter “Draining”) before turning off.

After the cooling or draining process has been initiated, a red button displaying an X replaces the shut down symbol. If you want to restart the system during the cooling or draining process, press X. The process stops and the system starts up as normal.

This screen won't display if your temperature control system does not include a draining feature and the temperature is below the shut down temperature. The device shuts down immediately after being turned off.

In order to drain a temperature control system that has been switched off, you first need to switch it on briefly.

The cooling or draining process is illustrated on a display that shows the progress.

The most recent settings are stored if the unit is turned off at the controller or via the main switch.

If the supply voltage is interrupted or the device is turned off at the main switch, the controller switches to ready mode when you turn it on.

In environments with frequent supply voltage interruptions, it can be useful to have the temperature control system start automatically once supply is re-established. You can configure this at the device by setting the “Reclosing lockout” parameter in the control parameters to off. The system will then start automatically when the supply voltage comes back.

2.2 Remote switching on and off / reclosing lockout

The temperature control system can be switched on and off remotely with one of the following two methods:

Switching on/off via an external contact: The controller's adapter board includes an input for switching the device on and off through an external floating contact. The factory setting for the contact is “high”. To operate the device, the on/off input must be set to logical 1 (24V signal), and the device needs to be switched on manually. The device shuts down if the on/off input is set to logically 0 (0V signal). Setting the input back to logically 1 will switch on

the device. Switching the device on and off remotely will work until it is turned off manually on the display, which you may do at any time.

Switching on and off via the interface: A variety of interfaces are available. For more information on interface-based operation, see “Communication”. The device can only be operated via interface when this feature has been enabled.

Both options are affected by setting “Cool down mode” to on or off and by activating a shut down temperature. If the device is turned off remotely and “Cool down mode” is enabled, the unit cools down until it reaches the shut down temperature.

2.3 Filling the system

A magnetic float switch monitors and controls the filling process. The switching contacts of the float switch are typically designed as normally open contacts at rising level.

Water-operated systems: During automatic filling, the filling valve remains open within the temperature control system until the contact signals “full”. This process starts only after the unit has been turned on.

Oil-operated systems: Oil-based systems are typically designed for manual filling. They must not be overfilled. If an automatic filling feature is provided, filling stops when reaching the “empty” contact. If the level reaches “full”, the system triggers an overfill alarm and stops heating.

To protect the pump, an alarm is always triggered when the level falls below “empty”.

If the system an empty unit is switched on, no alarm message occurs. The system has to be filled automatically, or it start the automatic filling if the parameter is filling is on automatic and the is the piping for an automatic filling.

If the system has been filling without interruptions for longer than the indicated filling time, it will be assumed that there is a substantial leak. The system stops filling and triggers an alarm. The filling time is configured in the Setup control parameters.

The system is equipped with an aqua timer to monitor smaller leaks. An alarm is triggered if the number of filling cycles is exceeded. The aqua timer is overridden during initial filling for the duration of the parameter aqua timer starting time as well as during a change of water. The number of cycles and the starting time delay are specified in the Setup unit control parameters.

To help with manual filling, the system beeps if the level reaches the “empty” contact during filling.

An “almost empty” contact is available for SCT professional (as an option together with a float switch). This contact triggers a warning just before the level reaches “empty”.

2.4 System closing output

To ensure that water-based temperature control systems can be operated at temperatures above 90°C, the system needs to be pressurized. The system contains a purpose-specific valve which closes water circulation off from atmospheric contact. This leads to a pressure build-up, keeping the water liquid. The point of closure is at system closing temperature, which is configured through the “Close system”-parameter in the alarms and limits section.

This valve stays closed when the controller starts up. If the unit is off, the system closing vale is closed with ione exemption: It is open after draining.

The prerun sensor and the control sensor are queried to ensure that the system temperature is lower than the system closing temperature. The system closing valve will only open, if both values are valid and lower.

The system closure temperature is also important for other functions, since some features are not available in the pressurized range for physical reasons (for example, leakstop and change of water).

2.5 Draining

The draining is only possible, if the necessary valve are equipped within the unit. This function is an option for most of the temperature control systems. Please check in the technical specification or order confirmation, if this function is available.

There are two methods for draining:

- draining using compressed air
- draining by emptying the consumer through suction

Compressed air draining
This time-controlled process blows compressed air into the system. The water is redirected through a branch pipe into the cooling water outlet. If draining is initiated at a temperature above the pump overrun temperature, the system is automatically cooled down to the pump overrun temperature, the pump is switched off and the draining cycle starts. The pump is not running during draining. After the draining, the system starts a pressure relief function; the caged pressure is release into the atmosphere.

Suction-based draining
Here the pump switches to suction mode by reversing the direction of rotation. After a time delay, a valve opens to let in air. The water is sucked into the expansion tank.

Please ensure that the drained volume does not exceed the available container volume. Here the water is also cooled down to shut down temperature. The pump is running during draining.

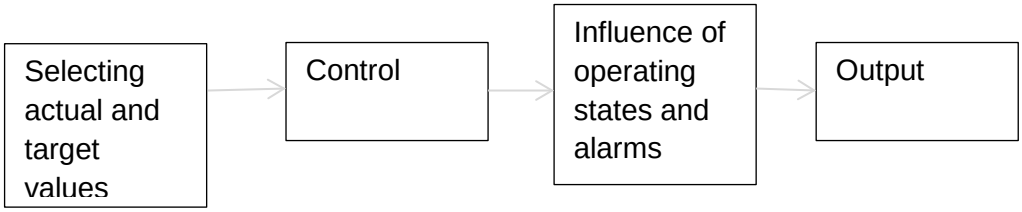
During the period of draining, the system will not issue any error messages related to the fill level or flow.

The change of water and EcoTemp features are poffed if they were activated before draining.

3. Temperature control

The regulation and control unit can assume different operating states. The system regulates the temperature to a desired value only during normal operation, while the control outputs are set to zero in other operating modes e.g. draining. The actual control behaviour is influenced by a variety of factors which are described in chapter “Setup”.

Control behaviour can be divided into the following categories:



Firstly, you can choose between different inputs, such as temperature sensors. Then there are various setpoints – fixed, variable (program mode, ramps) or externally defined (analog or via interface) target values.

The controller determines a regulation ratio based on input signals and parameters.

Operating states and alarms influence this regulation ratio where required. A film temperature alarm, for example will set the heating regulation ratio to zero.

The output determines how the various outputs are controlled, e.g. control elements may be regulated through analog or binary methods.

3.1 Control sensor

By default, the “control” sensor provides the temperature value used for control.

If the “External sensor” setting is enabled in the control parameters, the controller will use the input for external temperature sensors. If no valid signal is available, control falls back to the control sensor and a warning is displayed (see above).

If the “External sensor” is set to internal and “temperature control pre- or backrun is set to “backrun“, the controller will use the backrun signal. If the controller do not measure a valid signal (sensor not connected or with failure), control falls back to the control sensor and a warning is displayed (see above).

3.2 Setpoint for temperature control

By default, the setpoint parameter is used for control. You can only enter setpoints within the limits specified by the maximum and minimum set value. However, other settings may override the setpoint.

Priority 1 (interface mode):

If interface mode is enabled, the transmitted setpoint is used for control and overrides any other target values.

If interface mode is disabled:

Priority 2 (program mode):

The setpoint is determined dynamically when a program is activated. Setpoints change over the duration of the program. When the program finishes, the setpoint falls back to the regular setpoint. If the program is disabled, the setpoint reverts to the configured value (see priority 3 below).

Priority 3 (fixed values): a configured set point value. You can also specify a different setpoint under “Selection of setpoint”.

Priority 3a: If

- the “Selection of setpoint” parameter is set to “second setpoint”, or
- the input “2nd set point active” is set to 1, or
- standby delay time has expired in EcoTemp mode

then the second setpoint is used for control.

Priority 3b: For SCT-P: If “Selection of setpoint” is set to external or the input “external setpoint is set to on, the input signal from the external setpoint input is used for control.

Otherwise, the controller uses the value of the “Setpoint” parameter. The expert mode screen shows which static or dynamic setpoint is used for control.

If the transmitted setpoint is outside the lower or upper setpoint limits, it is adjusted to match the relevant limit value. The warning “Transmitted setpoint outside tolerance limits” is displayed. The same is true for interface and program modes.

3.3 Temperature control

No regulation signal is generated if the parameter “Switch temp. control” is set to external.

The temperature controller is either a PID or for refrigeration systems a two-position controller. For details on configuring these parameters please refer to chapter “Setup”.

You can enable cascade control when connecting an external temperature signal. If the temperature difference between external sensor and control sensor is larger than dT for cascade control, the controller disables the control outputs until the difference falls below the parameter value. The “I”-component of the PID controller is frozen during this time.

PID control behaviour

The controller uses standard control engineering parameters.

All control parameters can be set separately for heating and cooling.

A separate control signal is generated for heating and cooling, and they cannot overlap. The system is either used for heating or for cooling, never both simultaneously. The heater is always implemented as PID controller, the cooling side as PID or two point e.g. to control compressor circuits.

Control behaviour 2-point controller

This is a classic two-point controller with hysteresis. The hysteresis can be adjusted above and below the setpoint separately. An inner and an outer hysteresis can be configured for energy-optimized systems with two power levels. The two-point controller influences the cooling output only.

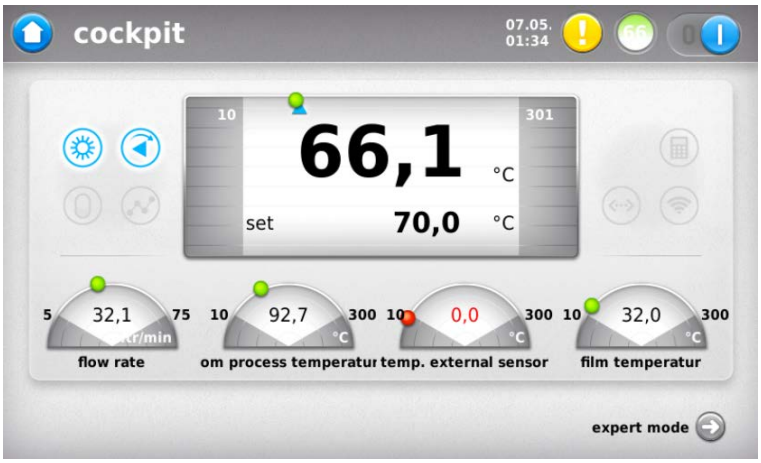
4. Most important screens

4.1 Process indicators

The cockpit shows the most important states of the temperature control system.

Both the actual temperature and the target temperature are displayed. The actual temperature is used for control. On delivery, this is the control sensor, but you can configure the parameters to define that the return temperature or an external sensor is used for control instead.

The target temperature is based on the setpoint configured on delivery. A setpoint may be dynamic in interface mode or based on ramp functions and certain program sequences.



Other process parameters are displayed in addition to these values, such as “flow”, “pressure” and other sensors. The orb on the semi-circle instruments shows the value in relation to set limits.

You can specify device limits for temperatures, pressure, flow, etc. For more information about these settings, see chapter “Alarms and limits”.

The orb on the semi-circle instruments shows the value in relation to the specified limit. If the limit is exceeded, the value and the orb turn red.

Pictograms show which state the system is:

- cooling  or heating 

- Pump (normaldirection)  :

- System open  or closed 

- Program mode 

- Energy saving mode of pump 

- EcoTemp-mode

- Interface mode 

    -grey: not active

    -blue: passive interface mode (only send data)

    -blue and blinking: active interface mode (send and receive date)

- other data traffic 

Pressing on the central display will open the “Alarm and limit”-window. Here, the Setpoint can be changed.

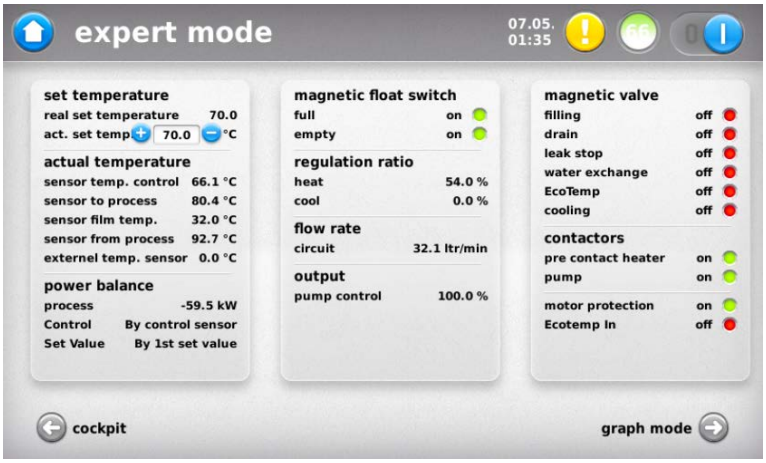
Pressing an arrow key will launch expert mode, which shows a large range of details and is designed for certain applications and servicing.

This mode displays, for instance, signals for all connected sensors (the measured values without offset) , the state of the float switch, heating and cooling regulation ratios, flow and pressure, all output valves, pump output and pre-contact heating output and the state of the motor protection switch.

In the left column, the actual for control used sensor and source of the set value is displayed. The control is normally based on the values of the control sensor. By parameters (e.g. control by from process sensor), or because of a failure of the control sensor, the temperature control is done by a different sensor. At this placed the currently for control used sensor is displayed.

It is similar with the set value. This can be given from different sources, like set value, second set value, program, interface or similar. Here the source of the currently used sensor is shown.

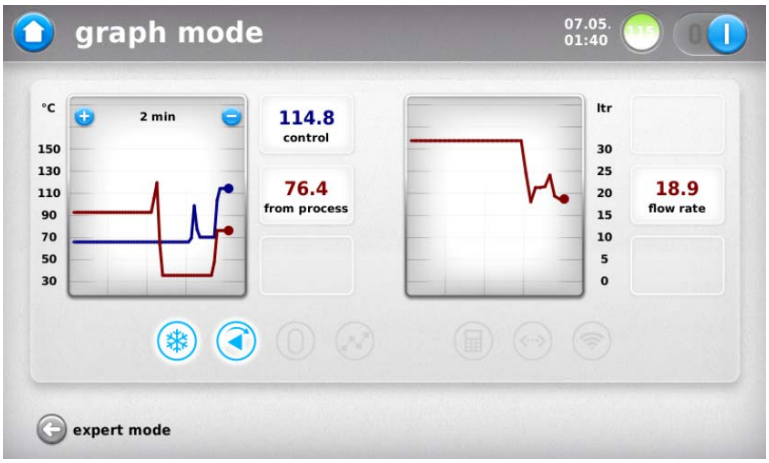
Close to the setpoint, there are a “+” and “-“ button. Here, the setpoint can be changed in steps of 5°C. If the system is in an interface or program mode, the buttons are not displayed.



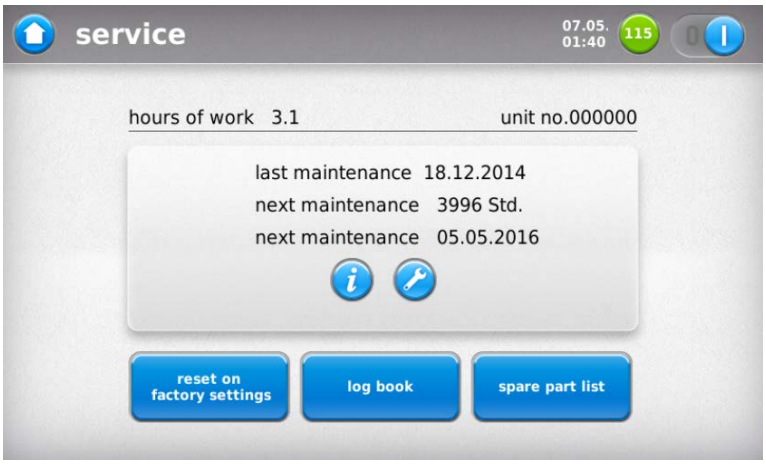
Some of the displays are connected to optional sensors (e.g. pressure gauge) or actuators (e.g. valves for EcoTemp). If these optional components are not installed, the corresponding values are not displayed.

There is also a process monitor, which shows the history for the control sensor, return and external sensor temperature values. This monitor spans a range between 10 seconds and 1hour per scale mark which can be adjusted with the + and - buttons.

The status information is displayed as described for the cockpit. Those data's are in the working storage, and are only available as long as the unit is on. For the process documentation the unit record process data all the time. Those process data can be downloaded to an USB-stick in the menu up-/ downloads.



4.2 Service



This screen displays the operating hours and the device number for the temperature control system. This information is important for servicing; SINGLE stores device data under the device number.

The most recent service and the next recommended service are displayed. After a service you can press the wrench icon to reset the maintenance counter. Pressing this button records an entry in the log.

Press the “i” button to display the software version for the controller.

The “Restore factory settings button activates all parameters that were specified when the controller was delivered. Note: Any customer-configured parameters will be lost.

The log documents the device history. The operator can record manual entries, such as service activities or where the device is used. Service and release activities are recorded automatically. Entries can be modified or deleted within 24 hours. They cannot be changed after that.

The log can be exported and downloaded as a text file.

The “Spare parts list”-button launches the default spare parts list. It is used during servicing to find correct spare parts quickly. The SINGLE spare parts number is indicated for the same reason. The spare parts list can also be downloaded.

4.3 Setup

Setup is used to configure the device for operation. From any sub-menu, simply press the back button to get back to the “Setup” menu.

The following functions are available:

Basic settings

User settings

Communication

Configuration of water exchange

Configuration of EcoTemp

Timer

Alarms and limits

Temperature controller configuration

Unit control parameters

Offset values

These settings are described in more detail in chapter 5.

4.4 Alarm/warning messages history

This screen displays the most recent alarm and warning messages.

The controller distinguishes between warnings and alarms. An alarm indicates a device malfunction, such as insufficient filling levels or a tripped motor protection switch. Alarm messages are marked with a red exclamation mark.

Warnings are less serious faults where the device continues to operate. They may also indicate hints or process violations, such as insufficient volume flow. Warning messages are marked with a yellow exclamation mark.

The screen shows the most recent message including date and time at the top. This is followed by an error code and a brief description. For diagnosis and troubleshooting purposes, a question mark is linked to message-specific information.

Messages can be acknowledged, marked as read or deleted. If a coffe for a message has not been resolved, this message is regenerated and displayed again. You can scroll the screen if the number of available messages exceeds the screen size.

SINGLE customer service can display deleted messages.

4.5 Upload and download of parameters and download of process data through USB

You can load a variety of data onto a USB stick or load data from a USB stick onto the temperature control system.

You will need a commercial memory stick. Due to the variety of versions and new developments, we cannot guarantee that every stick works.

The display fields remain grey and a warning message appears if no USB stick is plugged in or the system is unable to detect the drive.

After a successful download the system shows a corresponding message.

4.6 EcoTemp

EcoTemp is a feature that interrupts the temperature control process – typically cooling an injection moulding process – by redirecting the water flow to an internal bypass.

The “EcoTemp” tile is used to switch the feature on and off. If the feature is active, a green bar is displayed across the tile. Please refer to chapter “Setup” for configuration details.

In combination with a VFD (variable frequency drive) the pump turns are reduced during the none cooling period to that value, which is set under “fix value” in the screen pump control. This is to save energy during the non cooling period.

The status of EcoTemp is displayed in the Cockpit and expert mode display, if EcoTemp is assembled in the unit.

In the expert mode display the EcoTemp output (EcoTemp Out) and input (EcoTemp In) is shown in the right column. In the Cockpit a symbol with a pocket calculator is display in grey or blue, containing the following information:

Symbol grey: Unit or EcoTemp is switched off.

Symbol grey blinking: Unit is on, EcoTemp is activ, units waits on trigger at EcoTemp input.

Symbol blue blinking: Starts after the impulse at EcoTemp-input, the delay until the non cooling periode is beginning.

Symbol Blue: Unit is in non cooling period (unit works in bypass mode).

4.7 Leakstop

This feature reverses the direction of the pump rotation. This coffes the pump to run in suction mode to stop water escaping from a leak. This feature is only available for open systems or below the system closing temperature. It cannot be operated at the same time as a change of water process. The tile is greyed out if this feature is available for the device but cannot be activated due to system closing.

The pump transports much smaller amounts if leakstop is enabled. Flow sensors only measure in one direction, which is why the flow display is suppressed and no messages in relation to the volume flow are displayed.

4.8 Change of water

Press “Change of water” to initiate a water-change process.

A green status message indicates that the change of water feature is enabled.

You will find instructions for configuring an automatic change of water under “Setup”.

4.9 Contact

Displays the company name, phone number, website and e-mail address.

4.10 Documentation

This view lets the user retrieve and display key documents. The individual elements are displayed by tiles, which in the standard version include. The information is stored in a file “tempertureSystem” on the stick and can be copied to a regular PC or server:

Device documentation:

Operating instructions:

Safety instructions:

Spare parts list: The list can be downloaded to a USB-Stick. For an Upload a text-file in a special formation is needed. In this is necessary, e.g. after a rework with different parts, please contact the Single-Service.

Download documentation feature: Saves the device documentation to USB.

4.11 Program

Instead of a changeless temperature, the program function allows to run a temperature process. This process is compounded be a number of linear slopes.

Each slope has a starting and ending temperature, as well as a duration (in minutes).

By starting a program, the starting temperature of the first program step is the as the temperature set value. During the step duration, the set value is adjusted steadily, in a manner that the end temperature value is reached at the end of the duration. Example: Start temperature is 50°C, end temperature is 80°, the duration is 3 minutes. The programs starts with 50°, after 30 seconds the set temperature has reaches 55°, after one minute 60° and so on.

The program can contain one of more, in maximum 50 steps. In case there is more than one step, the program processes one step by step. Is is possible, that the ending temperature is not the same as the starting temperature of the next step. In this case there is a kind of jump function as the set temperature. The controller tries to reach is jump function, but becoffe of the thermal masses the whole system the temperature change takes a while.

Press the “+” button to create a new program. First enter a program name. Press Return to create the program. Initially it contains only one step, for which you can specify start and end temperatures and the duration. During the specified duration, the controller moves in linear motion from the start value to the end value.

You can then use the small “+” button in the program line to add more steps. A jump in the setpoint curve appears if the start value does not match the final value of the preceding step.

Use the “-“ button to delete steps. You can also change a name at a later stage in the name field.

A check mark indicates that a program was created successfully. Programs can be subsequently changed. Use the double-page icon to copy a program. A program cannot be modified while it is running.

Press the button in front of a program to activate the program. The button turns green and a round arrow appears. When the button is pressed twice, the program switches to repeat mode, indicated by two green arrows on the button. If you press the button again, the program stops immediately.

If the program is running, the operation is also displayed in the graph mode. The start of the program is on the left side of the graph, the ending at the red vertical bar.

After the program has ended, the set value falls back on the set value of the temperature control parameter. In case of an interface operation it is not possible to start a program.

4.12 Tools

Temperature control systems are often used for different end products, which may require different system configurations. This is where the tools feature comes in. Parameters are stored and can be reused for specific tools.

Use the +button to create a new tool and store the current parameters. The system asks for a tool name when this button is pressed.

The controller can handle 50 tools.

If a tool –a new set of parameter- is created by pressing the “+” button, it remains active. If parameters are changed, the change is not saved automatically in the tool. This is, to refuse not valid trails or settings.

If the change parameters should be saved, the disk symbol has to be pressed. In this case, set tool parameters are updates with the current parameters. Alternatively, with pressing the “+” button, a new tool can be created.

It is also possible to download and upload tools, not for single tools, but for the whole set of tools. It is recommended to have one reference unit and to create the tools on this unit. Afterwards, the tool can be translated to other units. This can be done under Up-/Download.

In a running system, it is only possible to switch between tools. A switch off normally makes no sense and is not possible. If it is necessary to have e.g. the factory settings available as a set of parameter, create a “standard” tool with those settings. In the case the unit runs without a designated tool, the “standard” tool can be started.

It is not possible to delete an activated tool.

4.13 Self-optimization

Self-optimization is used to determine suitable parameters for the P- and I-part of the PID temperature controller. The aim is to reach the setpoint temperature as quickly as possible with minimum overshooting.

The start of self-optimization triggers a program routine which coffes a cooling of approx. 10K and – after a certain period of time – a heating up of 10K. The production process should run as normal during optimization. The change in temperature, however, may lead to the production of scrap goods.

External circumstances must not be changed and interference must be kept to a minimum during self-optimization.

The self-optimization routine is cancelled, if an alarm occurs. Because of the temperature behaviour during the routine, the self-optimization must be started in the range between 20K higher than minimum temperature and 10K less than maximum temperature of unit and tool.

You should reduce the switch cycle time if the temperature profile shows heating or cooling as cyclical fluctuating temperatures.

Since equipment and controllers are not linear systems and the optimum control settings are temperature-dependent, it makes sense to perform optimization at the same temperature that will be used later in the process, but keep within the above mentioned limits. Please set the device to the desired setpoint temperature and start self-optimization. This should take no more than half an hour.

After starting, a “Start self-optimization” window opens with Cancel and Run buttons. Selecting „Cancel“ returns the system to the Home menu.

Selecting “Run” will start self-optimization. While self-optimization is in progress, status information displays in another window, providing the option of cancelling the process. No other operations can be performed during self-optimization.

The process can be cancelled at any time, for example by switching off the device.

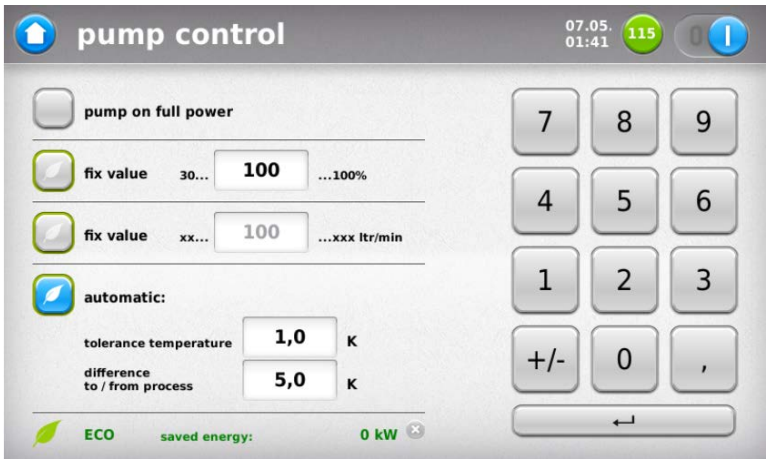
The self-optimization routine evaluates conservative parameters without temperature over steering. If you require faster temperature control behavior, reduce the parameter Xp until the desired behavior is reached.

4.14 Pump control

This function works only with an optional frequency converter.

The “Pump control” analog output controls a frequency inverter which regulates the pump speed.

Options:



<u>Full load</u>

Here, the pump runs on full load. If the Ecotemp function is enabled and active, during the non-cooling time the pumps runs on the load which is set in “fixed value”. At this time, the system runs in a bypass mode; during this time a reduced speed is sufficient. If this is not desired, set the fixed value on 100%.

<u>Fixed value in %</u>

The fixed value sets a fixed speed relative to the maximum speed. 100% is full load. The minimum accepted speed is 30% in order to satisfy minimum requirements for temperature control. Becoffe power is an approximate square of the load, an output of 30% results in an electrical power consumption of about 10%.

Fixed value in ltr/min

The system regulates to the value that you specify. This feature requires the installation of a flow sensor (which is usually in place for the SCT controller).

If you set a value above the maximum value that the device can produce, the pump will run at full load. To achieve correct temperature control results, the specified volume flow must not be below 10% of the maximum volume flow.

Automatic operation

In this mode the controller tries to reduce speed without impacting on the result of the temperature control process. This concept is based on a defined maximum deviation of the setpoint and maximum temperature difference between flow and return. The system reduces the pump power gradually within the tolerance limits.

This screen shows how much energy was saved in comparison with an operation under full load. This display can be set to zero by pressing the “x”-button.

4.15 Login (customer access authorization)

On delivery, users have full access to the system and its parameters. If you wish to restrict access for users, you can configure access restrictions under “Login”. A restriction feature is available, and you can specify if it enables or disables setpoint adjustment.

When restriction is first configured the system prompts the user to enter a 6-digit code which consists only of digits. Code entry is repeated to avoid incorrect entries. You must keep this code in a secure place.

To unlock the system, the user launches the login screen and enters the code. If the code is incorrect, the system remains locked.

If the code is no longer available, the system needs to be unlocked by entering a special release code in the Setup section under “User settings”. You can request the code from SINGLE service department.

If the login-code is lost, please get in contact with the Single service department. In this case you get an “master” login code, which has to be feeded into the login window.

5. Setup: Configuring the temperature control system

Setup

Setup is used to configure the device for operation. From any sub-menu, simply press the back button to get back to the “Setup” menu.

The following functions are available:

Basic settings

User settings

Communication

Configuration of water exchange

Configuration of EcoTemp

Time switch

Alarms and limit values

Temperature controller configuration

Unit control parameters

Offset values

5.1 Basic settings

The basic settings include the following options:

Time/date

Date format/time format (European/US)

Units (metric/US)

Language (choice of languages)

5.2 User settings

This section is used to configure:

preferred process image (expert, normal, recorder)

tile priority (first or second side of the home menu)

screensaver (on/off), time in minutes

The screensaver shade the display by 20%. Main reason is to longer the lifetime of the display. With the use of the function or while an alarm occurs, the display turns on full brightness.

Enter unlock codes: This is where you enter any unlock code provided by SINGLE to unlock additional functionality. This code applies to one controller only.

5.3 Communication

Use this menu item to specify the type of communication, for example, which protocol to use.

If the system is equipped with a digital interface and a communication protocol is selected, the controller sends actual data to the communication participant. The communication symbol  in the cockpit is steady on. The controller starts reacting on commands of the communication participant, if the interface mode is on. In this case, the communication symbol is blinking.

If the unit runs in the remote mode a small “R” is displayed at the On/Off Switch.

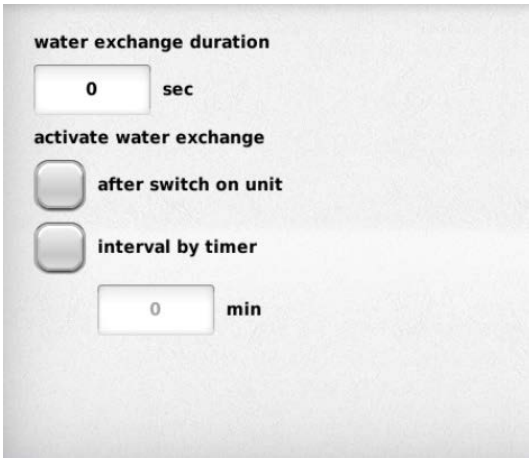
If the unit was not ordered with a digital interface, there is the possibility to enable the interface with a (paid) enable code, more information are available at the Single service. It is also possible to enable a second interface, e.g. to run the unit at two machines with different interfaces. But it can be only one interface active at the same time.

Beside fully specified interfaces there are some Single protocols. For further information, the protocol definition can be requested from Single.

5.4 Exchange of water

The exchange of water process is triggered manually or automatically and includes periodically replacing the water through the regular filling process. This function can be selected through a button or controlled automatically through parameters.

For the water exchange, the temperature control system includes valves which remove water from circulation and redirect it into the cooling water outlet. The system then feeds fresh water into the circuit. It is vital that the device is connected to a water supply and automatic filling is enabled in the control parameters.



The three methods for changing water are configured in this screen.

Manual: The exchange of water is triggered by pressing the tile in the Home menu.

When the system turns on: The exchange of water parameter must be set to “after switch-on unit”. This triggers a change of water each time the system starts up. The time for the exchange of water is specified as duration.

Exchange of water at specific intervals: The exchange of water option must be set to “interval by timer”. When this option is enabled, the change of water output is activated for the duration of the specified time. The system then counts down the time specified under “interval by timer” and restarts the cycle. This feature remains active for as long as the parameter is set to time-controlled.

A change of water works only under pressure-free conditions, i.e. below the specified system closing temperature. If the temperature is too high, the water will not be changed and the tile in the main menu is greyed out.

The aqua timer is disabled during the change of water process.

5.5 EcoTemp

The optional EcoTemp module generates an intermittent flow through the mould. It manages the cooling and non-cooling periods of the temperature control system. Temperature control for the injection mould is systematically graduated which offers a number of benefits in terms of processes, component surface and strength, and efficiency.

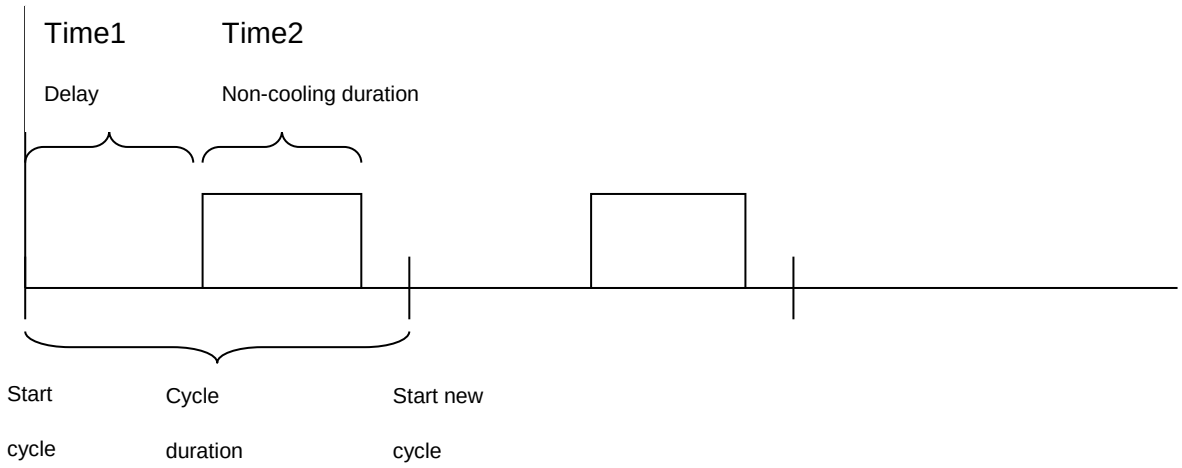
In addition, this feature offers a watchdog functionality which puts the system into standby mode after a specified period (“timer standby mode”). In standby mode, the device operates based on the second setpoint.

At the EcoTemp input, the temperature controller expects a signal 24V DC. The reaction is exactly at the change of status from zero to 24V. Normally, the temperature control system has a steady 24V on socket of the EcoTemp-connection; with a potential free contact between 24V and Ecotemp in the controller has the required signal. Details are shown in the electrical diagram, which is part of the documentation.

After the input changes from “low” to “high” at the Ecotemp-input, and a defined time span begins to run, this is the delay (“Start non-cooling period”). This is the temperature control process (cooling) for the mould.

The end of this period marks the beginning of the non-cooling period. During this time, the device is in bypass mode and the mould is not being cooled. If the temperature control systems is equipped with an optional frequency converter, the power of pump is reduced during the bypass periode to the fix value (in the display pump control).

If no signal is received after the end of the standby period, the system regulates the temperature to a standby temperature which is indicated by the second setpoint.



Press the tile to open the configuration screen. This feature cannot be activated, if no mode is specified or mode configuration has not been completed.

The screen contains the following parameters (cf. description above):

- Start non-cooling period (value range 0..100 sec, duration 0.1 sec)
- Duration non-cooling period (value range 0..1000 sec, duration 0.1 sec)
- Timer standby mode (value range 0..2000 sec, duration sec)

5.6 Timer

You can specify switch-on and switch-off times for each day of the week. This feature is activated through an on/off icon with a watch. The main switch must be in on position.

The time has to be set with four digits in all cases; for hours 0..9 there must be added a leading „0“; e.g. B time 6:30 has to be set with the following input: 0..6..3..0.

It is possible only to start the unit. For this procedure, the required day has to be activated and only the start time. The system stays on, until it is switched off manually.

5.7 Alarms and limits

General information about alarms and warnings:

They can be enabled and disabled through the relevant buttons. A value is required if they enabled.

Most alarms are not activated immediately after a fault occurs, but with a 10 second delay. This is to ensure that brief alarm states will not shut down the system immediately.

5.7.1 Setpoint and 2nd setpoint

This is where you enter setpoints. For details on selecting setpoints, please refer to chapter “Temperature Control”.

5.7.2 Temperature alarms

Temperature alarms can be triggered through a variety of settings:

<u>Signal value</u>

This value is added to the setpoint. A warning is triggered if the current temperature reaches this total value.

Limit value

This value is an absolute value. A warning is triggered, if this value is exceeded.

Comparator

This value defines an operating range around the setpoint (both upward and downward). A warning triggered, if this range is exceeded in either direction.

Comparator on standby

This mode is similar to the comparator mode, but the warning feature is initially disabled. It becomes available once the actual temperature reaches the operating range of the comparator, so from then on warnings are issued when the operating range is exceeded.

5.7.3 “To process temp.” (prerun) warning

The system triggers a warning if the preflow sensor reaches this value.

5.7.4 Minimum flow alarm

If the level falls below this value, the system triggers a warning. The system requires a minimum flow rate to grease the pump and to remove the heat produced by the heater. A minimum flow is also essential to ensure proper temperature control. The user should not change the specified alarm value.

In the for some units optional available leakstop mode, the medium flows through the flow sensor in reverse direction. No measurements are performed at this stage, and therefore no alarm messages are triggered.

5.7.5 Lower/upper flow value warnings

A warning is triggered if these limits are violated. These values are also used to scale the cockpit displays.

5.7.6 High/low pressure warnings (only for SCT-P)

A warning is triggered if these limits are violated. These values are also used to scale the cockpit displays.

If the “pressure high” alarm option is enabled and an optional frequency converter is installed, the pump regulates to a speed not exceeding the “pressure high” value.

5.7.7 Upper setpoint

Defines the maximum temperature value that can be specified.

Warning: This setting must not to changed to a value which is higher than the unit allows.

value will never be exceeded in interface or program mode, even if higher values are transmitted, in which case a warning message would be generated.

5.7.8 Lower setpoint

Defines the minimum temperature value that can be specified. The temperature will never fall below this value in interface or program mode, even if lower values are transmitted, in which case a warning message would be generated.

5.7.9 Film temperature alarm

This alarm coffes the heater to switch off.

5.7.10 Delta T warning

A warning is triggered if the temperature difference between flow and return is greater than delta T.

5.7.11 “From process temp.” warning

The system triggers a warning if the return sensor reaches this value.

5.7.12 System closure temperature

This temperature defines when the system lockout valve closes in pressurized systems.

5.8 Temperature controller parameter

The control parameters are described in the parameter list specification.

Please see below for a design overview. Scroll through the list and use the keypad to the right of the list for numeric entry.

5.8.1 Limitation of regulation ratio heating / cooling

These parameters are used to set the regulation ratio and limit actual power to a value between 0 and 100%, slowing down the heating or cooling process. Specifying such a limit can be useful if the consumer cannot tolerate too rapid heating or cooling.

5.8.2 Control parameters XP, TV and TN

The parameters XP, TV and TN are used to determine the control behaviour. Parameters can be configured individually since a temperature control system for cooling and heating may be used for different services.

XP is the amplification factor. Reduce this parameter if the system tends to overload or overshoot. Increase the parameter if the system heats up too slowly at a regulation ratio below 100%.

TN is the integral component, which is required to ensure that the system regulates to the desired value (which cannot be achieved with the XP value alone). Increase this parameter if the system tends to overload. You can try reducing this parameter if a deviation remains in place for a relatively long period of time, even though the system has not yet reached a regulation ratio of 100%.

TV comes into play when an interference coffes the actual temperature to move away from the target temperature. In this case the differential component counteracts the change in corresponding proportion. You can try increasing the TV value, if interferences coffe the temperature to move away too much and the system has not yet reached a regulation ratio of 100%.

5.8.3 Switch cycle time

The percentage-based regulation ratio is converted into a binary on/off behaviour for heating and cooling valves. A regulation ratio of 70% means that a control element is 70% on and 30% off.

The on/off cycle is always the same length, which is specified with the “Switch cycle time” parameter. To protect the components, the time period should be as long as possible, without the switching behaviour affecting the temperature.

5.8.4 Setpoint ramp

The setpoint ramp is used to set a specific heating or cooling speed in K/min.

5.8.5 Dead zone between heating and cooling

This parameter defines a dead band around the setpoint. Operating a system at a very low regulation ratio can lead to cycles of alternate heating and cooling. To avoid this, you can define an area in which no cooling or heating takes place.

5.8.6 Prerun and backrun control

You can control the backrun temperature as an alternative to the control sensor. If no signal is received from the return sensor, for example due to a wire break or a short circuit of the sensor, control automatically falls back to the control sensor. A warning message is issued if the sensor malfunctions.

5.8.7 Cascade control dT

Cascade control is required in conjunction with external sensors. Positioning a sensor too far away from the temperature-control medium can coffe a time delay between the point when the device responds and the point when the sensor measures the change. This might result in the controller over-regulating, sending the entire system into temperature oscillation.

To avoid this, the controller switches off the heating when the flow temperature exceeds a certain value from the external temperature sensor plus dT of the cascade control

Example: Set tempera

ture 150°C, dT 10K. The unit switches off the heating once the control temperature is higher than 160°C, even if the external sensor displays lower values.

This works analog during cooling: The cooling is being switched off, if the control temperature is lower than set temperature minus dT of the cascade control.

This gives the external sensor time to receive the changes. The system is no longer over-regulating but instead heats up in sync with the change at the external sensor.

5.8.8 Actual value output (only for SCT-P)

This parameter calibrates the actual value output. The actual value is either output as 0-to-10V signal or as 4...20mA signal. The lower and upper actual value outputs are calibrated to the desired working range. 0V or 4mA correspond to the lower actual value output, while 10V or 20mA corresponds to the upper actual value output.

Note: The working range of set value input and actual value output, as well as for the external temperature signal is set under Setup/Temperature control parameter in the field Actual value lower and upper Value. Set value input and actual value output have the same working range.

On delivery, the device is set to 0 to 10V, unless otherwise stated. If you subsequently want to switch to 4 to 20mA, you will also need to reconnect a jumper on the adapter board. Please contact SINGLE service for support.

5.8.9 Adaptive heat output restriction (heating regulation ratio only)

If the film temperature exceeds the film temperature limit value, the regulation ratio is decreased, i.e. the regulation ratio for the controller is limited. The limit as a percentage is:

$$\text{Limit} = \frac{\text{limit film temperature - film temperature}}{\text{tolerance film temperature}}$$

Example:

maximum film temperature: 370°

tolerance film temperature: 10°

Currently measured film temperature: 366°; controller-side regulation ratio is 95%

Resulting correction:

$$\frac{370-366}{10} = 40\%$$

Maximum regulation ratio is limited 40%.

No correction takes place if the “limitation of film temperature limit” parameter is disabled.

5.8.10 Cooling water discharge temperature restriction (cooling regulation ratio only)

The probe for the external sensor input must be installed at the cooling water outlet which means this input is no longer available to external tools.

A variable regulation ratio limit can maintain the cooling water outlet temperature at a maximum value. Configuration is the same as for the film temperature limit, using a three-way valve for continuous cooling systems. For solenoid valve-based cooling systems, a sufficiently large bypass must be installed in the cooling water.

If the cooling water temperature exceeds the parameter cooling water temperature limit value, the regulation ratio is decreased (proportionally more water flows past the heat

exchanger, and the discharge temperature sinks), i.e. the regulation ratio for the controller is limited:

$$\text{Limit} = \frac{\text{Temp. cooling water outlet- limit cooling water temperature}}{\text{tolerance cooling water temperature}}$$

Restricting the cooling water temperature may lead to limited cooling capacity. This needs to be assessed on a case-by-case basis.

Example:

Parameter: maximum cooling water temperature: 60°

Parameter: tolerance cooling water temperature: 10°

Currently measured cooling water outlet temperature: 54°.

The cooling regulation ratio is now restricted to (60-54)/10=60%.

No correction takes place if the parameter “cooling water temperature limit” is disabled.

5.9 Control parameters

5.9.1 Draining time

This value defines the duration of the draining process.

5.9.2 Manual/automatic filling

This parameter defines whether the device is filled manually or automatically. For more detailed information, see chapter “Operation”. Please note that the unit has to be equipped in accordance to this option. It is described in the technical specification or in the order confirmation, if the unit is equipped with an manually and/or an automatic filling.

5.9.3 Pump overrun/shut down temperature

Please refer to chapter “Operation”.

5.9.4 Indirect/direct cooling

If the relevant feature is installed in the hydraulic system, cooling can be set to indirect cooling. This increases the cooling capacity for lower temperatures. Indirect cooling of temperature control devices means that cooling water is passed through a heat exchanger. The cooling water circuit supply contains a solenoid valve or a continuous valve which is controlled by the temperature controller.

A direct cooling approach feeds the cooling water directly into the heating circuit. The cooling control output directly influences the filling output, thereby regulating the filling valve.

For direct cooling the aquatimer has to be switched of (under Setup/unit control parameter).

Using direct cooling for pressurized temperature control systems (temperatures of up to 200°C) requires compliance with a boundary condition. The system closing valve must be opened for direct cooling so that the hot water can flow through the system closing valve into the cooling water outlet.

5.9.5 External driven heat / cool

If this parameter is set to external, the controller will not issue any control signal. If it is set to internal, the control unit takes over control.

It is possible to drive heating and cooling by an external signal. For this function there ist he parameter controil„internal/external“.

If this parameter is set to external, the controller do not switch the heating and cooling; the regulation ratio is zero. In this case the external signal switches the heating and cooling (each on/off). The exact electrical configuration of this signal has to be taken from the electrical diagram; in the Single standard it is a potential free contact each for heating and cooling.

The SCT controller continues to steer and supervise the unit; e.g. alarms, warnings and process documentation is still given.

In the mode internal, the controller steers heating and cooling. In this mode, any signals heating / cooling must not be given by external signals.

5.9.6 Selection of setpoint

This parameter defines which setpoint to use (see also chapter “Temperature control”).

5.9.7 External sensor

If this parameter is set to external, the temperature signal provided by the external sensor is used for control (for more information see chapter “Temperature control”).

5.9.8 Actual value output (SCT-P only)

This parameter defines which temperature signal is applied to the actual value output.

Actual Control Sensor: Output of the value which is currently used for control

External Sensor: Output of the external sensor

Internal Sensor: Output of the control sensor

5.9.9 Aqua timer

This function is used for leakage monitoring (see chapter “Filling”).

5.9.10 Maximum fill time

If the duration of the filling process exceeds the specified time period, the system switches off as the system assumes there might be a major leak.

5.9.11 Reclosing lockout

This parameter defines whether the device starts automatically after operating voltage is applied (reclosing lockout must be set to off for this to take effect).

5.9.12 Sample time

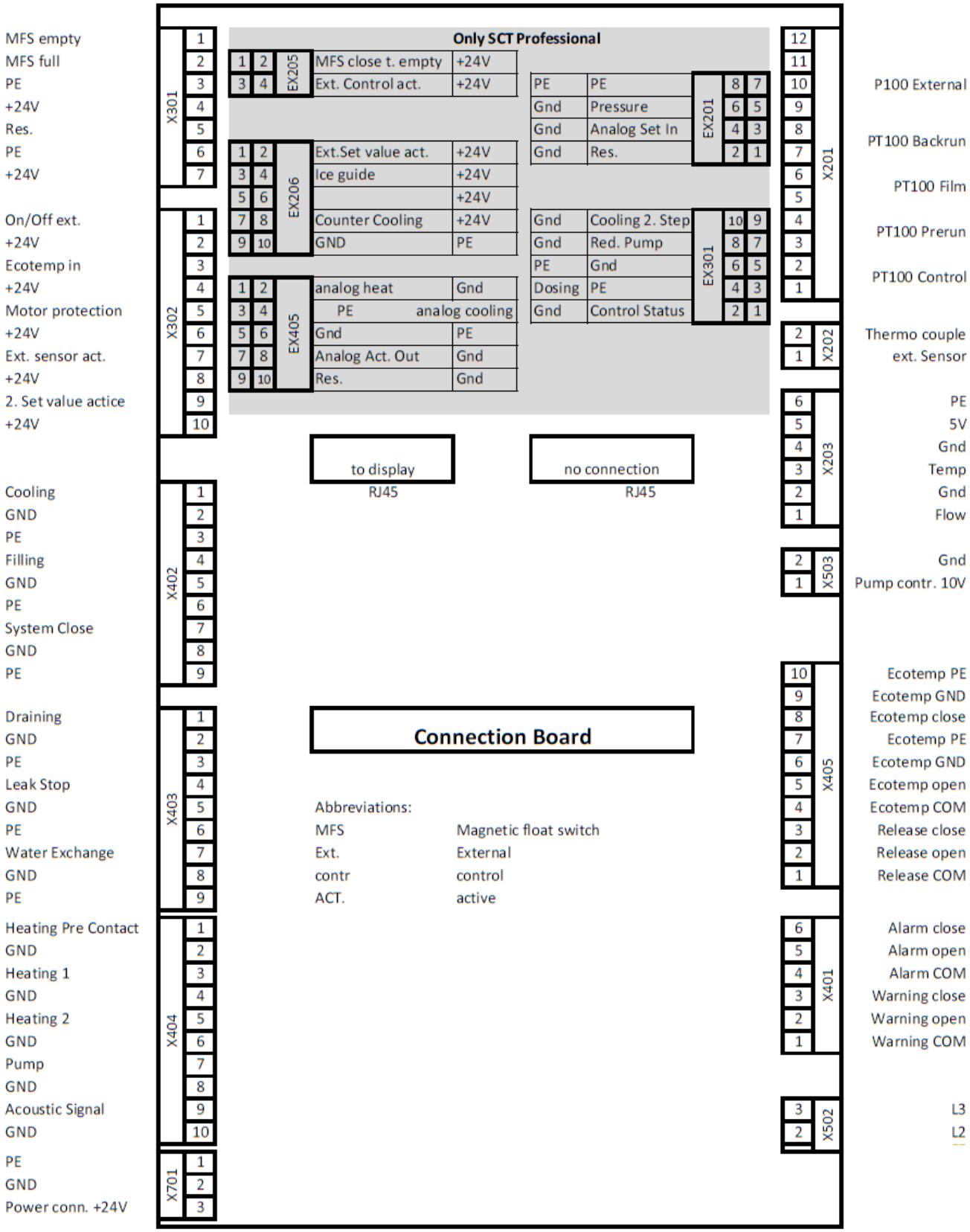
The system stores records of process data at the specified interval. Each record includes, for example, operating state, key temperature values, flow and temperature. These records can be download under Up/Download onto an USB-Stick. The records are saved in a text-file under temperatureSystem/logger.

The default value is 1 Minute.

5.10 Offset and analog values

The user can adjust sensor measurement values in this view. The following values must be specified:

6. Connection diagram and jumpers



Basic board

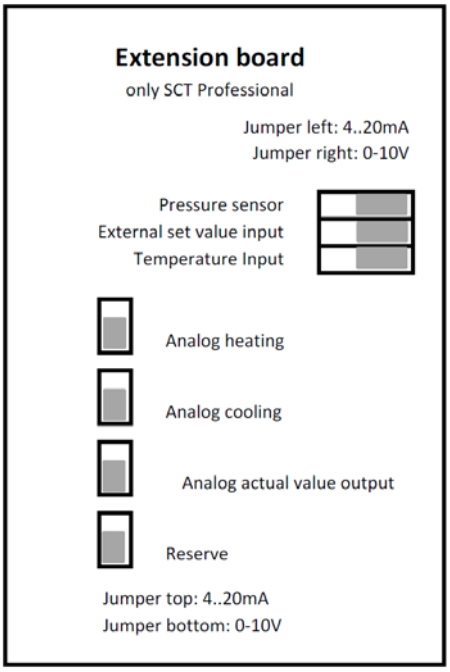
Jumper left: 4..20mA
Jumper right: 0-10V

Jumper

Temp.Sensor Flow
Flow
Pump Control

Jumpered as 0..10V, if not specifically specified

In change of setting, controller parameters have to be changed,too


Extension board
only SCT Professional
Jumper left: 4..20mA
Jumper right: 0-10V
Pressure sensor
External set value input
Temperature Input
Analog heating
Analog cooling
Analog actual value output
Reserve
Jumper top: 4..20mA
Jumper bottom: 0-10V

7. Hardware Inputs and Outputs

7.1 Hardware-Inputs

Connection	Typ	Description	Type of Input	Function	S	P
X201.1	Sensor input	Temp. Control	Pt 100 2 wire	Prerun temperature for Temperature control and display	X	X
X201.3	Sensor input	Prerun	Pt 100 2 wire	Prerun temperature for Prerun temperature monitor and display	X	X
X201.5	Sensor input	Filmtemperature	Pt 100 2 wire	Filmtemperature for temperature limiter function and display	X	X
X201.7	Sensor input	Backrun temperature	Pt 100 2 wire	Backrun temperature for Backruntemperature monitor and display	X	X
X201.9 (PT100)/ X202 (Thermoelement)	Sensor input for external Temperature-sensor	Temperature external	Pt 100 3-wire Fe-CuNi Type J Fe-CuNi Type L- NiCr-Ni Type K	Sensor input	X	X
EX201.5	Pressure input	Pressure	0 to 10 V analog 4 to 20 mA analog	Pressure monitor		X
X203.1	Flow	Flow	0 to 10 V analog 4 to 20 mA analog	Flow input	X	X
X203.3	Sensor input	Temperature Flowsensor	0-10V analog	Temperatureinputssignal	X	X
EX201.3	Setpoint input	Setpoint	0 to 10 V analog 4 to 20 mA analog	Setpoint input		X
X302.1	On/Off	On/Off	Digital Input	0 = Off I = On from external	X	X
X301.1	Magnetic float switch empty	Empty	Digital Input	0 = unit empty	X	X
X301.2	Magnetic float switch full	Voll	Digital Input	I = unit full	X	X
EX205.1	Magnetic float switch filling	Close to be empty	Digital Input	Function see description		X
X302.3	EcoTemp	Eco on	Digital Input	Input (alternative: Flow monitoring I = Flow	X	X

				0 = no flow)		
X302.5	Motor protection	Motor protection	Digital Input	I = Motor o.k.t 0 = Motor protection released	X	X
X302.7	External Sensor active	External sensor on	Digital Input	1 = External Sensor active 0= Internal Sensor active	X	X
X302.9	2. Setpoint active	2. Setpoint active	Digital Input	1 = 2. Setpoint active 0= Setpoint active	X	X
EX205.3	External Controller active	External Controller active	Digital Input	1 = External Controller 0= Internal Controller		X
EX206.1	External Setpoint	External Setpoint active	Digital Input	0 = External setpoint not active I = External setpoint active		X
X502	Phase control	Phase control	3p, to 600V		X	X
EX206.7	Flow Measuring Cooling water		impulse counter 1 kHz	Monitor and display of der Cooling water flow		X
X301.5	Reserve 1/Chiller Pressostat	Reserve 1	Digital Input	For Chiller: too high pressure at Pressostat	X	X
EX206.3	Reserve 2/Chiller antifreeze	Reserve 2	Digital Input	For Chiller: Anti Freeze monitoring		X
EX201.1	Sensor input	Temperature extern	0..10V/4..20mA	Sensor input		X

7.2 Hardware-Outputs

Belegung	Benennung	Art des Outputes	Schaltfunktion	S	P
X404.3	heating 1	Digital Output	SSR	X	X
X404.5	heating 2	Digital Output	(currently not used)	X	X
X402.1	kühlen	Digital Output	Magnetic valve cooling	X	X
X404.1	Heating enabled	Digital Output	Heating contactors	X	X
X402.4	Filling	Digital Output	Magnetic valve Filling	X	X
X404.7	Pump	Digital Output	Pump contactor	X	X
X402.7	System closing	Digital Output	Magnetic valve system close	X	X
X403.1	Draining	Digital Output		X	X
X403.4	Leak stop	Digital Output		X	X
X403.7	Water exchange	Digital Output		X	X
X405.3	Release Temperature limiter	Relaisoutput Closer	Release of external Temperature limiter	X	X
EX301.1	System on	Digital Output	Output unit on		X
X405.5/8	EcoTemp	Relais		X	X
X401.2/3	Warnings	Relais output opener/closer		X	X
X401.5/6	Sammelalarm	Relais output opener/closer		X	X
EX405.1	Analog heating	Analog Output	0 to 10 V or 4 to 20 mA		X
EX405.4	Analog cooling	Analog Output	0 to 10 V or 4 to 20 mA		X
EX405.7	Actual value output	Analog signal	0 to 10 V or 4 to 20 mA		X
X404.9	Beeper	Piezo	Warnings and alarms	X	X
X503	Pump control	Analog Output	For Frequency converter 0-10V	X	X
EX301.4	Dosierpumpe	Digital Output			X
EX301.7	Redandant pump	Digital Output			X
	Reserve 1	Digital Output			
EX301.9	Reserve 2/chiller: 2. Step	Digital Output			X
EX405.9	Reserve 3	Analog output	0 to 10 V oder 4 to 20 mA		X

Digital Output: Output 24 VDC, max. 0.5 A

8. Parameter lists

Unit Control

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Draining time	10..900 sec	10	X	Tool Draining time (optional)	X	x
Filling	Manually/Automatic	Automatic			X	X
Temperature Control	Internal/external	Internal	X	Interne Control active Externe Control active	X	X
Pump Shut Off	On/Off	On		Off: Units stops immediately On: Unit cools down	X	X
Switch off temperature	30..90°C/F	60°		Unit cools down to this temperature		
Indirect/direct Cooling	Indirect/Direct	Indirect	X		x	X
Setpoint	See Funktion	Setpoint		Setpoint, 2. Setpoint2, external setpoint (only SCT-P)	x	(x)
Type external Sensor	PT100, 3-wire Fe-CuNi Type J Fe-CuNi Type L- 4..20mA bzw.0-10V	PT100	x	4..20mA or 0-10V only SCT-P	X	(x)
External Sensor	Internal/External	Internal		Temperature control on internal/external sensor (external only with a valid sensor signal)	x	X
Actual value output	Actual control value/ external sensor/ internal sensor	Actual Control value		See description		X
Aquatimer Starting time	5..120 min	5 min		Aquatimer starts after this time	x	X
Aquatimer cycles	Off, 1..40	Off		If more filling cycles: Unit generates an alarm	x	X
Maximum Filling duration	1..99 min	10 min		Alarm, if exceeded	x	X
Protection against automatic	On/Off	On			x	X
Sampletime	1sec..10 min	1 min		One data record in the sample time	X	X
Maximum temperature Cooling water	20..100°	50°		Only with optional valve		X

Water exchange (Optional)

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Water exchange time	Off, 1..30 sec	Off	X	Duration water exchanges	x	x
Water exchange intervall	Off, 1..300 min	Off	X	Time between water exchanges	x	x

(Remark: Manuel Water exchange by pressing of tile water exchange tile in main menu)

Pump control (with optional frequency converter)

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Type of Pump control		Full power	x		x	x
Fixvalue in %	30..100 %	100%	x		x	x
Fix flow value	0..9999	100ltr/min	x		x	x
Tolerance actual value	0..10K	1K	x		x	x
Tolerance Diff.Prerun/Backrun	1..20K	5K	X		x	x

EcoTemp

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Start none cooling period	0..100 sec	10	X		X	X
Duration none cooling period	0..1000 sec	30	X		X	X
Timer Standby-Mode	0..2000 sec	60	X	Timer für den Standby-mode	X	X

Alarms and and limits

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Setpoint	Lower/upper Setpoint limit.	20°			X	X
2. Setpoint	Lower/upper Setpoint limit	20°			X	X
Configuration Temperature warning	Off or as described in Function	Off		Signal value Limit value Comparator Comparator with readyness	X	X
Value Temperature warning	Off, -30..400°	0°			X	X
Upper setpoint limitation	0..400°C	90°			X	X
Lower setpoint limitation	-30..149°C (lower than upper value)	10°			X	X
Alarm prerun temp.	Off, Lower to upper setpoint limitation +5K	95	X		X	X
Alarm film temperature	Off, -30..400°C	Off	X		X	X
Warning ΔT	Off, 0,1..20K	Off	X	Delta-T-Monitoring prerun/backrun	X	X
Warning Backrun temp.	Off,-30..400°C	Off	X	-	X	X
System closing-temperature	Off, 35..90°	Off		-	X	X
Alarm Minimum flow	Off, 1..600ltr/min	Off	X	Must not be changed (flow which is required for unit)	X	X
Warnmeldung low flow	Off, 1..600ltr/min	Off	X	Flow which is required for process	X	X
Warning high flow	Off, 1..600ltr/min	Off	X	Only for process reasons	X	X
Warning pressure high	Off, 0,0.. 50bar	Off	X			X
Warning pressure low	Off, 0,0.. 50bar	Off	X			X
Unit stops if alarm occur	On, Off	Off			X	X

Temperature control

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Limitation regulation ration heating	0..100%	100%			X	X
Limitation regulation ration cooling	0..100%	100%		.	X	X
XP-heating	Off, 0,1..99,9% (Aufl 0,1)	3%			X	X
TV-heating	Off, 1..200 sec	18sec			X	X
TN-heating	Off, 1..999 sec	90sec			X	X
XP-cooling	Off, 0,1..99,9%	6%			X	X
TV-cooling	Off, 1..200 sec	18			X	X
TN-cooling	Off, 1..999 sec	90			X	X
Dead zone between heating/cooling	Off, 0,1..10°C	Off		Heating or cooling in this area.	X	X
Switching cycletime heating	1..240 sec	10			X	X
Switching cycletime cooling	1..240 sec	10			X	X
Setpoint ramp increasing	Off, 0,1..99,9 K/min	Off		-	X	X
Setpoint ramp decreasing	Off, 0,1..99,9 K/min	Off		-	X	X
Hysteresis Cooling switch on	0,5..10K	1,0		Only for chillers	X	X
Hysteresis Cooling switch off	0,5..10K	1,0		Only for chillers	X	X
Hysteresis Cooling switch on 2. step	0,5..10K	0,5		Only for chillers	X	X
Hysteresis Cooling switch off 2. step	0,5..10K	0,5		Only for chillers	X	X
Actual value output upper value	-30..400	400				X
Actual value output lower value	-30..400, (lower than upper value)	0				X
Control prerun or backrun	Prerun/backrun	prerun			X	X
dT Cascade control	Off, 0..100°C	Off		Difference external sensor to	X	X

				control sensor		
Limiter film temperature	Off, 100..400	370		Limitation of regulation ratio if exceeded	X	X
tolerance film temperature	0..20	10			X	X
Limiter Cooling water temperature	Off, 50..120°	90		Limitation of regulation ratio if exceeded	X	X
Tolerance Cooling water temperature	0..20	10			X	X

Offset values

Parameter	Range	Default	Enabler	Function overview (more information in section of this manual)	S	P
Offset control sensor	-199..+199 K	0			X	X
Offset external sensor	-199..+199 K	0			X	X
Offset backrun sensor	-199..+199 K	0			X	X
Offset prerun sensor	-10..+10 K	0			X	X
Offset Film sensor	-10..+10 K	0			X	X
Flow Offset	-99..99 l/min	0			X	X
Cooling regulation offset	Off,100 %	Off		Too avoid small regulation for analog cooling valves	X	X
Output actual value	4..20mA/0-10V	o..10V				X
Input setpoint	4..20mA/0-10V	0..10V				x